

June 21, 2016

**SPECIAL PERMIT &
SITE PLAN APPROVAL NARRATIVE**

To Accompany an Application for Special Permits
and Site Plan Approval

For

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266 Waverly Street
Framingham, MA

Prepared for:

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NITSCH PROJECT #11085



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SECTION 1

SPECIAL PERMIT/SITE PLAN NARRATIVE

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1.0 PROJECT SUMMARY

The proposed development at 266 Waverly Street in Framingham, Massachusetts (the “Site”) consists of a 270-unit multi-family six-story residential apartment building with associated parking, utilities, and site improvements (the “Project”). The Site area is approximately 3.0 acres, all of which will be associated with the proposed residential use. The Project will be developed as apartments, and the building and the property will be owned and managed by an affiliate of Mill Creek Residential Trust (the “Proponent”) in its entirety.

2.0 EXISTING CONDITIONS

2.1 Existing Site Development

The Site is currently completely developed and includes two retail buildings with building footprints of 32,861 and 1,546 sf. The Site contains a 136-space parking lot with landscape islands and concrete curb. A loading/service area is located at the rear of the larger retail building at the intersection of Marble Street and Blandin Avenue.

The Site is accessed by six driveway curb cuts at the following locations (distances noted from centerline of curb cut to centerline of roadway):

- On Waverly Street approximately 135 feet east of Marble Street;
- On Waverly Street approximately 280 feet east of Marble Street (exit only);
- On Marble Street approximately 84 feet south of Waverly Street;
- On Marble Street approximately 278 feet south of Waverly Street;
- On Blandin Avenue approximately 65 feet northeast of Marble Street; and
- On Blandin Avenue approximately 315 feet northeast of Marble Street (gated driveway).

Nearly the entire Site is covered by impervious surfaces including building roofs, paved parking and access areas, and paved pedestrian areas. Of the 3.0 acres, approximately 2.4 acres are impervious. Pervious cover consists of various types of plant beds and landscaped areas.

2.2 Site Utilities (municipal systems)

Sanitary Sewer

The sewer service for the larger retail building is located on the south side of the building and consists of an 8-inch polyvinyl chloride (PVC) pipe. This sewer service passes through two sewer manholes in the loading/service area before tying into a 10-inch VC sewer main in Marble Street at a sewer manhole just south of the roadway. The sewer service for the smaller retail building is on the north side of the building and connects to a 10-inch VC sewer pipe in Waverly Street at a sewer manhole.

Water Services

The domestic water service to the larger retail building comes from a 6-inch water main in Blandin Avenue and enters the south side of the building. Record tie cards indicate this water service is a 2-inch CI pipe. The water service to the smaller retail building comes from a 12-inch water main in Waverly Street and enters the west side of the building. Record tie cards indicate this water service is a 1.5-inch plastic pipe.

Although there is apparently no existing fire protection service connection for the existing buildings, there are multiple existing public hydrants located in the area of the Project. Those locations are as follows:

- On the south side of Waverly Street approximately 85 feet east of Marble Street;
- On the west side of Marble Street approximately 260 feet northwest of Blandin Avenue; and
- On the east side of Blandin Avenue approximately 270 feet northeast of Marble Street.

Storm Drainage

The existing parking lot storm drainage system includes three catch basins, six drain manholes, an oil/water separator, and drain pipes of various sizes from 6 inches to 15 inches and various materials (RCP, PVC, and HDPE). Record plans indicate the site parking lot storm drainage system discharges from the Site via a 15-inch RCP drain pipe that heads towards Blandin Avenue. A topographic survey conducted by Nitsch Engineering confirmed the presence and general direction of this pipe connection. Further investigation is required to identify the actual connection point and to confirm its condition. This investigation will be undertaken by the Proponent prior to initiation of construction activity.

Additional site drainage includes a catch basin northeast of the smaller retail building that ties into the Waverly Street storm drainage system. A second catch basin south of the larger retail building picks up roof drainage from the building and ties into the Blandin Avenue storm drainage system.

2.3 Other Characteristics

Several environmental and regulatory factors have been evaluated in terms of effects on the redevelopment potential for the Site. None of the following factors has been determined to be applicable to the Site or Project:

- Wetland resource areas & flood plain
- Wildlife habitat
- MEPA permit thresholds
- Historically significant resources

3.0 PROPOSED CONDITIONS

3.1 Proposed Redevelopment Overview

The Project involves complete demolition of all existing site improvements including buildings, pavements, signage, site utilities, and landscaping. A new 270-unit residential building will be constructed as previously described. Related site construction will include new vehicular parking and access areas, pedestrian access ways and recreation areas, building utility services, stormwater management infrastructure, and landscaping.

3.2 Construction Period

Access and Site Management

The Site will be secured and completely enclosed by a construction security fence. Access for construction vehicles and personnel will occur in the vicinity of the new vehicle driveways at Waverly Street and Blandin Avenue. Temporary construction facilities and equipment including office trailer(s), dumpster(s), portable sanitary facilities, and large excavation/construction equipment, will be located within the limits of the construction site enclosure. Parking of personal vehicles by construction personnel will occur on the construction site to the extent practical, and some on-street parking in designated parking areas may be required. Due to the relatively compact nature of the Site with regard to the proposed building footprint area, it is anticipated that material stockpiling on the Site will include limited storage of construction materials and supplies and that large volume soil stockpiling will not occur. All products of demolition including but not limited to grubbed stumps and landscape waste, construction debris, and rubbish will be removed from the Site and legally disposed of.

Erosion and Sediment Control

The Site is relatively flat with little to no areas that will represent substantial erosive concern during construction. As a precaution, the Site will be enclosed with a staked silt fence to prevent incidental conveyance of sediment from disturbed areas. All existing drain inlets on or in close proximity to the Site, and all new drain inlets, will be fitted with filter basket inserts to trap sediment during the construction period. In order to prevent vehicles from tracking sediment onto adjacent public ways, a stone tracking pad (a.k.a. stabilized construction entrance) will be installed at the two construction access drives.

The erosion and sediment control measures will remain in place until all construction activity is complete and the landscaped areas of the Site are fully stabilized. The contractor will be required to inspect all controls regularly to ensure that the controls are working properly, and to clean and/or reinstall any control on an as-needed basis. The proposed project will disturb greater than one acre of land, and as such, filing of a National Pollutant Discharge Elimination System (NPDES) Stormwater Construction General Permit is required. A corresponding Stormwater Pollution Prevention Plan (SWPPP) will be prepared for the NPDES permit, and will prescribe in detail the performance standards to which the contractor for the Project will be responsible. The SWPPP will be maintained at the construction site throughout the duration of the Project.

3.3 Stormwater Runoff Conditions

The Project will result in a net reduction in impervious area of 2,874sf (Table 1).

Table 1. Existing and proposed land cover types for the Project

Land Use	Existing (sf)	Proposed (sf)	Change (sf)
Impervious Area (roof, pavements)	104,317	101,443	(-) 2,874
Pervious Area (vegetation, landscape)	26,548	29,422	(+) 2,874
Total	130,865	130,865	---

A hydrologic model was used to evaluate overall stormwater runoff characteristics of the Site under pre-development and post-development conditions. The hydrologic model was developed using HydroCAD stormwater modeling software. The resulting data sheets are included in Section 5. The hydrologic model confirmed that the reduction in impervious area represents a corresponding slight reduction in peak stormwater runoff rate and volume compared to the pre-development site condition (Table 2 and Table 3).

Table 2. Pre-Development and Post-Development Peak Runoff Rate

Design Storm	Pre (cfs)	Post (cfs)	Change (cfs)
2 year	7.3	7.0	(-) 0.3
10 year	11.7	11.5	(-) 0.2
25 year	14.0	13.9	(-) 0.1
100 year	17.6	17.4	(-) 0.2

Table 3. Pre-Development and Post-Development Runoff Volume

Design Storm	Pre (ac-ft)	Post (ac-ft)	Change (ac-ft)
2 year	0.56	0.52	(-) 0.04
10 year	0.91	0.87	(-) 0.04
25 year	1.10	1.06	(-) 0.04
100 year	1.39	1.35	(-) 0.04

3.4 Site Utilities (municipal systems)

Stormwater Management System

The Project includes the installation of a new stormwater management system designed in accordance with the MassDEP Stormwater Management Standards. The stormwater management system will provide water quality treatment of flows from paved/trafficked surfaces prior to discharge from the site and into the municipal stormwater system.

Runoff from the surface parking lot will be collected in deep sump hooded catch basins and routed through a water quality structure (Contech Model CDS2015-4). This treatment train will provide total suspended solids (TSS) removal in excess of the MassDEP removal requirement of 80%.

Roof runoff will be routed separately and connected to the site discharge pipe “downstream” of the treatment chamber. The roof runoff will also be routed to two separate discharge points to mimic existing site flow patterns. A portion of the new roof area will drain to the existing discharge pipe that will accept flow from the parking area. A section of the building roof, roughly corresponding to the existing building roof area, will be routed to the southerly side of the Site and will discharge to the municipal drainage system at the point of connection of the existing building.

Because stormwater runoff from the Project will be slightly less in volume and peak rate than that corresponding to the existing site condition, and because the existing flow patterns will remain generally unchanged, no adverse effects on adjacent/abutting properties are anticipated.

The increase in pervious cover that will result from the Project also represents an increase, albeit slight, in the amount of groundwater recharge from the Site.

Sanitary Sewer

The Project includes a proposed sanitary service connection to the existing 20” sewer main in Waverly Street. Table 3 shows the capacity of the 20” sewer main as well as the 10” sewer main to which the existing buildings are currently connected.

Table 3. Existing Sewer Main Flow Capacities

Sewer Dia. (in)	Slope (%)	“N” Value	Capacity (cfs)
10	0.27	0.015	0.98
20	0.18	0.015	5.11

The estimated proposed sewer flow for the residential development is 48,400gpd, or 0.075cfs, which is based on 270 residential units with a total of 440 bedrooms (310CMR 15.000 – Title 5 criteria). Assuming a peaking factor of 3, the adjusted peak flow for the Project is estimated at 0.22cfs. Because this represents approximately 4.3% of the total capacity of the existing sanitary sewer main, it is likely that the municipal sewer system has capacity to accept flow from the Project.

In an effort to verify this assumption, the Proponent intends to conduct flow monitoring in the two existing sewer mains in Waverly Street. The results of the monitoring effort will be reported to the Framingham Department of Public Works for review.

Water Services

Domestic water and fire protection services for the Project will be derived from new 6”D1CL and 8”D1CL tap connections, respectively, to the existing 12” water main in Marble Street. In lieu of a peak water demand calculation based on a plumbing fixture unit count, the daily water usage for the Project is currently estimated at 110% of the Title 5 sanitary sewer flow, or 48,400gpd x 110%, 53,240gpd. Assuming a peaking factor of 3, the corresponding peak water usage is estimated at 110gpm. A more accurate estimate of domestic water demand will be provided by the Applicant as the building design progresses.

4.0 TRANSPORTATION

4.1 Transportation Impact Assessment

Vanasse & Associates, Inc. (VAI) conducted a Transportation Impact Assessment (TIA), attached hereto (the “Traffic Report”), in order to determine the potential impacts on the transportation infrastructure associated with the Project. This assessment was prepared in consultation with the Town of Framingham and the Massachusetts Department of Transportation (MassDOT); was performed in accordance with MassDOT’s *Transportation Impact Assessment (TIA) Guidelines*; and was conducted pursuant to the standards of the Traffic Engineering and Transportation Planning professions for the preparation of such reports. Based on this assessment, we have concluded the following with respect to the Project:

1. The Project is expected to generate 1,672 new vehicle trips on an average weekday (836 entering and 836 exiting), with approximately 129 new vehicle trips (25 entering and 104 exiting) expected during the weekday morning peak hour and 158 new vehicle trips (103 entering and 55 exiting) during the weekday evening peak hour.
2. It should be noted that the Project will generate less traffic during the weekday evening peak hour and on a daily basis, in comparison to if the Site were to be re-tenanted with retail uses.
3. The Project will not have a significant impact (increase) on motorist delays or vehicle queuing over Existing or anticipated future conditions without the Project (No-Build conditions);
4. No apparent safety deficiencies are expected at the study intersections. Specific safety-related improvement measures have been identified and implemented for the Town at the Waverly Street/Bishop Street/Beaver Street intersection to address prior safety and capacity concerns.

A total of four curb-cuts will be closed with the development of the Project, and two curb-cuts relocated. The two full-access curb-cuts on Marble Street and the one full-access curb-cut on Waverly Street will be closed, and the right-in/right-out only curb-cut on Waverly Street will be closed and relocated to the

east. The loading entrance will be closed on Blandin Avenue, and a relocated driveway will serve the location.

In consideration of the above and as more fully set forth in the Traffic Report, we have concluded that the Project can be accommodated within the confines of the existing transportation infrastructure in a safe and efficient manner with implementation of the recommendations set forth in the Traffic Report.

4.2 Parking

The Project will consist of 270 residential apartment units and 409 parking spaces (358 parking spaces in a 2-level parking garage beneath the residential units and 51 parking spaces in a surface parking lot). The proposed parking supply meets the Town requirements, as set forth in Table 1 below. There is no on-street parking in the immediate vicinity of the Site and all parking will be accommodated on-site. In order to minimize the Project impact on parking, the Proponent will implement a Transportation Demand Management program which includes providing secure bicycle parking on-site and promotion of public transportation service in the area.

Table 1. Proposed Unit Types and Parking Requirements

Unit Type	# Units	Min. Spaces per Unit	Min. Spaces
Studio	30	0.5	15
One Bedroom	95	1	95
Two Bedroom	120	1.5	180
Three Bedroom	25	2	50
Total	270		340

5.0 PLANNING CONSISTENCY

5.1 Compliance with Section II.1.3 of Zoning Bylaw

The Project repurposes an existing surface parking lot and vacant retail structure into multifamily residential use consistent with Central Business Zoning District. The Project also will include the construction of a new sidewalk to improve the safety of pedestrian access to the adjacent streets and businesses. The Project will include balconies for residents, and several units will have metal French balcony railings. At grade, the building will provide a consistent residential edge, with projecting bays, front gardens and an activity street façade along Waverly Street.

5.2 Compliance with Section II.1.4(a)-(k) of Zoning Bylaw

Building Scale

The building's architectural components will be clearly expressed, with a precast concrete base, a brick veneer middle, and a cementitious panel cornice. The building will be 70 feet (six stories), which is allowed as-of right in the Central Business Zoning District. The building's ground level height is 15 feet, and will have a ceiling height of 12'. This is because we do not have retail but Residential Amenity space and parking beyond. The Amenity space will activate the ground floor all day long which is in harmony with the objectives of the bylaws. Projection bay elements will vary in height but will not exceed 70 feet.

Facades

To avoid creation of a flat façade, the building provides a number of bays and stepped projections, balconies, windows featuring metal French balcony railings, and projecting cornices. The materials vary between brick veneer, cementitious panels and cementitious clapboards to provide a residential feel. The building is further defined by projecting corner elements with a continuous set back, including projecting bays, which helps to avoid continuous massing. The bays are a multi-story element clad in cementitious panel. The corners of the building are emphasized through use of a brick veneer and cementitious panels to create a vertical element to book end the massing. The sides of the building materials vary between brick veneer, cementitious panels and cementitious clapboards to provide a residential feel. The project does not include blank walls greater than 20 feet in width from a visible street.

Windows

The Waverly Street façade incorporates 70 percent transparent glazing on the ground floor and the Marble and Blandin Street façades incorporates 50 percent transparent glazing on the ground floor. Although this exceeds the 60 percent and 40 percent, respectively, required under Section II.1.4, the increased transparent glazing was used in the Project design because it provides an added benefit of street level activity, which is in harmony with the objectives of the By-Law and ultimately beneficial to the Project from a planning perspective. Moreover, any adverse effect from the additional transparent glazing is mitigated by the fact that no portion of the façade will be constructed of glass that prevents pedestrian visibility of the interior ground floor activities. The upper floor windows will be single hung windows consistent with adjacent styles and in context with the use of the new building, and will not be larger than the ground floor windows.

Entrances

The primary building entrance will be located on Waverly Street and will lead directly to a public sidewalk. Doors do not extend beyond the exterior façade into a pedestrian pathway. The parking garage entrances are located interior to the property line with direct access from the surface parking area to eliminate conflict with pedestrians and vehicles. Audible notifications are planned at all egress locations of the parking garage to increase pedestrian safety.

Parking

The Project will provide two levels of structured parking consisting of 358 spaces, an additional 51 surface parking spaces will be provided on site for a total of 409 spaces. Per Zoning the required parking under the By-Law is 340 spaces. Twenty of the parking spaces within the garage will be compact size. The surface parking towards the north of the property will have a continuous fence located along the property line such that the parking will not be visible from the adjacent properties. The lighting design for the parking and loading area will enhance safety while minimizing light spillover onto adjacent properties.

External Materials

The building's architectural materials will be clearly expressed, with a precast concrete base, a brick veneer middle, and a cementitious panel cornice. The building will include cementitious siding and panels along portions of Marble and Blandin Street elevations. The project will not be using simulated and/or prefabricated brick or stone, particle board, plywood, and/or aluminum and vinyl siding on any of the street facing facades.

Awnings and Canopies

The project will have an entrance canopy located at the Waverly Street entrance, which will enliven the ground floor and provide shelter to those entering and exiting the building.

Roof Form

The roof forms and lines are consistent with the intent of the Design Handbook for the Central Business Zoning District. The roof of the building is defined by the projecting corner elements, interrupted cornice projections and material changes that relate to the façade. The building will have a continuous parapet to screen the roof top equipment from the street view. The Project will have individual condenser units mounted on the roof. The inclusion of the roof parapet will accommodate the soundproofing for the condensers.

Service Areas, Utilities and Mechanical Equipment

Service and loading areas will be located on the north side of the property adjacent to the surface parking lot. The electrical transformer will be located on the north side of the property to the north of the surface parking lot and will be screened on three sides with appropriate vegetation. The Project will not use chain linked fence for screening.

Sidewalks

To increase safety as well as enhance the resident living experience, the building maximizes the windows facing public streets. In addition, the amenity and entrance at Waverly Street will be predominantly glass. Sidewalks on Waverly Street will provide adequate space for all users and trees/plantings. Bike parking will be located adjacent to the vehicle drop off area on the north side of the site adjacent to the entrance. The front setback will be used to provide space for planters.

Signage

All signage will comply with the Town's Sign By-Law.

6.0 ENVIRONMENTAL IMPACT

6.1 Stormwater Management

The proposed stormwater management system is designed in accordance with the MassDEP Stormwater Management Standards. Best Management Practices (BMPs) in the form of deep sump hooded catch basins and a water quality treatment chamber will be used to effectively treat stormwater prior to discharge from the Site. As previously stated, the Project represents a decrease in impervious area, and also represents a slight decrease in net stormwater runoff rates and volumes.

Verification of pipe flow capacity for the 25-year design storm event was completed using AutoDesk's Storm and Sanitary Analysis (SSA) software. The associated data sheets reflecting this analysis are attached. TSS removal calculations and water quality flow calculations that describe the effectiveness of the proposed stormwater treatment BMPs are also attached.

6.2 Stormwater Management System Maintenance

A Stormwater Operation and Maintenance Plan is attached that was prepared in compliance with Standard 9 of the 2008 MassDEP Stormwater Handbook to provide best management practices for implementing maintenance activities for the stormwater management system in a manner that minimizes impacts to wetland resource areas.

6.3 Long-Term Pollution Prevention

A Long-Term Pollution Prevention Plan has been prepared in compliance with the Standards 4 and 9 of the 2008 Massachusetts Department of Environmental Protection (MassDEP) Stormwater Management Standards, which require provisions for the following:

- Good Housekeeping
- Storing materials and waste products inside or under cover
- Vehicle washing
- Routine inspections of stormwater best management practices
- Spill prevention and response
- Maintenance of lawns, gardens, and other landscaped areas
- Storage and used of fertilizers, herbicides, and pesticides
- Proper management of deicing chemicals and snow

6.4 Landscape Design

The project will remove dead or invasive species currently present on site and introduce native or adapted plant species into the site plan. Landscape improvements will be installed along the project perimeter, which will provide landscape screening, shade during summer months and visual enhancements to the site. Open space areas located south of the proposed building and an internal courtyard space, will provide a variety of external amenity areas for residents to use throughout the year.

7.0 COMPLIANCE WITH ZONING BYLAW

7.1 Relief Requested

The Proponent controls the approximately 3.0 acre Site, which is located within the Central Business Zoning District at 266 Waverly Street, Framingham, Massachusetts. As noted above and shown in the plan set submitted herewith, the Site currently contains two retail buildings. The Proponent plans to remove the existing buildings to redevelop the Site and construct a six-story, 270-unit multi-family residential apartment complex.

The Proponent requests that the Framingham Planning Board (the “Board”) grant the requisite special permits, access permit, and site plan approval described below to develop the Project at the Site. As discussed in more detail in the preceding sections and as outlined in Sections 7.2, 7.3 and 7.4 below, the Project is in harmony with the objectives set forth in the Framingham Zoning By-Law (the “By-Law”) and satisfies the applicable criteria therein.

7.2 Compliance with Special Permit Criteria

The Project will require two special permits. Pursuant to By-Law §II.B (footnote 10), the Project will require a special permit to allow a multi-family dwelling use of over 30,000 square feet in the Central Business Zoning District. Pursuant to By-Law §V.F, the Project will also require a Land Disturbance Special Permit because the project will involve earth moving activity of more than 1,000 cubic yards and/or earth removal or earth fill of more than 400 cubic yards.

7.2.1 Special Permit II.B, Use

For the reasons set forth below, and as discussed more fully in the preceding Sections of this narrative, the Project satisfies the following Special Permit criteria set forth in By-Law §VI.E.3.:

The Site is appropriate for multifamily residential use. The purpose of the Central Business Zoning District is to promote “a livable urban downtown environment with a multitude of activities and pedestrian presence.” To encourage this, multi-family residential was added to the Framingham Zoning Bylaw in order to bring high-density residential use to the Central Business Zoning District and encourage an active, pedestrian friendly, atmosphere. The Project will further these purposes by bringing pedestrian activity to the district.

The Project will have adequate and appropriate facilities for the proper operation of multifamily residential use, including adequate off-street parking. The Project will include new vehicular parking and access areas, pedestrian access ways and recreation areas, building utility services, stormwater management infrastructure and landscaping. Specifically, the project will include 358 parking spaces in a 2-level parking garage beneath the residential units and 51 parking spaces in a surface parking lot, totaling 409 parking spaces. Accordingly, the Project will have safe and adequate facilities for the proper operation of multifamily residential use.

The use as developed will not create a hazard to abutters, vehicles or pedestrians. The Site will provide adequate pedestrian and vehicular access areas. As set forth in the Traffic Report, no traffic safety deficiencies are expected as a result of the Project. As further provided in Section 3.4 of hereof, no adverse effects on adjacent/abutting properties are anticipated as a result of stormwater runoff from the Project.

The use is consistent with the intent of the district in which the use is proposed, and with the purpose and intent of the By-Law. As stated above, the purpose of the Central Business Zoning District is to promote “a livable urban downtown environment with a multitude of activities and pedestrian presence.” To encourage this, multi-family residential was added to the Framingham Zoning Bylaw in order to bring high-density residential use to the Central Business Zoning District and encourage an active, pedestrian friendly, atmosphere. The Project will further these purposes by bringing multi-family residential to create pedestrian activity in the district.

All municipal services necessary to meet the needs of the proposed use are adequate and sufficient. Based on our consultations with the Town of Framingham, municipal service systems will adequately serve the Site. Excess stormwater will be discharged to a municipal drainage system (see Section 3.4 hereof). The Project will be connected to the existing 20” sanitary sewer main, and the municipal sewer system has capacity to accept flow from the Project. Moreover, the Traffic Report concludes that the existing transportation infrastructure can accommodate the Project in a safe and efficient manner. Finally, domestic water and fire protection services for the project will be derived from new tap connections.

7.2.2 Special Permit V.F, Land Disturbance

For the reasons set forth below, and as discussed more fully in the preceding Sections of this narrative, the Proponent requests that the Board find that the Project satisfies the following Land Disturbance Special Permit criteria set forth in By-Law §V.F.:

Site Management and Control. The majority of the site has already been disturbed as a result of the current development of the site. Despite this, the design of the building envelope for the Project and accessory structures, driveways, open spaces, etc. is aimed at limiting additional land disturbances. During construction, suitable areas will be designated for temporary uses such as the parking of construction vehicles, trailers and stockpiling of equipment and materials, dust control will be used appropriately, a gravel apron will be provided at any site access from a paved public way to prevent unstable material from being transported onto the roadway by vehicle tires, and temporary erosion and sedimentation control measures will be employed in accordance with the Best Management Practices (as defined in the By-Law). Moreover, all waste products, grubbed stumps, slash,

construction materials, etc., will be lawfully disposed of and will not be in any manner incorporated into the project site. We anticipate that the construction period will be 18-24 months.

Control of Stormwater Runoff. The Project will have control mechanisms in place for stormwater runoff. As a result, stormwater from the Project will be slightly less in volume and peak rate than that corresponding to the existing site conditions and existing flow patterns will remain generally unchanged. As a result, no adverse effects on adjacent/abutting properties are anticipated. Moreover, there will be no adverse impact to groundwater resources in terms of quantity or quality.

7.3 Compliance with Site Plan Approval Criteria

Pursuant to Section VI.F.2.c.2 of the By-Law, major site plan review is required for the Project because it entails construction of a new structure resulting in greater than 30,000 square feet of gross floor area. For the reasons set forth below, and as discussed more fully in the preceding Sections of this narrative, the Project promotes the objectives set forth in the By-Law, complies with the Project and Design Standards set forth in Section §VIF.5, and complies with the following goals and criteria:

Retain community character. The architectural design of the Project seeks to blend and harmonize with the architectural style of the adjacent residential buildings and surrounding neighborhood and to promote architectural consistency. As stated above, the Town specifically rezoned the Central Business Zoning District and promulgated the “Central Business Zoning District Design Review Standards” in an effort to encourage a mixed-use, pedestrian friendly streetscape. The Project adheres to such standards relating to building scale, facades, windows, entrances, parking, materials, etc. The Project has also been designed to screen features such as loading and storage areas, from neighboring properties and roadways. Blank walls greater than 20 feet in width are not visible from a street. The Project is also appropriate relative to the size and shape of the buildings within the neighborhood.

Traffic, parking and public access. As stated above, the Traffic Report concludes that the existing transportation infrastructure can accommodate the Project in a safe and efficient manner and that no traffic safety deficiencies are expected as a result of the Project. The Project will provide adequate pedestrian access ways and recreation areas to provide convenient and safe pedestrian access. The project will not require any on-street parking, as there will be adequate off-street parking provided.

Environmental Impact. The proposed stormwater management system is designed in accordance with the MassDEP Stormwater Management Standards and will effectively utilize Best Management Practices. In addition, a Stormwater Operation and Maintenance Plan has been prepared in compliance with Standards 9 of the 2008 MassDEP Stormwater Handbook, and a Long-term Pollution Prevention Plan has been prepared in compliance with the Standards 4 and 9 of the 2008 MassDEP Stormwater Handbook. The Project will comply with all laws regarding emission of noise, dust, fumes, noxious gases, radiation or water pollutants.

Health. As stated above, the Project will not create a hazard to abutters, vehicles or pedestrians. Moreover, the Project has been designed to minimize adverse air-quality impact, noise, glare and odors. Further, as stated above, the Project will comply with all laws regarding air quality and noise.

Public Service and Utilities. As stated above, municipal systems will adequately serve the Site. Excess stormwater will be discharged to a municipal drainage system (see Section 3.4 hereof). The Project will be connected to the existing 20” sanitary sewer main, and it is anticipated that the municipal sewer system has capacity to accept flow from the Project. Moreover, the Traffic Report concludes that the existing transportation infrastructure can accommodate the Project in a safe and efficient manner. Finally, domestic water and fire protection services for the project will be derived from new tap connections.

Land Use Planning. As stated above, the Town specifically rezoned the Central Business Zoning District and promulgated the “Central Business Zoning District Design Review Standards” in an effort to encourage a mixed-use, pedestrian friendly streetscape. The Project design is consistent with the land-use goals of the By-Laws, the Framingham Planning Board Project Review Guidelines and the Central Business Zoning District Design Review Standards. In addition, the Project’s landscape design incorporates native or adapted plant species that are well suited to the site conditions and local climate, can thrive without regular watering once established and are non-invasive plant species.

7.4 Access Permit

Pursuant to By-Law Appendix 10, the Project will require a Public Way Access Permit because the Project will involve physical modifications to existing accesses to a public way (i.e. closing four of the six existing curb cuts and relocating the remaining two). As set forth in the Traffic Report, the Project will provide sufficient roadway improvements to facilitate safe and efficient roadway operations, and construction or use of the new access will not create a condition that is unsafe or endangers the public safety and welfare. As stated above and as described in the Traffic Report, no traffic safety deficiencies are expected as a result of the Project.

7.5 Conclusion

In conclusion, the Project requires two special permits (a Use Special Permit to allow multi-family residential use and a Land Disturbance Special Permit), site plan review, and a Public Way Access Permit. For the reasons set forth herein, the Proponent requests that the Board grant the requisite permits and site plan approval described above to develop the Project at the Site. As discussed in Sections 7.2, 7.3 and 7.4 above, the Project is in harmony with the objectives set forth in the Framingham Zoning By-Law (the “By-Law”) and satisfies the applicable criteria therein.

SECTION 2
FIGURES

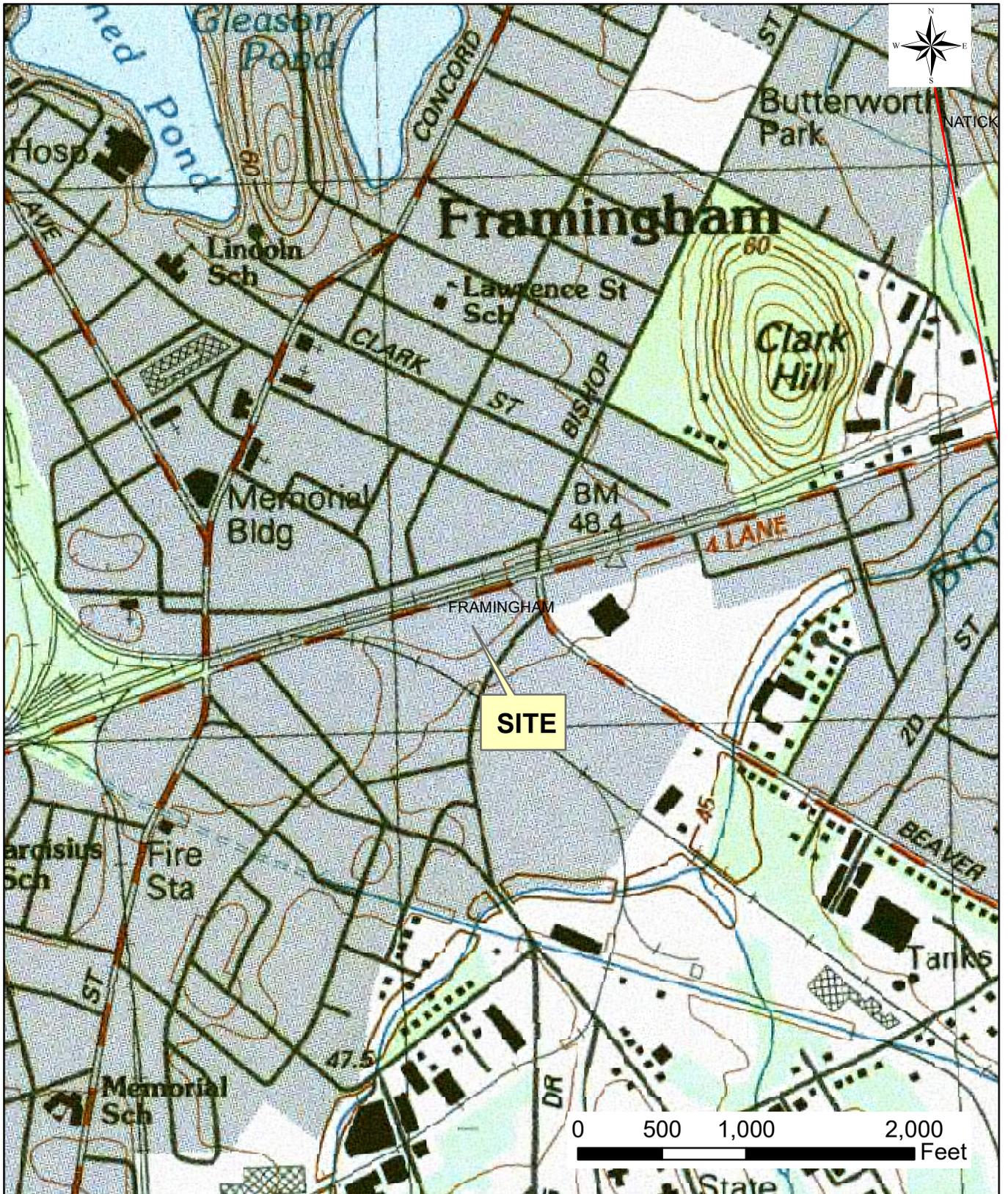


Figure 1: USGS Locus
 266 Waverly Street
 Framingham, MA



Figure 2: NHESP Estimated and Priority Habitats Map
 266 Waverly Street
 Framingham, MA

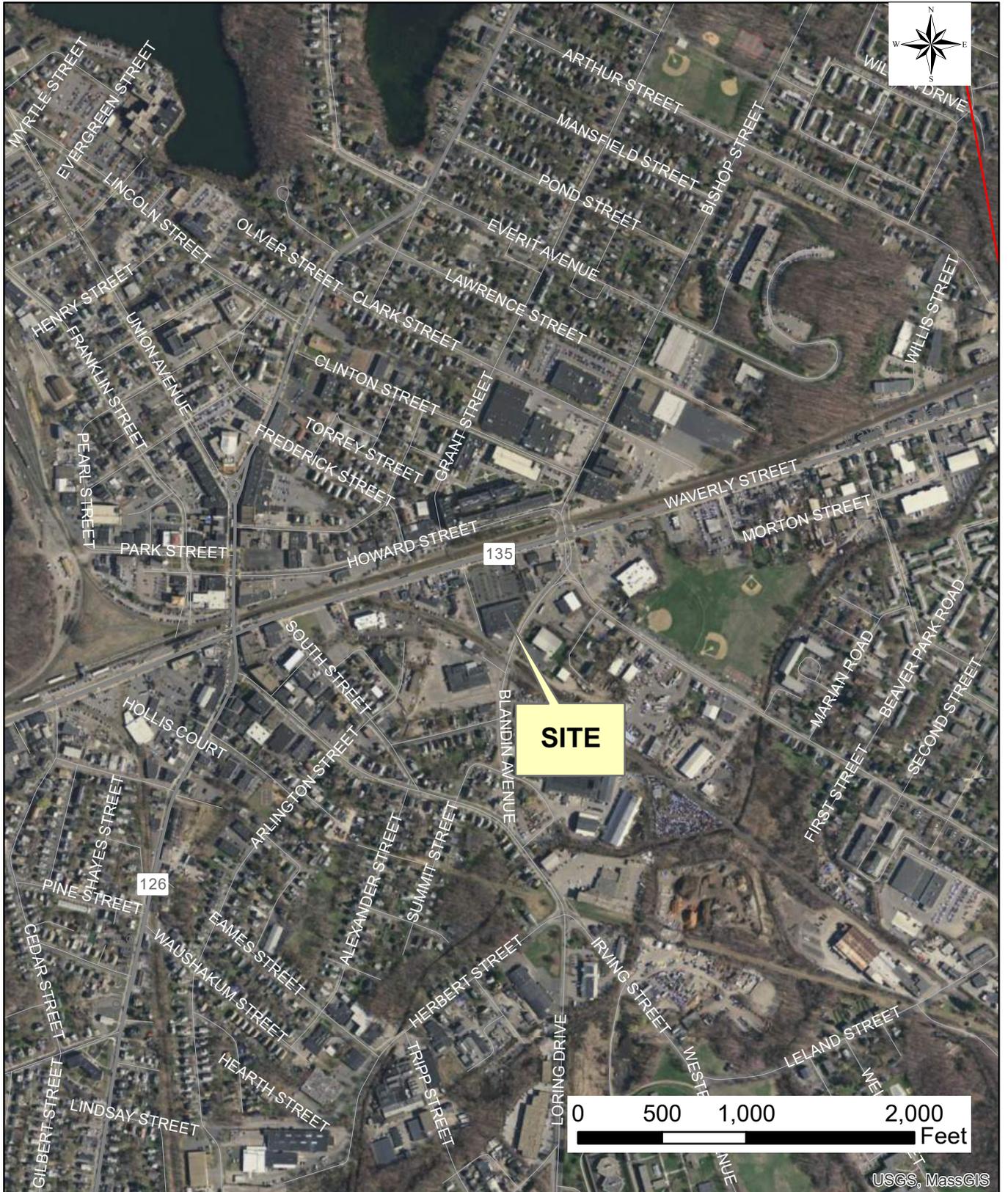


Figure 3: Locus Map
 266 Waverly Street
 Framingham, MA

Legend

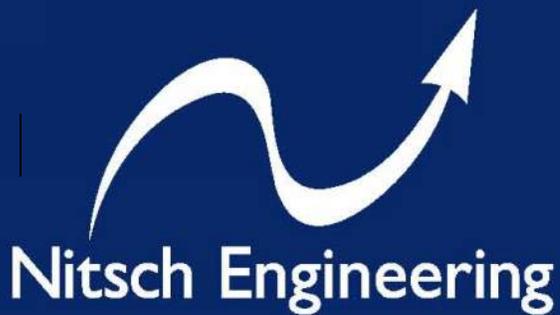
- Town Boundary
- MassDOT Major Roads**
- Administrative Type**
- Interstate
- U.S. Highway
- State Route
- MassDOT Roads

Data Source: MassGIS
 Nitsch Project #11085



SECTION 3

LONG-TERM POLLUTION PREVENTION AND STORMWATER OPERATION AND MAINTENANCE PLAN



**LONG-TERM POLLUTION
PREVENTION AND STORMWATER
OPERATION AND MAINTENANCE PLAN**

For

**MODERA FRAMINGHAM
266 WAVERLY STREET**
Framingham, Massachusetts

Prepared for:

MILL CREEK RESIDENTIAL
200 Wheeler Road
Burlington, MA 01803

Prepared by:

NITSCH ENGINEERING, INC.
120 Front Street, Suite 820
Worcester, MA 01608

Nitsch Project #11085

June 21, 2016

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1.0 INTRODUCTION

The purpose of this document is to specify the pollution prevention measures and stormwater management system operation and maintenance for the Modera Framingham project. The Owner shall implement the management practices outlined in this Manual and proactively conduct operations in an environmentally responsible manner. Compliance with this Manual does not in any way dismiss the Owner or occupants from compliance with other applicable Federal, State or local laws.

This Document has been prepared in compliance with Standards 4 and 9 of the 2008 Massachusetts Department of Environmental Protection (MassDEP) Stormwater Management Standards, which state:

Standard 4:

The Long Term Pollution Prevention Plan shall include the proper procedures for the following:

- Good housekeeping;
- Storing materials and waste products inside or under cover;
- Vehicle washing;
- Routine inspections of stormwater best management practices;
- Spill prevention and response;
- Maintenance of lawns, gardens, and other landscaped areas;
- Storage and used of fertilizers, herbicides, and pesticides;
- Pet waste management; and
- Proper management of deicing chemicals and snow.

Standard 9:

The Long-Term Operation and Maintenance Plan shall at a minimum include:

- Stormwater management system(s) owner(s);
- The party or parties responsible for operation and maintenance, including how future property owners shall be notified of the presence of the stormwater management system and the requirement for operation and maintenance;
- The routine and non-routine maintenance tasks to be undertaken after construction is complete and a schedule for implementing those tasks;
- A plan that is drawn to scale and shows the location of all stormwater BMPs in each treatment train along with the discharge point;
- A description of public safety features; and
- An estimated operations and maintenance budget.

2.0 LONG-TERM POLLUTION PREVENTION PLAN

2.1 Source Control Practices for Pollution Prevention

The Owner and occupants should follow good housekeeping procedures to reduce the possibility of accidental releases and to reduce safety hazards, which shall include but not be limited to the following:

- Proper handling, storage, disposal, and recycling of hazardous materials and waste products;
- Proper handling, storage and inventory of household chemicals; and
- Prompt cleanup and removal of spills and releases

2.2 Storage of Hazardous Materials

To prevent leaks and spills, keep hazardous materials and waste products under cover or inside. Use drip pans or spill containment systems to prevent chemicals from entering the drainage system. Inspect storage areas for materials and waste products at least once per year to determine amount and type of the material on site, and if the material requires disposal.

Securely store liquid petroleum products and other liquid chemicals in federally- and state-approved containers. Restrict access to maintenance personnel and administrators.

Store fluid fertilizers in labeled containers and/or structures that prevent the discharge of fluid fertilizers and are resistant to corrosion, puncture, or cracking. Store and handle dry fertilizers in a manner to prevent pollution by minimizing losses to the air, surface water, ground water, or subsoil.

2.3 Storage of Waste Products

Collect and store all waste materials in securely lidded dumpster(s) or other secure containers as applicable to the material. Keep dumpster lids closed and the areas around them clean. Do not fill the dumpsters with liquid waste or hose them out. Sweep areas around the dumpster regularly and put the debris in the garbage, instead of sweeping or hosing it into the parking lot. Legally dispose of collected waste on a regular basis.

Segregate liquid wastes, including motor oil, antifreeze, solvents, and lubricants, from solid waste and recycle through hazardous waste disposal companies, whenever possible. Separate oil filters, batteries, tires, and metal filings from grinding and polishing metal parts from common trash items and recycle. These items are not trash and are illegal to dump. Contact a hazardous waste hauler for proper disposal of unwanted pesticides to a hazardous waste collection center.

2.4 Spill Prevention and Response

The Owner shall implement spill response procedures for releases of significant materials such as fuels, oils, or chemical materials onto the ground or other area that could reasonably be expected to discharge to surface or groundwater.

- For minor spills, keep fifty (50) gallon spill control kits and Speedy Dry at all shop and work areas.
- Immediately contact applicable Federal, State, and local agencies for reportable quantities as required by law. For minor spills, keep fifty (50) gallon spill control kits and Speedy Dry at

- all shop and work areas.
- Immediately perform applicable containment and cleanup procedures following a spill release.
- Promptly remove and dispose of all material collected during the response in accordance with Federal, State, and local requirements. A licensed emergency response contractor may be required to assist in cleanup of releases depending on the amount of the release, and the ability of the Contractor to perform the required response.
- Reportable quantities of chemicals, fuels, or oils are established under the Clean Water Act and enforced through Massachusetts Department of Environmental Protection (DEP).

2.5 Minimize Soil Erosion

Soil erosion facilitates mechanical transport of nutrients, pathogens, and organic matter to surface water bodies. Repair all areas where erosion is occurring throughout the project site. Stabilize bare soil with riprap, seed, mulch, or vegetation.

2.6 Vehicle Washing

Vehicle washing shall not occur on the property

2.7 Maintenance of Lawns, Gardens, and other Landscaped Areas

The maintenance of lawns, gardens, and other landscaped areas should use an Integrated Pest Management (IPM) system that reduces the amount of pesticides and fertilizers used. Spot applications of pesticide should be used and fertilizer rates should be diminished or used according to manufacturer recommendations. Grass clippings, pruned branches and any other landscaped waste should be disposed of or composted in an appropriate location. Use natural, non-toxic alternatives to traditional garden chemicals. Avoid application of chemicals prior to rain fall events.

2.8 Storage of Fertilizers, Herbicides, and Pesticides

These chemicals should be stored inside or under cover with adequate containment.

2.9 Pet Waste Management

Pet waste contributes to poor water quality that affects the drainage system and surrounding water bodies. The Owner shall implement a cleanup program where pet owners must put the pet waste into bags and dispose of the waste in the trash.

2.10 Management of Deicing Chemicals and Snow

The qualified contractor selected for snow plowing and deicing shall be made fully aware of the requirements of this section.

During typical snow plowing operations, snow shall be pushed to the designated snow removal areas. Snow shall not be stockpiled in or on drainage system components. In severe conditions where snow cannot be stockpiled on site, the snow shall be removed from the site and properly disposed of in accordance with MA DEP Guideline BRP601-01.

Sand and salt for parking lot and roadway deicing should not be stored on site. These materials are supplied during snow plowing and deicing operations performed by the contractor. Small amounts to

handle individual walkways can be stored onsite under cover and on an impervious surface or in proper containers within the building.

Before winter begins, the Owner and the contractor shall review snow plowing, deicing, and stockpiling procedures. Areas designated for stockpiling should be cleaned of any debris. Street and parking lot sweeping should be followed in accordance with the Operation and Maintenance Plan.

2.11 Coordination with other Permits and Requirements

Certain conditions of other approvals affecting the long term management of the property shall be considered part of this Long Term Pollution Prevention Plan. The Owner shall become familiar with those documents and comply with the guidelines set forth in those documents.

3.0 STORMWATER MANAGEMENT SYSTEM OPERATION AND MAINTENANCE PLAN

3.1 Introduction

This Operation and Maintenance Plan (O&M Plan) is required under Standard 9 of the 2008 MassDEP Stormwater Handbook to provide best management practices for implementing maintenance activities for the stormwater management system that ensures the long-term performance of the system and minimizes impacts to nearby wetland resource areas.

The Owner shall implement this O&M Plan and proactively conduct operations at the site in an environmentally responsible manner. Compliance with this O&M Plan does not in any way dismiss the Owner from compliance with other applicable Federal, State or local laws.

All stormwater best management practices (BMPs) shall be operated and maintained in accordance with the design plans and the Operation and Maintenance Plan. The Owner shall:

- a. Maintain an operation and maintenance log for the last three years, including inspections, repairs, replacement and disposal (for disposal the log shall indicate the type of material and the disposal location). This is a rolling log in which the responsible party records all operation and maintenance activities for the past three years.
- b. Make this log available to the Zoning Board of Appeals, the Conservation Commission, and the Planning Board upon request; and
- c. Allow members of the Zoning Board of Appeals, the Conservation Commission, and the Planning Board to enter and inspect the premises to evaluate and ensure that the Owner complies with the Operation and Maintenance requirements for each BMP.

3.2 Stormwater Operation and Maintenance Requirements

Inspect and maintain the stormwater management system as directed below. Repairs to any component of the system shall be made as soon as possible to prevent any potential pollutants (including silt) from entering the storm drainage system.

Deep-Sump and Hooded Catch Basins

Inspect catch basins four times per year, including after the foliage season. Other inspection and maintenance requirements include:

- Remove organic material, sediment and hydrocarbons four times per year or whenever the depth of deposits is greater than or equal to one half the depth from the bottom of the invert of the lowest pipe in the basin.
- Always clean out catch basins after street sweeping. If any evidence of hydrocarbons is found during inspection, the material immediately remove using absorbent pads or other suitable measures and dispose of legally. Remove other accumulated debris as necessary.
- Transport and disposal of accumulated sediment offsite shall be in accordance with applicable local, state and federal guidelines and regulations.

Water Quality Structures (Proprietary Separators)

Maintain water quality units according the recommendations set forth by the manufacturer. General inspection and maintenance procedures for proprietary devices are provided below:

- Inspect units following completion of construction, prior to being put into service.
- Inspect units at least twice per year following installation and no less than once per year thereafter.
- Inspect units immediately after any oil, fuel or chemical spill.
- All inspections shall include checking the oil level and sediment depth in the unit. Removal of sediments/oils shall occur per manufacturer recommendations.
- A licensed waste management company shall remove captured petroleum waste products from any oil, chemical or fuel spills and dispose.
- OSHA confined space entry protocols shall be followed if entry into the unit is required.

3.3 Street Sweeping

Perform street sweeping at least twice per year and whenever there is significant debris present on roads and parking lots. Street sweeping shall occur in March (or before spring rains begin) and November (or before the first snow storm). Sweepings must be handled and disposed of properly according to applicable local, state, and federal guidelines and regulations.

3.4 Repair of the Stormwater Management System

The stormwater management system shall be maintained. The repair of any component of the system shall be made as soon as possible to prevent any potential pollutants including silt from entering the storm drainage system.

3.5 Reporting

The Owner shall maintain a record of drainage system inspections and maintenance (per this Plan) and submit to the applicable local authorities as requested.

STORMWATER MANAGEMENT SYSTEM INSPECTION FORM

Modera Framingham Framingham, MA		Inspected by: _____ Date: _____
Component	Status/Inspection	Action Taken
Deep Sump Catch Basins and Drain Manholes		
Water Quality Structures (Propriety Separators)		
General site conditions – evidence of erosion, etc.		

**SUBMIT COPIES OF STORMWATER MANAGEMENT SYSTEM INSPECTION FORM TO THE
LOCAL AUTHORITIES AS REQUESTED**

SECTION 4
TRAFFIC REPORT

Transportation Impact Assessment

Proposed Residential Development

Framingham, MA

Prepared for:

**Mill Creek Residential
Burlington, Massachusetts**

TRANSPORTATION IMPACT ASSESSMENT

PROPOSED RESIDENTIAL DEVELOPMENT FRAMINGHAM, MASSACHUSETTS

Prepared for:

Mill Creek Residential
Burlington, Massachusetts

June 2016

Prepared by:

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10	Level-of-Service Criteria for Signalized Intersections
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EXECUTIVE SUMMARY

Vanasse & Associates, Inc. (VAI) has conducted a Transportation Impact Assessment (TIA) in order to determine the potential impacts on the transportation infrastructure associated with the proposed construction of 270 residential apartment units to be located at 266 Waverly Street in Framingham, Massachusetts (hereafter referred to as the "Project"). This assessment was prepared in consultation with the Town of Framingham and the Massachusetts Department of Transportation (MassDOT); was performed in accordance with MassDOT's *Transportation Impact Assessment (TIA) Guidelines*; and was conducted pursuant to the standards of the Traffic Engineering and Transportation Planning professions for the preparation of such reports. Based on this assessment, we have concluded the following with respect to the Project:

1. The project is expected to generate 1,672 new vehicle trips on an average weekday (836 entering and 836 exiting), with approximately 129 new vehicle trips (25 entering and 104 exiting) expected during the weekday morning peak hour and 158 new vehicle trips (103 entering and 55 exiting) during the weekday evening peak hour.
2. It should be noted that the project will generate less traffic during the weekday evening peak hour and on a daily basis, in comparison to if the project site were to be re-tenanted with retail uses.
3. The Project will not have a significant impact (increase) on motorist delays or vehicle queuing over Existing or anticipated future conditions without the Project (No-Build conditions);
4. No apparent safety deficiencies are expected at the study intersections. Specific safety-related improvement measures have been identified and implemented for the Town at the Waverly Street/Bishop Street/Beaver Street intersection to address prior safety and capacity concerns.

5. A total of four curb-cuts will be closed with the development of this project, and two curb-cuts relocated. The two full-access curb-cuts on Marble Street and the one full-access curb-cut on Waverly Street will be closed, and the right-in/right-out only curb-cut on Waverly Street will be closed and relocated to the east. The loading entrance will be closed on Blandin Avenue, and a relocated driveway will serve the location.

In consideration of the above, we have concluded that the Project can be accommodated within the confines of the existing transportation infrastructure in a safe and efficient manner with implementation of the recommendations that follow.

RECOMMENDATIONS

A detailed transportation improvement program has been developed that is designed to provide safe and efficient access to the Project site. The following improvements have been recommended as a part of this evaluation and, where applicable, will be completed in conjunction with the Project subject to receipt of all necessary rights, permits, and approvals.

Project Access

Access to the Project site will be provided by way of two driveways defined as follows: one (1) right-in/right-out only driveway on Waverly Street; and one (1) full access driveway on Blandin Avenue.

- The Blandin Avenue Site Drive should be a minimum of 24-feet in width and accommodate two-way traffic.
- The Waverly Street Site Drive right-in entrance should be a minimum of 15-feet in width, and the right-out exit should be a minimum of 15-feet in width. A channelized island should guide vehicles for the right-in/right-out only movements.
- Vehicles exiting the Project site should be placed under STOP-sign control with a marked STOP-line provided.
- All signs and pavement markings to be installed within the Project site shall conform to the applicable standards of the *Manual on Uniform Traffic Control Devices* (MUTCD).¹
- Wheelchair ramps should be provided for crossing the Project site driveways where a sidewalk is present.
- Signs and landscaping to be installed along the Project site driveways should be designed and maintained so as not to restrict lines of sight.
- Adequate street lighting should be installed at Blandin Avenue and Waverly Street at the Site Drives in order to ensure adequate visibility.

Off-Site

The project proponent is discussing providing an easement to the Town of Framingham to upgrade Marble Street. In addition, A STOP-sign should be installed on Marble Street at the intersection of Marble Street at Blandin Avenue.

¹*Manual on Uniform Traffic Control Devices (MUTCD)*; Federal Highway Administration; Washington, D.C.; 2009.

Transportation Demand Management

The Project site is ideally situated to take advantage of available public transportation opportunities in the area, including both Commuter Rail and bus service along Waverly Street. In an effort to encourage use of alternative modes of transportation to single-occupant vehicles, the following Transportation Demand Management (TDM) measures will be implemented as a part of the Project:

- Information regarding public transportation services, maps, schedules and fare information will be posted in a central location;
- A packet will be provided to new residents of the Project detailing available public transportation services, bicycle and walking alternatives.
- Pedestrian accommodations will be incorporated within the Project site; and
- Secure bicycle parking will be provided, including both an exterior bicycle rack and weather protected bicycle parking in a secure area.

With implementation of the above recommendations, safe and efficient access will be provided to the Project site and the Project can be accommodated within the confines of the existing and improved transportation system.

INTRODUCTION

Vanasse & Associates, Inc. (VAI) has conducted a Transportation Impact Assessment (TIA) in order to determine the potential impacts on the transportation infrastructure associated with the proposed construction of a residential development to be located at 266 Waverly Street in Framingham, Massachusetts (hereafter referred to as the “Project”). This study evaluates the following specific areas as they relate to the Project: i) access requirements; ii) potential off-site improvements; and iii) safety considerations; and identifies and analyzes existing traffic conditions and future traffic conditions, both with and without the Project, along Waverly Street and at the following intersections: Waverly Street at Marble Street; Marble Street at Blandin Avenue; Bishop Street at Howard Street; Waverly Street at Bishop Street and Beaver Street; and Blandin Avenue at Beaver Street.

PROJECT DESCRIPTION

As proposed, the Project will entail the construction of 270 apartment units to be located at 266 Waverly Street in Framingham, Massachusetts. The Project site is bounded by Waverly Street to the north; Blandin Avenue to the south; and Marble Street to the west. Figure 1 depicts the Project site location in relation to the existing roadway network. At present, the Project site contains retail uses that will be removed in conjunction with the Project. Access to the Project site will be provided by way of two driveways defined as follows: one (1) right-in/right-out only driveway on Waverly Street; and one (1) full access driveway on Blandin Avenue.

STUDY METHODOLOGY

This study was prepared in consultation with the Town of Framingham and the Massachusetts Department of Transportation (MassDOT); was performed in accordance with MassDOT’s *Transportation Impact Assessment (TIA) Guidelines* and the standards of the Traffic Engineering and Transportation Planning professions for the preparation of such reports; and was conducted in three distinct stages.

The first stage involved an assessment of existing conditions in the study area and included an inventory of roadway geometrics; pedestrian and bicycle facilities; public transportation services; observations of traffic flow; and collection of daily and peak period traffic counts.

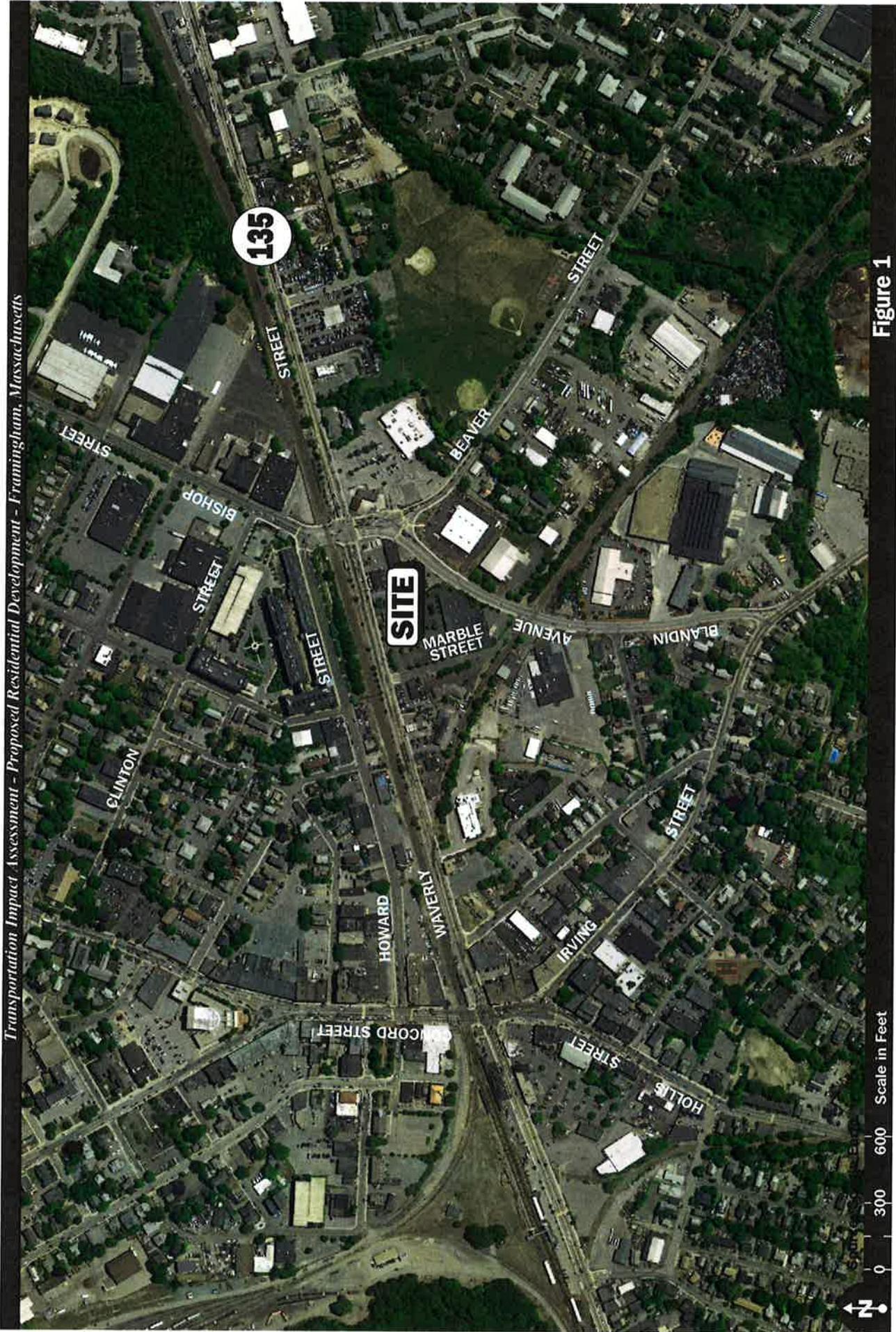


Figure 1

Site Location Map

Vanasse & Associates, Inc.
Transportation Engineers & Planners



In the second stage of the study, future traffic conditions were projected and analyzed. Specific travel demand forecasts for the Project were assessed along with future traffic demands due to expected traffic growth independent of the Project. A seven-year time horizon was selected for analyses consistent with MassDOT's *Transportation Impact Assessment (TIA) Guidelines*. The traffic analysis conducted in stage two identifies existing or projected future roadway capacity, traffic safety, and site access issues.

The third stage of the study presents and evaluates measures to address traffic and safety issues, if any, identified in stage two of the study.

EXISTING CONDITIONS

A comprehensive field inventory of existing conditions within the study area was conducted in May 2016. The field investigation consisted of an inventory of existing roadway geometrics; pedestrian and bicycle facilities; public transportation services; traffic volumes; and operating characteristics; as well as posted speed limits and land use information within the study area. The study area for the Project was selected to contain the major roadway providing access to the Project site, Waverly Street, as well as the following specific intersections: Waverly Street at Marble Street; Marble Street at Blandin Avenue; Bishop Street at Howard Street; Waverly Street at Bishop Street and Beaver Street; and Blandin Avenue at Beaver Street.

The following describes the study area roadway and intersections.

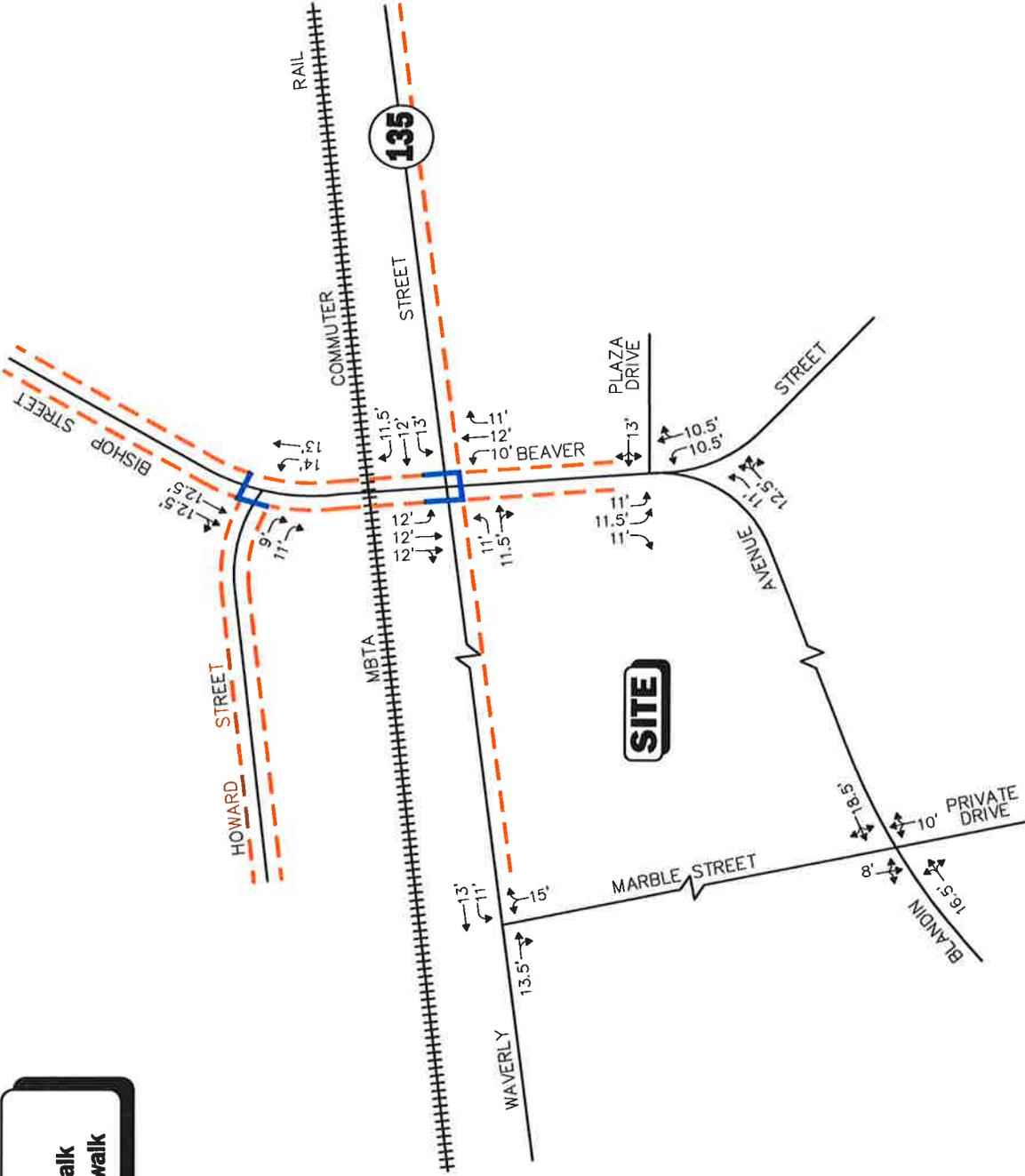
Roadway

Waverly Street

- Two-lane urban collector roadway under Town jurisdiction
- Traverses study area in a general east-west direction
- Provides two 13 to 14-foot wide travel lanes separated by a double-yellow centerline with marked shoulders provided
- A sidewalk is provided continuously along the south side of the roadway
- Illumination is provided by way of street lights mounted on wood poles
- Land use consists of the Project site and commercial properties

Intersections

Table 1 and Figure 2 summarize lane use, traffic control, and pedestrian and bicycle accommodations at the study area intersections as observed in May 2016.



Not To Scale

VAI Vanasse & Associates, Inc.
 Transportation Engineers & Planners

Figure 2

Existing Intersection Lane Use and Travel Lane Width

**Table 1
STUDY AREA INTERSECTION DESCRIPTION**

Intersection	Traffic Control Type^a	No. of Travel Lanes Provided	Shoulder Provided? (Yes/No/Width)	Pedestrian Accommodations? (Yes/No/Description)	Bicycle Accommodations? (Yes/No/Description)
Waverly Street/ Bishop Street/ Beaver Street	TS	Waverly Street approaches accommodate a left-turn lane and a through travel lane with a right-turn lane provided on the westbound approach; Bishop Street and Beaver Street approaches accommodate a left-turn lane, 1 through travel lane and 1 through/right turn lane	Yes; 1-2 feet on all approaches	Yes – both sides of Bishop Street and Beaver Street, and south side of Waverly Street; Crosswalks across Waverly Street (both legs) and Beaver Street; traffic signal system includes pushbuttons, signal indications and phasing.	Yes - Shared travelled-way on all approaches ^b
Bishop Street/ Howard Street	TS	2 lanes on Bishop Street; Howard Street provides 2 right-turn lanes (left-turns are prohibited)	Yes; 1-2 feet on Bishop Street; no shoulders on Howard Street	Yes – both sides of Bishop Street and Howard Street; Crosswalks across Bishop Street north leg and Howard Street; traffic signal system includes pushbuttons, signal indications and phasing.	Yes - Shared travelled-way on all approaches
Beaver Street/Blandin Avenue/Plaza Drive	TS	Beaver Street southbound approach accommodates 1 left-turn/through lane and 2 right-turn lanes; Beaver Street northbound approach accommodates 1 left-turn lane and 1 shared through/right-turn lane. Blandin Avenue approach accommodates 2 general purpose travel lanes. Plaza Drive accommodates 1 general purpose travel lane	Yes; 1 foot on all roadways	Yes – both sides of all roads; Crosswalks across Plaza Drive, Blandin Avenue and south leg of Beaver Street.	No
Waverly Street/Marble Street	S	Waverly Street eastbound provides 1 travel lane; Waverly Street westbound provides 1 left-turn lane and 1 through lane. Marble Street provides 1 general purpose travel lane	Yes; 2-4 feet on Waverly Street eastbound, 9 feet on Waverly Street westbound	Yes – the south side of Waverly Street; Crosswalks across Marble Street.	Yes - Shared travelled-way on all approaches
Blandin Avenue at Marble Street	S	All approaches provide 1 general purpose travel lane	Yes; 1-3 feet on Blandin Avenue	Yes, both sides of Blandin Avenue, east of Marble Street.	Yes - Shared travelled-way on all approaches

^aTS = traffic signal control; S = STOP-sign control; Y = YIELD-sign control; R = rotary/roundabout control; NC = no control present.

^bCombined shoulder and travel lane width equal to or exceed 14 feet.

^cAssumed STOP-control; STOP-sign is not present.

EXISTING TRAFFIC VOLUMES

In order to determine existing traffic-volume demands and flow patterns within the study area, automatic traffic recorder (ATR) counts, manual turning movement counts (TMCs) and vehicle classification counts were completed in May 2016. The ATR counts were conducted on Waverly Street and Marble Street in the vicinity of the Project site in order to record weekday daily traffic conditions over an extended period, with weekday morning (7:00 to 9:00 AM) and weekday evening (4:00 to 6:00 PM) peak period manual TMCs performed at the study intersections. These time periods were selected for analysis purposes as they are representative of the peak traffic volume hours for both the Project and the adjacent roadway network.

Traffic Volume Adjustments

In order to evaluate the potential for seasonal fluctuation of traffic volumes within the study area, MassDOT weekday seasonal factors for Group 6 roadways (urban arterials, collectors and rural arterials, the functional classification of Waverly Street) were reviewed.² Based on a review of this data, it was determined that traffic volumes for the month of May are approximately 9 percent above average-month conditions and, therefore, were not adjusted downward in order to provide a conservative (above-average) analysis condition. The 2016 Existing traffic volumes are summarized in Table 2, with the weekday morning and weekday evening peak-hour traffic volumes graphically depicted on Figures 3 and 4, respectively. Note that the peak-hour traffic volumes presented in Table 2 were obtained from the TMCs and are reflected on the aforementioned figure.

Table 2
2016 EXISTING TRAFFIC VOLUMES

Location	AWT ^a	VPH ^b	K Factor ^c	Directional Distribution
<i>Waverly Street, west of Marble Street:</i>				
Weekday Morning Peak Hour	13,800	--	--	--
Weekday Evening Peak Hour	--	944	6.8	60% EB
	--	1,076	7.8	54% WB
<i>Marble Street, Between Framingham Liquors Driveways:</i>				
Weekday Morning Peak Hour	900	--	--	--
Weekday Evening Peak Hour	--	89	9.9	62% NB
	--	126	14.0	58% SB

^aAverage weekday traffic in vehicles per day.

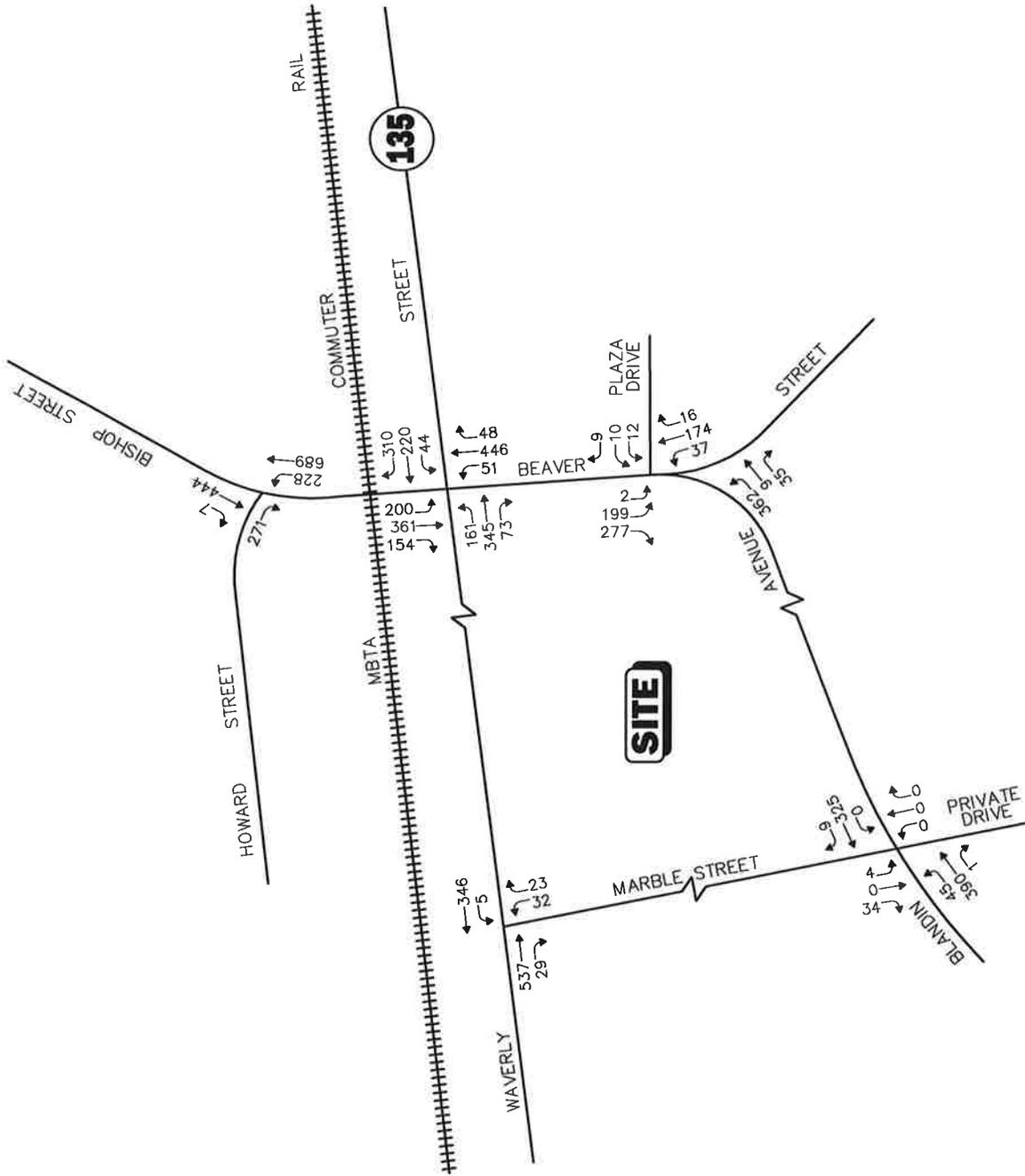
^bVehicles per hour.

^cPercent of daily traffic occurring during the peak-hour.

NB = northbound; SB = southbound; EB = eastbound; WB = westbound.

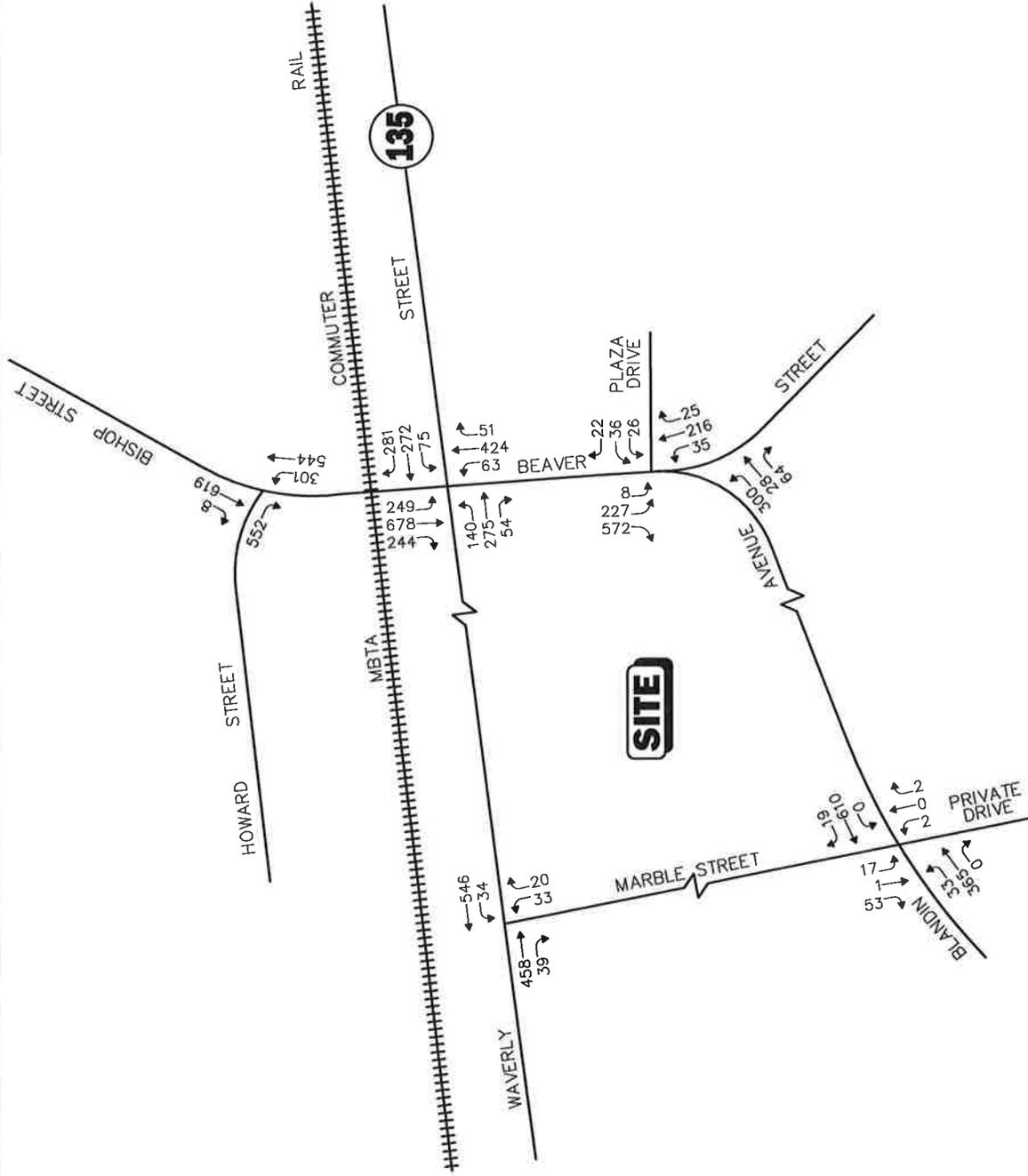
As can be seen in Table 2, Waverly Street in the vicinity of the Project site was found to accommodate approximately 13,800 vehicles on an average weekday (two-way, 24-hour volumes), with approximately 944 vehicles per hour (vph) during the weekday morning peak-hour and 1,076 vph during the weekday evening peak-hour.

²MassDOT Traffic Volumes for the Commonwealth of Massachusetts; 2011 Weekday Seasonal Factors, Group 6 – Urban Arterials, Collectors and Rural Arterials.



Note: Imbalances exist due to numerous curb cuts and side streets that are not shown.
Not To Scale

Figure 3
2016 Existing
Weekday Morning
Peak Hour Traffic Volumes



Note: Imbalances exist due to numerous curb cuts and side streets that are not shown.

Not To Scale



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Figure 4

2016 Existing
Weekday Evening
Peak Hour Traffic Volumes

Marble Street in the vicinity of the Project site was found to accommodate approximately 900 vehicles on an average weekday (two-way, 24-hour volumes), with approximately 89 vehicles per hour (vph) during the weekday morning peak-hour and 126 vph during the weekday evening peak-hour.

PEDESTRIAN AND BICYCLE FACILITIES

A comprehensive field inventory of pedestrian and bicycle facilities within the study area was undertaken in May 2016. The field inventory consisted of a review of the location of sidewalks and pedestrian crossing locations along the study roadways and at the study intersections, as well as the location of existing and planned future bicycle facilities. In general, sidewalks are provided along all study area roadways, with the exception of Marble Street, with crosswalks provided at all signalized intersections.

Formal bicycle facilities were not identified within the study area; however, the study area roadways provide sufficient width (combined travel lane and shoulder) to support bicycle travel in a shared travelled-way configuration.³

PUBLIC TRANSPORTATION

Public transportation services are provided within the study area by the MBTA and the Metrowest Regional Transit Authority (MWRTA). Framingham Station on the Framingham/Worcester MBTA Commuter Rail system is located off Waverly Street approximately 0.4 miles west of the Project site. The commuter rail provides service between Worcester and South Station in Boston, with 10-30 minutes headways during peak commuter hours. Weekday service runs between 5:30 AM and 1:00 AM, with weekend service running from 7:40 AM to 11:40 PM. The MWRTA operates fixed-route bus service along Waverly Street outside the study area. The closest regular stop to the Project site is located at Memorial House which is proximate to the Waverly Street/Coolidge Street intersection and approximately 0.3 miles east of the Project site.

SPOT SPEED MEASUREMENTS

Vehicle travel speed measurements were performed on Waverly Street in the vicinity of the Project site in conjunction with the ATR counts. Table 3 summarizes the vehicle travel speed measurements.

³A minimum combined travel lane and paved shoulder width of 14-feet is required to support bicycle travel in a shared travelled-way condition.

Table 3
VEHICLE TRAVEL SPEED MEASUREMENTS

	Waverly Street	
	Eastbound	Westbound
Mean Travel Speed (mph)	24	27
85 th Percentile Speed (mph)	27	31
Posted Speed Limit (mph)	N/A	N/A

mph = miles per hour.

As can be seen in Table 3, the mean (average) vehicle travel speed along Waverly Street in the vicinity of the Project site was found to be approximately 24 mph in the eastbound direction and 27 mph in the westbound direction. The average measured 85th percentile vehicle travel speed, or the speed at which 85 percent of the observed vehicles traveled at or below, was found to be approximately 27 mph in the eastbound direction and 31 mph in the westbound direction. The 85th percentile speed is used as the basis of engineering design and in the evaluation of sight distances, and is often used in establishing posted speed limits. There was no posted speed limit in the vicinity of the project site.

MOTOR VEHICLE CRASH DATA

Motor vehicle crash information for the study area intersections was provided by the MassDOT Highway Division Safety Management/Traffic Operations Unit for the most recent five-year period available (2009 through 2013, inclusive) in order to examine motor vehicle crash trends occurring within the study area. The data is summarized by intersection, type, severity, and day of occurrence, and presented in Table 4.

Table 4
MOTOR VEHICLE CRASH DATA SUMMARY^a

	Waverly St./ Bishop St./ Beaver St.	Bishop St./ Howard St.	Waverly St./ Marble St.	Blandin Ave./ Marble St.	Beaver St./ Blandin Ave.
Traffic Control Type: ^b	TS	TS	U	U	TS
<i>Year:</i>					
2009	18	3	1	2	4
2010	18	4	2	1	3
2011	20	4	2	0	2
2012	5	1	0	0	0
<u>2013</u>	<u>7</u>	<u>1</u>	<u>2</u>	<u>0</u>	<u>0</u>
Total	68	13	7	3	9
Average	13.60	2.60	1.40	0.60	1.8
Rate ^c	1.20	0.32	0.31	0.13	0.28
Significant? ^e	Yes	No	No	No	No
<i>Type:</i>					
Angle	36	2	3	2	3
Rear-End	12	6	2	0	3
Head-On	1	0	0	0	0
Sideswipe	16	3	2	1	3
Fixed Object	0	1	0	0	0
Pedestrian/Bicycle	0	0	0	0	0
<u>Unknown/Other</u>	<u>3</u>	<u>1</u>	<u>0</u>	<u>0</u>	<u>0</u>
Total	68	13	7	3	9
<i>Day of Week:</i>					
Monday through Friday	54	7	5	3	7
Saturday	9	4	2	0	1
<u>Sunday</u>	<u>5</u>	<u>2</u>	<u>0</u>	<u>0</u>	<u>1</u>
Total	68	13	7	3	9
<i>Severity:</i>					
Property Damage Only	49	10	5	3	8
Personal Injury	19	3	2	0	1
<u>Fatality</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>
Total	68	13	7	3	9

^aSource: MassDOT Safety Management/Traffic Operations Unit records, 2009 through 2013.

^bTraffic Control Type: U = unsignalized; TS = traffic signal.

^cCrash rate per million vehicles entering the intersection.

^eThe intersection crash rate is significant if it is found to exceed the MassDOT crash rate for the MassDOT Highway Division District in which the Project is located (District 3).

As can be seen in Table 4, with the exception of the Waverly Street/Bishop Street/Beaver Street intersection, the study area intersections were found to have experienced an average of less than three (3) reported motor vehicle crash per year over the five-year review period and were found to have a motor vehicle crash rate below both the MassDOT statewide and District averages for a signalized or unsignalized intersection, as appropriate, for the MassDOT Highway Division District in which the intersections are located (District 3).

The Waverly Street/Bishop Street/Beaver Street intersection was reported to have experienced a total of 68 crashes over the five-year review period, or an average of approximately 14 crashes per year, the majority of which occurred on a weekday, involved angle-type collisions and resulted in property damage only. In addition, the intersection was also found to have a motor vehicle crash rate above both the MassDOT statewide and District crash rates for a signalized intersection, and as was listed on MassDOT's *Top 200 Crash Location List* (number 92 out of 200).

Traffic signal and safety improvements have recently been completed at this location and should improve safety conditions.

No fatal motor vehicle crashes were reported to have occurred at the study area intersections over the five-year review period.

FUTURE CONDITIONS

Traffic volumes in the study area were projected to the year 2023, which reflects a seven-year planning horizon consistent with MassDOT's *Transportation Impact Assessment (TIA) Guidelines*. Independent of the Project, traffic volumes on the roadway network in the year 2023 under No-Build conditions include all existing traffic and new traffic resulting from background traffic growth. Anticipated Project-generated traffic volumes superimposed upon the 2023 No-Build traffic volumes reflect 2023 Build traffic volume conditions with the Project.

FUTURE TRAFFIC GROWTH

Future traffic growth is a function of the expected land development in the immediate area and the surrounding region. Several methods can be used to estimate this growth. A procedure frequently employed estimates an annual percentage increase in traffic growth and applies that percentage to all traffic volumes under study. The drawback to such a procedure is that some turning volumes may actually grow at either a higher or a lower rate at particular intersections.

An alternative procedure identifies the location and type of planned development, estimates the traffic to be generated, and assigns it to the area roadway network. This procedure produces a more realistic estimate of growth for local traffic; however, potential population growth and development external to the study area would not be accounted for in the resulting traffic projections.

To provide a conservative analysis framework, both procedures were used, the salient components of which are described below.

Specific Development by Others

The Town of Framingham Planning Department was contacted in order to determine if there were any projects planned within the study area that would have an impact on future traffic volumes at the study intersections. Based on this discussion, the following project was identified that may result in an increase in traffic within the study area:

- ***Grant Street Residential Development, Framingham, Massachusetts.*** This project will entail the construction of a 79-unit residential apartment community to be located at 39 Grant Street in Framingham, Massachusetts.

Traffic volumes associated with the aforementioned specific development project by others were obtained from the traffic study and were assigned onto the study area roadway network based on existing traffic patterns where no other information was available. No other developments were identified at this time that are expected to result in an increase in traffic within the study area beyond the general background traffic growth rate.

General Background Traffic Growth

Traffic-volume data compiled by MassDOT from permanent count stations and historic traffic counts in the area were reviewed in order to determine general traffic growth trends. Based on a review of this data it was determined that traffic volumes within the Town of Framingham have declined slightly over the past several years. In order to provide a conservative (high) analysis condition, a 1.0 percent per year compounded annual background traffic growth rate was used in order to account for future traffic growth and presently unforeseen development within the study area.

Roadway Improvement Projects

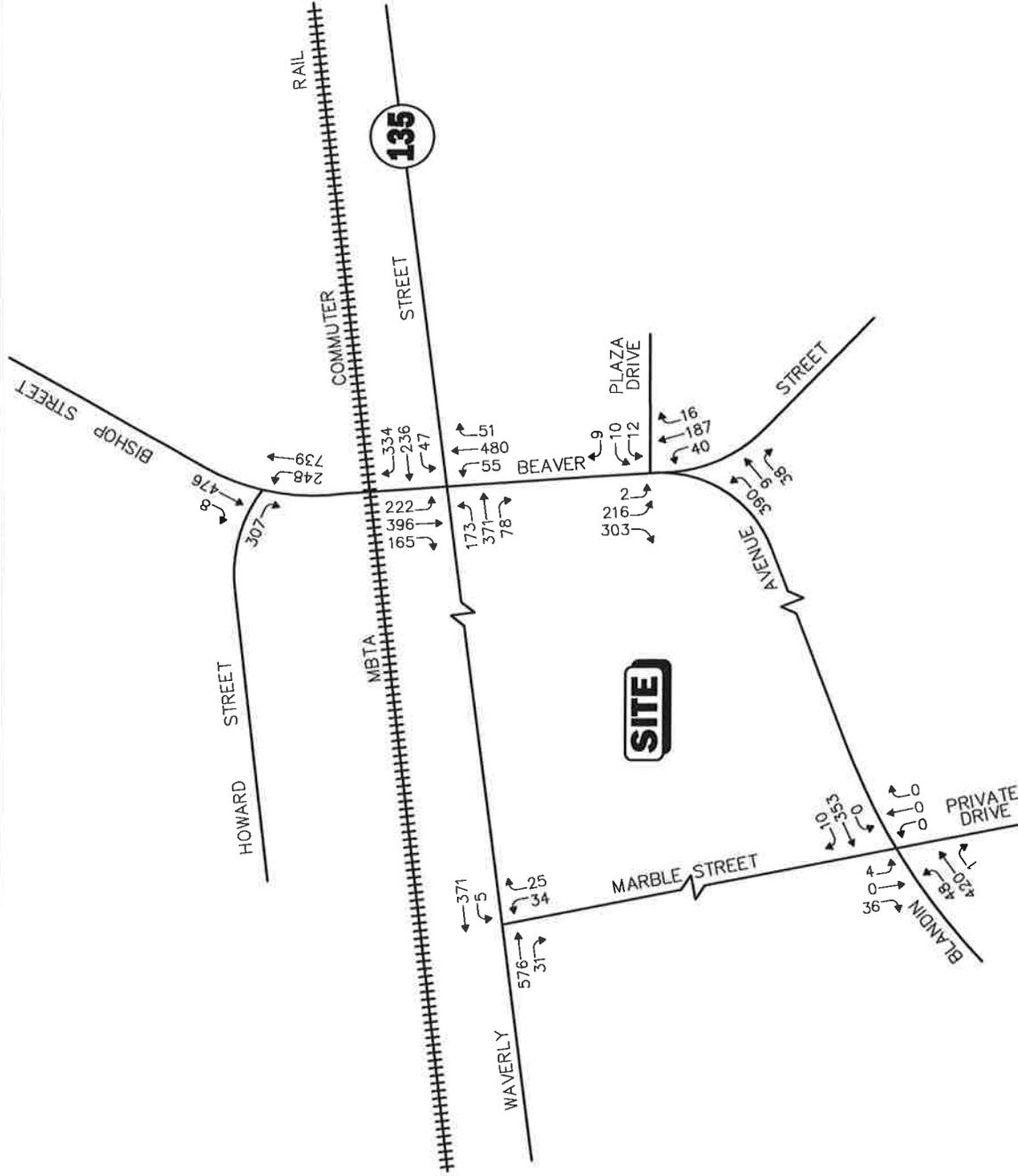
MassDOT and the Town of Framingham Department of Public Works were contacted in order to determine if there were any planned future roadway improvement projects expected to be complete by 2023 within the study area. Based on these discussions, the Town has recently completed traffic signal and safety improvements at the following locations:

- Howard Street at Bishop Street
- Waverly Street at Beaver Street
- Beaver Street at Blandin Street

These improvements include the installation of pavement markings, the replacement of traffic signal equipment, the upgrade of pedestrian signals and pushbuttons and the optimization of signal timings.

No-Build Traffic Volumes

The 2023 No-Build condition peak-hour traffic-volumes were developed by applying the 1.0 percent per year compounded annual background traffic growth rate to the 2016 Existing peak-hour traffic volumes and then superimposing the peak-hour traffic volumes associated with the identified specific development projects by others. The resulting 2023 No-Build weekday morning and weekday evening peak-hour traffic volumes are shown on Figures 5 and 6, respectively.

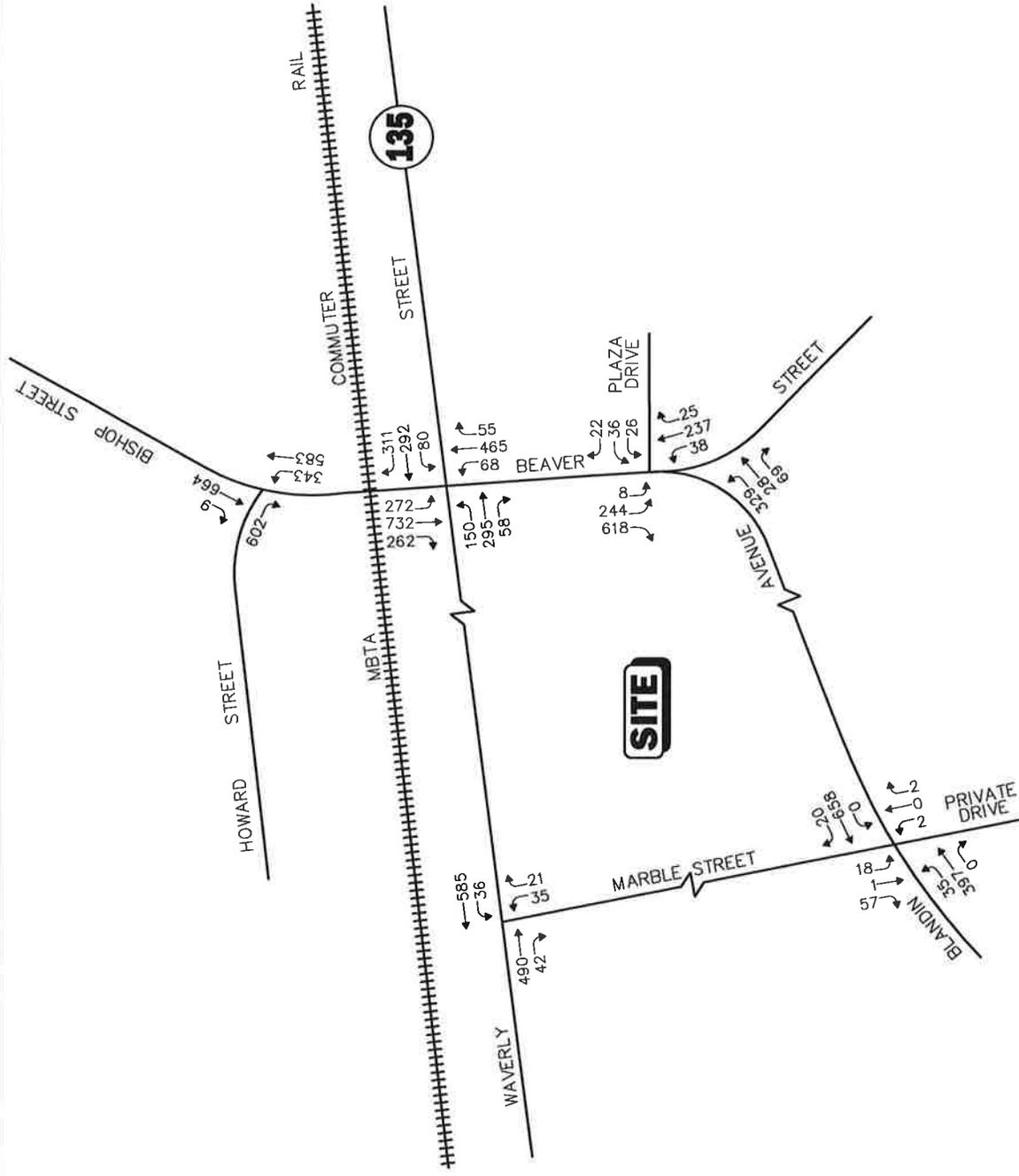


Note: Imbalances exist due to numerous curb cuts and side streets that are not shown.
Not To Scale

Figure 5

2023 No-Build
Weekday Morning
Peak Hour Traffic Volumes

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Note: Imbalances exist due to numerous curb cuts and side streets that are not shown.
Not To Scale

Figure 6

2023 No-Build
Weekday Evening
Peak Hour Traffic Volumes

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PROJECT-GENERATED TRAFFIC

Design year (2023 Build) traffic volumes for the study area roadways were determined by estimating Project-generated traffic volumes and assigning those volumes on the study roadways. The following sections describe the methodology used to develop the anticipated traffic characteristics of the Project.

As proposed, the Project will entail the construction of a 270 unit apartment building. Trip-generation statistics published by the ITE⁴ for LUC 220, Apartments were used to develop the traffic characteristics of the project. It is expected that a portion of the traffic generated by the project will consist of transit trips due to the project's close proximity to the Framingham MBTA Station. Based on a review of modal split data from the 2000 Census for the Town of Framingham, a 5 percent transit rate was applied to the residential trips.

Table 5 summarizes the anticipated traffic characteristics of the Project using the above methodology. Table 6 summarizes the trip generation if the project were re-tenanted with a retail use.

Table 5
TRIP GENERATION SUMMARY

Time Period/Direction	Apartments ^a	Transit Trips ^b	Total
<i>Weekday Morning Peak Hour:</i>			
Entering	27	2	25
<u>Exiting</u>	<u>109</u>	<u>5</u>	<u>104</u>
Total	136	7	129
<i>Weekday Evening Peak Hour:</i>			
Entering	108	5	103
<u>Exiting</u>	<u>58</u>	<u>3</u>	<u>55</u>
Total	166	8	158
<i>Weekday Daily</i>	1,760	88	1,672

^aBased on ITE LUC 220, Apartments at 270 units.

^bBased on U.S. Census of 5% Transit Trips in Framingham.

⁴Ibid 1.

Table 6
TRIP GENERATION COMPARISON

Time Period/Direction	Retail ^a	Pass-By Trips ^b	Total
<i>Weekday Morning Peak Hour:</i>			
Entering	20	-4	16
<u>Exiting</u>	<u>13</u>	<u>-4</u>	<u>9</u>
Total	33	-8	25
<i>Weekday Evening Peak Hour:</i>			
Entering	141	-37	104
<u>Exiting</u>	<u>153</u>	<u>-37</u>	<u>116</u>
Total	294	-74	220
<i>Weekday Daily</i>	3,404	-850	2,554

^aBased on ITE LUC 820, Shopping Center.

^bBased on a Pass-By Rate of 25%.

As shown in Table 6, the project will generate less traffic during the weekday evening peak hour and on a daily basis, in comparison to if the project site were to be re-tenanted with retail uses.

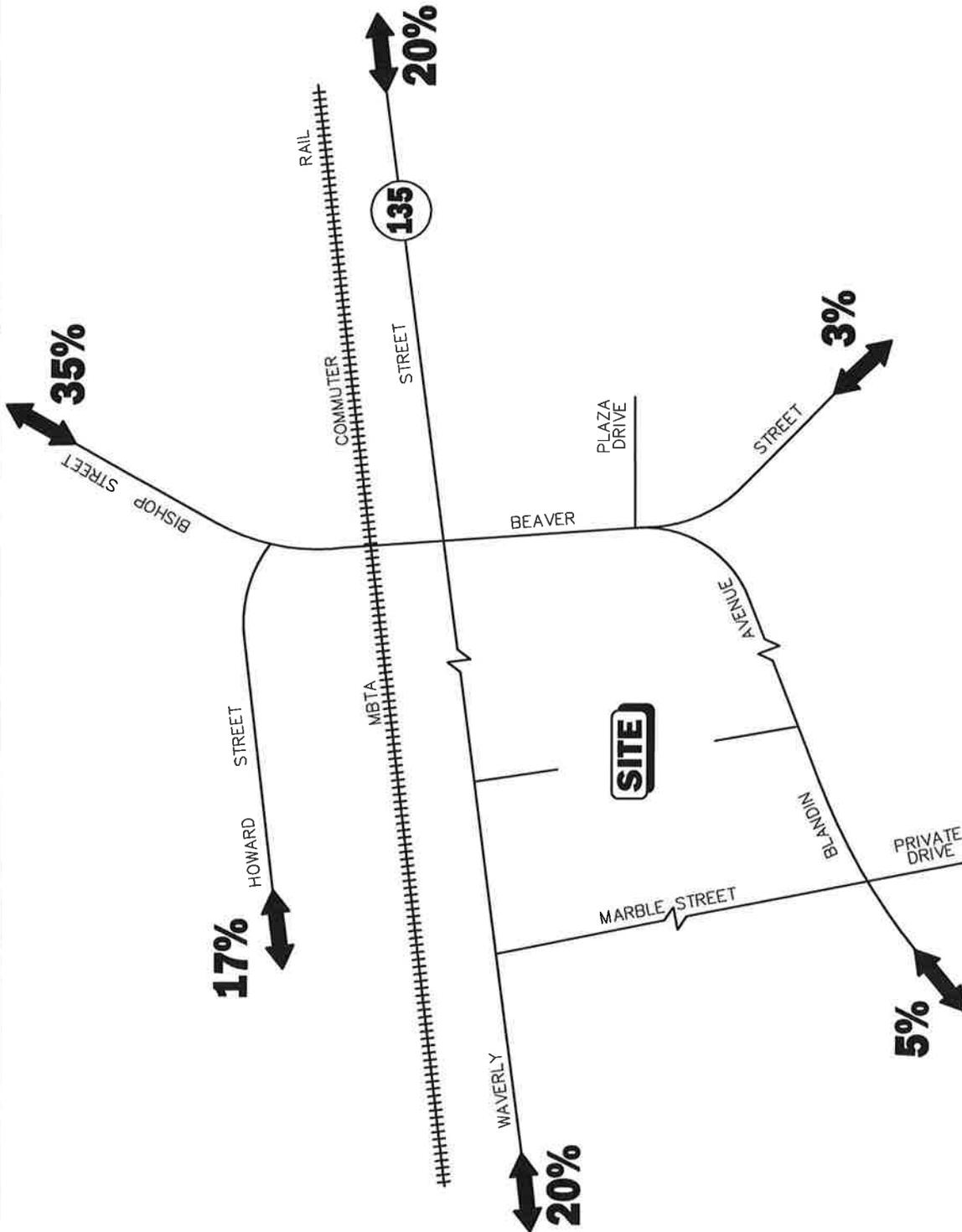
Project-Generated Traffic Volume Summary

The project is expected to generate approximately 1,672 new vehicle trips on an average weekday (836 entering and 836 exiting), with approximately 129 new vehicle trips (25 entering and 104 exiting) expected during the weekday morning peak hour and 158 new vehicle trips (103 entering and 55 exiting) during the weekday evening peak hour.

It should be noted that the project will generate less daily traffic in comparison to if the project site were to be occupied with retail uses.

Trip Distribution and Assignment

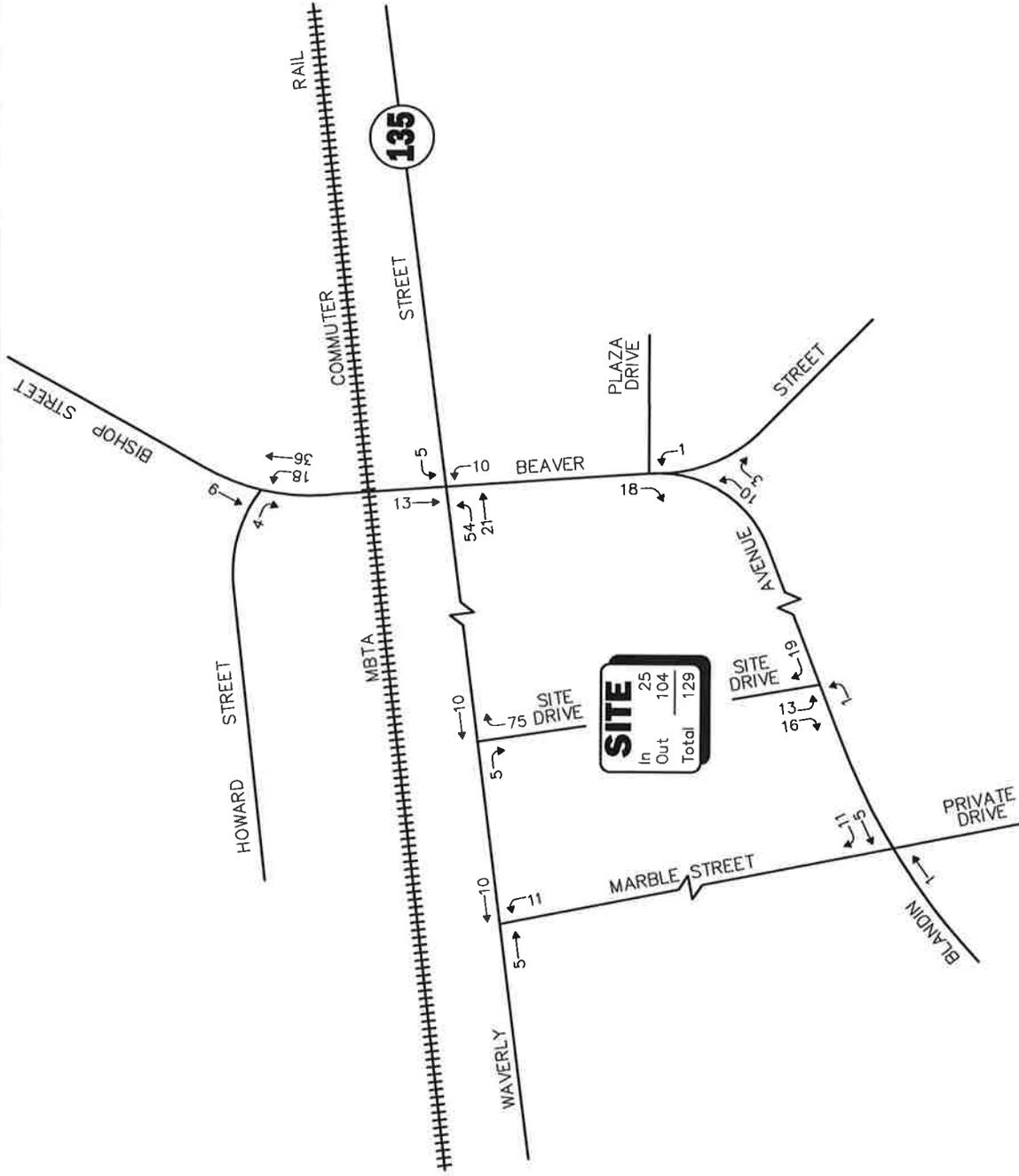
The directional distribution of generated trips to and from the Project site was determined based on a review of Journey to Work data during the commuter peak periods. The general trip distribution for the Project is graphically depicted on Figure 7 and summarized in Table 7. The additional traffic expected to be generated by the Project was assigned on the study area roadway network as shown on Figures 8 and 9 for the weekday morning and weekday evening peak hours, respectively.



Note: Imbalances exist due to numerous curb cuts and side streets that are not shown.
Not To Scale



Figure 7
Trip Distribution Map



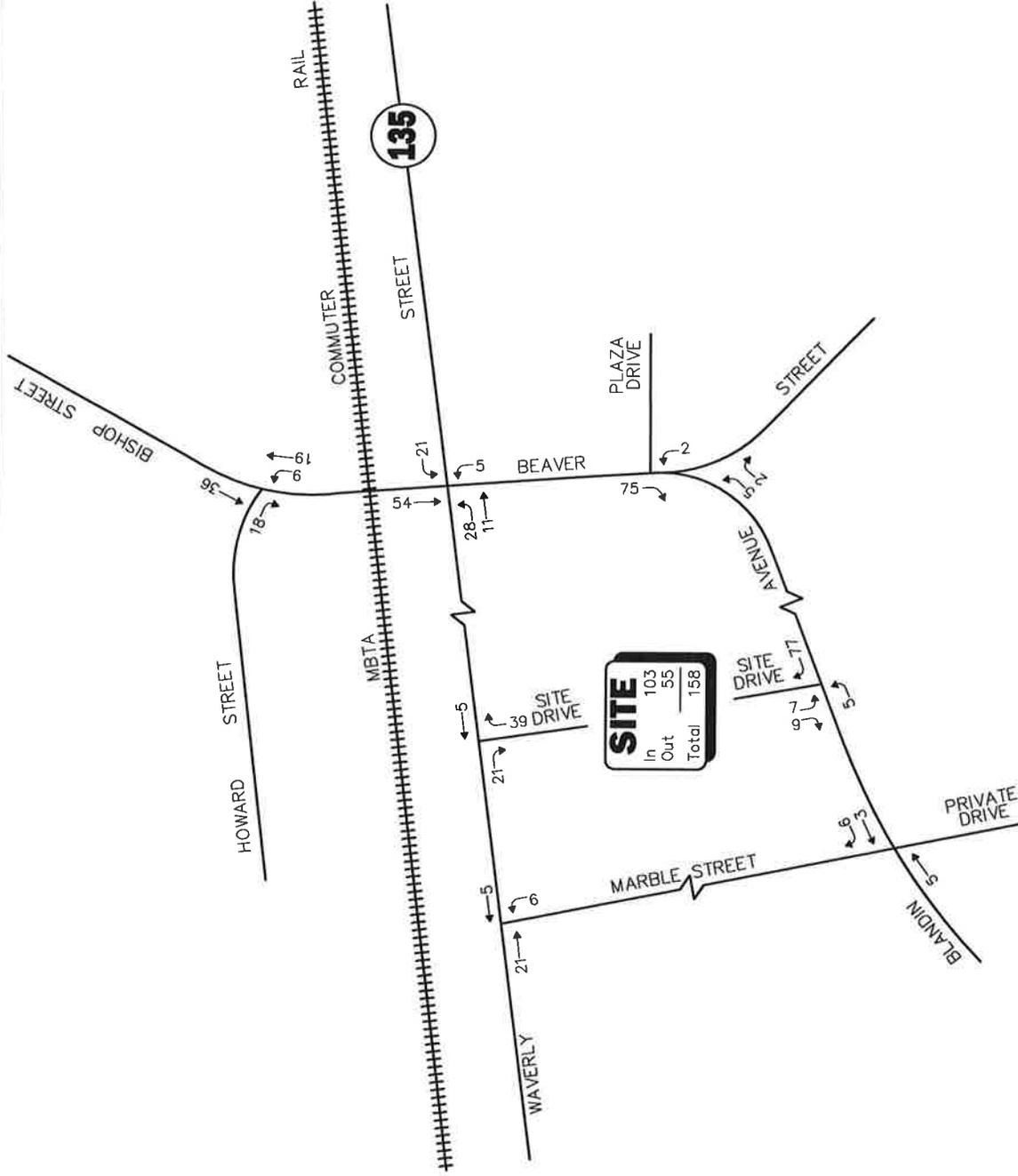
Note: Imbalances exist due to numerous curb cuts and side streets that are not shown.
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Figure 8

Weekday Morning
Site Generated
Peak Hour Traffic Volumes



Note: Imbalances exist due to numerous curb cuts and side streets that are not shown.
Not To Scale



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Figure 9

Weekday Evening
Site Generated
Peak Hour Traffic Volumes

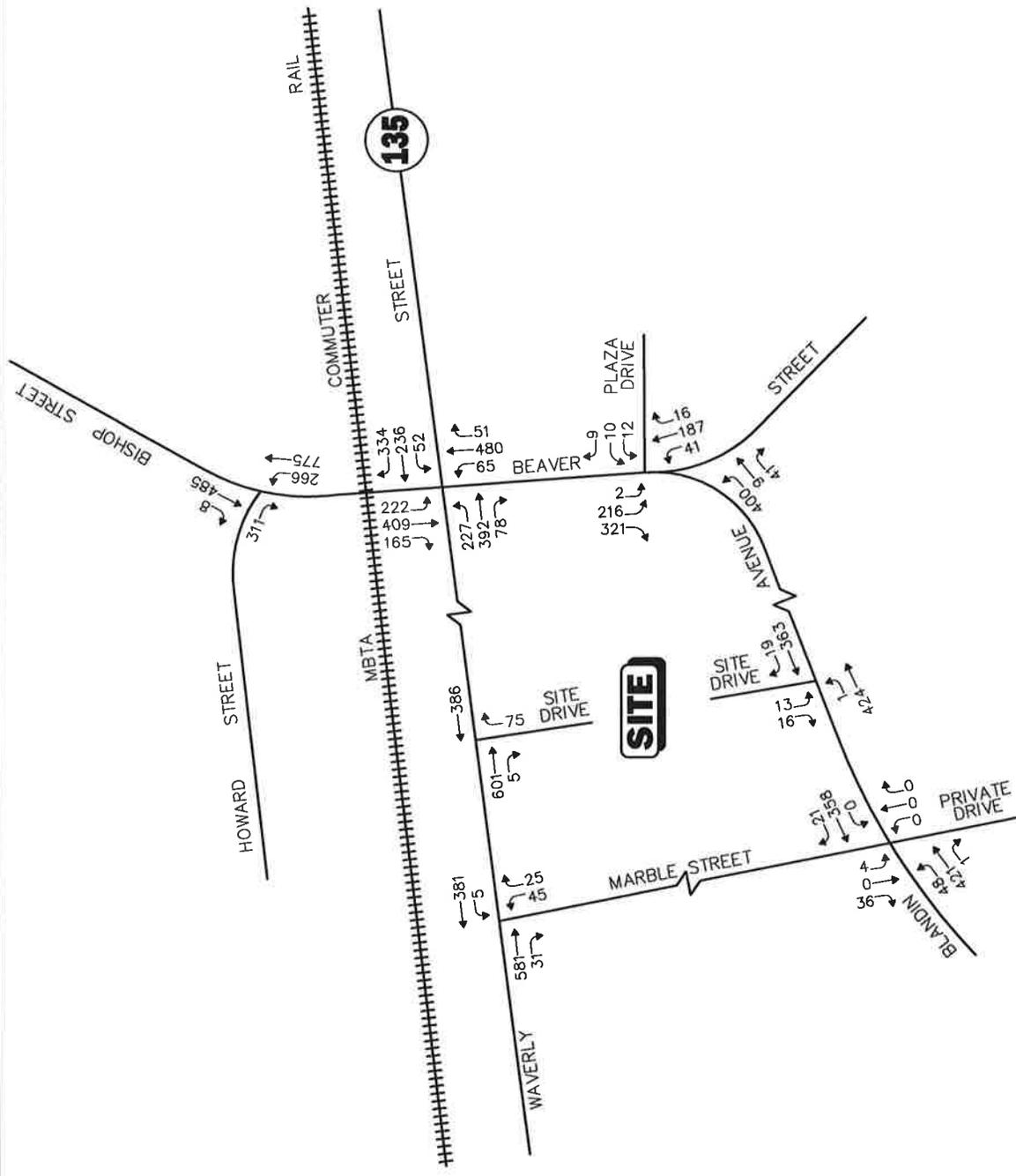
Table 7
TRIP-DISTRIBUTION SUMMARY

Roadway	Direction (to/from)	Percent
Bishop Street	North	35%
Waverly Street	East	20%
Waverly Street	West	20%
Howard Street	North	17%
Blandin Avenue	South	5%
Beaver Street	South	3%
TOTAL		100%

FUTURE TRAFFIC VOLUMES - BUILD CONDITION

The 2023 Build condition traffic volumes consist of the 2023 No-Build traffic volumes with the additional traffic expected to be generated by the Project added to them. The 2023 Build weekday morning and weekday evening peak-hour traffic-volumes are graphically depicted on Figures 10 and 11, respectively.

A summary of peak-hour projected traffic-volume increases external to the study area that is the subject of this assessment is shown in Table 8. These volumes are based on the expected increases from the Project.

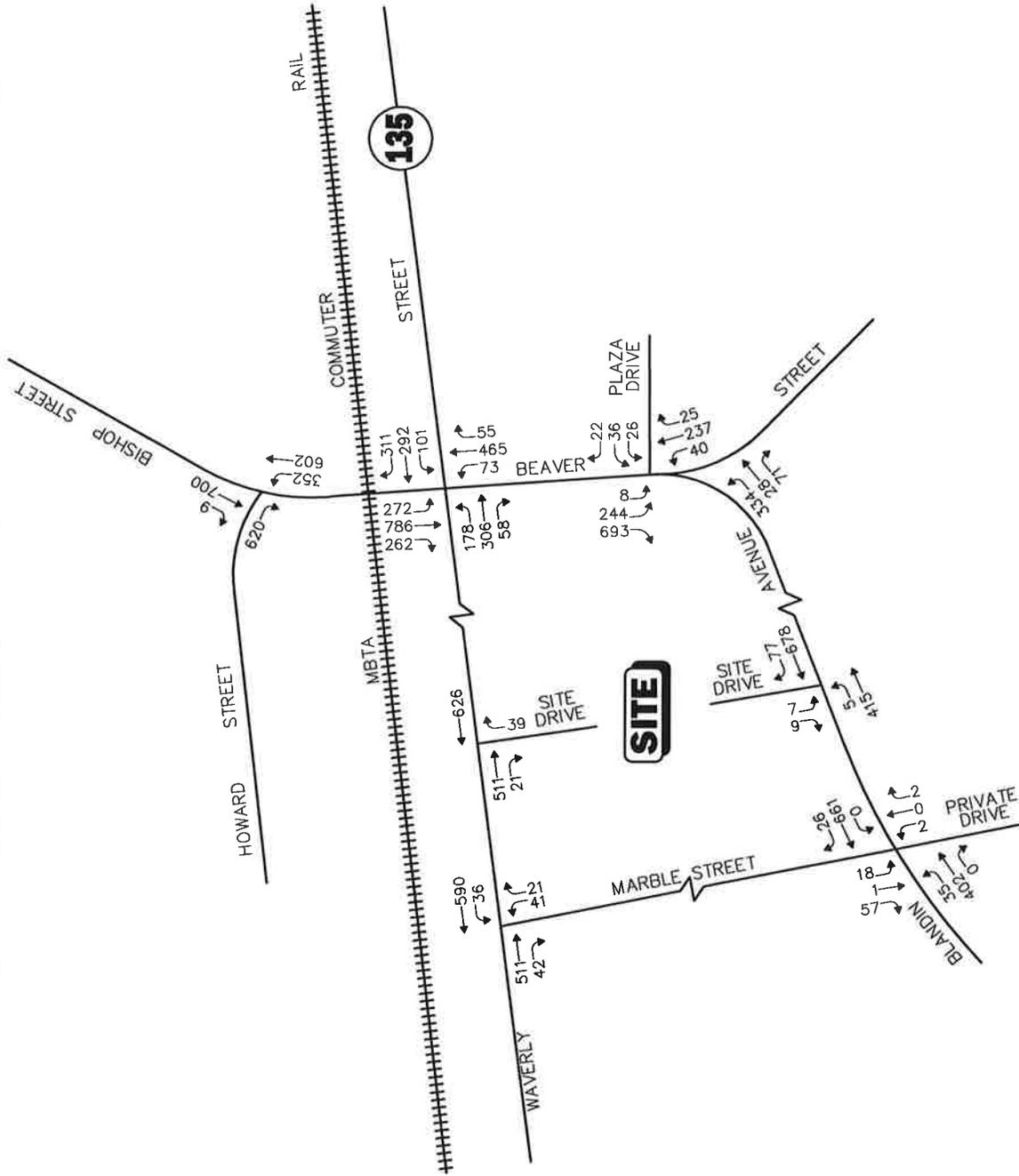


Note: Imbalances exist due to numerous curb cuts and side streets that are not shown.
Not To Scale

Figure 10

**2023 Build
Weekday Morning
Peak Hour Traffic Volumes**

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Note: Imbalances exist due to numerous curb cuts and side streets that are not shown.
Not To Scale

Figure 11
2023 Build
Weekday Evening
Peak Hour Traffic Volumes

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Table 8
PEAK-HOUR TRAFFIC-VOLUME INCREASES

Location/Peak Hour	2023 No-Build	2023 Build	Traffic Volume Increase Over No-Build	Percent Increase Over No-Build
<i>Bishop Street, north of Howard Street:</i>				
Weekday Morning	1,223	1,268	45	3.7
Weekday Evening	1,256	1,311	55	4.4
<i>Waverly Street, east of Beaver Street:</i>				
Weekday Morning	1,261	1,287	26	2.1
Weekday Evening	1,305	1,337	32	2.5
<i>Waverly Street, west of Marble Street:</i>				
Weekday Morning	1,012	1,038	26	2.6
Weekday Evening	1,152	1,184	32	2.8
<i>Howard Street, west of Bishop Street:</i>				
Weekday Morning	563	585	22	3.9
Weekday Evening	954	981	27	2.8
<i>Blandin Avenue, west of Marble Street:</i>				
Weekday Morning	858	864	6	0.7
Weekday Evening	1,149	1,157	8	0.7
<i>Beaver Street, south of Blandin Avenue:</i>				
Weekday Morning	509	513	4	0.8
Weekday Evening	639	643	4	0.6

As shown in Table 7, Project-related traffic-volume increases external to the study area relative to 2023 No-Build conditions are anticipated to range from 0.6 to 4.4 percent during the peak periods. ***Such increases are considered nominal when dispersed over the peak-hour and would not result in a material impact (increase) on motorist delays or vehicle queuing outside of the immediate study area that is the subject of this assessment.***

TRAFFIC OPERATIONS ANALYSIS

Measuring existing and future traffic volumes quantifies traffic flow within the study area. To assess quality of flow, roadway capacity and vehicle queue analyses were conducted under Existing, No-Build and Build traffic volume conditions. Capacity analyses provide an indication of how well the roadway facilities serve the traffic demands placed upon them, with vehicle queue analyses providing a secondary measure of the operational characteristics of an intersection or section of roadway under study.

METHODOLOGY

Levels of Service

A primary result of capacity analyses is the assignment of level of service to traffic facilities under various traffic-flow conditions.⁵ The concept of level of service is defined as a qualitative measure describing operational conditions within a traffic stream and their perception by motorists and/or passengers. A level-of-service definition provides an index to quality of traffic flow in terms of such factors as speed, travel time, freedom to maneuver, traffic interruptions, comfort, convenience, and safety.

Six levels of service are defined for each type of facility. They are given letter designations from A to F, with level-of-service (LOS) A representing the best operating conditions and LOS F representing congested or constrained operating conditions.

Since the level of service of a traffic facility is a function of the traffic flows placed upon it, such a facility may operate at a wide range of levels of service, depending on the time of day, day of week, or period of year.

⁵The capacity analysis methodology is based on the concepts and procedures presented in the *Highway Capacity Manual*; Transportation Research Board; Washington, DC; 2010.

Unsignalized Intersections

The six levels of service for unsignalized intersections may be described as follows:

- *LOS A* represents a condition with little or no control delay to minor street traffic.
- *LOS B* represents a condition with short control delays to minor street traffic.
- *LOS C* represents a condition with average control delays to minor street traffic.
- *LOS D* represents a condition with long control delays to minor street traffic.
- *LOS E* represents operating conditions at or near capacity level, with very long control delays to minor street traffic.
- *LOS F* represents a condition where minor street demand volume exceeds capacity of an approach lane, with extreme control delays resulting.

The levels of service of unsignalized intersections are determined by application of a procedure described in the 2000 *Highway Capacity Manual*.⁶ Level of service is measured in terms of average control delay. Mathematically, control delay is a function of the capacity and degree of saturation of the lane group and/or approach under study and is a quantification of motorist delay associated with traffic control devices such as traffic signals and STOP signs. Control delay includes the effects of initial deceleration delay approaching a STOP sign, stopped delay, queue move-up time, and final acceleration delay from a stopped condition. Definitions for level of service at unsignalized intersections are also given in the 2000 *Highway Capacity Manual*. Table 9 summarizes the relationship between level of service and average control delay for two-way stop controlled and all-way stop controlled intersections.

Table 9
LEVEL-OF-SERVICE CRITERIA FOR
UNSIGNALIZED INTERSECTIONS^a

Level-Of-Service by Volume-to-Capacity Ratio		Average Control Delay (Seconds Per Vehicle)
$v/c \leq 1.0$	$v/c > 1.0$	
A	F	≤ 10.0
B	F	10.1 to 15.0
C	F	15.1 to 25.0
D	F	25.1 to 35.0
E	F	35.1 to 50.0
F	F	> 50.0

^aSource: *Highway Capacity Manual*; Transportation Research Board; Washington, DC; 2000

⁶*Highway Capacity Manual*; Transportation Research Board; Washington, DC; 2010.

Signalized Intersections

The six levels of service for signalized intersections may be described as follows:

- *LOS A* describes operations with very low control delay; most vehicles do not stop at all.
- *LOS B* describes operations with relatively low control delay. However, more vehicles stop than *LOS A*.
- *LOS C* describes operations with higher control delays. Individual cycle failures may begin to appear. The number of vehicles stopping is significant at this level, although many still pass through the intersection without stopping.
- *LOS D* describes operations with control delay in the range where the influence of congestion becomes more noticeable. Many vehicles stop and individual cycle failures are noticeable.
- *LOS E* describes operations with high control delay values. Individual cycle failures are frequent occurrences.
- *LOS F* describes operations with high control delay values that often occur with over-saturation. Poor progression and long cycle lengths may also be major contributing causes to such delay levels.

Levels of service for signalized intersections are calculated using the operational analysis methodology of the 2000 *Highway Capacity Manual*. This method assesses the effects of signal type, timing, phasing, and progression; vehicle mix; and geometrics on delay. Level-of-service designations are based on the criterion of control or signal delay per vehicle. Control or signal delay is a measure of driver discomfort, frustration, and fuel consumption, and includes initial deceleration delay approaching the traffic signal, queue move-up time, stopped delay and final acceleration delay. Table 10 summarizes the relationship between level of service and control delay. The tabulated control delay criterion may be applied in assigning level-of-service designations to individual lane groups, to individual intersection approaches, or to entire intersections.

Table 10
LEVEL-OF-SERVICE CRITERIA
FOR SIGNALIZED INTERSECTIONS^a

Level of Service	Control (Signal) Delay Per Vehicle (Seconds)
A	≤10.0
B	10.1 to 20.0
C	20.1 to 35.0
D	35.1 to 55.0
E	55.1 to 80.0
F	>80.0

^aSource: *Highway Capacity Manual*; Transportation Research Board; Washington, DC; 2000; page 16-2.

ANALYSIS RESULTS

Level-of-service and vehicle queue analyses were conducted for 2016 Existing, 2023 No-Build and 2023 Build conditions for the intersections within the study area. The results of the intersection capacity and vehicle queue analyses are summarized in Tables 11 and 12. The detailed analysis results are presented in the Appendix. The following is a summary of the level-of-service and vehicle queue analyses for the intersections within the study area.

Signalized Intersections

Waverly Street at Bishop Street and Beaver Street

Under all conditions, this signalized intersection overall operates at LOS D, during the weekday morning and weekday evening peak hours.

Bishop Street at Howard Street

Under all conditions, this signalized intersection overall operates at LOS D during the weekday morning peak hour and at LOS F during the weekday evening peak hour.

Beaver Street at Blandin Avenue and Plaza Drive

Under all conditions, this signalized intersection overall operates at LOS D, during the weekday morning and weekday evening peak hours.

Unsignalized Intersections

Waverly Street at Marble Street

Under Existing and No-Build conditions, the critical movements (all turning movements from Marble Street), operated at LOS C during both the weekday morning and weekday evening peak hours. Under the Build condition, the critical movements operated at LOS C during the weekday morning peak hour and at LOS D during the weekday evening peak hour.

Waverly Street at Site Drive

Under the Build condition, the critical movements (right-turns from Site Drive), operated at LOS B during both the weekday morning and weekday evening peak hours.

Blandin Avenue at Marble Street

Under all conditions, the critical movements (all turning movements from Marble Street), operated at LOS B during the weekday morning peak hour and at LOS C during the weekday evening peak hour.

Blandin Avenue at Site Drive

Under the Build condition, the critical movements (all turning movements from Site Drive), operated at LOS B during the weekday morning peak hour and at LOS C during the weekday evening peak hour.

Table 11
SIGNALIZED INTERSECTION LEVEL-OF-SERVICE AND VEHICLE QUEUE SUMMARY

Signalized Intersection/Peak Hour/Movement	2016 Existing			2023 No-Build			2023 Build					
	V/C ^a	Delay ^b	LOS ^c	Queue ^d 50 th /95 th	V/C	Delay	LOS	Queue 50 th /95 th	V/C	Delay	LOS	Queue 50 th /95 th
Waverly Street and Bishop Street and Beaver Street												
<i>Weekday Morning:</i>												
Waverly Street EB LT	0.42	34.6	C	125/184	0.45	35.1	D	132/193	0.59	38.7	D	180/254
Waverly Street EB TH/RT	0.58	38.0	D	383/502	0.61	39.0	D	410/536	0.64	40.0	D	438/570
Waverly Street WB LT	0.20	43.1	D	38/76	0.22	43.6	D	41/82	0.27	44.5	D	46/90
Waverly Street WB TH	0.39	46.3	D	205/288	0.42	46.8	D	222/310	0.42	46.8	D	222/310
Waverly Street WB RT	0.32	45.0	D	61/159	0.37	45.9	D	86/191	0.37	45.9	D	86/191
Beaver Street NB LT	0.46	62.6	E	35/55	0.53	64.6	E	38/62	0.63	70.3	E	45/85
Beaver Street NB TH/RT	1.02	>80.0	F	341/438	1.09	>80.0	F	379/490	1.09	>80.0	F	380/492
Bishop Street SB LT	0.61	51.2	D	208/263	0.68	54.0	D	236/279	0.68	53.6	D	236/276
Bishop Street SB TH/RT	0.30	3.7	A	58/67	0.33	4.0	A	65/72	0.34	4.1	A	67/73
Overall	0.73	47.5	D	--	0.79	52.8	D	--	0.80	52.8	D	--
<i>Weekday Evening:</i>												
Waverly Street EB LT	0.41	34.8	C	107/161	0.44	35.4	D	113/168	0.53	36.6	D	136/197
Waverly Street EB TH/RT	0.45	34.9	C	280/375	0.47	35.2	D	298/398	0.49	35.5	D	310/412
Waverly Street WB LT	0.25	44.0	D	67/117	0.28	44.4	D	72/125	0.04	40.6	D	9/27
Waverly Street WB TH	0.48	48.0	D	264/361	0.51	48.7	D	287/390	0.51	48.7	D	287/390
Waverly Street WB RT	0.34	45.4	D	99/194	0.39	46.3	D	128/231	0.39	46.3	D	128/231
Beaver Street NB LT	0.86	>80.0	F	58/145	1.00	>80.0	F	71/160	1.13	>80.0	F	101/179
Beaver Street NB TH/RT	0.96	>80.0	F	255/407	1.05	>80.0	F	354/467	1.05	>80.0	F	353/468
Bishop Street SB LT	0.72	55.6	E	264/270	0.79	57.3	E	293/274	0.79	56.8	E	293/260
Bishop Street SB TH/RT	0.54	8.5	A	461/123	0.58	9.8	A	496/460	0.61	10.8	B	526/474
Overall	0.70	43.4	D	--	0.76	49.0	D	--	0.78	49.8	D	--

See notes at end of table.

Table 11 (Continued)
SIGNALIZED INTERSECTION LEVEL-OF-SERVICE AND VEHICLE QUEUE SUMMARY

Signalized Intersection/Peak Hour/Movement	2016 Existing			2023 No-Build			2023 Build					
	V/C ^a	Delay ^b	LOS ^c	Queue ^d 50 th /95 th	V/C	Delay	LOS	Queue 50 th /95 th	V/C	Delay	LOS	Queue 50 th /95 th
Bishop Street at Howard Street												
<i>Weekday Morning:</i>												
Howard Street EB RT	0.43	52.9	D	80/108	0.48	53.8	D	90/120	0.49	53.9	D	92/121
Bishop Street NB LT	0.27	4.6	A	20/40	0.27	5.2	A	33/67	0.29	5.1	A	41/71
Bishop Street NB RT	0.52	9.2	A	624/583	0.52	8.8	A	648/189	0.55	8.4	A	635/190
Bishop Street SB TH/RT	0.90	>80.0	F	293/395	0.96	>80.0	F	318/442	0.98	>80.0	F	325/454
Overall	0.65	37.1	D	--	0.67	41.7	D	--	0.69	42.1	D	--
<i>Weekday Evening:</i>												
Howard Street EB RT	0.79	64.6	E	167/209	0.86	70.4	E	187/251	0.88	73.4	E	194/287
Bishop Street NB LT	0.34	9.2	A	103/141	0.39	10.9	B	151/176	0.40	10.6	B	157/183
Bishop Street NB RT	0.38	2.9	A	28/42	0.40	3.3	A	34/52	0.42	3.3	A	34/55
Bishop Street SB TH/RT	1.24	>80.0	F	506/641	1.33	>80.0	F	568/706	1.40	>80.0	F	618/756
Overall	0.75	>80.0	F	--	0.82	>80.0	F	--	0.85	>80.0	F	--
Beaver Street at Blandin Avenue and Plaza Drive												
<i>Weekday Morning:</i>												
Plaza Drive WB LT/TH/RT	0.02	>80.0	F	0/0	0.02	>80.0	F	0/0	0.02	>80.0	F	0/0
Beaver Street NB LT	0.11	54.0	D	40/76	0.11	54.0	D	41/80	0.12	54.2	D	43/83
Beaver Street NB TH/RT	0.55	61.6	E	230/310	0.55	60.0	E	229/326	0.55	61.7	E	229/326
Beaver Street SB LT/TH	0.21	13.6	B	90/118	0.23	19.3	B	97/124	0.23	13.3	B	96/118
Beaver Street SB RT	0.11	18.8	B	5/11	0.12	18.1	B	7/13	0.13	18.2	B	7/14
Blandin Avenue NEB LT/TH/RT	0.74	79.0	E	176/237	0.78	72.6	F	195/262	0.80	>80.0	F	204/272
Overall	0.39	49.1	D	--	0.42	49.5	D	--	0.42	49.5	D	--
<i>Weekday Evening:</i>												
Plaza Drive WB LT/TH/RT	0.05	79.5	E	0/33	0.05	79.5	E	0/30	0.05	79.5	E	0/30
Beaver Street NB LT	0.09	48.0	D	37/67	0.09	48.7	D	36/73	0.09	48.7	D	37/76
Beaver Street NB TH/RT	0.61	58.0	E	289/362	0.60	58.6	E	284/404	0.60	58.6	E	284/404
Beaver Street SB LT/TH	0.29	17.8	B	117/144	0.29	16.9	B	114/143	0.29	16.9	B	104/130
Beaver Street SB RT	0.24	29.1	C	26/27	0.24	28.5	C	27/32	0.27	32.3	C	34/40
Blandin Avenue NEB LT/TH/RT	0.74	79.4	E	178/240	0.79	>80.0	F	200/268	0.80	>80.0	F	205/273
Overall	0.48	47.2	D	--	0.48	47.7	D	--	0.49	48.8	D	--

^aVolume-to-capacity ratio.

^bControl (signal) delay per vehicle in seconds.

^cLevel-of-Service.

^dQueue length in feet.

NB = northbound; SB = southbound; EB = eastbound; WB = westbound; LT = left-turning movements; TH = through movements; RT = right-turning movements.

Table 12
UNSIGNALIZED INTERSECTION LEVEL-OF-SERVICE AND VEHICLE QUEUE SUMMARY

Unsignalized Intersection/Peak Hour/Movement	2016 Existing			2023 No-Build			2023 Build					
	Demand ^a	Delay ^b	LOS ^c	Queue ^d 95 th	Demand	Delay	LOS	Queue 95 th	Demand	Delay	LOS	Queue 95 th
Waverly Street at Marble Street												
<i>Weekday Morning:</i>												
Waverly Street WB LT	5	9.0	A	0	5	9.2	A	0	5	9.2	A	0
Marble Street NB LT/RT	55	17.4	C	19	59	17.9	C	17	70	19.4	C	22
<i>Weekday Evening:</i>												
Waverly Street WB LT	34	8.6	A	3	36	8.7	A	3	36	8.8	A	3
Marble Street NB LT/RT	53	20.5	C	20	56	22.7	C	22	62	25.1	D	27
Waverly Street at Site Drive												
<i>Weekday Morning:</i>												
Site Drive NB RT	--	--	--	--	--	--	--	--	75	13.9	B	15
<i>Weekday Evening:</i>												
Site Drive NB RT	--	--	--	--	--	--	--	--	39	12.2	B	6
Blandin Avenue at Marble Street												
<i>Weekday Morning:</i>												
Blandin Avenue EB LT	45	1.2	A	3	48	1.3	A	3	48	1.3	A	3
Marble Street SB LT/RT	38	11.1	B	7	40	11.2	B	6	40	11.3	B	6
<i>Weekday Evening:</i>												
Blandin Avenue EB LT	33	1.2	A	3	35	1.2	A	3	35	1.3	A	3
Marble Street SB LT/RT	71	18.3	C	26	76	18.4	C	23	76	18.6	C	23
Blandin Avenue at Site Drive												
<i>Weekday Morning:</i>												
Blandin Avenue EB LT	--	--	--	--	--	--	--	--	1	0.0	A	0
Site Drive SB LT/RT	--	--	--	--	--	--	--	--	29	13.0	B	5
<i>Weekday Evening:</i>												
Blandin Avenue EB LT	--	--	--	--	--	--	--	--	5	0.2	A	1
Site Drive SB LT/RT	--	--	--	--	--	--	--	--	16	19.1	C	5

^aDemand in vehicles per hour.

^bAverage control delay per vehicle (in seconds).

^cLevel-of-Service.

^dQueue length in vehicles.

NB = northbound; SB = southbound; EB = eastbound; WB = westbound; SEB = southeastbound; LT = left-turning movements; TH = through movements; RT = right-turning movements.

CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS

Vanasse & Associates, Inc. (VAI) has conducted a Transportation Impact Assessment (TIA) in order to determine the potential impacts on the transportation infrastructure associated with the proposed construction of 270 residential apartment units to be located at 266 Waverly Street in Framingham, Massachusetts (hereafter referred to as the “Project”). This assessment was prepared in consultation with the Town of Framingham and the Massachusetts Department of Transportation (MassDOT); was performed in accordance with MassDOT’s *Transportation Impact Assessment (TIA) Guidelines*; and was conducted pursuant to the standards of the Traffic Engineering and Transportation Planning professions for the preparation of such reports. Based on this assessment, we have concluded the following with respect to the Project:

1. The project is expected to generate 1,672 new vehicle trips on an average weekday (836 entering and 836 exiting), with approximately 129 new vehicle trips (25 entering and 104 exiting) expected during the weekday morning peak hour and 158 new vehicle trips (103 entering and 55 exiting) during the weekday evening peak hour.
2. It should be noted that the project will generate less traffic during the weekday evening peak hour and on a daily basis, in comparison to if the project site were to be re-tenanted with retail uses.
3. The Project will not have a significant impact (increase) on motorist delays or vehicle queuing over Existing or anticipated future conditions without the Project (No-Build conditions);
4. No apparent safety deficiencies are expected at the study intersections. Specific safety-related improvement measures have been identified and implemented for the Town at the Waverly Street/Bishop Street/Beaver Street intersection to address prior safety and capacity concerns.

5. A total of four curb-cuts will be closed with the development of this project, and two curb-cuts relocated. The two full-access curb-cuts on Marble Street and the one full-access curb-cut on Waverly Street will be closed, and the right-in/right-out only curb-cut on Waverly Street will be closed and relocated to the east. The loading entrance will be closed on Blandin Avenue, and a relocated driveway will serve the location.

In consideration of the above, we have concluded that the Project can be accommodated within the confines of the existing transportation infrastructure in a safe and efficient manner with implementation of the recommendations that follow.

RECOMMENDATIONS

A detailed transportation improvement program has been developed that is designed to provide safe and efficient access to the Project site. The following improvements have been recommended as a part of this evaluation and, where applicable, will be completed in conjunction with the Project subject to receipt of all necessary rights, permits, and approvals.

Project Access

Access to the Project site will be provided by way of two driveways defined as follows: one (1) right-in/right-out only driveway on Waverly Street; and one (1) full access driveway on Blandin Avenue.

- The Blandin Avenue Site Drive should be a minimum of 24-feet in width and accommodate two-way traffic.
- The Waverly Street Site Drive right-in entrance should be a minimum of 15-feet in width, and the right-out exit should be a minimum of 15-feet in width. A channelized island should guide vehicles for the right-in/right-out only movements.
- Vehicles exiting the Project site should be placed under STOP-sign control with a marked STOP-line provided.
- All signs and pavement markings to be installed within the Project site shall conform to the applicable standards of the *Manual on Uniform Traffic Control Devices (MUTCD)*.⁷
- Wheelchair ramps should be provided for crossing the Project site driveways where a sidewalk is present.
- Signs and landscaping to be installed along the Project site driveways should be designed and maintained so as not to restrict lines of sight.
- Adequate street lighting should be installed at Blandin Avenue and Waverly Street at the Site Drives in order to ensure adequate visibility.

Off-Site

The project proponent is discussing providing an easement to the Town of Framingham to upgrade Marble Street. In addition, A STOP-sign should be installed on Marble Street at the intersection of Marble Street at Blandin Avenue.

⁷*Manual on Uniform Traffic Control Devices (MUTCD)*; Federal Highway Administration; Washington, D.C.; 2009.

Transportation Demand Management

The Project site is ideally situated to take advantage of available public transportation opportunities in the area, including both Commuter Rail and bus service along Waverly Street. In an effort to encourage use of alternative modes of transportation to single-occupant vehicles, the following Transportation Demand Management (TDM) measures will be implemented as a part of the Project:

- Information regarding public transportation services, maps, schedules and fare information will be posted in a central location;
- A packet will be provided to new residents of the Project detailing available public transportation services, bicycle and walking alternatives.
- Pedestrian accommodations will be incorporated within the Project site; and
- Secure bicycle parking will be provided, including both an exterior bicycle rack and weather protected bicycle parking in a secure area.

With implementation of the above recommendations, safe and efficient access will be provided to the Project site and the Project can be accommodated within the confines of the existing and improved transportation system.

APPENDIX

TRAFFIC COUNT DATA
CAPACITY ANALYSIS

TRAFFIC COUNT DATA

Accurate Counts

978-664-2565

Location : Waverly Street
 Location : West of Marble Street
 City/State: Framingham, MA

7325VOL1

Start Time	18-May-16 Wed	EB		Hour Totals		WB		Hour Totals		Combined Totals	
		Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon
12:00		*	*			*	*				
12:15		*	*			*	*				
12:30		*	*			*	*				
12:45		*	*			*	*				
01:00		*	93	0	0	*	101	0	0	0	0
01:15		*	111			*	121				
01:30		*	85			*	121				
01:45		*	77	0	366	*	125	0	468	0	834
02:00		*	104			*	99				
02:15		*	72			*	108				
02:30		*	87			*	123				
02:45		*	95	0	358	*	122	0	452	0	810
03:00		*	90			*	124				
03:15		*	91			*	111				
03:30		*	83			*	128				
03:45		*	94	0	358	*	124	0	487	0	845
04:00		*	102			*	137				
04:15		*	60			*	118				
04:30		*	91			*	143				
04:45		*	69	0	322	*	129	0	527	0	849
05:00		*	66			*	114				
05:15		*	63			*	116				
05:30		*	72			*	120				
05:45		*	76	0	277	*	141	0	491	0	768
06:00		*	60			*	124				
06:15		*	68			*	123				
06:30		*	54			*	120				
06:45		*	82	0	264	*	166	0	533	0	797
07:00		*	83			*	134				
07:15		*	76			*	129				
07:30		*	66			*	148				
07:45		*	60	0	285	*	132	0	543	0	828
08:00		*	69			*	104				
08:15		*	64			*	118				
08:30		*	59			*	86				
08:45		*	55	0	247	*	90	0	398	0	645
09:00		*	48			*	106				
09:15		*	50			*	80				
09:30		*	53			*	87				
09:45		*	30	0	181	*	78	0	351	0	532
10:00		*	24			*	70				
10:15		*	39			*	62				
10:30		*	20			*	58				
10:45		*	30	0	113	*	40	0	230	0	343
11:00		*	22			*	35				
11:15		*	28			*	34				
11:30		*	16			*	21				
11:45		*	7	0	73	*	24	0	114	0	187
Total		0	2844			0	4594			0	7438
Percent		0.0%	100.0%			0.0%	100.0%			0.0%	100.0%

Accurate Counts

Location : Waverly Street
 Location : West of Marble Street
 City/State: Framingham, MA

7325VOL1

Start Time	19-May-16		EB		Hour Totals		WB		Hour Totals		Combined Totals	
	Thu	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	
12:00		9	99			16	96					
12:15		6	83			12	111					
12:30		0	92			10	130					
12:45		15	75	30	349	11	122	49	459	79	808	
01:00		5	93			4	97					
01:15		7	85			2	117					
01:30		5	93			6	122					
01:45		5	75	22	346	6	120	18	456	40	802	
02:00		5	86			3	137					
02:15		5	94			10	94					
02:30		3	84			5	129					
02:45		6	117	19	381	1	115	19	475	38	856	
03:00		0	97			0	125					
03:15		0	77			1	121					
03:30		2	86			3	146					
03:45		0	79	2	339	2	123	6	515	8	854	
04:00		4	95			5	142					
04:15		1	110			6	110					
04:30		14	69			7	95					
04:45		18	96	37	370	6	125	24	472	61	842	
05:00		21	82			21	131					
05:15		27	60			19	161					
05:30		42	104			31	102					
05:45		49	72	139	318	44	147	115	541	254	859	
06:00		111	66			47	127					
06:15		105	71			63	140					
06:30		139	94			68	122					
06:45		127	98	482	329	101	130	279	519	761	848	
07:00		132	60			81	132					
07:15		148	92			95	118					
07:30		109	78			89	107					
07:45		95	71	484	301	80	101	345	458	829	759	
08:00		133	49			80	131					
08:15		133	74			94	109					
08:30		102	58			81	109					
08:45		132	51	500	232	98	114	353	463	853	695	
09:00		118	53			89	93					
09:15		118	67			102	90					
09:30		90	52			87	107					
09:45		116	44	442	216	104	75	382	365	824	581	
10:00		112	34			88	84					
10:15		83	49			91	66					
10:30		110	32			98	53					
10:45		83	17	388	132	96	46	373	249	761	381	
11:00		94	14			98	89					
11:15		75	6			83	69					
11:30		99	4			98	33					
11:45		101	7	369	31	111	18	390	209	759	240	
Total		2914	3344			2353	5181			5267	8525	
Percent		46.6%	53.4%			31.2%	68.8%			38.2%	61.8%	

Accurate Counts

Location : Waverly Street
 Location : West of Marble Street
 City/State: Framingham, MA

978-664-2565

7325VOL1

Start Time	20-May-16 Fri	EB		Hour Totals		WB		Hour Totals		Combined Totals	
		Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon	Morning	Afternoon
12:00		8	*			20	*				
12:15		5	*			15	*				
12:30		2	*			7	*				
12:45		4	*	19	0	6	*	48	0	67	0
01:00		2	*			7	*				
01:15		2	*			6	*				
01:30		0	*			4	*				
01:45		2	*	6	0	7	*	24	0	30	0
02:00		3	*			2	*				
02:15		3	*			4	*				
02:30		2	*			7	*				
02:45		3	*	11	0	5	*	18	0	29	0
03:00		2	*			1	*				
03:15		0	*			3	*				
03:30		6	*			4	*				
03:45		2	*	10	0	2	*	10	0	20	0
04:00		*	*	*	*	*	*	*	*	*	*
04:15		*	*	*	*	*	*	*	*	*	*
04:30		*	*	*	*	*	*	*	*	*	*
04:45		*	*	*	*	*	*	*	*	*	*
05:00		*	*	*	*	*	*	*	*	*	*
05:15		*	*	*	*	*	*	*	*	*	*
05:30		*	*	*	*	*	*	*	*	*	*
05:45		*	*	*	*	*	*	*	*	*	*
06:00		*	*	*	*	*	*	*	*	*	*
06:15		*	*	*	*	*	*	*	*	*	*
06:30		*	*	*	*	*	*	*	*	*	*
06:45		*	*	*	*	*	*	*	*	*	*
07:00		*	*	*	*	*	*	*	*	*	*
07:15		*	*	*	*	*	*	*	*	*	*
07:30		*	*	*	*	*	*	*	*	*	*
07:45		*	*	*	*	*	*	*	*	*	*
08:00		*	*	*	*	*	*	*	*	*	*
08:15		*	*	*	*	*	*	*	*	*	*
08:30		*	*	*	*	*	*	*	*	*	*
08:45		*	*	*	*	*	*	*	*	*	*
09:00		*	*	*	*	*	*	*	*	*	*
09:15		*	*	*	*	*	*	*	*	*	*
09:30		*	*	*	*	*	*	*	*	*	*
09:45		*	*	*	*	*	*	*	*	*	*
10:00		*	*	*	*	*	*	*	*	*	*
10:15		*	*	*	*	*	*	*	*	*	*
10:30		*	*	*	*	*	*	*	*	*	*
10:45		*	*	*	*	*	*	*	*	*	*
11:00		*	*	*	*	*	*	*	*	*	*
11:15		*	*	*	*	*	*	*	*	*	*
11:30		*	*	*	*	*	*	*	*	*	*
11:45		*	*	*	*	*	*	*	*	*	*
Total		46	0			100	0			146	0
Percent		100.0%	0.0%			100.0%	0.0%			100.0%	0.0%
Grand Total		2960	6188			2453	9775			5413	15963
Percent		32.4%	67.6%			20.1%	79.9%			25.3%	74.7%
ADT		ADT 13,638				AADT 13,638					

Accurate Counts

978-664-2565

Location : Waverly Street
 Location : West of Marble Street
 City/State: Framingham, MA

7325VOL1

Start Time	16-May-16		Tue		Wed		Thu		Fri		Sat		Sun		Week Average	
	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB	EB	WB
12:00 AM	*	*	*	*	*	*	30	49	19	48	*	*	*	*	24	48
01:00	*	*	*	*	*	*	22	18	6	24	*	*	*	*	14	21
02:00	*	*	*	*	*	*	19	19	11	18	*	*	*	*	15	18
03:00	*	*	*	*	*	*	2	6	10	10	*	*	*	*	6	8
04:00	*	*	*	*	*	*	37	24	*	*	*	*	*	*	37	24
05:00	*	*	*	*	*	*	139	115	*	*	*	*	*	*	139	115
06:00	*	*	*	*	*	*	482	279	*	*	*	*	*	*	482	279
07:00	*	*	*	*	*	*	484	345	*	*	*	*	*	*	484	345
08:00	*	*	*	*	*	*	500	353	*	*	*	*	*	*	500	353
09:00	*	*	*	*	*	*	442	382	*	*	*	*	*	*	442	382
10:00	*	*	*	*	*	*	388	373	*	*	*	*	*	*	388	373
11:00	*	*	*	*	*	*	369	390	*	*	*	*	*	*	369	390
12:00 PM	*	*	*	*	*	*	349	459	*	*	*	*	*	*	349	459
01:00	*	*	*	*	*	*	346	456	*	*	*	*	*	*	346	456
02:00	*	*	*	*	366	468	381	475	*	*	*	*	*	*	366	462
03:00	*	*	*	*	358	452	339	475	*	*	*	*	*	*	358	464
04:00	*	*	*	*	322	487	370	515	*	*	*	*	*	*	322	501
05:00	*	*	*	*	322	527	370	472	*	*	*	*	*	*	322	484
06:00	*	*	*	*	277	491	318	541	*	*	*	*	*	*	277	484
07:00	*	*	*	*	264	533	329	519	*	*	*	*	*	*	264	500
08:00	*	*	*	*	285	543	301	458	*	*	*	*	*	*	285	526
09:00	*	*	*	*	247	398	232	463	*	*	*	*	*	*	247	500
10:00	*	*	*	*	181	361	216	365	*	*	*	*	*	*	181	430
11:00	*	*	*	*	113	230	132	249	*	*	*	*	*	*	113	358
11:00	*	*	*	*	73	114	31	209	*	*	*	*	*	*	73	240
Lane	0	0	0	0	2844	4594	6258	7534	46	100	0	0	0	0	6168	7474
Day						7438	13792		146		0	0	0		13642	
AM Peak	-	-	-	-	-	-	08:00	11:00	00:00	00:00	-	-	-	-	08:00	11:00
Vol.	-	-	-	-	-	-	500	390	19	48	-	-	-	-	500	390
PM Peak	-	-	-	-	13:00	19:00	14:00	17:00	-	-	-	-	-	-	14:00	18:00
Vol.	-	-	-	-	366	543	381	541	-	-	-	-	-	-	370	526

Comb. Total 0 0 7438 13792 146 0 0 13642

ADT ADT 13.638 AADT 13.638

Accurate Counts

978-664-2565

Location : Waverly Street
 Location : West of Marble Street
 City/State: Framingham, MA

7325SPD1

EB

Start Time	1	4	7	10	13	16	19	22	25	28	31	34	37	40	Total
	3	6	9	12	15	18	21	24	27	30	33	36	39	999	
05/18/16	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
01:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
02:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
03:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
04:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
05:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
06:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
07:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
08:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
09:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
10:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
11:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
12 PM	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
13:00	0	0	1	0	14	42	36	94	98	66	12	1	1	1	366
14:00	0	0	2	34	34	46	56	86	60	34	5	1	0	0	358
15:00	0	0	1	10	16	34	32	84	118	52	11	0	0	0	358
16:00	2	0	0	8	14	20	32	78	98	52	15	2	1	0	322
17:00	2	0	3	12	12	42	42	74	60	24	3	2	1	0	277
18:00	0	0	3	28	6	20	26	66	70	32	10	3	0	0	264
19:00	0	0	0	0	8	10	36	76	84	64	7	0	0	0	285
20:00	0	0	0	8	8	4	20	78	84	30	11	2	1	1	247
21:00	2	0	0	6	6	8	22	44	50	30	11	2	0	0	181
22:00	0	0	0	6	2	2	6	22	36	34	3	2	0	0	113
23:00	0	0	0	4	0	0	2	20	24	18	4	1	0	0	73
Total	6	0	10	116	120	228	310	722	782	436	92	16	4	2	2844

Daily

15th Percentile : 17 MPH
 50th Percentile : 23 MPH
 85th Percentile : 27 MPH
 95th Percentile : 29 MPH

Mean Speed(Average) : 23 MPH
 10 MPH Pace Speed : 21-30 MPH
 Number in Pace : 2043
 Percent in Pace : 71.8%
 Number of Vehicles > 25 MPH : 1071
 Percent of Vehicles > 25 MPH : 37.7%

Accurate Counts

978-664-2565

Location : Waverly Street
 Location : West of Marble Street
 City/State: Framingham, MA

7325SPD1

EB

Start Time	1	4	7	10	13	16	19	22	25	28	31	34	37	40	Total
	3	6	9	12	15	18	21	24	27	30	33	36	39	999	
05/19/16	0	0	0	0	8	2	0	4	4	8	2	2	0	0	30
01:00	0	0	0	0	0	2	0	2	6	6	3	2	1	0	22
02:00	0	0	0	0	0	0	0	4	8	4	0	2	1	0	19
03:00	0	0	0	0	0	0	0	0	0	0	0	1	1	0	2
04:00	0	0	0	0	0	2	6	2	8	12	4	3	0	0	37
05:00	1	0	0	0	4	2	2	14	34	54	16	9	3	0	139
06:00	0	0	0	18	10	22	40	102	164	94	22	10	0	0	482
07:00	3	0	0	6	24	26	58	136	156	86	8	1	0	0	484
08:00	0	0	0	28	50	54	78	130	98	52	8	1	1	0	500
09:00	0	0	0	4	8	18	44	118	152	76	16	3	3	0	442
10:00	1	0	0	6	12	18	38	84	118	92	15	4	0	0	388
11:00	1	0	0	12	24	16	36	100	110	54	12	3	1	0	369
12 PM	0	0	0	6	16	42	32	78	114	52	6	3	0	0	349
13:00	3	0	1	6	16	54	38	98	84	38	7	1	0	0	346
14:00	0	0	0	18	22	36	62	98	92	42	7	2	2	0	381
15:00	0	0	0	6	16	40	76	76	74	40	7	2	2	0	339
16:00	1	0	1	14	22	42	34	92	116	40	6	2	0	0	370
17:00	3	0	1	8	10	32	60	80	94	24	3	3	0	0	318
18:00	0	0	2	20	20	46	46	48	88	52	6	1	0	0	329
19:00	0	0	0	8	6	14	28	68	104	54	16	2	0	1	301
20:00	0	0	0	4	4	12	26	42	88	50	6	0	0	0	232
21:00	0	0	1	6	2	2	18	68	64	46	5	3	0	1	216
22:00	0	0	0	8	8	12	6	36	34	24	4	0	0	0	132
23:00	0	0	0	4	0	0	2	2	10	10	1	1	1	0	31
Total	13	0	6	182	282	494	730	1482	1820	990	180	61	16	2	6258

Daily

15th Percentile : 17 MPH
 50th Percentile : 23 MPH
 85th Percentile : 27 MPH
 95th Percentile : 29 MPH

Mean Speed(Average) : 24 MPH
 10 MPH Pace Speed : 21-30 MPH
 Number in Pace : 4535
 Percent in Pace : 72.5%
 Number of Vehicles > 25 MPH : 2462
 Percent of Vehicles > 25 MPH : 39.3%

Accurate Counts

978-664-2565

Location : Waverly Street
 Location : West of Marble Street
 City/State: Framingham, MA

7325SPD1

EB

Start Time	1	4	7	10	13	16	19	22	25	28	31	34	37	40	999	Total
05/20/16	0	0	0	2	0	2	2	2	6	0	2	2	0	1		19
01:00	0	0	0	0	0	0	0	0	2	4	0	0	0	0		6
02:00	0	0	0	0	0	0	2	0	4	2	1	0	0	2		11
03:00	0	0	0	0	0	0	0	2	0	7	0	0	1	0		10
04:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*		*
05:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*		*
06:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*		*
07:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*		*
08:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*		*
09:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*		*
10:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*		*
11:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*		*
12 PM	*	*	*	*	*	*	*	*	*	*	*	*	*	*		*
13:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*		*
14:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*		*
15:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*		*
16:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*		*
17:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*		*
18:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*		*
19:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*		*
20:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*		*
21:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*		*
22:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*		*
23:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*		*
Total	0	0	0	2	0	2	4	4	12	13	3	2	1	3		46

Daily

- 15th Percentile : 19 MPH
- 50th Percentile : 26 MPH
- 85th Percentile : 29 MPH
- 95th Percentile : 34 MPH
- Mean Speed(Average) : 26 MPH
- 10 MPH Pace Speed : 22-31 MPH
- Number in Pace : 30
- Percent in Pace : 65.2%
- Number of Vehicles > 25 MPH : 30
- Percent of Vehicles > 25 MPH : 65.2%

Grand Total	19	0	16	300	402	724	1044	2208	2614	1439	275	79	21	7		9148
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Overall

- 15th Percentile : 17 MPH
- 50th Percentile : 23 MPH
- 85th Percentile : 27 MPH
- 95th Percentile : 29 MPH
- Mean Speed(Average) : 24 MPH
- 10 MPH Pace Speed : 21-30 MPH
- Number in Pace : 6609
- Percent in Pace : 72.2%
- Number of Vehicles > 25 MPH : 3564
- Percent of Vehicles > 25 MPH : 39.0%

Accurate Counts

978-664-2565

Location : Waverly Street
 Location : West of Marble Street
 City/State: Framingham, MA

7325SPD1

WB

Start Time	1	4	7	10	13	16	19	22	25	28	31	34	37	40	999	Total
05/18/16	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
01:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
02:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
03:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
04:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
05:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
06:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
07:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
08:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
09:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
10:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
11:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
12 PM	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
13:00	2	0	0	9	39	15	39	75	94	97	56	28	12	2	468	
14:00	0	0	0	4	5	7	22	57	106	119	69	47	13	3	452	
15:00	0	0	0	6	2	7	20	65	126	125	92	29	12	3	487	
16:00	0	0	0	5	13	17	33	68	123	133	84	30	16	5	527	
17:00	2	0	0	23	51	55	47	60	95	76	48	25	4	5	491	
18:00	0	0	0	5	21	29	46	87	115	120	65	30	10	5	533	
19:00	0	0	0	8	19	17	30	95	149	117	69	30	8	1	543	
20:00	0	0	0	0	3	5	19	64	105	101	66	23	8	4	398	
21:00	2	0	0	2	10	8	11	58	101	83	52	19	4	1	351	
22:00	0	0	0	1	3	2	7	17	51	65	50	20	10	4	230	
23:00	0	0	0	0	0	0	8	6	24	30	19	16	6	5	114	
Total	6	0	0	63	166	162	282	652	1089	1066	670	297	103	38	4594	

Daily

15th Percentile :	21 MPH
50th Percentile :	26 MPH
85th Percentile :	31 MPH
95th Percentile :	34 MPH
Mean Speed(Average) :	27 MPH
10 MPH Pace Speed :	24-33 MPH
Number in Pace :	3042
Percent in Pace :	66.2%
Number of Vehicles > 25 MPH :	2900
Percent of Vehicles > 25 MPH :	63.1%

Accurate Counts

978-664-2565

Location : Waverly Street
 Location : West of Marble Street
 City/State: Framingham, MA

7325SPD1

WB

Start Time	1	4	7	10	13	16	19	22	25	28	31	34	37	40	Total
	3	6	9	12	15	18	21	24	27	30	33	36	39	999	
05/19/16	0	0	0	0	1	0	3	2	8	10	12	7	2	4	49
01:00	0	0	0	0	0	0	0	0	5	3	3	2	1	4	18
02:00	0	0	0	0	0	0	1	5	3	4	2	3	1	0	19
03:00	0	0	0	0	0	0	0	0	0	0	1	2	3	0	6
04:00	0	0	0	0	0	0	1	1	1	3	7	8	3	0	24
05:00	1	0	0	0	0	1	4	8	27	33	31	7	3	0	115
06:00	0	0	0	1	0	0	9	19	57	87	64	26	12	4	279
07:00	3	0	0	0	2	4	9	45	81	100	60	29	7	5	345
08:00	0	0	0	2	5	9	25	34	81	95	67	28	4	3	353
09:00	0	0	0	0	4	7	37	62	95	88	49	26	13	1	382
10:00	1	0	0	3	5	7	9	50	93	88	67	37	10	3	373
11:00	3	0	0	1	2	5	10	52	87	110	81	28	9	2	390
12 PM	0	0	0	0	4	9	29	64	108	115	79	32	14	5	459
13:00	1	0	0	2	6	16	34	70	113	92	72	33	14	3	456
14:00	2	0	0	4	5	6	17	78	122	120	71	35	10	5	475
15:00	0	0	0	2	3	4	30	76	122	138	92	36	6	6	515
16:00	5	0	4	40	63	33	39	66	72	66	53	22	8	1	472
17:00	3	0	0	14	27	41	42	107	128	90	58	23	5	3	541
18:00	0	0	0	13	34	29	58	82	97	106	56	33	6	5	519
19:00	0	0	0	2	4	7	13	62	105	125	90	30	15	5	458
20:00	0	0	0	2	4	11	22	74	124	138	56	28	4	0	463
21:00	2	0	0	2	6	4	13	47	113	89	59	25	3	2	365
22:00	0	0	0	0	6	4	11	47	61	59	40	15	4	2	249
23:00	0	0	2	12	29	34	14	28	21	30	20	16	2	1	209
Total	21	0	6	100	210	231	430	1079	1724	1789	1190	531	159	64	7534

Daily

- 15th Percentile : 21 MPH
- 50th Percentile : 26 MPH
- 85th Percentile : 31 MPH
- 95th Percentile : 34 MPH
- Mean Speed(Average) : 27 MPH
- 10 MPH Pace Speed : 24-33 MPH
- Number in Pace : 5063
- Percent in Pace : 67.2%
- Number of Vehicles > 25 MPH : 4882
- Percent of Vehicles > 25 MPH : 64.8%

Accurate Counts
978-664-2565

Location : Waverly Street
Location : West of Marble Street
City/State: Framingham, MA

7325SPD1

WB

Start Time	1	4	7	10	13	16	19	22	25	28	31	34	37	40	999	Total
05/20/16	0	0	0	0	0	0	2	3	3	13	12	11	2	2	2	48
01:00	0	0	0	0	1	0	0	2	1	4	5	7	4	0	0	24
02:00	0	0	0	0	0	0	2	1	4	1	4	1	3	2	2	18
03:00	0	0	0	0	0	0	0	1	2	3	1	1	1	1	1	10
04:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
05:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
06:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
07:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
08:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
09:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
10:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
11:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
12 PM	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
13:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
14:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
15:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
16:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
17:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
18:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
19:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
20:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
21:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
22:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
23:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Total	0	0	0	0	1	0	4	7	10	21	22	20	10	5	100	

Daily
 15th Percentile : 24 MPH
 50th Percentile : 30 MPH
 85th Percentile : 35 MPH
 95th Percentile : 37 MPH

 Mean Speed(Average) : 31 MPH
 10 MPH Pace Speed : 28-37 MPH
 Number in Pace : 66
 Percent in Pace : 66.0%
 Number of Vehicles > 25 MPH : 85
 Percent of Vehicles > 25 MPH : 84.7%

Grand Total	27	0	6	163	377	393	716	1738	2823	2876	1882	848	272	107	12228
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Overall
 15th Percentile : 21 MPH
 50th Percentile : 26 MPH
 85th Percentile : 31 MPH
 95th Percentile : 34 MPH

 Mean Speed(Average) : 27 MPH
 10 MPH Pace Speed : 24-33 MPH
 Number in Pace : 8160
 Percent in Pace : 66.7%
 Number of Vehicles > 25 MPH : 7867
 Percent of Vehicles > 25 MPH : 64.3%

Accurate Counts

978-664-2565

Location : Waverly Street
 Location : West of Marble Street
 City/State: Framingham, MA

7325SPD1

EB, WB

Start Time	1	4	7	10	13	16	19	22	25	28	31	34	37	40	Total
05/18/16	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
01:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
02:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
03:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
04:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
05:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
06:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
07:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
08:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
09:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
10:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
11:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
12 PM	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
13:00	2	0	1	9	53	57	75	169	192	163	68	29	13	3	834
14:00	0	0	2	38	39	53	78	143	166	153	74	48	13	3	810
15:00	0	0	1	16	18	41	52	149	244	177	103	29	12	3	845
16:00	2	0	0	13	27	37	65	146	221	185	99	32	17	5	849
17:00	4	0	3	35	63	97	89	134	155	100	51	27	5	5	768
18:00	0	0	3	33	27	49	72	153	185	152	75	33	10	5	797
19:00	0	0	0	8	27	27	66	171	233	181	76	30	8	1	828
20:00	0	0	0	8	11	9	39	142	189	131	77	25	9	5	645
21:00	4	0	0	8	16	16	33	102	151	113	63	21	4	1	532
22:00	0	0	0	7	5	4	13	39	87	99	53	22	10	4	343
23:00	0	0	0	4	0	0	10	26	48	48	23	17	6	5	187
Total	12	0	10	179	286	390	592	1374	1871	1502	762	313	107	40	7438

Daily

15th Percentile :	19 MPH
50th Percentile :	25 MPH
85th Percentile :	30 MPH
95th Percentile :	33 MPH
Mean Speed(Average) :	25 MPH
10 MPH Pace Speed :	22-31 MPH
Number in Pace :	5001
Percent in Pace :	67.2%
Number of Vehicles > 25 MPH :	3971
Percent of Vehicles > 25 MPH :	53.4%

Accurate Counts

978-664-2565

Location : Waverly Street
 Location : West of Marble Street
 City/State: Framingham, MA

7325SPD1

EB, WB

Start Time	1	4	7	10	13	16	19	22	25	28	31	34	37	40	999	Total
05/19/16	0	0	0	0	9	2	3	6	12	18	14	9	2	4	4	79
01:00	0	0	0	0	0	2	0	2	11	9	6	4	2	4	4	40
02:00	0	0	0	0	0	0	1	9	11	8	2	5	2	0	0	38
03:00	0	0	0	0	0	0	0	0	0	0	1	3	4	0	0	8
04:00	0	0	0	0	0	2	7	3	9	15	11	11	3	0	0	61
05:00	2	0	0	0	4	3	6	22	61	87	47	16	6	0	0	254
06:00	0	0	0	19	10	22	49	121	221	181	86	36	12	4	4	761
07:00	6	0	0	6	26	30	67	181	237	166	68	30	7	5	5	829
08:00	0	0	0	30	55	63	103	164	179	147	75	29	5	3	3	853
09:00	0	0	0	4	12	25	81	180	247	164	65	29	16	1	1	824
10:00	2	0	0	9	17	25	47	134	211	180	82	41	10	3	3	761
11:00	4	0	0	13	26	21	46	152	197	164	93	31	10	2	2	759
12 PM	0	0	0	6	20	51	61	142	222	167	85	35	14	5	5	808
13:00	4	0	1	8	22	70	72	168	197	130	79	34	14	3	3	802
14:00	2	0	0	22	27	42	79	176	214	162	78	37	12	5	5	856
15:00	0	0	0	8	19	44	106	152	196	178	99	38	8	6	6	854
16:00	6	0	5	54	85	75	73	158	188	106	59	24	8	1	1	842
17:00	6	0	1	22	37	73	102	187	222	114	61	26	5	3	3	859
18:00	0	0	2	33	54	75	104	130	185	158	62	34	6	5	5	848
19:00	0	0	0	10	10	21	41	130	209	179	106	32	15	6	6	759
20:00	0	0	0	6	8	23	48	116	212	188	62	28	4	0	0	695
21:00	2	0	1	8	8	6	31	115	177	135	64	28	3	3	3	581
22:00	0	0	0	8	14	16	17	83	95	83	44	15	4	2	2	381
23:00	0	0	2	16	29	34	16	30	31	40	21	17	3	1	1	240
Total	34	0	12	282	492	725	1160	2561	3544	2779	1370	592	175	66	66	13792

Daily

15th Percentile :	19 MPH
50th Percentile :	25 MPH
85th Percentile :	30 MPH
95th Percentile :	33 MPH
Mean Speed(Average) :	25 MPH
10 MPH Pace Speed :	22-31 MPH
Number in Pace :	9341
Percent in Pace :	67.7%
Number of Vehicles > 25 MPH :	7345
Percent of Vehicles > 25 MPH :	53.3%

Accurate Counts

978-664-2565

Location : Waverly Street
 Location : West of Marble Street
 City/State: Framingham, MA

7325SPD1

EB, WB

Start Time	1	4	7	10	13	16	19	22	25	28	31	34	37	40	999	Total
05/20/16	0	0	0	2	0	2	4	5	9	13	14	13	2	3		67
01:00	0	0	0	0	1	0	0	2	3	8	5	7	4	0		30
02:00	0	0	0	0	0	0	4	1	8	3	5	1	3	4		29
03:00	0	0	0	0	0	0	0	3	2	10	1	1	2	1		20
04:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*		*
05:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*		*
06:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*		*
07:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*		*
08:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*		*
09:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*		*
10:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*		*
11:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*		*
12 PM	*	*	*	*	*	*	*	*	*	*	*	*	*	*		*
13:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*		*
14:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*		*
15:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*		*
16:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*		*
17:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*		*
18:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*		*
19:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*		*
20:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*		*
21:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*		*
22:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*		*
23:00	*	*	*	*	*	*	*	*	*	*	*	*	*	*		*
Total	0	0	0	2	1	2	8	11	22	34	25	22	11	8		146

Daily

- 15th Percentile : 23 MPH
- 50th Percentile : 29 MPH
- 85th Percentile : 34 MPH
- 95th Percentile : 37 MPH
- Mean Speed(Average) : 29 MPH
- 10 MPH Pace Speed : 27-36 MPH
- Number in Pace : 88
- Percent in Pace : 60.3%
- Number of Vehicles > 25 MPH : 115
- Percent of Vehicles > 25 MPH : 78.5%

Grand Total	46	0	22	463	779	1117	1760	3946	5437	4315	2157	927	293	114		21376
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Overall

- 15th Percentile : 19 MPH
- 50th Percentile : 25 MPH
- 85th Percentile : 30 MPH
- 95th Percentile : 33 MPH
- Mean Speed(Average) : 25 MPH
- 10 MPH Pace Speed : 22-31 MPH
- Number in Pace : 14417
- Percent in Pace : 67.4%
- Number of Vehicles > 25 MPH : 11431
- Percent of Vehicles > 25 MPH : 53.5%



PRECISION
D A T A
INDUSTRIES, LLC

46 Morton Street, Framingham, MA 01752
Office: 508.875.0100 Fax: 508.875-0118
Email: datarequests@pdilk.com

Marble Street
between Framingham Liquors Driveways
City, State: Framingham, MA
Client: Town of Framingham/ A. Kiel

165064 A Class
Site Code:
Date Start: 26-Apr-16

NB

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
04/26/1														
6	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:00	0	1	0	0	0	0	0	0	0	0	0	0	0	1
03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:00	0	1	0	0	0	0	0	0	0	0	0	0	0	1
05:00	0	2	3	0	1	0	0	0	0	0	0	0	0	6
06:00	0	5	3	0	3	0	0	0	0	0	0	0	0	11
07:00	0	17	3	0	2	0	0	0	0	0	0	0	0	22
08:00	0	38	8	0	5	0	0	1	0	0	0	0	0	52
09:00	0	19	6	0	2	0	0	0	0	0	0	0	0	27
10:00	1	14	5	0	2	0	0	0	0	0	0	0	0	22
11:00	0	17	6	0	3	0	0	0	0	0	0	0	0	26
12 PM	0	13	4	0	4	0	0	0	0	0	0	0	0	21
13:00	0	9	2	0	2	0	0	0	0	0	0	0	0	13
14:00	0	18	1	0	5	0	0	0	0	0	0	0	0	24
15:00	0	24	1	0	2	0	0	0	0	0	0	0	0	27
16:00	0	17	2	0	2	0	0	0	0	0	0	0	0	21
17:00	0	18	3	0	0	0	0	0	0	0	0	0	0	21
18:00	0	19	3	0	2	0	0	0	0	0	0	0	0	24
19:00	0	15	3	0	5	0	0	0	0	0	0	0	0	23
20:00	0	6	1	0	2	0	0	0	0	0	0	0	0	9
21:00	0	5	1	0	0	0	0	0	0	0	0	0	0	6
22:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23:00	0	1	0	0	0	0	0	0	0	0	0	0	0	1
Total	1	259	55	0	42	0	0	1	0	0	0	0	0	358
Percent	0.3%	72.3%	15.4%	0.0%	11.7%	0.0%	0.0%	0.3%	0.0%	0.0%	0.0%	0.0%	0.0%	
AM Peak	10:00	08:00	08:00		08:00			08:00						08:00
Vol.	1	38	8		5			1						52
PM Peak		15:00	12:00		14:00									15:00
Vol.		24	4		5									27

Marble Street
 between Framingham Liquors Driveways
 City, State: Framingham, MA
 Client: Town of Framingham/ A. Kiel



45 Morton Street, Framingham, MA 01752
 Office: 508-875-0100 Fax: 508-875-0118
 Email: datarequests@pdilc.com

165064 A Class
 Site Code:
 Date Start: 26-Apr-16

NB

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
04/27/1														
6	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:00	0	2	0	0	0	0	0	0	0	0	0	0	0	2
05:00	0	0	0	0	1	0	0	0	0	0	0	0	0	1
06:00	0	7	2	0	3	0	0	0	0	0	0	0	0	12
07:00	0	16	6	0	2	0	0	0	0	0	0	0	0	24
08:00	0	44	3	0	4	0	0	0	0	0	0	0	0	51
09:00	0	20	4	0	2	0	0	0	0	0	0	0	0	26
10:00	0	14	4	0	2	1	0	0	0	0	0	0	0	21
11:00	0	11	2	0	4	0	0	0	0	0	0	0	0	17
12 PM	0	18	2	0	3	0	0	0	0	0	0	0	0	23
13:00	0	9	3	0	3	0	0	0	0	0	0	0	0	15
14:00	0	18	3	0	3	0	0	0	0	0	0	0	0	24
15:00	0	27	3	0	6	0	0	0	0	0	0	0	0	36
16:00	1	29	2	0	2	0	0	0	0	0	0	0	0	34
17:00	0	23	5	0	2	0	0	0	0	0	0	0	0	30
18:00	0	28	3	0	2	0	0	0	0	0	0	0	0	33
19:00	1	16	8	0	3	0	0	0	0	0	0	0	0	28
20:00	0	6	4	0	0	0	0	0	0	0	0	0	0	10
21:00	0	7	1	0	0	0	0	0	0	0	0	0	0	8
22:00	0	5	0	0	0	0	0	0	0	0	0	0	0	5
23:00	0	1	0	0	0	0	0	0	0	0	0	0	0	1
Total	2	301	55	0	42	1	0	0	0	0	0	0	0	401
Percent	0.5%	75.1%	13.7%	0.0%	10.5%	0.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
AM Peak		08:00	07:00		08:00	10:00								08:00
Vol.		44	6		4	1								51
PM Peak	16:00	16:00	19:00		15:00									15:00
Vol.	1	29	8		6									36
Total		560	110	0	84	1	0	1	0	0	0	0	0	759



Marble Street
 between Framingham Liquors Driveways
 City, State: Framingham, MA
 Client: Town of Framingham/ A. Kiel

46 Morton Street, Framingham, MA 01752
 Office: 508-875-0100 Fax: 508-875-0118
 Email: datarequests@pdilc.com

165064 A Speed
 Site Code:
 Date Start: 26-Apr-16

NB

Start Time	1	15	20	25	30	35	40	45	50	55	60	65	70	Total	85th %ile	Ave Speed
04/26/16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
01:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
02:00	0	0	1	0	0	0	0	0	0	0	0	0	0	1	23	22
03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
04:00	0	1	0	0	0	0	0	0	0	0	0	0	0	1	18	17
05:00	1	3	2	0	0	0	0	0	0	0	0	0	0	6	21	17
06:00	1	3	3	4	0	0	0	0	0	0	0	0	0	11	26	21
07:00	2	8	10	2	0	0	0	0	0	0	0	0	0	22	23	19
08:00	6	12	21	12	1	0	0	0	0	0	0	0	0	52	26	21
09:00	6	7	8	5	1	0	0	0	0	0	0	0	0	27	25	19
10:00	2	14	4	2	0	0	0	0	0	0	0	0	0	22	22	18
11:00	6	13	6	0	1	0	0	0	0	0	0	0	0	26	21	17
12 PM	2	10	8	1	0	0	0	0	0	0	0	0	0	21	22	18
13:00	1	5	4	3	0	0	0	0	0	0	0	0	0	13	25	20
14:00	6	9	5	4	0	0	0	0	0	0	0	0	0	24	24	17
15:00	6	8	10	3	0	0	0	0	0	0	0	0	0	27	23	18
16:00	1	12	6	0	2	0	0	0	0	0	0	0	0	21	23	19
17:00	4	7	7	3	0	0	0	0	0	0	0	0	0	21	23	18
18:00	4	7	8	5	0	0	0	0	0	0	0	0	0	24	25	19
19:00	5	9	7	2	0	0	0	0	0	0	0	0	0	23	22	17
20:00	3	6	0	0	0	0	0	0	0	0	0	0	0	9	17	14
21:00	1	4	1	0	0	0	0	0	0	0	0	0	0	6	19	16
22:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
23:00	0	0	0	1	0	0	0	0	0	0	0	0	0	1	28	27
Total	57	138	111	47	5	0	358									
%	15.9%	38.5%	31.0%	13.1%	1.4%	0.0%										

AM Peak	08:00	08:00	08:00	08:00	08:00											08:00
Vol.	6	12	21	12	1											52

Midday Peak	11:00	11:00	12:00	14:00	11:00											11:00
Vol.	6	13	8	4	1											26

PM Peak	15:00	16:00	15:00	18:00	16:00											15:00
Vol.	6	12	10	5	2											27

%iles	15th Percentile :				13 MPH
	50th Percentile :				18 MPH
	85th Percentile :				23 MPH
	95th Percentile :				27 MPH

Stats	10 MPH Pace Speed :	15-24 MPH
	Number In Pace :	249
	Percent in Pace :	69.6%
	Number of Vehicles > 20 MPH :	141
	Percent of Vehicles > 20 MPH :	39.3%
	Mean Speed(Average) :	19 MPH



PRECISION
D A T A
INDUSTRIES, LLC

46 Morton Street, Framingham, MA 01752
Office: 508.875.0100 Fax: 508.875-0118
Email: datarequests@pdillc.com

Marble Street
between Framingham Liquors Driveways
City, State: Framingham, MA
Client: Town of Framingham/ A. Kiel

165064 A Speed
Site Code:
Date Start: 26-Apr-16

NB

Start Time	1	15	20	25	30	35	40	45	50	55	60	65	70	Total	85th %ile	Ave Speed
04/27/16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
01:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
02:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
04:00	1	1	0	0	0	0	0	0	0	0	0	0	0	2	17	12
05:00	0	1	0	0	0	0	0	0	0	0	0	0	0	1	18	17
06:00	4	6	2	0	0	0	0	0	0	0	0	0	0	12	19	15
07:00	2	5	9	7	1	0	0	0	0	0	0	0	0	24	27	22
08:00	4	10	22	13	2	0	0	0	0	0	0	0	0	51	26	22
09:00	5	5	9	6	1	0	0	0	0	0	0	0	0	26	26	20
10:00	10	5	6	0	0	0	0	0	0	0	0	0	0	21	21	14
11:00	5	8	4	0	0	0	0	0	0	0	0	0	0	17	20	15
12 PM	5	7	11	0	0	0	0	0	0	0	0	0	0	23	22	17
13:00	5	6	4	0	0	0	0	0	0	0	0	0	0	15	21	15
14:00	3	9	10	1	1	0	0	0	0	0	0	0	0	24	23	19
15:00	5	9	19	2	1	0	0	0	0	0	0	0	0	36	23	19
16:00	5	8	17	4	0	0	0	0	0	0	0	0	0	34	23	19
17:00	5	10	11	3	1	0	0	0	0	0	0	0	0	30	23	19
18:00	6	16	7	3	1	0	0	0	0	0	0	0	0	33	23	18
19:00	4	12	11	1	0	0	0	0	0	0	0	0	0	28	22	18
20:00	1	4	4	1	0	0	0	0	0	0	0	0	0	10	23	19
21:00	1	3	3	1	0	0	0	0	0	0	0	0	0	8	23	19
22:00	0	2	3	0	0	0	0	0	0	0	0	0	0	5	22	20
23:00	0	0	0	1	0	0	0	0	0	0	0	0	0	1	28	27
Total	71	127	152	43	8	0	0	0	0	0	0	0	0	401		
%	17.7%	31.7%	37.9%	10.7%	2.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			

AM Peak	09:00	08:00	08:00	08:00	08:00											08:00
Vol.	5	10	22	13	2											51
Midday Peak	11:00	14:00	12:00	14:00	14:00											14:00
Vol.	5	9	11	1	1											24
PM Peak	18:00	18:00	15:00	16:00	15:00											15:00
Vol.	6	16	19	4	1											36

%iles	15th Percentile :	11 MPH
	50th Percentile :	19 MPH
	85th Percentile :	23 MPH
	95th Percentile :	27 MPH

Stats	10 MPH Pace Speed :	15-24 MPH
	Number in Pace :	279
	Percent in Pace :	69.6%
	Number of Vehicles > 20 MPH :	173
	Percent of Vehicles > 20 MPH :	43.0%
	Mean Speed(Average) :	19 MPH



PRECISION
D A T A
INDUSTRIES, LLC

46 Morton Street, Framingham, MA 01752
Office: 508-875-0100 Fax: 508-875-0118
Email: datarequests@pdilc.com

Marble Street
between Framingham Liquors Driveways
City, State: Framingham, MA
Client: Town of Framingham/ A, Kiel

165064 A Class
Site Code:
Date Start: 26-Apr-16

SB

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
04/26/16														
6	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01:00	0	1	0	0	0	0	0	0	0	0	0	0	0	1
02:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:00	0	1	0	0	0	0	0	0	0	0	0	0	0	1
05:00	0	4	3	0	1	0	0	0	0	0	0	0	0	8
06:00	0	24	12	0	3	0	0	0	0	0	0	0	0	39
07:00	0	30	2	0	4	0	0	0	0	0	0	0	0	36
08:00	0	21	7	0	4	0	0	0	0	0	0	0	0	32
09:00	0	17	5	0	3	0	0	0	0	0	0	0	0	25
10:00	0	18	7	0	2	0	0	0	0	0	0	0	0	27
11:00	0	23	2	0	4	0	0	0	0	0	0	0	0	29
12 PM	0	19	4	0	5	0	0	0	0	0	0	0	0	28
13:00	0	10	7	0	5	0	0	0	0	0	0	0	0	22
14:00	0	27	6	0	3	0	0	0	0	0	0	0	0	36
15:00	0	23	6	0	3	0	0	0	0	0	0	0	0	32
16:00	0	45	7	0	2	0	0	0	0	0	0	0	0	54
17:00	0	43	7	0	1	0	0	0	0	0	0	0	0	51
18:00	0	20	6	0	3	0	0	0	0	0	0	0	0	29
19:00	0	16	1	0	2	0	0	0	0	0	0	0	0	19
20:00	0	6	1	0	0	0	0	0	0	0	0	0	0	7
21:00	0	3	0	0	0	0	0	0	0	0	0	0	0	3
22:00	0	6	0	0	0	0	0	0	0	0	0	0	0	6
23:00	0	1	0	0	0	0	0	0	0	0	0	0	0	1
Total	0	358	83	0	45	0	0	0	0	0	0	0	0	486
Percent	0.0%	73.7%	17.1%	0.0%	9.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
AM Peak		07:00	06:00		07:00									06:00
Vol.		30	12		4									39
PM Peak		16:00	13:00		12:00									16:00
Vol.		45	7		5									54

Marble Street
 between Framingham Liquors Driveways
 City, State: Framingham, MA
 Client: Town of Framingham/ A. Kiel



46 Newton Street, Framingham, MA 01752
 Office: 508.875.0100 Fax: 508.875.0118
 Email: datarequests@pdilk.com

165064 A Class
 Site Code:
 Date Start: 26-Apr-16

SB

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
04/27/16														
6	0	0	0	0	0	0	0	0	0	0	0	0	0	0
01:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:00	0	1	0	0	0	0	0	0	0	0	0	0	0	1
05:00	0	5	2	0	2	0	0	0	0	0	0	0	0	9
06:00	0	20	7	0	2	0	0	0	0	0	0	0	0	29
07:00	0	18	10	0	2	0	0	0	0	0	0	0	0	30
08:00	0	24	3	0	3	0	0	0	0	0	0	0	0	30
09:00	0	15	8	0	3	0	0	0	0	0	0	0	0	26
10:00	0	15	7	0	1	0	0	0	0	0	0	0	0	23
11:00	0	11	2	0	3	0	0	0	0	0	0	0	0	16
12 PM	0	23	7	1	7	0	0	0	0	0	0	0	0	38
13:00	0	25	4	0	4	0	0	0	0	0	0	0	0	33
14:00	0	23	6	1	4	0	0	0	0	0	0	0	0	34
15:00	1	31	2	0	2	0	0	0	0	0	0	0	0	36
16:00	1	31	8	0	2	0	0	0	0	0	0	0	0	42
17:00	0	42	6	0	1	0	0	0	0	0	0	0	0	49
18:00	0	15	7	0	4	0	0	0	0	0	0	0	0	26
19:00	1	21	10	0	4	0	0	0	0	0	0	0	0	36
20:00	0	11	6	0	1	0	0	0	0	0	0	0	0	18
21:00	0	3	1	0	1	0	0	0	0	0	0	0	0	5
22:00	0	6	2	0	0	0	0	0	0	0	0	0	0	8
23:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	3	340	98	2	46	0	0	0	0	0	0	0	0	489
Percent	0.6%	69.5%	20.0%	0.4%	9.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	
AM Peak Vol.		08:00	07:00		08:00									07:00
		24	10		3									30
PM Peak Vol.	15:00	17:00	19:00	12:00	12:00									17:00
	1	42	10	1	7									49
Total		698	181	2	91	0	0	0	0	0	0	0	0	975



PRECISION
D A T A
INDUSTRIES, LLC

46 Morton Street, Framingham, MA 01752
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Marble Street
between Framingham Liquors Driveways
City, State: Framingham, MA
Client: Town of Framingham/ A. Kiel

165064 A Speed

Site Code:

Date Start: 26-Apr-16

SB

Start Time	1	15	20	25	30	35	40	45	50	55	60	65	70	Total	85th %ile	Ave Speed
04/26/																
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
01:00	0	0	0	1	0	0	0	0	0	0	0	0	0	1	28	27
02:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
04:00	0	0	1	0	0	0	0	0	0	0	0	0	0	1	23	22
05:00	0	3	5	0	0	0	0	0	0	0	0	0	0	8	22	20
06:00	1	10	24	4	0	0	0	0	0	0	0	0	0	39	23	21
07:00	2	15	16	3	0	0	0	0	0	0	0	0	0	36	23	20
08:00	8	7	16	1	0	0	0	0	0	0	0	0	0	32	22	17
09:00	4	10	9	2	0	0	0	0	0	0	0	0	0	25	23	18
10:00	3	15	6	3	0	0	0	0	0	0	0	0	0	27	23	18
11:00	2	10	16	1	0	0	0	0	0	0	0	0	0	29	22	19
12 PM	8	10	6	3	1	0	0	0	0	0	0	0	0	28	23	17
13:00	3	12	5	2	0	0	0	0	0	0	0	0	0	22	22	18
14:00	5	10	18	3	0	0	0	0	0	0	0	0	0	36	23	19
15:00	6	9	15	1	1	0	0	0	0	0	0	0	0	32	23	18
16:00	3	26	18	6	1	0	0	0	0	0	0	0	0	54	23	20
17:00	4	14	23	8	2	0	0	0	0	0	0	0	0	51	25	21
18:00	3	16	8	1	1	0	0	0	0	0	0	0	0	29	22	18
19:00	3	11	3	2	0	0	0	0	0	0	0	0	0	19	22	17
20:00	0	1	4	2	0	0	0	0	0	0	0	0	0	7	26	23
21:00	1	1	1	0	0	0	0	0	0	0	0	0	0	3	21	15
22:00	0	2	3	1	0	0	0	0	0	0	0	0	0	6	24	21
23:00	0	0	1	0	0	0	0	0	0	0	0	0	0	1	23	22
Total	56	182	198	44	6	0	0	0	0	0	0	0	0	486		
%	11.5%	37.4%	40.7%	9.1%	1.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			

AM Peak	08:00	07:00	06:00	06:00													06:00
Vol.	8	15	24	4													39

Midday Peak	12:00	13:00	14:00	12:00	12:00												14:00
Vol.	8	12	18	3	1												36

PM Peak	15:00	16:00	17:00	17:00	17:00												16:00
Vol.	6	26	23	8	2												54

%iles	15th Percentile :				14 MPH
	50th Percentile :				19 MPH
	85th Percentile :				23 MPH
	95th Percentile :				26 MPH

Stats	10 MPH Pace Speed :	15-24 MPH
	Number in Pace :	380
	Percent in Pace :	78.2%
	Number of Vehicles > 20 MPH :	208
	Percent of Vehicles > 20 MPH :	42.9%
	Mean Speed(Average) :	19 MPH



PRECISION
D A T A
INDUSTRIES, LLC

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Email: datarequests@pdi.com

Marble Street
between Framingham Liquors Driveways
City, State: Framingham, MA
Client: Town of Framingham/ A. Kiel

165064 A Speed
Site Code:
Date Start: 26-Apr-16

SB

Start Time	1	15	20	25	30	35	40	45	50	55	60	65	70	Total	85th %ile	Ave Speed
04/27/	14	19	24	29	34	39	44	49	54	59	64	69	9999			
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
01:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
02:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
03:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
04:00	0	0	0	1	0	0	0	0	0	0	0	0	0	1	28	27
05:00	0	6	3	0	0	0	0	0	0	0	0	0	0	9	21	19
06:00	3	5	14	7	0	0	0	0	0	0	0	0	0	29	25	21
07:00	0	15	11	3	1	0	0	0	0	0	0	0	0	30	23	20
08:00	1	12	13	4	0	0	0	0	0	0	0	0	0	30	23	20
09:00	4	11	7	4	0	0	0	0	0	0	0	0	0	26	24	18
10:00	3	11	7	2	0	0	0	0	0	0	0	0	0	23	22	18
11:00	5	4	6	1	0	0	0	0	0	0	0	0	0	16	22	17
12 PM	6	16	13	3	0	0	0	0	0	0	0	0	0	38	22	18
13:00	1	14	12	5	1	0	0	0	0	0	0	0	0	33	25	20
14:00	4	8	18	3	1	0	0	0	0	0	0	0	0	34	23	20
15:00	6	9	17	2	2	0	0	0	0	0	0	0	0	36	23	19
16:00	4	14	18	5	1	0	0	0	0	0	0	0	0	42	23	20
17:00	7	14	20	6	2	0	0	0	0	0	0	0	0	49	24	20
18:00	4	7	13	1	1	0	0	0	0	0	0	0	0	26	23	19
19:00	8	11	15	2	0	0	0	0	0	0	0	0	0	36	22	18
20:00	1	6	8	3	0	0	0	0	0	0	0	0	0	18	24	20
21:00	1	1	3	0	0	0	0	0	0	0	0	0	0	5	22	18
22:00	1	4	3	0	0	0	0	0	0	0	0	0	0	8	22	18
23:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	*	*
Total	59	168	201	52	9	0	0	0	0	0	0	0	0	489		
%	12.1%	34.4%	41.1%	10.6%	1.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%			
AM Peak	09:00	07:00	06:00	06:00	07:00											07:00
Vol.	4	15	14	7	1											30
Midda	12:00	12:00	14:00	13:00	13:00											
y Peak																12:00
Vol.	6	16	18	5	1											38
PM Peak	19:00	16:00	17:00	17:00	15:00											
Vol.	8	14	20	6	2											49
%iles				15th Percentile :					14 MPH							
				50th Percentile :					19 MPH							
				85th Percentile :					23 MPH							
				95th Percentile :					27 MPH							

Stats

10 MPH Pace Speed : 15-24 MPH
Number in Pace : 369
Percent in Pace : 75.5%
Number of Vehicles > 20 MPH : 222
Percent of Vehicles > 20 MPH : 45.4%
Mean Speed(Average) : 19 MPH

Marble Street
 between Framingham Liquors Driveways
 City, State: Framingham, MA
 Client: Town of Framingham/ A. Kiel



PRECISION
 D A T A
 INDUSTRIES, LLC

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165064 A Volume
 Site Code:
 Date Start: 26-Apr-16

Start Time	SB		NB		Combined		26-Apr-16 Tue				
	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.					
12:00	0	6	0	8	0	14					
12:15	0	11	0	5	0	16					
12:30	0	5	0	5	0	10					
12:45	0	6	28	0	0	3	21	0	0	9	49
01:00	0	7	0	5	0	12					
01:15	1	2	0	3	1	5					
01:30	0	4	0	4	0	8					
01:45	0	9	22	0	0	1	13	0	1	10	35
02:00	0	10	1	5	1	15					
02:15	0	11	0	4	0	15					
02:30	0	5	0	8	0	13					
02:45	0	10	36	0	1	7	24	0	1	17	60
03:00	0	8	0	6	0	14					
03:15	0	11	0	5	0	16					
03:30	0	8	0	11	0	19					
03:45	0	5	32	0	0	5	27	0	0	10	59
04:00	0	8	0	3	0	11					
04:15	1	14	0	8	1	22					
04:30	0	15	0	7	0	22					
04:45	0	17	54	1	1	3	21	1	2	20	75
05:00	2	10	1	5	3	15					
05:15	2	12	1	8	3	20					
05:30	1	19	2	6	3	25					
05:45	3	10	51	2	6	2	21	5	14	12	72
06:00	6	12	2	8	8	20					
06:15	9	8	3	4	12	12					
06:30	14	6	1	8	15	14					
06:45	10	3	29	5	11	4	24	15	50	7	53
07:00	16	4	5	6	21	10					
07:15	7	4	7	3	14	7					
07:30	5	6	3	6	8	12					
07:45	8	5	19	7	22	8	23	15	58	13	42
08:00	13	3	19	2	32	5					
08:15	6	2	17	2	23	4					
08:30	8	0	7	3	15	3					
08:45	5	2	7	9	52	2	9	14	84	4	16
09:00	6	0	7	1	13	1					
09:15	8	0	7	1	15	1					
09:30	4	2	9	1	13	3					
09:45	7	1	3	4	27	3	6	11	52	4	9
10:00	6	1	6	0	12	1					
10:15	7	1	4	0	11	1					
10:30	6	2	6	0	12	2					
10:45	8	2	6	6	22	0	0	14	49	2	6
11:00	6	0	7	0	13	0					
11:15	10	1	2	1	12	2					
11:30	8	0	9	0	17	0					
11:45	5	0	1	8	26	0	1	13	55	0	2
Total	198	288	168	190	366	478					
Percent	54.1%	60.3%	45.9%	39.7%							
Day Total		486		358		844					
Peak	06:15	04:45	08:00	02:45	07:45	04:45					
Vol.	49	58	52	29	85	80					
P.H.F.	0.766	0.763	0.684	0.659	0.664	0.800					



PRECISION
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between Framingham Liquors Driveways
City, State: Framingham, MA
Client: Town of Framingham/ A. Kiel

165064 A Volume
Site Code:
Date Start: 28-Apr-16

Start Time	SB		NB		Combined		27-Apr-16 Wed
	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.	
12:00	0	7	0	9	0	16	
12:15	0	16	0	3	0	19	
12:30	0	9	0	8	0	17	
12:45	0	6	38	3	0	9	61
01:00	0	7	0	3	0	10	
01:15	0	5	0	6	0	11	
01:30	0	11	0	4	0	15	
01:45	0	10	33	2	0	12	48
02:00	0	9	0	3	0	12	
02:15	0	10	0	7	0	17	
02:30	0	8	0	4	0	12	
02:45	0	7	34	10	0	17	58
03:00	0	10	0	4	0	14	
03:15	0	10	0	11	0	21	
03:30	0	11	0	12	0	23	
03:45	0	5	36	9	0	14	72
04:00	0	7	0	4	0	11	
04:15	0	9	0	10	0	19	
04:30	1	10	0	9	1	19	
04:45	0	16	42	11	2	27	76
05:00	0	11	0	9	0	20	
05:15	3	17	0	7	3	24	
05:30	1	15	1	10	2	25	
05:45	5	6	49	4	1	10	79
06:00	4	8	1	11	5	19	
06:15	8	6	1	5	9	11	
06:30	10	10	2	6	12	16	
06:45	7	2	26	11	15	13	59
07:00	6	8	5	2	11	10	
07:15	7	7	2	5	9	12	
07:30	8	7	10	10	18	17	
07:45	9	14	36	11	16	25	64
08:00	7	11	10	4	17	15	
08:15	7	4	13	3	20	7	
08:30	9	0	13	1	22	1	
08:45	7	3	18	15	22	5	28
09:00	6	2	7	3	13	5	
09:15	4	0	6	1	10	1	
09:30	8	1	4	2	12	3	
09:45	8	2	5	9	17	4	13
10:00	3	4	4	3	7	7	
10:15	6	3	5	1	11	4	
10:30	7	0	5	0	12	0	
10:45	7	1	8	1	14	2	13
11:00	5	0	7	0	12	0	
11:15	6	0	3	1	9	1	
11:30	2	0	4	0	6	0	
11:45	3	0	3	17	6	0	1
Total	164	325	154	247	318	572	
Percent	51.6%	56.8%	48.4%	43.2%			
Day Total		489		401		890	
Peak	07:45	-	04:45	-	08:00	-	04:45
Vol.	32	-	59	-	51	-	39
P.H.F.	0.800	-	0.868	-	0.850	-	0.813

Accurate Counts

978-664-2565

N/S Street : Marble Street
 E/W Street: Waverly Street
 City/State : Framingham, MA
 Weather : Clear

File Name : 73250001
 Site Code : 73250001
 Start Date : 5/19/2016
 Page No : 1

Groups Printed- Cars - Trucks

Start Time	Waverly St From East		Marble St From South		Waverly St From West		Int. Total
	Left	Thru	Left	Right	Thru	Right	
07:00 AM	0	87	6	0	131	7	231
07:15 AM	0	100	3	3	134	6	246
07:30 AM	1	75	8	3	110	6	203
07:45 AM	1	78	6	3	101	17	206
Total	2	340	23	9	476	36	886
08:00 AM	1	69	10	9	134	9	232
08:15 AM	2	95	5	7	131	11	251
08:30 AM	1	83	9	4	130	3	230
08:45 AM	1	99	8	3	142	6	259
Total	5	346	32	23	537	29	972
Grand Total	7	686	55	32	1013	65	1858
Apprch %	1	99	63.2	36.8	94	6	
Total %	0.4	36.9	3	1.7	54.5	3.5	
Cars	6	661	52	31	981	64	1795
% Cars	85.7	96.4	94.5	96.9	96.8	98.5	96.6
Trucks	1	25	3	1	32	1	63
% Trucks	14.3	3.6	5.5	3.1	3.2	1.5	3.4

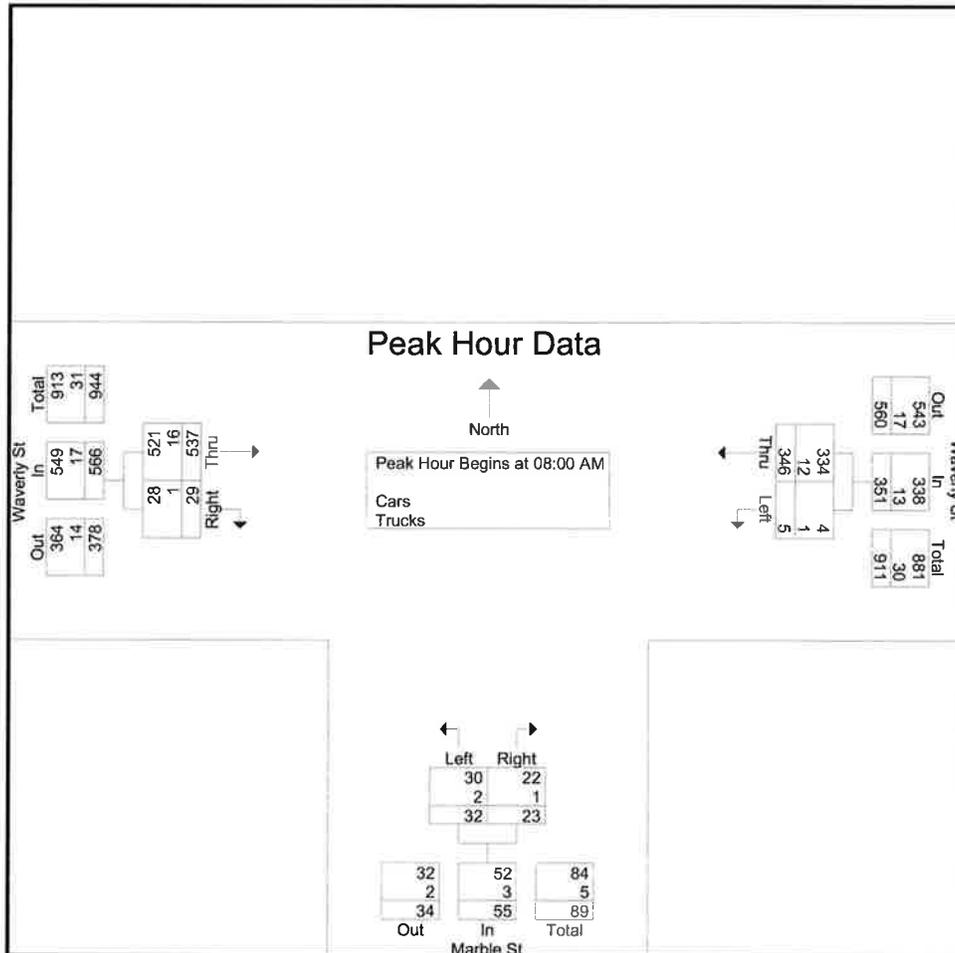
Accurate Counts

978-664-2565

N/S Street : Marble Street
 E/W Street: Waverly Street
 City/State : Framingham, MA
 Weather : Clear

File Name : 73250001
 Site Code : 73250001
 Start Date : 5/19/2016
 Page No : 2

Start Time	Waverly St From East			Marble St From South			Waverly St From West			Int. Total
	Left	Thru	App. Total	Left	Right	App. Total	Thru	Right	App. Total	
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 08:00 AM										
08:00 AM	1	69	70	10	9	19	134	9	143	232
08:15 AM	2	95	97	5	7	12	131	11	142	251
08:30 AM	1	83	84	9	4	13	130	3	133	230
08:45 AM	1	99	100	8	3	11	142	6	148	259
Total Volume	5	346	351	32	23	55	537	29	566	972
% App. Total	1.4	98.6		58.2	41.8		94.9	5.1		
PHF	.625	.874	.878	.800	.639	.724	.945	.659	.956	.938
Cars	4	334	338	30	22	52	521	28	549	939
% Cars	80.0	96.5	96.3	93.8	95.7	94.5	97.0	96.6	97.0	96.6
Trucks	1	12	13	2	1	3	16	1	17	33
% Trucks	20.0	3.5	3.7	6.3	4.3	5.5	3.0	3.4	3.0	3.4



Accurate Counts

978-664-2565

N/S Street : Marble Street
 E/W Street: Waverly Street
 City/State : Framingham, MA
 Weather : Clear

File Name : 73250001
 Site Code : 73250001
 Start Date : 5/19/2016
 Page No : 1

Groups Printed- Cars - Trucks - Bikes Peds

Start Time	Waverly St From East		Marble St From South		Waverly St From West		Int. Total
	Left	Thru	Left	Right	Thru	Right	
04:00 PM	7	147	9	8	114	11	296
04:15 PM	14	109	9	8	111	8	259
04:30 PM	11	133	10	6	121	13	294
04:45 PM	8	131	5	6	111	5	266
Total	40	520	33	28	457	37	1115
05:00 PM	3	145	11	2	105	9	275
05:15 PM	12	137	7	6	121	12	295
05:30 PM	9	133	5	4	104	4	259
05:45 PM	10	123	4	4	110	6	257
Total	34	538	27	16	440	31	1086
Grand Total	74	1058	60	44	897	68	2201
Apprch %	6.5	93.5	57.7	42.3	93	7	
Total %	3.4	48.1	2.7	2	40.8	3.1	
Cars	74	1042	60	44	884	67	2171
% Cars	100	98.5	100	100	98.6	98.5	98.6
Trucks	0	9	0	0	9	0	18
% Trucks	0	0.9	0	0	1	0	0.8
Bikes Peds	0	7	0	0	4	1	12
% Bikes Peds	0	0.7	0	0	0.4	1.5	0.5

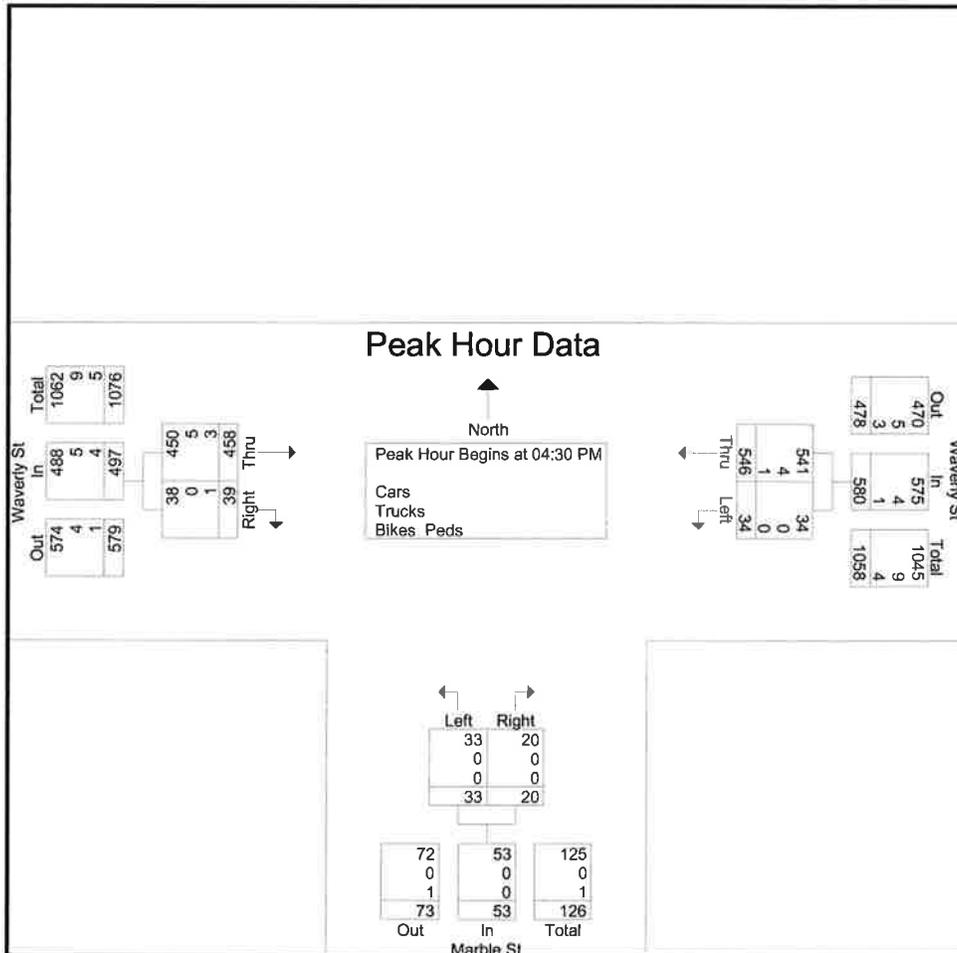
Accurate Counts

978-664-2565

N/S Street : Marble Street
 E/W Street: Waverly Street
 City/State : Framingham, MA
 Weather : Clear

File Name : 73250001
 Site Code : 73250001
 Start Date : 5/19/2016
 Page No : 2

Start Time	Waverly St From East			Marble St From South			Waverly St From West			Int. Total
	Left	Thru	App. Total	Left	Right	App. Total	Thru	Right	App. Total	
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1										
Peak Hour for Entire Intersection Begins at 04:30 PM										
04:30 PM	11	133	144	10	6	16	121	13	134	294
04:45 PM	8	131	139	5	6	11	111	5	116	266
05:00 PM	3	145	148	11	2	13	105	9	114	275
05:15 PM	12	137	149	7	6	13	121	12	133	295
Total Volume	34	546	580	33	20	53	458	39	497	1130
% App. Total	5.9	94.1		62.3	37.7		92.2	7.8		
PHF	.708	.941	.973	.750	.833	.828	.946	.750	.927	.958
Cars	34	541	575	33	20	53	450	38	488	1116
% Cars	100	99.1	99.1	100	100	100	98.3	97.4	98.2	98.8
Trucks	0	4	4	0	0	0	5	0	5	9
% Trucks	0	0.7	0.7	0	0	0	1.1	0	1.0	0.8
Bikes Peds	0	1	1	0	0	0	3	1	4	5
% Bikes Peds	0	0.2	0.2	0	0	0	0.7	2.6	0.8	0.4



Accurate Counts

978-664-2565

N/S Street : Blandin Avenue
 E/W Street: Marble Street / Driveway
 City/State : Framingham, MA
 Weather : Clear

File Name : 73250002
 Site Code : 73250002
 Start Date : 5/19/2016
 Page No : 1

Groups Printed- Cars - Trucks

Start Time	Blandin Ave From North			Private Dwy From East			Blandin Ave From South			Marble St From West			Int. Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
07:00 AM	0	63	3	0	0	0	2	86	0	1	0	6	161
07:15 AM	0	65	0	2	0	0	7	113	0	1	0	4	192
07:30 AM	0	81	4	0	0	0	11	107	0	0	0	7	210
07:45 AM	0	81	1	0	0	0	8	72	0	3	0	11	176
Total	0	290	8	2	0	0	28	378	0	5	0	28	739
08:00 AM	0	79	3	0	0	0	17	105	1	0	0	9	214
08:15 AM	0	84	1	0	0	0	9	106	0	1	0	7	208
08:30 AM	0	84	4	0	0	0	8	105	0	0	0	4	205
08:45 AM	1	65	4	0	0	1	5	98	0	0	0	5	179
Total	1	312	12	0	0	1	39	414	1	1	0	25	806
Grand Total	1	602	20	2	0	1	67	792	1	6	0	53	1545
Apprch %	0.2	96.6	3.2	66.7	0	33.3	7.8	92.1	0.1	10.2	0	89.8	
Total %	0.1	39	1.3	0.1	0	0.1	4.3	51.3	0.1	0.4	0	3.4	
Cars	1	596	20	2	0	1	64	778	1	6	0	53	1522
% Cars	100	99	100	100	0	100	95.5	98.2	100	100	0	100	98.5
Trucks	0	6	0	0	0	0	3	14	0	0	0	0	23
% Trucks	0	1	0	0	0	0	4.5	1.8	0	0	0	0	1.5

Accurate Counts

978-664-2565

N/S Street : Blandin Avenue
 E/W Street: Marble Street / Driveway
 City/State : Framingham, MA
 Weather : Clear

File Name : 73250002
 Site Code : 73250002
 Start Date : 5/19/2016
 Page No : 1

Groups Printed- Cars - Trucks

Start Time	Blandin Ave From North			Private Dwy From East			Blandin Ave From South			Marble St From West			Int. Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
04:00 PM	0	116	7	0	0	0	3	93	0	4	0	8	231
04:15 PM	0	118	7	0	0	0	6	89	0	4	0	12	236
04:30 PM	1	141	5	0	0	0	4	83	0	8	0	13	255
04:45 PM	0	130	4	0	0	1	11	99	0	3	0	7	255
Total	1	505	23	0	0	1	24	364	0	19	0	40	977
05:00 PM	0	174	5	2	0	0	5	101	0	4	0	13	304
05:15 PM	0	151	4	0	0	0	8	87	0	5	0	15	270
05:30 PM	0	155	6	0	0	1	9	78	0	5	1	18	273
05:45 PM	0	123	8	0	0	0	5	95	0	5	0	10	246
Total	0	603	23	2	0	1	27	361	0	19	1	56	1093
Grand Total	1	1108	46	2	0	2	51	725	0	38	1	96	2070
Apprch %	0.1	95.9	4	50	0	50	6.6	93.4	0	28.1	0.7	71.1	
Total %	0	53.5	2.2	0.1	0	0.1	2.5	35	0	1.8	0	4.6	
Cars	1	1104	46	2	0	2	51	721	0	38	1	95	2061
% Cars	100	99.6	100	100	0	100	100	99.4	0	100	100	99	99.6
Trucks	0	4	0	0	0	0	0	4	0	0	0	1	9
% Trucks	0	0.4	0	0	0	0	0	0.6	0	0	0	1	0.4

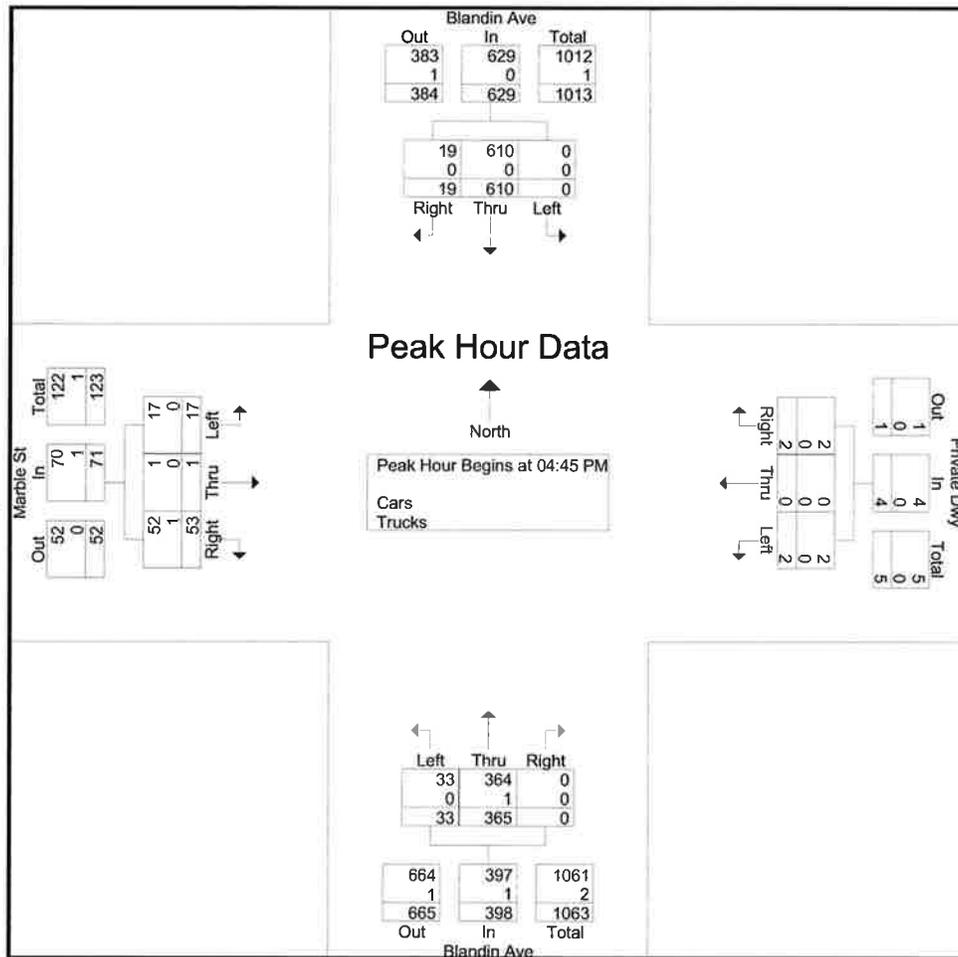
Accurate Counts

978-664-2565

N/S Street : Blandin Avenue
 E/W Street: Marble Street / Driveway
 City/State : Framingham, MA
 Weather : Clear

File Name : 73250002
 Site Code : 73250002
 Start Date : 5/19/2016
 Page No : 2

Start Time	Blandin Ave From North				Private Dwy From East				Blandin Ave From South				Marble St From West				Int. Total
	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:45 PM																	
04:45 PM	0	130	4	134	0	0	1	1	11	99	0	110	3	0	7	10	255
05:00 PM	0	174	5	179	2	0	0	2	5	101	0	106	4	0	13	17	304
05:15 PM	0	151	4	155	0	0	0	0	8	87	0	95	5	0	15	20	270
05:30 PM	0	155	6	161	0	0	1	1	9	78	0	87	5	1	18	24	273
Total Volume	0	610	19	629	2	0	2	4	33	365	0	398	17	1	53	71	1102
% App. Total	0	97	3		50	0	50		8.3	91.7	0		23.9	1.4	74.6		
PHF	.000	.876	.792	.878	.250	.000	.500	.500	.750	.903	.000	.905	.850	.250	.736	.740	.906
Cars	0	610	19	629	2	0	2	4	33	364	0	397	17	1	52	70	1100
% Cars	0	100	100	100	100	0	100	100	100	99.7	0	99.7	100	100	98.1	98.6	99.8
Trucks	0	0	0	0	0	0	0	0	0	1	0	1	0	0	1	1	2
% Trucks	0	0	0	0	0	0	0	0	0	0.3	0	0.3	0	0	1.9	1.4	0.2



Accurate Counts

978-664-2565

N/S Street : Beaver Street
 E/W Street: Plaza Drwy / Blandin Ave
 City/State : Framingham, MA
 Weather : Clear

File Name : 73250003
 Site Code : 73250003
 Start Date : 5/19/2016
 Page No : 1

Groups Printed- Cars - Trucks

Start Time	Beaver St From North			Plaza Drwy From East			Beaver St From South			Blandin Ave From West			Int. Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
07:00 AM	1	51	39	1	0	2	12	53	1	58	0	14	232
07:15 AM	1	53	53	1	1	1	3	49	2	66	5	10	245
07:30 AM	0	52	67	2	2	0	8	42	4	75	1	15	268
07:45 AM	0	45	75	1	0	2	8	27	3	58	2	4	225
Total	2	201	234	5	3	5	31	171	10	257	8	43	970
08:00 AM	1	48	64	5	1	1	8	37	7	80	2	5	259
08:15 AM	0	40	71	3	4	2	9	25	4	84	2	11	255
08:30 AM	0	34	58	2	2	4	14	43	4	84	2	9	256
08:45 AM	1	52	50	2	3	2	6	55	1	86	3	10	271
Total	2	174	243	12	10	9	37	160	16	334	9	35	1041
Grand Total	4	375	477	17	13	14	68	331	26	591	17	78	2011
Apprch %	0.5	43.8	55.7	38.6	29.5	31.8	16	77.9	6.1	86.2	2.5	11.4	
Total %	0.2	18.6	23.7	0.8	0.6	0.7	3.4	16.5	1.3	29.4	0.8	3.9	
Cars	4	368	468	16	13	13	67	325	26	581	17	76	1974
% Cars	100	98.1	98.1	94.1	100	92.9	98.5	98.2	100	98.3	100	97.4	98.2
Trucks	0	7	9	1	0	1	1	6	0	10	0	2	37
% Trucks	0	1.9	1.9	5.9	0	7.1	1.5	1.8	0	1.7	0	2.6	1.8

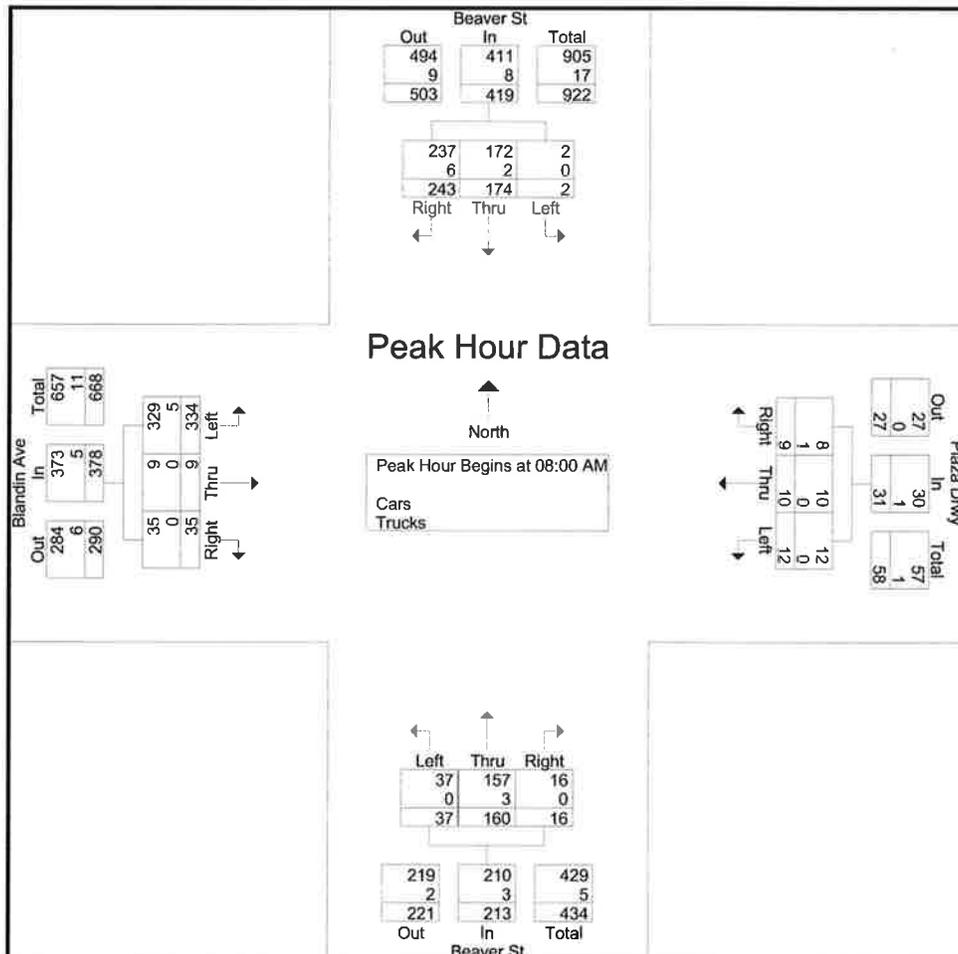
Accurate Counts

978-664-2565

N/S Street : Beaver Street
 E/W Street: Plaza Drwy / Blandin Ave
 City/State : Framingham, MA
 Weather : Clear

File Name : 73250003
 Site Code : 73250003
 Start Date : 5/19/2016
 Page No : 2

Start Time	Beaver St From North				Plaza Drwy From East				Beaver St From South				Blandin Ave From West				Int. Total
	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 08:00 AM																	
08:00 AM	1	48	64	113	5	1	1	7	8	37	7	52	80	2	5	87	259
08:15 AM	0	40	71	111	3	4	2	9	9	25	4	38	84	2	11	97	255
08:30 AM	0	34	58	92	2	2	4	8	14	43	4	61	84	2	9	95	256
08:45 AM	1	52	50	103	2	3	2	7	6	55	1	62	86	3	10	99	271
Total Volume	2	174	243	419	12	10	9	31	37	160	16	213	334	9	35	378	1041
% App. Total	0.5	41.5	58		38.7	32.3	29		17.4	75.1	7.5		88.4	2.4	9.3		
PHF	.500	.837	.856	.927	.600	.625	.563	.861	.661	.727	.571	.859	.971	.750	.795	.955	.960
Cars	2	172	237	411	12	10	8	30	37	157	16	210	329	9	35	373	1024
% Cars	100	98.9	97.5	98.1	100	100	88.9	96.8	100	98.1	100	98.6	98.5	100	100	98.7	98.4
Trucks	0	2	6	8	0	0	1	1	0	3	0	3	5	0	0	5	17
% Trucks	0	1.1	2.5	1.9	0	0	11.1	3.2	0	1.9	0	1.4	1.5	0	0	1.3	1.6



Accurate Counts

978-664-2565

N/S Street : Beaver Street
 E/W Street: Plaza Drwy / Blandin Ave
 City/State : Framingham, MA
 Weather : Clear

File Name : 73250003
 Site Code : 73250003
 Start Date : 5/19/2016
 Page No : 1

Groups Printed- Cars - Trucks

Start Time	Beaver St From North			Plaza Drwy From East			Beaver St From South			Blandin Ave From West			Int. Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
04:00 PM	1	49	94	4	6	10	11	59	7	58	3	13	315
04:15 PM	1	49	94	3	11	10	8	40	3	70	3	13	305
04:30 PM	1	54	115	7	8	6	12	70	3	53	7	22	358
04:45 PM	1	46	98	7	9	3	6	32	4	53	4	18	281
Total	4	198	401	21	34	29	37	201	17	234	17	66	1259
05:00 PM	1	53	150	8	7	9	9	48	5	80	1	16	387
05:15 PM	2	56	124	3	7	3	15	47	4	61	8	14	344
05:30 PM	3	43	128	6	11	6	5	38	3	68	10	8	329
05:45 PM	2	45	93	9	11	4	6	58	13	57	9	26	333
Total	8	197	495	26	36	22	35	191	25	266	28	64	1393
Grand Total	12	395	896	47	70	51	72	392	42	500	45	130	2652
Apprch %	0.9	30.3	68.8	28	41.7	30.4	14.2	77.5	8.3	74.1	6.7	19.3	
Total %	0.5	14.9	33.8	1.8	2.6	1.9	2.7	14.8	1.6	18.9	1.7	4.9	
Cars	11	393	892	47	69	50	72	389	42	497	45	130	2637
% Cars	91.7	99.5	99.6	100	98.6	98	100	99.2	100	99.4	100	100	99.4
Trucks	1	2	4	0	1	1	0	3	0	3	0	0	15
% Trucks	8.3	0.5	0.4	0	1.4	2	0	0.8	0	0.6	0	0	0.6

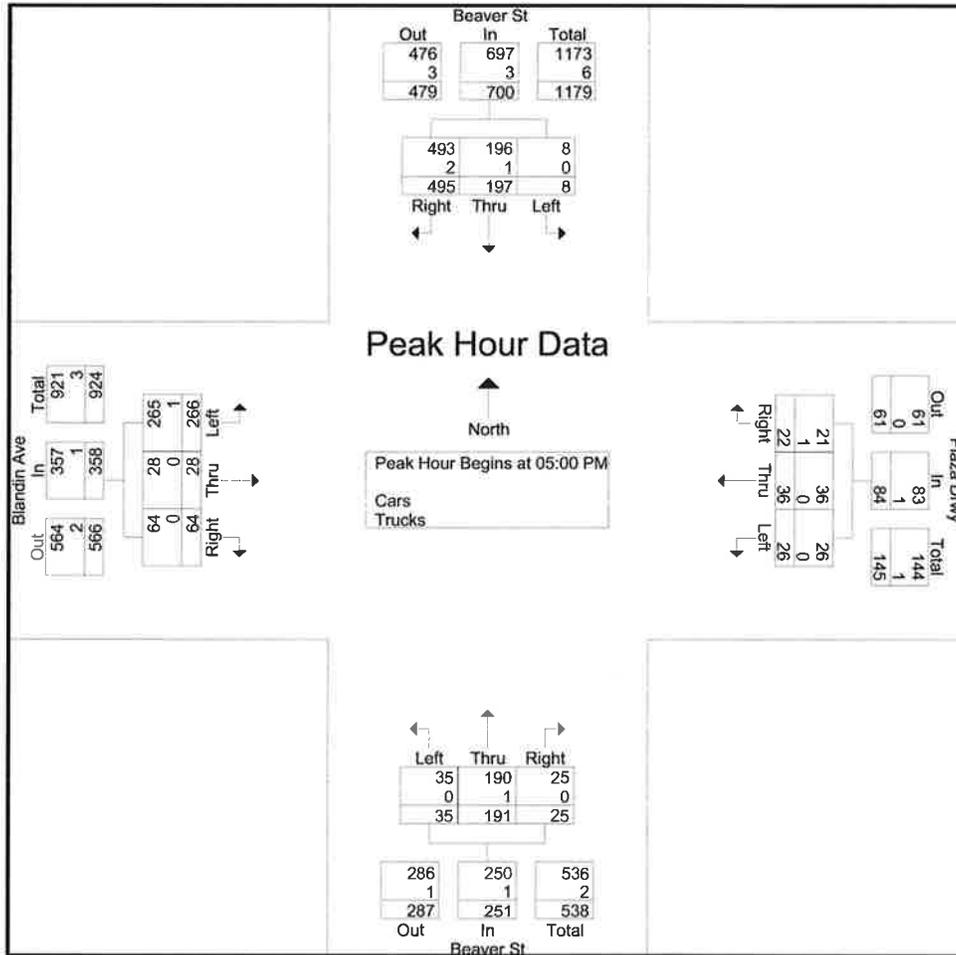
Accurate Counts

978-664-2565

N/S Street : Beaver Street
 E/W Street: Plaza Drwy / Blandin Ave
 City/State : Framingham, MA
 Weather : Clear

File Name : 73250003
 Site Code : 73250003
 Start Date : 5/19/2016
 Page No : 2

Start Time	Beaver St From North				Plaza Drwy From East				Beaver St From South				Blandin Ave From West				Int. Total
	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	Left	Thru	Right	App. Total	
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 05:00 PM																	
05:00 PM	1	53	150	204	8	7	9	24	9	48	5	62	80	1	16	97	387
05:15 PM	2	56	124	182	3	7	3	13	15	47	4	66	61	8	14	83	344
05:30 PM	3	43	128	174	6	11	6	23	5	38	3	46	68	10	8	86	329
05:45 PM	2	45	93	140	9	11	4	24	6	58	13	77	57	9	26	92	333
Total Volume	8	197	495	700	26	36	22	84	35	191	25	251	266	28	64	358	1393
% App. Total	1.1	28.1	70.7		31	42.9	26.2		13.9	76.1	10		74.3	7.8	17.9		
PHF	.667	.879	.825	.858	.722	.818	.611	.875	.583	.823	.481	.815	.831	.700	.615	.923	.900
Cars	8	196	493	697	26	36	21	83	35	190	25	250	265	28	64	357	1387
% Cars	100	99.5	99.6	99.6	100	100	95.5	98.8	100	99.5	100	99.6	99.6	100	100	99.7	99.6
Trucks	0	1	2	3	0	0	1	1	0	1	0	1	1	0	0	1	6
% Trucks	0	0.5	0.4	0.4	0	0	4.5	1.2	0	0.5	0	0.4	0.4	0	0	0.3	0.4



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N/S: Bishop Street
 E/W: Waverly Street (Route 135)
 City, State: Framingham, MA
 Client: VAI/B. Guen

File Name : 04626A
 Site Code : 7156
 Start Date : 10/22/2015
 Page No : 1

Groups Printed- Cars & Peds - Trucks & Buses - Bikes by Direction

Start Time	Bishop Street From North				Waverly Street (Route 135) From East				Bishop Street From South				Waverly Street (Route 135) From West				Int. Total
	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	
07:00 AM	28	83	40	0	62	33	7	4	23	101	15	1	12	79	38	0	526
07:15 AM	32	102	44	1	61	56	4	1	14	99	18	1	10	79	37	0	559
07:30 AM	33	90	48	0	86	47	7	0	13	129	20	0	14	79	45	0	611
07:45 AM	41	96	35	0	69	51	14	1	9	108	14	0	15	74	38	0	565
Total	134	371	167	1	278	187	32	6	59	437	67	2	51	311	158	0	2261
08:00 AM	33	95	38	1	61	48	12	3	8	101	10	0	19	92	47	1	569
08:15 AM	36	100	47	0	66	63	15	5	11	104	11	0	17	91	31	1	598
08:30 AM	41	87	48	0	75	59	6	3	10	107	18	0	14	82	29	0	579
08:45 AM	39	67	61	0	91	48	11	1	19	111	11	0	22	77	45	4	607
Total	149	349	194	1	293	218	44	12	48	423	50	0	72	342	152	6	2353
Grand Total	283	720	361	2	571	405	76	18	107	860	117	2	123	653	310	6	4614
Approch %	20.7	52.7	26.4	0.1	53.4	37.9	7.1	1.7	9.9	79.2	10.8	0.2	11.3	59.8	28.4	0.5	
Total %	6.1	15.6	7.8	0	12.4	8.8	1.6	0.4	2.3	18.6	2.5	0	2.7	14.2	6.7	0.1	
Cars & Peds	277	710	341	2	541	384	73	18	103	847	112	2	121	626	304	6	4467
% Cars & Peds	97.9	98.6	94.5	100	94.7	94.8	96.1	100	96.3	98.5	95.7	100	98.4	95.9	98.1	100	96.8
Trucks & Buses	6	8	19	0	29	20	3	0	4	9	5	0	2	21	4	0	130
% Trucks & Buses	2.1	1.1	5.3	0	5.1	4.9	3.9	0	3.7	1	4.3	0	1.6	3.2	1.3	0	2.8
Bikes by Direction	0	2	1	0	1	1	0	0	0	4	0	0	0	6	2	0	17
% Bikes by Direction	0	0.3	0.3	0	0.2	0.2	0	0	0	0.5	0	0	0	0.9	0.6	0	0.4

Start Time	Bishop Street From North					Waverly Street (Route 135) From East					Bishop Street From South					Waverly Street (Route 135) From West					Int. Total
	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 08:00 AM																					
08:00 AM	33	95	38	1	167	61	48	12	3	124	8	101	10	0	119	19	92	47	1	159	569
08:15 AM	36	100	47	0	183	66	63	15	5	149	11	104	11	0	126	17	91	31	1	140	598
08:30 AM	41	87	48	0	176	75	59	6	3	143	10	107	18	0	135	14	82	29	0	125	579
08:45 AM	39	67	61	0	167	91	48	11	1	151	19	111	11	0	141	22	77	45	4	148	607
Total Volume	149	349	194	1	693	293	218	44	12	567	48	423	50	0	521	72	342	152	6	572	2353
% App. Total	21.5	50.4	28	0.1	100	51.7	38.4	7.8	2.1	100	9.2	81.2	9.6	0	100	12.6	59.8	26.6	1	100	
PHF	.909	.873	.795	.250	.947	.805	.865	.733	.600	.939	.632	.953	.694	.000	.924	.818	.929	.809	.375	.899	.969
Cars & Peds	146	343	182	1	672	278	212	41	12	543	46	416	46	0	508	71	331	149	6	557	2280
% Cars & Peds	98.0	98.3	93.8	100	97.0	94.9	97.2	93.2	100	95.8	95.8	98.3	92.0	0	97.5	98.6	96.8	98.0	100	97.4	96.9
Trucks & Buses	3	5	12	0	20	15	6	3	0	24	2	4	4	0	10	1	8	2	0	11	65
% Trucks & Buses	2.0	1.4	6.2	0	2.9	5.1	2.8	6.8	0	4.2	4.2	0.9	8.0	0	1.9	1.4	2.3	1.3	0	1.9	2.8
Bikes by Direction	0	1	0	0	1	0	0	0	0	0	0	3	0	0	3	0	3	1	0	4	8
% Bikes by Direction	0	0.3	0	0	0.1	0	0	0	0	0	0	0.7	0	0	0.6	0	0.9	0.7	0	0.7	0.3

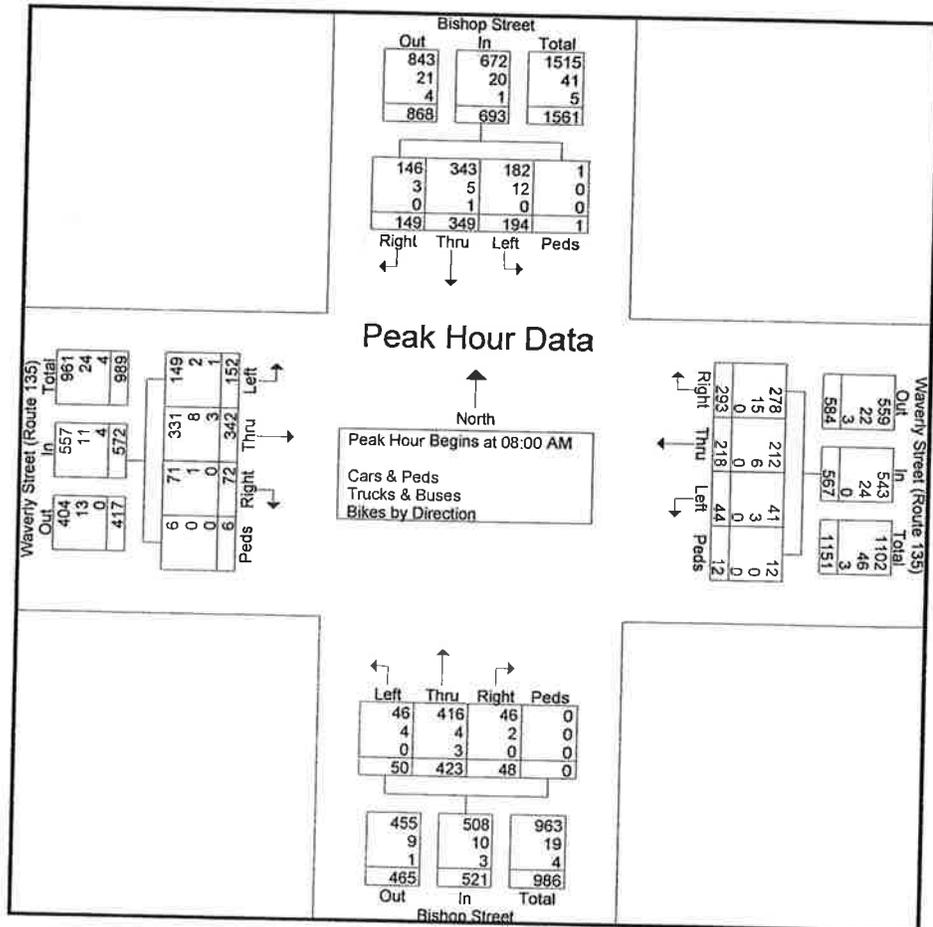
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N/S: Bishop Street
E/W: Waverly Street (Route 135)
City, State: Framingham, MA
Client: VAI/B. Guen

File Name : 04620
Site Code : 7156
Start Date : 10/20
Page No : 1

Start Time	Bishop Street From North					Waverly Street (Route 135) From East					Bishop Street From South					Waverly Street (Route 135) From West				
	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1																				
Peak Hour for Entire Intersection Begins at 08:00 AM																				
08:00 AM	33	95	38	1	167	61	48	12	3	124	8	101	10	0	119	19	92	47	1	159
08:15 AM	36	100	47	0	183	66	63	15	5	149	11	104	11	0	126	17	91	31	1	140
08:30 AM	41	87	48	0	176	75	59	6	3	143	10	107	18	0	135	14	82	29	0	125
08:45 AM	39	67	61	0	167	91	48	11	1	151	19	111	11	0	141	22	77	45	4	148
Total Volume	149	349	194	1	693	293	218	44	12	543	46	416	46	0	508	71	331	149	6	557
% App. Total	21.5	50.4	28	0.1		51.7	38.4	7.8	2.1		9.2	81.2	9.6	0		12.6	59.8	26.6	1	
PHF	.909	.873	.795	.250	.947	.805	.865	.733	.600	.939	.632	.953	.694	.000	.924	.818	.929	.809	.375	.899
Cars & Peds	146	343	182	1	672	278	212	41	12	543	46	416	46	0	508	71	331	149	6	557
% Cars & Peds	98.0	98.3	93.8	100	97.0	94.9	97.2	93.2	100	95.8	95.8	98.3	92.0	0	97.5	98.6	96.8	98.0	100	97.4
Trucks & Buses	3	5	12	0	20	15	6	3	0	24	2	4	4	0	10	1	8	2	0	11
% Trucks & Buses	2.0	1.4	6.2	0	2.9	5.1	2.8	6.8	0	4.2	4.2	0.9	8.0	0	1.9	1.4	2.3	1.3	0	1.9
Bikes by Direction	0	1	0	0	1	0	0	0	0	0	0	3	0	0	3	0	3	1	0	4
% Bikes by Direction	0	0.3	0	0	0.1	0	0	0	0	0	0	0.7	0	0	0.6	0	0.9	0.7	0	0.7



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N/S: Bishop Street
 W: Howard Street
 City, State: Framingham, MA
 Client: VAI/B. Guen

File Name : 0462
 Site Code : 7156
 Start Date : 10/2
 Page No : 1

Groups Printed- Cars & Peds - Trucks & Buses - Bikes by Direction

Start Time	Bishop Street From North			Bishop Street From South			Howard Street From West		
	Right	Thru	Peds	Thru	Left	Peds	Right	Left	Peds
07:00 AM	4	88	0	140	59	0	60	0	0
07:15 AM	5	125	6	144	47	0	57	0	0
07:30 AM	3	100	3	186	79	0	71	0	0
07:45 AM	1	119	2	156	67	0	74	0	2
Total	13	432	11	626	252	0	262	0	2
08:00 AM	2	101	2	183	40	0	55	0	0
08:15 AM	1	119	4	157	40	0	68	0	4
08:30 AM	1	122	5	162	49	0	52	0	0
08:45 AM	1	107	2	179	68	0	55	0	1
Total	5	449	13	681	197	0	230	0	5
Grand Total	18	881	24	1307	449	0	492	0	7
Approch %	2	95.4	2.6	74.4	25.6	0	98.6	0	1.4
Total %	0.6	27.7	0.8	41.1	14.1	0	15.5	0	0.2
Cars & Peds	18	861	23	1269	440	0	475	0	5
% Cars & Peds	100	97.7	95.8	97.1	98	0	96.5	0	71.4
Trucks & Buses	0	17	0	33	9	0	17	0	1
% Trucks & Buses	0	1.9	0	2.5	2	0	3.5	0	14.3
Bikes by Direction	0	3	1	5	0	0	0	0	1
% Bikes by Direction	0	0.3	4.2	0.4	0	0	0	0	14.3

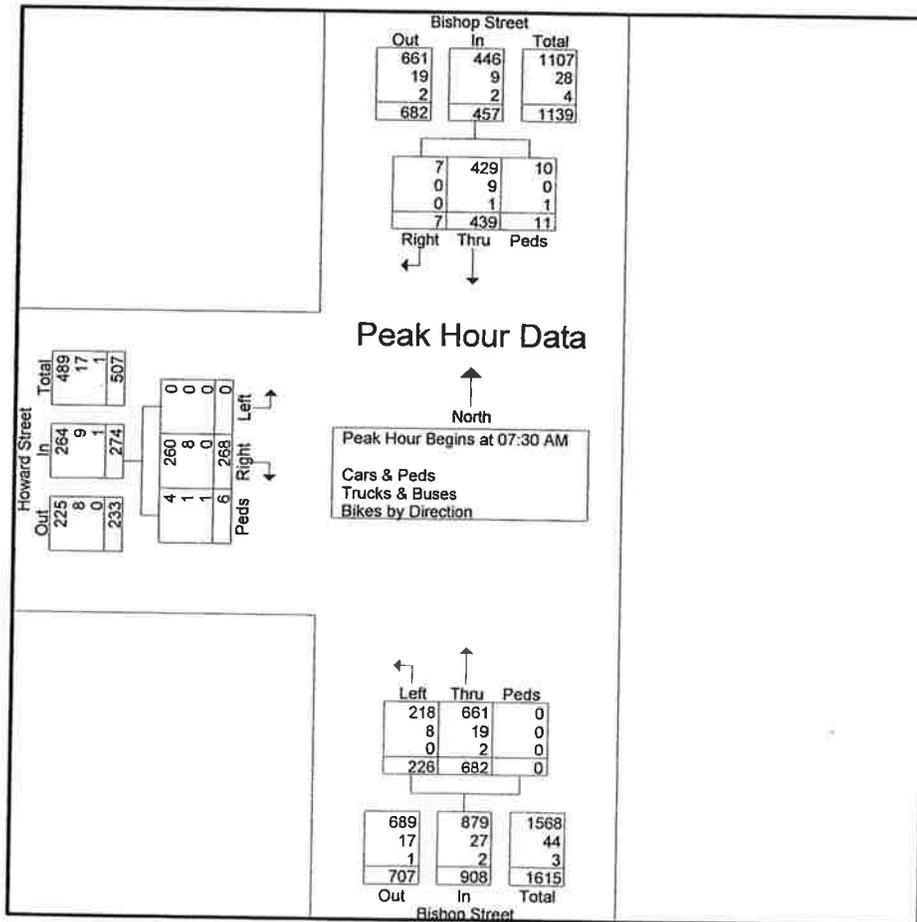
Start Time	Bishop Street From North				Bishop Street From South				Howard Street From West			
	Right	Thru	Peds	App. Total	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1												
Peak Hour for Entire Intersection Begins at 07:30 AM												
07:30 AM	3	100	3	106	186	79	0	265	71	0	0	71
07:45 AM	1	119	2	122	156	67	0	223	74	0	2	76
08:00 AM	2	101	2	105	183	40	0	223	55	0	0	55
08:15 AM	1	119	4	124	157	40	0	197	68	0	4	72
Total Volume	7	439	11	457	682	226	0	908	268	0	6	274
% App. Total	1.5	96.1	2.4		75.1	24.9	0		97.8	0	2.2	
PHF	.583	.922	.688	.921	.917	.715	.000	.857	.905	.000	.375	.901
Cars & Peds	7	429	10	446	661	218	0	879	260	0	4	264
% Cars & Peds	100	97.7	90.9	97.6	96.9	96.5	0	96.8	97.0	0	66.7	96.4
Trucks & Buses	0	9	0	9	19	8	0	27	8	0	1	9
% Trucks & Buses	0	2.1	0	2.0	2.8	3.5	0	3.0	3.0	0	16.7	3.3
Bikes by Direction	0	1	1	2	2	0	0	2	0	0	1	1
% Bikes by Direction	0	0.2	9.1	0.4	0.3	0	0	0.2	0	0	16.7	0.4

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N/S: Bishop Street
 W: Howard Street
 City, State: Framingham, MA
 Client: VAI/B. Guen

File Name : 04626B
 Site Code : 7156
 Start Date : 10/22/2015
 Page No : 1

Start Time	Bishop Street From North				Bishop Street From South				Howard Street From West				Int. Total
	Right	Thru	Peds	App. Total	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	
Peak Hour Analysis From 07:00 AM to 08:45 AM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 07:30 AM													
07:30 AM	3	100	3	106	186	79	0	265	71	0	0	71	442
07:45 AM	1	119	2	122	156	67	0	223	74	0	2	76	421
08:00 AM	2	101	2	105	183	40	0	223	55	0	0	55	383
08:15 AM	1	119	4	124	157	40	0	197	68	0	4	72	393
Total Volume	7	439	11	457	682	226	0	908	268	0	6	274	1639
% App. Total	1.5	96.1	2.4		75.1	24.9	0		97.8	0	2.2		
PHF	.583	.922	.688	.921	.917	.715	.000	.857	.905	.000	.375	.901	.927
Cars & Peds	7	429	10	446	661	218	0	879	260	0	4	264	1589
% Cars & Peds	100	97.7	90.9	97.6	96.9	96.5	0	96.8	97.0	0	66.7	96.4	96.9
Trucks & Buses	0	9	0	9	19	8	0	27	8	0	1	9	45
% Trucks & Buses	0	2.1	0	2.0	2.8	3.5	0	3.0	3.0	0	16.7	3.3	2.7
Bikes by Direction	0	1	1	2	2	0	0	2	0	0	1	1	5
% Bikes by Direction	0	0.2	9.1	0.4	0.3	0	0	0.2	0	0	16.7	0.4	0.3



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N/S: Bishop Street
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 City, State: Framingham, MA
 Client: VAI/B. Guen

File Name : 04626AA
 Site Code : 7156
 Start Date : 10/22/2015
 Page No : 1

Groups Printed- Cars & Peds - Trucks & Buses - Bikes by Direction

Start Time	Bishop Street From North				Waverly Street (Route 135) From East				Bishop Street From South				Waverly Street (Route 135) From West				Int. Total
	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	Right	Thru	Left	Peds	
04:00 PM	60	109	56	1	79	64	12	3	15	106	18	0	13	70	35	3	644
04:15 PM	47	118	55	0	59	63	23	11	7	98	15	2	16	83	28	2	627
04:30 PM	46	106	45	0	73	79	22	1	10	80	17	0	12	89	24	1	605
04:45 PM	69	157	65	0	76	64	15	2	16	109	15	0	5	65	31	2	691
Total	222	490	221	1	287	270	72	17	48	393	65	2	46	307	118	8	2567
05:00 PM	55	170	58	0	68	68	28	5	15	98	12	0	15	72	35	2	701
05:15 PM	63	176	61	1	63	73	13	2	9	112	20	0	16	62	32	1	704
05:30 PM	53	162	61	0	67	64	18	0	10	94	15	0	17	73	39	1	674
05:45 PM	56	142	30	1	76	60	17	3	6	103	16	2	15	71	33	2	633
Total	227	650	210	2	274	265	76	10	40	407	63	2	63	278	139	6	2712
Grand Total	449	1140	431	3	561	535	148	27	88	800	128	4	109	585	257	14	5279
Approch %	22.2	56.4	21.3	0.1	44.1	42.1	11.6	2.1	8.6	78.4	12.5	0.4	11.3	60.6	26.6	1.5	
Total %	8.5	21.6	8.2	0.1	10.6	10.1	2.8	0.5	1.7	15.2	2.4	0.1	2.1	11.1	4.9	0.3	
Cars & Peds	445	1126	423	3	556	531	144	27	86	795	128	4	109	576	252	14	5219
% Cars & Peds	99.1	98.8	98.1	100	99.1	99.3	97.3	100	97.7	99.4	100	100	100	98.5	98.1	100	98.9
Trucks & Buses	2	5	8	0	2	1	4	0	2	2	0	0	0	7	3	0	36
% Trucks & Buses	0.4	0.4	1.9	0	0.4	0.2	2.7	0	2.3	0.2	0	0	0	1.2	1.2	0	0.7
Bikes by Direction	2	9	0	0	3	3	0	0	0	3	0	0	0	2	2	0	24
% Bikes by Direction	0.4	0.8	0	0	0.5	0.6	0	0	0	0.4	0	0	0	0.3	0.8	0	0.5

Start Time	Bishop Street From North					Waverly Street (Route 135) From East					Bishop Street From South					Waverly Street (Route 135) From West					Int. Total
	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:45 PM																					
04:45 PM	69	157	65	0	291	76	64	15	2	157	16	109	15	0	140	5	65	31	2	103	691
05:00 PM	55	170	58	0	283	68	68	28	5	169	15	98	12	0	125	15	72	35	2	124	701
05:15 PM	63	176	61	1	301	63	73	13	2	151	9	112	20	0	141	16	62	32	1	111	704
05:30 PM	53	162	61	0	276	67	64	18	0	149	10	94	15	0	119	17	73	39	1	130	674
Total Volume	240	665	245	1	1151	274	269	74	9	626	50	413	62	0	525	53	272	137	6	468	2770
% App. Total	20.9	57.8	21.3	0.1		43.8	43	11.8	1.4		9.5	78.7	11.8	0		11.3	58.1	29.3	1.3		
PHF	.870	.945	.942	.250	.956	.901	.921	.661	.450	.926	.781	.922	.775	.000	.931	.779	.932	.878	.750	.900	.984
Cars & Peds	238	662	241	1	1142	273	267	71	9	620	49	412	62	0	523	53	267	133	6	459	2744
% Cars & Peds	99.2	99.5	98.4	100	99.2	99.6	99.3	95.9	100	99.0	98.0	99.8	100	0	99.6	100	98.2	97.1	100	98.1	99.1
Trucks & Buses	1	1	4	0	6	0	1	3	0	4	1	1	0	0	2	0	3	2	0	5	17
% Trucks & Buses	0.4	0.2	1.6	0	0.5	0	0.4	4.1	0	0.6	2.0	0.2	0	0	0.4	0	1.1	1.5	0	1.1	0.6
Bikes by Direction	1	2	0	0	3	1	1	0	0	2	0	0	0	0	0	0	2	2	0	4	9
% Bikes by Direction	0.4	0.3	0	0	0.3	0.4	0.4	0	0	0.3	0	0	0	0	0	0	0.7	1.5	0	0.9	0.3

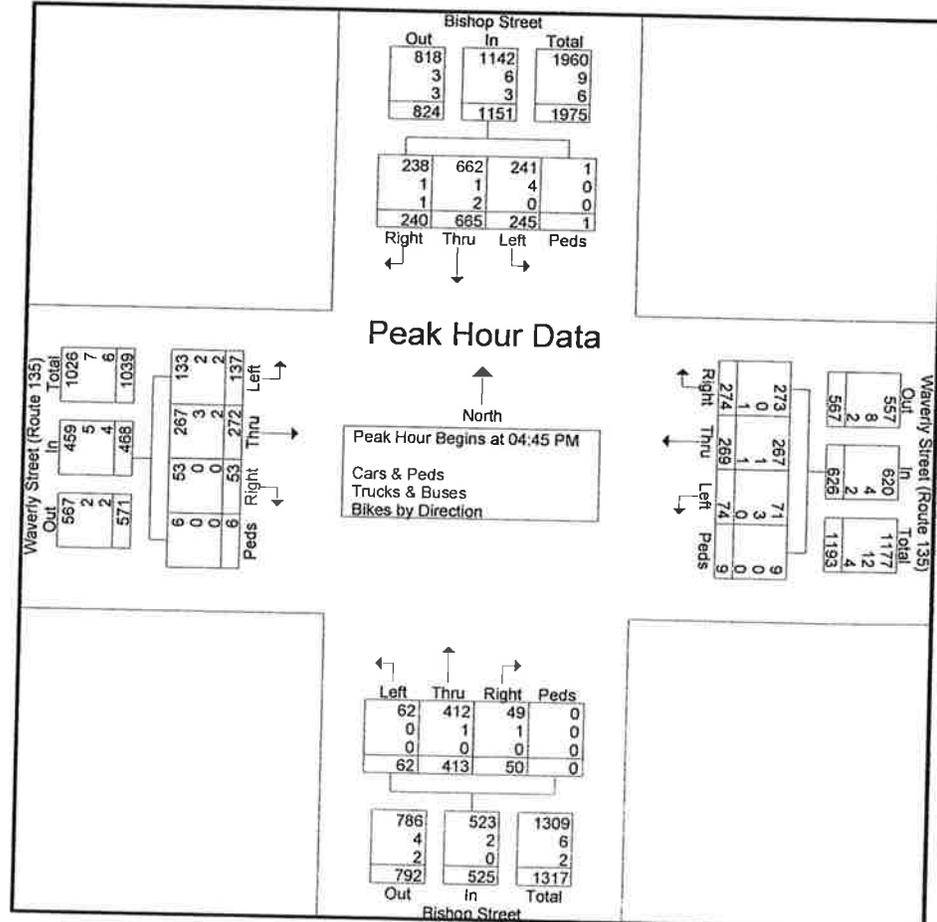
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N/S: Bishop Street
E/W: Waverly Street (Route 135)
City, State: Framingham, MA
Client: VAI/B. Guen

File Name : 046261
Site Code : 7156
Start Date : 10/22/
Page No : 1

Start Time	Bishop Street From North					Waverly Street (Route 135) From East					Bishop Street From South					Waverly Street (Route 135) From West					Int.
	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:45 PM																					
04:45 PM	69	157	65	0	291	76	64	15	2	157	16	109	15	0	140	5	65	31	2	103	
05:00 PM	55	170	58	0	283	68	68	28	5	169	15	98	12	0	125	15	72	35	2	124	
05:15 PM	63	176	61	1	301	63	73	13	2	151	9	112	20	0	141	16	62	32	1	111	
05:30 PM	53	162	61	0	276	67	64	18	0	149	10	94	15	0	119	17	73	39	1	130	
Total Volume	240	665	245	1	1151	274	269	74	9	626	50	413	62	0	525	53	272	137	6	468	
% App. Total	20.9	57.8	21.3	0.1		43.8	43	11.8	1.4		9.5	78.7	11.8	0		11.3	58.1	29.3	1.3		
PHF	870	945	942	250	956	901	921	661	450	926	781	922	775	000	931	779	932	878	750	900	
Cars & Peds	238	662	241	1	1142	273	267	71	9	620	49	412	62	0	523	53	267	133	6	459	
% Cars & Peds	99.2	99.5	98.4	100	99.2	99.6	99.3	95.9	100	99.0	98.0	99.8	100	0	99.6	100	98.2	97.1	100	98.1	
Trucks & Buses	1	1	4	0	6	0	1	3	0	4	1	1	0	0	2	0	3	2	0	5	
% Trucks & Buses	0.4	0.2	1.6	0	0.5	0	0.4	4.1	0	0.6	2.0	0.2	0	0	0.4	0	1.1	1.5	0	1.1	
Bikes by Direction	1	2	0	0	3	1	1	0	0	2	0	0	0	0	0	0	2	2	0	4	
% Bikes by Direction	0.4	0.3	0	0	0.3	0.4	0.4	0	0	0.3	0	0	0	0	0	0	0.7	1.5	0	0.9	



N/S: Bishop Street
 W: Howard Street
 City, State: Framingham, MA
 Client: VAI/B. Guen

File Name : 046261
 Site Code : 7156
 Start Date : 10/22,
 Page No : 1

Groups Printed- Cars & Peds - Trucks & Buses - Bikes by Direction

Start Time	Bishop Street From North			Bishop Street From South			Howard Street From West		
	Right	Thru	Peds	Thru	Left	Peds	Right	Left	Peds
04:00 PM	1	131	4	137	87	0	93	0	1
04:15 PM	4	134	4	112	76	0	85	0	0
04:30 PM	3	99	0	115	58	0	87	1	1
04:45 PM	4	164	3	143	86	0	138	1	1
Total	12	528	11	507	307	0	403	2	3
05:00 PM	0	145	1	127	70	5	135	0	3
05:15 PM	4	164	3	133	76	0	140	0	1
05:30 PM	0	140	0	136	66	0	134	0	3
05:45 PM	1	148	1	149	75	0	100	1	1
Total	5	597	5	545	287	5	509	1	8
Grand Total	17	1125	16	1052	594	5	912	3	11
Apprch %	1.5	97.2	1.4	63.7	36	0.3	98.5	0.3	1.2
Total %	0.5	30.1	0.4	28.2	15.9	0.1	24.4	0.1	0.3
Cars & Peds	15	1106	16	1039	588	5	902	1	11
% Cars & Peds	88.2	98.3	100	98.8	99	100	98.9	33.3	100
Trucks & Buses	0	8	0	7	0	0	7	0	0
% Trucks & Buses	0	0.7	0	0.7	0	0	0.8	0	0
Bikes by Direction	2	11	0	6	6	0	3	2	0
% Bikes by Direction	11.8	1	0	0.6	1	0	0.3	66.7	0

Start Time	Bishop Street From North				Bishop Street From South				Howard Street From West			
	Right	Thru	Peds	App. Total	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total
04:45 PM	4	164	3	171	143	86	0	229	138	1	1	140
05:00 PM	0	145	1	146	127	70	5	202	135	0	3	138
05:15 PM	4	164	3	171	133	76	0	209	140	0	1	141
05:30 PM	0	140	0	140	136	66	0	202	134	0	3	137
Total Volume	8	613	7	628	539	298	5	842	547	1	8	556
% App. Total	1.3	97.6	1.1	619	64	35.4	0.6	98.4	98.4	0.2	1.4	98.6
PHF	.500	.934	.583	.918	.942	.866	.250	.919	.977	.250	.667	.986
Cars & Peds	7	605	7	619	532	296	5	833	543	1	8	552
% Cars & Peds	87.5	98.7	100	98.6	98.7	99.3	100	98.9	99.3	100	100	99.3
Trucks & Buses	0	3	0	3	3	0	0	3	3	0	0	3
% Trucks & Buses	0	0.5	0	0.5	0.6	0	0	0.4	0.5	0	0	0.5
Bikes by Direction	1	5	0	6	4	2	0	6	1	0	0	1
% Bikes by Direction	12.5	0.8	0	1.0	0.7	0.7	0	0.7	0.2	0	0	0.2

Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1

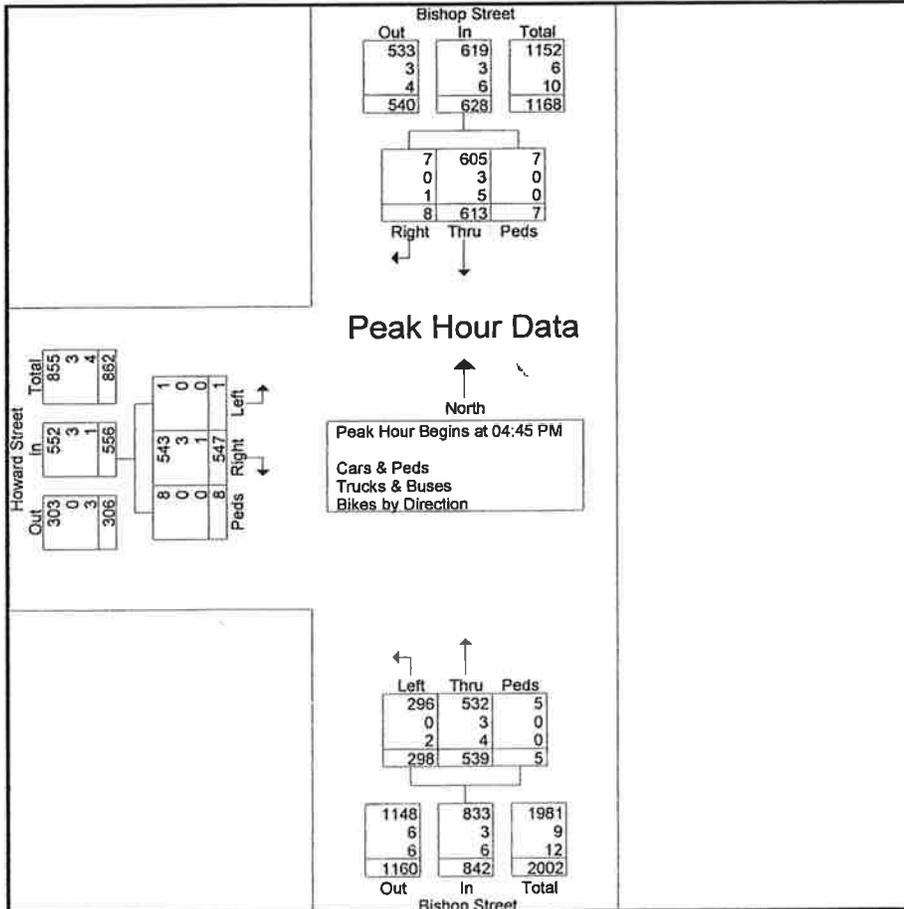
Peak Hour for Entire Intersection Begins at 04:45 PM

Transportation Data Corporation
 Mario Perone, mperone1@verizon.net
 tel (781) 587-0086 cell (781) 439-4999

N/S: Bishop Street
 W: Howard Street
 City, State: Framingham, MA
 Client: VAI/B. Guen

File Name : 04626BB
 Site Code : 7156
 Start Date : 10/22/2015
 Page No : 1

Start Time	Bishop Street From North				Bishop Street From South				Howard Street From West				Int. Total
	Right	Thru	Peds	App. Total	Thru	Left	Peds	App. Total	Right	Left	Peds	App. Total	
Peak Hour Analysis From 04:00 PM to 05:45 PM - Peak 1 of 1													
Peak Hour for Entire Intersection Begins at 04:45 PM													
04:45 PM	4	164	3	171	143	86	0	229	138	1	1	140	540
05:00 PM	0	145	1	146	127	70	5	202	135	0	3	138	486
05:15 PM	4	164	3	171	133	76	0	209	140	0	1	141	521
05:30 PM	0	140	0	140	136	66	0	202	134	0	3	137	479
Total Volume	8	613	7	628	539	298	5	842	547	1	8	556	2026
% App. Total	1.3	97.6	1.1		64	35.4	0.6		98.4	0.2	1.4		
PHF	.500	.934	.583	.918	.942	.866	.250	.919	.977	.250	.667	.986	.938
Cars & Peds	7	605	7	619	532	296	5	833	543	1	8	552	2004
% Cars & Peds	87.5	98.7	100	98.6	98.7	99.3	100	98.9	99.3	100	100	99.3	98.9
Trucks & Buses	0	3	0	3	3	0	0	3	3	0	0	3	9
% Trucks & Buses	0	0.5	0	0.5	0.6	0	0	0.4	0.5	0	0	0.5	0.4
Bikes by Direction	1	5	0	6	4	2	0	6	1	0	0	1	13
% Bikes by Direction	12.5	0.8	0	1.0	0.7	0.7	0	0.7	0.2	0	0	0.2	0.6



CAPACITY ANALYSIS

Waverly Street at Marble Street

Waverly Street at Site Drive

Marble Street at Blandin Avenue and Private Drive

Blandin Avenue at Site Drive

Blandin Avenue at Beaver Street and Plaza Drive

Waverly Street at Beaver Street

Bishop Street at Howard Street

Waverly Street at Marble Street



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↩		↩	↩	↩	
Volume (veh/h)	537	29	5	346	32	23
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.96	0.96	0.88	0.88	0.72	0.72
Hourly flow rate (vph)	559	30	6	393	44	32
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)				758		
pX, platoon unblocked					0.92	
vC, conflicting volume			590		979	574
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			590		931	574
tC, single (s)			4.3		*6.0	*6.0
tC, 2 stage (s)						
tF (s)			2.4		3.6	3.3
p0 queue free %			99		85	94
cM capacity (veh/h)			903		299	534

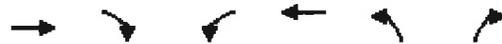
Direction, Lane #	EB 1	WB 1	WB 2	NB 1
Volume Total	590	6	393	76
Volume Left	0	6	0	44
Volume Right	30	0	0	32
cSH	1700	903	1700	366
Volume to Capacity	0.35	0.01	0.23	0.21
Queue Length 95th (ft)	0	0	0	19
Control Delay (s)	0.0	9.0	0.0	17.4
Lane LOS		A		C
Approach Delay (s)	0.0	0.1		17.4
Approach LOS				C

Intersection Summary			
Average Delay		1.3	
Intersection Capacity Utilization		40.0%	ICU Level of Service A
Analysis Period (min)		15	

* User Entered Value

	→	↘	↙	←	↖	↗
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↗		↖	↗	↖	
Volume (veh/h)	458	39	34	546	33	20
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.93	0.93	0.97	0.97	0.83	0.83
Hourly flow rate (vph)	492	42	35	563	40	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)	758					
pX, platoon unblocked					0.88	
vC, conflicting volume			534			513
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			534			513
tC, single (s)			4.1			*6.0
tC, 2 stage (s)						
tF (s)			2.2			3.3
p0 queue free %			97			96
cM capacity (veh/h)			1044			581
Direction, Lane #	EB 1	WB 1	WB 2	NB 1		
Volume Total	534	35	563	64		
Volume Left	0	35	0	40		
Volume Right	42	0	0	24		
cSH	1700	1044	1700	296		
Volume to Capacity	0.31	0.03	0.33	0.22		
Queue Length 95th (ft)	0	3	0	20		
Control Delay (s)	0.0	8.6	0.0	20.5		
Lane LOS	A			C		
Approach Delay (s)	0.0	0.5			20.5	
Approach LOS					C	
Intersection Summary						
Average Delay			1.3			
Intersection Capacity Utilization			38.7%	ICU Level of Service	A	
Analysis Period (min)			15			

* User Entered Value



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↩		↩	↩	↩	
Volume (veh/h)	576	31	5	371	34	25
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.96	0.96	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	600	32	5	403	37	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)	758					
pX, platoon unblocked					0.91	
vC, conflicting volume			632		1030	616
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			632		985	616
tC, single (s)			4.3		*6.0	*6.0
tC, 2 stage (s)						
tF (s)			2.4		3.6	3.3
p0 queue free %			99		87	95
cM capacity (veh/h)			870		278	507

Direction, Lane #	EB 1	WB 1	WB 2	NB 1
Volume Total	632	5	403	64
Volume Left	0	5	0	37
Volume Right	32	0	0	27
cSH	1700	870	1700	344
Volume to Capacity	0.37	0.01	0.24	0.19
Queue Length 95th (ft)	0	0	0	17
Control Delay (s)	0.0	9.2	0.0	17.9
Lane LOS		A		C
Approach Delay (s)	0.0	0.1		17.9
Approach LOS				C

Intersection Summary			
Average Delay		1.1	
Intersection Capacity Utilization		42.3%	ICU Level of Service A
Analysis Period (min)		15	

* User Entered Value

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	490	42	36	585	35	21
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.93	0.93	0.97	0.97	0.92	0.92
Hourly flow rate (vph)	527	45	37	603	38	23
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)	758					
pX, platoon unblocked					0.86	
vC, conflicting volume			572			549
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			572			549
tC, single (s)			4.1			*6.0
tC, 2 stage (s)						
tF (s)			2.2			3.3
p0 queue free %			96			96
cM capacity (veh/h)			1011			556

Direction, Lane #	EB 1	WB 1	WB 2	NB 1
Volume Total	572	37	603	61
Volume Left	0	37	0	38
Volume Right	45	0	0	23
cSH	1700	1011	1700	263
Volume to Capacity	0.34	0.04	0.35	0.23
Queue Length 95th (ft)	0	3	0	22
Control Delay (s)	0.0	8.7	0.0	22.7
Lane LOS	A		C	
Approach Delay (s)	0.0	0.5	22.7	
Approach LOS	C			

Intersection Summary			
Average Delay	1.3		
Intersection Capacity Utilization	40.8%	ICU Level of Service	A
Analysis Period (min)	15		

* User Entered Value

						
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	581	31	5	381	45	25
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.96	0.96	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	605	32	5	414	49	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)	758					
pX, platoon unblocked					0.91	
vC, conflicting volume	638			1046 621		
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	638			1002 621		
tC, single (s)	4.3			*6.0 *6.0		
tC, 2 stage (s)						
tF (s)	2.4			3.6 3.3		
p0 queue free %	99			82 95		
cM capacity (veh/h)	866			272 504		

Direction, Lane #	EB 1	WB 1	WB 2	NB 1
Volume Total	638	5	414	76
Volume Left	0	5	0	49
Volume Right	32	0	0	27
cSH	1700	866	1700	325
Volume to Capacity	0.38	0.01	0.24	0.23
Queue Length 95th (ft)	0	0	0	22
Control Delay (s)	0.0	9.2	0.0	19.4
Lane LOS		A		C
Approach Delay (s)	0.0	0.1		19.4
Approach LOS				C

Intersection Summary			
Average Delay		1.3	
Intersection Capacity Utilization		43.1%	ICU Level of Service A
Analysis Period (min)		15	

* User Entered Value



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↔		↔	↔	↔	
Volume (veh/h)	511	42	36	590	41	21
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.93	0.93	0.97	0.97	0.92	0.92
Hourly flow rate (vph)	549	45	37	608	45	23
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None		None			
Median storage (veh)						
Upstream signal (ft)				758		
pX, platoon unblocked					0.86	
vC, conflicting volume			595		1255	572
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			595		1216	572
tC, single (s)			4.1		*6.0	*6.0
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			96		77	96
cM capacity (veh/h)			991		192	540

Direction, Lane #	EB 1	WB 1	WB 2	NB 1
Volume Total	595	37	608	67
Volume Left	0	37	0	45
Volume Right	45	0	0	23
cSH	1700	991	1700	246
Volume to Capacity	0.35	0.04	0.36	0.27
Queue Length 95th (ft)	0	3	0	27
Control Delay (s)	0.0	8.8	0.0	25.1
Lane LOS		A		D
Approach Delay (s)	0.0	0.5		25.1
Approach LOS				D

Intersection Summary			
Average Delay		1.5	
Intersection Capacity Utilization		41.3%	ICU Level of Service A
Analysis Period (min)		15	

* User Entered Value

Waverly Street at Site Drive



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↷			↶		↷
Volume (veh/h)	601	5	0	386	0	75
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)	653	5	0	420	0	82
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage (veh)						
Upstream signal (ft)				495		
pX, platoon unblocked					0.89	
vC, conflicting volume			659		1076	656
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			659		1025	656
tC, single (s)			4.1		6.4	*6.0
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	83
cM capacity (veh/h)			939		235	486

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	659	420	82
Volume Left	0	0	0
Volume Right	5	0	82
cSH	1700	1700	486
Volume to Capacity	0.39	0.25	0.17
Queue Length 95th (ft)	0	0	15
Control Delay (s)	0.0	0.0	13.9
Lane LOS			B
Approach Delay (s)	0.0	0.0	13.9
Approach LOS			B

Intersection Summary

Average Delay		1.0	
Intersection Capacity Utilization		43.2%	ICU Level of Service
Analysis Period (min)		15	A

* User Entered Value



Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations	↔			↑		↗
Volume (veh/h)	511	21	0	626	0	39
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)	555	23	0	680	0	42
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh						
Upstream signal (ft)				495		
pX, platoon unblocked					0.84	
vC, conflicting volume			578		1247	567
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			578		1198	567
tC, single (s)			4.1		6.4	*6.0
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			100		100	92
cM capacity (veh/h)			1005		173	544

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	578	680	42
Volume Left	0	0	0
Volume Right	23	0	42
cSH	1700	1700	544
Volume to Capacity	0.34	0.40	0.08
Queue Length 95th (ft)	0	0	6
Control Delay (s)	0.0	0.0	12.2
Lane LOS			B
Approach Delay (s)	0.0	0.0	12.2
Approach LOS			B

Intersection Summary			
Average Delay		0.4	
Intersection Capacity Utilization		38.2%	ICU Level of Service A
Analysis Period (min)		15	

* User Entered Value

Marble Street at Blandin Avenue and Private Drive

11: Private Drive/Marble Street & Blandin Avenue

6/3/2016



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Volume (veh/h)	45	390	1	0	325	9	0	0	0	4	0	34
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.89	0.89	0.89	0.98	0.98	0.98	0.92	0.92	0.92	0.68	0.68	0.68
Hourly flow rate (vph)	51	438	1	0	332	9	0	0	0	6	0	50
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)					908							
pX, platoon unblocked												
vC, conflicting volume	341			439			926	881	439	876	877	336
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	341			439			926	881	439	876	877	336
tC, single (s)	4.1			4.1			*6.0	6.5	*6.0	*6.0	*6.0	*6.0
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	96			100			100	100	100	98	100	93
cM capacity (veh/h)	1218			1131			300	276	638	344	313	724

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	490	341	0	56
Volume Left	51	0	0	6
Volume Right	1	9	0	50
cSH	1218	1131	1700	648
Volume to Capacity	0.04	0.00	0.00	0.09
Queue Length 95th (ft)	3	0	0	7
Control Delay (s)	1.2	0.0	0.0	11.1
Lane LOS	A		A	B
Approach Delay (s)	1.2	0.0	0.0	11.1
Approach LOS			A	B

Intersection Summary			
Average Delay		1.4	
Intersection Capacity Utilization	54.1%		ICU Level of Service A
Analysis Period (min)	15		

* User Entered Value

11: Private Drive/Marble Street & Blandin Avenue

6/3/2016

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Volume (veh/h)	33	365	0	0	610	19	2	0	2	17	1	53	
Sign Control		Free			Free			Stop			Stop		
Grade		0%			0%			0%			0%		
Peak Hour Factor	0.91	0.91	0.91	0.88	0.88	0.88	0.50	0.50	0.50	0.74	0.74	0.74	
Hourly flow rate (vph)	36	401	0	0	693	22	4	0	4	23	1	72	
Pedestrians													
Lane Width (ft)													
Walking Speed (ft/s)													
Percent Blockage													
Right turn flare (veh)													
Median type	None					None							
Median storage veh													
Upstream signal (ft)	908												
pX, platoon unblocked													
vC, conflicting volume	715			401				1250	1188	401	1182	1178	704
vC1, stage 1 conf vol													
vC2, stage 2 conf vol													
vCu, unblocked vol	715			401				1250	1188	401	1182	1178	704
tC, single (s)	4.1			4.1				*6.0	6.5	*6.0	*6.0	*6.0	*6.0
tC, 2 stage (s)													
tF (s)	2.2			2.2				3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	96			100				98	100	99	90	99	84
cM capacity (veh/h)	895			1169				180	182	668	233	218	456
Direction, Lane #	EB 1	WB 1	NB 1	SB 1									
Volume Total	437	715	8	96									
Volume Left	36	0	4	23									
Volume Right	0	22	4	72									
cSH	895	1169	284	366									
Volume to Capacity	0.04	0.00	0.03	0.26									
Queue Length 95th (ft)	3	0	2	26									
Control Delay (s)	1.2	0.0	18.1	18.3									
Lane LOS	A		C	C									
Approach Delay (s)	1.2	0.0	18.1	18.3									
Approach LOS			C	C									

Intersection Summary

Average Delay	1.9		
Intersection Capacity Utilization	57.7%	ICU Level of Service	B
Analysis Period (min)	15		

* User Entered Value

11: Private Drive/Marble Street & Blandin Avenue

6/3/2016



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Volume (veh/h)	48	420	1	0	353	10	0	0	0	4	0	36
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.98	0.98	0.98	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	52	457	1	0	360	10	0	0	0	4	0	39
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)					908							
pX, platoon unblocked												
vC, conflicting volume	370			458			966	932	457	927	927	365
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	370			458			966	932	457	927	927	365
tC, single (s)	4.1			4.1			*6.0	6.5	*6.0	*6.0	*6.0	*6.0
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	96			100			100	100	100	99	100	94
cM capacity (veh/h)	1188			1114			289	257	623	322	294	698
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	510	370	0	43								
Volume Left	52	0	0	4								
Volume Right	1	10	0	39								
cSH	1188	1114	1700	625								
Volume to Capacity	0.04	0.00	0.00	0.07								
Queue Length 95th (ft)	3	0	0	6								
Control Delay (s)	1.3	0.0	0.0	11.2								
Lane LOS	A		A	B								
Approach Delay (s)	1.3	0.0	0.0	11.2								
Approach LOS			A	B								

Intersection Summary			
Average Delay		1.2	
Intersection Capacity Utilization	57.3%		ICU Level of Service B
Analysis Period (min)	15		

* User Entered Value

11: Private Drive/Marble Street & Blandin Avenue

6/3/2016

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations		↕			↕			↕			↕		
Volume (veh/h)	35	397	0	0	658	20	2	0	2	18	1	57	
Sign Control		Free			Free			Stop			Stop		
Grade		0%			0%			0%			0%		
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.50	0.50	0.50	0.92	0.92	0.92	
Hourly flow rate (vph)	38	432	0	0	715	22	4	0	4	20	1	62	
Pedestrians													
Lane Width (ft)													
Walking Speed (ft/s)													
Percent Blockage													
Right turn flare (veh)													
Median type	None					None							
Median storage (veh)													
Upstream signal (ft)	908												
pX, platoon unblocked													
vC, conflicting volume	737			432				1296	1245	432	1238	1234	726
vC1, stage 1 conf vol													
vC2, stage 2 conf vol													
vCu, unblocked vol	737			432				1296	1245	432	1238	1234	726
tC, single (s)	4.1			4.1				*6.0	6.5	*6.0	*6.0	*6.0	*6.0
tC, 2 stage (s)													
tF (s)	2.2			2.2				3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	96			100				98	100	99	91	99	86
cM capacity (veh/h)	878			1139				173	168	643	216	202	444
Direction, Lane #	EB 1	WB 1	NB 1	SB 1									
Volume Total	470	737	8	83									
Volume Left	38	0	4	20									
Volume Right	0	22	4	62									
cSH	878	1139	272	351									
Volume to Capacity	0.04	0.00	0.03	0.24									
Queue Length 95th (ft)	3	0	2	23									
Control Delay (s)	1.2	0.0	18.6	18.4									
Lane LOS	A		C	C									
Approach Delay (s)	1.2	0.0	18.6	18.4									
Approach LOS			C	C									

Intersection Summary

Average Delay		1.7										
Intersection Capacity Utilization		61.4%	ICU Level of Service	B								
Analysis Period (min)		15										

* User Entered Value

11: Private Drive/Marble Street & Blandin Avenue

6/9/2016

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations		↕			↕			↕			↕		
Volume (veh/h)	48	421	1	0	358	21	0	0	0	4	0	36	
Sign Control		Free			Free			Stop			Stop		
Grade		0%			0%			0%			0%		
Peak Hour Factor	0.92	0.92	0.92	0.98	0.98	0.98	0.92	0.92	0.92	0.92	0.92	0.92	
Hourly flow rate (vph)	52	458	1	0	365	21	0	0	0	4	0	39	
Pedestrians													
Lane Width (ft)													
Walking Speed (ft/s)													
Percent Blockage													
Right turn flare (veh)													
Median type	None					None							
Median storage veh													
Upstream signal (ft)	909												
pX, platoon unblocked													
vC, conflicting volume	387						459	978	949	458	939	939	376
vC1, stage 1 conf vol													
vC2, stage 2 conf vol													
vCu, unblocked vol	387						459	978	949	458	939	939	376
tC, single (s)	4.1						4.1	*6.0	6.5	*6.0	*6.0	*6.0	*6.0
tC, 2 stage (s)													
tF (s)	2.2						2.2	3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	96						100	100	100	100	99	100	94
cM capacity (veh/h)	1172						1113	285	251	623	317	290	689
Direction, Lane #	EB 1	WB 1	NB 1	SB 1									
Volume Total	511	387	0	43									
Volume Left	52	0	0	4									
Volume Right	1	21	0	39									
cSH	1172	1113	1700	617									
Volume to Capacity	0.04	0.00	0.00	0.07									
Queue Length 95th (ft)	3	0	0	6									
Control Delay (s)	1.3	0.0	0.0	11.3									
Lane LOS	A		A	B									
Approach Delay (s)	1.3	0.0	0.0	11.3									
Approach LOS			A	B									

Intersection Summary			
Average Delay		1.2	
Intersection Capacity Utilization	58.3%	ICU Level of Service	B
Analysis Period (min)	15		

* User Entered Value

11: Private Drive/Marble Street & Blandin Avenue

6/9/2016



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Volume (veh/h)	35	402	0	0	661	26	2	0	2	18	1	57
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.50	0.50	0.50	0.92	0.92	0.92
Hourly flow rate (vph)	38	437	0	0	718	28	4	0	4	20	1	62
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage (veh)												
Upstream signal (ft)					908							
pX, platoon unblocked												
vC, conflicting volume	747			437			1308	1260	437	1250	1246	733
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	747			437			1308	1260	437	1250	1246	733
tC, single (s)	4.1			4.1			*6.0	6.5	*6.0	*6.0	*6.0	*6.0
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	96			100			98	100	99	91	99	86
cM capacity (veh/h)	871			1134			170	164	639	213	199	440
Direction, Lane #	EB 1	WB 1	NB 1	SB 1								
Volume Total	475	747	8	83								
Volume Left	38	0	4	20								
Volume Right	0	28	4	62								
cSH	871	1134	268	347								
Volume to Capacity	0.04	0.00	0.03	0.24								
Queue Length 95th (ft)	3	0	2	23								
Control Delay (s)	1.3	0.0	18.8	18.6								
Lane LOS	A		C	C								
Approach Delay (s)	1.3	0.0	18.8	18.6								
Approach LOS			C	C								

Intersection Summary

Average Delay		1.7		
Intersection Capacity Utilization		61.6%	ICU Level of Service	B
Analysis Period (min)		15		

* User Entered Value

Blandin Avenue at Site Drive



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↔	↔		↔	
Volume (veh/h)	1	424	363	19	13	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)	1	461	395	21	14	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)			587			
pX, platoon unblocked						
vC, conflicting volume	415				868	405
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	415				868	405
tC, single (s)	4.1				*6.0	*6.0
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				96	97
cM capacity (veh/h)	1144				358	665

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	462	415	32
Volume Left	1	0	14
Volume Right	0	21	17
cSH	1144	1700	480
Volume to Capacity	0.00	0.24	0.07
Queue Length 95th (ft)	0	0	5
Control Delay (s)	0.0	0.0	13.0
Lane LOS	A		B
Approach Delay (s)	0.0	0.0	13.0
Approach LOS			B

Intersection Summary			
Average Delay		0.5	
Intersection Capacity Utilization		33.1%	ICU Level of Service A
Analysis Period (min)		15	

* User Entered Value



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕	↕		↕	
Volume (veh/h)	5	415	678	77	7	9
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)	5	451	737	84	8	10
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (ft)			617			
pX, platoon unblocked						
vC, conflicting volume	821				1241	779
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	821				1241	779
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				96	98
cM capacity (veh/h)	817				194	399

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	457	821	17
Volume Left	5	0	8
Volume Right	0	84	10
cSH	817	1700	273
Volume to Capacity	0.01	0.48	0.06
Queue Length 95th (ft)	1	0	5
Control Delay (s)	0.2	0.0	19.1
Lane LOS	A		C
Approach Delay (s)	0.2	0.0	19.1
Approach LOS			C

Intersection Summary			
Average Delay		0.3	
Intersection Capacity Utilization		50.4%	ICU Level of Service A
Analysis Period (min)		15	

Blandin Avenue at Beaver Street and Plaza Drive

3: Blandin Avenue & Beaver Street & Plaza Drive

6/3/2016

Movement	WBL2	WBL	WBR	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NER	NER2
Lane Configurations												
Volume (vph)	12	10	9	37	174	16	2	199	277	362	9	35
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	13	12	11	11	12	12	11	11	11	13	12
Total Lost time (s)		4.0		4.0	4.0			4.0	4.0	4.0		
Lane Util. Factor		1.00		1.00	1.00			1.00	0.88	0.97		
Fr _t		0.96		1.00	0.99			1.00	0.85	0.98		
Flt Protected		0.97		0.95	1.00			1.00	1.00	0.96		
Satd. Flow (prot)		1770		1745	1780			1818	2668	3297		
Flt Permitted		0.97		0.95	1.00			1.00	1.00	0.96		
Satd. Flow (perm)		1770		1745	1780			1818	2668	3297		
Peak-hour factor, PHF	0.86	0.86	0.86	0.86	0.86	0.86	0.93	0.93	0.93	0.96	0.96	0.96
Adj. Flow (vph)	14	12	10	43	202	19	2	214	298	377	9	36
RTOR Reduction (vph)	0	35	0	0	2	0	0	0	131	103	0	0
Lane Group Flow (vph)	0	1	0	43	219	0	0	216	167	319	0	0
Heavy Vehicles (%)	0%	0%	11%	0%	2%	0%	0%	1%	3%	2%	0%	0%
Turn Type	Prot	Prot		Split	NA		Split	NA	Prot	Prot		
Protected Phases	1	1		5	5		4	4	4	7		
Permitted Phases												
Actuated Green, G (s)		4.4		36.8	36.8			95.3	95.3	20.9		
Effective Green, g (s)		6.4		38.8	38.8			97.3	97.3	22.9		
Actuated g/C Ratio		0.04		0.22	0.22			0.56	0.56	0.13		
Clearance Time (s)		6.0		6.0	6.0			6.0	6.0	6.0		
Vehicle Extension (s)		3.0		3.0	3.0			3.0	3.0	3.0		
Lane Grp Cap (vph)		65		389	396			1016	1491	433		
v/s Ratio Prot		c0.00		0.02	c0.12			c0.12	0.06	c0.10		
v/s Ratio Perm												
v/c Ratio		0.02		0.11	0.55			0.21	0.11	0.74		
Uniform Delay, d1		80.8		53.9	59.9			19.2	18.0	72.6		
Progression Factor		1.00		1.00	1.00			0.68	1.03	1.00		
Incremental Delay, d2		0.1		0.1	1.7			0.5	0.1	6.4		
Delay (s)		80.9		54.0	61.6			13.6	18.8	79.0		
Level of Service		F		D	E			B	B	E		
Approach Delay (s)		80.9			60.4			16.6		79.0		
Approach LOS		F			E			B		E		
Intersection Summary												
HCM 2000 Control Delay			49.1			HCM 2000 Level of Service				D		
HCM 2000 Volume to Capacity ratio			0.39									
Actuated Cycle Length (s)			174.0			Sum of lost time (s)				24.0		
Intersection Capacity Utilization			49.1%			ICU Level of Service				A		
Analysis Period (min)			15									
c Critical Lane Group												

3: Blandin Avenue & Beaver Street & Plaza Drive

6/3/2016



Lane Group	WBL	NBL	NBT	SBT	SBR	NEL
Lane Group Flow (vph)	36	43	221	216	298	422
v/c Ratio	0.19	0.11	0.56	0.21	0.18	0.79
Control Delay	2.2	57.0	66.7	13.3	1.8	63.1
Queue Delay	0.2	0.0	0.4	2.6	0.7	5.2
Total Delay	2.4	57.0	67.2	15.9	2.5	68.3
Queue Length 50th (ft)	0	40	230	90	5	176
Queue Length 95th (ft)	0	76	310	118	11	237
Internal Link Dist (ft)	140		488	170		199
Turn Bay Length (ft)		40				
Base Capacity (vph)	223	389	397	1017	1623	593
Starvation Cap Reductn	0	0	0	679	983	0
Spillback Cap Reductn	35	0	26	0	0	115
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.19	0.11	0.60	0.64	0.47	0.88

Intersection Summary

3: Blandin Avenue & Beaver Street & Plaza Drive

6/3/2016

Movement	WBL2	WBL	WBR	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NER	NER2
Lane Configurations												
Volume (vph)	26	36	22	35	216	25	8	227	572	300	28	64
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	13	12	11	11	12	12	11	11	11	13	12
Total Lost time (s)		4.0		4.0	4.0			4.0	4.0	4.0		
Lane Util. Factor		1.00		1.00	1.00			1.00	0.88	0.97		
Fr't		0.96		1.00	0.98			1.00	0.85	0.96		
Flt Protected		0.96		0.95	1.00			1.00	1.00	0.96		
Satd. Flow (prot)		1803		1745	1792			1816	2748	3311		
Flt Permitted		0.96		0.95	1.00			1.00	1.00	0.96		
Satd. Flow (perm)		1803		1745	1792			1816	2748	3311		
Peak-hour factor, PHF	0.88	0.88	0.88	0.82	0.82	0.82	0.86	0.86	0.86	0.92	0.92	0.92
Adj. Flow (vph)	30	41	25	43	263	30	9	264	665	326	30	70
RTOR Reduction (vph)	0	91	0	0	2	0	0	0	323	103	0	0
Lane Group Flow (vph)	0	5	0	43	291	0	0	273	342	323	0	0
Heavy Vehicles (%)	0%	0%	5%	0%	1%	0%	0%	1%	0%	0%	0%	0%
Turn Type	Prot	Prot		Split	NA		Split	NA	Prot	Prot		
Protected Phases	1	1		5	5		4	4	4	7		
Permitted Phases												
Actuated Green, G (s)		6.2		44.5	44.5			87.6	87.6	20.9		
Effective Green, g (s)		8.2		46.5	46.5			89.6	89.6	22.9		
Actuated g/C Ratio		0.05		0.27	0.27			0.51	0.51	0.13		
Clearance Time (s)		6.0		6.0	6.0			6.0	6.0	6.0		
Vehicle Extension (s)		3.0		3.0	3.0			3.0	3.0	3.0		
Lane Grp Cap (vph)		84		466	478			935	1415	435		
v/s Ratio Prot		c0.00		0.02	c0.16			c0.15	0.12	c0.10		
v/s Ratio Perm												
v/c Ratio		0.05		0.09	0.61			0.29	0.24	0.74		
Uniform Delay, d1		79.2		47.9	55.8			24.1	23.4	72.7		
Progression Factor		1.00		1.00	1.00			0.71	1.23	1.00		
Incremental Delay, d2		0.3		0.1	2.2			0.7	0.4	6.7		
Delay (s)		79.5		48.0	58.0			17.8	29.1	79.4		
Level of Service		E		D	E			B	C	E		
Approach Delay (s)		79.5			56.7			25.8		79.4		
Approach LOS		E			E			C		E		
Intersection Summary												
HCM 2000 Control Delay			47.2			HCM 2000 Level of Service				D		
HCM 2000 Volume to Capacity ratio			0.48									
Actuated Cycle Length (s)			174.0			Sum of lost time (s)				24.0		
Intersection Capacity Utilization			54.8%			ICU Level of Service				A		
Analysis Period (min)			15									
c Critical Lane Group												

3: Blandin Avenue & Beaver Street & Plaza Drive

6/3/2016



Lane Group	WBL	NBL	NBT	SBT	SBR	NEL
Lane Group Flow (vph)	96	43	293	273	665	426
v/c Ratio	0.48	0.09	0.61	0.29	0.38	0.79
Control Delay	13.8	49.4	61.9	17.9	2.2	63.3
Queue Delay	1.7	0.0	0.9	2.6	0.5	7.2
Total Delay	15.5	49.4	62.8	20.4	2.7	70.6
Queue Length 50th (ft)	0	37	289	117	26	178
Queue Length 95th (ft)	33	67	362	144	27	240
Internal Link Dist (ft)	140		488	170		199
Turn Bay Length (ft)		40				
Base Capacity (vph)	225	466	481	934	1736	595
Starvation Cap Reductn	0	0	0	533	600	0
Spillback Cap Reductn	47	0	51	0	0	127
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.54	0.09	0.68	0.68	0.59	0.91

Intersection Summary

3: Blandin Avenue & Beaver Street & Plaza Drive

6/3/2016

Movement	WBL2	WBL	WBR	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NER	NER2	
Lane Configurations													
Volume (vph)	12	10	9	40	187	16	2	216	303	390	9	38	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width	12	13	12	11	11	12	12	11	11	11	13	12	
Total Lost time (s)		4.0		4.0	4.0			4.0	4.0	4.0			
Lane Util. Factor		1.00		1.00	1.00			1.00	0.88	0.97			
Frt		0.96		1.00	0.99			1.00	0.85	0.98			
Flt Protected		0.97		0.95	1.00			1.00	1.00	0.96			
Satd. Flow (prot)		1764		1745	1782			1818	2668	3297			
Flt Permitted		0.97		0.95	1.00			1.00	1.00	0.96			
Satd. Flow (perm)		1764		1745	1782			1818	2668	3297			
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.93	0.93	0.93	0.96	0.96	0.96	
Adj. Flow (vph)	13	11	10	43	203	17	2	232	326	406	9	40	
RTOR Reduction (vph)	0	33	0	0	2	0	0	0	143	103	0	0	
Lane Group Flow (vph)	0	1	0	43	218	0	0	234	183	352	0	0	
Heavy Vehicles (%)	0%	0%	11%	0%	2%	0%	0%	1%	3%	2%	0%	0%	
Turn Type	Prot	Prot		Split	NA		Split	NA	Prot	Prot			
Protected Phases	1	1		5	5		4	4	4	7			
Permitted Phases													
Actuated Green, G (s)		4.4		36.6	36.6			95.5	95.5	21.8			
Effective Green, g (s)		6.4		38.6	38.6			97.5	97.5	23.8			
Actuated g/C Ratio		0.04		0.22	0.22			0.56	0.56	0.14			
Clearance Time (s)		6.0		6.0	6.0			6.0	6.0	6.0			
Vehicle Extension (s)		3.0		3.0	3.0			3.0	3.0	3.0			
Lane Grp Cap (vph)		64		387	395			1018	1495	450			
v/s Ratio Prot		0.00		0.02	c0.12			c0.13	0.07	c0.11			
v/s Ratio Perm													
v/c Ratio		0.02		0.11	0.55			0.23	0.12	0.78			
Uniform Delay, d1		80.8		54.0	60.0			19.3	18.1	72.6			
Progression Factor		1.00		1.00	1.00			0.68	1.04	1.00			
Incremental Delay, d2		0.1		0.1	1.7			0.5	0.2	8.6			
Delay (s)		80.9		54.1	61.7			13.6	19.0	81.2			
Level of Service		F		D	E			B	B	F			
Approach Delay (s)		80.9			60.5			16.7		81.2			
Approach LOS		F			E			B		F			
Intersection Summary													
HCM 2000 Control Delay			49.5		HCM 2000 Level of Service					D			
HCM 2000 Volume to Capacity ratio			0.42										
Actuated Cycle Length (s)			174.0		Sum of lost time (s)					24.0			
Intersection Capacity Utilization			51.6%		ICU Level of Service					A			
Analysis Period (min)			15										
c Critical Lane Group													

3: Blandin Avenue & Beaver Street & Plaza Drive

6/3/2016



Lane Group	WBL	NBL	NBT	SBT	SBR	NEL
Lane Group Flow (vph)	34	43	220	234	326	455
v/c Ratio	0.18	0.11	0.56	0.23	0.20	0.82
Control Delay	2.1	57.1	66.9	13.4	1.8	66.4
Queue Delay	0.3	0.0	0.6	2.7	0.7	12.7
Total Delay	2.3	57.1	67.4	16.1	2.4	79.0
Queue Length 50th (ft)	0	41	229	97	7	195
Queue Length 95th (ft)	0	80	326	124	13	262
Internal Link Dist (ft)	140		488	170		199
Turn Bay Length (ft)		40				
Base Capacity (vph)	222	386	396	1019	1638	593
Starvation Cap Reductn	0	0	0	663	961	0
Spillback Cap Reductn	41	0	34	0	0	121
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.19	0.11	0.61	0.66	0.48	0.96

Intersection Summary

3: Blandin Avenue & Beaver Street & Plaza Drive

6/3/2016

Movement	WBL2	WBL	WBR	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NER	NER2
Lane Configurations												
Volume (vph)	26	36	22	38	237	25	8	244	618	329	28	69
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	13	12	11	11	12	12	11	11	11	13	12
Total Lost time (s)		4.0		4.0	4.0			4.0	4.0	4.0		
Lane Util. Factor		1.00		1.00	1.00			1.00	0.88	0.97		
Frnt		0.96		1.00	0.99			1.00	0.85	0.97		
Flt Protected		0.96		0.95	1.00			1.00	1.00	0.96		
Satd. Flow (prot)		1802		1745	1794			1816	2748	3314		
Flt Permitted		0.96		0.95	1.00			1.00	1.00	0.96		
Satd. Flow (perm)		1802		1745	1794			1816	2748	3314		
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	28	39	24	41	258	27	9	265	672	358	30	75
RTOR Reduction (vph)	0	87	0	0	1	0	0	0	322	103	0	0
Lane Group Flow (vph)	0	4	0	41	284	0	0	274	350	360	0	0
Heavy Vehicles (%)	0%	0%	5%	0%	1%	0%	0%	1%	0%	0%	0%	0%
Turn Type	Prot	Prot		Split	NA		Split	NA	Prot	Prot		
Protected Phases	1	1		5	5		4	4	4	7		
Permitted Phases												
Actuated Green, G (s)		6.1		43.5	43.5			88.6	88.6	22.1		
Effective Green, g (s)		8.1		45.5	45.5			90.6	90.6	24.1		
Actuated g/C Ratio		0.05		0.26	0.26			0.52	0.52	0.14		
Clearance Time (s)		6.0		6.0	6.0			6.0	6.0	6.0		
Vehicle Extension (s)		3.0		3.0	3.0			3.0	3.0	3.0		
Lane Grp Cap (vph)		83		456	469			945	1430	459		
v/s Ratio Prot		0.00		0.02	c0.16			c0.15	0.13	c0.11		
v/s Ratio Perm												
v/c Ratio		0.05		0.09	0.60			0.29	0.24	0.79		
Uniform Delay, d1		79.3		48.6	56.4			23.5	22.9	72.4		
Progression Factor		1.00		1.00	1.00			0.69	1.23	1.00		
Incremental Delay, d2		0.3		0.1	2.2			0.7	0.4	8.6		
Delay (s)		79.5		48.7	58.6			16.9	28.5	81.0		
Level of Service		E		D	E			B	C	F		
Approach Delay (s)		79.5			57.3			25.1		81.0		
Approach LOS		E			E			C		F		
Intersection Summary												
HCM 2000 Control Delay			47.7			HCM 2000 Level of Service				D		
HCM 2000 Volume to Capacity ratio			0.48									
Actuated Cycle Length (s)			174.0			Sum of lost time (s)				24.0		
Intersection Capacity Utilization			57.8%			ICU Level of Service				B		
Analysis Period (min)			15									
c Critical Lane Group												

3: Blandin Avenue & Beaver Street & Plaza Drive

6/3/2016



Lane Group	WBL	NBL	NBT	SBT	SBR	NEL
Lane Group Flow (vph)	91	41	285	274	672	463
v/c Ratio	0.46	0.09	0.61	0.29	0.38	0.83
Control Delay	12.5	50.5	62.9	16.8	2.1	66.9
Queue Delay	1.7	0.0	2.1	3.0	0.6	18.3
Total Delay	14.2	50.5	65.0	19.9	2.6	85.2
Queue Length 50th (ft)	0	36	284	114	27	200
Queue Length 95th (ft)	30	73	404	143	32	268
Internal Link Dist (ft)	140		488	170		199
Turn Bay Length (ft)		40				
Base Capacity (vph)	225	456	470	944	1752	596
Starvation Cap Reductn	0	0	0	556	642	0
Spillback Cap Reductn	50	0	84	0	0	130
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.52	0.09	0.74	0.71	0.61	0.99
Intersection Summary						

3: Blandin Avenue & Beaver Street & Plaza Drive

6/9/2016

Movement	WBL2	WBL	WBR	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NER	NER2
Lane Configurations												
Volume (vph)	12	10	9	41	187	16	2	216	321	400	9	41
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	12	13	12	11	11	12	12	11	11	11	13	12
Total Lost time (s)		4.0		4.0	4.0			4.0	4.0	4.0		
Lane Util. Factor		1.00		1.00	1.00			1.00	0.88	0.97		
Fr't		0.96		1.00	0.99			1.00	0.85	0.98		
Fit Protected		0.97		0.95	1.00			1.00	1.00	0.96		
Satd. Flow (prot)		1764		1745	1782			1818	2668	3296		
Fit Permitted		0.97		0.95	1.00			1.00	1.00	0.96		
Satd. Flow (perm)		1764		1745	1782			1818	2668	3296		
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.93	0.93	0.93	0.96	0.96	0.96
Adj. Flow (vph)	13	11	10	45	203	17	2	232	345	417	9	43
RTOR Reduction (vph)	0	33	0	0	2	0	0	0	152	102	0	0
Lane Group Flow (vph)	0	1	0	45	218	0	0	234	193	367	0	0
Heavy Vehicles (%)	0%	0%	11%	0%	2%	0%	0%	1%	3%	2%	0%	0%
Turn Type	Prot	Prot		Split	NA		Split	NA	Prot	Prot		
Protected Phases	1	1		5	5		4	4	4	7		
Permitted Phases												
Actuated Green, G (s)		4.4		36.6	36.6			95.5	95.5	22.2		
Effective Green, g (s)		6.4		38.6	38.6			97.5	97.5	24.2		
Actuated g/C Ratio		0.04		0.22	0.22			0.56	0.56	0.14		
Clearance Time (s)		6.0		6.0	6.0			6.0	6.0	6.0		
Vehicle Extension (s)		3.0		3.0	3.0			3.0	3.0	3.0		
Lane Grp Cap (vph)		64		387	395			1018	1495	458		
v/s Ratio Prot		0.00		0.03	c0.12			c0.13	0.07	c0.11		
v/s Ratio Perm												
v/c Ratio		0.02		0.12	0.55			0.23	0.13	0.80		
Uniform Delay, d1		80.8		54.1	60.0			19.3	18.1	72.6		
Progression Factor		1.00		1.00	1.00			0.66	0.99	1.00		
Incremental Delay, d2		0.1		0.1	1.7			0.5	0.2	9.7		
Delay (s)		80.9		54.2	61.7			13.3	18.2	82.2		
Level of Service		F		D	E			B	B	F		
Approach Delay (s)		80.9			60.4			16.2		82.2		
Approach LOS		F			E			B		F		
Intersection Summary												
HCM 2000 Control Delay			49.5			HCM 2000 Level of Service				D		
HCM 2000 Volume to Capacity ratio			0.42									
Actuated Cycle Length (s)			174.0			Sum of lost time (s)			24.0			
Intersection Capacity Utilization			51.9%			ICU Level of Service			A			
Analysis Period (min)			15									
c Critical Lane Group												

3: Blandin Avenue & Beaver Street & Plaza Drive

6/9/2016



Lane Group	WBL	NBL	NBT	SBT	SBR	NEL
Lane Group Flow (vph)	34	45	220	234	345	469
v/c Ratio	0.18	0.12	0.56	0.23	0.21	0.84
Control Delay	2.1	57.2	66.9	13.1	1.7	67.9
Queue Delay	0.2	0.0	0.6	2.7	0.7	16.9
Total Delay	2.3	57.2	67.5	15.8	2.3	84.8
Queue Length 50th (ft)	0	43	229	96	7	204
Queue Length 95th (ft)	0	83	326	118	14	272
Internal Link Dist (ft)	140		488	170		199
Turn Bay Length (ft)		40				
Base Capacity (vph)	222	386	396	1019	1647	593
Starvation Cap Reductn	0	0	0	664	945	0
Spillback Cap Reductn	39	0	36	0	0	119
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.19	0.12	0.61	0.66	0.49	0.99

Intersection Summary

3: Blandin Avenue & Beaver Street & Plaza Drive

6/9/2016

													
Movement	WBL2	WBL	WBR	NBL	NBT	NBR	SBL	SBT	SBR	NEL	NER	NER2	
Lane Configurations													
Volume (vph)	26	36	22	40	237	25	8	244	693	334	28	71	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width	12	13	12	11	11	12	12	11	11	11	13	12	
Total Lost time (s)		4.0		4.0	4.0			4.0	4.0	4.0			
Lane Util. Factor		1.00		1.00	1.00			1.00	0.88	0.97			
Fr _t		0.96		1.00	0.99			1.00	0.85	0.97			
Fl _t Protected		0.96		0.95	1.00			1.00	1.00	0.96			
Satd. Flow (prot)		1802		1745	1794			1816	2748	3313			
Fl _t Permitted		0.96		0.95	1.00			1.00	1.00	0.96			
Satd. Flow (perm)		1802		1745	1794			1816	2748	3313			
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	
Adj. Flow (vph)	28	39	24	43	258	27	9	265	753	363	30	77	
RTOR Reduction (vph)	0	87	0	0	1	0	0	0	361	102	0	0	
Lane Group Flow (vph)	0	4	0	43	284	0	0	274	392	368	0	0	
Heavy Vehicles (%)	0%	0%	5%	0%	1%	0%	0%	1%	0%	0%	0%	0%	
Turn Type	Prot	Prot		Split	NA		Split	NA	Prot	Prot			
Protected Phases	1	1		5	5		4	4	4	7			
Permitted Phases													
Actuated Green, G (s)		6.1		43.5	43.5			88.6	88.6	22.2			
Effective Green, g (s)		8.1		45.5	45.5			90.6	90.6	24.2			
Actuated g/C Ratio		0.05		0.26	0.26			0.52	0.52	0.14			
Clearance Time (s)		6.0		6.0	6.0			6.0	6.0	6.0			
Vehicle Extension (s)		3.0		3.0	3.0			3.0	3.0	3.0			
Lane Grp Cap (vph)		83		456	469			945	1430	460			
v/s Ratio Prot		0.00		0.02	c0.16			c0.15	0.14	c0.11			
v/s Ratio Perm													
v/c Ratio		0.05		0.09	0.60			0.29	0.27	0.80			
Uniform Delay, d1		79.3		48.6	56.4			23.5	23.3	72.5			
Progression Factor		1.00		1.00	1.00			0.69	1.37	1.00			
Incremental Delay, d2		0.3		0.1	2.2			0.7	0.4	9.4			
Delay (s)		79.5		48.7	58.6			16.9	32.3	81.9			
Level of Service		E		D	E			B	C	F			
Approach Delay (s)		79.5			57.3			28.2		81.9			
Approach LOS		E			E			C		F			
Intersection Summary													
HCM 2000 Control Delay			48.8		HCM 2000 Level of Service					D			
HCM 2000 Volume to Capacity ratio			0.49										
Actuated Cycle Length (s)			174.0		Sum of lost time (s)					24.0			
Intersection Capacity Utilization			58.0%		ICU Level of Service					B			
Analysis Period (min)			15										
c Critical Lane Group													

3: Blandin Avenue & Beaver Street & Plaza Drive

6/9/2016



Lane Group	WBL	NBL	NBT	SBT	SBR	NEL
Lane Group Flow (vph)	91	43	285	274	753	470
v/c Ratio	0.46	0.09	0.61	0.29	0.42	0.83
Control Delay	12.5	50.6	62.9	16.9	2.3	67.8
Queue Delay	1.7	0.0	1.9	3.8	0.7	21.7
Total Delay	14.2	50.6	64.8	20.7	3.0	89.4
Queue Length 50th (ft)	0	37	284	104	34	205
Queue Length 95th (ft)	30	76	404	130	40	273
Internal Link Dist (ft)	140		488	170		199
Turn Bay Length (ft)		40				
Base Capacity (vph)	225	456	470	944	1791	596
Starvation Cap Reductn	0	0	0	575	650	0
Spillback Cap Reductn	50	0	81	0	0	130
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.52	0.09	0.73	0.74	0.66	1.01

Intersection Summary

Waverly Street at Beaver Street

1: Beaver Street/Bishop Street & Route 135

6/3/2016

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	161	345	73	44	220	310	51	446	48	200	361	154
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	12	12	13	12	12	10	12	12	12	12	12
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		1.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Frt	1.00	0.97		1.00	1.00	0.85	1.00	0.99		1.00	0.96	
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1728	1817		1743	1845	1538	1685	3512		1703	3404	
Flt Permitted	0.46	1.00		0.41	1.00	1.00	0.45	1.00		0.07	1.00	
Satd. Flow (perm)	843	1817		748	1845	1538	798	3512		124	3404	
Peak-hour factor, PHF	0.90	0.90	0.90	0.94	0.94	0.94	0.92	0.92	0.92	0.95	0.95	0.95
Adj. Flow (vph)	179	383	81	47	234	330	55	485	52	211	380	162
RTOR Reduction (vph)	0	5	0	0	0	172	0	4	0	0	23	0
Lane Group Flow (vph)	179	459	0	47	234	158	55	533	0	211	519	0
Heavy Vehicles (%)	1%	2%	1%	7%	3%	5%	0%	1%	4%	6%	1%	2%
Turn Type	D.P+P	NA		Perm	NA	Prot	Perm	NA		custom	NA	
Protected Phases	1	1 2 3 4			2 3 4	2 3 4		8		7	6 7 8	
Permitted Phases	2 3 4			2 3 4			8			6 8		
Actuated Green, G (s)	70.0	76.0		56.0	56.0	56.0	24.0	24.0		74.0	86.0	
Effective Green, g (s)	72.0	76.0		56.0	56.0	56.0	26.0	26.0		89.0	88.0	
Actuated g/C Ratio	0.41	0.44		0.32	0.32	0.32	0.15	0.15		0.51	0.51	
Clearance Time (s)	6.0						6.0	6.0		6.0		
Vehicle Extension (s)	3.0						3.0	3.0		3.0		
Lane Grp Cap (vph)	430	793		240	593	494	119	524		344	1721	
v/s Ratio Prot	0.04	c0.25			0.13	0.10		c0.15		c0.11	0.15	
v/s Ratio Perm	0.13			0.06			0.07			c0.20		
v/c Ratio	0.42	0.58		0.20	0.39	0.32	0.46	1.02		0.61	0.30	
Uniform Delay, d1	34.0	36.9		42.7	45.8	44.6	67.6	74.0		62.0	25.1	
Progression Factor	1.00	1.00		1.00	1.00	1.00	0.89	0.88		0.79	0.15	
Incremental Delay, d2	0.7	1.0		0.4	0.4	0.4	2.2	38.5		2.2	0.1	
Delay (s)	34.6	38.0		43.1	46.3	45.0	62.6	103.6		51.2	3.7	
Level of Service	C	D		D	D	D	E	F		D	A	
Approach Delay (s)		37.1			45.3			99.8			17.0	
Approach LOS		D			D			F			B	

Intersection Summary			
HCM 2000 Control Delay	47.5	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	174.0	Sum of lost time (s)	30.0
Intersection Capacity Utilization	64.2%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			



Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	179	464	47	234	330	55	537	211	542
v/c Ratio	0.41	0.57	0.19	0.38	0.48	0.46	1.02	0.61	0.31
Control Delay	32.8	38.2	43.9	46.5	13.2	71.3	100.9	45.2	3.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	29.6	0.9	4.1
Total Delay	32.8	38.2	43.9	46.5	13.2	71.3	130.5	46.1	7.8
Queue Length 50th (ft)	125	383	38	205	61	35	~341	208	58
Queue Length 95th (ft)	184	502	76	288	159	m55	#438	m263	m67
Internal Link Dist (ft)		415		313			170		71
Turn Bay Length (ft)	270		120		120				
Base Capacity (vph)	440	818	249	615	682	119	528	344	1743
Starvation Cap Reductn	0	0	0	0	0	0	67	28	1099
Spillback Cap Reductn	1	0	0	0	7	0	16	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.41	0.57	0.19	0.38	0.49	0.46	1.16	0.67	0.84

Intersection Summary

- ~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
- # 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
- m Volume for 95th percentile queue is metered by upstream signal.

1: Beaver Street/Bishop Street & Route 135

6/3/2016

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	140	275	54	75	272	281	63	424	51	249	678	244
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	12	12	13	12	12	10	12	12	12	12	12
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		1.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Fr _t	1.00	0.98		1.00	1.00	0.85	1.00	0.98		1.00	0.96	
Fl _t Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1728	1838		1793	1900	1615	1685	3544		1770	3467	
Fl _t Permitted	0.39	1.00		0.53	1.00	1.00	0.30	1.00		0.07	1.00	
Satd. Flow (perm)	700	1838		1006	1900	1615	529	3544		128	3467	
Peak-hour factor, PHF	0.90	0.90	0.90	0.93	0.93	0.93	0.93	0.93	0.93	0.96	0.96	0.96
Adj. Flow (vph)	156	306	60	81	292	302	68	456	55	259	706	254
RTOR Reduction (vph)	0	4	0	0	0	126	0	5	0	0	17	0
Lane Group Flow (vph)	156	362	0	81	292	176	68	506	0	259	943	0
Heavy Vehicles (%)	1%	1%	0%	4%	0%	0%	0%	0%	2%	2%	0%	0%
Turn Type	D.P+P	NA		Perm	NA	Prot	Perm	NA		custom	NA	
Protected Phases	1	1 2 3 4			2 3 4	2 3 4		8		7	6 7 8	
Permitted Phases	2 3 4			2 3 4			8			6 8		
Actuated Green, G (s)	69.9	75.9		55.9	55.9	55.9	24.0	24.0		74.1	86.1	
Effective Green, g (s)	71.9	75.9		55.9	55.9	55.9	26.0	26.0		89.1	88.1	
Actuated g/C Ratio	0.41	0.44		0.32	0.32	0.32	0.15	0.15		0.51	0.51	
Clearance Time (s)	6.0						6.0	6.0		6.0		
Vehicle Extension (s)	3.0						3.0	3.0		3.0		
Lane Grp Cap (vph)	383	801		323	610	518	79	529		359	1755	
v/s Ratio Prot	0.04	c0.20			c0.15	0.11		c0.14		c0.13	0.27	
v/s Ratio Perm	0.13			0.08			0.13			c0.24		
v/c Ratio	0.41	0.45		0.25	0.48	0.34	0.86	0.96		0.72	0.54	
Uniform Delay, d1	34.1	34.4		43.6	47.4	45.0	72.2	73.4		63.5	29.1	
Progression Factor	1.00	1.00		1.00	1.00	1.00	1.01	1.01		0.87	0.29	
Incremental Delay, d2	0.7	0.4		0.4	0.6	0.4	46.8	23.4		0.7	0.0	
Delay (s)	34.8	34.9		44.0	48.0	45.4	120.0	97.4		55.6	8.5	
Level of Service	C	C		D	D	D	F	F		E	A	
Approach Delay (s)		34.8			46.3			100.1			18.5	
Approach LOS		C			D			F			B	

Intersection Summary			
HCM 2000 Control Delay	43.4	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.70		
Actuated Cycle Length (s)	174.0	Sum of lost time (s)	30.0
Intersection Capacity Utilization	66.9%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

1: Beaver Street/Bishop Street & Route 135

6/3/2016



Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	156	366	81	292	302	68	511	259	960
v/c Ratio	0.40	0.44	0.24	0.46	0.46	0.87	0.96	0.72	0.54
Control Delay	32.5	34.5	44.5	48.7	19.0	129.6	96.5	47.9	8.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	43.0	4.7	51.4
Total Delay	32.5	34.5	44.6	48.7	19.0	129.6	139.5	52.6	59.8
Queue Length 50th (ft)	107	280	67	264	99	58	255	264	461
Queue Length 95th (ft)	161	375	117	361	194	m#145	#407	m270	m123
Internal Link Dist (ft)		415		313			170		71
Turn Bay Length (ft)	270		120		120				
Base Capacity (vph)	392	819	330	624	655	78	534	359	1772
Starvation Cap Reductn	0	0	0	0	0	0	113	52	1012
Spillback Cap Reductn	2	17	9	0	6	0	86	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.40	0.46	0.25	0.47	0.47	0.87	1.21	0.84	1.26

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

1: Beaver Street/Bishop Street & Route 135

6/3/2016

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Volume (vph)	173	371	78	47	236	334	55	480	51	222	396	165	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width	11	12	12	13	12	12	10	12	12	12	12	12	
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		1.0	4.0		
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	0.95		1.00	0.95		
Frt	1.00	0.97		1.00	1.00	0.85	1.00	0.99		1.00	0.96		
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00		
Satd. Flow (prot)	1728	1817		1743	1845	1538	1685	3513		1703	3406		
Flt Permitted	0.44	1.00		0.38	1.00	1.00	0.43	1.00		0.07	1.00		
Satd. Flow (perm)	801	1817		693	1845	1538	761	3513		124	3406		
Peak-hour factor, PHF	0.92	0.92	0.92	0.94	0.94	0.94	0.92	0.92	0.92	0.95	0.95	0.95	
Adj. Flow (vph)	188	403	85	50	251	355	60	522	55	234	417	174	
RTOR Reduction (vph)	0	5	0	0	0	173	0	4	0	0	22	0	
Lane Group Flow (vph)	188	483	0	50	251	182	60	573	0	234	569	0	
Heavy Vehicles (%)	1%	2%	1%	7%	3%	5%	0%	1%	4%	6%	1%	2%	
Turn Type	D.P+P	NA		Perm	NA	Prot	Perm	NA		custom	NA		
Protected Phases	1	1 2 3 4			2 3 4	2 3 4		8		7	6 7 8		
Permitted Phases	2 3 4			2 3 4			8			6 8			
Actuated Green, G (s)	70.0	76.0		56.0	56.0	56.0	24.0	24.0		74.0	86.0		
Effective Green, g (s)	72.0	76.0		56.0	56.0	56.0	26.0	26.0		89.0	88.0		
Actuated g/C Ratio	0.41	0.44		0.32	0.32	0.32	0.15	0.15		0.51	0.51		
Clearance Time (s)	6.0						6.0	6.0		6.0			
Vehicle Extension (s)	3.0						3.0	3.0		3.0			
Lane Grp Cap (vph)	416	793		223	593	494	113	524		344	1722		
v/s Ratio Prot	0.04	c0.27			0.14	0.12		c0.16		c0.12	0.17		
v/s Ratio Perm	0.15			0.07			0.08			c0.23			
v/c Ratio	0.45	0.61		0.22	0.42	0.37	0.53	1.09		0.68	0.33		
Uniform Delay, d1	34.3	37.6		43.1	46.3	45.4	68.4	74.0		62.9	25.5		
Progression Factor	1.00	1.00		1.00	1.00	1.00	0.89	0.87		0.80	0.15		
Incremental Delay, d2	0.8	1.3		0.5	0.5	0.5	3.5	62.0		3.4	0.1		
Delay (s)	35.1	39.0		43.6	46.8	45.9	64.6	126.0		54.0	4.0		
Level of Service	D	D		D	D	D	E	F		D	A		
Approach Delay (s)		37.9			46.1			120.2			18.2		
Approach LOS		D			D			F			B		
Intersection Summary													
HCM 2000 Control Delay			52.8		HCM 2000 Level of Service						D		
HCM 2000 Volume to Capacity ratio			0.79										
Actuated Cycle Length (s)			174.0		Sum of lost time (s)						30.0		
Intersection Capacity Utilization			68.1%		ICU Level of Service						C		
Analysis Period (min)			15										
c Critical Lane Group													

1: Beaver Street/Bishop Street & Route 135

6/3/2016



Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	188	488	50	251	355	60	577	234	591
v/c Ratio	0.44	0.60	0.22	0.41	0.52	0.53	1.09	0.68	0.34
Control Delay	33.5	39.2	44.9	47.3	15.5	75.1	118.5	48.9	4.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	4.7	1.4	5.5
Total Delay	33.5	39.2	44.9	47.3	15.5	75.1	123.2	50.3	9.5
Queue Length 50th (ft)	132	410	41	222	86	38	~379	236	65
Queue Length 95th (ft)	193	536	82	310	191	m62	#490	m279	m72
Internal Link Dist (ft)		415		313			170		71
Turn Bay Length (ft)	270		120		120				
Base Capacity (vph)	426	818	231	615	682	113	529	344	1744
Starvation Cap Reductn	0	0	0	0	0	0	65	28	1077
Spillback Cap Reductn	3	0	0	0	4	0	22	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.44	0.60	0.22	0.41	0.52	0.53	1.24	0.74	0.89

Intersection Summary

- ~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
- # 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
- m Volume for 95th percentile queue is metered by upstream signal.

1: Beaver Street/Bishop Street & Route 135

6/3/2016

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	150	295	58	80	292	311	68	465	55	272	732	262
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	12	12	13	12	12	10	12	12	12	12	12
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		1.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Fr _t	1.00	0.98		1.00	1.00	0.85	1.00	0.98		1.00	0.96	
Fl _t Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1728	1838		1793	1900	1615	1685	3545		1770	3467	
Fl _t Permitted	0.36	1.00		0.51	1.00	1.00	0.28	1.00		0.07	1.00	
Satd. Flow (perm)	649	1838		962	1900	1615	491	3545		128	3467	
Peak-hour factor, PHF	0.92	0.92	0.92	0.93	0.93	0.93	0.93	0.93	0.93	0.96	0.96	0.96
Adj. Flow (vph)	163	321	63	86	314	334	73	500	59	283	762	273
RTOR Reduction (vph)	0	4	0	0	0	130	0	5	0	0	17	0
Lane Group Flow (vph)	163	380	0	86	314	204	73	554	0	283	1018	0
Heavy Vehicles (%)	1%	1%	0%	4%	0%	0%	0%	0%	2%	2%	0%	0%
Turn Type	D.P+P	NA		Perm	NA	Prot	Perm	NA		custom	NA	
Protected Phases	1	1 2 3 4			2 3 4	2 3 4		8		7	6 7 8	
Permitted Phases	2 3 4			2 3 4			8			6 8		
Actuated Green, G (s)	70.0	76.0		56.0	56.0	56.0	24.0	24.0		74.0	86.0	
Effective Green, g (s)	72.0	76.0		56.0	56.0	56.0	26.0	26.0		89.0	88.0	
Actuated g/C Ratio	0.41	0.44		0.32	0.32	0.32	0.15	0.15		0.51	0.51	
Clearance Time (s)	6.0						6.0	6.0		6.0		
Vehicle Extension (s)	3.0						3.0	3.0		3.0		
Lane Grp Cap (vph)	367	802		309	611	519	73	529		358	1753	
v/s Ratio Prot	0.04	c0.21			c0.17	0.13		c0.16		c0.14	0.29	
v/s Ratio Perm	0.14			0.09			0.15			c0.26		
v/c Ratio	0.44	0.47		0.28	0.51	0.39	1.00	1.05		0.79	0.58	
Uniform Delay, d ₁	34.5	34.8		43.9	47.9	45.8	74.0	74.0		64.6	30.1	
Progression Factor	1.00	1.00		1.00	1.00	1.00	0.99	0.98		0.87	0.32	
Incremental Delay, d ₂	0.9	0.4		0.5	0.7	0.5	88.7	45.9		1.1	0.0	
Delay (s)	35.4	35.2		44.4	48.7	46.3	161.7	118.4		57.3	9.8	
Level of Service	D	D		D	D	D	F	F		E	A	
Approach Delay (s)		35.3			47.1			123.4			20.0	
Approach LOS		D			D			F			B	

Intersection Summary

HCM 2000 Control Delay	49.0	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	174.0	Sum of lost time (s)	30.0
Intersection Capacity Utilization	70.6%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			



Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	163	384	86	314	334	73	559	283	1035
v/c Ratio	0.43	0.46	0.27	0.50	0.50	1.00	1.05	0.79	0.58
Control Delay	33.2	35.1	45.3	49.6	21.7	158.2	112.5	50.3	9.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	21.4	9.6	51.4
Total Delay	33.3	35.1	45.3	49.6	21.7	158.2	133.9	59.9	61.0
Queue Length 50th (ft)	113	298	72	287	128	~71	~354	293	496
Queue Length 95th (ft)	168	398	125	390	231	m#160	#467	m274	m460
Internal Link Dist (ft)		415		313			170		71
Turn Bay Length (ft)	270		120		120				
Base Capacity (vph)	375	827	321	633	665	73	534	358	1770
Starvation Cap Reductn	0	0	0	0	0	0	103	52	1013
Spillback Cap Reductn	2	5	2	0	7	0	108	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.44	0.47	0.27	0.50	0.51	1.00	1.31	0.92	1.37

Intersection Summary

- ~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
- # 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
- m Volume for 95th percentile queue is metered by upstream signal.

1: Beaver Street/Bishop Street & Route 135

6/9/2016

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Volume (vph)	227	392	78	52	236	334	65	480	51	222	409	165	
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	
Lane Width	11	12	12	13	12	12	10	12	12	12	12	12	
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		1.0	4.0		
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	0.95		1.00	0.95		
Fr _t	1.00	0.98		1.00	1.00	0.85	1.00	0.99		1.00	0.96		
Fl _t Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00		
Satd. Flow (prot)	1728	1819		1743	1845	1538	1685	3513		1703	3410		
Fl _t Permitted	0.44	1.00		0.35	1.00	1.00	0.42	1.00		0.07	1.00		
Satd. Flow (perm)	801	1819		641	1845	1538	750	3513		124	3410		
Peak-hour factor, PHF	0.92	0.92	0.92	0.94	0.94	0.94	0.92	0.92	0.92	0.95	0.95	0.95	
Adj. Flow (vph)	247	426	85	55	251	355	71	522	55	234	431	174	
RTOR Reduction (vph)	0	4	0	0	0	173	0	4	0	0	21	0	
Lane Group Flow (vph)	247	507	0	55	251	182	71	573	0	234	584	0	
Heavy Vehicles (%)	1%	2%	1%	7%	3%	5%	0%	1%	4%	6%	1%	2%	
Turn Type	D.P+P	NA		Perm	NA	Prot	Perm	NA		custom	NA		
Protected Phases	1	1 2 3 4			2 3 4	2 3 4		8		7	6 7 8		
Permitted Phases	2 3 4			2 3 4			8			6 8			
Actuated Green, G (s)	70.0	76.0		56.0	56.0	56.0	24.0	24.0		74.0	86.0		
Effective Green, g (s)	72.0	76.0		56.0	56.0	56.0	26.0	26.0		89.0	88.0		
Actuated g/C Ratio	0.41	0.44		0.32	0.32	0.32	0.15	0.15		0.51	0.51		
Clearance Time (s)	6.0						6.0	6.0		6.0			
Vehicle Extension (s)	3.0						3.0	3.0		3.0			
Lane Grp Cap (vph)	416	794		206	593	494	112	524		344	1724		
v/s Ratio Prot	0.05	c0.28			0.14	0.12		c0.16		c0.12	0.17		
v/s Ratio Perm	0.19			0.09			0.09			c0.23			
v/c Ratio	0.59	0.64		0.27	0.42	0.37	0.63	1.09		0.68	0.34		
Uniform Delay, d1	36.4	38.3		43.8	46.3	45.4	69.5	74.0		62.9	25.6		
Progression Factor	1.00	1.00		1.00	1.00	1.00	0.89	0.87		0.80	0.16		
Incremental Delay, d2	2.3	1.7		0.7	0.5	0.5	8.4	62.1		3.3	0.1		
Delay (s)	38.7	40.0		44.5	46.8	45.9	70.3	126.6		53.6	4.1		
Level of Service	D	D		D	D	D	E	F		D	A		
Approach Delay (s)		39.6			46.1			120.4			17.9		
Approach LOS		D			D			F			B		
Intersection Summary													
HCM 2000 Control Delay			52.8		HCM 2000 Level of Service						D		
HCM 2000 Volume to Capacity ratio			0.80										
Actuated Cycle Length (s)			174.0		Sum of lost time (s)					30.0			
Intersection Capacity Utilization			69.2%		ICU Level of Service					C			
Analysis Period (min)			15										
c Critical Lane Group													



Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	247	511	55	251	355	71	577	234	605
v/c Ratio	0.58	0.62	0.26	0.41	0.52	0.63	1.09	0.68	0.35
Control Delay	37.9	40.4	46.5	47.3	15.5	81.7	118.9	48.5	4.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	4.8	1.4	6.1
Total Delay	37.9	40.4	46.5	47.3	15.5	81.7	123.7	49.9	10.2
Queue Length 50th (ft)	180	438	46	222	86	45	~380	236	67
Queue Length 95th (ft)	254	570	90	310	191	m85	#492	m276	m73
Internal Link Dist (ft)		415		313			170		71
Turn Bay Length (ft)	270		120		120				
Base Capacity (vph)	426	819	213	615	682	112	529	344	1745
Starvation Cap Reductn	0	0	0	0	0	0	69	28	1072
Spillback Cap Reductn	3	0	0	0	4	0	26	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.58	0.62	0.26	0.41	0.52	0.63	1.25	0.74	0.90

Intersection Summary

- ~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
- # 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
- m Volume for 95th percentile queue is metered by upstream signal.

1: Beaver Street/Bishop Street & Route 135

6/9/2016



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↖	↗		↖	↗	↗	↖	↕		↖	↕	
Volume (vph)	178	306	58	11	292	311	73	465	55	272	786	262
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	12	12	13	12	12	10	12	12	12	12	12
Total Lost time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0		1.0	4.0	
Lane Util. Factor	1.00	1.00		1.00	1.00	1.00	1.00	0.95		1.00	0.95	
Fr _t	1.00	0.98		1.00	1.00	0.85	1.00	0.98		1.00	0.96	
Fit Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1728	1839		1793	1900	1615	1685	3545		1770	3475	
Fit Permitted	0.36	1.00		0.49	1.00	1.00	0.26	1.00		0.07	1.00	
Satd. Flow (perm)	649	1839		933	1900	1615	464	3545		128	3475	
Peak-hour factor, PHF	0.92	0.92	0.92	0.93	0.93	0.93	0.93	0.93	0.93	0.96	0.96	0.96
Adj. Flow (vph)	193	333	63	12	314	334	78	500	59	283	819	273
RTOR Reduction (vph)	0	4	0	0	0	130	0	5	0	0	16	0
Lane Group Flow (vph)	193	392	0	12	314	204	78	554	0	283	1076	0
Heavy Vehicles (%)	1%	1%	0%	4%	0%	0%	0%	0%	2%	2%	0%	0%
Turn Type	D.P+P	NA		Perm	NA	Prot	Perm	NA		custom	NA	
Protected Phases	1	1 2 3 4			2 3 4	2 3 4		8		7	6 7 8	
Permitted Phases	2 3 4			2 3 4			8			6 8		
Actuated Green, G (s)	70.0	76.0		56.0	56.0	56.0	24.0	24.0		74.0	86.0	
Effective Green, g (s)	72.0	76.0		56.0	56.0	56.0	26.0	26.0		89.0	88.0	
Actuated g/C Ratio	0.41	0.44		0.32	0.32	0.32	0.15	0.15		0.51	0.51	
Clearance Time (s)	6.0						6.0	6.0		6.0		
Vehicle Extension (s)	3.0						3.0	3.0		3.0		
Lane Grp Cap (vph)	367	803		300	611	519	69	529		358	1757	
v/s Ratio Prot	0.05	c0.21			0.17	0.13		0.16		c0.14	0.31	
v/s Ratio Perm	c0.17			0.01			c0.17			c0.26		
v/c Ratio	0.53	0.49		0.04	0.51	0.39	1.13	1.05		0.79	0.61	
Uniform Delay, d1	35.2	35.1		40.5	47.9	45.8	74.0	74.0		64.6	30.8	
Progression Factor	1.00	1.00		1.00	1.00	1.00	0.99	0.98		0.86	0.35	
Incremental Delay, d2	1.4	0.5		0.1	0.7	0.5	130.5	45.9		1.1	0.1	
Delay (s)	36.6	35.5		40.6	48.7	46.3	204.0	118.5		56.8	10.8	
Level of Service	D	D		D	D	D	F	F		E	B	
Approach Delay (s)		35.9			47.3			128.9			20.2	
Approach LOS		D			D			F			C	

Intersection Summary

HCM 2000 Control Delay	49.8	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	174.0	Sum of lost time (s)	30.0
Intersection Capacity Utilization	73.7%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

1: Beaver Street/Bishop Street & Route 135

6/9/2016



Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	193	396	12	314	334	78	559	283	1092
v/c Ratio	0.51	0.48	0.04	0.50	0.50	1.13	1.05	0.79	0.62
Control Delay	35.4	35.5	39.9	49.6	21.7	191.7	112.6	49.9	10.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	21.5	9.6	51.3
Total Delay	35.4	35.5	39.9	49.6	21.7	191.7	134.0	59.5	61.9
Queue Length 50th (ft)	136	310	9	287	128	~101	~353	293	526
Queue Length 95th (ft)	197	412	27	390	231	m#179	#468	m260	m474
Internal Link Dist (ft)		415		313			170		71
Turn Bay Length (ft)	270		120		120				
Base Capacity (vph)	375	828	311	633	665	69	534	358	1772
Starvation Cap Reductn	0	0	0	0	0	0	104	52	1008
Spillback Cap Reductn	2	0	0	0	7	0	111	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.52	0.48	0.04	0.50	0.51	1.13	1.32	0.92	1.43

Intersection Summary

- ~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
- # 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
- m Volume for 95th percentile queue is metered by upstream signal.

Bishop Street at Howard Street

2: Bishop Street & Howard Street

6/3/2016



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↗↗	↖	↑	↑↑	
Volume (vph)	0	271	228	689	444	7
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	10	12	14	13	12
Total Lost time (s)		4.0	6.0	4.0	4.0	
Lane Util. Factor		0.88	1.00	1.00	0.95	
Frt		0.85	1.00	1.00	1.00	
Flt Protected		1.00	0.95	1.00	1.00	
Satd. Flow (prot)		2576	1736	1968	3649	
Flt Permitted		1.00	0.47	1.00	1.00	
Satd. Flow (perm)		2576	864	1968	3649	
Peak-hour factor, PHF	0.90	0.90	0.86	0.86	0.92	0.92
Adj. Flow (vph)	0	301	265	801	483	8
RTOR Reduction (vph)	0	0	0	0	1	0
Lane Group Flow (vph)	0	301	265	801	490	0
Heavy Vehicles (%)	0%	3%	4%	3%	2%	0%
Turn Type		custom	custom	NA	NA	
Protected Phases		4 8	1 2 3 4	1 2 3 4	6	
Permitted Phases		4	5 7 8	5 6 8		
Actuated Green, G (s)		43.0	132.0	124.0	24.0	
Effective Green, g (s)		47.0	128.0	128.0	26.0	
Actuated g/C Ratio		0.27	0.74	0.74	0.15	
Clearance Time (s)					6.0	
Vehicle Extension (s)					3.0	
Lane Grp Cap (vph)		695	996	1538	545	
v/s Ratio Prot		0.12	0.11	c0.23	c0.13	
v/s Ratio Perm			c0.09	0.18		
v/c Ratio		0.43	0.27	0.52	0.90	
Uniform Delay, d1		52.5	8.8	9.9	72.7	
Progression Factor		1.00	0.51	0.91	1.00	
Incremental Delay, d2		0.4	0.1	0.2	17.5	
Delay (s)		52.9	4.6	9.2	90.2	
Level of Service		D	A	A	F	
Approach Delay (s)	52.9			8.1	90.2	
Approach LOS	D			A	F	

Intersection Summary

HCM 2000 Control Delay	37.1	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	174.0	Sum of lost time (s)	40.0
Intersection Capacity Utilization	39.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

2: Bishop Street & Howard Street

6/3/2016



Lane Group	EBR	NBL	NBT	SBT
Lane Group Flow (vph)	301	265	801	491
v/c Ratio	0.43	0.26	0.51	0.90
Control Delay	28.4	3.3	6.7	92.4
Queue Delay	0.3	2.3	1.4	48.7
Total Delay	28.8	5.6	8.1	141.1
Queue Length 50th (ft)	80	20	624	293
Queue Length 95th (ft)	108	m40	m583	#395
Internal Link Dist (ft)			71	398
Turn Bay Length (ft)				
Base Capacity (vph)	695	1036	1560	546
Starvation Cap Reductn	0	630	521	0
Spillback Cap Reductn	97	0	0	124
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.50	0.65	0.77	1.16

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

2: Bishop Street & Howard Street

6/3/2016



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↗↘	↖	↑	↑↓	
Volume (vph)	0	552	301	544	619	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	10	12	14	13	12
Total Lost time (s)		4.0	6.0	4.0	4.0	
Lane Util. Factor		0.88	1.00	1.00	0.95	
Fr _t		0.85	1.00	1.00	1.00	
Fl _t Protected		1.00	0.95	1.00	1.00	
Satd. Flow (prot)		2627	1787	2007	3687	
Fl _t Permitted		1.00	0.39	1.00	1.00	
Satd. Flow (perm)		2627	738	2007	3687	
Peak-hour factor, PHF	0.99	0.99	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	558	327	591	673	9
RTOR Reduction (vph)	0	0	0	0	1	0
Lane Group Flow (vph)	0	558	327	591	681	0
Heavy Vehicles (%)	0%	1%	1%	1%	1%	0%
Turn Type		custom	custom	NA	NA	
Protected Phases		4 8	1 2 3 4	1 2 3 4	6	
Permitted Phases		4	5 7 8	5 6 8		
Actuated Green, G (s)		43.0	132.0	123.9	24.0	
Effective Green, g (s)		47.0	128.0	127.9	26.0	
Actuated g/C Ratio		0.27	0.74	0.74	0.15	
Clearance Time (s)					6.0	
Vehicle Extension (s)					3.0	
Lane Grp Cap (vph)		709	976	1567	550	
v/s Ratio Prot		c0.21	0.14	c0.16	c0.18	
v/s Ratio Perm			c0.11	0.13		
v/c Ratio		0.79	0.34	0.38	1.24	
Uniform Delay, d1		58.9	10.9	8.4	74.0	
Progression Factor		1.00	0.83	0.33	1.00	
Incremental Delay, d2		5.8	0.1	0.1	122.2	
Delay (s)		64.6	9.2	2.9	196.2	
Level of Service		E	A	A	F	
Approach Delay (s)	64.6			5.1	196.2	
Approach LOS	E			A	F	

Intersection Summary			
HCM 2000 Control Delay	80.9	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	0.75		
Actuated Cycle Length (s)	174.0	Sum of lost time (s)	40.0
Intersection Capacity Utilization	43.3%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			



Lane Group	EBR	NBL	NBT	SBT
Lane Group Flow (vph)	558	327	591	682
v/c Ratio	0.79	0.32	0.37	1.24
Control Delay	38.7	6.6	2.3	179.3
Queue Delay	12.2	3.5	1.1	1.5
Total Delay	50.9	10.1	3.4	180.8
Queue Length 50th (ft)	167	103	28	~506
Queue Length 95th (ft)	209	m141	m42	#641
Internal Link Dist (ft)			71	398
Turn Bay Length (ft)				
Base Capacity (vph)	709	1005	1582	551
Starvation Cap Reductn	0	572	718	0
Spillback Cap Reductn	135	0	0	91
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.97	0.76	0.68	1.48

Intersection Summary

- ~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
- # 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
- m Volume for 95th percentile queue is metered by upstream signal.

2: Bishop Street & Howard Street

6/3/2016



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↗↗	↖	↑	↑↓	
Volume (vph)	0	307	248	739	476	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	10	12	14	13	12
Total Lost time (s)		4.0	6.0	4.0	4.0	
Lane Util. Factor		0.88	1.00	1.00	0.95	
Fr _t		0.85	1.00	1.00	1.00	
Fl _t Protected		1.00	0.95	1.00	1.00	
Satd. Flow (prot)		2576	1736	1968	3649	
Fl _t Permitted		1.00	0.46	1.00	1.00	
Satd. Flow (perm)		2576	835	1968	3649	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	334	270	803	517	9
RTOR Reduction (vph)	0	0	0	0	1	0
Lane Group Flow (vph)	0	334	270	803	525	0
Heavy Vehicles (%)	0%	3%	4%	3%	2%	0%
Turn Type		custom	custom	NA	NA	
Protected Phases		4 8	1 2 3 4	1 2 3 4	6	
Permitted Phases		4	5 7 8	5 6 8		
Actuated Green, G (s)		43.0	132.0	124.0	24.0	
Effective Green, g (s)		47.0	128.0	128.0	26.0	
Actuated g/C Ratio		0.27	0.74	0.74	0.15	
Clearance Time (s)					6.0	
Vehicle Extension (s)					3.0	
Lane Grp Cap (vph)		695	987	1538	545	
v/s Ratio Prot		0.13	0.11	c0.23	c0.14	
v/s Ratio Perm			c0.09	0.18		
v/c Ratio		0.48	0.27	0.52	0.96	
Uniform Delay, d1		53.3	9.0	9.9	73.5	
Progression Factor		1.00	0.56	0.87	1.00	
Incremental Delay, d2		0.5	0.1	0.2	29.3	
Delay (s)		53.8	5.2	8.8	102.9	
Level of Service		D	A	A	F	
Approach Delay (s)	53.8			7.9	102.9	
Approach LOS	D			A	F	

Intersection Summary			
HCM 2000 Control Delay	41.7	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.67		
Actuated Cycle Length (s)	174.0	Sum of lost time (s)	40.0
Intersection Capacity Utilization	42.2%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			



Lane Group	EBR	NBL	NBT	SBT
Lane Group Flow (vph)	334	270	803	526
v/c Ratio	0.48	0.26	0.51	0.97
Control Delay	29.2	3.7	6.4	102.9
Queue Delay	0.5	2.5	1.4	41.2
Total Delay	29.7	6.1	7.8	144.1
Queue Length 50th (ft)	90	33	648	318
Queue Length 95th (ft)	120	m67	m189	#442
Internal Link Dist (ft)			71	398
Turn Bay Length (ft)				
Base Capacity (vph)	695	1026	1560	545
Starvation Cap Reductn	0	622	527	0
Spillback Cap Reductn	104	0	0	87
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.57	0.67	0.78	1.15

Intersection Summary

- # 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
- m Volume for 95th percentile queue is metered by upstream signal.

2: Bishop Street & Howard Street

6/3/2016



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↗↗	↖	↑	↑↓	
Volume (vph)	0	602	343	583	664	9
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	10	12	14	13	12
Total Lost time (s)		4.0	6.0	4.0	4.0	
Lane Util. Factor		0.88	1.00	1.00	0.95	
Frt		0.85	1.00	1.00	1.00	
Flt Protected		1.00	0.95	1.00	1.00	
Satd. Flow (prot)		2627	1787	2007	3686	
Flt Permitted		1.00	0.37	1.00	1.00	
Satd. Flow (perm)		2627	703	2007	3686	
Peak-hour factor, PHF	0.99	0.99	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	608	373	634	722	10
RTOR Reduction (vph)	0	0	0	0	1	0
Lane Group Flow (vph)	0	608	373	634	731	0
Heavy Vehicles (%)	0%	1%	1%	1%	1%	0%
Turn Type		custom	custom	NA	NA	
Protected Phases		4 8	1 2 3 4	1 2 3 4	6	
Permitted Phases		4	5 7 8	5 6 8		
Actuated Green, G (s)		43.0	132.0	124.0	24.0	
Effective Green, g (s)		47.0	128.0	128.0	26.0	
Actuated g/C Ratio		0.27	0.74	0.74	0.15	
Clearance Time (s)					6.0	
Vehicle Extension (s)					3.0	
Lane Grp Cap (vph)		709	965	1568	550	
v/s Ratio Prot		c0.23	0.16	c0.18	c0.20	
v/s Ratio Perm			c0.12	0.14		
v/c Ratio		0.86	0.39	0.40	1.33	
Uniform Delay, d1		60.3	13.0	8.7	74.0	
Progression Factor		1.00	0.83	0.37	1.00	
Incremental Delay, d2		10.0	0.2	0.1	160.4	
Delay (s)		70.4	10.9	3.3	234.4	
Level of Service		E	B	A	F	
Approach Delay (s)	70.4			6.1	234.4	
Approach LOS	E			A	F	

Intersection Summary			
HCM 2000 Control Delay	94.0	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	0.82		
Actuated Cycle Length (s)	174.0	Sum of lost time (s)	40.0
Intersection Capacity Utilization	46.4%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			



Lane Group	EBR	NBL	NBT	SBT
Lane Group Flow (vph)	608	373	634	732
v/c Ratio	0.86	0.37	0.40	1.33
Control Delay	44.0	8.1	2.5	213.0
Queue Delay	36.1	3.6	1.2	1.5
Total Delay	80.1	11.6	3.7	214.6
Queue Length 50th (ft)	187	151	34	~568
Queue Length 95th (ft)	#251	m176	m52	#706
Internal Link Dist (ft)			71	398
Turn Bay Length (ft)				
Base Capacity (vph)	709	1007	1591	551
Starvation Cap Reductn	0	530	686	0
Spillback Cap Reductn	138	0	0	94
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	1.06	0.78	0.70	1.60

Intersection Summary

- ~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
- # 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
- m Volume for 95th percentile queue is metered by upstream signal.

2: Bishop Street & Howard Street

6/3/2016



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations		↗↗	↖	↑	↑↔	
Volume (vph)	0	311	266	775	485	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	10	12	14	13	12
Total Lost time (s)		4.0	6.0	4.0	4.0	
Lane Util. Factor		0.88	1.00	1.00	0.95	
Fr _t		0.85	1.00	1.00	1.00	
Fl _t Protected		1.00	0.95	1.00	1.00	
Satd. Flow (prot)		2576	1736	1968	3649	
Fl _t Permitted		1.00	0.45	1.00	1.00	
Satd. Flow (perm)		2576	827	1968	3649	
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	338	289	842	527	9
RTOR Reduction (vph)	0	0	0	0	1	0
Lane Group Flow (vph)	0	338	289	842	535	0
Heavy Vehicles (%)	0%	3%	4%	3%	2%	0%
Turn Type		custom	custom	NA	NA	
Protected Phases		4 8	1 2 3 4	1 2 3 4	6	
Permitted Phases		4	5 7 8	5 6 8		
Actuated Green, G (s)		43.0	132.0	124.0	24.0	
Effective Green, g (s)		47.0	128.0	128.0	26.0	
Actuated g/C Ratio		0.27	0.74	0.74	0.15	
Clearance Time (s)					6.0	
Vehicle Extension (s)					3.0	
Lane Grp Cap (vph)		695	984	1538	545	
v/s Ratio Prot		0.13	0.12	c0.24	c0.15	
v/s Ratio Perm			c0.09	0.19		
v/c Ratio		0.49	0.29	0.55	0.98	
Uniform Delay, d1		53.4	9.3	10.2	73.8	
Progression Factor		1.00	0.54	0.81	1.00	
Incremental Delay, d2		0.5	0.1	0.2	33.7	
Delay (s)		53.9	5.1	8.4	107.5	
Level of Service		D	A	A	F	
Approach Delay (s)	53.9			7.6	107.5	
Approach LOS	D			A	F	

Intersection Summary			
HCM 2000 Control Delay	42.1	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	174.0	Sum of lost time (s)	40.0
Intersection Capacity Utilization	44.1%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			



Lane Group	EBR	NBL	NBT	SBT
Lane Group Flow (vph)	338	289	842	536
v/c Ratio	0.49	0.28	0.54	0.98
Control Delay	29.3	3.7	6.2	106.8
Queue Delay	0.5	2.6	1.5	38.0
Total Delay	29.8	6.3	7.6	144.8
Queue Length 50th (ft)	92	41	635	325
Queue Length 95th (ft)	121	m71	m190	#454
Internal Link Dist (ft)			71	398
Turn Bay Length (ft)				
Base Capacity (vph)	695	1024	1560	545
Starvation Cap Reductn	0	605	494	0
Spillback Cap Reductn	106	0	0	89
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	0.57	0.69	0.79	1.18

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

2: Bishop Street & Howard Street

6/3/2016



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (vph)	0	620	352	602	700	9
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Width	12	10	12	14	13	12
Total Lost time (s)		4.0	6.0	4.0	4.0	
Lane Util. Factor		0.88	1.00	1.00	0.95	
Frt		0.85	1.00	1.00	1.00	
Flt Protected		1.00	0.95	1.00	1.00	
Satd. Flow (prot)		2627	1787	2007	3687	
Flt Permitted		1.00	0.36	1.00	1.00	
Satd. Flow (perm)		2627	676	2007	3687	
Peak-hour factor, PHF	0.99	0.99	0.92	0.92	0.92	0.92
Adj. Flow (vph)	0	626	383	654	761	10
RTOR Reduction (vph)	0	0	0	0	1	0
Lane Group Flow (vph)	0	626	383	654	770	0
Heavy Vehicles (%)	0%	1%	1%	1%	1%	0%
Turn Type		custom	custom	NA	NA	
Protected Phases		4 8	1 2 3 4	1 2 3 4	6	
Permitted Phases		4	5 7 8	5 6 8		
Actuated Green, G (s)		43.0	132.0	124.0	24.0	
Effective Green, g (s)		47.0	128.0	128.0	26.0	
Actuated g/C Ratio		0.27	0.74	0.74	0.15	
Clearance Time (s)					6.0	
Vehicle Extension (s)					3.0	
Lane Grp Cap (vph)		709	957	1568	550	
v/s Ratio Prot		c0.24	0.17	c0.18	c0.21	
v/s Ratio Perm			c0.13	0.14		
v/c Ratio		0.88	0.40	0.42	1.40	
Uniform Delay, d1		60.9	13.7	8.8	74.0	
Progression Factor		1.00	0.77	0.36	1.00	
Incremental Delay, d2		12.5	0.2	0.1	190.9	
Delay (s)		73.4	10.6	3.3	264.9	
Level of Service		E	B	A	F	
Approach Delay (s)	73.4			6.0	264.9	
Approach LOS	E			A	F	

Intersection Summary			
HCM 2000 Control Delay	105.3	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	174.0	Sum of lost time (s)	40.0
Intersection Capacity Utilization	48.0%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

2: Bishop Street & Howard Street

6/3/2016



Lane Group	EBR	NBL	NBT	SBT
Lane Group Flow (vph)	626	383	654	771
v/c Ratio	0.88	0.38	0.41	1.40
Control Delay	46.7	8.2	2.5	240.4
Queue Delay	48.6	3.5	1.1	1.5
Total Delay	95.2	11.7	3.6	242.0
Queue Length 50th (ft)	194	157	34	~618
Queue Length 95th (ft)	#287	m183	m55	#756
Internal Link Dist (ft)			71	398
Turn Bay Length (ft)				
Base Capacity (vph)	709	997	1591	551
Starvation Cap Reductn	0	509	655	0
Spillback Cap Reductn	143	0	0	94
Storage Cap Reductn	0	0	0	0
Reduced v/c Ratio	1.11	0.78	0.70	1.69

Intersection Summary

- ~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
- # 95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.
- m Volume for 95th percentile queue is metered by upstream signal.

SECTION 5

SUPPORTIVE DOCUMENTATION

Rational Method Surface Area Tabulation
SSA Pipe Flow Calculation Data Sheets
Water Quality Flow Calculation
TSS Removal Calculation
HydroCAD Data Sheets

Mill Creek Residential
266 Waverly Street
Framingham, MA
Nitsch Project #11085
Proposed Rational Areas
6/17/2016

CB#100							
Pavement	6530		Grass	344		Roof	0
Total	6530		Total	344		Total	0
Total Area =	6874.00	sf	0.158	acres			
Weighted C Value =	0.87						

CB#101							
Pavement	8287		Grass	645		Roof	0
Total	8287		Total	645		Total	0
Total Area =	8932.00	sf	0.205	acres			
Weighted C Value =	0.86						

CB#102							
Pavement	6161		Grass	705		Roof	0
Total	6161		Total	705		Total	0
Total Area =	6866.00	sf	0.158	acres			
Weighted C Value =	0.84						

RD#1							
Pavement	0		Grass	0		Roof	41627.85
Total	0		Total	0		Total	41627.85
Total Area =	41627.85	sf	0.956	acres			
Weighted C Value =	0.90						

Mill Creek Residential
266 Waverly Street
Framingham, MA
Nitsch Project #11085
Proposed Rational Areas
6/17/2016

RD#2							
Pavement	0		Grass	0		Roof	34059.15
Total	0		Total	0		Total	34059.15
Total Area =	34059.15	sf	0.782	acres			
Weighted C Value =	0.90						

Project Description

File Name 11085 SSA (2016-06-15).SPF

Project Options

Flow Units CFS
Elevation Type Elevation
Hydrology Method Rational
Time of Concentration (TOC) Method User-Defined
Link Routing Method Hydrodynamic
Enable Overflow Ponding at Nodes YES
Skip Steady State Analysis Time Periods NO

Analysis Options

Start Analysis On Jun 17, 2016 00:00:00
End Analysis On Jun 17, 2016 01:00:00
Start Reporting On Jun 17, 2016 00:00:00
Antecedent Dry Days 0 days
Runoff (Dry Weather) Time Step 0 01:00:00 days hh:mm:ss
Runoff (Wet Weather) Time Step 0 00:05:00 days hh:mm:ss
Reporting Time Step 0 00:05:00 days hh:mm:ss
Routing Time Step 30 seconds

Number of Elements

	Qty
Rain Gages	1
Subbasins.....	5
Nodes.....	10
<i>Junctions</i>	7
<i>Outfalls</i>	3
<i>Flow Diversions</i>	0
<i>Inlets</i>	0
<i>Storage Nodes</i>	0
Links.....	7
<i>Channels</i>	0
<i>Pipes</i>	7
<i>Pumps</i>	0
<i>Orifices</i>	0
<i>Weirs</i>	0
<i>Outlets</i>	0
Pollutants	0
Land Uses	0

Rainfall Details

Return Period..... 25 year(s)

Subbasin Summary

SN	Subbasin ID	Area (ac)	Weighted Runoff Coefficient	Total Rainfall (in)	Total Runoff (in)	Total Runoff Volume (ac-in)	Peak Runoff (cfs)	Time of Concentration (days hh:mm:ss)
1	DA-CB#100	0.16	0.87	0.64	0.56	0.09	0.88	0 00:06:00
2	DA-CB#101	0.21	0.86	0.64	0.55	0.11	1.13	0 00:06:00
3	DA-CB#102	0.16	0.84	0.64	0.54	0.08	0.85	0 00:06:00
4	DA-RD#1	0.96	0.90	0.64	0.58	0.55	5.50	0 00:06:00
5	Sub-05	0.78	0.90	0.64	0.58	0.45	4.50	0 00:06:00

Junction Input

SN	Element ID	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)
1	CB#100	154.00	156.50
2	CB#101	153.40	156.40
3	CB#102	154.00	156.40
4	DMH#200	153.00	156.60
5	RD#1	154.50	157.20
6	RD#2	155.50	160.50
7	WQS#201	152.80	156.80

Link Summary

From (Inlet) Node	To (Outlet) Node	Pipe Length (ft)	Inlet Invert Elevation (ft)	Outlet Invert Elevation (ft)	Pipe Slope (%)	Pipe Diameter (in)	Manning's Roughness	Peak Flow Q (cfs)	Design Flow Capacity Q (cfs)	Q/Qf Ratio	Peak Flow Velocity V (ft/sec)	Peak Flow Depth (ft)	Peak Flow Depth/ Total Depth Ratio
RD#1	DMH#202	42.60	154.50	153.60	2.11	12	0.012	5.50	5.61	0.98	7.38	0.90	0.90
RD#2	EX.CB	106.10	155.50	153.60	1.79	12	0.012	4.43	5.17	0.86	6.74	0.79	0.79
WQS#201	Out-1Pipe - (103)	24.30	152.80	152.60	0.82	12	0.012	2.65	3.50	0.76	4.14	0.76	0.76
CB#102	DMH#200	135.09	154.00	153.30	0.52	8	0.012	0.82	0.94	0.87	2.67	0.58	0.87
CB#100	DMH#200	119.33	154.00	153.30	0.59	8	0.012	0.85	1.00	0.85	2.80	0.58	0.87
CB#101	DMH#200	8.97	153.40	153.30	1.12	8	0.012	1.12	1.38	0.81	3.43	0.67	1.00
DMH#200	WQS#201	11.44	153.00	152.90	0.87	12	0.012	2.65	3.61	0.73	3.66	0.88	0.88

**Form S4-C: Standard 4 – Water Quality
 TSS Worksheet
 Modera Framingham**

Project Name: Modera Framingham	Nitsch Project #11085
Location: Framingham, MA	Checked by: MB
Prepared by: JEG	Sheet No. 1 of 1
Date: 6/17/16	

DISCHARGE TO MUNICIPAL STORM DRAINAGE SYSTEM

INSTRUCTIONS:

Version 1, Automated: Mar. 4, 2008

1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Location:

	B BMP ¹	C TSS Removal Rate ¹	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
TSS Removal Calculation Worksheet	Deep Sump and Hooded Catch Basin	0.25	1.00	0.25	0.75
	Proprietary Treatment Practice	0.80	0.75	0.60	0.15
		0.00	0.15	0.00	0.15
		0.00	0.15	0.00	0.15
		0.00	0.15	0.00	0.15

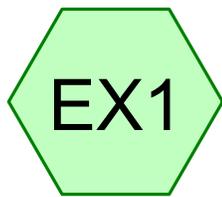
Total TSS Removal =

Separate Form Needs to
 be Completed for Each
 Outlet or BMP Train

Project:
 Prepared By:
 Date:

*Equals remaining load from previous BMP (E)
 which enters the BMP

TSS WORKSHEET from Volume 2, Chapter 3, Table 4, TSS Removal



To Blandin Avenue



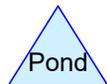
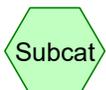
Blandin Avenue



To Waverly Street



Waverly Street



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Page 2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.609	61	>75% Grass cover, Good, HSG B (EX1, EX2)
1.492	98	Paved parking, HSG B (EX1)
0.112	98	Paved roads w/curbs & sewers, HSG B (EX2)
0.791	98	Roofs, HSG B (EX1)
3.004	90	TOTAL AREA

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Page 3

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
3.004	HSG B	EX1, EX2
0.000	HSG C	
0.000	HSG D	
0.000	Other	
3.004		TOTAL AREA

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Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.609	0.000	0.000	0.000	0.609	>75% Grass cover, Good	EX 1, EX 2
0.000	1.492	0.000	0.000	0.000	1.492	Paved parking	EX 1
0.000	0.112	0.000	0.000	0.000	0.112	Paved roads w/curbs & sewers	EX 2
0.000	0.791	0.000	0.000	0.000	0.791	Roofs	EX 1
0.000	3.004	0.000	0.000	0.000	3.004	TOTAL AREA	

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Modera Framingham - Existing Conditions

Type III 24-hr 2-YEAR Rainfall=3.10"

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Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentEX1: To Blandin Avenue Runoff Area=112,390 sf 88.48% Impervious Runoff Depth=2.45"
Tc=6.0 min CN=94 Runoff=6.94 cfs 0.526 af

SubcatchmentEX2: To Waverly Street Runoff Area=18,475 sf 26.35% Impervious Runoff Depth=0.82"
Tc=6.0 min CN=71 Runoff=0.36 cfs 0.029 af

Link DP1: Blandin Avenue Inflow=6.94 cfs 0.526 af
Primary=6.94 cfs 0.526 af

Link DP2: Waverly Street Inflow=0.36 cfs 0.029 af
Primary=0.36 cfs 0.029 af

Total Runoff Area = 3.004 ac Runoff Volume = 0.555 af Average Runoff Depth = 2.22"
20.29% Pervious = 0.609 ac 79.71% Impervious = 2.395 ac

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Modera Framingham - Existing Conditions

Type III 24-hr 2-YEAR Rainfall=3.10"

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Summary for Subcatchment EX1: To Blandin Avenue

Runoff = 6.94 cfs @ 12.09 hrs, Volume= 0.526 af, Depth= 2.45"

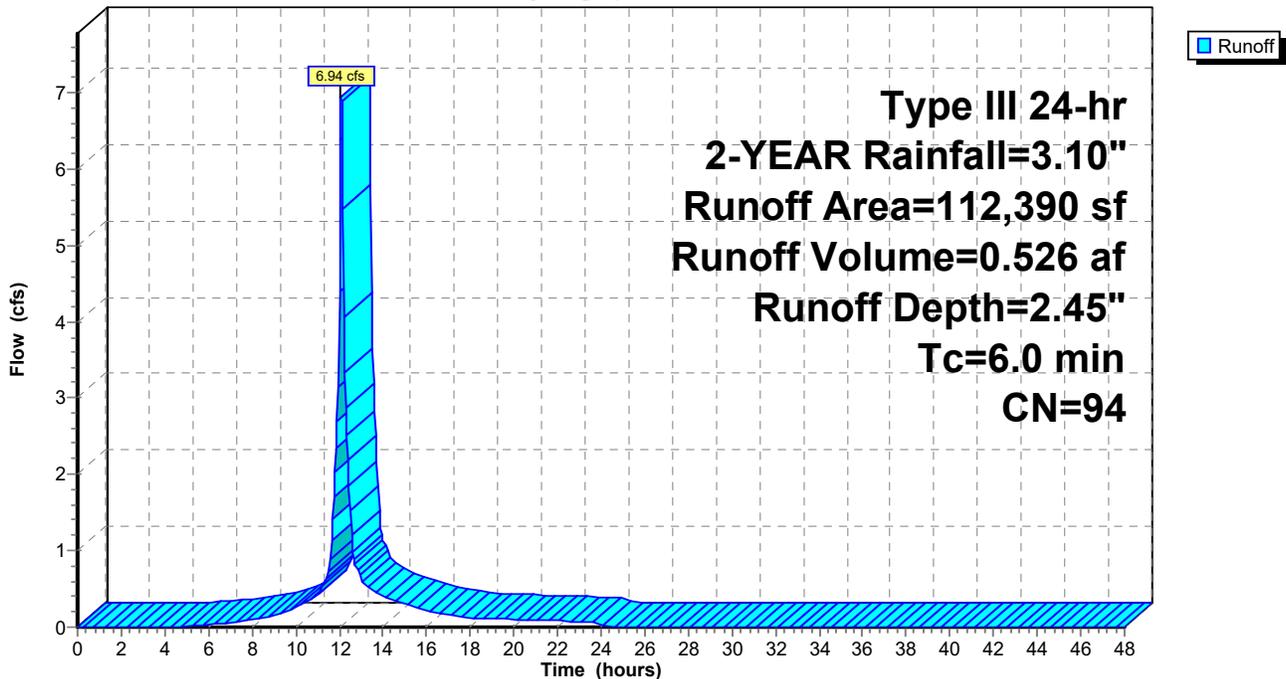
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YEAR Rainfall=3.10"

Area (sf)	CN	Description
64,988	98	Paved parking, HSG B
12,942	61	>75% Grass cover, Good, HSG B
34,460	98	Roofs, HSG B
112,390	94	Weighted Average
12,942		11.52% Pervious Area
99,448		88.48% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

Subcatchment EX1: To Blandin Avenue

Hydrograph



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Modera Framingham - Existing Conditions

Type III 24-hr 2-YEAR Rainfall=3.10"

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Summary for Subcatchment EX2: To Waverly Street

Runoff = 0.36 cfs @ 12.10 hrs, Volume= 0.029 af, Depth= 0.82"

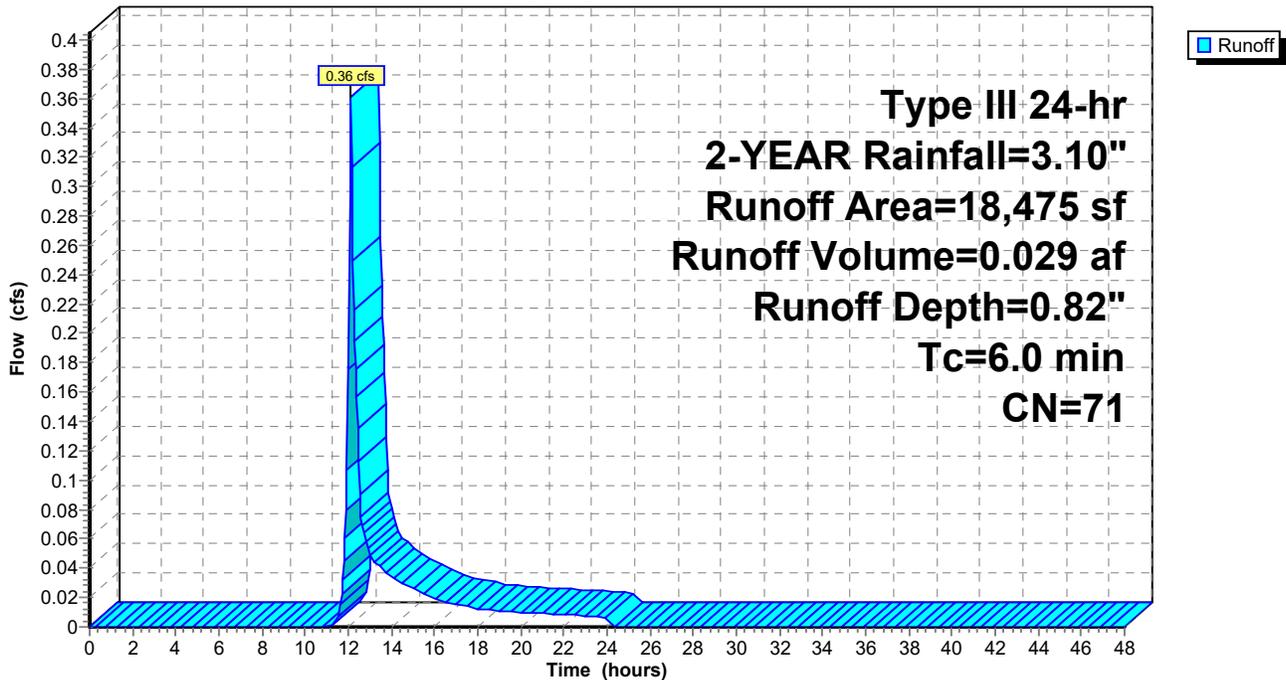
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YEAR Rainfall=3.10"

Area (sf)	CN	Description
4,869	98	Paved roads w/curbs & sewers, HSG B
13,606	61	>75% Grass cover, Good, HSG B
18,475	71	Weighted Average
13,606		73.65% Pervious Area
4,869		26.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

Subcatchment EX2: To Waverly Street

Hydrograph



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Modera Framingham - Existing Conditions

Type III 24-hr 2-YEAR Rainfall=3.10"

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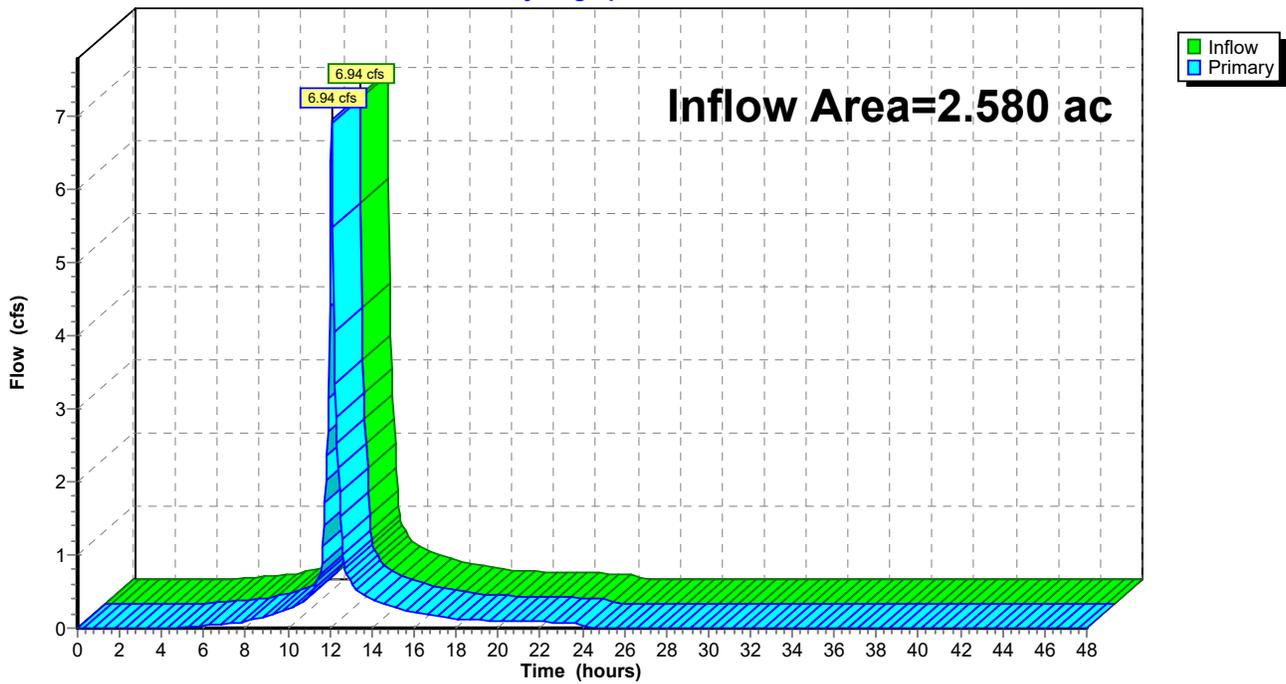
Summary for Link DP1: Blandin Avenue

Inflow Area = 2.580 ac, 88.48% Impervious, Inflow Depth = 2.45" for 2-YEAR event
Inflow = 6.94 cfs @ 12.09 hrs, Volume= 0.526 af
Primary = 6.94 cfs @ 12.09 hrs, Volume= 0.526 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Link DP1: Blandin Avenue

Hydrograph



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Modera Framingham - Existing Conditions

Type III 24-hr 2-YEAR Rainfall=3.10"

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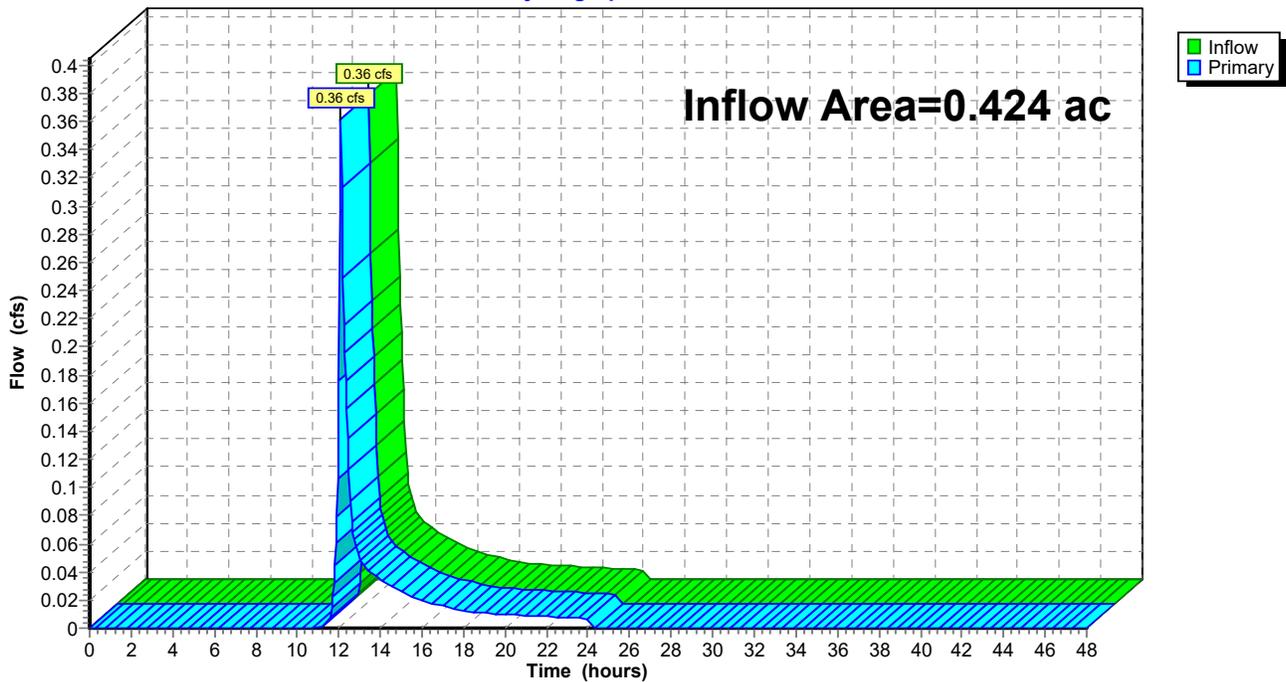
Summary for Link DP2: Waverly Street

Inflow Area = 0.424 ac, 26.35% Impervious, Inflow Depth = 0.82" for 2-YEAR event
Inflow = 0.36 cfs @ 12.10 hrs, Volume= 0.029 af
Primary = 0.36 cfs @ 12.10 hrs, Volume= 0.029 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Link DP2: Waverly Street

Hydrograph



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Modera Framingham - Existing Conditions

Type III 24-hr 10-YEAR Rainfall=4.60"

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Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentEX1: To Blandin Avenue Runoff Area=112,390 sf 88.48% Impervious Runoff Depth=3.91"
Tc=6.0 min CN=94 Runoff=10.81 cfs 0.841 af

SubcatchmentEX2: To Waverly Street Runoff Area=18,475 sf 26.35% Impervious Runoff Depth=1.82"
Tc=6.0 min CN=71 Runoff=0.87 cfs 0.064 af

Link DP1: Blandin Avenue Inflow=10.81 cfs 0.841 af
Primary=10.81 cfs 0.841 af

Link DP2: Waverly Street Inflow=0.87 cfs 0.064 af
Primary=0.87 cfs 0.064 af

Total Runoff Area = 3.004 ac Runoff Volume = 0.906 af Average Runoff Depth = 3.62"
20.29% Pervious = 0.609 ac 79.71% Impervious = 2.395 ac

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Type III 24-hr 10-YEAR Rainfall=4.60"

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Summary for Subcatchment EX1: To Blandin Avenue

Runoff = 10.81 cfs @ 12.09 hrs, Volume= 0.841 af, Depth= 3.91"

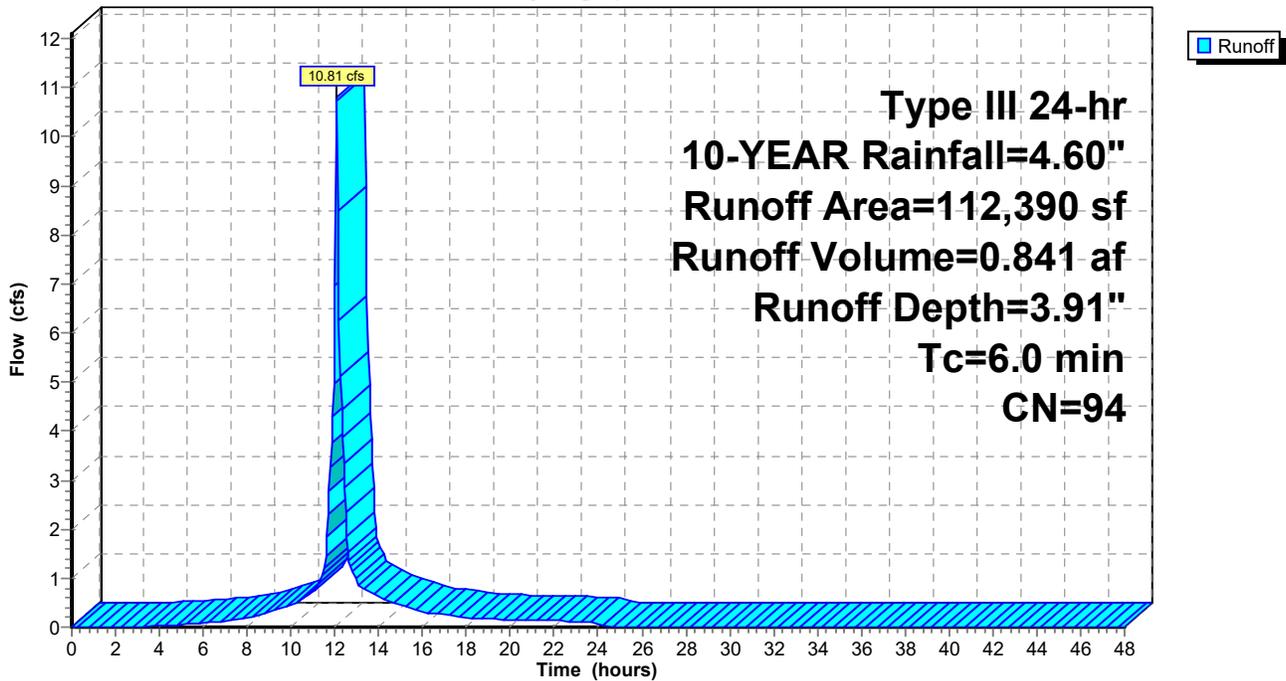
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YEAR Rainfall=4.60"

Area (sf)	CN	Description
64,988	98	Paved parking, HSG B
12,942	61	>75% Grass cover, Good, HSG B
34,460	98	Roofs, HSG B
112,390	94	Weighted Average
12,942		11.52% Pervious Area
99,448		88.48% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

Subcatchment EX1: To Blandin Avenue

Hydrograph



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Type III 24-hr 10-YEAR Rainfall=4.60"

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Summary for Subcatchment EX2: To Waverly Street

Runoff = 0.87 cfs @ 12.10 hrs, Volume= 0.064 af, Depth= 1.82"

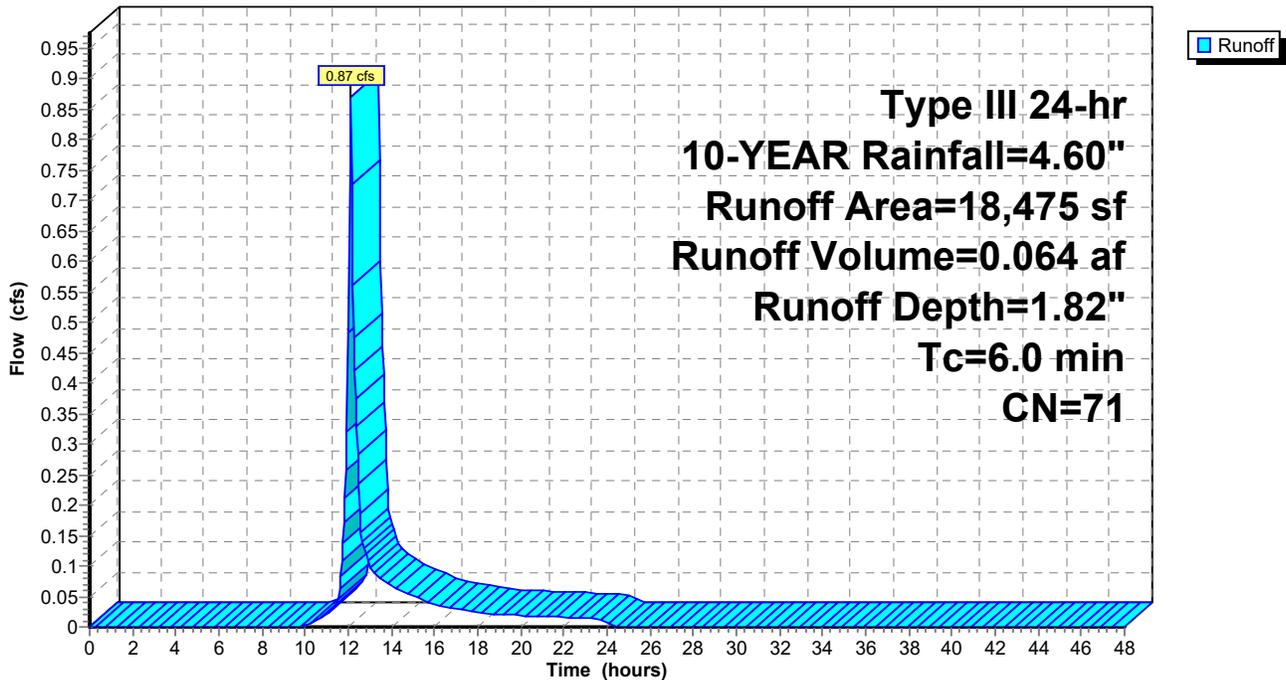
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YEAR Rainfall=4.60"

Area (sf)	CN	Description
4,869	98	Paved roads w/curbs & sewers, HSG B
13,606	61	>75% Grass cover, Good, HSG B
18,475	71	Weighted Average
13,606		73.65% Pervious Area
4,869		26.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

Subcatchment EX2: To Waverly Street

Hydrograph



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Type III 24-hr 10-YEAR Rainfall=4.60"

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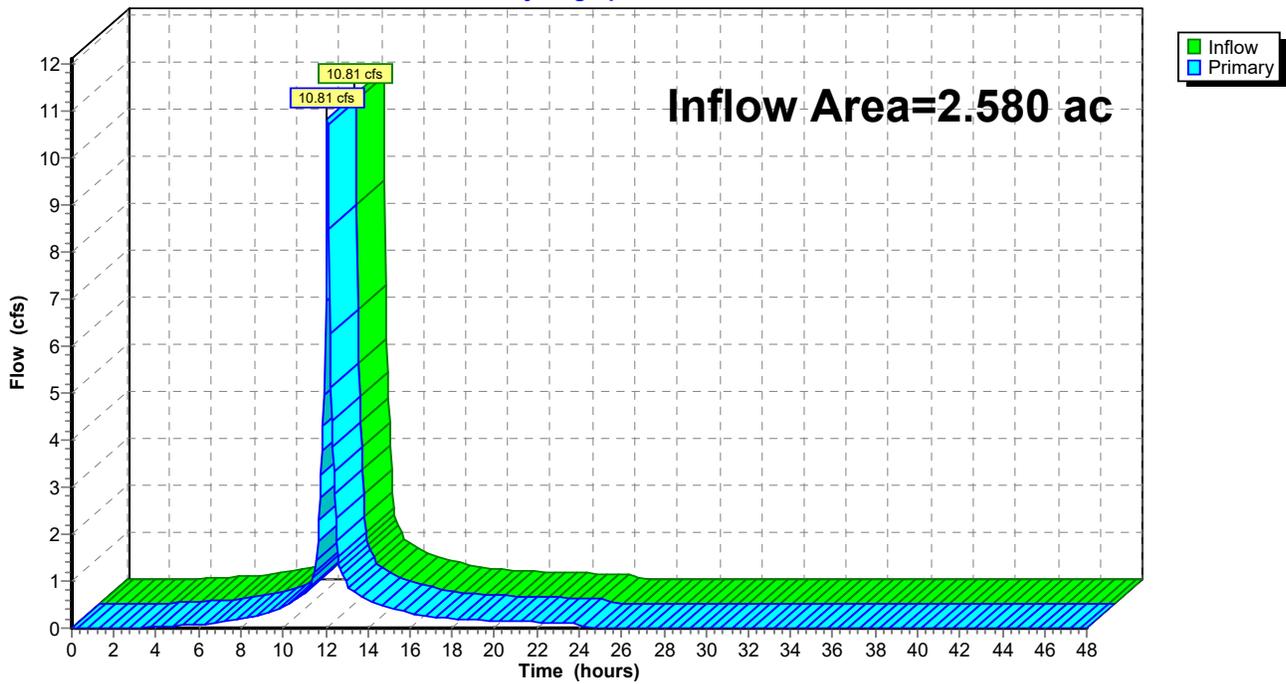
Summary for Link DP1: Blandin Avenue

Inflow Area = 2.580 ac, 88.48% Impervious, Inflow Depth = 3.91" for 10-YEAR event
Inflow = 10.81 cfs @ 12.09 hrs, Volume= 0.841 af
Primary = 10.81 cfs @ 12.09 hrs, Volume= 0.841 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Link DP1: Blandin Avenue

Hydrograph



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Type III 24-hr 10-YEAR Rainfall=4.60"

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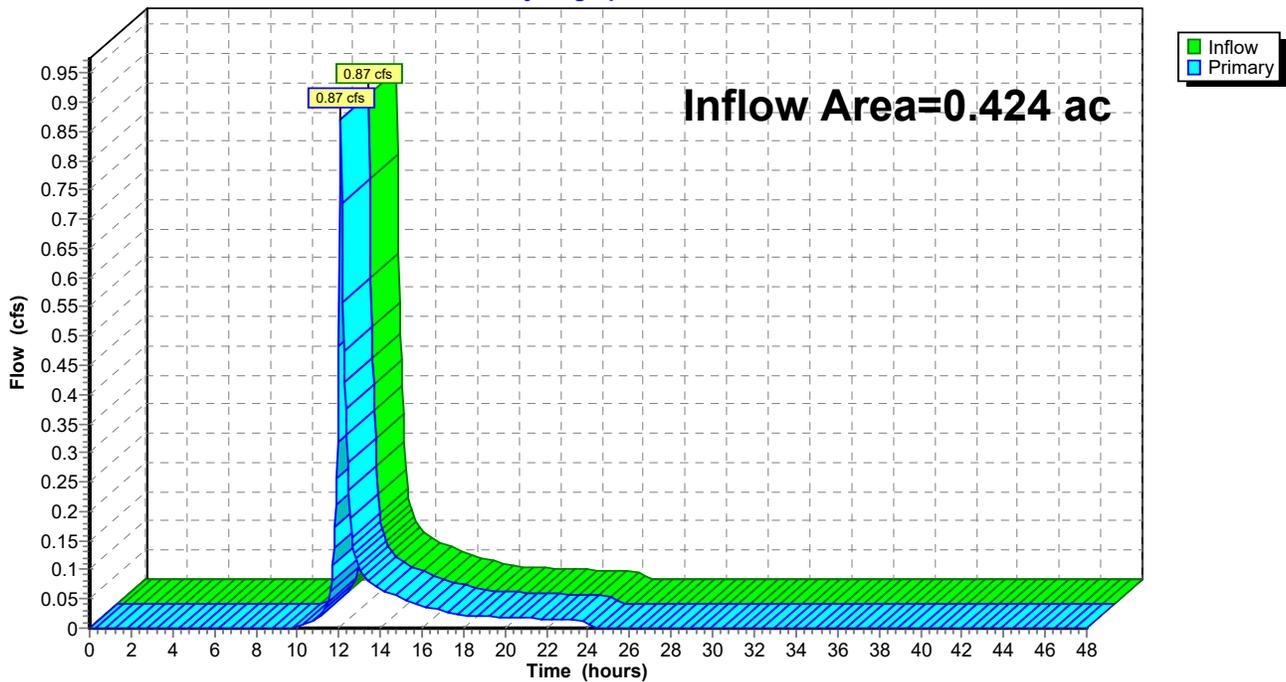
Summary for Link DP2: Waverly Street

Inflow Area = 0.424 ac, 26.35% Impervious, Inflow Depth = 1.82" for 10-YEAR event
Inflow = 0.87 cfs @ 12.10 hrs, Volume= 0.064 af
Primary = 0.87 cfs @ 12.10 hrs, Volume= 0.064 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Link DP2: Waverly Street

Hydrograph



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Type III 24-hr 25-YEAR Rainfall=5.40"

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Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentEX1: To Blandin Avenue Runoff Area=112,390 sf 88.48% Impervious Runoff Depth=4.70"
Tc=6.0 min CN=94 Runoff=12.85 cfs 1.011 af

SubcatchmentEX2: To Waverly Street Runoff Area=18,475 sf 26.35% Impervious Runoff Depth=2.42"
Tc=6.0 min CN=71 Runoff=1.17 cfs 0.086 af

Link DP1: Blandin Avenue Inflow=12.85 cfs 1.011 af
Primary=12.85 cfs 1.011 af

Link DP2: Waverly Street Inflow=1.17 cfs 0.086 af
Primary=1.17 cfs 0.086 af

Total Runoff Area = 3.004 ac Runoff Volume = 1.097 af Average Runoff Depth = 4.38"
20.29% Pervious = 0.609 ac 79.71% Impervious = 2.395 ac

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Type III 24-hr 25-YEAR Rainfall=5.40"

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Summary for Subcatchment EX1: To Blandin Avenue

Runoff = 12.85 cfs @ 12.09 hrs, Volume= 1.011 af, Depth= 4.70"

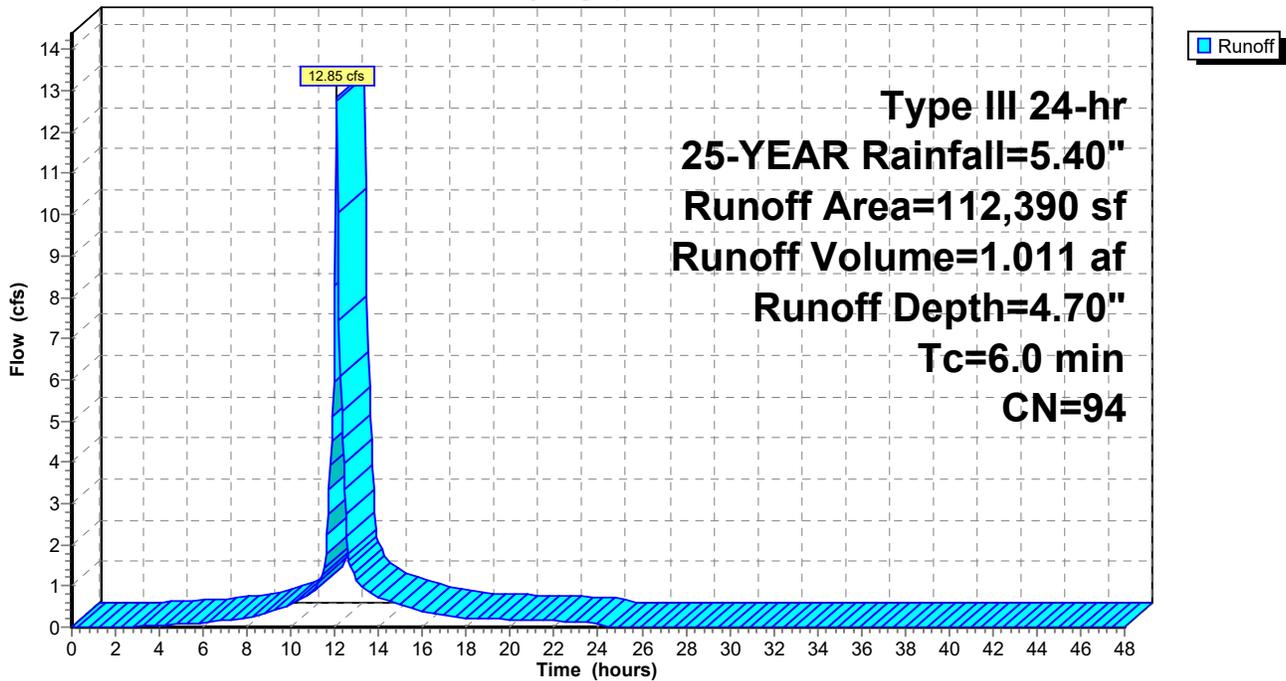
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YEAR Rainfall=5.40"

Area (sf)	CN	Description
64,988	98	Paved parking, HSG B
12,942	61	>75% Grass cover, Good, HSG B
34,460	98	Roofs, HSG B
112,390	94	Weighted Average
12,942		11.52% Pervious Area
99,448		88.48% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

Subcatchment EX1: To Blandin Avenue

Hydrograph



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Type III 24-hr 25-YEAR Rainfall=5.40"

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Summary for Subcatchment EX2: To Waverly Street

Runoff = 1.17 cfs @ 12.10 hrs, Volume= 0.086 af, Depth= 2.42"

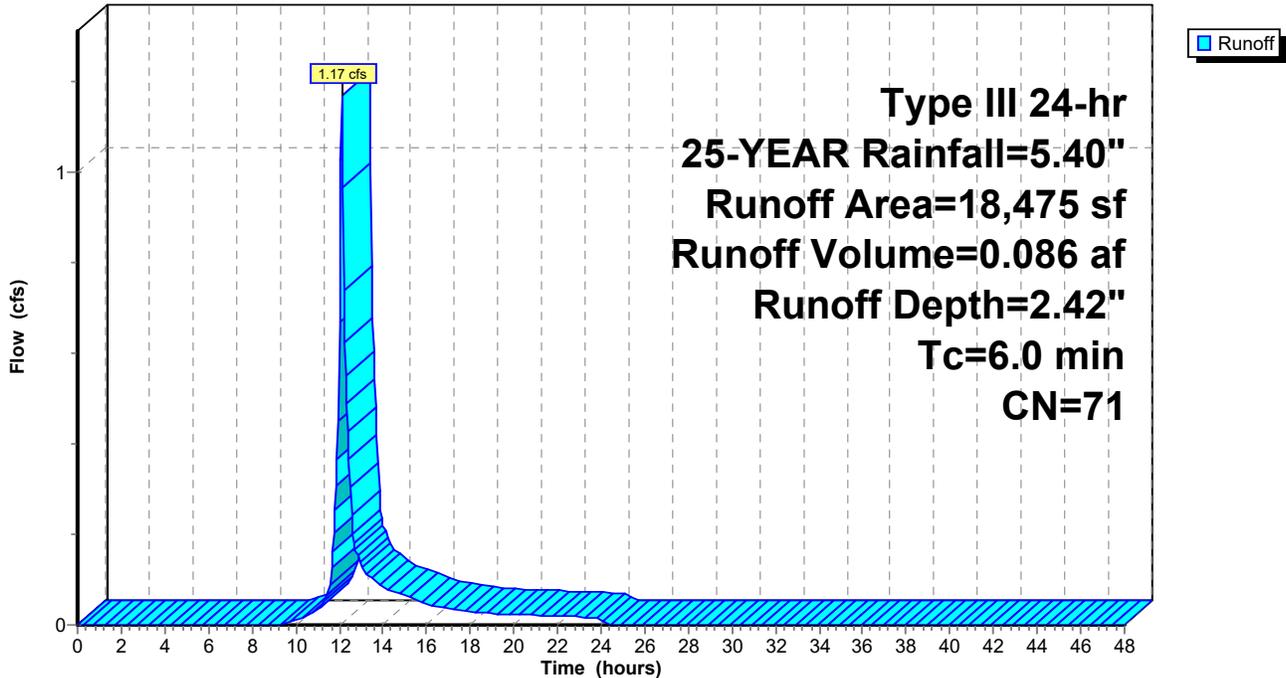
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YEAR Rainfall=5.40"

Area (sf)	CN	Description
4,869	98	Paved roads w/curbs & sewers, HSG B
13,606	61	>75% Grass cover, Good, HSG B
18,475	71	Weighted Average
13,606		73.65% Pervious Area
4,869		26.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

Subcatchment EX2: To Waverly Street

Hydrograph



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Type III 24-hr 25-YEAR Rainfall=5.40"

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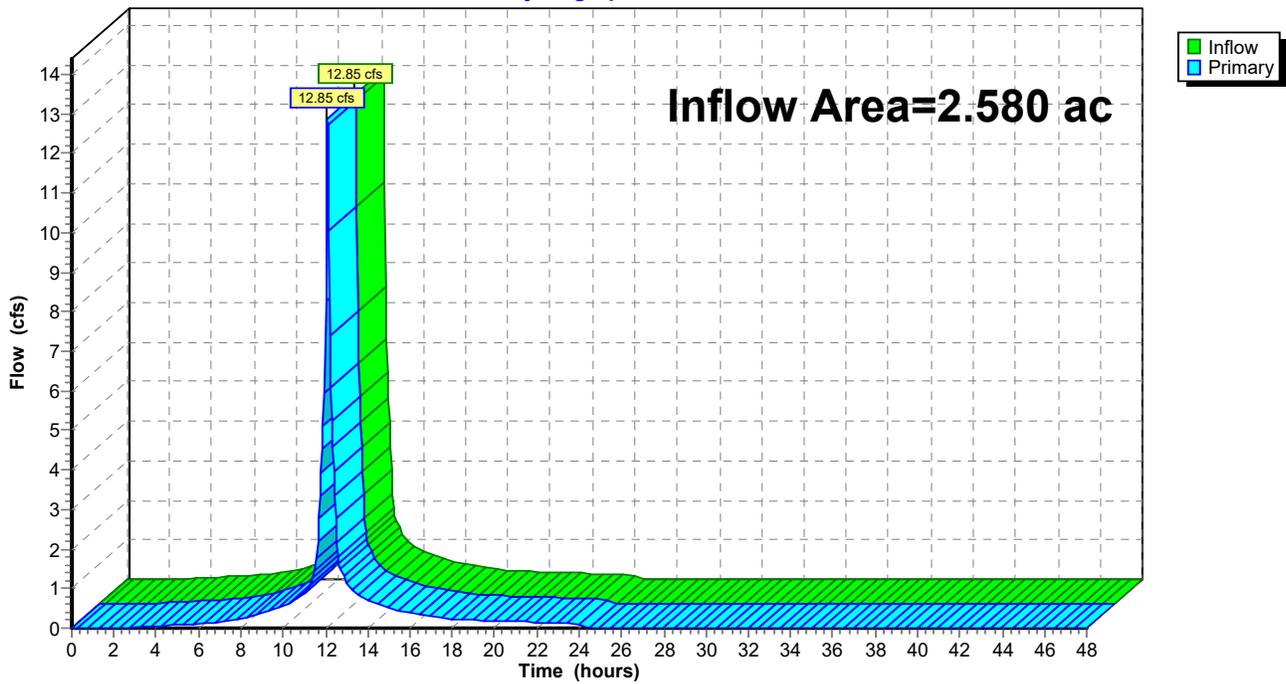
Summary for Link DP1: Blandin Avenue

Inflow Area = 2.580 ac, 88.48% Impervious, Inflow Depth = 4.70" for 25-YEAR event
Inflow = 12.85 cfs @ 12.09 hrs, Volume= 1.011 af
Primary = 12.85 cfs @ 12.09 hrs, Volume= 1.011 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Link DP1: Blandin Avenue

Hydrograph



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Type III 24-hr 25-YEAR Rainfall=5.40"

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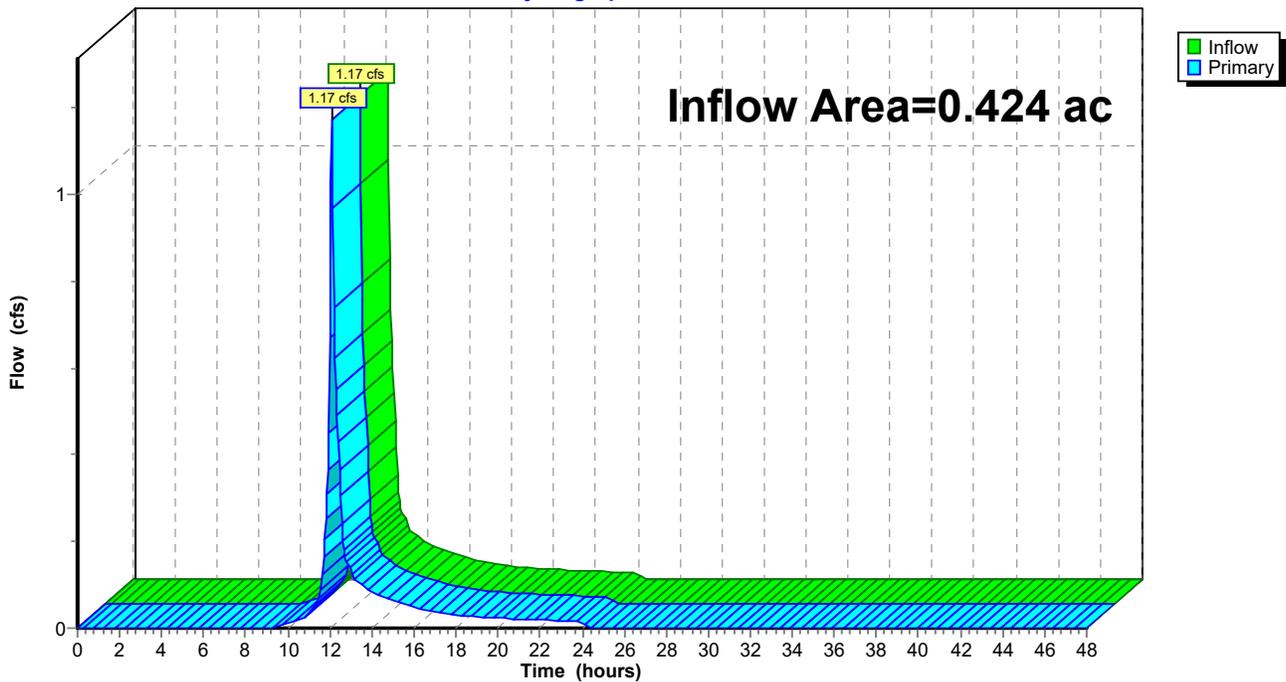
Summary for Link DP2: Waverly Street

Inflow Area = 0.424 ac, 26.35% Impervious, Inflow Depth = 2.42" for 25-YEAR event
Inflow = 1.17 cfs @ 12.10 hrs, Volume= 0.086 af
Primary = 1.17 cfs @ 12.10 hrs, Volume= 0.086 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Link DP2: Waverly Street

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Type III 24-hr 100-YEAR Rainfall=6.60"

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Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentEX1: To Blandin Avenue Runoff Area=112,390 sf 88.48% Impervious Runoff Depth=5.89"
Tc=6.0 min CN=94 Runoff=15.90 cfs 1.267 af

SubcatchmentEX2: To Waverly Street Runoff Area=18,475 sf 26.35% Impervious Runoff Depth=3.39"
Tc=6.0 min CN=71 Runoff=1.65 cfs 0.120 af

Link DP1: Blandin Avenue Inflow=15.90 cfs 1.267 af
Primary=15.90 cfs 1.267 af

Link DP2: Waverly Street Inflow=1.65 cfs 0.120 af
Primary=1.65 cfs 0.120 af

Total Runoff Area = 3.004 ac Runoff Volume = 1.386 af Average Runoff Depth = 5.54"
20.29% Pervious = 0.609 ac 79.71% Impervious = 2.395 ac

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Type III 24-hr 100-YEAR Rainfall=6.60"

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Summary for Subcatchment EX1: To Blandin Avenue

Runoff = 15.90 cfs @ 12.09 hrs, Volume= 1.267 af, Depth= 5.89"

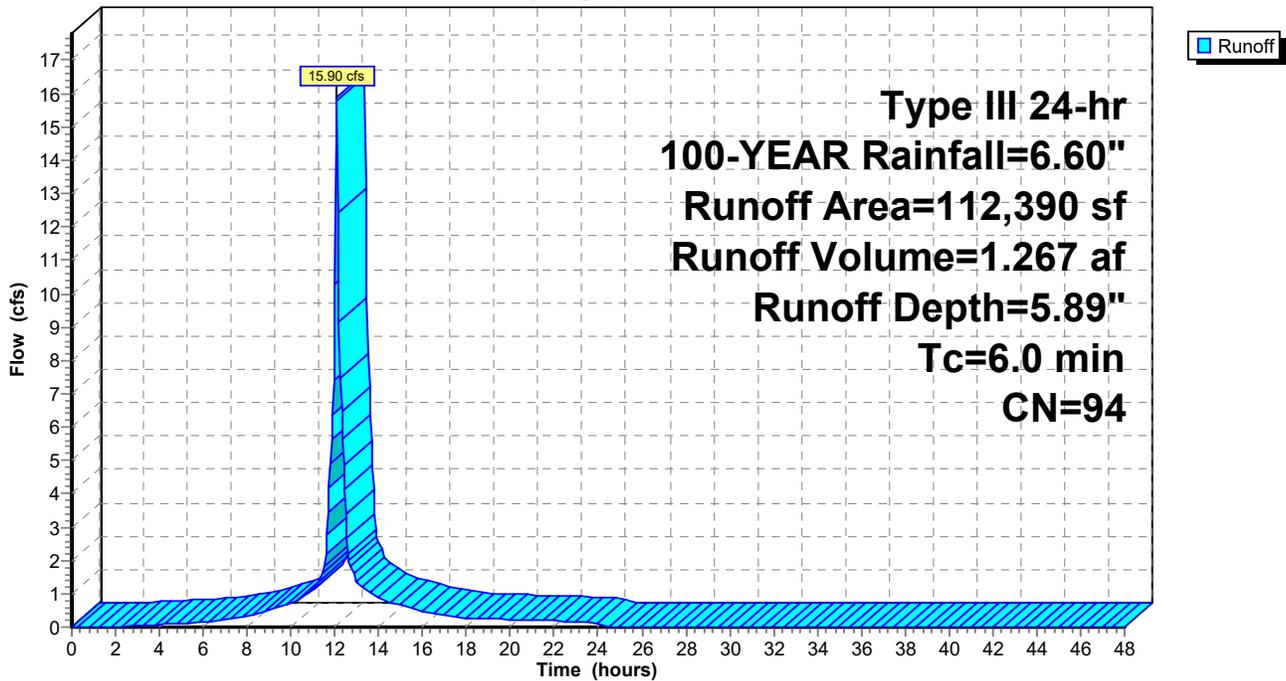
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YEAR Rainfall=6.60"

Area (sf)	CN	Description
64,988	98	Paved parking, HSG B
12,942	61	>75% Grass cover, Good, HSG B
34,460	98	Roofs, HSG B
112,390	94	Weighted Average
12,942		11.52% Pervious Area
99,448		88.48% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

Subcatchment EX1: To Blandin Avenue

Hydrograph



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Type III 24-hr 100-YEAR Rainfall=6.60"

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Summary for Subcatchment EX2: To Waverly Street

Runoff = 1.65 cfs @ 12.09 hrs, Volume= 0.120 af, Depth= 3.39"

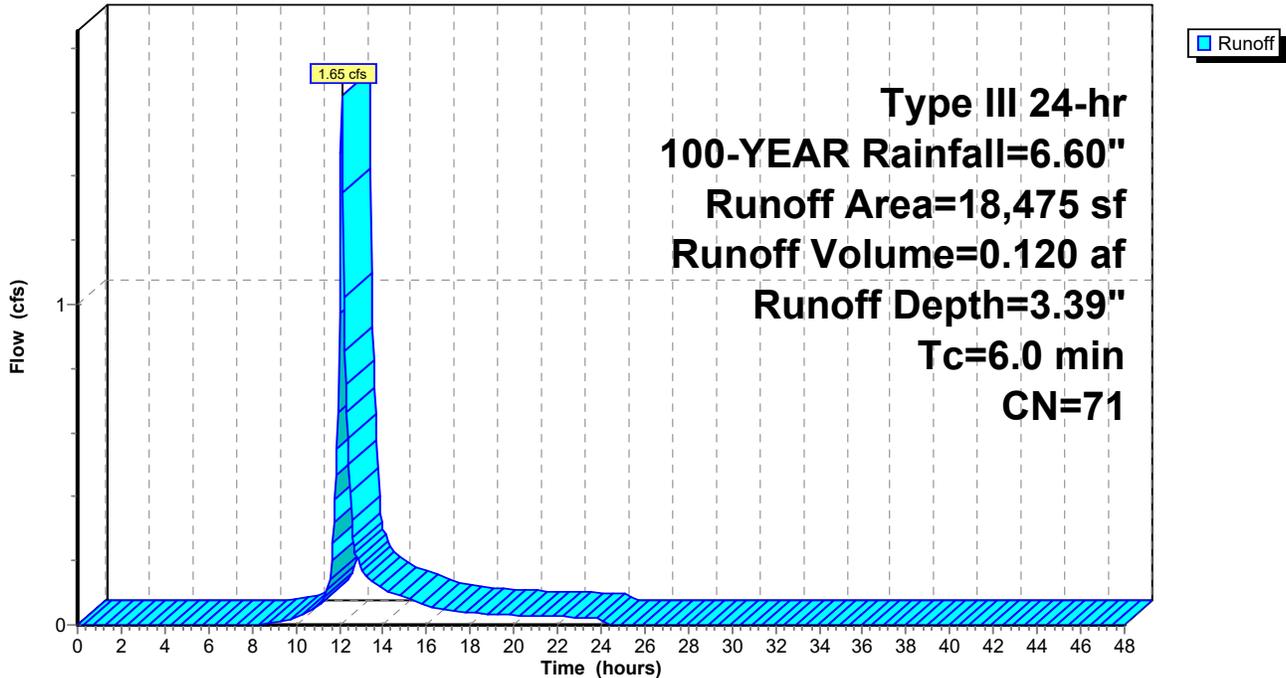
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YEAR Rainfall=6.60"

Area (sf)	CN	Description
4,869	98	Paved roads w/curbs & sewers, HSG B
13,606	61	>75% Grass cover, Good, HSG B
18,475	71	Weighted Average
13,606		73.65% Pervious Area
4,869		26.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

Subcatchment EX2: To Waverly Street

Hydrograph



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Type III 24-hr 100-YEAR Rainfall=6.60"

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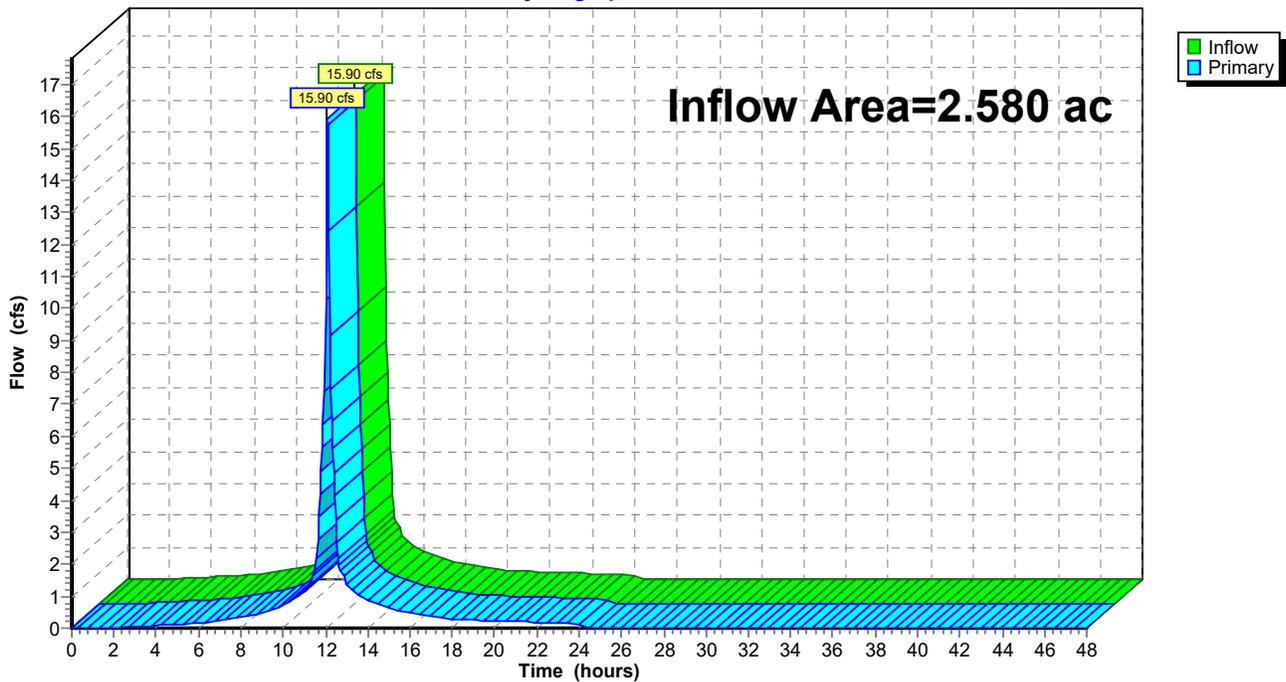
Summary for Link DP1: Blandin Avenue

Inflow Area = 2.580 ac, 88.48% Impervious, Inflow Depth = 5.89" for 100-YEAR event
Inflow = 15.90 cfs @ 12.09 hrs, Volume= 1.267 af
Primary = 15.90 cfs @ 12.09 hrs, Volume= 1.267 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Link DP1: Blandin Avenue

Hydrograph



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Type III 24-hr 100-YEAR Rainfall=6.60"

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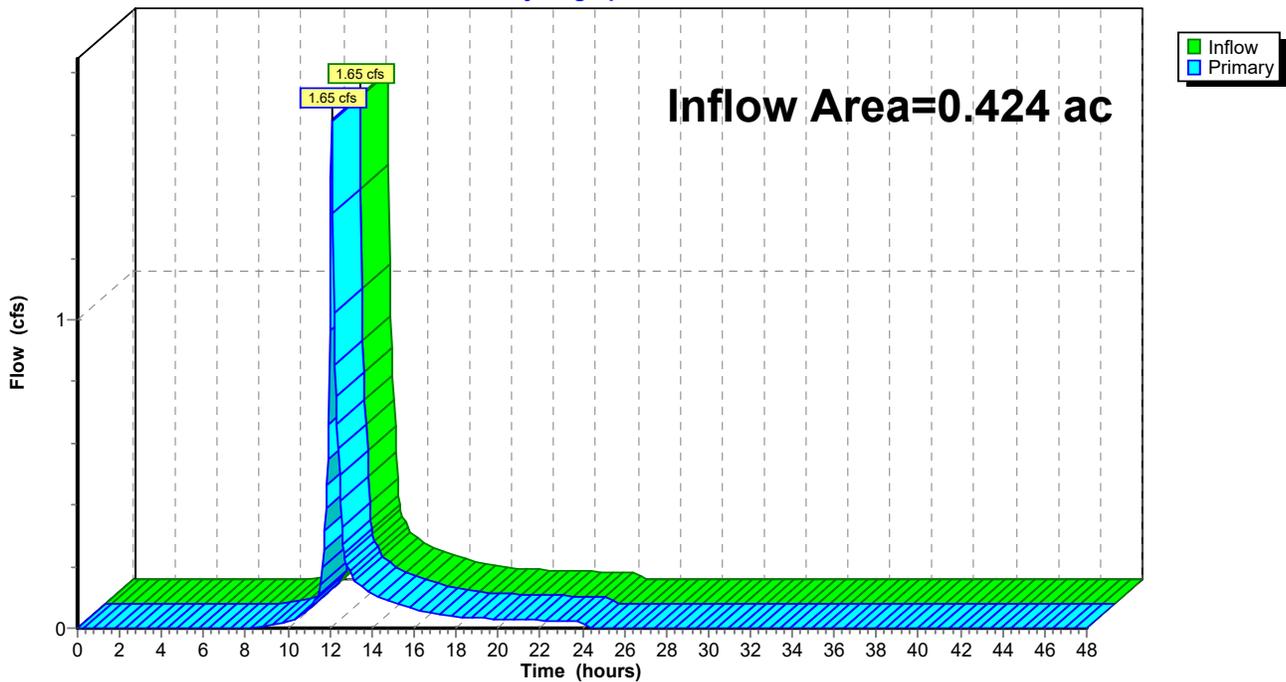
Summary for Link DP2: Waverly Street

Inflow Area = 0.424 ac, 26.35% Impervious, Inflow Depth = 3.39" for 100-YEAR event
Inflow = 1.65 cfs @ 12.09 hrs, Volume= 0.120 af
Primary = 1.65 cfs @ 12.09 hrs, Volume= 0.120 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Link DP2: Waverly Street

Hydrograph





To Blandin Avenue



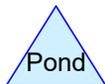
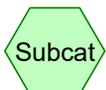
Blandin Avenue



To Waverly Street



Waverly Street



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Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.675	61	>75% Grass cover, Good, HSG B (PR1, PR2)
0.572	98	Paved parking, HSG B (PR1)
0.019	98	Paved roads w/curbs & sewers, HSG B (PR2)
1.738	98	Roofs, HSG B (PR1)
3.004	90	TOTAL AREA

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Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
3.004	HSG B	PR1, PR2
0.000	HSG C	
0.000	HSG D	
0.000	Other	
3.004		TOTAL AREA

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Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.675	0.000	0.000	0.000	0.675	>75% Grass cover, Good	PR 1, PR 2
0.000	0.572	0.000	0.000	0.000	0.572	Paved parking	PR 1
0.000	0.019	0.000	0.000	0.000	0.019	Paved roads w/curbs & sewers	PR 2
0.000	1.738	0.000	0.000	0.000	1.738	Roofs	PR 1
0.000	3.004	0.000	0.000	0.000	3.004	TOTAL AREA	

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Type III 24-hr 2-YEAR Rainfall=3.10"

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Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentPR1: To Blandin Avenue Runoff Area=122,800 sf 81.94% Impervious Runoff Depth=2.16"
Tc=6.0 min CN=91 Runoff=6.90 cfs 0.509 af

SubcatchmentPR2: To Waverly Street Runoff Area=8,065 sf 10.22% Impervious Runoff Depth=0.55"
Tc=6.0 min CN=65 Runoff=0.09 cfs 0.009 af

Link DP1: Blandin Avenue Inflow=6.90 cfs 0.509 af
Primary=6.90 cfs 0.509 af

Link DP2: Waverly Street Inflow=0.09 cfs 0.009 af
Primary=0.09 cfs 0.009 af

Total Runoff Area = 3.004 ac Runoff Volume = 0.517 af Average Runoff Depth = 2.07"
22.48% Pervious = 0.675 ac 77.52% Impervious = 2.329 ac

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Type III 24-hr 2-YEAR Rainfall=3.10"

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Summary for Subcatchment PR1: To Blandin Avenue

Runoff = 6.90 cfs @ 12.09 hrs, Volume= 0.509 af, Depth= 2.16"

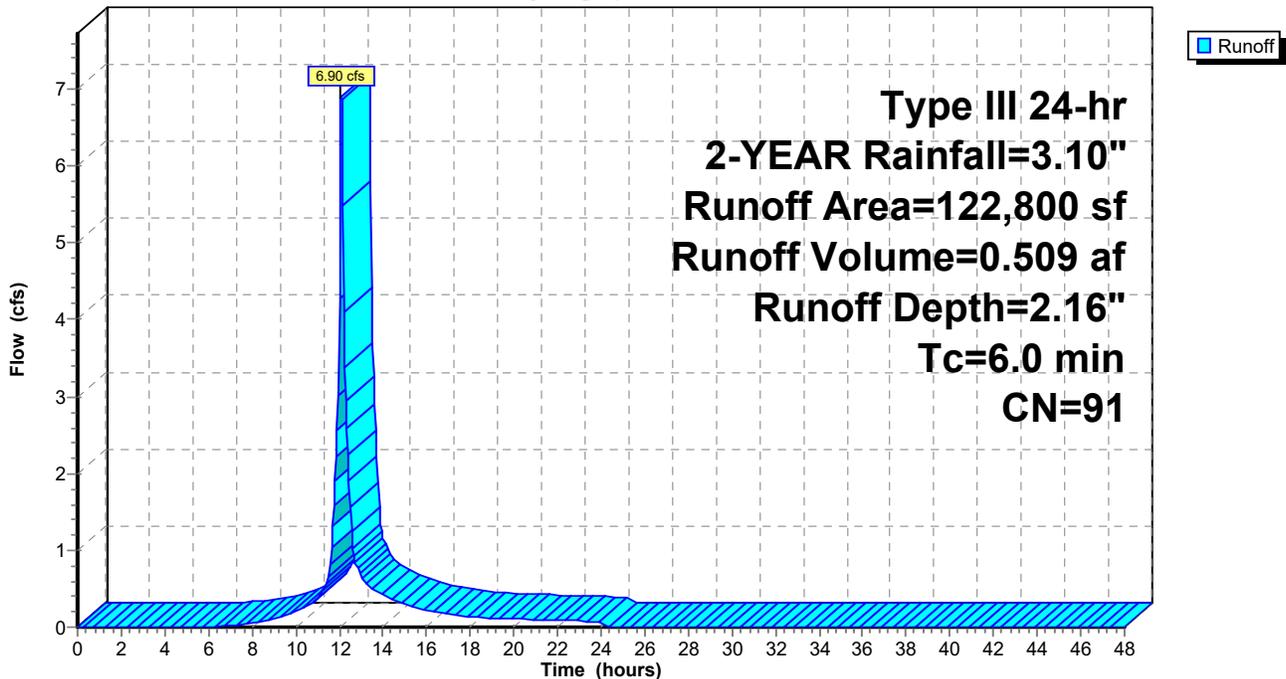
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YEAR Rainfall=3.10"

Area (sf)	CN	Description
24,933	98	Paved parking, HSG B
22,181	61	>75% Grass cover, Good, HSG B
75,686	98	Roofs, HSG B
122,800	91	Weighted Average
22,181		18.06% Pervious Area
100,619		81.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

Subcatchment PR1: To Blandin Avenue

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Type III 24-hr 2-YEAR Rainfall=3.10"

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Summary for Subcatchment PR2: To Waverly Street

Runoff = 0.09 cfs @ 12.11 hrs, Volume= 0.009 af, Depth= 0.55"

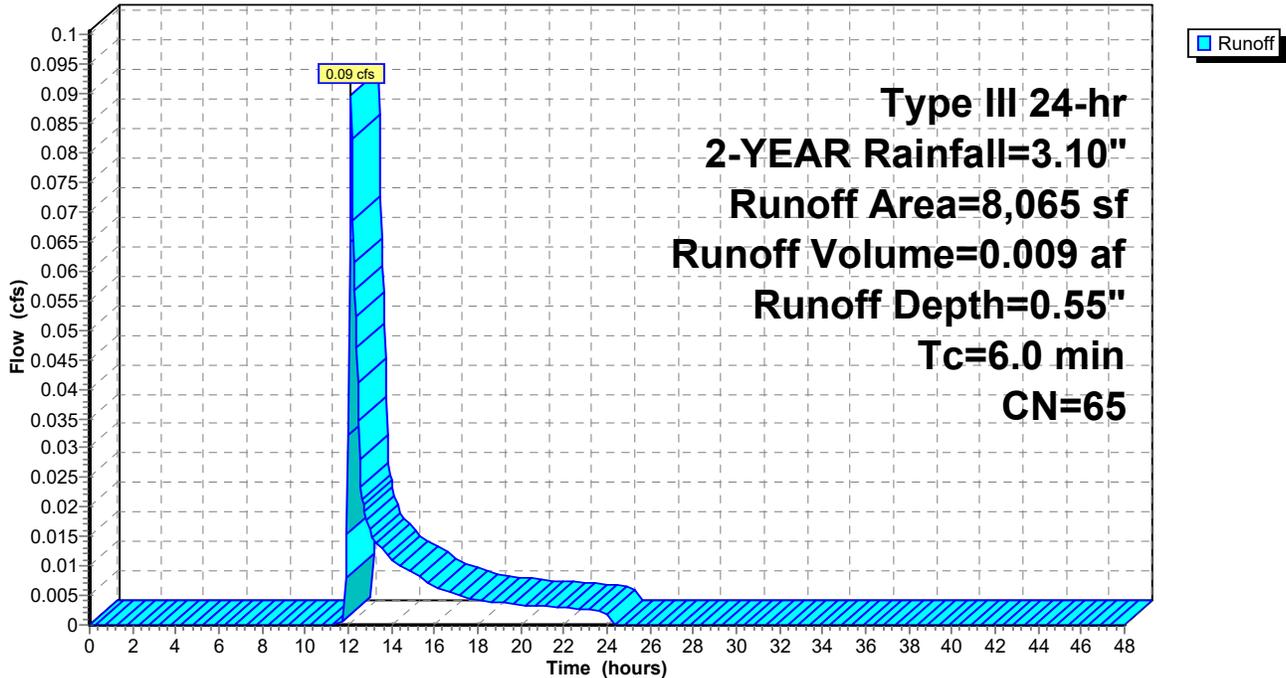
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-YEAR Rainfall=3.10"

Area (sf)	CN	Description
824	98	Paved roads w/curbs & sewers, HSG B
7,241	61	>75% Grass cover, Good, HSG B
8,065	65	Weighted Average
7,241		89.78% Pervious Area
824		10.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

Subcatchment PR2: To Waverly Street

Hydrograph



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Type III 24-hr 2-YEAR Rainfall=3.10"

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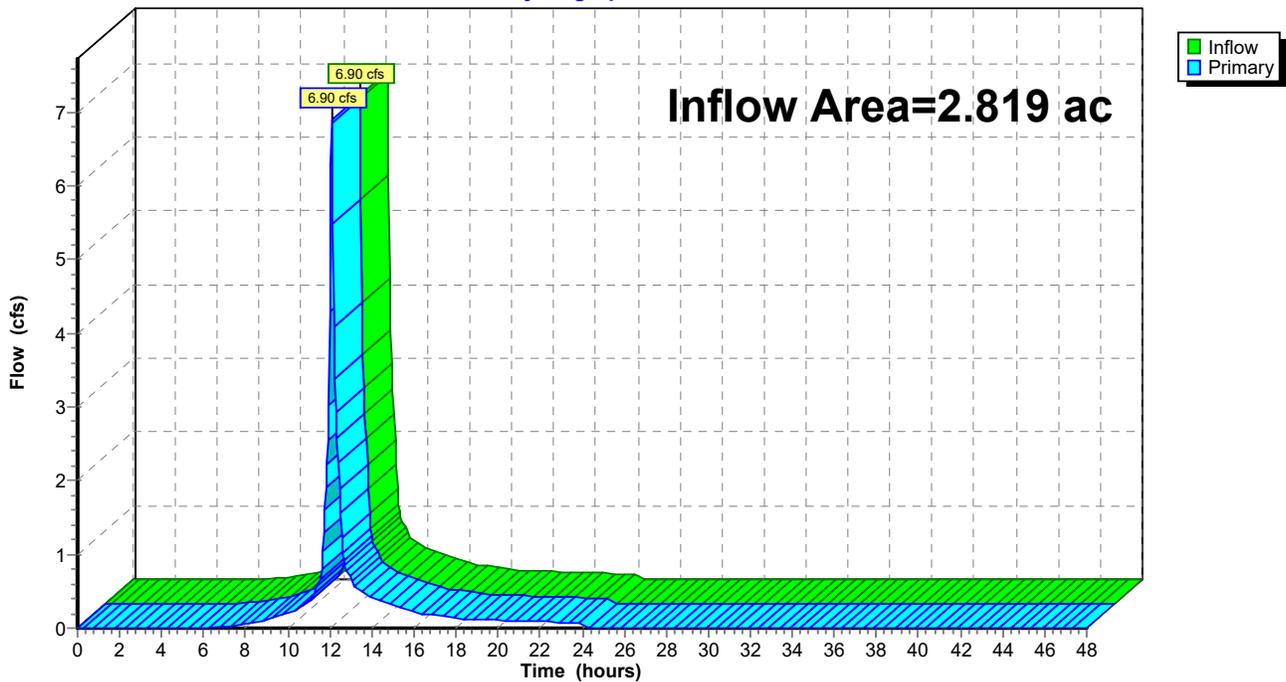
Summary for Link DP1: Blandin Avenue

Inflow Area = 2.819 ac, 81.94% Impervious, Inflow Depth = 2.16" for 2-YEAR event
Inflow = 6.90 cfs @ 12.09 hrs, Volume= 0.509 af
Primary = 6.90 cfs @ 12.09 hrs, Volume= 0.509 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Link DP1: Blandin Avenue

Hydrograph



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Type III 24-hr 2-YEAR Rainfall=3.10"

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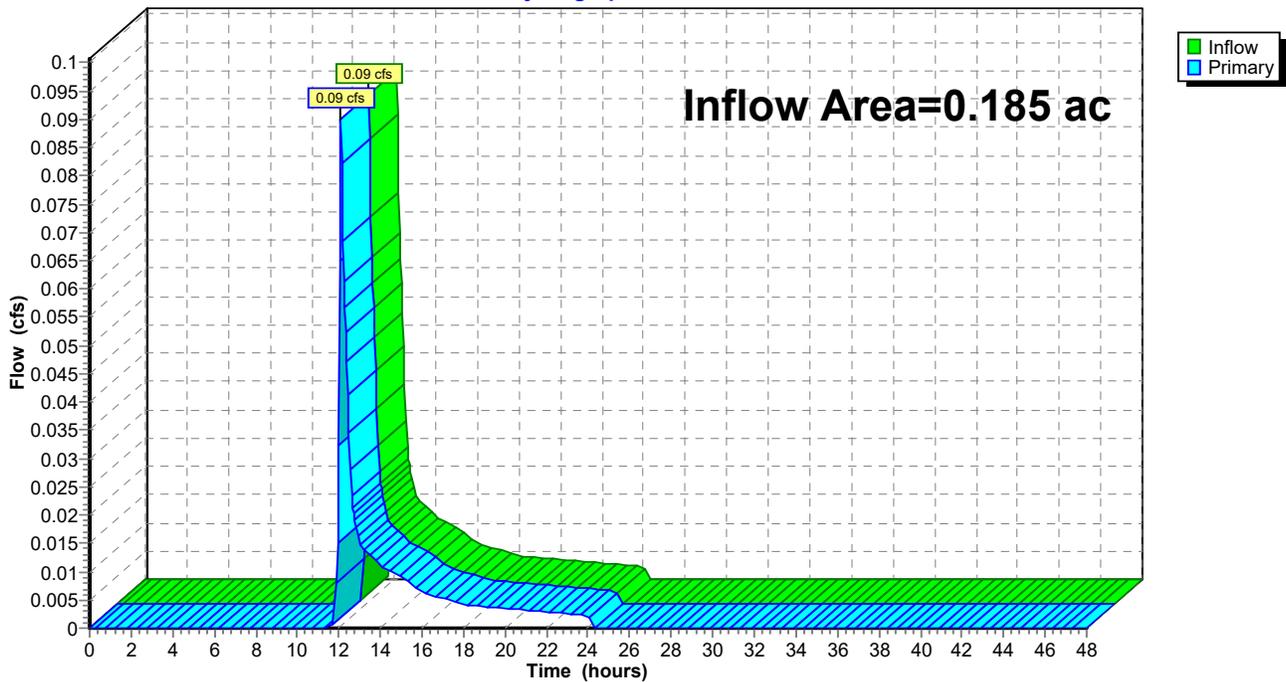
Summary for Link DP2: Waverly Street

Inflow Area = 0.185 ac, 10.22% Impervious, Inflow Depth = 0.55" for 2-YEAR event
Inflow = 0.09 cfs @ 12.11 hrs, Volume= 0.009 af
Primary = 0.09 cfs @ 12.11 hrs, Volume= 0.009 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Link DP2: Waverly Street

Hydrograph



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Type III 24-hr 10-YEAR Rainfall=4.60"

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Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentPR1: To Blandin Avenue Runoff Area=122,800 sf 81.94% Impervious Runoff Depth=3.59"
Tc=6.0 min CN=91 Runoff=11.18 cfs 0.844 af

SubcatchmentPR2: To Waverly Street Runoff Area=8,065 sf 10.22% Impervious Runoff Depth=1.39"
Tc=6.0 min CN=65 Runoff=0.28 cfs 0.021 af

Link DP1: Blandin Avenue Inflow=11.18 cfs 0.844 af
Primary=11.18 cfs 0.844 af

Link DP2: Waverly Street Inflow=0.28 cfs 0.021 af
Primary=0.28 cfs 0.021 af

Total Runoff Area = 3.004 ac Runoff Volume = 0.866 af Average Runoff Depth = 3.46"
22.48% Pervious = 0.675 ac 77.52% Impervious = 2.329 ac

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Type III 24-hr 10-YEAR Rainfall=4.60"

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Summary for Subcatchment PR1: To Blandin Avenue

Runoff = 11.18 cfs @ 12.09 hrs, Volume= 0.844 af, Depth= 3.59"

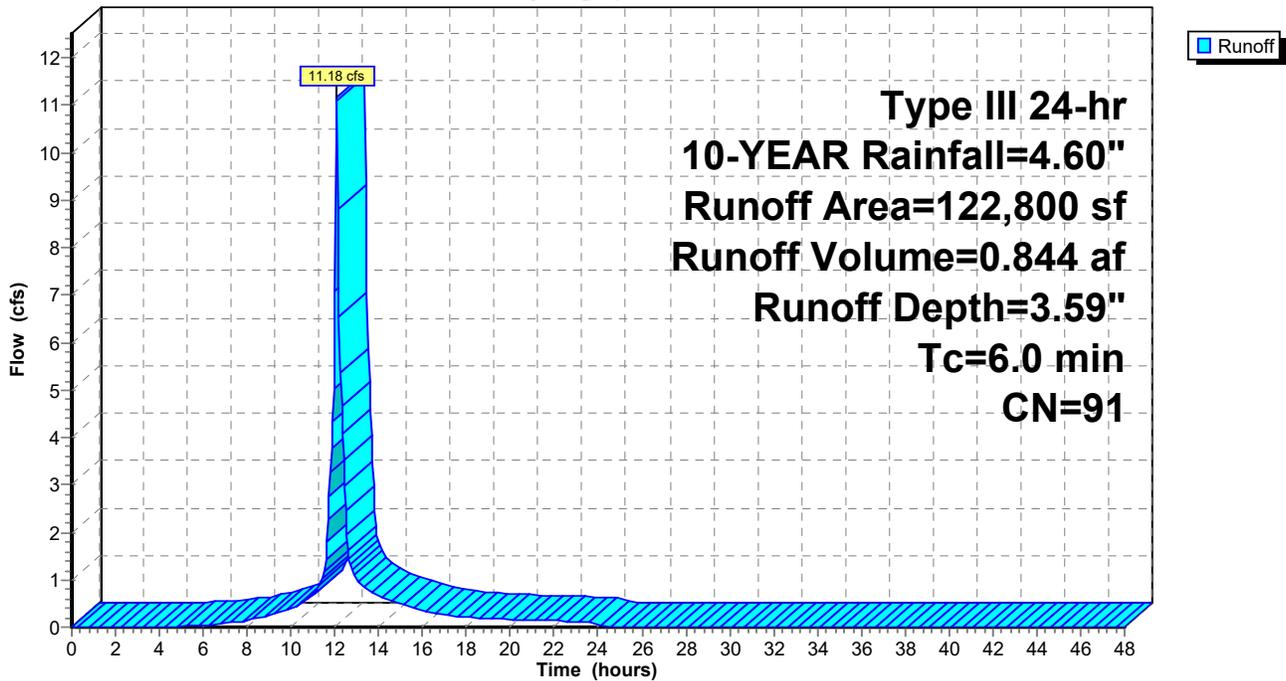
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YEAR Rainfall=4.60"

Area (sf)	CN	Description
24,933	98	Paved parking, HSG B
22,181	61	>75% Grass cover, Good, HSG B
75,686	98	Roofs, HSG B
122,800	91	Weighted Average
22,181		18.06% Pervious Area
100,619		81.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

Subcatchment PR1: To Blandin Avenue

Hydrograph



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Type III 24-hr 10-YEAR Rainfall=4.60"

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Summary for Subcatchment PR2: To Waverly Street

Runoff = 0.28 cfs @ 12.10 hrs, Volume= 0.021 af, Depth= 1.39"

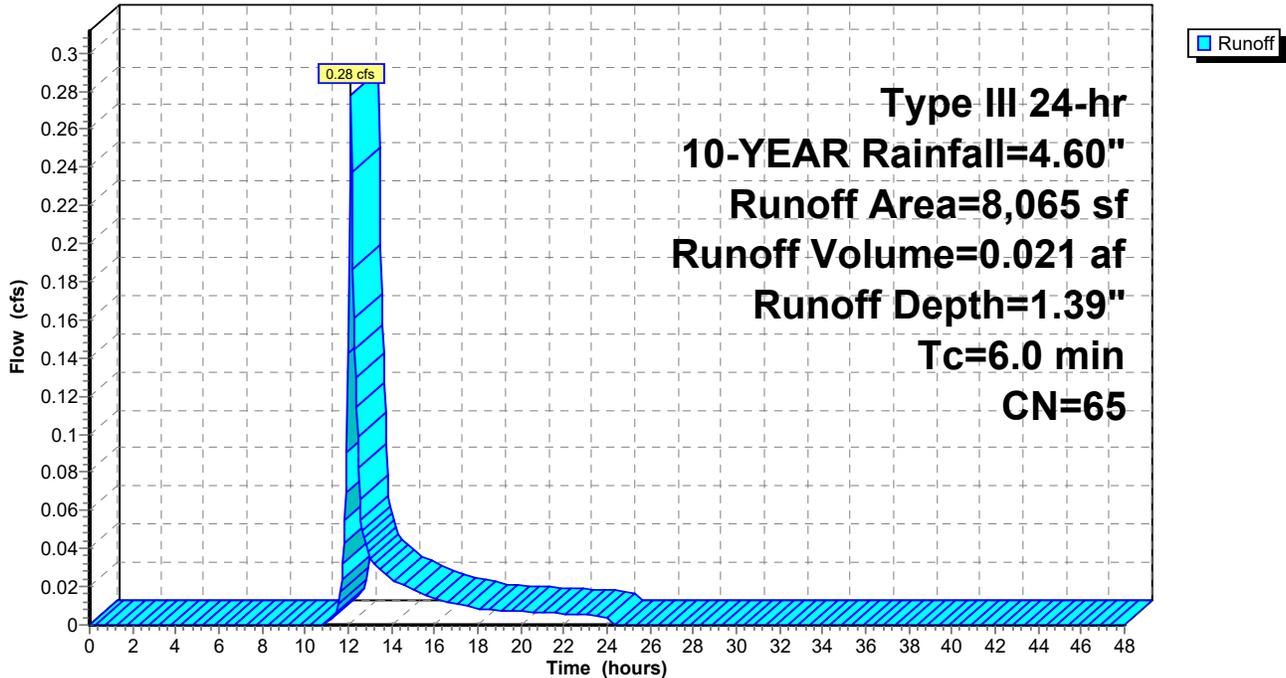
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-YEAR Rainfall=4.60"

Area (sf)	CN	Description
824	98	Paved roads w/curbs & sewers, HSG B
7,241	61	>75% Grass cover, Good, HSG B
8,065	65	Weighted Average
7,241		89.78% Pervious Area
824		10.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

Subcatchment PR2: To Waverly Street

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Type III 24-hr 10-YEAR Rainfall=4.60"

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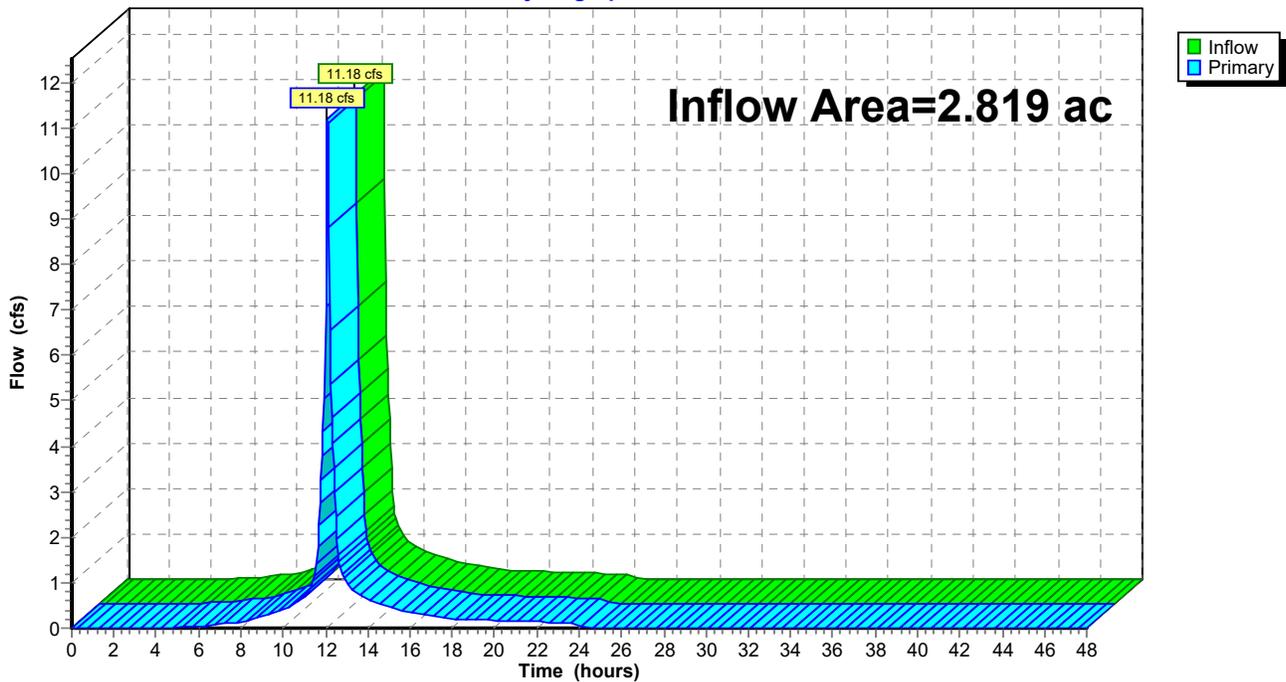
Summary for Link DP1: Blandin Avenue

Inflow Area = 2.819 ac, 81.94% Impervious, Inflow Depth = 3.59" for 10-YEAR event
Inflow = 11.18 cfs @ 12.09 hrs, Volume= 0.844 af
Primary = 11.18 cfs @ 12.09 hrs, Volume= 0.844 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Link DP1: Blandin Avenue

Hydrograph



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Type III 24-hr 10-YEAR Rainfall=4.60"

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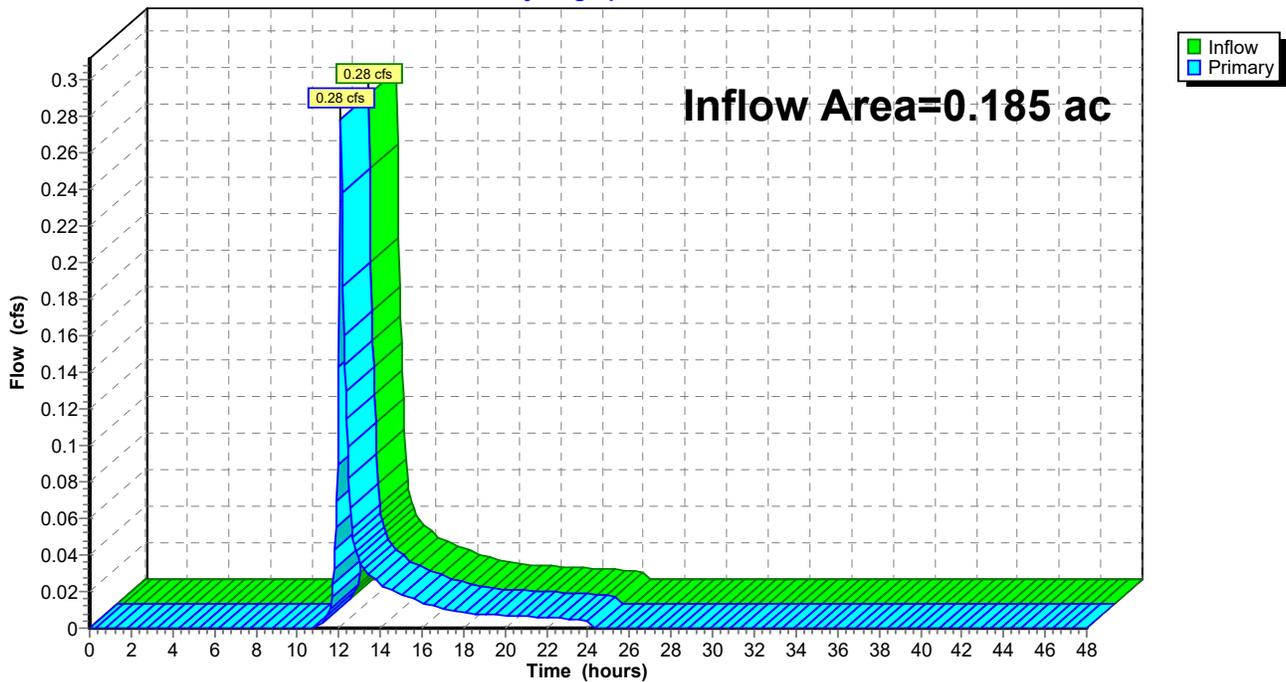
Summary for Link DP2: Waverly Street

Inflow Area = 0.185 ac, 10.22% Impervious, Inflow Depth = 1.39" for 10-YEAR event
Inflow = 0.28 cfs @ 12.10 hrs, Volume= 0.021 af
Primary = 0.28 cfs @ 12.10 hrs, Volume= 0.021 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Link DP2: Waverly Street

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Type III 24-hr 25-YEAR Rainfall=5.40"

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Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentPR1: To Blandin Avenue Runoff Area=122,800 sf 81.94% Impervious Runoff Depth=4.37"
Tc=6.0 min CN=91 Runoff=13.45 cfs 1.027 af

SubcatchmentPR2: To Waverly Street Runoff Area=8,065 sf 10.22% Impervious Runoff Depth=1.93"
Tc=6.0 min CN=65 Runoff=0.40 cfs 0.030 af

Link DP1: Blandin Avenue Inflow=13.45 cfs 1.027 af
Primary=13.45 cfs 1.027 af

Link DP2: Waverly Street Inflow=0.40 cfs 0.030 af
Primary=0.40 cfs 0.030 af

Total Runoff Area = 3.004 ac Runoff Volume = 1.057 af Average Runoff Depth = 4.22"
22.48% Pervious = 0.675 ac 77.52% Impervious = 2.329 ac

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Type III 24-hr 25-YEAR Rainfall=5.40"

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Summary for Subcatchment PR1: To Blandin Avenue

Runoff = 13.45 cfs @ 12.09 hrs, Volume= 1.027 af, Depth= 4.37"

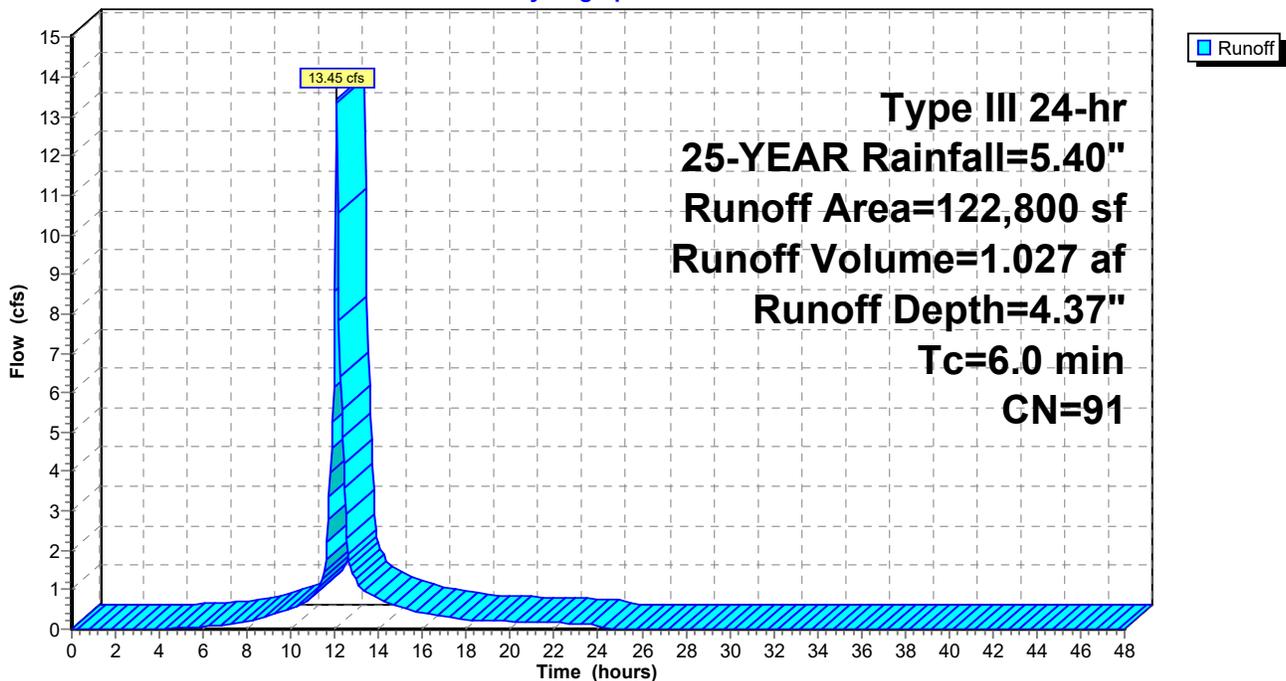
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YEAR Rainfall=5.40"

Area (sf)	CN	Description
24,933	98	Paved parking, HSG B
22,181	61	>75% Grass cover, Good, HSG B
75,686	98	Roofs, HSG B
122,800	91	Weighted Average
22,181		18.06% Pervious Area
100,619		81.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

Subcatchment PR1: To Blandin Avenue

Hydrograph



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Type III 24-hr 25-YEAR Rainfall=5.40"

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Summary for Subcatchment PR2: To Waverly Street

Runoff = 0.40 cfs @ 12.10 hrs, Volume= 0.030 af, Depth= 1.93"

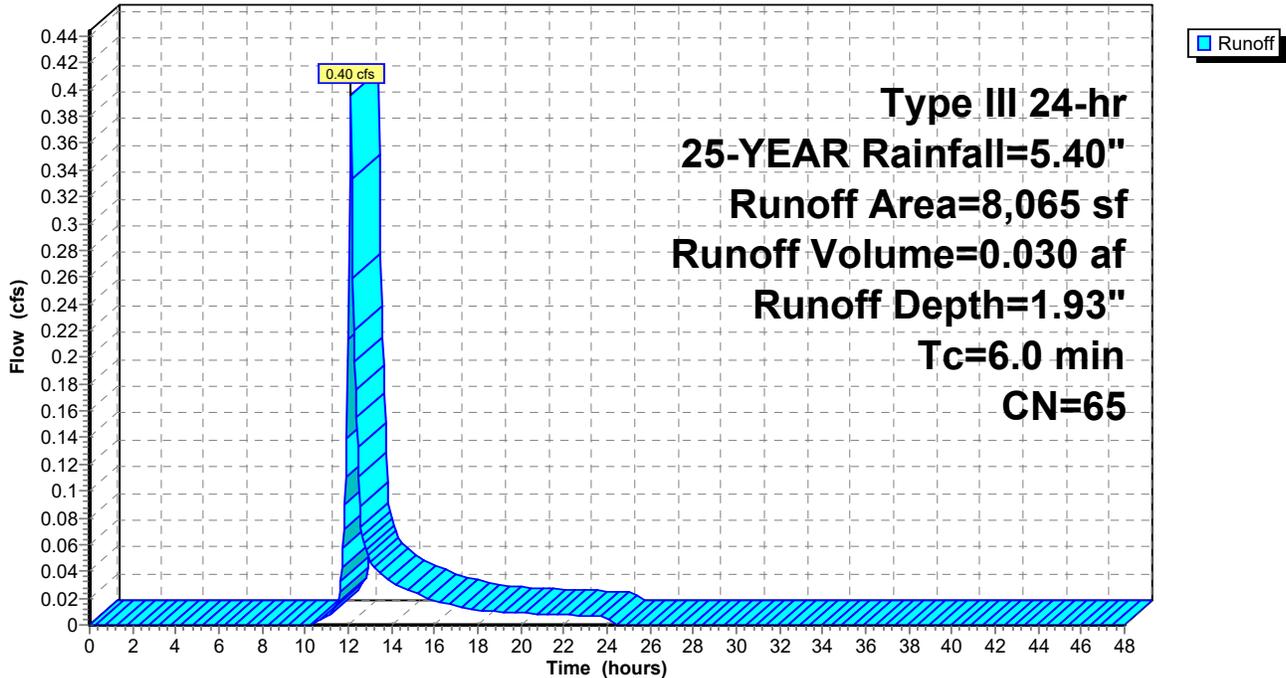
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-YEAR Rainfall=5.40"

Area (sf)	CN	Description
824	98	Paved roads w/curbs & sewers, HSG B
7,241	61	>75% Grass cover, Good, HSG B
8,065	65	Weighted Average
7,241		89.78% Pervious Area
824		10.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

Subcatchment PR2: To Waverly Street

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Type III 24-hr 25-YEAR Rainfall=5.40"

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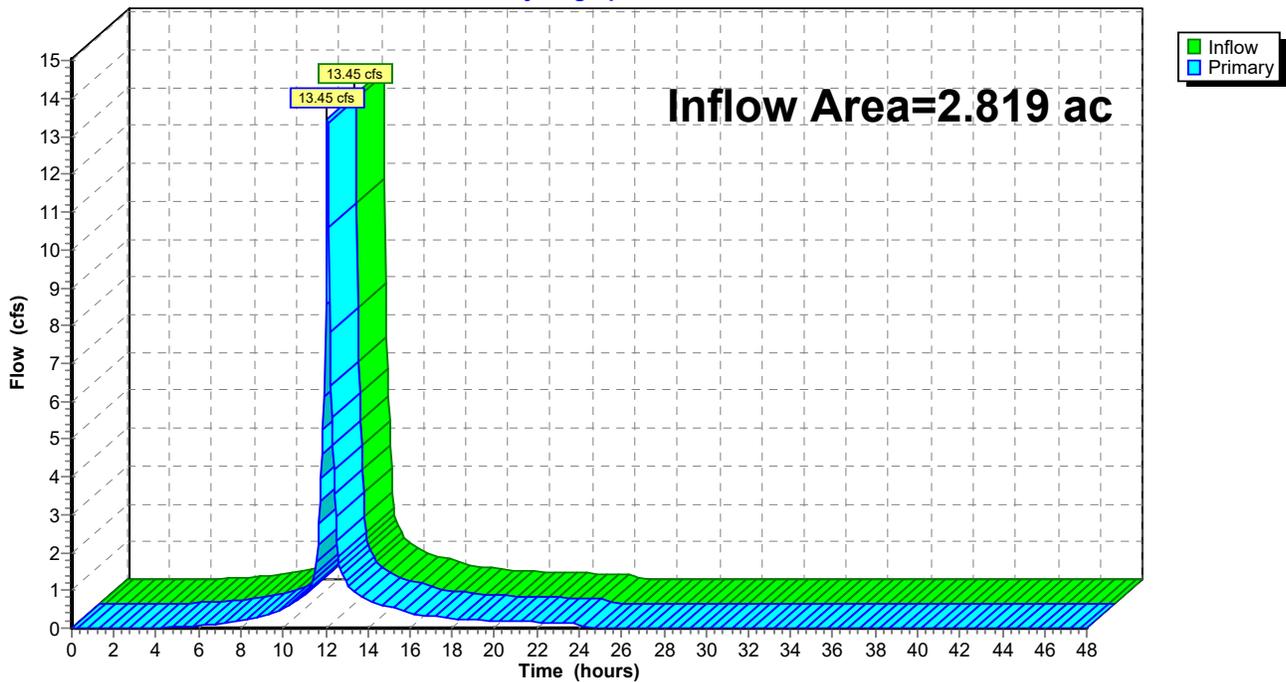
Summary for Link DP1: Blandin Avenue

Inflow Area = 2.819 ac, 81.94% Impervious, Inflow Depth = 4.37" for 25-YEAR event
Inflow = 13.45 cfs @ 12.09 hrs, Volume= 1.027 af
Primary = 13.45 cfs @ 12.09 hrs, Volume= 1.027 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Link DP1: Blandin Avenue

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Type III 24-hr 25-YEAR Rainfall=5.40"

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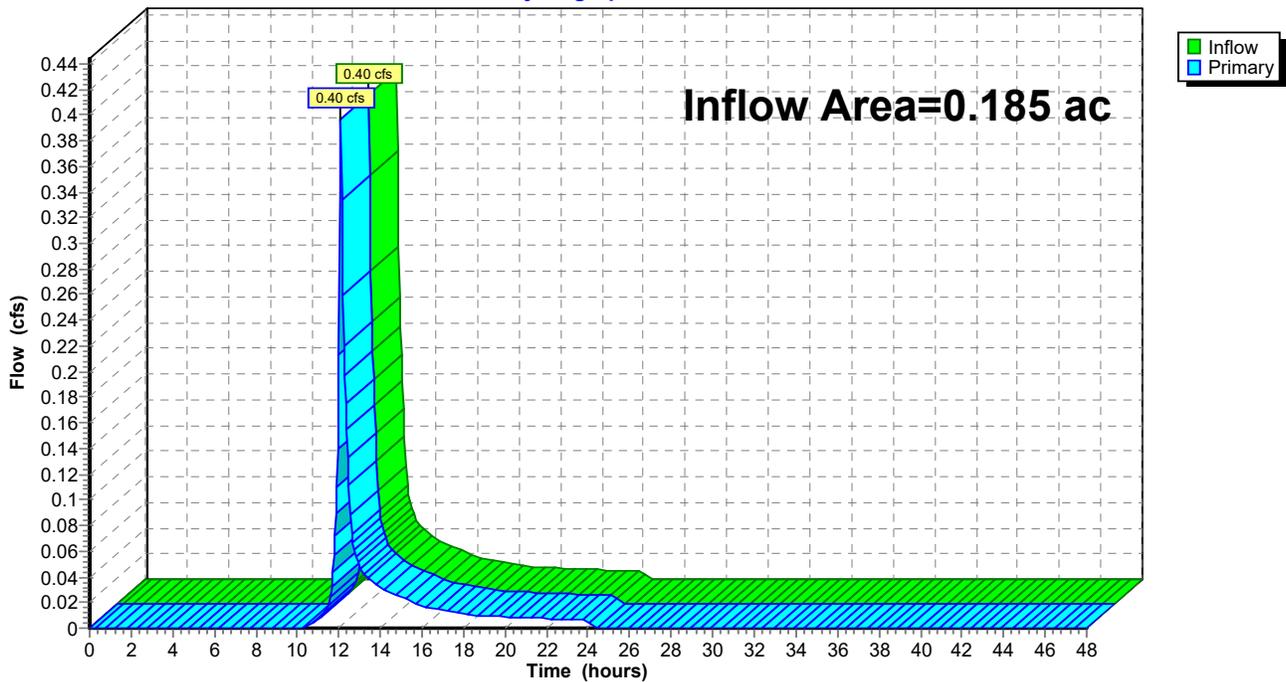
Summary for Link DP2: Waverly Street

Inflow Area = 0.185 ac, 10.22% Impervious, Inflow Depth = 1.93" for 25-YEAR event
Inflow = 0.40 cfs @ 12.10 hrs, Volume= 0.030 af
Primary = 0.40 cfs @ 12.10 hrs, Volume= 0.030 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Link DP2: Waverly Street

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Type III 24-hr 100-YEAR Rainfall=6.60"

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Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentPR1: To Blandin Avenue Runoff Area=122,800 sf 81.94% Impervious Runoff Depth=5.55"
Tc=6.0 min CN=91 Runoff=16.83 cfs 1.303 af

SubcatchmentPR2: To Waverly Street Runoff Area=8,065 sf 10.22% Impervious Runoff Depth=2.80"
Tc=6.0 min CN=65 Runoff=0.59 cfs 0.043 af

Link DP1: Blandin Avenue Inflow=16.83 cfs 1.303 af
Primary=16.83 cfs 1.303 af

Link DP2: Waverly Street Inflow=0.59 cfs 0.043 af
Primary=0.59 cfs 0.043 af

Total Runoff Area = 3.004 ac Runoff Volume = 1.346 af Average Runoff Depth = 5.38"
22.48% Pervious = 0.675 ac 77.52% Impervious = 2.329 ac

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Type III 24-hr 100-YEAR Rainfall=6.60"

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Summary for Subcatchment PR1: To Blandin Avenue

Runoff = 16.83 cfs @ 12.09 hrs, Volume= 1.303 af, Depth= 5.55"

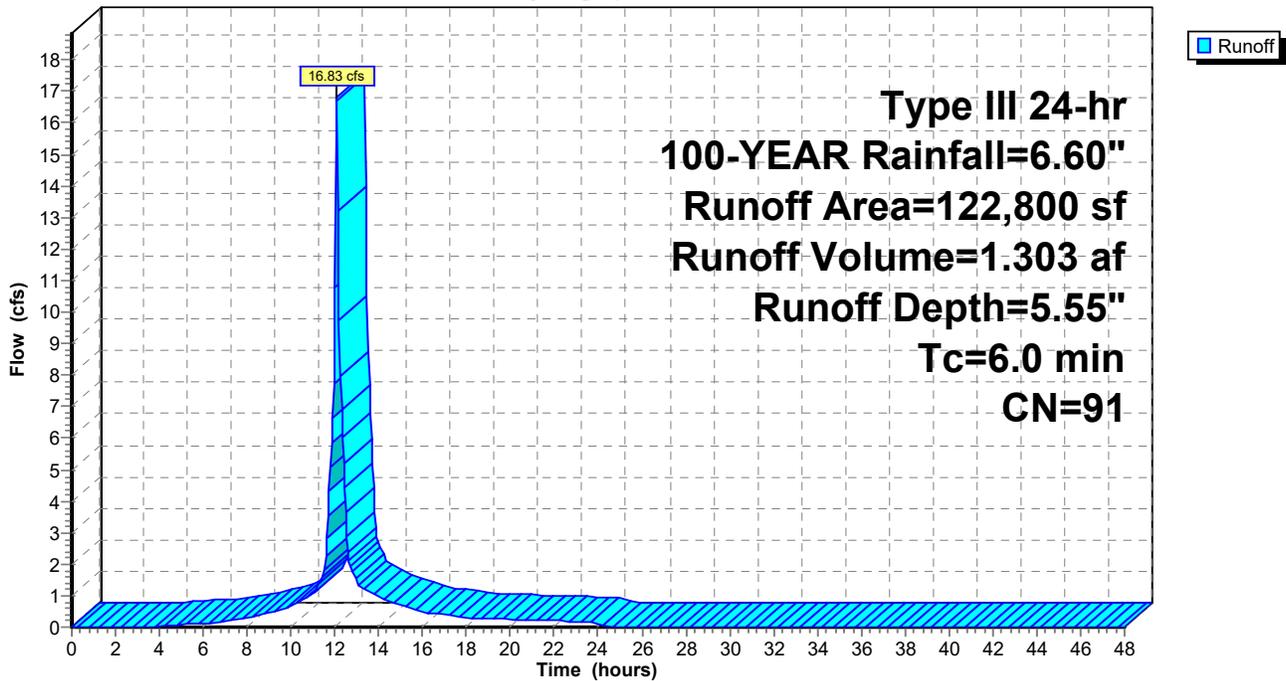
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YEAR Rainfall=6.60"

Area (sf)	CN	Description
24,933	98	Paved parking, HSG B
22,181	61	>75% Grass cover, Good, HSG B
75,686	98	Roofs, HSG B
122,800	91	Weighted Average
22,181		18.06% Pervious Area
100,619		81.94% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

Subcatchment PR1: To Blandin Avenue

Hydrograph



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Type III 24-hr 100-YEAR Rainfall=6.60"

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Summary for Subcatchment PR2: To Waverly Street

Runoff = 0.59 cfs @ 12.10 hrs, Volume= 0.043 af, Depth= 2.80"

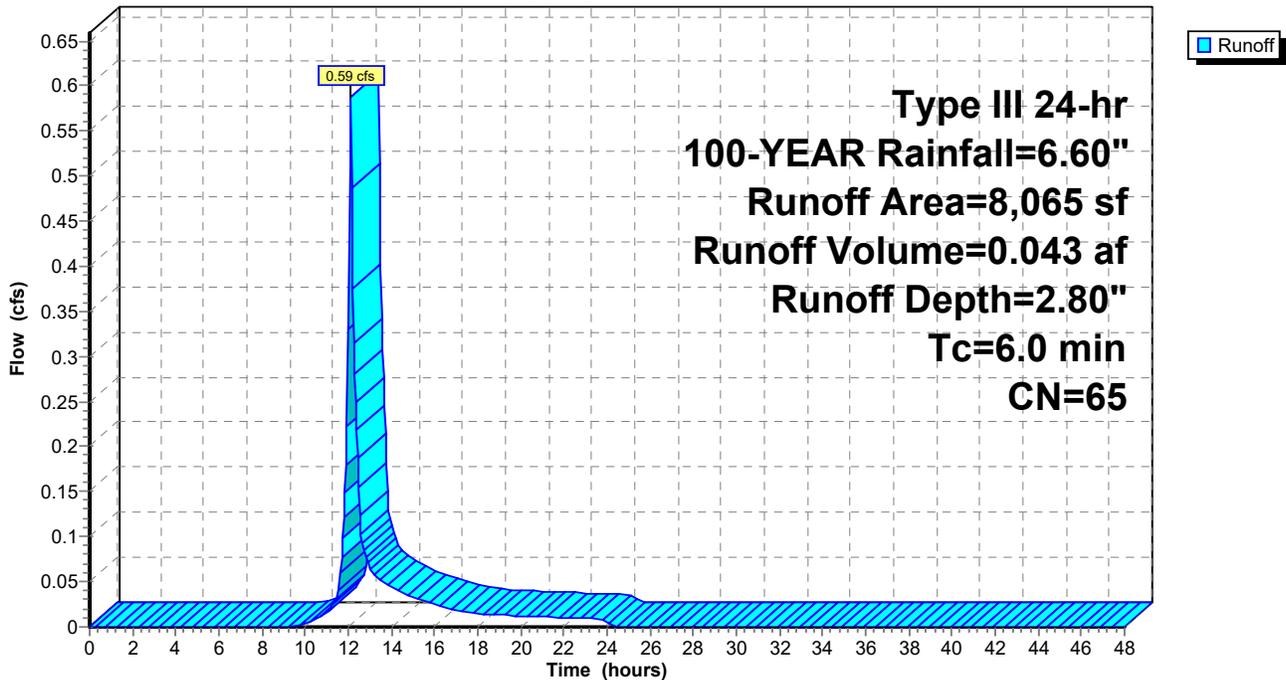
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-YEAR Rainfall=6.60"

Area (sf)	CN	Description
824	98	Paved roads w/curbs & sewers, HSG B
7,241	61	>75% Grass cover, Good, HSG B
8,065	65	Weighted Average
7,241		89.78% Pervious Area
824		10.22% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					Direct Entry,

Subcatchment PR2: To Waverly Street

Hydrograph



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Type III 24-hr 100-YEAR Rainfall=6.60"

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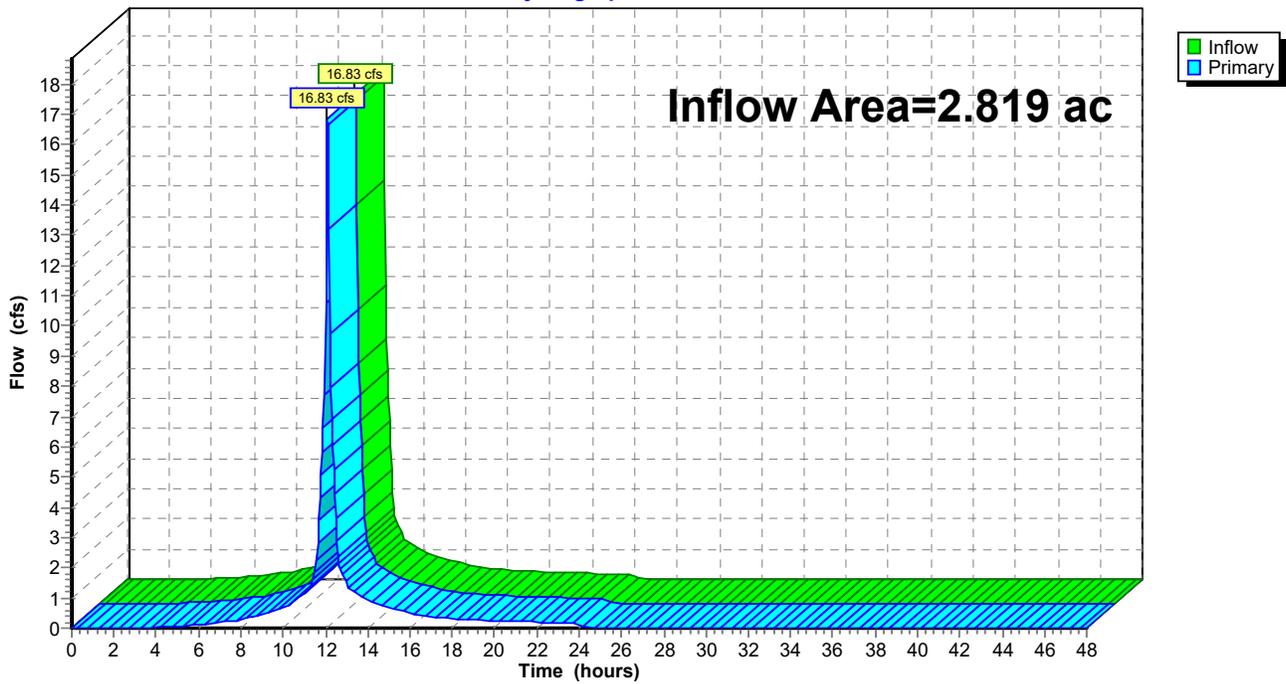
Summary for Link DP1: Blandin Avenue

Inflow Area = 2.819 ac, 81.94% Impervious, Inflow Depth = 5.55" for 100-YEAR event
Inflow = 16.83 cfs @ 12.09 hrs, Volume= 1.303 af
Primary = 16.83 cfs @ 12.09 hrs, Volume= 1.303 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Link DP1: Blandin Avenue

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Type III 24-hr 100-YEAR Rainfall=6.60"

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Summary for Link DP2: Waverly Street

Inflow Area = 0.185 ac, 10.22% Impervious, Inflow Depth = 2.80" for 100-YEAR event
Inflow = 0.59 cfs @ 12.10 hrs, Volume= 0.043 af
Primary = 0.59 cfs @ 12.10 hrs, Volume= 0.043 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Link DP2: Waverly Street

Hydrograph

