



October 11, 2022

Mr. Gregory Rondeau, Chairman  
Franklin Planning Board  
355 East Central Street  
Franklin, MA 02038

**Re: 700-712 Union Street (Primrose School)  
Site Plan and Special Permit Review Update**

Dear Mr. Rondeau:

BETA Group, Inc. (BETA) has reviewed documents for the project entitled: **Primrose School** located at 700-712 Union Street in Franklin, MA. This letter is provided to update BETA's findings, comments and recommendations.

#### **BASIS OF REVIEW**

The following documents were received by BETA and will form the basis of the review:

- Application for Approval of a Site Plan, dated July 6, 2022, including the following attachments:
  - Form P
  - Certificate of Ownership
  - Certified Abutters List
  - Existing Conditions Survey
- Plans (17 sheets) entitled: **Site Plan Set for Primrose School Franchising Company Proposed Child Day Care Facility** June 22, 2022, revised 9/23/2022, prepared by Stonefield Engineering & Design, LLC. of Salem, MA.
- Architectural Plans (3 Sheets) dated May 31, 2022, prepared by ADA Architects, Inc. of Lakewood, Ohio.
- Traffic Impact Assessment, dated June 22, 2022, revised September 23, 2022, prepared by Stonefield Engineering & Design, LLC.
- Stormwater Pollution Prevention Plan, including drainage report, dated May 20, 2022, revised September 23, 2022, prepared by Stonefield Engineering & Design, LLC.
- Soil Movement Exhibit, dated 9/23/2022, prepared by Stonefield Engineering & Design, LLC.
- Waiver Request Memorandum, dated 9/23/2022, prepared by Stonefield Engineering & Design, LLC.
- Test Pit Report, dated 2/19/2019, prepared by TSI Testing Services.
- Response to Comments letter, dated September 28, 2022, prepared by Stonefield Engineering & Design, LLC.

Review by BETA included the above items along with the following, as applicable:

- Site Visit
- **Zoning Chapter 185 From the Code of the Town of Franklin**, current through July 2021
- **Zoning Map of the Town of Franklin, Massachusetts**, attested to October 7, 2020
- **Stormwater Management Chapter 153 From the Code of the Town of Franklin**, Adopted May 2, 2007
- **Subdivision Regulations Chapter 300 From the Code of the Town of Franklin**, current through March 8, 2021
- **Wetlands Protection Chapter 181 From the Code of the Town of Franklin**, dated August 20, 1997
- **Town of Franklin Best Development Practices Guidebook**, dated September 2016

## INTRODUCTION

The project site includes two parcels, Lots 303-46 & 303-47 with a total area of 2.6 acres located at the corner of Union Street and Spruce Pond Road in the Town of Franklin (the "Site"). The Site is located within the Commercial II zoning district. Lots to the west, south, and east of the Site are also within this district while lots to the north are within Residential VI zoning district. The site has frontage on both East Central Street and Chestnut Street. The Site is not located within the Water Resource District.

The existing Site is an area of open space with various amenities including a playground, basketball court, and two sheds. The majority of the Site is an open field and is bordered by a fence. Existing utilities include utility poles and overhead wire. A sidewalk is present along Union Street on the opposite side of the roadway from the Site.

Topography at the Site is generally directed north towards Spruce Pond Road at the rear of the parcel. No wetland resource areas are known to be present within or in proximity of the Site. The Site is not located within a FEMA mapped 100-year floodplain, an NHESP-mapped estimated habitat of rare or endangered species, a wellhead protection area, or any other critical area. NRCS soil maps indicate the presence of Montauk fine sandy loam with a Hydrologic Soil Group (HSG) rating of C (low infiltration potential) and Woodbridge fine sandy loam with an HSG of C/D (low infiltration potential when unsaturated).

The project proposes to demolish existing site features and construct a 13,525± sq. ft. one-story childcare facility. Associated site features will include a playground area, a parking lot, a gravel access path, retaining walls, lighting, and landscaping. Access to the Site is proposed via a new curb cut and driveway along Union Street at the southeastern corner of the Site. Proposed utilities include domestic water, fire service, electric & telecommunications, sanitary sewer, and gas. Stormwater management is proposed via a surface infiltration basin and a subsurface infiltration system with associated closed drainage system consisting of catch basin to drain manhole connections.

To help with the review, the Stonefield response to the 1<sup>st</sup> review will be labeled "STONEFIELD". The BETA response to these comments will follow the Stonefield response and be labeled "BETA2."

## SITE VISIT

A thorough field review by BETA is currently pending. BETA has reviewed the Site using available aerial imagery and street view photography. Comments associated with this review are as noted throughout this report.

SV1. *Provide existing conditions information for the area abutting the Site to the northeast, including Spruce Pond Road. Indicate topography in this area and location of existing catch basins within the street to show anticipated flow characteristics of stormwater runoff discharged via the proposed outfalls.*

*STONEFIELD: Existing conditions for the area abutting the site to the northeast is provided on the site plans included as part of this submission.*

**BETA2: Plans revised. Recommend evaluating possibility of a piped connection between OS-2 and the nearby existing culvert to mitigate erosion potential at the steep slope.**

SV2. *Revise plan to show the location of the existing building located between the northern property line and Spruce Pond Road.*

*STONEFIELD: Location of this existing building is provided on the site plans included as part of this submission.*

**BETA2: Plan revised. Issue resolved.**

## FINDINGS, COMMENTS AND RECOMMENDATIONS

### GENERAL

- G1. *BETA notes that the project proposes significant excavation which may require approval under the Earth Removal Regulations (§185-23). Overall soil quantities should be developed and shown on the site plans.*

*STONEFIELD: Please see enclosed the Earthwork. Exhibit based on review with the Building Official the project would not require an Earth Removal Permit. The summary of earthwork quantities is also provided on the Grading Plan (Sheet C-5) of the site plans included as part of this submission*

***BETA2: Information provided. BETA defers to the Town regarding required permits. Issue resolved.***

- G2. *The project as proposed will modify the nature of the stormwater discharge on to the abutting parcel. Based upon the topography, it appears that under existing conditions the majority of site runoff will flow towards a swale along the rear property line and flow from west to east to a low point at the northeast corner of the lot. The applicant should note if there are any easement rights for this flow condition and if they apply to the proposed conditions.*

*STONEFIELD: The existing storm and drainage easement associated with the outfall in the rear of the site are provided as part of this submission. This documentation has also been approved for compliance by the town DPW.*

***BETA2: Information provided. Depict location of referenced easements on the plans and provide plan showing that the subject parcel is one of the subdivided lots benefitted by the easement. BETA defers to the Town whether modification of flow characteristics falls under the rights granted by the easement.***

### ZONING

The Site is located within the Commercial II (CII) Zoning District. The proposed use as an educational use is permitted within this district by right.

### SCHEDULE OF LOT, AREA, FRONTAGE, YARD AND HEIGHT REQUIREMENTS (§185 ATTACHMENT 9)

The Site meets the requirements for lot area, depth, frontage, width; front, side, and rear yards; impervious coverage and building height.

### DRAWING REQUIREMENTS (§185-31)

Drawings must be prepared in accordance with the Zoning Bylaw (§185-31).

- Z1. *Provide note that all proposed plantings come from the Best Development Practices Guidebook and revise any proposed species which are not on that list (§185-31.C.(3).(k)).*

*STONEFIELD: The requested note is provided on the Landscaping Plan (Sheet C-10) of the site plans included as part of this submission.*

***BETA2: Note provided. Issue resolved.***

### SIGNS (§185-20)

The project proposes the following signs:

<u>Sign Designation</u>	<u>Location</u>
Externally Illuminated Freestanding Sign	East Site Entrance
Stop (R1-1)	East Site Entrance & Northeast Parking Area
Accessible Parking Signs	Accessible Parking Spaces

The freestanding sign is in accordance with dimensional requirements of the sign bylaw and landscaping will be provided in its vicinity. BETA anticipates further review of the final sign design by the building commissioner.

**PARKING, LOADING AND DRIVEWAY REQUIREMENTS (§185-21)**

The Project proposes a Daycare facility (nonresidential building) in the Commercial II zoning district. §185-21.B(3.b) does not provide parking requirements for this use. The Applicant has determined a minimum parking requirements based on the ITE 5<sup>th</sup> Edition of 2.45 spaces per 1,000 square feet of gross floor area. BETA concurs with this methodology. The required parking is thus as follows:

Use	Area (SF)	Rate (Space / SF)	Required Parking
Day Care	13,525	2.45 / 1,000 SF	33.14
<u>Total:</u>			<u>34</u>

Parking is proposed to the east of the new Daycare building. A total of 39 parking spaces are provided. Parking spaces are shown as nine (9) feet by 19 feet with a min. 24-foot access aisle. Americans With Disabilities Act (ADA) regulations require a minimum of two (2) ADA-accessible spaces for lots ranging from 25 to 50 spaces. One (1) shall be van accessible with a 96-inch-wide access aisle and the remaining parking space is to be served by a 60-inch-wide access aisle. The proposed two (2) accessible spaces, both van accessible, meet these requirements.

Access to the Site is proposed via a new curb cut along Union Street in the southeast corner of the property. A 24-foot wide driveway will extend from this curb cut and connect to the proposed parking areas. Concrete curbing is proposed around the perimeter of the driveways and parking lot.

Refer to the Screening and Landscaping section of this report for comments relating to parking lot screening requirements.

The Site Plans indicate that the Applicant has requested a Variance from the requirement to provide a concrete sidewalk along the street frontage per §185-28.

BETA provides the following comments relative to the parking, loading access and landscaping:

22. *Indicate distance between the proposed curb cut and the nearby driveway entrance associated with 750 Union Street. Entrance of exit center lines may not fall within 150 feet of the entrance of any other parking area entrance or exit on the same side of the street (§185-21.C(7.a)).*

*STONEFIELD: Dimensions between the proposed curb cut and the nearby driveway entrance are now provided on the Site Plan (Sheet C-4) of the site plans included as part of this submission.*

**BETA2: Dimensions provided. Issue resolved.**

23. *Consider providing a crosswalk across Union Street and extending the proposed walkway to facilitate pedestrian access to the Site.*

*STONEFIELD: Noted, at this time the Applicant is not proposing a crosswalk across Union Street.*

**BETA2: No further comment.**



Z4. *Review grading of gravel access road to confirm that vertical curves can be safely traveled by a Town of Westwood Fire Apparatus.*

*STONEFIELD:* The proposed gravel access path is designed at a maximum slope of 10% and to function safely for access by emergency vehicles.

***BETA2: The proposed access road as designed will require two vertical curves: one which transitions from the Union Street cross slope to the 10% downslope, and one which transitions from the 10% downslope to the 1% ± bottom area. Vertical curves must be designed such that a fire apparatus or other vehicle will not get stuck while navigating these curves. Provide profile for access road with curve lengths and rate of vertical curvature (K) identified. Also review driveway entrance to ensure a fire apparatus can safely navigate the turn from Union Street onto the access road. Recommend coordinating with Fire Department to design access road to their satisfaction.***

#### **FOUNDATION GRADING (§185-32)**

The proposed structure has a finished floor elevation (FFE) of 356'. This elevation is approximately 7 feet below the Union Street elevation of 363.05' and is located within 125 feet of the right-of-way. The site plans indicate that the Applicant has requested a variance from this requirement.

#### **SCREENING (§185-35) AND LANDSCAPING**

The project proposes thirteen (13) tree plantings and seventy-six (76) shrub plantings located predominantly around the perimeter of the parking areas. The project also proposed three "shrub areas" consisting of tall grasses with a total shrub planting quantity of 227 plantings. The provided planting quantity is in accordance with those required for the proposed number of parking spaces.

§185-35(A) requires that outdoor parking for 10 or more cars must be screened from any adjacent residential district or use. Such districts/uses are located only to the north of the Site. A vinyl fence is proposed along the east, south, west, and northwest perimeters of the Site, but no screening is provided along the northern side of the parking lot except for an existing area of trees to remain between Spruce Pond Road and the Site. This area appears to consist of a mix of deciduous and evergreen trees. In addition, this northern area is located at a lower elevation compared to the Site which will limit visibility of the parking lot.

Z5. *BETA defers to the Board regarding adequacy of the existing screening.*

*STONEFIELD: Acknowledged.*

***BETA2: No further comment.***

#### **LIGHTING (§185-31.C(4)(E))**

Project Lighting Plans (C-8) indicate that a total of 4 pole-mounted and 19 wall-mounted luminaires are proposed. Wall-mounted luminaires are located around the perimeter of the building while pole-mounted luminaires are located throughout the eastern parking lot. A photometric plan was provided.

The Illuminating Engineers Society of North America (IESNA) recommends the following for parking lots:

Level	Horizontal Illuminance (min)	Vertical Illuminance (min)	Uniformity Ratio (max/min)
Basic Maintained Illuminance	0.2	0.1	20/1
Enhanced Security Illuminance	0.5	0.25	15/1

Luminance within the parking lot is consistent with the above table. A minor amount of light spillage (0.1 to 0.3) will occur onto Union Street near the driveway entrance.

Z6. *Request waiver for light spillage beyond the limit of the property (§185-31.C.(4).(e)).*

*STONEFIELD: A waiver is requested for light spillage beyond the limit of the property, as noted in the waiver request memorandum included as part of this submission. It should be noted that the spillage occurs at the proposed driveway location.*

**BETA2: BETA defers to the Town regarding the proposed waiver.**

## **STORMWATER MANAGEMENT**

The stormwater management design proposes a subsurface infiltration system (porous pavement) and above-ground infiltration system to capture, store, and infiltrate stormwater runoff from the parking lot, roof, and playground areas. Stormwater runoff will be conveyed to the above-ground system via a new closed drainage system consisting of catch basins and drainage manholes. Conveyance to the subsurface system is presumed to be accomplished via infiltration through the artificial turf. Overflow from these systems will be conveyed to new outfalls at the northwestern and northeastern corners of the Site. A sediment forebay is proposed for pretreatment prior to discharge to the above-ground system.

SW1. *Provide anti-float ring or similar for OS-1 and other structures which may extend below the water table.*

*STONEFIELD: An anti-float pad for OS- 1 is now proposed within the aboveground infiltration basin. Please refer to Stormwater Management Plan (Sheet C-6) and Construction Details (Sheet C-15) of the site plans included as part of this submission.*

**BETA2: Plan revised. Issue resolved.**

## **STORMWATER MANAGEMENT REGULATIONS (CHAPTER 153)**

The project proposes to disturb land in excess of once acre within the Town of Franklin. It is therefore subject to the Stormwater Management Regulations. The project is also required to comply with the Town of Franklin Best Development Practices Guidebook (BDPG) Compliance with these regulations is outlined below and throughout the following sections.

### **SUBDIVISION REGULATIONS - STORMWATER MANAGEMENT REGULATIONS (§300-11)**

Additional requirements for stormwater management are outlined in §300-11 of the Town of Franklin Subdivision Regulations.

SW2. *Provide min. 20' setback between subsurface porous pavement infiltration system and building foundation ((§300-11.A(7.a)).*

*STONEFIELD: A 20' setback is now provided between the subsurface infiltration system and the building foundation as shown on Stormwater Management Plan (Sheet C-6) of the site plans included as part of this submission.*

**BETA2: Setback provided. Issue resolved.**

SW3. *Revise proposed drainage pipe to be reinforced concrete or request waiver (§300-11.B(2.a)).*

*STONEFIELD: A waiver is requested for the utilization of reinforced concrete drainage pipes, as noted in the waiver request memorandum included as part of this submission.*

**BETA2: BETA defers to the Town regarding the proposed waiver.**

SW4. *Provide required headwall at outfalls (§300-11.B(2.b)).*

*STONEFIELD: Headwalls are now provided at outfalls as seen on Stormwater Management Plan (Sheet C-6) of the site plans included as part of this submission.*

**BETA2: Plans revised and detail provided. Issue resolved.**

SW5. *Revise catch basin detail to include a 4' sump (§300-11.B(3.c)).*

*STONEFIELD: The Double Grate Catch Basin Detail now provides a 4' sump note on Sheet C-14 and a Hood and Sump detail is has been added on Sheet C-15 of the site plans included as part of this submission.*

**BETA2: Detail revised. Correct Double Grate Catch Basin Detail to specifically call out 4' sump depth.**

### **MASSDEP STORMWATER STANDARDS**

The project is subject to the Massachusetts Stormwater Standards as outlined by MassDEP. Compliance with these standards is outlined below:

**NO UNTREATED STORMWATER (STANDARD NUMBER 1):** *No new stormwater conveyances (e.g., outfalls) may discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth.* The project proposes two new outfalls. Neither outfall is located in proximity to a wetland resource area. Riprap aprons are proposed at each discharge point for erosion control.

**POST-DEVELOPMENT PEAK DISCHARGE RATES (STANDARD NUMBER 2):** *Stormwater management systems must be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates.* The project proposes a net increase in impervious area and changes to site hydrology. Stormwater runoff will be mitigated via two new infiltration BMPs. Calculations indicate a decrease in peak discharge rate to all watersheds.

SW6. *Provide table comparing pre- and post-development runoff volume*

*STONEFIELD: A table comparing pre- and post-development runoff volume is provided within the SWPPP included as part of this submission.*

**BETA2: Table provided. The proposed design will result in a 1.54% increase in runoff volume during the 100-year storm event. Provide information on the Quince Island Road drainage system outfall to evaluate potential increase in off-site flooding.**

SW7. *Revise watershed boundaries to include any offsite areas that will drain to the proposed infiltration BMPs. This is anticipated to include a portion of Union Street and its associated catchment area where the lack of curbing will allow stormwater to flow onto the property.*

*STONEFIELD: Watershed boundaries have been revised to include offsite areas that will drain to the proposed infiltration BMP as detailed in the SWPPP included as part of this submission.*

**BETA2: Boundaries revised. Issue resolved.**

SW8. *Revise area of infiltration basin to use a cover type of impervious Water Surface to avoid "double-counting" the infiltration that will occur in this area.*

*STONEFIELD: As part of the stormwater analysis included within the SWPPP and based on meetings with BETA Group, the infiltration basin is now modeled with a CN value of 80.*

**BETA2: Model revised. Issue resolved.**

SW9. *Provide data quantifying the anticipated rate of infiltration through the artificial turf layer. Provide means of ensuring that stormwater runoff will flow into the artificial turf layer rather than flowing to the north and west.*

*STONEFIELD: Tested infiltration rates through the artificial turf layer are included as part of this submission. It should be noted the infiltration rate through the turf surface far exceeds the infiltration rate of a typical porous asphalt or pervious paver system.*

**BETA2: Data provided. Provide means of ensuring that stormwater runoff will flow into the artificial turf layer rather than flowing to the north and west.**

SW10. *Review design of pipe "M-100 to FB." Based on provided calculations, the design capacity is inadequate.*

*STONEFIELD: The storm pipe from manhole M-100 to Headwall HW3 has been revised to a 15" pipe.*

**BETA2: Pipe revised. Issue resolved.**

**RECHARGE TO GROUNDWATER (STANDARD NUMBER 3):** *Loss of annual recharge to groundwater should be minimized through the use of infiltration measures to maximum extent practicable. NRCS soil maps indicate that soil in the area of proposed modifications is Montauk fine sandy loam with a Hydrologic Soil Group (HSG) rating of C (low infiltration potential) and Woodbridge fine sandy loam with an HSG of C/D (low infiltration potential when unsaturated).*

The Applicant has conducted test pits at the Site indicating that subsurface soil is loamy sand. Estimated groundwater at the Site ranged from 2'-0" below grade to 11'-0" below grade, and no elevations were provided. Test pit logs indicate an estimated exfiltration rate of 2.41 in/hr. or 0.17 in/hr., though minimal data is provided as to how this rate was determined.

Recharge is proposed via a new above-ground infiltration system and a new subsurface infiltration system which will capture runoff. The BMPs are anticipated to provide groundwater recharge in excess of what is required.

SW11. *Provide plan showing the location of each test pit to verify elevation of groundwater*

*STONEFIELD: Test pit locations are now provided on the site plans included as part of this submission.*

**BETA2: Locations provided showing adequate separation to groundwater. Issue resolved.**

SW12. *Based upon the density of the underlying native soils noted by the soil evaluator. BETA agrees that an infiltration rate of 0.17 inches per hour is appropriate for the site.*

*STONEFIELD: Acknowledged.*

**BETA2: No further comment.**

SW13. *Provide calculations for provided recharge volume. Due to the proposed low-flow outlets, there is no static storage within this basin and calculations to support dynamic storage have not been provided.*

*STONEFIELD: Calculations of the proposed recharge volume are provided within the SWPPP included as part of this submission.*

**BETA2: See SW18 below**

SW14. *Revise infiltration basin to provide a min. 1-foot of freeboard between the 100-yr storm elevation and the top of basin berm elevation.*

*STONEFIELD: The aboveground infiltration basin B-2 has been revised to provide a minimum of 1 -foot of freeboard between the 100-year storm and the top of basin berm elevation. Please refer to the HydroCAD reports provided in Appendix C of the SWPPP and the Infiltration Basin B-2 Detail on Sheet C-14 of the site plans included as part of this submission.*

**BETA2: Freeboard provided. Issue resolved.**



SW15. *Provide impervious barrier, typically a curb, through emergency spillway riprap to prevent flows through the spillway below the intended invert elevation.*

*STONEFIELD: Concrete curb spillway enforcement is now provided. Please refer to Stormwater Management Plan (Sheet C-6) and Construction Details (Sheet C-14) of the site plans included as part of this submission.*

**BETA2: Revise detail to show top of curb at the top of spillway elevation. As designed, the spillway will be obstructed.**

**TOTAL SUSPENDED SOLIDS (STANDARD NUMBER 4):** *For new development, stormwater management systems must be designed to remove 80% (90% per Town Bylaw) of the annual load of Total Suspended Solids (TSS). The project includes the following treatment trains:*

Treatment Train	BMP 1	BMP 2	Infiltration BMP	TSS Removal %
A	Deep Sump Catch Basin	Sediment Forebay	Infiltration Basin	80%
B	None	None	Subsurface Infiltration System	80%

The project is required to treat the 1.0-inch water quality volume per Town Bylaws. Water quality volume is provided via the proposed infiltration BMPs in excess of what is required. At least 44% TSS removal is achieved prior to discharge to the above-ground infiltration basin. No pretreatment is provided for the subsurface system on the grounds that the BMP's catchment includes only the building roof and the playground area.

SW16. *Provide worksheets for calculation of TSS removal for each treatment train. The TSS removal for Treatment Train A is only 80%. The pretreatment provided by the catch basin and the forebay are requirements for the 80% provided by the basin.*

*STONEFIELD: Worksheets for calculation of TSS removal are provided within Appendix C of the SWPPP included as part of this submission.*

**BETA2: Worksheets provided. Issue resolved.**

SW17. *Provide calculations for provided total phosphorus (TP) removal and total nitrogen removal (TN) (BDPG).*

*STONEFIELD: Because the provided water quality volume exceeds the required minimum by 6,687 CF, the project is therefore not subject to the Town of Franklin's treatment requirements (90% average annual post-construction Total Suspended Solids (TSS) removal and 60% Total Phosphorus (TP) removal) and has been designed to meet the MassDEP 80% TSS treatment requirement standard.*

**BETA2: See SW18 below**

SW18. *Refer to comment SW13 above for determination of water quality volume, accounting for runoff that will bypass treatment via the low-flow outlets. If the project cannot retain the 1.0-inch water quality volume on-site, the treatment train must provide 90% TSS removal and 60% Phosphorus removal.*

*STONEFIELD: An anti-float pad for OS- 1 is proposed within the aboveground infiltration basin. Please refer to Stormwater Management Plan (Sheet C-6) and Construction Details (Sheet C-15) of the site plans included as part of this submission. [BETA anticipates this response was erroneously duplicated from SW-1]*

**BETA2: The basin design has been revised such that there is now storage between the basin bottom and the lowest invert. However, most of the water quality volume is provided via the subsurface drainage system,**

***with only a small storage volume available in the above-ground basin. This will limit the water quality treatment provided by the above-ground basin. Revise above-ground basin such that it has adequate storage to treat the 1-inch water quality volume from its contributing impervious area.***

SW19. *Provide Long-Term Pollution Prevention Plan or include required measures as part of the Operation & Maintenance Plan.*

*STONEFIELD: A long-term pollution prevention plan is provided in the SWPPP included as part of this submission.*

***BETA2: BETA could not locate this plan. Required content of the long-term pollution prevention plan is outlined in Volume 1, Chapter 1, Page 9 of the MA Stormwater Handbook.***

SW20. *Review design of artificial turf and subsurface infiltration system. The artificial turf detail calls for 95% min. compacted fill beneath the turf and references a soils report, while the basin detail calls for Type #2 stone beneath the turf. Provide a copy of this soils report and rectify the inconsistency.*

*STONEFIELD: The Artificial Turf Detail has been revised, rectifying the inconsistency. Please refer to Artificial Turf Detail (Sheet C-12) and Infiltration Basin B-I Detail (Sheet C-14) of the site plans included as part of this submission.*

***BETA2: Details revised. Issue resolved.***

**HIGHER POTENTIAL POLLUTANT LOADS (STANDARD NUMBER 5):** *Stormwater discharges from Land Uses with Higher Potential Pollutant Loads (LUHPPLs) require the use of specific stormwater management BMPs. The project is not considered a LUHPPL – not applicable.*

**CRITICAL AREAS (STANDARD NUMBER 6):** *Stormwater discharges to critical areas must utilize certain stormwater management BMPs approved for critical areas. The project is not located within a critical area – not applicable.*

**REDEVELOPMENT (STANDARD NUMBER 7):** *Redevelopment of previously developed sites must meet the Stormwater Management Standards to the maximum extent practicable. The project is not considered a redevelopment – not applicable.*

**EROSION AND SEDIMENT CONTROLS (STANDARD NUMBER 8):** *Erosion and sediment controls must be implemented to prevent impacts during construction or land disturbance activities. As the project proposes to disturb greater than one acre of land, it will be required to file a Notice of Intent with EPA and develop a Stormwater Pollution Prevention Plan (SWPPP). Erosion control measures are depicted on the plans include silt fence, inlet protection, stabilized construction entrance, dust control, and designated stockpile area.*

SW21. *Provide Stormwater Pollution Prevention Plan (SWPPP).*

*STONEFIELD: A stormwater pollution prevention plan is included as part of this submission.*

***BETA2: Though the Stormwater Report has been titled as a SWPPP, it lacks much of the required information required for an EPA NPDES permit. BETA recommends the use of the SWPPP template available on the EPA website.***

SW22. *Supplement silt fence with additional perimeter control (compost filter tube) along downgradient property boundaries to ensure adequate erosion mitigation.*

*STONEFIELD: Silt fence and additional perimeter control are provided as seen on Sheet C-9 of the site plans included as part of this submission.*

***BETA2: Additional controls provided. Issue resolved.***

SW23. *Provide measures to prevent access to the Site via the proposed gravel driveway to ensure all construction period access is via the stabilized construction entrance.*

*STONEFIELD: Measures to ensure that vehicles can only access the site via the stabilized construction entrance have been provided via silt fencing around the perimeter of the site. Please refer to Soil Erosion & Sediment Control Plan (Sheet C-9) of the site plans included as part of this submission.*

**BETA2: Measures provided. Issue resolved.**

SW24. *Provide inlet protection at downgradient catch basins within Union Street and Spruce Pond Road.*

*STONEFIELD: Silt fences, additional perimeter control, and inlet protection filters are provided as protection for downgradient catch basins. Please refer to Soil Erosion & Sediment Control Plan (Sheet C- 9) of the site plans included as part of this submission.*

**BETA2: Plans revised. Issue resolved.**

SW25. *Clarify location of temporary sediment basin noted in the construction sequence. If the infiltration basin is intended to be used as this sediment basin, provide measures to remove any construction period sediment from the basin during site restoration.*

*STONEFIELD: No temporary sediment basin is proposed as part of the project scope and the sequence of construction has been revised accordingly. Please refer to Soil Erosion & Sediment Control Plan (Sheet C-9) of the site plans included as part of this submission.*

**BETA2: Plan revised. Issue resolved.**

SW26. *Provide means of protecting subsurface infiltration system from construction-period sediment.*

*STONEFIELD: Additional basin protection notes have been added for both infiltration basin locations including fencing to be installed around the perimeter of the proposed infiltration basins and limiting access to light weight equipment to the greatest extent possible. Please refer to Soil Erosion & Sediment Control Plan (Sheet C-9) of the site plans included as part of this submission.*

**BETA2: Measures provided. Issue resolved.**

SW27. *Provide description of all construction and stockpile and/or excess materials removed from the Site of expected to be stored on-site (§153-12.L).*

*STONEFIELD: Description of all stockpile materials and/or excess materials to be removed from the site is provided under Section 3.0 - Proposed Conditions of the SWPPP included as part of this submission.*

**BETA2: Recommend that SWPPP prepared in conjunction with the EPA filing and the DPW stormwater permit include language associated with both proposed stockpile locations and protection measures. (See SW22 above)**

SW28. *Revise construction sequencing to include timing of stripping and clearing, construction of utilities, infrastructure, and buildings, and final grading (§153-12.M).*

*STONEFIELD: The sequence of construction has been revised accordingly. Please refer to Soil Erosion & Sediment Control Plan (Sheet C-9) of the site plans included as part of this submission.*

**BETA2: Plan revised. Issue resolved.**

SW29. *Include requirement that erosion control barriers must be installed, inspected, and approved by a professional engineer or licensed wetlands scientist and that no sedimentation barrier may be removed without prior approval of the commission or its staff (BDPG).*

*STONEFIELD: The requested note is provided on the Soil Erosion & Sediment Control Plan (Sheet C-9) of the site plans included as part of this submission.*

**BETA2: Note provided. Issue resolved.**

**OPERATIONS/MAINTENANCE PLAN (STANDARD NUMBER 9):** *A Long-Term Operation and Maintenance Plan shall be developed and implemented to ensure that stormwater management systems function as designed. A Stormwater Operation and Maintenance Manual was provided with the Stormwater Management Report.*

SW30. *Include maintenance of the outfalls and riprap aprons.*

*STONEFIELD: Maintenance plan for outfalls and riprap aprons is provided in the SWPPP included as part of this submission.*

**BETA2: Plan revised. Issue resolved.**

SW31. *Provide owner signature (§153-18.B(5)).*

*STONEFIELD: Owner's signature to be provided prior to construction or final approval.*

**BETA2: BETA recommends including the signature as a Condition of Approval.**

SW32. *Include provision requiring a documentation submittal to the DPW confirming when maintenance has been satisfactorily completed (§153-18.B(6)).*

*STONEFIELD: A provision requiring documentation submittal to the DPW when maintenance has been satisfactorily completed is provided within the SWPPP included as part of this submission.*

**BETA2: Plan revised. Issue resolved.**

SW33. *Include note that the owner of the stormwater management system must notify the Director of changes in ownership or assignment of financial responsibility (§153-18.D(1)).*

*STONEFIELD: A provision requiring documentation of a change in ownership to the DPW is provided within the SWPPP included as part of this submission.*

**BETA2: Plan revised. Issue resolved.**

SW34. *Include maintenance of sediment forebays.*

*STONEFIELD: Maintenance plan for sediment forebays is provided in the SWPPP included as part of this submission.*

**BETA2: Plan revised. Issue resolved.**

SW35. *Provide inspection and maintenance of deep sump catch basins at a frequency of at least 4 times per year.*

*STONEFIELD: Inspection and maintenance plan for deep sump catch basins is provided in the SWPPP included as part of this submission.*

**BETA2: Plan revised. Issue resolved.**

SW36. *Provide Map showing the location of all stormwater BMPs in each treatment train along with the discharge point.*

*STONEFIELD: Plan sheets inclusive of the locations of all stormwater BMP's are provided in the appendices to the SWPPP included as part of this submission.*

**BETA2: Consider providing simplified stormwater BMP map for ease of operation and maintenance. The plan sheets include text and detail that may not be necessary for field crews performing maintenance. Issue resolved.**

SW37. Provide inspection ports for the subsurface infiltration system.

*STONEFIELD: Inspection ports for subsurface infiltration system are now proposed. Please refer to Stormwater Management Plan (Sheet C-6) of the site plans included as part of this submission.*

**BETA2: Plan revised. Issue resolved.**

SW38. Indicate anticipated means of accessing infiltration basin, sediment forebay, outlet control structure, and outfalls for maintenance.

*STONEFIELD: Access paths to the stormwater facilities are shown on the Stormwater Management Plan (Sheet C-6) of the site plans included as part of this submission.*

**BETA2: Plan revised. Issue resolved.**

**ILLICIT DISCHARGES (STANDARD NUMBER 10): All illicit discharges to the stormwater management system are prohibited.** An Illicit Discharge Compliance Statement was provided with the submission

SW39. Revise statement to note that there are no existing illicit discharges present on the Site.

*STONEFIELD: The SWPPP has been revised to state that there are no illicit discharges present on the site.*

**BETA2: Statement revised. Issue resolved.**

SW40. Provide signature of owner on the illicit discharge compliance statement.

*STONEFIELD: Owner's signature to be provided prior to construction or final approval.*

**BETA2: BETA recommends including the signature as a Condition of Approval.**

If we can be of any further assistance regarding this matter, please contact us at our office.

Very truly yours,  
BETA Group, Inc.



Gary D. James, P.E.  
Senior Project Manager



Stephen Borgatti, PE, MENG  
Project Engineer

cc: Amy Love, Town Planner  
Job No: 10519.01



October 05, 2022

Mr. Gregory Rondeau, Chairman  
Franklin Planning Board  
355 East Central Street  
Franklin, MA 02038

Re: 700-712 Union Street (Primrose School)  
Site Plan and Special Permit Review  
Traffic Review

Dear Mr. Rondeau:

BETA Group, Inc. (BETA) has reviewed documents for the project entitled: Primrose School located at 700-712 Union Street in Franklin, MA. This letter is provided to present BETA's findings, comments and recommendations.

#### BASIS OF REVIEW

The following documents were received by BETA and will form the basis of the review:

- Plans (16 sheets) entitled: Site Plan Set for Primrose School Franchising Company Proposed Child Day Care Facility dated June 22, 2022, revised September 23, 2022, prepared by Stonefield Engineering & Design, LLC. of Salem, MA.
- Traffic Impact Assessment, dated June 22, 2022, revised September 23, 2022, prepared by Stonefield Engineering & Design, LLC.

#### INTRODUCTION

The project site is approximately 2.6 acres and is located at the corner of Union Street and Spruce Pond Road in the Town of Franklin (the "Site"). The Site is located within the Commercial II zoning district.

The existing Site is an area of open space with various amenities including a playground, basketball court, and two sheds. The majority of the Site is an open field and is bordered by a fence. A sidewalk is present along Union Street on the opposite side of the roadway from the Site.

#### FINDINGS, COMMENTS AND RECOMMENDATIONS

To help with the review, the Stonefield response to the 1<sup>st</sup> review will be labeled "STONEFIELD". The BETA response to these comments will follow the Stonefield response and be labeled "BETA2".

The proposed development would consist of a 13,525± sq. ft. one-story childcare facility with 50 parking spaces. Access to the Site is proposed via a new curb cut and driveway along Union Street at the southeastern corner of the Site.

The study area includes the signalized intersection of King Street at Union Street, in addition to the unsignalized access driveway intersection with Union Street.

- T1. Previous studies in the area, including the 700 Union Street development, have additionally included the signalized intersections of King Street at Interstate 495 (I-495) Northbound Ramps, King Street at I-495

Southbound Ramps, and King Street at Constitution Boulevard. Clarify why these intersections are missing as they operate under coordinated conditions.

STONEFIELD: Per the Massachusetts Department of Transportation (MassDOT) Transportation Impact Assessment (TIA) Guidelines, "intersections (to be assessed by approach) or roadway segments where site-generated trips increase the peak hour traffic volumes by a) five (5) percent or more or b) by more than 100 vehicles per hour should be included in the study." Based on a review of the 2021 Existing Traffic Volume data presented in the "Response to Peer Review Update" prepared by Vanasse & Associates, Inc. (VAI), dated January 10, 2022 for the proposed warehouse development at 585 King Street, and the site-generated trip assignment for the proposed child care center, the anticipated subject site impacts would not exceed the thresholds identified within the MassDOT TIA guidelines at the signalized intersections of King Street at Interstate 495 (I-495) Northbound Ramps, King Street at I-495 Southbound Ramps, and King Street at Constitution Boulevard. As such, as the development is not anticipated to have a significant adverse impact on the signal operations at these intersections, an analysis of these intersections was not deemed necessary.

BETA2: Information provided. No further comment.

- T2. The timing directives mentioned in the report are missing from the Appendix. Provide the information for reference.

STONEFIELD: Traffic Signal Plans provided by MassDOT pertaining to the study intersection of King Street and Union Street utilized for analysis purposes are contained within the Technical Appendix of the Traffic Impact Assessment prepared by Stonefield.

BETA2: Information provided. No further comment.

## 2022 EXISTING TRAFFIC VOLUMES

Traffic volume data was obtained from a Traffic Impact Assessment prepared by Vanasse & Associates, Inc. (VAI) dated October 2021 for the proposed development located at 585 King Street in Franklin, MA.

This included manual turning movement counts (TMCs) taken on Wednesday, May 26<sup>th</sup>, 2021, from 7:00 AM to 9:00 AM and 4:00 PM to 6:00 PM and automatic traffic recorder (ATR) on King Street over a 48-hour period on Wednesday, May 26<sup>th</sup> and Thursday, May 27<sup>th</sup>, 2021. To account for the difference in traffic patterns due to the pandemic, permanent count station data from 2018 was compared to the 2021 data by VAI. The existing 2021 volumes were increased by 6.1% to account for the volume reduction due to the pandemic. Additionally, the proponent applied a 1.0% growth rate to bring the 2021 volume to 2022 in the report.

The base volumes used in this study were taken from the original 585 King Street TIA prior to any peer review comments. As part of the 585 King Street project review, the 2021 volumes were compared with 2018 volumes presented in the 700 Union Street Traffic Study. This comparison found several movements were lower in 2021 than in 2018. In particular, the Union Street southbound AM & PM right-turn movement, and the King Street through movements and Union Street northbound left-turn movements during the AM peak.

MassDOT recently updated their volume data policies stating traffic data collected after May 1<sup>st</sup>, 2022, is generally considered typical for "post-pandemic" conditions, with the application of adjustments as needed.

- T3. Consideration should be given to collecting AM and PM peak hour data at the intersection to verify the data provided in this study.

STONEFIELD: Given that there is acceptable pre-COVID-19 traffic volume data available in connection with the other planned developments within the subject site vicinity, and per consultations with BETA, it was deemed that collection of new traffic count data is not necessary at this time.

In order to address comments contained within the subject review letter regarding the difference in the identified turning movements from the 2018 versus 2021 historical traffic volumes at the study intersection, the analysis was updated to reflect the revisions contained within the "Response to Peer Review Update" prepared by Vanasse & Associates, Inc. (VAI), dated January 10, 2022, for the proposed warehouse development at 585 King Street. These revisions include the use of turning movement counts collected in 2018 which were grown to 2021 in accordance with "Guidance on Traffic Counting Data," published by MassDOT in April 2020, rather than utilizing 2021 turning movement counts. Note the 2021 Existing Traffic Volumes presented within the aforementioned response letter were conservatively grown by 1.0% for one (1) year to illustrate the 2022 Existing Traffic Volumes utilized within the enclosed Traffic Impact Assessment. The Level of Service analysis of the 2022 Existing, 2029 No-Build, and 2029 Build Conditions was revised accordingly within the Traffic Impact Assessment. Based on the analysis findings, the proposed development would not have a significant impact on the operations of the adjacent roadway network.

BETA2: Information provided. No further comment.

#### MOTOR VEHICLE COLLISION ANALYSIS

Crash data were obtained from the MassDOT database for the three-year period from March 1, 2017, to March 1, 2020. Eleven crashes were reported at the intersection over the three-year period which included six angle-type crashes. MassDOT crash data after 2019 is generally deemed "not complete" and may not accurately represent conditions. Crash data from January 2017 to December 2019 may be requested pending the review of additional data/information outlined below.

The crash rate, quantified as crashes per million entering vehicles, was found to be 0.49 MEV for the King Street at Union Street intersection which is lower than both the statewide and District 3 average crash rates for signalized intersections.

- T4. The directional volumes used to calculate the crash rate on the Intersection Crash Rate Worksheet could not be verified. Please clarify how these traffic volumes were developed.

STONEFIELD: The directional volumes and calculations contained within the Crash Intersection Worksheet were revised to be consistent with the 2022 Existing Traffic Volumes illustrated in Figure 2 within the revised Traffic Impact Assessment prepared by Stonefield.

BETA2: Information provided. No further comment.

- T5. The study referenced a "MassDOT Collision Diagram" which was not included in the Appendix. Please provide the Collision Diagram and list of associated crashes for reference.

STONEFIELD: A detailed list of the crashes referred to in the analysis and an updated MassDOT Intersection Crash Rate Worksheet are provided in the Technical Appendix of the revised Traffic Impact Assessment.

BETA2: A MassDOT Collision Diagram, as originally stated, was not provided but it is not necessary for this study. No further comment.



**2029 NO-BUILD CONDITION**

No-Build traffic volumes were determined by applying a growth rate of 1-percent per year over a seven-year design horizon. This growth rate is consistent with other studies being conducted in the area.

The No-Build condition also includes the addition of the project trips from the proposed developments at 725 Union Street and 585 King Street. The projected trips were then distributed in the study area.

A review of the planned development trip distribution revealed small discrepancies with the number of proposed planned development site trips based on the TIA's for each project. These discrepancies are not expected to significantly impact the conclusions of the Assessment.

**TRIP GENERATION**

Project-generated traffic volumes were determined by utilizing trip-generation statistics published by the Institute of Transportation Engineers (ITE) for Land Use Code 565 (Day Care Center). The chosen land use is appropriate for the Project. The Project Site is estimated to generate approximately 650 new trips on an average weekday based on the gross floor area (GFA) of the facility. New peak hour trips are estimated to be 149 (79 entering, 70 exiting) in the weekday morning peak hour, and 150 (70 entering, 80 exiting) in the weekday afternoon peak hour.

- T6. BETA understands that there are multiple existing facilities similar to the proposed within the immediate region. Recommend the Applicant collect empirical trip generation data at one or two similar sized facilities to confirm the anticipated trip generation.

STONEFIELD: Stonefield completed a review of empirical data collected at a similar existing Primrose child care center operation in Paramus, New Jersey, and compared the Institute of Transportation Engineers' (ITE) trip generation projections prepared within the Traffic Impact Assessment for the proposed development. It is important to note that the empirical trip generation data is representative of the tenant-specific characteristics associated with the proposed development that would influence typical trip generation patterns. Please note the observed facility operated with 123 students whereas the proposed development would have a capacity of 183 students, and therefore the projections were proportionally increased to provide a conservative analysis. Please refer to Table I below.

TABLE I -TRIP GENERATION COMPARISON

Land Use	Weekday Morning Peak Hour			Weekday Evening Peak Hour		
	Ente	Exit	Total	Ente	Exit	Total
13,525 SF Day Care Center <i>ITE Land Use 565</i>	79	70	149	70	80	150
123-Student Primrose Child Care Center <i>Site-Specific Operations</i>	40	45	95	43	48	91
183-Student Primrose Child Care Center <i>Calibrated Site-Specific Operations</i>	60	67	127	64	71	135

A pass-by rate was applied to the proposed number of site trips. The pass-by rate of 44% was obtained from the ITE's Trip Generation Handbook, 3<sup>rd</sup> Edition for the weekday evening peak hour. BETA finds this methodology to generally be in accordance with ITE, though notes that the 44% pass-by rate is based on one



Study Site evaluated in 1990, which is not a good representation of what the pass-by rate would be. The proposed Project is located on a spur road nearby an interstate interchange and several other business/commercial parks and uses. It is very likely that some trips will divert from the Interstate and/or King Street to utilize the Site, though these patterns would not be directly apparent.

As shown in Table I, the ITE projection provides a more conservative projection of the anticipated site-generated trips compared to standard Primrose child care center operations. Accordingly, the ITE projections were maintained within the revised Traffic Impact Study. It should be noted that the Site Plan prepared by Stonefield indicates the development will operate with an 8,685-square-foot classroom floor area and a 13,525-square-foot total floor area. The total floor area of 13,525 square feet was conservatively utilized to prepare the trip generation projections and analyses contained within the Traffic Impact Assessment, however it is reasonable to assume that the number of trips generated by the site may be lower than projected within the analysis.

BETA2: Information provided. No further comment.

- T7. BETA recommends that a pass-by rate not be applied to the proposed trips due to the limited study size.

STONEFIELD: Data published within the ITE Trip Generation Manual, 11th Edition is widely accepted within the industry and is reflective of the anticipated portion of site-generated trips which would consist of diverted trips due to motorists temporarily diverting from King Street or 1-495 to complete a trip to the child care center. As stated within the traffic review letter, "it is very likely that some trips will divert from the Interstate and/or King Street to utilize the Site." However, since ITE publishes a pass-by rate for a day care center land use during the weekday evening peak hour only, the applied pass-by credit was removed from the weekday morning peak hour analysis contained within the revised Traffic Impact Assessment in order to provide a conservative analysis.

BETA2: Information provided. No further comment.

Trips were distributed through the study area based on existing travel patterns which BETA finds acceptable for the site location.

#### COMPARATIVE LEVEL OF SERVICE TABLES

Capacity analyses were performed for the Existing, No-Build, and Build conditions. The analysis results provided show the intersection currently operates, and would continue to operate during the Build condition, at acceptable Level of Service (LOS) C overall, with all approaches operating at LOS D or better during the morning peak period, and LOS E or better during the evening peak No-Build and Build conditions. The proposed driveway would operate at LOS B or better.

- T8. Queue information was not provided. Provide a simple table which shows the average and 95<sup>th</sup> percentile queue data.

STONEFIELD: The study was updated to provide a summary of the average and 95th percentile queue lengths at the adjacent intersection of King Street and Union Street and at the proposed site driveway along Union Street. Please refer to Tables 7 through 11 within the revised Traffic Impact Assessment prepared by Stonefield.

BETA2: Information provided. No further comment.

- T9. Table 5 of the Assessment should be revised to show the WB Left/Through/Right LOS for Existing, No-Build, and Build operate with LOS C instead of LOS B.

STONEFIELD: The aforementioned correction was applied to Table 5 within the revised Traffic Impact Assessment prepared by Stonefield.

BETA2: Table revised. No further comment.

#### SIGHT DISTANCE

The available stopping sight distance (SSD) at the site driveway was measured by the proponent and found to exceed the 390 feet minimum required SSD based on the 35-mph posted speed limit. BETA concurs with this assessment with the understanding that any vegetation would be cleared along the site that might restrict the sight line.

#### SITE CIRCULATION/PARKING

The site was reviewed as part of BETA's peer review letter dated August 4, 2022. The comments below are additional to the comments noted in the prior review.

- T10. Clarify the location of the proposed driveway in relation to the adjacent driveway and driveways on the opposite side of Union Street.

STONEFIELD: In relation to the easterly side of Union Street where the subject property is situated, the proposed site driveway is located approximately 207 feet north of the adjacent Milford-Franklin Eye Center driveway. In relation to the westerly (opposite) side of Union Street, the proposed site driveway is situated between the existing Hampton Inn driveways, approximately 25 feet from the northerly Hampton Inn driveway and approximately 75 feet from the southerly Hampton Inn driveway. Note these measurements do not include the driveway curb radii.

BETA2: Information provided. No further comment.

- T11. Elaborate on the placement and application of the proposed speed bumps. Clarify if these speed bumps have been installed in other day care location parking lots.

STONEFIELD: The proposed speed bump locations have been revised to provide a traffic calming effect along the ingress/egress to the site in order to reduce speeds when entering and exiting the property.

BETA2: The speed bumps have been relocated to the driveway which is an improved location. No further comment.

- T12. Ideally the speed bumps would not be located directly in line with parking spaces. Consideration should be given to installing islands in between the parking for the speed bump placements.

STONEFIELD: The proposed speed bump locations have been revised and no longer conflict with the proposed parking spaces.

BETA2: Speed bumps have been removed adjacent to parking spaces. No further comment.

- T13. Consideration should be given to one-way circulation throughout the parking lot to avoid the added potential conflicts throughout the parking lot given the tight two-way turning locations.

STONEFIELD: The Applicant has agreed to one-way circulation throughout the parking area. It should be noted the drive-aisles, turning radii, and parking space layout meet the Town requirements and are aligned with industry standards.

BETA2: The circulation has been reconfigured to one-way circulation. No further comment.

T14. Clarify if designated parking will be allocated to the employees and if so, please label.

STONEFIELD: Testimony was provided that employees are instructed to park in the spaces far away from the entrance area. The Applicant is providing designated drop-off and pick-up spaces along the building for parents to utilize.

BETA2: Information provided. No further comment.

T15. Consideration should be given to providing a pedestrian path connecting the parking adjacent to the driveway to the building.

STONEFIELD: The Applicant has provided enhanced measures to ensure safe pedestrian access to the building including introducing one-way circulation, providing designated drop-off/pick-up spaces along the building, and oversized aisles between parking spaces to assist the drop-off/pick-up operation.

BETA2: Information provided. No further comment.

If we can be of any further assistance regarding this matter, please contact us at our office.

Very truly yours,  
BETA Group, Inc.



Jaklyn Centracchio, PE, PTOE  
Project Manager

cc: Amy Love, Town Planner

Job No: 10519.01

# Town of Franklin

355 East Central Street  
Franklin, Massachusetts 02038-1352



Phone: (508) 520-4907  
www.franklinma.gov

## DEPARTMENT OF PLANNING AND COMMUNITY DEVELOPMENT

**DATE:** October 5, 2022  
**TO:** Franklin Planning Board  
**FROM:** Department of Planning and Community Development  
**RE:** 700 Union Street (750 Union St)  
Site Plan

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### **General:**

1. The site is located at 700 Union Street in the Commercial II Zoning District (Assessors Map 303 Lots 046 & 047).
2. The applicant is proposing to construct a 13,525 sq/ft foot daycare with 50 parking spaces.
3. The Applicant is not required to file with the Conservation Commission.

### **Comments from August 8, 2022:**

1. The Planning Board was concerned about the 12% grade and asked the Fire review. Fire has submitted a letter.
2. Provide an area for snow storage. One area has been provided.
3. Fencing around the basin in the rear.
4. Provide reinforced concrete detail. Applicant has added to the plans.
5. The Applicant should show on the abutting structures on the site plan.
6. The applicant will need to file with the Design Review Commission for signage and building facade. Applicant has recommendation from Design Review.
7. An ANR plan will need to be filed to combine the lots prior to construction.
8. A traffic Impact Assessment has been submitted by the Applicant. BETA has completed their traffic review and there are no outstanding items.

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**Primrose Franklin, MA (700-712 Union Street)**

1 message

**Joseph Barbieri** <jbarbieri@franklinma.gov>

Thu, Sep 29, 2022 at 2:16 PM

To: "Denk, Brian" &lt;bdenk@stonefieldeng.com&gt;

Cc: Amy Love &lt;alove@franklinma.gov&gt;, "Kline, Josh" &lt;jkline@stonefieldeng.com&gt;

Good afternoon,

We are in receipt of your email inquiring about any additional comments on the proposed project at 700-712 Union St. We have reviewed the plans again and we do not have any additional comments at this time.

Please let me know if you have any questions.

Joseph Barbieri, Deputy Fire Chief  
Franklin Fire Department  
[40 West Central St.](#)  
[Franklin, MA 02038](#)  
FD #: (508) 528-2323  
Fax: (508) 520-4912  
Direct Office Line (508) 553-5571



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# STONEFIELD

September 28, 2022

Mr. Gregory Rondeau  
Chairman  
Franklin Planning Board  
355 East Central Street  
Franklin, MA 02038

**RE: Primrose Schools Franchising Co.  
Map 303, Parcels 46 & 47  
700-712 Union Street  
Town of Franklin, Norfolk County, Massachusetts**

Dear Mr. Rondeau:

Our office is submitting documents on behalf of the Applicant to address the comments contained within the Board Professional's review letters dated August 4, 2022 and August 22, 2022. Please find the following items enclosed:

ITEM DESCRIPTION	DATED	COPIES	PREPARED BY
Site Plan Set (24" x 36")	09-23-2022	2	Stonefield Engineering & Design
Site Plan Set (11" x 17")	09-23-2022	5	Stonefield Engineering & Design
Stormwater Pollution Prevention Plan	09-23-2022	2	Stonefield Engineering & Design
Traffic Impact Statement	09-23-2022	2	Stonefield Engineering & Design
Soil Movement Exhibit (24" x 36")	09-23-2022	2	Stonefield Engineering & Design
Soil Movement Exhibit (11" x 17")	09-23-2022	5	Stonefield Engineering & Design
Waiver Request Memorandum	09-23-2022	2	Stonefield Engineering & Design
XGrass Drainage Test Report	02-19-2019	2	TSI Testing Service
Storm & Drain Easements	10-22-2021	2	Commonwealth of Massachusetts

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**The following is an itemized response to the comments contained within the BETA Group, Inc. Review Letter dated August 4, 2022. For the sake of brevity, any comments that are statements of fact or have been previously addressed are not included in the response below:**

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Site Visit:

SVI. *Provide existing conditions information for the area abutting the Site to the northeast, including Spruce Pond Road. Indicate topography in this area and location of existing catch basins within the street to show anticipated flow characteristics of stormwater runoff discharged via the proposed outfalls.*

**Existing conditions for the area abutting the site to the northeast is provided on the site plans included as part of this submission.**

STONEFIELDENG.COM

120 WASHINGTON STREET, SALEM, MA 01970 617.203.2076 T.201.340.4472 F.

SV2. *Revise plan to show the location of the existing building located between the northern property line and Spruce Pond Road.*

**Location of this existing building is provided on the site plans included as part of this submission.**

Finding, Comments, and Recommendations:

General:

G1. *BETA notes that the project proposes significant excavation which may require approval under the Earth Removal Regulations (§185-23). Overall soil quantities should be developed and shown on the site plans.*

**Please see enclosed the Earthwork Exhibit based on review with the Building Official the project would not require an Earth Removal Permit. The summary of earthwork quantities is also provided on the Grading Plan (Sheet C-5) of the site plans included as part of this submission.**

G2. *The project as proposed will modify the nature of the stormwater discharge on to the abutting parcel. Based upon the topography, it appears that under existing conditions the majority of site runoff will flow towards a swale along the rear property line and flow from west to east to a low point at the northeast corner of the lot. The applicant should note if there are any easement rights for this flow condition and if they apply to the proposed conditions.*

**The existing storm and drainage easement associated with the outfall in the rear of the site are provided as part of this submission. This documentation has also been approved for compliance by the town DPW.**

Drawing Requirements (§185-31):

Z1. *Provide note that all proposed plantings come from the Best Development Practices Guidebook and revise and proposed species which are not on that list (§185-31.C.(3).(k)).*

**The requested note is provided on the Landscaping Plan (Sheet C-10) of the site plans included as part of this submission.**

Parking, Loading And Driveway Requirements (§185-21):

Z2. *Indicate distance between the proposed curb cut and the nearby driveway entrance associated with 750 Union Street. Entrance of exit center lines may not fall within 150 feet of the entrance of any other parking area entrance or exit on the same side of the street (§185-21.C(7.a)).*

**Dimensions between the proposed curb cut and the nearby driveway entrance are now provided on the Site Plan (Sheet C-4) of the site plans included as part of this submission.**

Z3. *Consider providing a crosswalk across Union Street and extending the proposed walkway to facilitate pedestrian access to the Site.*

**Noted, at this time the Applicant is not proposing a cross-walk across Union Street.**



- Z4. *Review grading of gravel access road to confirm that vertical curves can be safely traveled by a Town of Westwood Fire Apparatus.*

**The proposed gravel access path is designed at a maximum slope of 10% and to function safely for access by emergency vehicles.**

Screening (§185-35) and Landscaping:

- Z5. *BETA defers to the Board regarding adequacy of the existing screening.*

**Acknowledged.**

Lighting (§185-31.C(4)(E)):

- Z6. *Request waiver for light spillage beyond the limit of the property (§185-31.C(4).(e)).*

**A waiver is requested for light spillage beyond the limit of the property, as noted in the waiver request memorandum included as part of this submission. It should be noted that the spillage occurs at the proposed driveway location.**

Stormwater Management:

- SW1. *Provide anti-float ring or similar for OS-I and other structures which may extend below the water table.*

**An anti-float pad for OS-I is now proposed within the aboveground infiltration basin. Please refer to Stormwater Management Plan (Sheet C-6) and Construction Details (Sheet C-15) of the site plans included as part of this submission.**

Subdivision Regulations - Stormwater Management Regulations (§300-11):

- SW2. *Provide min. 20' setback between subsurface porous pavement infiltration system and building foundation ((§300-11.A(7.a)).*

**A 20' setback is now provided between the subsurface infiltration system and the building foundation as shown on Stormwater Management Plan (Sheet C-6) of the site plans included as part of this submission.**

- SW3. *Revise proposed drainage pipe to be reinforced concrete or request waiver (§300-11.B(2.a)).*

**A waiver is requested for the utilization of reinforced concrete drainage pipes, as noted in the waiver request memorandum included as part of this submission.**

- SW4. *Provide required headwall at outfalls (§300-11.B(2.b)).*

**Headwalls are now provided at outfalls as seen on Stormwater Management Plan (Sheet C-6) of the site plans included as part of this submission.**

- SW5. *Revise catch basin detail to include a 4' sump (§300-11.B(3.c)).*

**The Double Grate Catch Basin Detail now provides a 4' sump note on Sheet C-14 and a Hood and Sump detail is has been added on Sheet C-15 of the site plans included as part of this submission.**

## Post-Development Peak Discharge Rates (Standard Number 2):

SW6. *Provide table comparing pre- and post-development runoff volume*

**A table comparing pre- and post-development runoff volume is provided within the SWPPP included as part of this submission.**

SW7. *Revise watershed boundaries to include any offsite areas that will drain to the proposed infiltration BMPs. This is anticipated to include a portion of Union Street and its associated catchment area where the lack of curbing will allow stormwater to flow onto the property.*

**Watershed boundaries have been revised to include offsite areas that will drain to the proposed infiltration BMP as detailed in the SWPPP included as part of this submission.**

SW8. *Revise area of infiltration basin to use a cover type of impervious Water Surface to avoid “double-counting” the infiltration that will occur in this area.*

**As part of the stormwater analysis included within the SWPPP and based on meetings with BETA Group, the infiltration basin is now modeled with a CN value of 80.**

SW9. *Provide data quantifying the anticipated rate of infiltration through the artificial turf layer. Provide means of ensuring that stormwater runoff will flow into the artificial turf layer rather than flowing to the north and west.*

**Tested infiltration rates through the artificial turf layer are included as part of this submission. It should be noted the infiltration rate through the turf surface far exceeds the infiltration rate of a typical porous asphalt or pervious paver system.**

SW10. *Review design of pipe “M-100 to FB.” Based on provided calculations, the design capacity is inadequate.*

**The storm pipe from manhole M-100 to Headwall HW-3 has been revised to a 15” pipe.**

## Recharge To Groundwater (Standard Number 3):

SW11. *Provide plan showing the location of each test pit to verify elevation of groundwater.*

**Test pit locations are now provided on the site plans included as part of this submission.**

SW12. *Based upon the density of the underlying native soils noted by the soil evaluator. BETA agrees that an infiltration rate of 0.17 inches per hour is appropriate for the site.*

**Acknowledged.**

SW13. *Provide calculations for provided recharge volume. Due to the proposed low-flow outlets, there is no static storage within this basin and calculations to support dynamic storage have not been provided.*

**Calculations of the proposed recharge volume are provided within the SWPPP included as part of this submission.**

SW14. *Revise infiltration basin to provide a min. 1-foot of freeboard between the 100-yr storm elevation and the top of basin berm elevation.*

**The aboveground infiltration basin B-2 has been revised to provide a minimum of 1-foot of freeboard between the 100-year storm and the top of basin berm elevation. Please refer to the HydroCAD reports provided in Appendix C of the SWPPP and the Infiltration Basin B-2 Detail on Sheet C-14 of the site plans included as part of this submission.**

SW15. *Provide impervious barrier, typically a curb, through emergency spillway riprap to prevent flows through the spillway below the intended invert elevation.*

**Concrete curb spillway enforcement is now provided. Please refer to Stormwater Management Plan (Sheet C-6) and Construction Details (Sheet C-14) of the site plans included as part of this submission.**

Total Suspended Solids (Standard Number 4):

SW16. *Provide worksheets for calculation of TSS removal for each treatment train. The TSS removal for Treatment Train A is only 80%. The pretreatment provided by the catch basin and the forebay are requirements for the 80% provided by the basin.*

**Worksheets for calculation of TSS removal are provided within Appendix C of the SWPPP included as part of this submission.**

SW17. *Provide calculations for provided total phosphorus (TP) removal and total nitrogen removal (TN) (BDPG).*

**Because the provided water quality volume exceeds the required minimum by 6,687 CF, the project is therefore not subject to the Town of Franklin's treatment requirements (90% average annual post-construction Total Suspended Solids (TSS) removal and 60% Total Phosphorus (TP) removal) and has been designed to meet the MassDEP 80% TSS treatment requirement standard.**

SW18. *Refer to comment SW13 above for determination of water quality volume, accounting for runoff that will bypass treatment via the low-flow outlets. If the project cannot retain the 1.0-inch water quality volume on-site, the treatment train must provide 90% TSS removal and 60% Phosphorus removal.*

**An anti-float pad for OS-1 is proposed within the aboveground infiltration basin. Please refer to Stormwater Management Plan (Sheet C-6) and Construction Details (Sheet C-15) of the site plans included as part of this submission.**

SW19. *Provide Long-Term Pollution Prevention Plan or include required measures as part of the Operation & Maintenance Plan.*

**A long-term pollution prevention plan is provided in the SWPPP included as part of this submission.**

SW20. *Review design of artificial turf and subsurface infiltration system. The artificial turf detail calls for 95% min. compacted fill beneath the turf and references a soils report, while the basin detail calls for Type #2 stone beneath the turf. Provide a copy of this soils report and rectify the inconsistency.*

**The Artificial Turf Detail has been revised, rectifying the inconsistency. Please refer to Artificial Turf Detail (Sheet C-12) and Infiltration Basin B-1 Detail (Sheet C-14) of the site plans included as part of this submission.**

Erosion And Sediment Controls (Standard Number 8):

SW21. *Provide Stormwater Pollution Prevention Plan (SWPPP).*

**A stormwater pollution prevention plan is included as part of this submission.**

SW22. *Supplement silt fence with additional perimeter control (compost filter tube) along downgradient property boundaries to ensure adequate erosion mitigation.*

**Silt fence and additional perimeter control are provided as seen on Sheet C-9 of the site plans included as part of this submission.**

SW23. *Provide measures to prevent access to the Site via the proposed gravel driveway to ensure all construction period access is via the stabilized construction entrance.*

**Measures to ensure that vehicles can only access the site via the stabilized construction entrance have been provided via silt fencing around the perimeter of the site. Please refer to Soil Erosion & Sediment Control Plan (Sheet C-9) of the site plans included as part of this submission.**

SW24. *Provide inlet protection at downgradient catch basins within Union Street and Spruce Pond Road.*

**Silt fences, additional perimeter control, and inlet protection filters are provided as protection for downgradient catch basins. Please refer to Soil Erosion & Sediment Control Plan (Sheet C-9) of the site plans included as part of this submission.**

SW25. *Clarify location of temporary sediment basin noted in the construction sequence. If the infiltration basin is intended to be used as this sediment basin, provide measures to remove any construction period sediment from the basin during site restoration.*

**No temporary sediment basin is proposed as part of the project scope and the sequence of construction has been revised accordingly. Please refer to Soil Erosion & Sediment Control Plan (Sheet C-9) of the site plans included as part of this submission.**

SW26. *Provide means of protecting subsurface infiltration system from construction-period sediment.*

**Additional basin protection notes have been added for both infiltration basin locations including fencing to be installed around the perimeter of the proposed infiltration basins and limiting access to light weight equipment to the greatest extent possible. Please refer to Soil Erosion & Sediment Control Plan (Sheet C-9) of the site plans included as part of this submission.**

SW27. *Provide description of all construction and stockpile and/or excess materials removed from the Site or expected to be stored on-site (§153-12.L).*

**Description of all stockpile materials and/or excess materials to be removed from the site is provided under Section 3.0 – Proposed Conditions of the SWPPP included as part of this submission.**

SW28. *Revise construction sequencing to include timing of stripping and clearing, construction of utilities, infrastructure, and buildings, and final grading (§153-12.M).*

**The sequence of construction has been revised accordingly. Please refer to Soil Erosion & Sediment Control Plan (Sheet C-9) of the site plans included as part of this submission.**

SW29. *Include requirement that erosion control barriers must be installed, inspected, and approved by a professional engineer or licensed wetlands scientist and that no sedimentation barrier may be removed without prior approval of the commission or its staff (BDPG).*

**The requested note is provided on the Soil Erosion & Sediment Control Plan (Sheet C-9) of the site plans included as part of this submission.**

Operations/Maintenance Plan (Standard Number 9):

SW30. *Include maintenance of the outfalls and riprap aprons.*

**Maintenance plan for outfalls and riprap aprons is provided in the SWPPP included as part of this submission.**

SW31. *Provide owner signature (§153-18.B(5)).*

**Owner's signature to be provided prior to construction or final approval.**

SW32. *Include provision requiring a documentation submittal to the DPW confirming when maintenance has been satisfactorily completed (§153-18.B(6)).*

**A provision requiring documentation submittal to the DPW when maintenance has been satisfactorily completed is provided within the SWPPP included as part of this submission.**

SW33. *Include note that the owner of the stormwater management system must notify the Director of changes in ownership or assignment of financial responsibility (§153-18.D(1)).*

**A provision requiring documentation of a change in ownership to the DPW is provided within the SWPPP included as part of this submission.**

SW34. *Include maintenance of sediment forebays.*

**Maintenance plan for sediment forebays is provided in the SWPPP included as part of this submission.**

SW35. *Provide inspection and maintenance of deep sump catch basins at a frequency of at least 4 times per year.*

**Inspection and maintenance plan for deep sump catch basins is provided in the SWPPP included as part of this submission.**

SW36. *Provide Map showing the location of all stormwater BMPs in each treatment train along with the discharge point.*

**Plan sheets inclusive of the locations of all stormwater BMP's are provided in the appendices of the SWPPP included as part of this submission.**

SW37. *Provide inspection ports for the subsurface infiltration system.*

**Inspection ports for subsurface infiltration system are now proposed. Please refer to Stormwater Management Plan (Sheet C-6) of the site plans included as part of this submission.**

SW38. *Indicate anticipated means of accessing infiltration basin, sediment forebay, outlet control structure, and outfalls for maintenance.*

**Access paths to the stormwater facilities are shown on the Stormwater Management Plan (Sheet C-6) of the site plans included as part of this submission.**

Illicit Discharges (Standard Number 10):

SW39. *Revise statement to note that there are no existing illicit discharges present on the Site.*

**The SWPPP has been revised to state that there are no illicit discharges present on the site.**

SW40. *Provide signature of owner on the illicit discharge compliance statement.*

**Owner's signature to be provided prior to construction or final approval.**

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**The following is an itemized response to the comments contained within the BETA Group, Inc. Review Letter dated August 4, 2022. For the sake of brevity, any comments that are statements of fact or have been previously addressed are not included in the response below:**

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Site Visit:

T1. *Previous studies in the area, including the 700 Union Street development, have additionally included the signalized intersection of King Street at Interstate 495 (I-495) Northbound Ramps, King Street at I-495 Southbound Ramps, and King Street at Constitution Boulevard. Clarify why these intersections are missing as they operate under coordinated conditions.*

**Per the Massachusetts Department of Transportation (MassDOT) Transportation Impact Assessment (TIA) Guidelines, "intersections (to be assessed by approach) or roadway segments where site-generated trips increase the peak hour traffic volumes by a) five (5) percent or more or b) by more than 100 vehicles per hour should be included in the study." Based on a review of the 2021 Existing Traffic Volume data presented in the "Response to Peer Review Update" prepared by Vanasse & Associates, Inc. (VAI), dated January 10, 2022 for the proposed warehouse development at 585 King Street, and the site-generated trip assignment for the proposed child care center, the anticipated subject site impacts would not exceed the thresholds identified within the MassDOT TIA guidelines at the signalized intersections of King Street at Interstate 495 (I-495) Northbound Ramps, King Street at I-495 Southbound Ramps, and King Street at Constitution Boulevard. As such, as the development is not anticipated to have a significant adverse impact on the signal operations at these intersections, an analysis of these intersections was not deemed necessary.**

T2. *The timing directives mentioned in the report are missing from the Appendix. Provide the information for reference.*

**Traffic Signal Plans provided by MassDOT pertaining to the study intersection of King Street and Union Street utilized for analysis purposes are contained within the Technical Appendix of the Traffic Impact Assessment prepared by Stonefield.**

- T3. Consideration should be given to collecting AM and PM peak hour data at the intersection to verify the data provided in this study.

**Given that there is acceptable pre-COVID-19 traffic volume data available in connection with the other planned developments within the subject site vicinity, and per consultations with BETA, it was deemed that collection of new traffic count data is not necessary at this time.**

**In order to address comments contained within the subject review letter regarding the difference in the identified turning movements from the 2018 versus 2021 historical traffic volumes at the study intersection, the analysis was updated to reflect the revisions contained within the “Response to Peer Review Update” prepared by Vanasse & Associates, Inc. (VAI), dated January 10, 2022 for the proposed warehouse development at 585 King Street. These revisions include the use of turning movement counts collected in 2018 which were grown to 2021 in accordance with “Guidance on Traffic Counting Data,” published by MassDOT in April 2020, rather than utilizing 2021 turning movement counts. Note the 2021 Existing Traffic Volumes presented within the aforementioned response letter were conservatively grown by 1.0% for one (1) year to illustrate the 2022 Existing Traffic Volumes utilized within the enclosed Traffic Impact Assessment. The Level of Service analysis of the 2022 Existing, 2029 No-Build, and 2029 Build Conditions was revised accordingly within the Traffic Impact Assessment. Based on the analysis findings, the proposed development would not have a significant impact on the operations of the adjacent roadway network.**

- T4. The direction volumes used to calculate the crash rate on the Intersection Crash Rate Worksheet could not be verified. Please clarify how these traffic volumes were developed.

**The directional volumes and calculations contained within the Crash Intersection Worksheet were revised to be consistent with the 2022 Existing Traffic Volumes illustrated in Figure 2 within the revised Traffic Impact Assessment prepared by Stonefield.**

- T5. The study reference a “MassDOT Collision Diagram” which was not included in the Appendix. Please provide the Collision Diagram and list of associated crashes for reference.

**A detailed list of the crashes referred to in the analysis and an updated MassDOT Intersection Crash Rate Worksheet are provided in the Technical Appendix of the revised Traffic Impact Assessment.**

- T6. BETA understands that there are multiple existing facilities similar to the proposed within the immediate region. Recommend the Applicant collect empirical trip generation data at one or two similar sized facilities to conform the anticipated trip generation.

**Stonefield completed a review of empirical data collected at a similar existing Primrose child care center operation in Paramus, New Jersey, and compared the Institute of Transportation Engineers’ (ITE) trip generation projections prepared within the Traffic Impact Assessment for the proposed development. It is important to note that the empirical trip generation data is representative of the tenant-specific characteristics associated with the proposed development that would influence typical trip generation patterns. Please note the observed facility operated with 123 students whereas the proposed development would have a capacity of 183 students, and therefore the projections were proportionally increased to provide a conservative analysis. Please refer to Table I below.**

**TABLE I –TRIP GENERATION COMPARISON**

Land Use	Weekday Morning Peak Hour			Weekday Evening Peak Hour		
	Enter	Exit	Total	Enter	Exit	Total
13,525 SF Day Care Center <i>ITE Land Use 565</i>	79	70	149	70	80	150
123-Student Primrose Child Care Center <i>Site-Specific Operations</i>	40	45	95	43	48	91
183-Student Primrose Child Care Center <i>Calibrated Site-Specific Operations</i>	60	67	127	64	71	135

As shown in Table I, the ITE projection provides a more conservative projection of the anticipated site-generated trips compared to standard Primrose child care center operations. Accordingly, the ITE projections were maintained within the revised Traffic Impact Study. It should be noted that the Site Plan prepared by Stonefield indicates the development will operate with an 8,685-square-foot classroom floor area and a 13,525-square-foot total floor area. The total floor area of 13,525 square feet was conservatively utilized to prepare the trip generation projections and analyses contained within the Traffic Impact Assessment, however it is reasonable to assume that the number of trips generated by the site may be lower than projected within the analysis.

T7. BETA recommends that a pass-by rate not be applied to the proposed trips due to the limited study size.

Data published within the ITE Trip Generation Manual, 11<sup>th</sup> Edition is widely accepted within the industry and is reflective of the anticipated portion of site-generated trips which would consist of diverted trips due to motorists temporarily diverting from King Street or I-495 to complete a trip to the child care center. As stated within the traffic review letter, “it is very likely that some trips will divert from the Interstate and/or King Street to utilize the Site.” However, since ITE publishes a pass-by rate for a day care center land use during the weekday evening peak hour only, the applied pass-by credit was removed from the weekday morning peak hour analysis contained within the revised Traffic Impact Assessment in order to provide a conservative analysis.

T8. Queue information was not provided. Provide a simple table which shows the average and 95<sup>th</sup> percentile queue data.

The study was updated to provide a summary of the average and 95<sup>th</sup> percentile queue lengths at the adjacent intersection of King Street and Union Street and at the proposed site driveway along Union Street. Please refer to Tables 7 through 11 within the revised Traffic Impact Assessment prepared by Stonefield.

T9. Table 5 of the Assessment should be revised to show the WB Left/Through/Right LOS for Existing, No-Build, and Build operate with LOS C instead of LOS B.

The aforementioned correction was applied to Table 5 within the revised Traffic Impact Assessment prepared by Stonefield.



T10. Clarify the location of the proposed driveway in relation to the adjacent driveways on the opposite side of Union Street.

**In relation to the easterly side of Union Street where the subject property is situated, the proposed site driveway is located approximately 207 feet north of the adjacent Milford-Franklin Eye Center driveway. In relation to the westerly (opposite) side of Union Street, the proposed site driveway is situated between the existing Hampton Inn driveways, approximately 25 feet from the northerly Hampton Inn driveway and approximately 75 feet from the southerly Hampton Inn driveway. Note these measurements do not include the driveway curb radii.**

T11. Elaborate on the placement and application of the proposed speed bumps. Clarify if these speed bumps have been installed in other day care location parking lots.

**The proposed speed bump locations have been revised to provide a traffic calming effect along the ingress/egress to the site in order to reduce speeds when entering and exiting the property.**

T12. Ideally the speed bumps would not be located directly in line with parking spaces. Consideration should be given to installing islands in between the parking for the proposed speed bump placement.

**The proposed speed bump locations have been revised and no longer conflict with the proposed parking spaces.**

T13. Consideration should be given to one-way circulation throughout the parking lot to avoid the added potential conflicts throughout the parking lot given the tight two-way turning locations.

**The Applicant has agreed to one-way circulation throughout the parking area. It should be noted the drive-aisles, turning radii, and parking space layout meet the Town requirements and are aligned with industry standards.**

T14. Clarify if designated parking will be allocated to the employees and if so, please label.

**Testimony was provided that employees are instructed to park in the spaces far away from the entrance area. The Applicant is providing designated drop-off and pick-up spaces along the building for parents to utilize.**

T15. Consideration should be given to providing a pedestrian path connecting the parking adjacent to the driveway to the building.

**The Applicant has provided enhanced measures to ensure safe pedestrian access to the building including introducing one-way circulation, providing designated drop-off/pick-up spaces along the building, and oversized aisles between parking spaces to assist the drop-off/pick-up operation.**

Should you have any questions regarding the submission items or responses above please do not hesitate to contact our office.

Regards,



Joshua Kline, PE  
**Stonefield Engineering and Design, LLC**

Via FedEx



# TRAFFIC IMPACT ASSESSMENT

## PROPOSED CHILD CARE CENTER

Proposed Child Care Center  
Map 303, Parcels 46 & 47  
700-712 Union Street  
Town of Franklin  
Norfolk County, Massachusetts

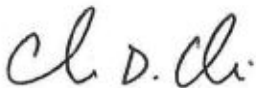
Prepared For:  
Primrose School Franchising Company

Date: June 22, 2022  
**Revised: September 23, 2022**  
SE&D Job No. BOS-210005



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**STONEFIELD**

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Intersection of King Street and Union Street

#### **MOTOR VEHICLE COLLISION DATA**

Motor Vehicle Collision Data – Intersection of King Street and Union Street  
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Intersection of Union Street & King Street

## EXECUTIVE SUMMARY

The revised Traffic Impact Assessment was prepared to update the June 22, 2022 issuance of the Traffic Impact Study. This issuance addresses the comments contained within the Traffic Review letter prepared by Beta Group Inc. (BETA), dated August 22, 2022. The following is a summary of the revisions and the analyses contained herein:

1. A review was conducted of the proposed child care center development using the Site Plan prepared by Stonefield Engineering & Design, dated September 23, 2022.
2. Historical turning movement counts which were collected at the intersection of King Street and Union Street on October 25, 2018, were utilized to establish the 2022 Existing Traffic Volumes in accordance with “Guidance on Traffic Counting Data,” published by MassDOT in April 2020. The turning movement counts, and count adjustments, were obtained from the “Response to Traffic Peer Review” prepared by Vanasse and Associates Inc. (VAI), dated December 2, 2021 and the “Response to Traffic Peer Review” prepared by VAI, dated January 10, 2022, respectively, in connection with the proposed warehouse building located proximate to the subject site at 585 King Street.
3. The previously applied diverted trip credit based on available pass-by data published within the Institute of Transportation Engineers’ (ITE) Trip Generation Manual, 11<sup>th</sup> Edition, was conservatively removed from the analysis during the weekday morning peak hour to address the comments contained within the aforementioned Traffic Review letter prepared by BETA.
4. A revised Level of Service Analysis was performed at the proposed site driveway and at the adjacent signalized intersection of King Street and Union Street based on the comments presented within the aforementioned Traffic Review letter prepared by BETA. The Level of Service analysis findings are generally consistent with the original study and indicate that the proposed development is not anticipated to have a significant adverse impact on the operations of the adjacent roadway network.
5. A summary of the average and 95<sup>th</sup> percentile queue lengths at the proposed site driveway and the adjacent signalized intersection of King Street and Union Street is provided for the 2022 Existing Condition, 2029 No-Build Condition, and 2029 Build Condition where applicable. Under the 2029 Build Condition, a minimal increase in average and 95<sup>th</sup> percentile queue lengths are calculated at the adjacent signalized intersection of King Street and Union Street, and the calculated 95<sup>th</sup> percentile queue lengths would be accommodated in the proposed driveway throat length without adversely impacting on-site circulation.
6. Empirical data pertaining to existing Primrose facilities were reviewed and cited to address the comments contained within the aforementioned Traffic Review letter prepared by BETA.

## INTRODUCTION

This Traffic Impact Assessment was prepared to investigate the potential impacts of the proposed child care center on the adjacent roadway network. The subject property is located along the easterly side of Union Street in the Town of Franklin, Norfolk County, Massachusetts. The site location is shown on appended **Figure I**.

The subject property is designated as Map 303, Parcels 46 & 47 as depicted on the Town of Franklin GIS Tax Accessor Interactive Map. The site has approximately 360 feet of frontage along Union Street and approximately 268 feet of frontage along Spruce Pond Road. The existing site is enclosed with fencing and occupied by various playground equipment and sporting facilities, and undeveloped grassland in connection with the Boston Sports Club. Vehicular access is not presently provided to the subject property. Under the proposed development program, a 13,525-square-foot child care center would be constructed. Access is proposed via one (1) full movement driveway along Union Street.

## METHODOLOGY

Stonefield Engineering & Design, LLC has prepared this Traffic Impact Assessment in accordance with the recommended guidelines and practices outlined by the Institute of Transportation Engineers (ITE) within Transportation Impact Analyses for Site Development. A detailed field investigation was performed to assess the existing conditions of the adjacent roadway network. A data collection effort was completed to identify the existing traffic volumes at the study intersections to serve as a base for the traffic analyses. Capacity analysis, a procedure used to estimate the traffic-carrying ability of roadway facilities over a range of defined operating conditions, was performed using the Highway Capacity Manual, 6<sup>th</sup> Edition (HCM), HCM 2000, and the Synchro II Software for all study conditions to assess the roadway operations.

For an unsignalized intersection, Level of Service (LOS) A indicates operations with delay of less than 10 seconds per vehicle, while LOS F describes operations with delay in excess of 50 seconds per vehicle. For a signalized intersection, LOS A indicates operations with delay of less than 10 seconds per vehicle, while LOS F describes operations with delay in excess of 80 seconds per vehicle. The Technical Appendix contains the Highway Capacity Analysis Detail Sheets for the study intersections analyzed in this assessment. The traffic signal timing utilized within the signalized analysis is based on timing directives provided by the Massachusetts Department of Transportation (MassDOT) and contained within the Traffic Impact Assessment prepared by Vanasse & Associates, Inc. (VAI), dated October 2021, for the proposed warehouse building located proximate to the subject site at 585 King Street.

## **2022 EXISTING CONDITION**

### 2022 EXISTING ROADWAY CONDITIONS

The proposed child care center is located along the easterly side of Union Street in the Town of Franklin, Norfolk County, Massachusetts. The subject property is designated as Map 303, Parcels 46 & 47 as depicted on the Town of Franklin GIS Tax Assessor Interactive Map. The site has approximately 360 feet of frontage along Union Street and approximately 268 feet of frontage along Spruce Pond Road. Land uses in the area are predominantly commercial, residential, and institutional.

Union Street is classified as a local roadway to the south of King Street and an urban minor arterial roadway to the north of King Street, has a general north-south orientation, and is under the jurisdiction of the Town of Franklin. Along the site frontage, the roadway carries approximately 1,154 vehicles daily, provides one (1) lane of travel in each direction, and has a posted speed limit of 30 mph. Along the site frontage, curb and sidewalk are provided along the westerly side of the roadway, shoulders are not provided along either side of the roadway, and on-street parking is not permitted along either side of the roadway. Union Street provides north-south connection between Beaver Street and the southerly roadway extent to the south of King Street for predominantly residential and commercial uses along its length.

King Street is classified as an urban minor arterial roadway, with a general northeast-southwest orientation, and is under the jurisdiction of the Town of Franklin. The roadway carries approximately 19,268 vehicles daily, provides one (1) lane of travel in each direction to the east of Union Street and two (2) lanes of travel in each direction to the west of Union Street, and has a posted speed limit of 35 mph within the site vicinity. To the east of Union Street curb and sidewalk are provided along both sides of the roadway, and to the west of Union Street curb and sidewalk are provided along the southerly side of the roadway. Shoulders are generally provided along both sides of the roadway and on-street parking is not permitted along either side of the roadway. King Street provides connection to thoroughfares such as State Route 140 and Interstate 495 and consists of predominantly residential and commercial uses along its length.

Union Street and King Street intersect to form a signalized four (4)-leg intersection. The eastbound approach of King Street provides one (1) exclusive left-turn lane, one (1) exclusive through lane, and one (1) exclusive right-turn lane and the westbound approach of King Street provides one (1) shared left-turn/through lane and one (1) shared through/right-turn lane. The northbound approach of Union Street provides one (1) exclusive left-turn lane and one (1) shared through/right-turn lane and the southbound approach of Union Street provides one (1) shared left-turn/through lane and one (1) exclusive right-turn lane. Crosswalks, pedestrian signals, and pedestrian ramps are provided across all legs of the intersection.

## 2022 EXISTING TRANSIT SERVICE

The subject site is located approximately 1.5 miles from the Massachusetts Bay Transportation Authority (MBTA) Franklin/Foxboro Commuter Rail Line, however there are no fixed public transit facilities located within the immediate vicinity of the site. Please note that the Greater Attleboro-Taunton Regional Transit Authority (GATRA) offers a program known as “GATRA GO United” which operates as a micro-transit service, allowing riders within a set service area to request same-day vehicle service. Additionally, GATRA provides a demand response service (“Dial-a-Ride”) which serves eligible seniors and persons with disabilities residing in the Town of Franklin.

## 2022 EXISTING TRAFFIC VOLUMES

Please note that per the comments contained within the “Traffic Review” letter prepared by BETA Group, Inc. (BETA), dated August 22, 2022 for the subject development, and consultations with BETA following, historical manual turning movement counts were obtained from the “Response to Traffic Peer Review” letter prepared by VAI, dated December 2, 2021 pertaining to the Traffic Impact Assessment for the proposed warehouse development located proximate to the subject site at 585 King Street. The manual turning movement counts were collected at the intersection of Union Street and King Street on Thursday, October 25, 2018, from 7:00 a.m. to 9:00 a.m. and from 4:00 p.m. to 6:00 p.m.

Based on the review of the count data, the weekday morning peak hour occurred from 7:30 a.m. to 8:30 a.m. and the weekday evening peak hour occurred from 4:45 p.m. to 5:45 p.m. Please note that a count of pedestrians and bicycles was included as part of the manual turning movement counts at the study intersection during the study time periods. During the weekday morning and weekday evening peak hours, minimal pedestrian and bicycle volumes were observed at the study intersection. The Technical Appendix contains a summary of the turning movement count data.

Please note that in connection with the COVID-19 pandemic and directives issued by the Massachusetts governor, the “Response to Traffic Peer Review” letter prepared by VAI, dated January 10, 2022, provides details on the calibration measures which were completed in accordance with “Guidance on Traffic Counting Data,” published by MassDOT in April 2020. The 2021 Existing Traffic Volumes which were calibrated from the historical 2018 turning movement counts accordingly and presented within the aforementioned “Response to Traffic Peer Review” letter prepared by VAI, dated January 10, 2022, were conservatively grown by 1.0% for an additional one (1) year to project the 2022 Existing Traffic Volumes. The 2022 Existing weekday morning and weekday evening peak-hour volumes are summarized on appended **Figure 2**.



## 2022 EXISTING LOS/CAPACITY ANALYSIS

A Level of Service and Volume/Capacity analysis was conducted for the 2022 Existing Condition during the weekday morning and weekday evening peak hours at the study intersection. Under the 2022 Existing Condition, the signalized intersection of Union Street and King Street is calculated to operate at overall Level of Service C during the weekday morning and weekday evening peak hours, and the turning movements at the study intersection are calculated to operate at Level of Service D or better during the study peak hours.

## MOTOR VEHICLE COLLISION ANALYSIS

In order to assess the safety of the intersection of Union Street and King Street, three (3) years of motor vehicle collision data were obtained from the MassDOT Crash Query and Visualization web application. Data for the time period spanning from March 1, 2017 to March 1, 2020 which is unaffected by COVID-19, was queried. Please note that the queried motor vehicle collision data sufficiently accounts for the 95<sup>th</sup> percentile queue lengths calculated at the study intersection. **Table I** provides a summary of the manner and severity of the motor vehicle collisions reported at or near the study intersection.

**TABLE I – MOTOR VEHICLE COLLISION ANALYSIS SUMMARY**

Location	Collision Type	Number of Collisions	Collisions Resulting in Injury	Collisions Resulting in Fatality
Intersection of Union Street & King Street	Angle	6	1	0
	Rear-end	2	0	0
	Sideswipe, same direction	2	0	0
	Head on	1	0	0
	<b>Total</b>	<b>11</b>	<b>1</b>	<b>0</b>

As shown in **Table I**, a total 11 collisions were reported at the study intersection over the 36-month period; this equates to approximately one (1) collision every three (3) months. It is important to note that zero (0) fatalities occurred as a result of the reported motor vehicle collisions in the study network. It should also be noted that zero (0) accidents involved pedestrian or bicycle interactions.

Based on historical data published by MassDOT and turning movement counts collected at the study location, the intersection of Union Street and King Street experienced approximately 25.6 million entering vehicles over the 3-year study period and has a calculated collision rate of 0.43 collisions per million entering vehicles. According to average accident rate data published by the MassDOT for District 3, where the subject site is located, a typical signalized intersection has an average crash rate of 0.89 per million entering vehicles. It should be noted that based on a review of the MassDOT “Top Crash Locations” interactive crash cluster map, the study area does not contain any vehicle, pedestrian, or bicycle crash clusters. A MassDOT Intersection

Crash Rate Worksheet for the study intersection is contained within the Technical Appendix. Crash rates at the study location are not anticipated to be adversely impacted due to the proposed development.

## **2029 NO-BUILD CONDITION**

### BACKGROUND GROWTH

The 2022 Existing Condition traffic volume data was grown to a future horizon year of 2029 in accordance with MassDOT Traffic Impact Assessment guidelines. In accordance with industry guidelines, the existing traffic volumes at the study intersections were increased by 1.0% annually for seven (7) years to generate the 2029 Base Traffic Volumes. These volumes are summarized on appended **Figure 3**. The 1.0% background growth rate is a conservative growth rate based on historical traffic growth trends in the study region.

### OTHER PLANNED DEVELOPMENT PROJECTS

To evaluate the future traffic conditions, it is important to consider the potential site-generated traffic of other projects that could influence the traffic volume at the study intersections. Other planned development projects include those that are either in the entitlement process or have recently been approved for building permits in proximity to the proposed development. Based on consultations with the Town of Franklin Planning Department the following developments are anticipated to impact traffic volumes within the study area:

- ◆ 585 King Street – Proposed 293,600-square-foot warehouse building to be constructed along King Street approximately 0.5 miles southwest of the subject site. The site-generated trips associated with the proposed development were routed through the study network during the weekday morning and weekday evening peak hours based on the site-generated trip distributions provided within the aforementioned Traffic Impact Assessment prepared by Vanasse & Associates.
- ◆ 725 Union Street – 100-room hotel building located across from the subject site on the westerly side of Union Street, currently under construction. Based on a review of the Trip Generation Assessment Report prepared by Vanasse & Associates, Inc., dated March 12, 2018, the development is expected to generate 45 trips (27 entering, 18 exiting) during the weekday morning peak hour and 49 trips (25 entering and 24 exiting) during the weekday evening peak hour. The site-generated trips were routed through the study network based on the existing traffic patterns along the adjacent roadways and the access management plan of the site.

Appended **Figure 4** illustrates the site-generated traffic associated with the other planned development projects assigned to the study area network.

**2029 NO-BUILD TRAFFIC VOLUMES**

The site-generated trips associated with the other planned development projects were added to the 2029 Base Traffic Volumes to calculate the 2029 No-Build Traffic Volumes for the weekday morning and weekday evening peak hours. These volumes are summarized on appended **Figure 5**.

**2029 NO-BUILD LOS/CAPACITY ANALYSIS**

A Level of Service and Volume/Capacity analysis was also conducted for the 2029 No-Build Condition during the weekday morning and weekday evening peak hours at the study intersection. Under the 2029 No-Build Condition, the signalized intersection of Union Street and King Street is calculated to operate generally consistent with the findings of the 2022 Existing Condition during the weekday morning and weekday evening peak hours. Please note that the southbound left/through movement at the study intersection exceeds the Level of Service D-E threshold during the weekday evening peak hour. The turning movements at the study intersection are otherwise calculated to operate generally consistent with the findings of the 2022 Existing Condition during the study peak hours.

**2029 BUILD CONDITION**

The site-generated traffic volume of the proposed child care center was estimated to identify the potential impacts of the project. For the purpose of this analysis, a complete project “build out” is assumed within seven (7) years of the preparation of this study.

**TRIP GENERATION**

Trip generation projections for the proposed child care center were prepared utilizing ITE’s Trip Generation Manual, 11<sup>th</sup> Edition. Trip generation rates associated with Land Use 565 “Day Care Center” were cited for the 13,525-square-foot child care center. **Table 2** provides the weekday morning and weekday evening trip generation volumes associated with the proposed development.

**TABLE 2 – PROPOSED TRIP GENERATION**

Land Use	Weekday Morning Peak Hour			Weekday Evening Peak Hour		
	Enter	Exit	Total	Enter	Exit	Total
13,525 SF Day Care Center <i>ITE Land Use 565</i>	79	70	149	70	80	150

In order to address the comments contained within the aforementioned Traffic Review letter prepared by BETA, empirical data collected at a similar existing Primrose child care center operation in Paramus, New Jersey was reviewed and compared to the trip generation projections cited from ITE. It is important to note

that the empirical trip generation data is representative of the tenant-specific characteristics associated with the proposed development that would influence typical trip generation patterns. Additionally, please note that the observed facility operated with 123 students whereas the proposed development would have a capacity of 183 students, and therefore the projections were proportionally increased to provide a conservative analysis. **Table 3** provides a comparison of the empirical data and the ITE data during the weekday morning and weekday evening peak hours.

**TABLE 3 –TRIP GENERATION COMPARISON**

Land Use	Weekday Morning Peak Hour			Weekday Evening Peak Hour		
	Enter	Exit	Total	Enter	Exit	Total
13,525 SF Day Care Center <i>ITE Land Use 565</i>	79	70	149	70	80	150
123-Student Primrose Child Care Center <i>Site-Specific Operations</i>	40	45	95	43	48	91
183-Student Primrose Child Care Center <i>Calibrated Site-Specific Operations</i>	60	67	127	64	71	135

As shown in **Table 3**, the ITE projection provides a more conservative projection of the anticipated site-generated trips compared to standard Primrose child care center operations. As such, the ITE projections are conservatively utilized for the analysis contained herein. It is important to note that the Site Plan prepared by Stonefield Engineering & Design, dated September 23, 2022, indicates the development will operate with an 8,685-square-foot classroom floor area and a 13,525-square-foot total floor area. The total floor area of 13,525 square feet was conservatively utilized to prepare the trip generation projections and analyses contained herein, however it is reasonable to assume that the number of trips generated by the site may be lower than projected within the analysis contained herein.

As stated within Chapter 10 of ITE’s Trip Generation Handbook, 3<sup>rd</sup> Edition, there are instances when the total number of trips generated by a site is different from the amount of new traffic added to the street system by the generator. Child care centers may be located on or adjacent to busy streets to provide a more convenient pick-up and drop-off location for parents/guardians commuting to and from work. Therefore, the proposed development would be expected to attract a portion of its trips from the traffic passing through the study intersection on the way from an origin to an ultimate destination. These trips do not add new traffic to the adjacent roadway system and are referred to as “pass-by” trips.

Based upon the published ITE data for Land Use 565 “Day Care Center,” 44% of the site-generated traffic during the weekday evening peak hour is comprised of pass-by traffic. While ITE does not publish pass-by rates during the weekday morning peak hour, it is reasonable to assume that a similar percentage of pass-by trips would be generated during the weekday morning peak hour. However, in order to provide a conservative

analysis and address the comments contained within the aforementioned Traffic Review letter prepared by BETA, a diverted credit was not applied during the weekday morning peak hour. **Table 4** shows the site generated traffic for the proposed development in terms of new trips and diverted trips.

**TABLE 4 – PROPOSED TRIP GENERATION – NEW & DIVERTED TRIPS**

Land Use	Weekday Morning Peak Hour			Weekday Evening Peak Hour		
	Enter	Exit	Total	Enter	Exit	Total
“New” Trips	79	70	149	40	50	90
“Diverted” Trips	0	0	0	30	30	60
<b>Total</b>	<b>79</b>	<b>70</b>	<b>149</b>	<b>70</b>	<b>80</b>	<b>150</b>

At the study intersection, the calculated number of diverted trips is shown as a negative number at the through movement as the vehicles are temporarily diverted from the through travel stream into and out of the site access point.

TRIP ASSIGNMENT/DISTRIBUTION

The trips generated by the proposed development were distributed according to the existing travel pattern along the adjacent roadways and the access management plan of the site. The “New” Site-Generated Traffic Volumes are illustrated on **Figure 6** and the “Diverted” Site-Generated Traffic Volumes expected to access the site are depicted on **Figure 7**.

2029 BUILD TRAFFIC VOLUMES

The site-generated trips were added to the 2029 No-Build Traffic Volumes to calculate the 2029 Build Traffic Volumes and are shown on appended **Figure 8**.

2029 BUILD LOS/CAPACITY ANALYSIS

A Level of Service and Volume/Capacity analysis was also conducted for the 2029 Build Condition during the weekday morning and weekday evening peak hours at the study intersection and proposed site driveway. **Tables 5** through **7** compare the 2022 Existing, 2029 No-Build, and 2029 Build Conditions Level of Service and delay values.

Under the 2029 Build Condition, the signalized intersection of Union Street and King Street is calculated to operate generally consistent with the findings of the 2029 No-Build Condition during the weekday morning and weekday evening peak hours. As such, the proposed development is not anticipated to have a significant adverse impact on the operations of the adjacent roadway network.

Under the 2029 Build Condition, the turning movements at the site driveway are calculated to operate at Level of Service B or better during the weekday morning peak hour and Level of Service A during the weekday evening peak hour.

**COMPARATIVE LEVEL OF SERVICE (DELAY) TABLES**

**UNION STREET & KING STREET**

EB (Eastbound) and WB (Westbound) approaches are the King Street approaches  
NB (Northbound) and SB (Southbound) approaches are the Union Street approaches  
X (n) = Level of Service (seconds of delay)

**TABLE 5 – WEEKDAY MORNING PEAK HOUR**

Lane Group	2022 Existing	2029 No-Build	2029 Build
EB Left	D (41.5)	D (42.1)	D (42.1)
EB Through	B (10.5)	B (11.0)	B (12.2)
EB Right	A (7.0)	A (7.1)	A (8.0)
WB Left/Through/Right	C (21.7)	C (23.0)	C (25.7)
NB Left	C (29.5)	C (30.7)	C (31.4)
NB Through/Right	C (26.8)	C (27.0)	C (26.2)
SB Left/Through	D (45.7)	D (50.1)	D (47.9)
SB Right	C (27.2)	C (27.9)	C (26.9)
<b>Intersection</b>	<b>C (22.8)</b>	<b>C (23.8)</b>	<b>C (24.7)</b>

**TABLE 6 – WEEKDAY EVENING PEAK HOUR**

Lane Group	2022 Existing	2029 No-Build	2029 Build
EB Left	D (40.8)	D (41.3)	D (41.3)
EB Through	A (8.9)	A (9.4)	A (9.5)
EB Right	A (5.6)	A (5.7)	A (6.0)
WB Left/Through/Right	C (23.0)	C (25.0)	C (26.8)
NB Left	C (31.8)	C (32.8)	D (36.6)
NB Through/Right	C (28.8)	C (29.0)	C (29.1)
SB Left/Through	D (48.6)	E (56.7)	E (69.4)
SB Right	C (27.1)	C (27.4)	C (27.3)
<b>Intersection</b>	<b>C (22.6)</b>	<b>C (23.8)</b>	<b>C (25.4)</b>

**UNION STREET & SITE DRIVEWAY**

WB (Westbound) approach is the site driveway approach  
NB (Southbound) approach is the Union Street approach  
X (n) = Level of Service (seconds of delay)

**TABLE 7 – 2029 BUILD CONDITION**

Lane Group	Weekday Morning Peak Hour	Weekday Evening Peak Hour
WB Left/Right	B (10.6)	A (9.8)
SB Left	A (8.1)	A (7.8)

**AVERAGE AND 95<sup>TH</sup> PERCENTILE QUEUEING ANALYSIS**

To address the comments contained within the aforementioned Traffic Review letter prepared by BETA, the average and 95<sup>th</sup> percentile queue lengths were calculated and reported for the adjacent intersection of King Street and Union Street and the proposed site driveway. **Tables 8 and 9** provide a summary calculated average queue lengths for the 2022 Existing, 2029 No-Build, and 2029 Build Conditions, and **Tables 10 through 12** provide a summary calculated 95<sup>th</sup> percentile queue lengths for the 2022 Existing, 2029 No-Build, and 2029 Build Conditions.

Based on the findings of the 2022 Existing, 2029 No-Build, and 2029 Build Conditions, a minimal increase in the average and 95<sup>th</sup> percentile queue lengths are calculated with the addition of the site-generated volumes to the adjacent intersection of King Street and Union Street. As such, the proposed development is not anticipated to have a significant adverse impact on the adjacent roadway network operations. The calculated 95<sup>th</sup> percentile queue lengths would be accommodated in the proposed driveway throat length without adversely impacting on-site circulation.

**COMPARATIVE AVERAGE & 95<sup>TH</sup> PERCENTILE QUEUE LENGTH TABLES**

**UNION STREET & KING STREET**

EB (Eastbound) and WB (Westbound) approaches are the King Street approaches  
NB (Northbound) and SB (Southbound) approaches are the Union Street approaches  
X (n) = Queue Length (feet)

**TABLE 8 –WEEKDAY MORNING PEAK HOUR AVERAGE QUEUE LENGTH**

<b>Lane Group</b>	<b>2022 Existing</b>	<b>2029 No-Build</b>	<b>2029 Build</b>
EB Left	110	118	118
EB Through	174	200	206
EB Right	0	0	0
WB Left/Through/Right	148	174	190
NB Left	92	103	121
NB Through/Right	32	38	51
SB Left/Through	44	50	60
SB Right	4	27	36

**TABLE 9 – WEEKDAY EVENING PEAK HOUR AVERAGE QUEUE LENGTH**

Lane Group	2022 Existing	2029 No-Build	2029 Build
EB Left	151	163	163
EB Through	190	203	193
EB Right	0	0	0
WB Left/Through/Right	203	225	232
NB Left	73	90	117
NB Through/Right	10	14	22
SB Left/Through	38	45	55
SB Right	41	59	59

**TABLE 10 – WEEKDAY MORNING PEAK HOUR 95<sup>TH</sup> PERCENTILE QUEUE LENGTH**

Lane Group	2022 Existing	2029 No-Build	2029 Build
EB Left	172	185	185
EB Through	241	260	260
EB Right	0	0	5
WB Left/Through/Right	214	236	253
NB Left	154	177	207
NB Through/Right	75	87	110
SB Left/Through	91	101	130
SB Right	52	82	94

**TABLE 11 – WEEKDAY EVENING PEAK HOUR 95<sup>TH</sup> PERCENTILE QUEUE LENGTH**

Lane Group	2022 Existing	2029 No-Build	2029 Build
EB Left	218	237	237
EB Through	242	274	274
EB Right	0	1	11
WB Left/Through/Right	281	313	334
NB Left	131	154	189
NB Through/Right	40	46	65
SB Left/Through	82	102	128
SB Right	98	120	120

**UNION STREET & SITE DRIVEWAY**

WB (Westbound) approach is the site driveway approach  
 NB (Southbound) approach is the Union Street approach  
 X (n) =Queue Length (feet)

**TABLE 12 – 2029 BUILD CONDITION 95<sup>TH</sup> PERCENTILE QUEUE LENGTH**

Lane Group	Weekday Morning Peak Hour	Weekday Evening Peak Hour
WB Left/Right	7.5	7.5
SB Left	5	5



## SITE CIRCULATION/PARKING SUPPLY

A review was conducted of the proposed child care center using the Site Plan prepared by Stonefield Engineering & Design, dated September 23, 2022. In completing this review, particular attention was focused on the site access, circulation, and parking supply.

Access is proposed via one (1) full-movement driveway along Union Street. The 24-foot wide driveway will be located on the southerly portion of the property. The 13,525-square-foot building to operate as a child care center will be constructed on the northwestern portion of the property. The primary building entrance will be located along the westerly building façade and an outdoor playground will be located along the easterly building façade. The accessory parking lot will be located along the southerly building façade and on the southerly portion of the property, and one (1)-way, counterclockwise vehicular circulation will be supported on site via 24-foot-wide drive aisles, in accordance with recommendations contained within the aforementioned Traffic Review letter prepared by BETA. Additionally, please note that per the comments contained within the aforementioned Traffic Review letter prepared by BETA, two (2) speed bumps are proposed within the southernmost drive aisle proximate to the site driveway and the accessory parking lot to act as a traffic calming measure for vehicles entering and exiting the site; additional speed bumps which were previously proposed on-site within the parking lot are no longer proposed, as depicted on the latest Site Plan.

The available sight lines for the proposed driveway along Union Street were evaluated in accordance with the American Association of State Highway and Transportation Officials (AASHTO) standards for a design speed of 35 mph. Based on the AASHTO standards, an intersection sight distance of 390 feet is required at the site driveway. The available sight lines at the proposed driveway exceed the minimum intersection sight distance requirements and therefore the driveway is not anticipated to operate with safety constraints.

Regarding the parking requirements for the proposed development, the Town of Franklin Zoning Ordinance does not have a specific requirement for child care centers. The site would provide 46 total parking spaces, inclusive of two (2) ADA-accessible parking stalls. The proposed spaces would be nine (9) feet wide by 19 feet deep in accordance with the Town of Franklin Ordinance and industry standards.

The proposed parking supply was evaluated with respect to data published within the ITE's Parking Generation, 5<sup>th</sup> Edition, for Land Use 565 "Day Care Center." Specifically, parking generation rates for General Urban/Suburban locations were utilized. The average parking demand rate during the peak weekday period for Land Use 565 "Day Care Center" is 2.45 vehicles per 1,000 square feet of gross floor area. For the proposed 13,525-square-foot child care center, this equates to 34 parking spaces. As such, the proposed parking supply of 46 spaces would be sufficient to support the parking demand of the site.

Additionally, parking count data collected at existing Primrose facilities was reviewed to provide a comparison of the square footage of the facility, parking supply provided, and observed maximum parking demand for similarly operating developments. **Table 13** provides a summary of the parking observations at the studied existing Primrose facilities.

**TABLE 13 – MAXIMUM OBSERVED PARKING DEMAND**

Primrose Center	Size of Center	Parking Supply	Maximum Observed Parking Demand
Berkely Heights, NJ	13,500 SF	39	25
Warren, NJ	12,275 SF	50	30
Mountainside, NJ	14,100 SF	35	29
Florham Park	12,800 SF	37	24
Old Bridge, NJ	12,275 SF	40	21
Paramus, NJ	12,220 SF	47	39

As shown in **Table 13**, the parking supply provided at typical Primrose facilities was sufficient to support the maximum observed parking demand at the study locations. It is also important to note that an average drop-off time of six (6) minutes was typically observed, thereby allowing for quick turnaround of parking utilization on site. Therefore, the proposed parking supply of 46 spaces would be sufficient to support the anticipated future parking demand of the proposed development.

## CONCLUSIONS

This report was prepared to examine the potential traffic impact of the proposed child care center. The analysis findings, which have been based on industry-standard guidelines, indicate that the proposed development would not have a significant impact on the traffic operations of the adjacent roadway network. The site driveway and on-site layout have been designed to provide for effective access to and from the subject property, and the parking supply would be sufficient to support this project.


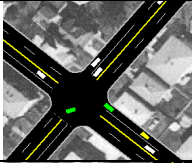




## **TECHNICAL APPENDIX**

**LEVEL OF SERVICE/AVERAGE CONTROL DELAY CRITERIA**

## LEVEL OF SERVICE /AVERAGE CONTROL DELAY CRITERIA

The ability of a roadway to effectively accommodate traffic demand is determined through an assessment of the volume-to-capacity ratio, delay and Level of Service of the lane group and/or intersection. The volume-to-capacity ratio is the ratio of traffic flow rate to capacity for a given transportation facility. As defined within the Highway Capacity Manual 2010 (HCM 2010), intersection delay is the total additional travel time experienced by drivers, passengers, or pedestrians as a result of control measures and interaction with other users of the facility, divided by the volume departing from the corresponding cross section of the facility. Level of service is a qualitative measure describing operational conditions within a traffic stream, based on service measures such as speed and travel time, freedom to maneuver, traffic interruptions, comfort and convenience.

For an unsignalized intersection, LOS A indicates operations with delay less than 10 seconds per vehicle, while LOS F describes operations with delay in excess of 50 seconds per vehicle. For a signalized intersection, LOS A indicates operations with delay less than 10 seconds per vehicle and LOS F denotes operations with delay in excess of 80 seconds per vehicle.

	Level Of Service (LOS)	Signalized Delay Range (average control delay in sec/veh)	Unsignalized Delay Range (average control delay in sec/veh)
	A	$\leq 10$	$\leq 10$
	B	$> 10$ and $\leq 20$	$> 10$ and $\leq 15$
	C	$> 20$ and $\leq 35$	$> 15$ and $\leq 25$
	D	$> 35$ and $\leq 55$	$> 25$ and $\leq 35$
	E	$> 55$ and $\leq 80$	$> 35$ and $\leq 50$
	F	$> 80$	$> 50$

Source: Highway Capacity Manual 2010

**TURNING MOVEMENT COUNT DATA**

PDI File #: **186542 C**  
 Location: **N: Union Street S: Union Street**  
 Location: **E: King Street W: King Street**  
 City, State: **Franklin, MA**  
 Client: **VAI/ S. Kelly**  
 Site Code: **TBA**  
 Count Date: **Thursday, October 25, 2018**  
 Start Time: **7:00 AM**  
 End Time: **9:00 AM**  
 Class:



**Cars and Heavy Vehicles (Combined)**

	Union Street					King Street					Union Street					King Street					Total
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	
7:00 AM	47	10	11	0	68	5	132	12	0	149	9	9	25	0	43	8	105	40	0	153	413
7:15 AM	46	11	9	0	66	3	104	8	0	115	9	12	51	0	72	8	126	32	0	166	419
7:30 AM	66	8	8	0	82	1	125	7	0	133	11	14	41	0	66	11	134	39	0	184	465
7:45 AM	57	11	4	0	72	1	123	7	0	131	12	12	52	0	76	10	131	59	0	200	479
<b>Total</b>	<b>216</b>	<b>40</b>	<b>32</b>	<b>0</b>	<b>288</b>	<b>10</b>	<b>484</b>	<b>34</b>	<b>0</b>	<b>528</b>	<b>41</b>	<b>47</b>	<b>169</b>	<b>0</b>	<b>257</b>	<b>37</b>	<b>496</b>	<b>170</b>	<b>0</b>	<b>703</b>	<b>1776</b>
8:00 AM	48	10	9	0	67	5	111	13	0	129	11	17	45	0	73	14	116	34	0	164	433
8:15 AM	49	12	9	0	70	10	139	12	0	161	16	15	41	0	72	8	119	43	0	170	473
8:30 AM	49	4	3	0	56	3	105	13	0	121	11	14	41	1	67	11	121	43	0	175	419
8:45 AM	43	8	8	0	59	4	99	11	0	114	14	15	28	0	57	8	87	39	0	134	364
<b>Total</b>	<b>189</b>	<b>34</b>	<b>29</b>	<b>0</b>	<b>252</b>	<b>22</b>	<b>454</b>	<b>49</b>	<b>0</b>	<b>525</b>	<b>52</b>	<b>61</b>	<b>155</b>	<b>1</b>	<b>269</b>	<b>41</b>	<b>443</b>	<b>159</b>	<b>0</b>	<b>643</b>	<b>1689</b>
<b>Grand Total</b>	<b>405</b>	<b>74</b>	<b>61</b>	<b>0</b>	<b>540</b>	<b>32</b>	<b>938</b>	<b>83</b>	<b>0</b>	<b>1053</b>	<b>93</b>	<b>108</b>	<b>324</b>	<b>1</b>	<b>526</b>	<b>78</b>	<b>939</b>	<b>329</b>	<b>0</b>	<b>1346</b>	<b>3465</b>
Approach %	75.0	13.7	11.3	0.0		3.0	89.1	7.9	0.0		17.7	20.5	61.6	0.2		5.8	69.8	24.4	0.0		
Total %	11.7	2.1	1.8	0.0	15.6	0.9	27.1	2.4	0.0	30.4	2.7	3.1	9.4	0.0	15.2	2.3	27.1	9.5	0.0	38.8	
Exiting Leg Total	469					1093					236					1667					3465
Cars	391	73	59	0	523	31	882	79	0	992	90	105	315	1	511	75	873	317	0	1265	3291
% Cars	96.5	98.6	96.7	0.0	96.9	96.9	94.0	95.2	0.0	94.2	96.8	97.2	97.2	100.0	97.1	96.2	93.0	96.4	0.0	94.0	95.0
Exiting Leg Total	453					1022					228					1588					3291
Heavy Vehicles	14	1	2	0	17	1	56	4	0	61	3	3	9	0	15	3	66	12	0	81	174
% Heavy Vehicles	3.5	1.4	3.3	0.0	3.1	3.1	6.0	4.8	0.0	5.8	3.2	2.8	2.8	0.0	2.9	3.8	7.0	3.6	0.0	6.0	5.0
Exiting Leg Total	16					71					8					79					174

**Peak Hour Analysis from 07:00 AM to 09:00 AM begins at:**

7:30 AM	Union Street					King Street					Union Street					King Street					Total
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	
7:30 AM	66	8	8	0	82	1	125	7	0	133	11	14	41	0	66	11	134	39	0	184	465
7:45 AM	57	11	4	0	72	1	123	7	0	131	12	12	52	0	76	10	131	59	0	200	479
8:00 AM	48	10	9	0	67	5	111	13	0	129	11	17	45	0	73	14	116	34	0	164	433
8:15 AM	49	12	9	0	70	10	139	12	0	161	16	15	41	0	72	8	119	43	0	170	473
Total Volume	220	41	30	0	291	17	498	39	0	554	50	58	179	0	287	43	500	175	0	718	1850
% Approach Total	75.6	14.1	10.3	0.0		3.1	89.9	7.0	0.0		17.4	20.2	62.4	0.0		6.0	69.6	24.4	0.0		
PHF	0.833	0.854	0.833	0.000	0.887	0.425	0.896	0.750	0.000	0.860	0.781	0.853	0.861	0.000	0.944	0.768	0.933	0.742	0.000	0.898	0.966
Cars	215	40	29	0	284	17	471	37	0	525	48	56	174	0	278	40	470	168	0	678	1765
Cars %	97.7	97.6	96.7	0.0	97.6	100.0	94.6	94.9	0.0	94.8	96.0	96.6	97.2	0.0	96.9	93.0	94.0	96.0	0.0	94.4	95.4
Heavy Vehicles	5	1	1	0	7	0	27	2	0	29	2	2	5	0	9	3	30	7	0	40	85
Heavy Vehicles %	2.3	2.4	3.3	0.0	2.4	0.0	5.4	5.1	0.0	5.2	4.0	3.4	2.8	0.0	3.1	7.0	6.0	4.0	0.0	5.6	4.6
Cars Enter Leg	215	40	29	0	284	17	471	37	0	525	48	56	174	0	278	40	470	168	0	678	1765
Heavy Enter Leg	5	1	1	0	7	0	27	2	0	29	2	2	5	0	9	3	30	7	0	40	85
Total Entering Leg	220	41	30	0	291	17	498	39	0	554	50	58	179	0	287	43	500	175	0	718	1850
Cars Exiting Leg	241					547					117					860					1765
Heavy Exiting Leg	9					33					6					37					85
Total Exiting Leg	250					580					123					897					1850

PDI File #: **186542 C**  
 Location: **N: Union Street S: Union Street**  
 Location: **E: King Street W: King Street**  
 City, State: **Franklin, MA**  
 Client: **VAI/ S. Kelly**  
 Site Code: **TBA**  
 Count Date: **Thursday, October 25, 2018**  
 Start Time: **7:00 AM**  
 End Time: **9:00 AM**  
 Class:



46 Morton Street, Framingham, MA 01702  
 Office: 508-875-0100 Fax: 508-875-0118  
 Email: datarequests@pdillc.com

**Cars-Combined (Motorcycles, Cars, Light Goods)**

	Union Street					King Street					Union Street					King Street					Total
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	
7:00 AM	47	10	10	0	67	5	127	12	0	144	9	9	24	0	42	8	93	37	0	138	391
7:15 AM	42	11	9	0	62	3	99	8	0	110	9	12	51	0	72	8	116	32	0	156	400
7:30 AM	64	8	7	0	79	1	118	7	0	126	11	14	41	0	66	10	129	38	0	177	448
7:45 AM	54	10	4	0	68	1	116	7	0	124	11	11	52	0	74	9	125	58	0	192	458
<b>Total</b>	<b>207</b>	<b>39</b>	<b>30</b>	<b>0</b>	<b>276</b>	<b>10</b>	<b>460</b>	<b>34</b>	<b>0</b>	<b>504</b>	<b>40</b>	<b>46</b>	<b>168</b>	<b>0</b>	<b>254</b>	<b>35</b>	<b>463</b>	<b>165</b>	<b>0</b>	<b>663</b>	<b>1697</b>
8:00 AM	48	10	9	0	67	5	104	12	0	121	10	17	42	0	69	14	110	32	0	156	413
8:15 AM	49	12	9	0	70	10	133	11	0	154	16	14	39	0	69	7	106	40	0	153	446
8:30 AM	47	4	3	0	54	3	97	11	0	111	10	13	38	1	62	11	112	42	0	165	392
8:45 AM	40	8	8	0	56	3	88	11	0	102	14	15	28	0	57	8	82	38	0	128	343
<b>Total</b>	<b>184</b>	<b>34</b>	<b>29</b>	<b>0</b>	<b>247</b>	<b>21</b>	<b>422</b>	<b>45</b>	<b>0</b>	<b>488</b>	<b>50</b>	<b>59</b>	<b>147</b>	<b>1</b>	<b>257</b>	<b>40</b>	<b>410</b>	<b>152</b>	<b>0</b>	<b>602</b>	<b>1594</b>
Grand Total	391	73	59	0	523	31	882	79	0	992	90	105	315	1	511	75	873	317	0	1265	3291
Approach %	74.8	14.0	11.3	0.0		3.1	88.9	8.0	0.0		17.6	20.5	61.6	0.2		5.9	69.0	25.1	0.0		
Total %	11.9	2.2	1.8	0.0	15.9	0.9	26.8	2.4	0.0	30.1	2.7	3.2	9.6	0.0	15.5	2.3	26.5	9.6	0.0	38.4	
Exiting Leg Total	453					1022					228					1588					3291

Peak Hour Analysis from 07:00 AM to 09:00 AM begins at:

	Union Street					King Street					Union Street					King Street					Total
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	
7:30 AM	64	8	7	0	79	1	118	7	0	126	11	14	41	0	66	10	129	38	0	177	448
7:45 AM	54	10	4	0	68	1	116	7	0	124	11	11	52	0	74	9	125	58	0	192	458
8:00 AM	48	10	9	0	67	5	104	12	0	121	10	17	42	0	69	14	110	32	0	156	413
8:15 AM	49	12	9	0	70	10	133	11	0	154	16	14	39	0	69	7	106	40	0	153	446
Total Volume	215	40	29	0	284	17	471	37	0	525	48	56	174	0	278	40	470	168	0	678	1765
% Approach Total	75.7	14.1	10.2	0.0		3.2	89.7	7.0	0.0		17.3	20.1	62.6	0.0		5.9	69.3	24.8	0.0		
PHF	0.840	0.833	0.806	0.000	0.899	0.425	0.885	0.771	0.000	0.852	0.750	0.824	0.837	0.000	0.939	0.714	0.911	0.724	0.000	0.883	0.963
Entering Leg	215	40	29	0	284	17	471	37	0	525	48	56	174	0	278	40	470	168	0	678	1765
Exiting Leg	241					547					117					860					1765
Total	525					1072					395					1538					3530



PDI File #: 186542 C  
 Location: N: Union Street S: Union Street  
 Location: E: King Street W: King Street  
 City, State: Franklin, MA  
 Client: VAI/ S. Kelly  
 Site Code: TBA  
 Count Date: Thursday, October 25, 2018  
 Start Time: 7:00 AM  
 End Time: 9:00 AM  
 Class:



**Heavy Vehicles-Combined (Buses, Single-Unit Trucks, Articulated Trucks)**

	Union Street					King Street					Union Street					King Street					Total
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	
7:00 AM	0	0	1	0	1	0	5	0	0	5	0	0	1	0	1	0	12	3	0	15	22
7:15 AM	4	0	0	0	4	0	5	0	0	5	0	0	0	0	0	0	10	0	0	10	19
7:30 AM	2	0	1	0	3	0	7	0	0	7	0	0	0	0	0	1	5	1	0	7	17
7:45 AM	3	1	0	0	4	0	7	0	0	7	1	1	0	0	2	1	6	1	0	8	21
<b>Total</b>	<b>9</b>	<b>1</b>	<b>2</b>	<b>0</b>	<b>12</b>	<b>0</b>	<b>24</b>	<b>0</b>	<b>0</b>	<b>24</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>3</b>	<b>2</b>	<b>33</b>	<b>5</b>	<b>0</b>	<b>40</b>	<b>79</b>
8:00 AM	0	0	0	0	0	0	7	1	0	8	1	0	3	0	4	0	6	2	0	8	20
8:15 AM	0	0	0	0	0	0	6	1	0	7	0	1	2	0	3	1	13	3	0	17	27
8:30 AM	2	0	0	0	2	0	8	2	0	10	1	1	3	0	5	0	9	1	0	10	27
8:45 AM	3	0	0	0	3	1	11	0	0	12	0	0	0	0	0	0	5	1	0	6	21
<b>Total</b>	<b>5</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>5</b>	<b>1</b>	<b>32</b>	<b>4</b>	<b>0</b>	<b>37</b>	<b>2</b>	<b>2</b>	<b>8</b>	<b>0</b>	<b>12</b>	<b>1</b>	<b>33</b>	<b>7</b>	<b>0</b>	<b>41</b>	<b>95</b>
Grand Total	14	1	2	0	17	1	56	4	0	61	3	3	9	0	15	3	66	12	0	81	174
Approach %	82.4	5.9	11.8	0.0		1.6	91.8	6.6	0.0		20.0	20.0	60.0	0.0		3.7	81.5	14.8	0.0		
Total %	8.0	0.6	1.1	0.0	9.8	0.6	32.2	2.3	0.0	35.1	1.7	1.7	5.2	0.0	8.6	1.7	37.9	6.9	0.0	46.6	
Exiting Leg Total	16					71					8					79					174
Buses	3	1	0	0	4	0	7	2	0	9	0	2	1	0	3	0	8	2	0	10	26
% Buses	21.4	100.0	0.0	0.0	23.5	0.0	12.5	50.0	0.0	14.8	0.0	66.7	11.1	0.0	20.0	0.0	12.1	16.7	0.0	12.3	14.9
Exiting Leg Total	4					8					3					11					26
Single-Unit Trucks	8	0	2	0	10	0	42	2	0	44	3	1	6	0	10	3	47	6	0	56	120
% Single-Unit	57.1	0.0	100.0	0.0	58.8	0.0	75.0	50.0	0.0	72.1	100.0	33.3	66.7	0.0	66.7	100.0	71.2	50.0	0.0	69.1	69.0
Exiting Leg Total	7					52					5					56					120
Articulated Trucks	3	0	0	0	3	1	7	0	0	8	0	0	2	0	2	0	11	4	0	15	28
% Articulated	21.4	0.0	0.0	0.0	17.6	100.0	12.5	0.0	0.0	13.1	0.0	0.0	22.2	0.0	13.3	0.0	16.7	33.3	0.0	18.5	16.1
Exiting Leg Total	5					11					0					12					28

Peak Hour Analysis from 07:00 AM to 09:00 AM begins at:

	Union Street					King Street					Union Street					King Street					Total
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	
7:45 AM	3	1	0	0	4	0	7	0	0	7	1	1	0	0	2	1	6	1	0	8	21
7:45 AM	3	1	0	0	4	0	7	0	0	7	1	1	0	0	2	1	6	1	0	8	21
8:00 AM	0	0	0	0	0	0	7	1	0	8	1	0	3	0	4	0	6	2	0	8	20
8:15 AM	0	0	0	0	0	0	6	1	0	7	0	1	2	0	3	1	13	3	0	17	27
8:30 AM	2	0	0	0	2	0	8	2	0	10	1	1	3	0	5	0	9	1	0	10	27
Total Volume	5	1	0	0	6	0	28	4	0	32	3	3	8	0	14	2	34	7	0	43	95
% Approach Total	83.3	16.7	0.0	0.0		0.0	87.5	12.5	0.0		21.4	21.4	57.1	0.0		4.7	79.1	16.3	0.0		
PHF	0.417	0.250	0.000	0.000	0.375	0.000	0.875	0.500	0.000	0.800	0.750	0.750	0.667	0.000	0.700	0.500	0.654	0.583	0.000	0.632	0.880
Buses	2	1	0	0	3	0	3	2	0	5	0	2	1	0	3	0	4	1	0	5	16
Buses %	40.0	100.0	0.0	0.0	50.0	0.0	10.7	50.0	0.0	15.6	0.0	66.7	12.5	0.0	21.4	0.0	11.8	14.3	0.0	11.6	16.8
Single-Unit Trucks	3	0	0	0	3	0	19	2	0	21	3	1	5	0	9	2	24	4	0	30	63
Single-Unit %	60.0	0.0	0.0	0.0	50.0	0.0	67.9	50.0	0.0	65.6	100.0	33.3	62.5	0.0	64.3	100.0	70.6	57.1	0.0	69.8	66.3
Articulated Trucks	0	0	0	0	0	0	6	0	0	6	0	0	2	0	2	0	6	2	0	8	16
Articulated %	0.0	0.0	0.0	0.0	0.0	0.0	21.4	0.0	0.0	18.8	0.0	0.0	25.0	0.0	14.3	0.0	17.6	28.6	0.0	18.6	16.8
Buses	2	1	0	0	3	0	3	2	0	5	0	2	1	0	3	0	4	1	0	5	16
Single-Unit Trucks	3	0	0	0	3	0	19	2	0	21	3	1	5	0	9	2	24	4	0	30	63
Articulated Trucks	0	0	0	0	0	0	6	0	0	6	0	0	2	0	2	0	6	2	0	8	16
Total Entering Leg	5	1	0	0	6	0	28	4	0	32	3	3	8	0	14	2	34	7	0	43	95
Buses	3					4					3					6					16
Single-Unit Trucks	5					27					4					27					63
Articulated Trucks	2					6					0					8					16
Total Exiting Leg	10					37					7					41					95

PDI File #: 186542 C  
 Location: N: Union Street S: Union Street  
 Location: E: King Street W: King Street  
 City, State: Franklin, MA  
 Client: VAI/ S. Kelly  
 Site Code: TBA  
 Count Date: Thursday, October 25, 2018  
 Start Time: 7:00 AM  
 End Time: 9:00 AM  
 Class:



**Bicycles (on Roadway and Crosswalks)**

	Union Street								King Street								Union Street								King Street								Total						
	from North								from East								from South								from West														
	Right	Thru	Left	U-Turn	CW-EB	CW-WB	Total		Right	Thru	Left	U-Turn	CW-SB	CW-NB	Total		Right	Thru	Left	U-Turn	CW-WB	CW-EB	Total		Right	Thru	Left	U-Turn	CW-NB	CW-SB	Total								
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grand Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Approach %	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0		
Total %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Exiting Leg Total	0								0								0								0														

Peak Hour Analysis from 07:00 AM to 09:00 AM begins at:

7:00 AM	Union Street								King Street								Union Street								King Street								Total						
	from North								from East								from South								from West														
	Right	Thru	Left	U-Turn	CW-EB	CW-WB	Total		Right	Thru	Left	U-Turn	CW-SB	CW-NB	Total		Right	Thru	Left	U-Turn	CW-WB	CW-EB	Total		Right	Thru	Left	U-Turn	CW-NB	CW-SB	Total								
7:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Volume	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
% Approach Total	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0		
PHF	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
Entering Leg	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Exiting Leg	0								0								0								0														
Total	0								0								0								0														

PDI File #: **186542 C**  
 Location: **N: Union Street S: Union Street**  
 Location: **E: King Street W: King Street**  
 City, State: **Franklin, MA**  
 Client: **VAI/ S. Kelly**  
 Site Code: **TBA**  
 Count Date: **Thursday, October 25, 2018**  
 Start Time: **7:00 AM**  
 End Time: **9:00 AM**  
 Class:



46 Morton Street, Framingham, MA 01702  
 Office: 508-875-0100 Fax: 508-875-0118  
 Email: datarequests@pdillc.com

**Pedestrians**

	Union Street								King Street								Union Street								King Street								Total											
	from North								from East								from South								from West																			
	Right	Thru	Left	U-Turn	CW-EB	CW-WB	Total		Right	Thru	Left	U-Turn	CW-SB	CW-NB	Total		Right	Thru	Left	U-Turn	CW-WB	CW-EB	Total		Right	Thru	Left	U-Turn	CW-NB	CW-SB	Total													
7:00 AM	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1				
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
<b>Total</b>	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1				
8:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
8:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
8:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
8:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
<b>Total</b>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
<b>Grand Total</b>	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1				
Approach %	0	0	0	0	0	100		0	0	0	0	0	0		0	0	0	0	0	0		0	0	0	0	0	0		0	0	0	0	0	0										
Total %	0	0	0	0	0	100	100	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0								
Exiting Leg Total								1								0								0	1																			

Peak Hour Analysis from 07:00 AM to 09:00 AM begins at:

	Union Street								King Street								Union Street								King Street								Total											
	from North								from East								from South								from West																			
	Right	Thru	Left	U-Turn	CW-EB	CW-WB	Total		Right	Thru	Left	U-Turn	CW-SB	CW-NB	Total		Right	Thru	Left	U-Turn	CW-WB	CW-EB	Total		Right	Thru	Left	U-Turn	CW-NB	CW-SB	Total													
7:00 AM	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1				
7:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
7:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
7:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
<b>Total Volume</b>	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1				
<b>% Approach Total</b>	0.0	0.0	0.0	0.0	0.0	100.0		0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0										0.250
PHF	0.000	0.000	0.000	0.000	0.000	0.250	0.250	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		0.250						
Entering Leg	0	0	0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1							
Exiting Leg								1								0								0	1																			
<b>Total</b>								2								0								0	2																			

PDI File #: **186542 CC**  
 Location: **N: Union Street S: Union Street**  
 Location: **E: King Street W: King Street**  
 City, State: **Franklin, MA**  
 Client: **VAI/ S. Kelly**  
 Site Code: **TBA**  
 Count Date: **Thursday, October 25, 2018**  
 Start Time: **4:00 PM**  
 End Time: **6:00 PM**  
 Class:



**Cars and Heavy Vehicles (Combined)**

	Union Street					King Street					Union Street					King Street					Total
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	
4:00 PM	43	9	7	0	59	5	136	5	0	146	10	3	33	0	46	13	125	54	0	192	443
4:15 PM	58	6	8	0	72	8	155	4	0	167	5	7	23	0	35	15	141	45	0	201	475
4:30 PM	55	1	14	0	70	13	150	9	0	172	3	10	24	0	37	22	133	40	0	195	474
4:45 PM	65	7	8	0	80	9	150	11	0	170	9	4	27	0	40	14	120	42	0	176	466
<b>Total</b>	<b>221</b>	<b>23</b>	<b>37</b>	<b>0</b>	<b>281</b>	<b>35</b>	<b>591</b>	<b>29</b>	<b>0</b>	<b>655</b>	<b>27</b>	<b>24</b>	<b>107</b>	<b>0</b>	<b>158</b>	<b>64</b>	<b>519</b>	<b>181</b>	<b>0</b>	<b>764</b>	<b>1858</b>
5:00 PM	69	7	10	0	86	8	151	11	0	170	7	7	32	0	46	24	143	64	0	231	533
5:15 PM	69	7	9	0	85	7	154	4	0	165	7	8	34	0	49	11	164	59	0	234	533
5:30 PM	44	4	7	0	55	10	147	9	0	166	2	4	40	0	46	16	134	73	0	223	490
5:45 PM	54	10	6	0	70	14	130	3	0	147	8	6	25	0	39	14	121	41	0	176	432
<b>Total</b>	<b>236</b>	<b>28</b>	<b>32</b>	<b>0</b>	<b>296</b>	<b>39</b>	<b>582</b>	<b>27</b>	<b>0</b>	<b>648</b>	<b>24</b>	<b>25</b>	<b>131</b>	<b>0</b>	<b>180</b>	<b>65</b>	<b>562</b>	<b>237</b>	<b>0</b>	<b>864</b>	<b>1988</b>
<b>Grand Total</b>	<b>457</b>	<b>51</b>	<b>69</b>	<b>0</b>	<b>577</b>	<b>74</b>	<b>1173</b>	<b>56</b>	<b>0</b>	<b>1303</b>	<b>51</b>	<b>49</b>	<b>238</b>	<b>0</b>	<b>338</b>	<b>129</b>	<b>1081</b>	<b>418</b>	<b>0</b>	<b>1628</b>	<b>3846</b>
Approach %	79.2	8.8	12.0	0.0		5.7	90.0	4.3	0.0		15.1	14.5	70.4	0.0		7.9	66.4	25.7	0.0		
Total %	11.9	1.3	1.8	0.0	15.0	1.9	30.5	1.5	0.0	33.9	1.3	1.3	6.2	0.0	8.8	3.4	28.1	10.9	0.0	42.3	
Exiting Leg Total	541					1201					236					1868					3846
Cars	449	51	68	0	568	72	1151	56	0	1279	51	47	238	0	336	127	1065	414	0	1606	3789
% Cars	98.2	100.0	98.6	0.0	98.4	97.3	98.1	100.0	0.0	98.2	100.0	95.9	100.0	0.0	99.4	98.4	98.5	99.0	0.0	98.6	98.5
Exiting Leg Total	533					1184					234					1838					3789
Heavy Vehicles	8	0	1	0	9	2	22	0	0	24	0	2	0	0	2	2	16	4	0	22	57
% Heavy Vehicles	1.8	0.0	1.4	0.0	1.6	2.7	1.9	0.0	0.0	1.8	0.0	4.1	0.0	0.6	0.6	1.6	1.5	1.0	0.0	1.4	1.5
Exiting Leg Total	8					17					2					30					57

**Peak Hour Analysis from 04:00 PM to 06:00 PM begins at:**

4:45 PM	Union Street					King Street					Union Street					King Street					Total
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	
4:45 PM	65	7	8	0	80	9	150	11	0	170	9	4	27	0	40	14	120	42	0	176	466
5:00 PM	69	7	10	0	86	8	151	11	0	170	7	7	32	0	46	24	143	64	0	231	533
5:15 PM	69	7	9	0	85	7	154	4	0	165	7	8	34	0	49	11	164	59	0	234	533
5:30 PM	44	4	7	0	55	10	147	9	0	166	2	4	40	0	46	16	134	73	0	223	490
<b>Total Volume</b>	<b>247</b>	<b>25</b>	<b>34</b>	<b>0</b>	<b>306</b>	<b>34</b>	<b>602</b>	<b>35</b>	<b>0</b>	<b>671</b>	<b>25</b>	<b>23</b>	<b>133</b>	<b>0</b>	<b>181</b>	<b>65</b>	<b>561</b>	<b>238</b>	<b>0</b>	<b>864</b>	<b>2022</b>
% Approach Total	80.7	8.2	11.1	0.0		5.1	89.7	5.2	0.0		13.8	12.7	73.5	0.0		7.5	64.9	27.5	0.0		
PHF	0.895	0.893	0.850	0.000	0.890	0.850	0.977	0.795	0.000	0.987	0.694	0.719	0.831	0.000	0.923	0.677	0.855	0.815	0.000	0.923	0.948
Cars	244	25	33	0	302	32	588	35	0	655	25	22	133	0	180	64	552	237	0	853	1990
Cars %	98.8	100.0	97.1	0.0	98.7	94.1	97.7	100.0	0.0	97.6	100.0	95.7	100.0	0.0	99.4	98.5	98.4	99.6	0.0	98.7	98.4
Heavy Vehicles	3	0	1	0	4	2	14	0	0	16	0	1	0	0	1	1	9	1	0	11	32
Heavy Vehicles %	1.2	0.0	2.9	0.0	1.3	5.9	2.3	0.0	0.0	2.4	0.0	4.3	0.0	0.6	0.6	1.5	1.6	0.4	0.0	1.3	1.6
Cars Enter Leg	244	25	33	0	302	32	588	35	0	655	25	22	133	0	180	64	552	237	0	853	1990
Heavy Enter Leg	3	0	1	0	4	2	14	0	0	16	0	1	0	0	1	1	9	1	0	11	32
<b>Total Entering Leg</b>	<b>247</b>	<b>25</b>	<b>34</b>	<b>0</b>	<b>306</b>	<b>34</b>	<b>602</b>	<b>35</b>	<b>0</b>	<b>671</b>	<b>25</b>	<b>23</b>	<b>133</b>	<b>0</b>	<b>181</b>	<b>65</b>	<b>561</b>	<b>238</b>	<b>0</b>	<b>864</b>	<b>2022</b>
Cars Exiting Leg	291					610					124					965					1990
Heavy Exiting Leg	4					10					1					17					32
<b>Total Exiting Leg</b>	<b>295</b>					<b>620</b>					<b>125</b>					<b>982</b>					<b>2022</b>

PDI File #: 186542 CC  
 Location: N: Union Street S: Union Street  
 Location: E: King Street W: King Street  
 City, State: Franklin, MA  
 Client: VAI/ S. Kelly  
 Site Code: TBA  
 Count Date: Thursday, October 25, 2018  
 Start Time: 4:00 PM  
 End Time: 6:00 PM  
 Class:



**Cars-Combined (Motorcycles, Cars, Light Goods)**

	Union Street					King Street					Union Street					King Street					Total
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	
4:00 PM	41	9	7	0	57	5	132	5	0	142	10	3	33	0	46	12	122	53	0	187	432
4:15 PM	56	6	8	0	70	8	152	4	0	164	5	6	23	0	34	15	140	43	0	198	466
4:30 PM	54	1	14	0	69	13	149	9	0	171	3	10	24	0	37	22	132	40	0	194	471
4:45 PM	64	7	8	0	79	9	146	11	0	166	9	4	27	0	40	14	119	42	0	175	460
<b>Total</b>	<b>215</b>	<b>23</b>	<b>37</b>	<b>0</b>	<b>275</b>	<b>35</b>	<b>579</b>	<b>29</b>	<b>0</b>	<b>643</b>	<b>27</b>	<b>23</b>	<b>107</b>	<b>0</b>	<b>157</b>	<b>63</b>	<b>513</b>	<b>178</b>	<b>0</b>	<b>754</b>	<b>1829</b>
5:00 PM	69	7	10	0	86	8	150	11	0	169	7	7	32	0	46	24	141	63	0	228	529
5:15 PM	67	7	8	0	82	6	151	4	0	161	7	7	34	0	48	10	160	59	0	229	520
5:30 PM	44	4	7	0	55	9	141	9	0	159	2	4	40	0	46	16	132	73	0	221	481
5:45 PM	54	10	6	0	70	14	130	3	0	147	8	6	25	0	39	14	119	41	0	174	430
<b>Total</b>	<b>234</b>	<b>28</b>	<b>31</b>	<b>0</b>	<b>293</b>	<b>37</b>	<b>572</b>	<b>27</b>	<b>0</b>	<b>636</b>	<b>24</b>	<b>24</b>	<b>131</b>	<b>0</b>	<b>179</b>	<b>64</b>	<b>552</b>	<b>236</b>	<b>0</b>	<b>852</b>	<b>1960</b>
<b>Grand Total</b>	<b>449</b>	<b>51</b>	<b>68</b>	<b>0</b>	<b>568</b>	<b>72</b>	<b>1151</b>	<b>56</b>	<b>0</b>	<b>1279</b>	<b>51</b>	<b>47</b>	<b>238</b>	<b>0</b>	<b>336</b>	<b>127</b>	<b>1065</b>	<b>414</b>	<b>0</b>	<b>1606</b>	<b>3789</b>
Approach %	79.0	9.0	12.0	0.0		5.6	90.0	4.4	0.0		15.2	14.0	70.8	0.0		7.9	66.3	25.8	0.0		
Total %	11.9	1.3	1.8	0.0	15.0	1.9	30.4	1.5	0.0	33.8	1.3	1.2	6.3	0.0	8.9	3.4	28.1	10.9	0.0	42.4	
Exiting Leg Total					533					1184					234					1838	3789

Peak Hour Analysis from 04:00 PM to 06:00 PM begins at:

	Union Street					King Street					Union Street					King Street					Total
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	
4:45 PM	64	7	8	0	79	9	146	11	0	166	9	4	27	0	40	14	119	42	0	175	460
5:00 PM	69	7	10	0	86	8	150	11	0	169	7	7	32	0	46	24	141	63	0	228	529
5:15 PM	67	7	8	0	82	6	151	4	0	161	7	7	34	0	48	10	160	59	0	229	520
5:30 PM	44	4	7	0	55	9	141	9	0	159	2	4	40	0	46	16	132	73	0	221	481
<b>Total Volume</b>	<b>244</b>	<b>25</b>	<b>33</b>	<b>0</b>	<b>302</b>	<b>32</b>	<b>588</b>	<b>35</b>	<b>0</b>	<b>655</b>	<b>25</b>	<b>22</b>	<b>133</b>	<b>0</b>	<b>180</b>	<b>64</b>	<b>552</b>	<b>237</b>	<b>0</b>	<b>853</b>	<b>1990</b>
<b>% Approach Total</b>	<b>80.8</b>	<b>8.3</b>	<b>10.9</b>	<b>0.0</b>		<b>4.9</b>	<b>89.8</b>	<b>5.3</b>	<b>0.0</b>		<b>13.9</b>	<b>12.2</b>	<b>73.9</b>	<b>0.0</b>		<b>7.5</b>	<b>64.7</b>	<b>27.8</b>	<b>0.0</b>		
PHF	0.884	0.893	0.825	0.000	0.878	0.889	0.974	0.795	0.000	0.969	0.694	0.786	0.831	0.000	0.938	0.667	0.863	0.812	0.000	0.931	0.940
Entering Leg	244	25	33	0	302	32	588	35	0	655	25	22	133	0	180	64	552	237	0	853	1990
Exiting Leg					291					610					124					965	1990
<b>Total</b>					<b>593</b>					<b>1265</b>					<b>304</b>					<b>1818</b>	<b>3980</b>

PDI File #: 186542 CC  
 Location: N: Union Street S: Union Street  
 Location: E: King Street W: King Street  
 City, State: Franklin, MA  
 Client: VAI/ S. Kelly  
 Site Code: TBA  
 Count Date: Thursday, October 25, 2018  
 Start Time: 4:00 PM  
 End Time: 6:00 PM  
 Class:



46 Morton Street, Framingham, MA 01702  
 Office: 508-875-0100 Fax: 508-875-0118  
 Email: datarequests@pdillc.com

**Heavy Vehicles-Combined (Buses, Single-Unit Trucks, Articulated Trucks)**

	Union Street					King Street					Union Street					King Street					Total
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	
4:00 PM	2	0	0	0	2	0	4	0	0	4	0	0	0	0	0	1	3	1	0	5	11
4:15 PM	2	0	0	0	2	0	3	0	0	3	0	1	0	0	1	0	1	2	0	3	9
4:30 PM	1	0	0	0	1	0	1	0	0	1	0	0	0	0	0	0	1	0	0	1	3
4:45 PM	1	0	0	0	1	0	4	0	0	4	0	0	0	0	0	0	1	0	0	1	6
<b>Total</b>	<b>6</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>6</b>	<b>0</b>	<b>12</b>	<b>0</b>	<b>0</b>	<b>12</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>6</b>	<b>3</b>	<b>0</b>	<b>10</b>	<b>29</b>
5:00 PM	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	2	1	0	3	4
5:15 PM	2	0	1	0	3	1	3	0	0	4	0	1	0	0	1	1	4	0	0	5	13
5:30 PM	0	0	0	0	0	1	6	0	0	7	0	0	0	0	0	0	2	0	0	2	9
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	2
<b>Total</b>	<b>2</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>3</b>	<b>2</b>	<b>10</b>	<b>0</b>	<b>0</b>	<b>12</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>10</b>	<b>1</b>	<b>0</b>	<b>12</b>	<b>28</b>
<b>Grand Total</b>	<b>8</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>9</b>	<b>2</b>	<b>22</b>	<b>0</b>	<b>0</b>	<b>24</b>	<b>0</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>2</b>	<b>16</b>	<b>4</b>	<b>0</b>	<b>22</b>	<b>57</b>
Approach %	88.9	0.0	11.1	0.0		8.3	91.7	0.0	0.0		0.0	100.0	0.0	0.0		9.1	72.7	18.2	0.0		
Total %	14.0	0.0	1.8	0.0	15.8	3.5	38.6	0.0	0.0	42.1	0.0	3.5	0.0	0.0	3.5	3.5	28.1	7.0	0.0	38.6	
Exiting Leg Total	8					17					2					30					57
Buses	0	0	1	0	1	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	2
% Buses	0.0	0.0	100.0	0.0	11.1	0.0	0.0	0.0	0.0	0.0	0.0	50.0	0.0	0.0	50.0	0.0	0.0	0.0	0.0	0.0	3.5
Exiting Leg Total	1					1					0					0					2
Single-Unit Trucks	7	0	0	0	7	1	16	0	0	17	0	1	0	0	1	2	14	3	0	19	44
% Single-Unit	87.5	0.0	0.0	0.0	77.8	50.0	72.7	0.0	0.0	70.8	0.0	50.0	0.0	0.0	50.0	100.0	87.5	75.0	0.0	86.4	77.2
Exiting Leg Total	5					14					2					23					44
Articulated Trucks	1	0	0	0	1	1	6	0	0	7	0	0	0	0	0	0	2	1	0	3	11
% Articulated	12.5	0.0	0.0	0.0	11.1	50.0	27.3	0.0	0.0	29.2	0.0	0.0	0.0	0.0	0.0	0.0	12.5	25.0	0.0	13.6	19.3
Exiting Leg Total	2					2					0					7					11

Peak Hour Analysis from 04:00 PM to 06:00 PM begins at:

	Union Street					King Street					Union Street					King Street					Total
	from North					from East					from South					from West					
	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	Right	Thru	Left	U-Turn	Total	
4:45 PM	1	0	0	0	1	0	4	0	0	4	0	0	0	0	0	0	1	0	0	1	6
5:00 PM	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	2	1	0	3	4
5:15 PM	2	0	1	0	3	1	3	0	0	4	0	1	0	0	1	1	4	0	0	5	13
5:30 PM	0	0	0	0	0	1	6	0	0	7	0	0	0	0	0	0	2	0	0	2	9
<b>Total Volume</b>	<b>3</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>4</b>	<b>2</b>	<b>14</b>	<b>0</b>	<b>0</b>	<b>16</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>9</b>	<b>1</b>	<b>0</b>	<b>11</b>	<b>32</b>
% Approach Total	75.0	0.0	25.0	0.0		12.5	87.5	0.0	0.0		0.0	100.0	0.0	0.0		9.1	81.8	9.1	0.0		
PHF	0.375	0.000	0.250	0.000	0.333	0.500	0.583	0.000	0.000	0.571	0.000	0.250	0.000	0.000	0.250	0.250	0.563	0.250	0.000	0.550	0.615
Buses	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Buses %	0.0	0.0	100.0	0.0	25.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.1
Single-Unit Trucks	3	0	0	0	3	1	11	0	0	12	0	1	0	0	1	1	9	1	0	11	27
Single-Unit %	100.0	0.0	0.0	0.0	75.0	50.0	78.6	0.0	0.0	75.0	0.0	100.0	0.0	0.0	100.0	100.0	100.0	100.0	0.0	100.0	84.4
Articulated Trucks	0	0	0	0	0	1	3	0	0	4	0	0	0	0	0	0	0	0	0	0	4
Articulated %	0.0	0.0	0.0	0.0	0.0	50.0	21.4	0.0	0.0	25.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.5
Buses	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
Single-Unit Trucks	3	0	0	0	3	1	11	0	0	12	0	1	0	0	1	1	9	1	0	11	27
Articulated Trucks	0	0	0	0	0	1	3	0	0	4	0	0	0	0	0	0	0	0	0	0	4
<b>Total Entering Leg</b>	<b>3</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>4</b>	<b>2</b>	<b>14</b>	<b>0</b>	<b>0</b>	<b>16</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>9</b>	<b>1</b>	<b>0</b>	<b>11</b>	<b>32</b>
Buses	0					1					0					0					1
Single-Unit Trucks	3					9					1					14					27
Articulated Trucks	1					0					0					3					4
<b>Total Exiting Leg</b>	<b>4</b>					<b>10</b>					<b>1</b>					<b>17</b>					<b>32</b>

PDI File #: **186542 CC**  
 Location: **N: Union Street S: Union Street**  
 Location: **E: King Street W: King Street**  
 City, State: **Franklin, MA**  
 Client: **VAI/ S. Kelly**  
 Site Code: **TBA**  
 Count Date: **Thursday, October 25, 2018**  
 Start Time: **4:00 PM**  
 End Time: **6:00 PM**  
 Class:



46 Morton Street, Framingham, MA 01702  
 Office: 508-875-0100 Fax: 508-875-0118  
 Email: datarequests@pdilic.com

**Bicycles (on Roadway and Crosswalks)**

	Union Street								King Street								Union Street								King Street								Total
	from North								from East								from South								from West								
	Right	Thru	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	Left	U-Turn	CW-SB	CW-NB	Total	Right	Thru	Left	U-Turn	CW-WB	CW-EB	Total	Right	Thru	Left	U-Turn	CW-NB	CW-SB	Total					
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
<b>Total</b>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
<b>Total</b>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
Grand Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
Approach %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0						
Total %	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0						
Exiting Leg Total	0								0								0								0								

Peak Hour Analysis from 04:00 PM to 06:00 PM begins at:

	Union Street								King Street								Union Street								King Street								Total
	from North								from East								from South								from West								
	Right	Thru	Left	U-Turn	CW-EB	CW-WB	Total	Right	Thru	Left	U-Turn	CW-SB	CW-NB	Total	Right	Thru	Left	U-Turn	CW-WB	CW-EB	Total	Right	Thru	Left	U-Turn	CW-NB	CW-SB	Total					
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
4:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
Total Volume	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0					
% Approach Total	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0						
PHF	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000					
Entering Leg	0								0								0								0								
Exiting Leg	0								0								0								0								
Total	0								0								0								0								

PDI File #: **186542 CC**  
 Location: **N: Union Street S: Union Street**  
 Location: **E: King Street W: King Street**  
 City, State: **Franklin, MA**  
 Client: **VAI/ S. Kelly**  
 Site Code: **TBA**  
 Count Date: **Thursday, October 25, 2018**  
 Start Time: **4:00 PM**  
 End Time: **6:00 PM**  
 Class:



46 Morton Street, Framingham, MA 01702  
 Office: 508-875-0100 Fax: 508-875-0118  
 Email: dararequests@pdilic.com

**Pedestrians**

	Union Street								King Street								Union Street								King Street								Total									
	from North								from East								from South								from West																	
	Right	Thru	Left	U-Turn	CW-EB	CW-WB	Total		Right	Thru	Left	U-Turn	CW-SB	CW-NB	Total		Right	Thru	Left	U-Turn	CW-WB	CW-EB	Total		Right	Thru	Left	U-Turn	CW-NB	CW-SB	Total											
4:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
4:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
4:30 PM	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	1	0	2	0				
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
Total	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	0	1	1	0	2	0				
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	1	0	1	0	1	1					
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	1	0	1	0	1	1					
5:30 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
5:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
Total	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	2	0	2	1	2	1	0	2	2				
Grand Total	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	3	0	3	2	3	2	0	4	4				
Approach %	0	0	0	0	100	0		0	0	0	0	0	0		0	0	0	0	0	0	0		0	0	0	0	33.3	66.7		0	33.3	66.7										
Total %	0	0	0	0	25	0	25	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	25	50	75	0	75	50	75	25	0	75	4					
Exiting Leg Total	1							0							0							3							4													

Peak Hour Analysis from 04:00 PM to 06:00 PM begins at:

4:30 PM	Union Street								King Street								Union Street								King Street								Total							
	from North								from East								from South								from West															
	Right	Thru	Left	U-Turn	CW-EB	CW-WB	Total		Right	Thru	Left	U-Turn	CW-SB	CW-NB	Total		Right	Thru	Left	U-Turn	CW-WB	CW-EB	Total		Right	Thru	Left	U-Turn	CW-NB	CW-SB	Total									
4:30 PM	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	1	1	0	0	2	2		
4:45 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
5:00 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	0	1	1	0	0	1	1		
5:15 PM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	1	0	1	0	0	1	1		
Total Volume	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	3	0	3	2	3	1	2	4	4		
% Approach Total	0.0	0.0	0.0	0.0	100.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0		0.0	0.0	0.0	0.0	33.3	66.7		33.3	66.7									
PHF	0.000	0.000	0.000	0.000	0.250	0.000	0.250	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.250	0.500	0.750	0.250	0.500	0.750	0.500	0.750	0.500	0.750	0.500			
Entering Leg	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2	3	0	3	2	3	1	2	4	4		
Exiting Leg	1							0							0							3							4											
Total	2							0							0							6							8											



**MOTOR VEHICLE COLLISION DATA**

Crash Number	Crash Date	Number of Vehicles	Manner of Collision	Total Fatalities	Total Non-Fatal Injuries	Vehicle Actions Prior to Crash (All Vehicles)	Vehicle Travel Directions (All Vehicles)	Location
4369789	05/07/2017	2	Angle	0	1	V1: Turning left / V2: Travelling straight ahead	V1: N / V2: S	King Street at Union Street
4416372	09/01/2017	3	Sideswipe, same direction	0	0	V1: Turning right / V2: Travelling straight ahead / V3: Not reported	V1: S / V2: S / V3: Not Reported	King Street at Union Street
4491901	01/18/2018	2	Angle	0	0	V1: Travelling straight ahead / V2: Turning left	V1: E / V2: W	King Street at Union Street
4596838	09/13/2018	2	Angle	0	0	V1: Travelling straight ahead / V2: Turning left	V1: S / V2: W	King Street at Union Street
4636973	12/11/2018	2	Rear-end	0	0	V1: Slowing or stopped in traffic / V2: Slowing or stopped in traffic	V1: W / V2: W	King Street at Union Street
4645520	12/31/2018	2	Angle	0	0	V1: Turning right / V2: Slowing or stopped in traffic	V1: N / V2: W	King Street at Union Street
4653226	01/15/2019	2	Angle	0	0	V1: Turning left / V2: Turning left	V1: W / V2: W	King Street at Union Street
4673990	03/05/2019	2	Sideswipe, same direction	0	0	V1: Travelling straight ahead / V2: Changing lanes	V1: E / V2: E	King Street at Union Street
4698860	05/06/2019	2	Head-on	0	0	V1: Turning left / V2: Travelling straight ahead	V1: S / V2: E	King Street at Union Street
4752265	09/17/2019	2	Rear-end	0	0	V1: Travelling straight ahead / V2: Slowing or stopped in traffic	V1: E / V2: E	King Street at Union Street
4756515	09/26/2019	2	Angle	0	0	V1: Turning left / V2: Travelling straight ahead	V1: S / V2: E	King Street at Union Street

Data Level: CRASH

Query Type: Spatial

Criteria: If you conducted an Advanced Query your SQL statement will be listed here

## INTERSECTION CRASH RATE WORKSHEET

CITY/TOWN : Town of Franklin                      COUNT DATE : 10/25/2018 (Adjusted)

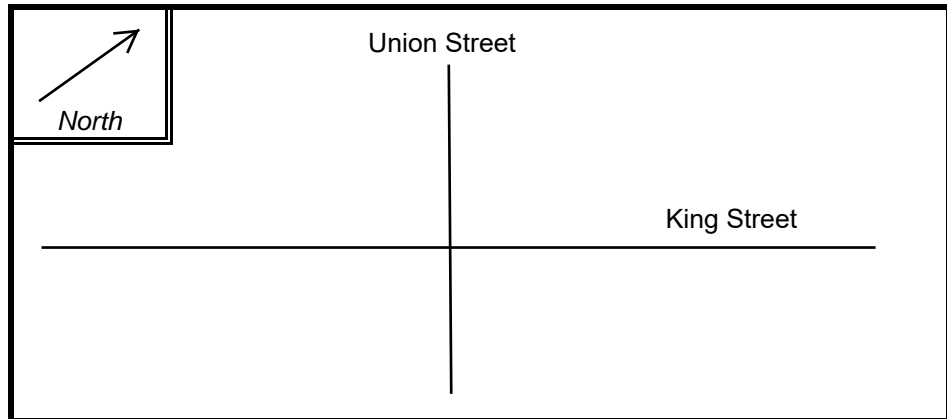
DISTRICT : 3                      UNSIGNALIZED :                       SIGNALIZED :

~ INTERSECTION DATA ~

MAJOR STREET : King Street

MINOR STREET(S) : Union Street

**INTERSECTION  
 DIAGRAM  
 (Label Approaches)**



**PEAK HOUR VOLUMES**

APPROACH :	1	2	3	4	5	Total Peak Hourly Approach Volume
DIRECTION :	NB	SB	EB	WB		
PEAK HOURLY VOLUMES (AM/PM) :	887	709	188	322		2106

" K " FACTOR :                       INTERSECTION ADT ( V ) = TOTAL DAILY APPROACH VOLUME :

TOTAL # OF CRASHES :                       # OF YEARS :                       AVERAGE # OF CRASHES PER YEAR ( A ) :

**CRASH RATE CALCULATION :**

**0.43**

$$\text{RATE} = \frac{(A * 1,000,000)}{(V * 365)}$$

Comments : \_\_\_\_\_

Project Title & Date: Proposed Child Care Center                      08/31/2022

**ITE TRIP GENERATION MANUAL, 11<sup>TH</sup> EDITION**

# Day Care Center (565)

**Vehicle Trip Ends vs: 1000 Sq. Ft. GFA**  
**On a: Weekday,**  
**Peak Hour of Adjacent Street Traffic,**  
**One Hour Between 7 and 9 a.m.**

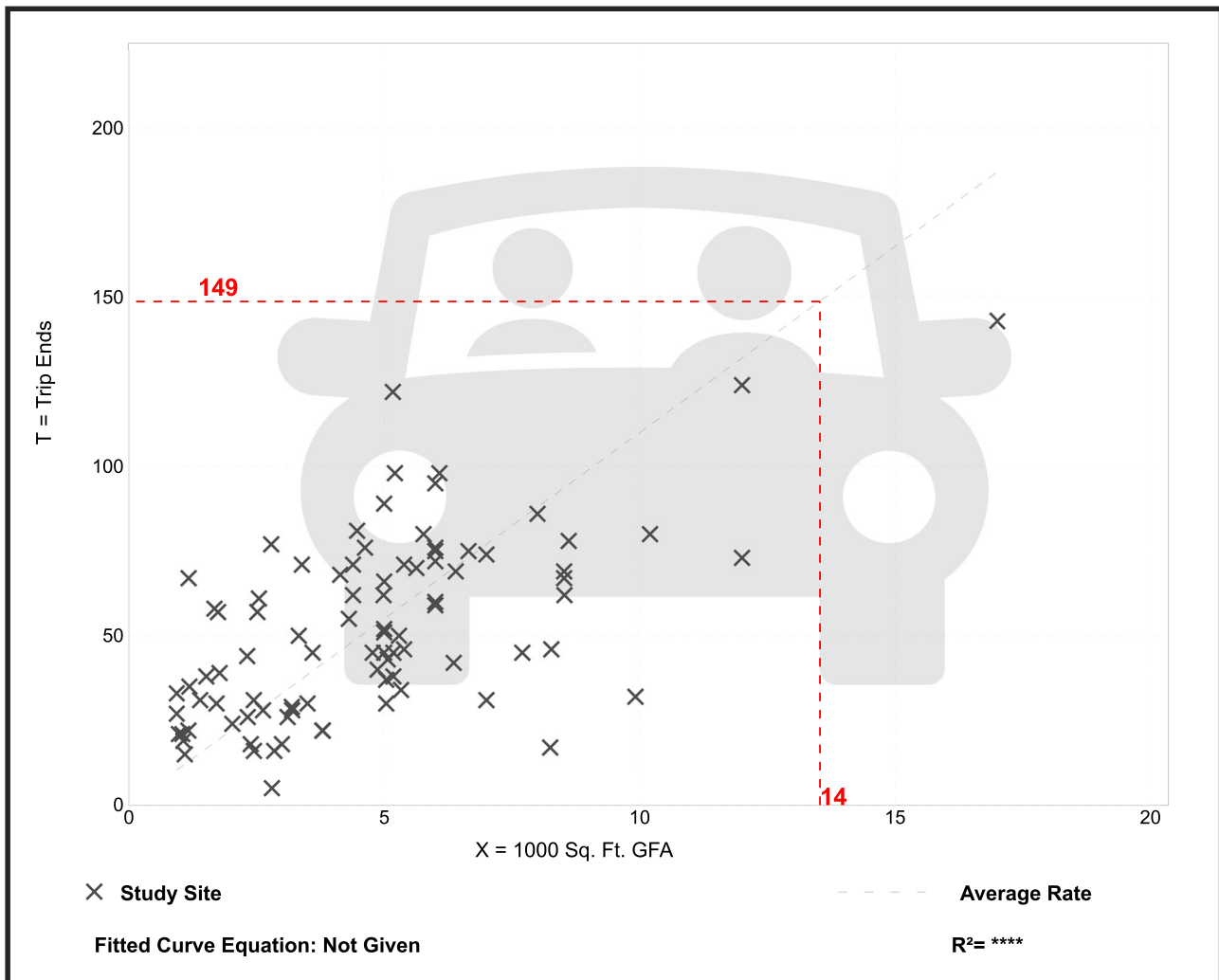
**Setting/Location: General Urban/Suburban**

Number of Studies: 89  
 Avg. 1000 Sq. Ft. GFA: 5  
 Directional Distribution: 53% entering, 47% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
11.00	1.79 - 57.02	6.08

## Data Plot and Equation



# Day Care Center (565)

**Vehicle Trip Ends vs: 1000 Sq. Ft. GFA**  
**On a: Weekday,**  
**Peak Hour of Adjacent Street Traffic,**  
**One Hour Between 4 and 6 p.m.**

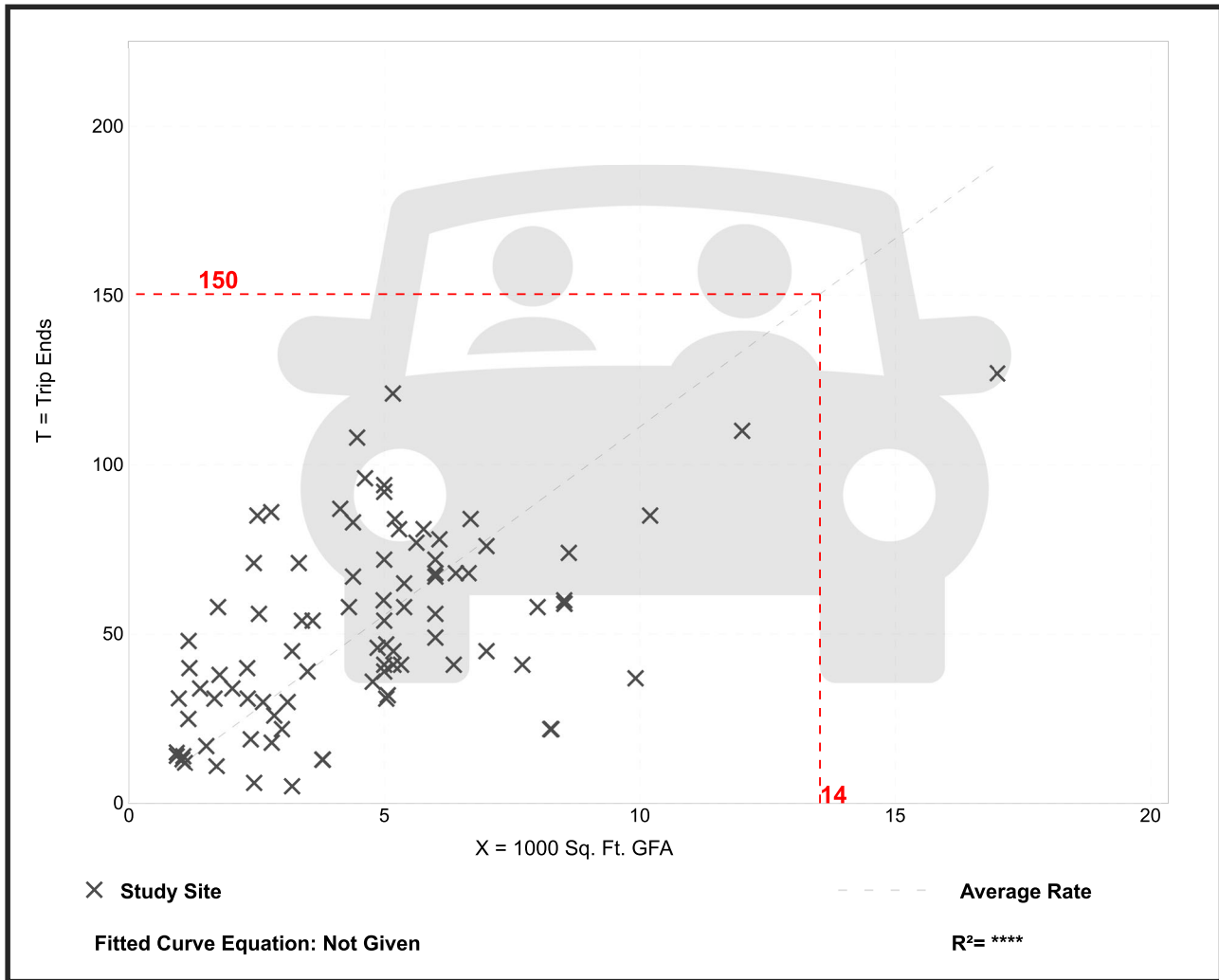
**Setting/Location: General Urban/Suburban**

Number of Studies: 90  
 Avg. 1000 Sq. Ft. GFA: 5  
 Directional Distribution: 47% entering, 53% exiting

## Vehicle Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
11.12	1.56 - 40.85	6.28

## Data Plot and Equation



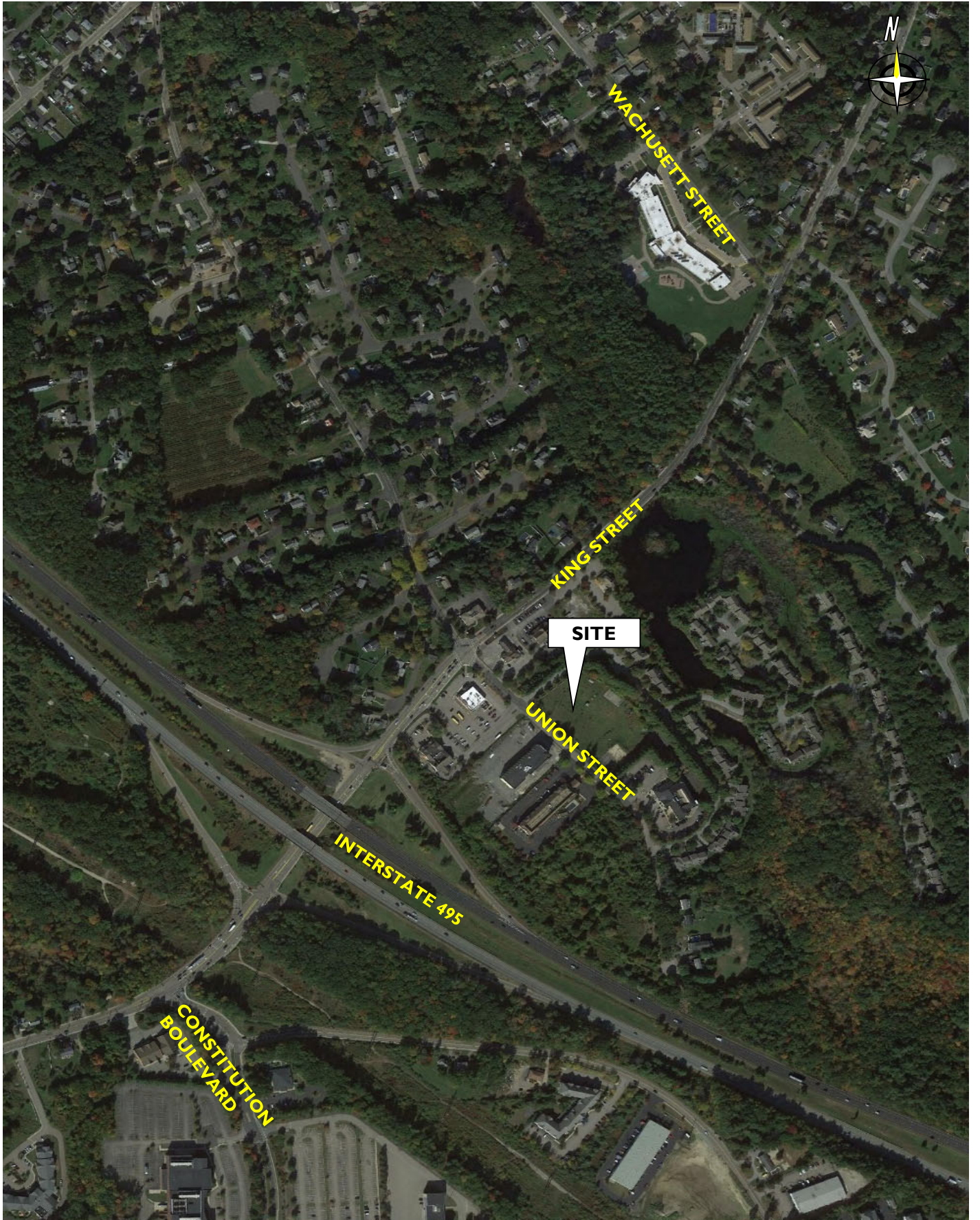
### Vehicle Pass-By Rates by Land Use

Source: ITE *Trip Generation Manual*, 11th Edition

Land Use Code	565								
Land Use	Day Care Center								
Setting	General Urban/Suburban								
Time Period	Weekday PM Peak Period								
# Data Sites	1								
Average Pass-By Rate	44%								
	Pass-By Characteristics for Individual Sites								
						Non-Pass-By Trips			Adj Street Peak
GFA (000)	State or Province	Survey Year	# Interviews	Pass-By Trip (%)	Primary (%)	Diverted (%)	Total (%)	Hour Volume	Source
7.2	Pennsylvania	1990	—	44	24	32	56	—	23

## **FIGURES**

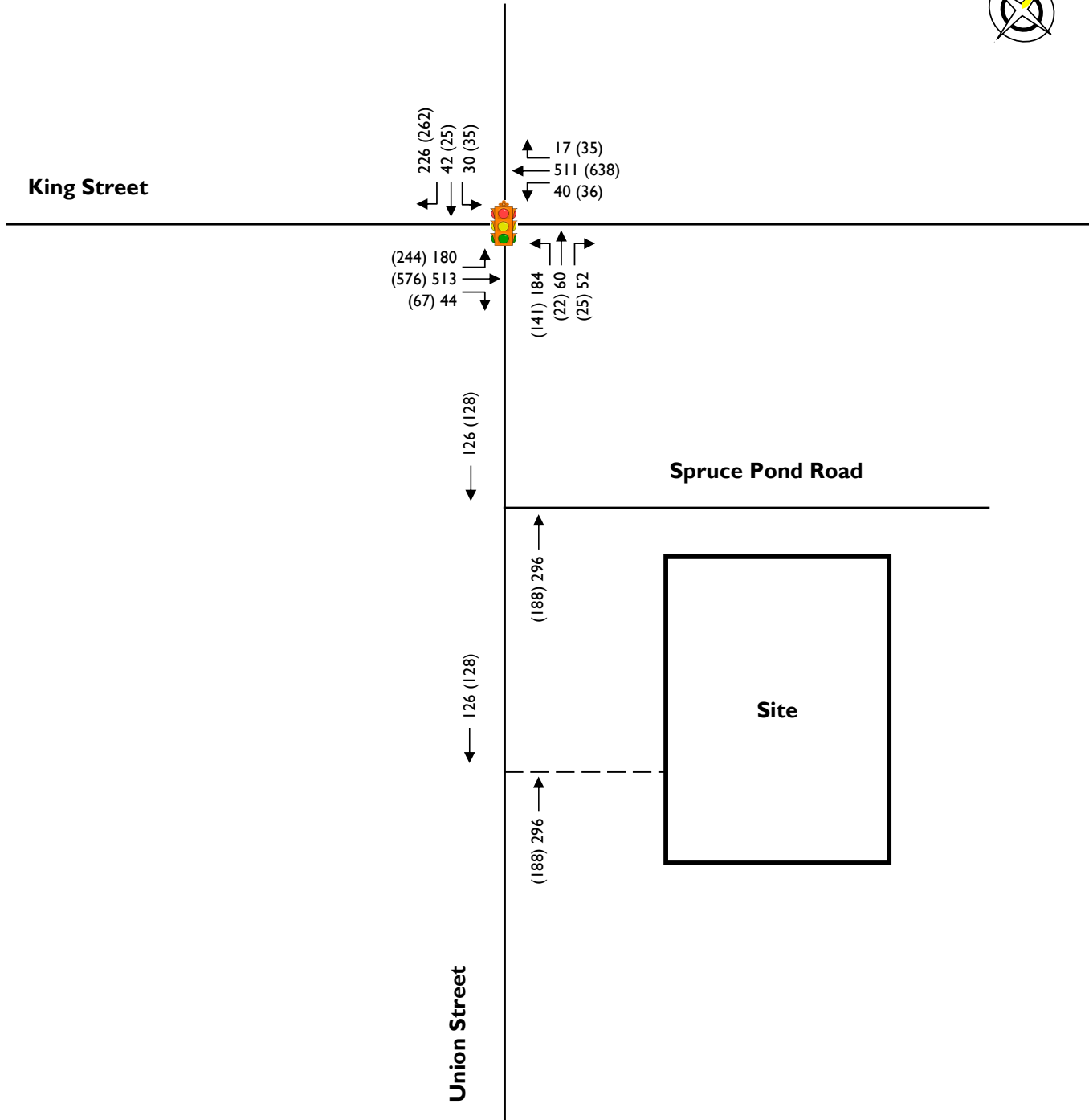





**STONEFIELD**

Proposed Child Care Center  
700-712 Union Street  
Town of Franklin, Norfolk County, Massachusetts  
Traffic Impact Study

**FIGURE I**  
Site Location Map



**LEGEND**

- Existing Roadway
- - - Proposed Driveway
- · - Existing Private Driveway
- ← AM (PM) Peak Hour Volumes
-  Signalized Intersection

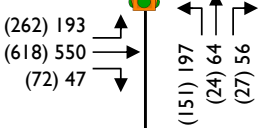
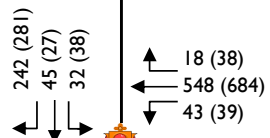
**STONEFIELD**

**Proposed Child Care Center**  
**700-712 Union Street**  
**Town of Franklin, Norfolk County, Massachusetts**  
**Traffic Impact Study**

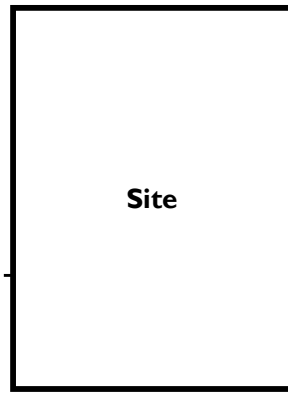
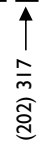
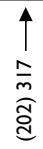
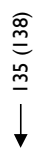
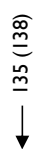
**FIGURE 2**  
**2022 Existing Traffic**  
**Volumes**



**King Street**



**Spruce Pond Road**



**Union Street**

**LEGEND**

- Existing Roadway
- - - Proposed Driveway
- · - Existing Private Driveway
- ← AM (PM) Peak Hour Volumes
- Signalized Intersection

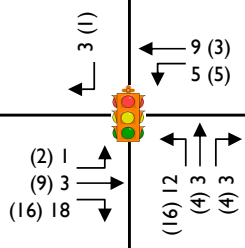
**STONEFIELD**

**Proposed Child Care Center**  
**700-712 Union Street**  
**Town of Franklin, Norfolk County, Massachusetts**  
**Traffic Impact Study**

**FIGURE 3**  
**2029 Base Traffic Volumes**



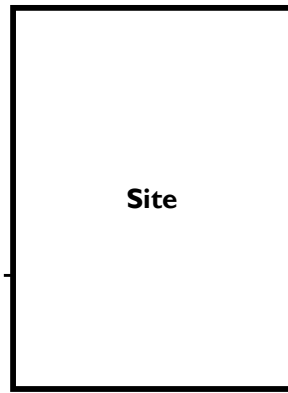
**King Street**



27 (25)

**Spruce Pond Road**

(24) 18



**Site**

**Union Street**

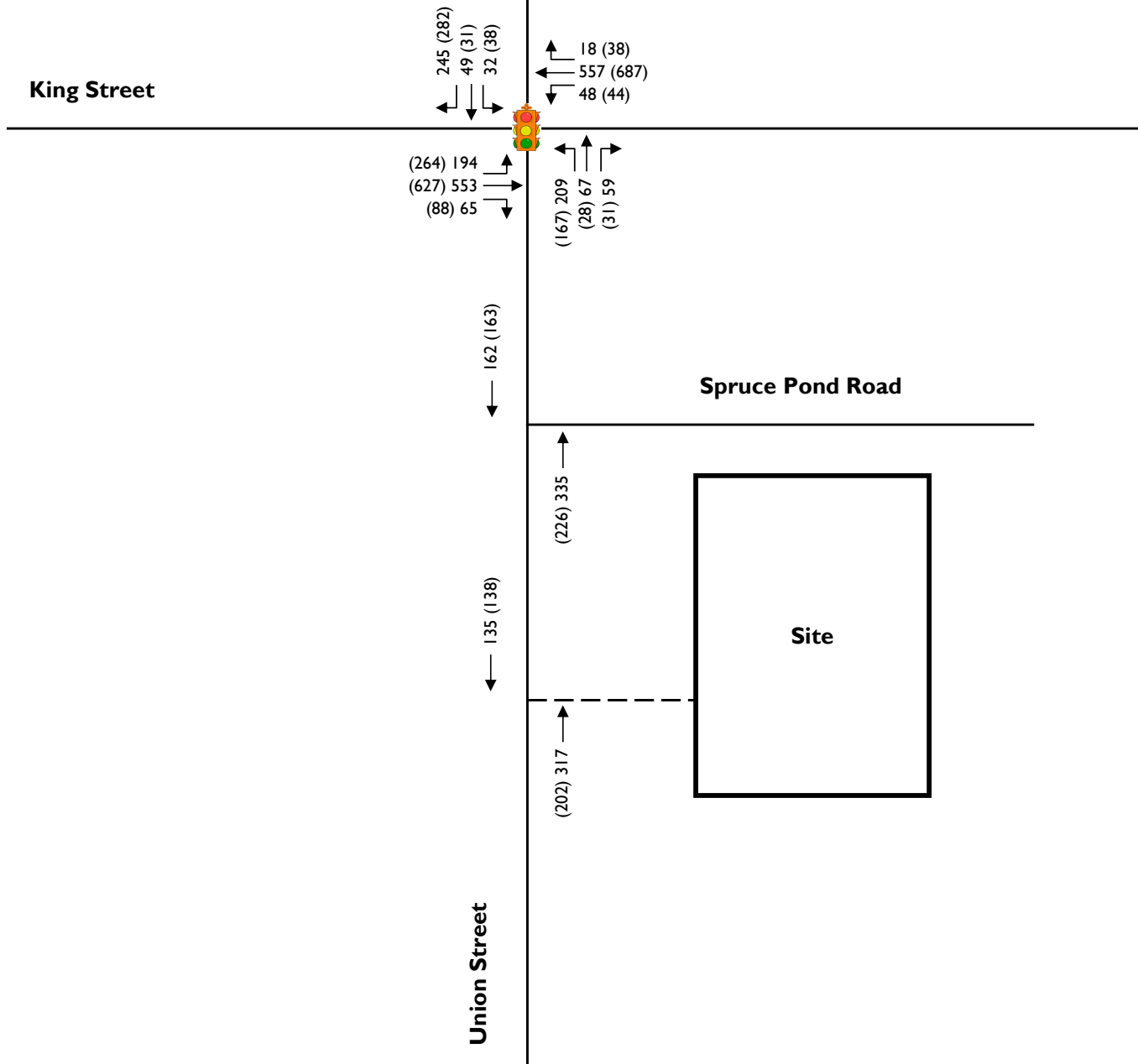
**LEGEND**

- Existing Roadway
- - - Proposed Driveway
- · - Existing Private Driveway
- ← AM (PM) Peak Hour Volumes
- Signalized Intersection


**STONEFIELD**

**Proposed Child Care Center**  
**700-712 Union Street**  
**Town of Franklin, Norfolk County, Massachusetts**  
**Traffic Impact Study**

**FIGURE 4**  
**Other Planned Projects**  
**Future Traffic Volumes**



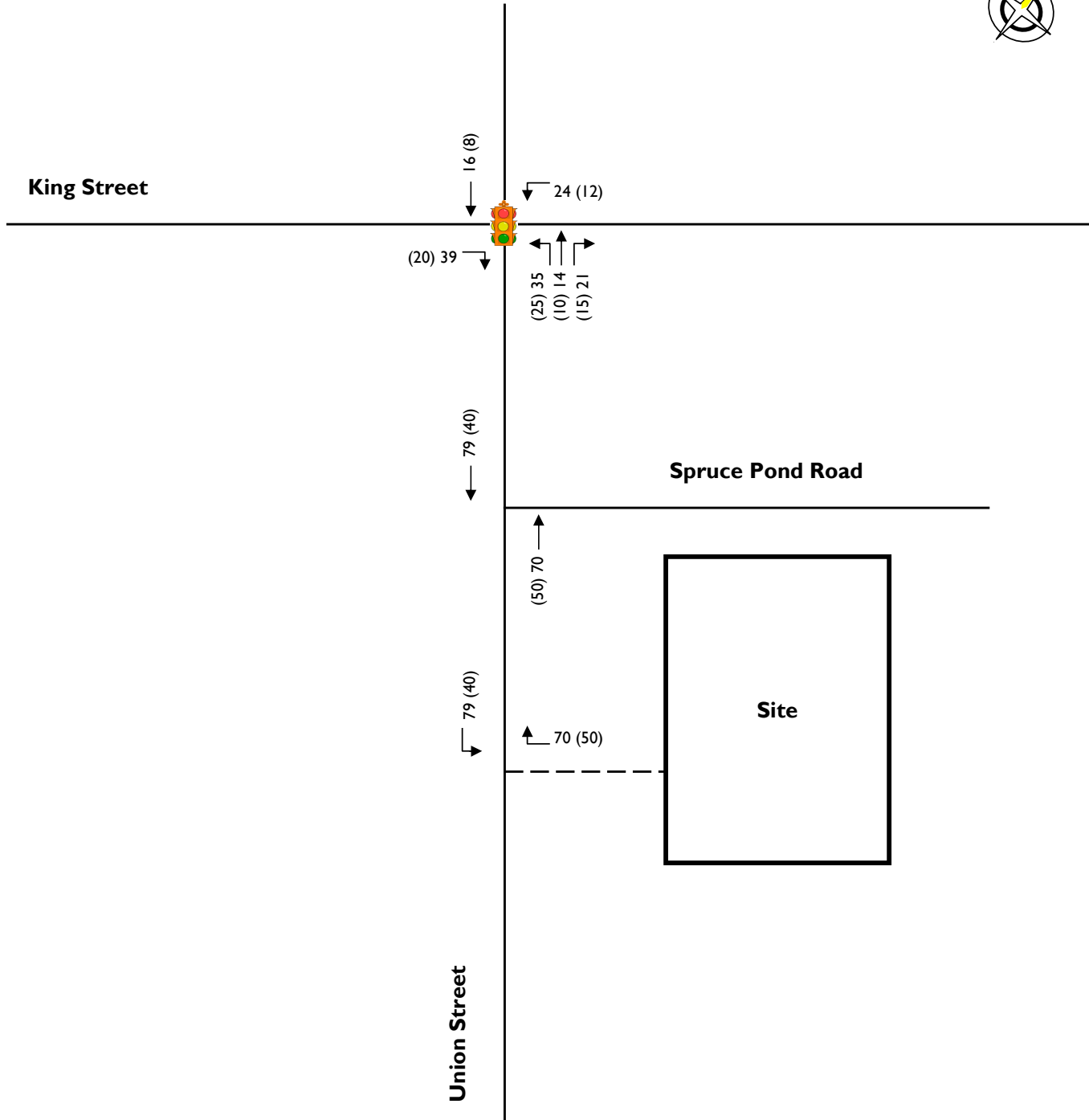
**LEGEND**

- Existing Roadway
- - - Proposed Driveway
- · - Existing Private Driveway
- ← AM (PM) Peak Hour Volumes
-  Signalized Intersection


**STONEFIELD**

**Proposed Child Care Center**  
**700-712 Union Street**  
**Town of Franklin, Norfolk County, Massachusetts**  
**Traffic Impact Study**

**FIGURE 5**  
**2029 No-Build Traffic**  
**Volumes**



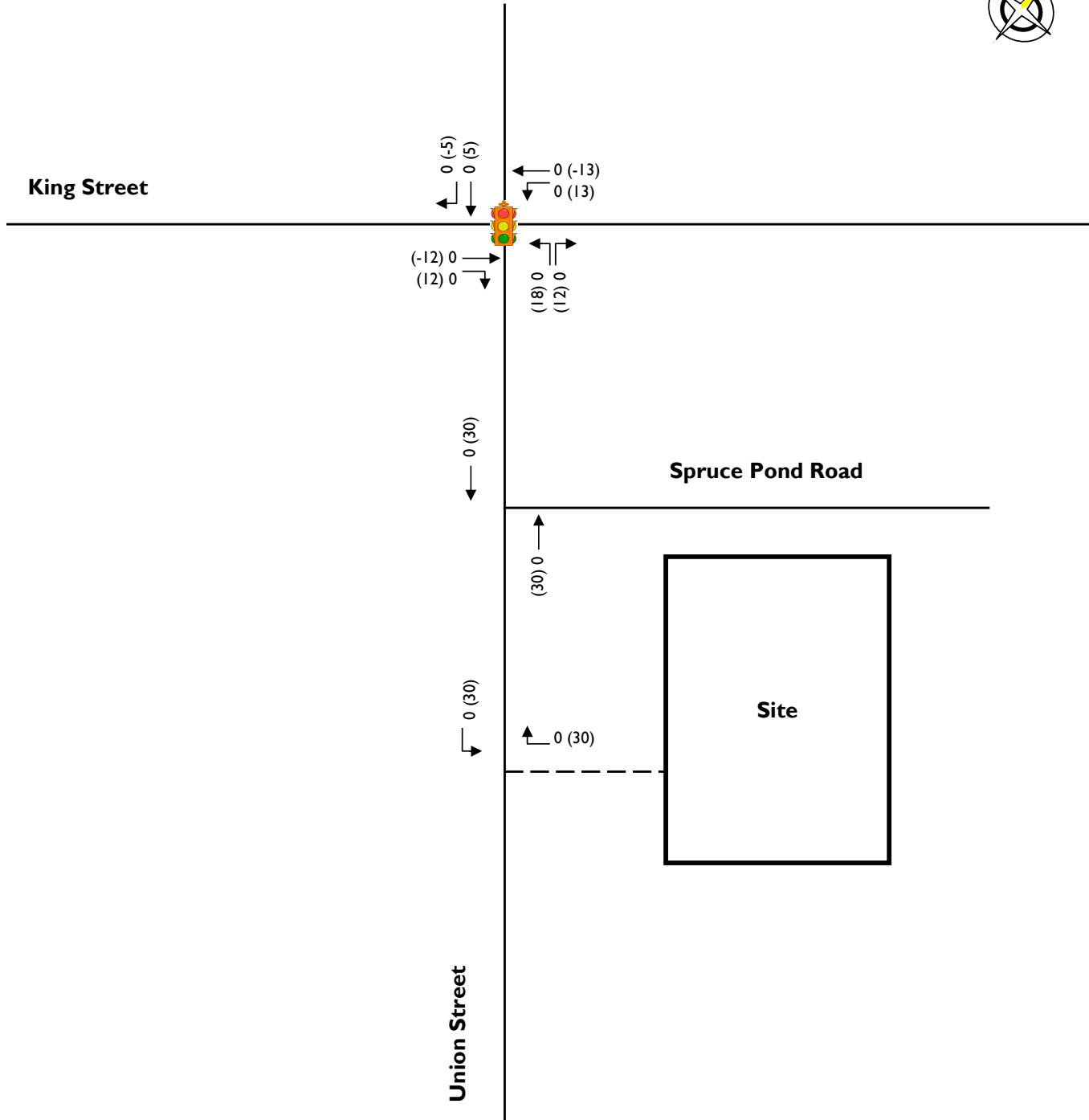
**LEGEND**

- Existing Roadway
- - - Proposed Driveway
- · - Existing Private Driveway
- ← AM (PM) Peak Hour Volumes
-  Signalized Intersection


**STONEFIELD**

**Proposed Child Care Center**  
**700-712 Union Street**  
**Town of Franklin, Norfolk County, Massachusetts**  
**Traffic Impact Study**

**FIGURE 6**  
**"New" Site-Generated**  
**Traffic Volumes**



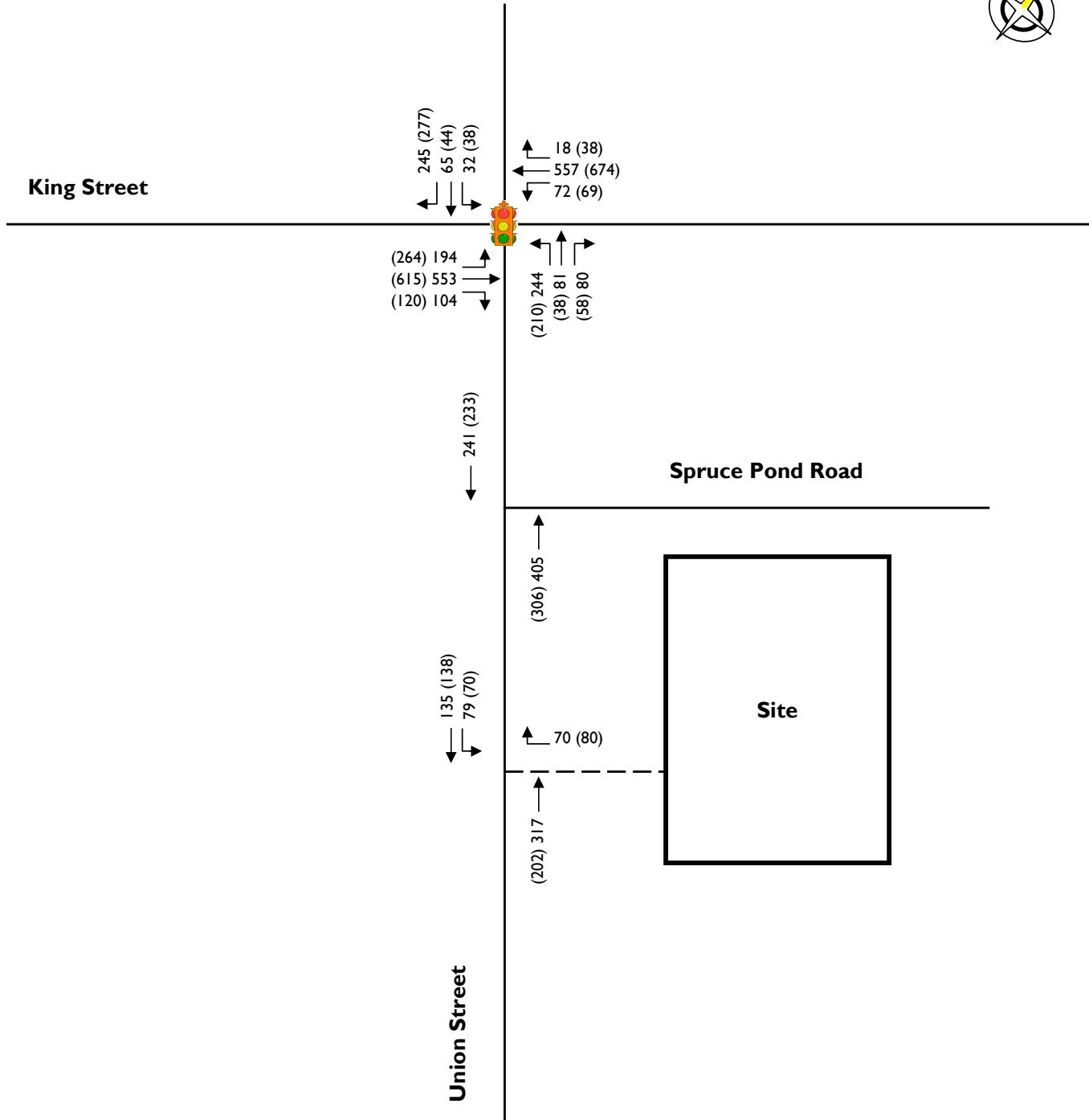
**LEGEND**

- Existing Roadway
- - - Proposed Driveway
- · - Existing Private Driveway
- ← AM (PM) Peak Hour Volumes
-  Signalized Intersection

**STONEFIELD**

**Proposed Child Care Center**  
**700-712 Union Street**  
**Town of Franklin, Norfolk County, Massachusetts**  
**Traffic Impact Study**

**FIGURE 7**  
**"Diverted" Site-Generated**  
**Traffic Volumes**



**LEGEND**

- Existing Roadway
- - - Proposed Driveway
- . . Existing Private Driveway
- ← AM (PM) Peak Hour Volumes
- Signalized Intersection

**STONEFIELD**

**Proposed Child Care Center**  
**700-712 Union Street**  
**Town of Franklin, Norfolk County, Massachusetts**  
**Traffic Impact Study**






















**FIGURE 8**  
**2029 Build Traffic Volumes**



**HIGHWAY CAPACITY ANALYSIS DETAIL SHEETS**

HCM Signalized Intersection Capacity Analysis  
3: Union Street & King Street






















2022 Existing Condition  
Weekday Morning Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	180	513	44	40	511	17	184	60	52	30	42	226
Future Volume (vph)	180	513	44	40	511	17	184	60	52	30	42	226
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	14	11	11	12	12	12	12	12	11	11	11
Total Lost time (s)	4.0	4.0	4.0		4.0		4.0	4.0			4.0	4.0
Lane Util. Factor	1.00	1.00	1.00		0.95		1.00	1.00			1.00	1.00
Frt	1.00	1.00	0.85		1.00		1.00	0.93			1.00	0.85
Flt Protected	0.95	1.00	1.00		1.00		0.95	1.00			0.98	1.00
Satd. Flow (prot)	1678	1912	1459		3415		1752	1708			1756	1531
Flt Permitted	0.95	1.00	1.00		0.88		0.51	1.00			0.81	1.00
Satd. Flow (perm)	1678	1912	1459		3032		934	1708			1455	1531
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	186	529	45	41	527	18	190	62	54	31	43	233
RTOR Reduction (vph)	0	0	17	0	2	0	0	32	0	0	0	161
Lane Group Flow (vph)	186	529	28	0	584	0	190	84	0	0	74	72
Heavy Vehicles (%)	4%	6%	7%	5%	5%	0%	3%	3%	4%	3%	2%	2%
Turn Type	Prot	NA	Perm	pm+pt	NA		pm+pt	NA		Perm	NA	pm+ov
Protected Phases	5	2		1	6		3	8			4	5
Permitted Phases			2	6			8			4		4
Actuated Green, G (s)	16.0	61.2	61.2		39.2		26.8	26.8			8.0	24.0
Effective Green, g (s)	18.0	63.2	63.2		41.2		28.8	28.8			10.0	28.0
Actuated g/C Ratio	0.18	0.63	0.63		0.41		0.29	0.29			0.10	0.28
Clearance Time (s)	6.0	6.0	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			3.0	3.0
Lane Grp Cap (vph)	302	1208	922		1249		390	491			145	489
v/s Ratio Prot	c0.11	0.28					c0.07	0.05				0.03
v/s Ratio Perm			0.02		c0.19		c0.07				0.05	0.02
v/c Ratio	0.62	0.44	0.03		0.47		0.49	0.17			0.51	0.15
Uniform Delay, d1	37.8	9.4	6.9		21.4		28.5	26.7			42.7	27.0
Progression Factor	1.00	1.00	1.00		1.00		1.00	1.00			1.00	1.00
Incremental Delay, d2	3.7	1.2	0.1		0.3		1.0	0.2			3.0	0.1
Delay (s)	41.5	10.5	7.0		21.7		29.5	26.8			45.7	27.2
Level of Service	D	B	A		C		C	C			D	C
Approach Delay (s)		17.9			21.7			28.5			31.6	
Approach LOS		B			C			C			C	
<b>Intersection Summary</b>												
HCM 2000 Control Delay			22.8	HCM 2000 Level of Service				C				
HCM 2000 Volume to Capacity ratio			0.54									
Actuated Cycle Length (s)			100.0	Sum of lost time (s)				18.0				
Intersection Capacity Utilization			69.7%	ICU Level of Service				C				
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis  
3: Union Street & King Street






















2022 Existing Condition  
Weekday Evening Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	244	576	67	36	638	35	141	22	25	35	25	262
Future Volume (vph)	244	576	67	36	638	35	141	22	25	35	25	262
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	14	11	11	12	12	12	12	12	11	11	11
Total Lost time (s)	4.0	4.0	4.0		4.0		4.0	4.0			4.0	4.0
Lane Util. Factor	1.00	1.00	1.00		0.95		1.00	1.00			1.00	1.00
Frt	1.00	1.00	0.85		0.99		1.00	0.92			1.00	0.85
Flt Protected	0.95	1.00	1.00		1.00		0.95	1.00			0.97	1.00
Satd. Flow (prot)	1745	1987	1546		3501		1805	1717			1753	1546
Flt Permitted	0.95	1.00	1.00		0.90		0.48	1.00			0.79	1.00
Satd. Flow (perm)	1745	1987	1546		3145		918	1717			1428	1546
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	257	606	71	38	672	37	148	23	26	37	26	276
RTOR Reduction (vph)	0	0	23	0	4	0	0	20	0	0	0	125
Lane Group Flow (vph)	257	606	48	0	743	0	148	29	0	0	63	151
Heavy Vehicles (%)	0%	2%	1%	0%	2%	6%	0%	4%	0%	3%	0%	1%
Turn Type	Prot	NA	Perm	pm+pt	NA		pm+pt	NA		Perm	NA	pm+ov
Protected Phases	5	2		1	6		3	8			4	5
Permitted Phases			2	6			8			4		4
Actuated Green, G (s)	19.7	65.2	65.2		39.5		22.8	22.8			6.3	26.0
Effective Green, g (s)	21.7	67.2	67.2		41.5		24.8	24.8			8.3	30.0
Actuated g/C Ratio	0.22	0.67	0.67		0.42		0.25	0.25			0.08	0.30
Clearance Time (s)	6.0	6.0	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			3.0	3.0
Lane Grp Cap (vph)	378	1335	1038		1305		338	425			118	525
v/s Ratio Prot	c0.15	0.30					c0.05	0.02				0.06
v/s Ratio Perm			0.03		c0.24		c0.05				0.04	0.04
v/c Ratio	0.68	0.45	0.05		0.57		0.44	0.07			0.53	0.29
Uniform Delay, d1	36.0	7.7	5.6		22.4		30.9	28.8			44.0	26.8
Progression Factor	1.00	1.00	1.00		1.00		1.00	1.00			1.00	1.00
Incremental Delay, d2	4.8	1.1	0.1		0.6		0.9	0.1			4.6	0.3
Delay (s)	40.8	8.9	5.6		23.0		31.8	28.8			48.6	27.1
Level of Service	D	A	A		C		C	C			D	C
Approach Delay (s)		17.4			23.0			31.1			31.1	
Approach LOS		B			C			C			C	
<b>Intersection Summary</b>												
HCM 2000 Control Delay			22.6	HCM 2000 Level of Service				C				
HCM 2000 Volume to Capacity ratio			0.60									
Actuated Cycle Length (s)			100.0	Sum of lost time (s)				18.0				
Intersection Capacity Utilization			74.6%	ICU Level of Service				D				
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis  
3: Union Street & King Street






















2029 No-Build Condition  
Weekday Morning Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	194	553	65	48	557	18	209	67	59	32	49	245
Future Volume (vph)	194	553	65	48	557	18	209	67	59	32	49	245
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	14	11	11	12	12	12	12	12	11	11	11
Total Lost time (s)	4.0	4.0	4.0		4.0		4.0	4.0			4.0	4.0
Lane Util. Factor	1.00	1.00	1.00		0.95		1.00	1.00			1.00	1.00
Frt	1.00	1.00	0.85		1.00		1.00	0.93			1.00	0.85
Flt Protected	0.95	1.00	1.00		1.00		0.95	1.00			0.98	1.00
Satd. Flow (prot)	1678	1912	1459		3415		1752	1707			1759	1531
Flt Permitted	0.95	1.00	1.00		0.87		0.47	1.00			0.81	1.00
Satd. Flow (perm)	1678	1912	1459		2975		874	1707			1461	1531
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	200	570	67	49	574	19	215	69	61	33	51	253
RTOR Reduction (vph)	0	0	25	0	2	0	0	32	0	0	0	135
Lane Group Flow (vph)	200	570	42	0	640	0	215	98	0	0	84	118
Heavy Vehicles (%)	4%	6%	7%	5%	5%	0%	3%	3%	4%	3%	2%	2%
Turn Type	Prot	NA	Perm	pm+pt	NA		pm+pt	NA		Perm	NA	pm+ov
Protected Phases	5	2		1	6		3	8			4	5
Permitted Phases			2	6			8			4		4
Actuated Green, G (s)	16.6	61.1	61.1		38.5		26.9	26.9			7.6	24.2
Effective Green, g (s)	18.6	63.1	63.1		40.5		28.9	28.9			9.6	28.2
Actuated g/C Ratio	0.19	0.63	0.63		0.40		0.29	0.29			0.10	0.28
Clearance Time (s)	6.0	6.0	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			3.0	3.0
Lane Grp Cap (vph)	312	1206	920		1204		386	493			140	492
v/s Ratio Prot	c0.12	0.30					c0.08	0.06				0.04
v/s Ratio Perm			0.03		c0.22		c0.08				0.06	0.03
v/c Ratio	0.64	0.47	0.05		0.53		0.56	0.20			0.60	0.24
Uniform Delay, d1	37.6	9.7	7.0		22.6		28.9	26.8			43.4	27.6
Progression Factor	1.00	1.00	1.00		1.00		1.00	1.00			1.00	1.00
Incremental Delay, d2	4.5	1.3	0.1		0.5		1.7	0.2			6.8	0.3
Delay (s)	42.1	11.0	7.1		23.0		30.7	27.0			50.1	27.9
Level of Service	D	B	A		C		C	C			D	C
Approach Delay (s)		18.1			23.0			29.3			33.4	
Approach LOS		B			C			C			C	
<b>Intersection Summary</b>												
HCM 2000 Control Delay			23.8									HCM 2000 Level of Service C
HCM 2000 Volume to Capacity ratio			0.60									
Actuated Cycle Length (s)			100.0								18.0	Sum of lost time (s)
Intersection Capacity Utilization			77.2%									ICU Level of Service D
Analysis Period (min)			15									

c Critical Lane Group

HCM Signalized Intersection Capacity Analysis  
3: Union Street & King Street

2029 No-Build Condition  
Weekday Evening Peak Hour






















												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	264	627	88	44	687	38	167	28	31	38	31	282
Future Volume (vph)	264	627	88	44	687	38	167	28	31	38	31	282
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	14	11	11	12	12	12	12	12	11	11	11
Total Lost time (s)	4.0	4.0	4.0		4.0		4.0	4.0			4.0	4.0
Lane Util. Factor	1.00	1.00	1.00		0.95		1.00	1.00			1.00	1.00
Frt	1.00	1.00	0.85		0.99		1.00	0.92			1.00	0.85
Flt Protected	0.95	1.00	1.00		1.00		0.95	1.00			0.97	1.00
Satd. Flow (prot)	1745	1987	1546		3500		1805	1716			1759	1546
Flt Permitted	0.95	1.00	1.00		0.88		0.47	1.00			0.80	1.00
Satd. Flow (perm)	1745	1987	1546		3083		895	1716			1437	1546
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	278	660	93	46	723	40	176	29	33	40	33	297
RTOR Reduction (vph)	0	0	31	0	4	0	0	25	0	0	0	114
Lane Group Flow (vph)	278	660	62	0	805	0	176	37	0	0	73	183
Heavy Vehicles (%)	0%	2%	1%	0%	2%	6%	0%	4%	0%	3%	0%	1%
Turn Type	Prot	NA	Perm	pm+pt	NA		pm+pt	NA		Perm	NA	pm+ov
Protected Phases	5	2		1	6		3	8			4	5
Permitted Phases			2	6			8			4		4
Actuated Green, G (s)	20.6	65.2	65.2		38.6		22.8	22.8			5.9	26.5
Effective Green, g (s)	22.6	67.2	67.2		40.6		24.8	24.8			7.9	30.5
Actuated g/C Ratio	0.23	0.67	0.67		0.41		0.25	0.25			0.08	0.30
Clearance Time (s)	6.0	6.0	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			3.0	3.0
Lane Grp Cap (vph)	394	1335	1038		1251		339	425			113	533
v/s Ratio Prot	c0.16	0.33					c0.07	0.02				0.08
v/s Ratio Perm			0.04		c0.26		c0.06				0.05	0.04
v/c Ratio	0.71	0.49	0.06		0.64		0.52	0.09			0.65	0.34
Uniform Delay, d1	35.6	8.1	5.6		23.9		31.4	28.9			44.7	27.0
Progression Factor	1.00	1.00	1.00		1.00		1.00	1.00			1.00	1.00
Incremental Delay, d2	5.7	1.3	0.1		1.1		1.3	0.1			12.0	0.4
Delay (s)	41.3	9.4	5.7		25.0		32.8	29.0			56.7	27.4
Level of Service	D	A	A		C		C	C			E	C
Approach Delay (s)		17.6			25.0			31.8			33.2	
Approach LOS		B			C			C			C	
<b>Intersection Summary</b>												
HCM 2000 Control Delay			23.8		HCM 2000 Level of Service			C				
HCM 2000 Volume to Capacity ratio			0.66									
Actuated Cycle Length (s)			100.0		Sum of lost time (s)			18.0				
Intersection Capacity Utilization			80.4%		ICU Level of Service			D				
Analysis Period (min)			15									

c Critical Lane Group

# HCM Signalized Intersection Capacity Analysis

## 3: Union Street & King Street

2029 Build Condition  
Weekday Morning Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	194	553	104	72	557	18	244	81	80	32	65	245
Future Volume (vph)	194	553	104	72	557	18	244	81	80	32	65	245
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	14	11	11	12	12	12	12	12	11	11	11
Total Lost time (s)	4.0	4.0	4.0		4.0		4.0	4.0			4.0	4.0
Lane Util. Factor	1.00	1.00	1.00		0.95		1.00	1.00			1.00	1.00
Frt	1.00	1.00	0.85		1.00		1.00	0.93			1.00	0.85
Flt Protected	0.95	1.00	1.00		0.99		0.95	1.00			0.98	1.00
Satd. Flow (prot)	1678	1912	1459		3409		1752	1700			1766	1531
Flt Permitted	0.95	1.00	1.00		0.82		0.46	1.00			0.83	1.00
Satd. Flow (perm)	1678	1912	1459		2808		842	1700			1485	1531
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	200	570	107	74	574	19	252	84	82	33	67	253
RTOR Reduction (vph)	0	0	42	0	2	0	0	35	0	0	0	117
Lane Group Flow (vph)	200	570	65	0	665	0	252	131	0	0	100	136
Heavy Vehicles (%)	4%	6%	7%	5%	5%	0%	3%	3%	4%	3%	2%	2%
Turn Type	Prot	NA	Perm	pm+pt	NA		pm+pt	NA		Perm	NA	pm+ov
Protected Phases	5	2		1	6		3	8			4	5
Permitted Phases			2	6			8			4		4
Actuated Green, G (s)	16.6	59.2	59.2		36.6		28.8	28.8			9.3	25.9
Effective Green, g (s)	18.6	61.2	61.2		38.6		30.8	30.8			11.3	29.9
Actuated g/C Ratio	0.19	0.61	0.61		0.39		0.31	0.31			0.11	0.30
Clearance Time (s)	6.0	6.0	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			3.0	3.0
Lane Grp Cap (vph)	312	1170	892		1083		400	523			167	519
v/s Ratio Prot	c0.12	0.30					c0.10	0.08				0.05
v/s Ratio Perm			0.04		c0.24		c0.10				0.07	0.04
v/c Ratio	0.64	0.49	0.07		0.61		0.63	0.25			0.60	0.26
Uniform Delay, d1	37.6	10.7	7.9		24.7		28.1	26.0			42.2	26.7
Progression Factor	1.00	1.00	1.00		1.00		1.00	1.00			1.00	1.00
Incremental Delay, d2	4.5	1.5	0.2		1.0		3.2	0.3			5.7	0.3
Delay (s)	42.1	12.2	8.0		25.7		31.4	26.2			47.9	26.9
Level of Service	D	B	A		C		C	C			D	C
Approach Delay (s)		18.5			25.7			29.3			32.9	
Approach LOS		B			C			C			C	
<b>Intersection Summary</b>												
HCM 2000 Control Delay			24.7									HCM 2000 Level of Service C
HCM 2000 Volume to Capacity ratio			0.66									
Actuated Cycle Length (s)			100.0								18.0	Sum of lost time (s)
Intersection Capacity Utilization			79.9%									ICU Level of Service D
Analysis Period (min)			15									

c Critical Lane Group

Intersection						
Int Delay, s/veh	2.3					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	0	70	317	0	79	135
Future Vol, veh/h	0	70	317	0	79	135
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	97	97	97	97	97	97
Heavy Vehicles, %	0	0	4	0	0	7
Mvmt Flow	0	72	327	0	81	139






















Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	628	327	0	0	327	0
Stage 1	327	-	-	-	-	-
Stage 2	301	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	450	719	-	-	1244	-
Stage 1	735	-	-	-	-	-
Stage 2	755	-	-	-	-	-
Platoon blocked, %			-	-	-	-
Mov Cap-1 Maneuver	418	719	-	-	1244	-
Mov Cap-2 Maneuver	418	-	-	-	-	-
Stage 1	735	-	-	-	-	-
Stage 2	701	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	10.6	0	3
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	719	1244
HCM Lane V/C Ratio	-	-	0.1	0.065
HCM Control Delay (s)	-	-	10.6	8.1
HCM Lane LOS	-	-	B	A
HCM 95th %tile Q(veh)	-	-	0.3	0.2

HCM Signalized Intersection Capacity Analysis  
3: Union Street & King Street

2029 Build Condition  
Weekday Evening Peak Hour

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	264	615	120	69	674	38	210	38	58	38	44	277
Future Volume (vph)	264	615	120	69	674	38	210	38	58	38	44	277
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width	11	14	11	11	12	12	12	12	12	11	11	11
Total Lost time (s)	4.0	4.0	4.0		4.0		4.0	4.0			4.0	4.0
Lane Util. Factor	1.00	1.00	1.00		0.95		1.00	1.00			1.00	1.00
Frt	1.00	1.00	0.85		0.99		1.00	0.91			1.00	0.85
Flt Protected	0.95	1.00	1.00		1.00		0.95	1.00			0.98	1.00
Satd. Flow (prot)	1745	1987	1546		3497		1805	1701			1770	1546
Flt Permitted	0.95	1.00	1.00		0.83		0.43	1.00			0.80	1.00
Satd. Flow (perm)	1745	1987	1546		2904		815	1701			1452	1546
Peak-hour factor, PHF	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Adj. Flow (vph)	278	647	126	73	709	40	221	40	61	40	46	292
RTOR Reduction (vph)	0	0	42	0	4	0	0	46	0	0	0	114
Lane Group Flow (vph)	278	647	84	0	818	0	221	55	0	0	86	178
Heavy Vehicles (%)	0%	2%	1%	0%	2%	6%	0%	4%	0%	3%	0%	1%
Turn Type	Prot	NA	Perm	pm+pt	NA		pm+pt	NA		Perm	NA	pm+ov
Protected Phases	5	2		1	6		3	8			4	5
Permitted Phases			2	6			8			4		4
Actuated Green, G (s)	20.6	64.8	64.8		38.2		23.2	23.2			5.9	26.5
Effective Green, g (s)	22.6	66.8	66.8		40.2		25.2	25.2			7.9	30.5
Actuated g/C Ratio	0.23	0.67	0.67		0.40		0.25	0.25			0.08	0.30
Clearance Time (s)	6.0	6.0	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			3.0	3.0
Lane Grp Cap (vph)	394	1327	1032		1167		337	428			114	533
v/s Ratio Prot	c0.16	0.33					c0.09	0.03				0.08
v/s Ratio Perm			0.05		c0.28		c0.08				0.06	0.04
v/c Ratio	0.71	0.49	0.08		0.70		0.66	0.13			0.75	0.33
Uniform Delay, d1	35.6	8.2	5.8		24.9		32.0	28.9			45.1	26.9
Progression Factor	1.00	1.00	1.00		1.00		1.00	1.00			1.00	1.00
Incremental Delay, d2	5.7	1.3	0.2		1.9		4.5	0.1			24.3	0.4
Delay (s)	41.3	9.5	6.0		26.8		36.6	29.1			69.4	27.3
Level of Service	D	A	A		C		D	C			E	C
Approach Delay (s)		17.5			26.8			34.2			36.8	
Approach LOS		B			C			C			D	
<b>Intersection Summary</b>												
HCM 2000 Control Delay			25.4									HCM 2000 Level of Service C
HCM 2000 Volume to Capacity ratio			0.73									
Actuated Cycle Length (s)			100.0								18.0	Sum of lost time (s)
Intersection Capacity Utilization			82.5%									ICU Level of Service E
Analysis Period (min)			15									

c Critical Lane Group



Intersection						
Int Delay, s/veh	2.7					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations	TT		T			T
Traffic Vol, veh/h	0	80	202	0	70	138
Future Vol, veh/h	0	80	202	0	70	138
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	-	-	-	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	0	0	4	0	0	1
Mvmt Flow	0	84	213	0	74	145

Major/Minor	Minor1	Major1	Major2			
Conflicting Flow All	506	213	0	0	213	0
Stage 1	213	-	-	-	-	-
Stage 2	293	-	-	-	-	-
Critical Hdwy	6.4	6.2	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.3	-	-	2.2	-
Pot Cap-1 Maneuver	530	832	-	-	1369	-
Stage 1	827	-	-	-	-	-
Stage 2	762	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	499	832	-	-	1369	-
Mov Cap-2 Maneuver	499	-	-	-	-	-
Stage 1	827	-	-	-	-	-
Stage 2	717	-	-	-	-	-

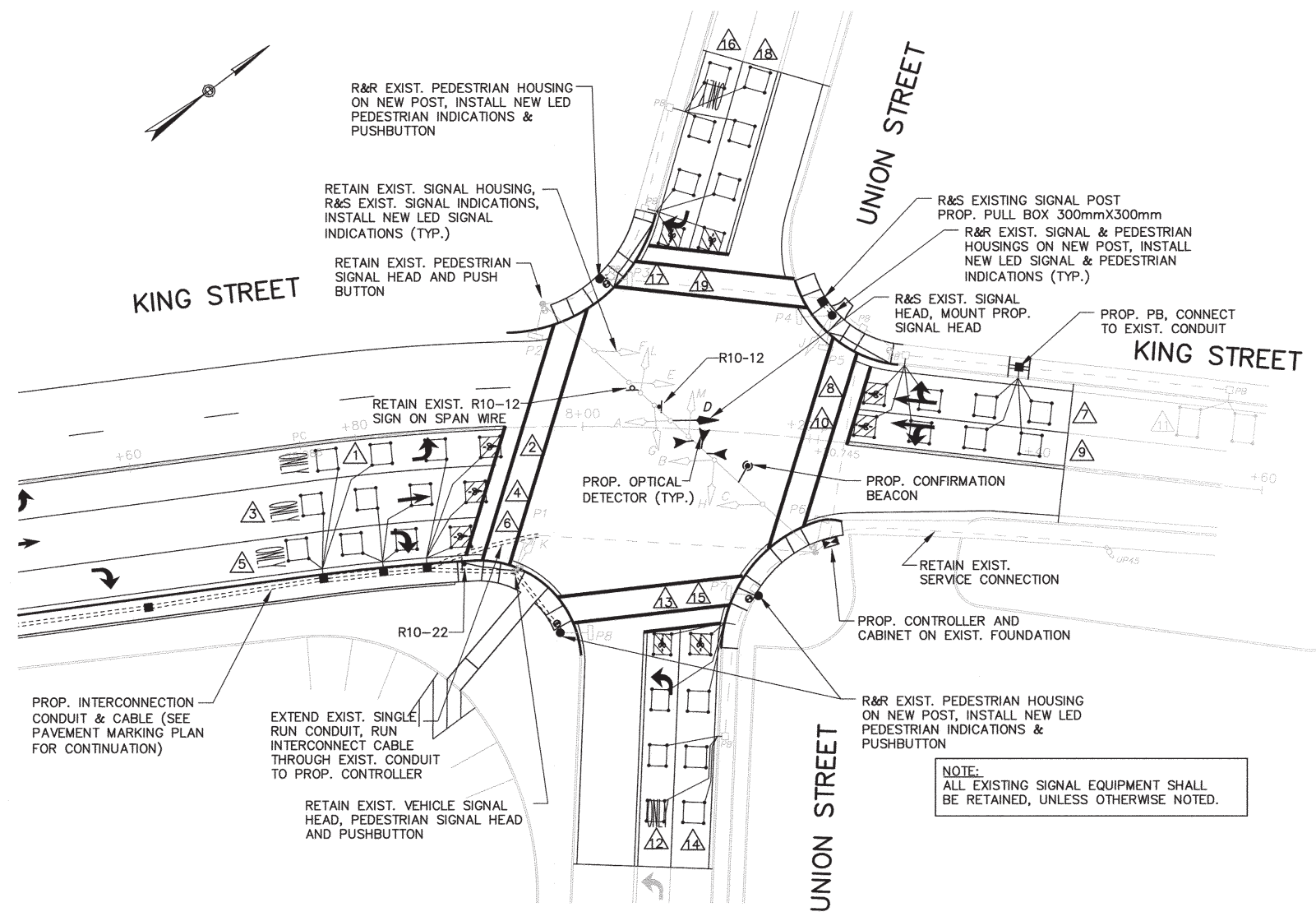
Approach	WB	NB	SB
HCM Control Delay, s	9.8	0	2.6
HCM LOS	A		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	SBL	SBT
Capacity (veh/h)	-	-	832	1369
HCM Lane V/C Ratio	-	-	0.101	0.054
HCM Control Delay (s)	-	-	9.8	7.8
HCM Lane LOS	-	-	A	A
HCM 95th %tile Q(veh)	-	-	0.3	0.2

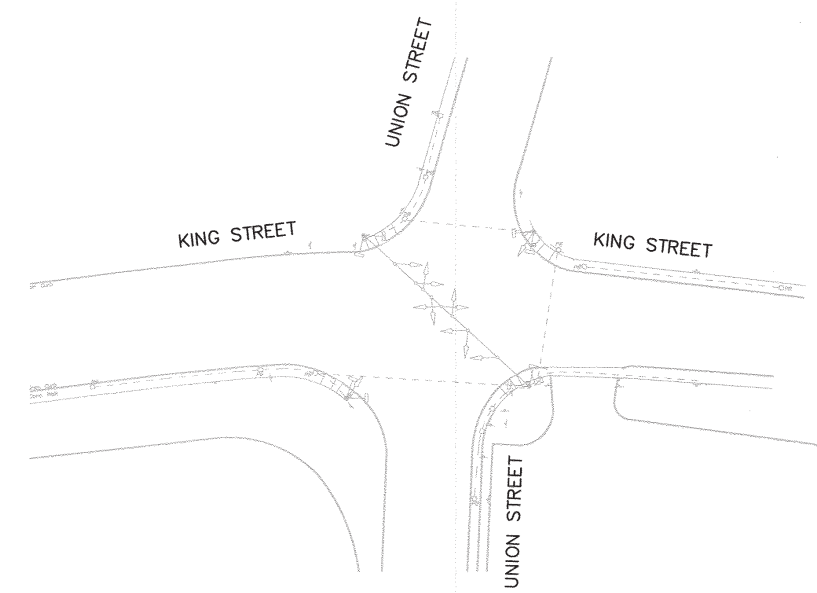
**TRAFFIC SIGNAL TIMING DIRECTIVE**

FRANKLIN					
KING STREET AND I-495 RAMPS					
STATE	FED.AID PROJ. NO.	FISCAL YEAR	SHEET NO.	TOTAL SHEETS	
MASS	CM-001S(704)	2009	42	77	
PROJECT FILE NO.			602962		

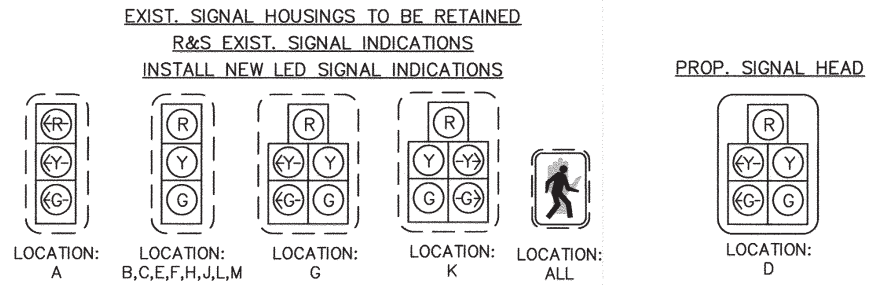
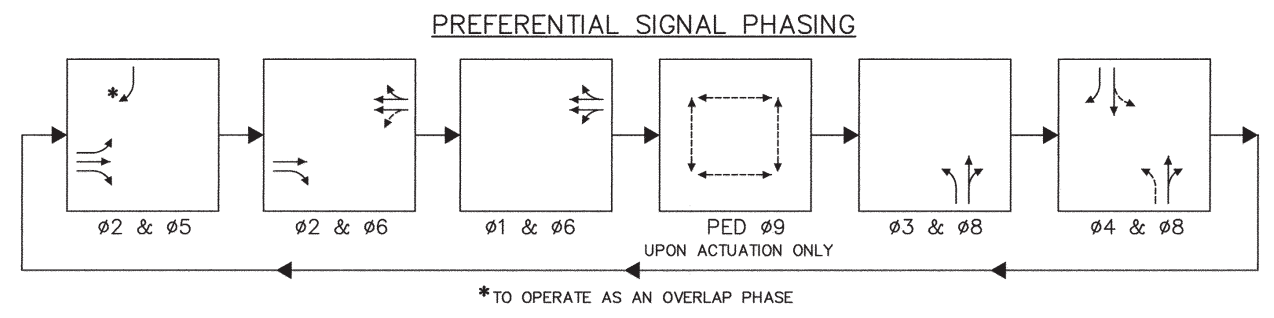
TRAFFIC SIGNAL PLAN  
LOCATION 4  
KING ST. AT UNION STREET



PROPOSED SIGNAL LAYOUT  
LOCATION 4  
SCALE  
0 5 10 15 20 25 METERS  
(1:250)



EXISTING SIGNAL LAYOUT  
SCALE  
0 10 20 30 40 50 METERS  
(1:500)



- NOTES: 1.) ALL PROPOSED SIGNAL HEADS SHALL HAVE TUNNEL VISORS & 125mm BACKPLATES.  
2.) ALL PROPOSED SIGNAL LENSES SHALL BE 300mm DIA.  
3.) ALL PROPOSED RED, AMBER AND GREEN INDICATIONS SHALL BE LED TYPE.

SIGNAL HEAD DATA  
NOT TO SCALE

P:\1000\1010 - King St I-495 Ramp\AutoCAD Files\Plan\1010-signal.dwg 03/12/2004 09:53:08 AM EST

SEQUENCE AND TIMING FOR FULLY-ACTUATED TRAFFIC SIGNAL CONTROL (COORDINATED)												PREEMPTION OPERATION												FLASH OPER.																										
												PREEMPT "A" ø2 & ø5			PREEMPT "B" ø1 & ø6			PREEMPT "C" ø4																																
STREET	DIRECTION	HOUSINGS	ø1	ø1	ø1	ø2	ø2	ø2	ø3	ø3	ø3	ø4	ø4	ø4	ø5	ø5	ø5	ø6	ø6	ø6	ø8	ø8	ø8	PED ø9	ø9	ø9	ø9	ø9	ø9	ø9	ø9	ø9	ø9	ø9	ø9															
KING STREET	EB	A	←R-	←R-	←R-	←R-	←R-	←R-	←R-	←R-	←R-	←R-	←R-	←R-	←G-	←Y-	←R-	←R-	←R-	←R-	←R-	←R-	←R-	←R-	←R-	←R-	←G-	←Y-	←R-	←R-	←R-	←R-	←R-	←R-	←R-	←FR-														
KING STREET	EB	B,C	R	R	R	G	Y	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	FY														
KING STREET	WB	D	←G-	←Y-	R	R	R	R	R	R	R	R	R	R	R	R	R	G	Y	R	R	R	R	R	R	R	R	R	R	←G-/←Y-/←Y	R	R	R	R	R	R	FY													
KING STREET	WB	E,F	G	Y	R	R	R	R	R	R	R	R	R	R	R	R	R	G	Y	R	R	R	R	R	R	R	R	R	R	G	Y	R	R	R	R	FY														
UNION STREET	NB	G	R	R	R	R	R	R	←G-	←Y-	R	R	R	R	R	R	R	R	R	R	G	Y	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	FR											
UNION STREET	NB	H,J	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	FR											
UNION STREET	SB	K	R	R	R	R	R	R	R	R	R	R	R	R	G	Y	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	G/G	Y/Y	R	R	R	R	FR								
UNION STREET	SB	L,M	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	FR								
PEDESTRIAN	ALL	P1-P8	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	W	FDW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	DW	OUT											
<b>TIMING IN SECONDS</b>																																																		
MINIMUM GREEN			5			7			5			7			5			7			7																													
VEHICLE EXTENSION			3			3			3			3			3			3			3																													
MAXIMUM GREEN 1 (FREE)			15			50			15			15			30			15			30																													
MAXIMUM GREEN 2 (COORDINATED)			15			60			20			15			35			40			35																													
YELLOW CLEARANCE				4			4			4			4			4			4			4						4			4																			
RED CLEARANCE					2			2			2			2			2			2			2					2				2																		
WALK INTERVAL CLEARANCE																																																		
HOLD																											*		*			*																		
RECALL (SOFT)			OFF			ON			OFF			OFF			OFF			ON			OFF			OFF																										
MEMORY			NON-LOCK			NON-LOCK			NON-LOCK			NON-LOCK			NON-LOCK			NON-LOCK			NON-LOCK			LOCK																										

QUANTITY	DESCRIPTION
1	TRAFFIC SIGNAL CONTROLLER (TS2, TYPE 1), LOCATED IN BASE-MOUNTED CABINET
3	TRAFFIC SIGNAL POST AND BASE STANDARD - 2.5m (STEEL)
1	TRAFFIC SIGNAL POST AND BASE STANDARD - 3.0m (STEEL)
11	DUAL CHANNEL LOOP DETECTOR AMPLIFIER
36	WIRE LOOP - 1.8m x 1.8m
1	SIGNAL HEAD, 5-SECTION, 300mm LENS - D
9	RED (BALL) LED SIGNAL INDICATION, 300mm LENS
9	AMBER (BALL) LED SIGNAL INDICATION, 300mm LENS
9	GREEN (BALL) LED SIGNAL INDICATION, 300mm LENS
1	RED (ARROW) LED SIGNAL INDICATION, 300mm LENS
3	AMBER (ARROW) LED SIGNAL INDICATION, 300mm LENS
3	GREEN (ARROW) LED SIGNAL INDICATION, 300mm LENS
8	PEDESTRIAN LED SIGNAL INDICATION, 300mm LENS
3	PEDESTRIAN PUSHBUTTON, INSTRUCTIONAL SIGN & SADDLE
5	PULL BOX, 300mm x 300mm
1	125mm BACKPLATE
3	PREEMPTION SYSTEM - OPTICAL DETECTOR, UNIDIRECTIONAL, SINGLE CHANNEL
1	PREEMPTION SYSTEM - CARD RACK
1	PREEMPTION SYSTEM - 4 CHANNEL PHASE SELECTOR
1	EMERGENCY PREEMPTION CONFIRMATION BEACON (WHITE)

PLUS ALL MISCELLANEOUS EQUIPMENT, LABOR AND MATERIAL NECESSARY TO PROVIDE A COMPLETE OPERATING TRAFFIC CONTROL SIGNAL.

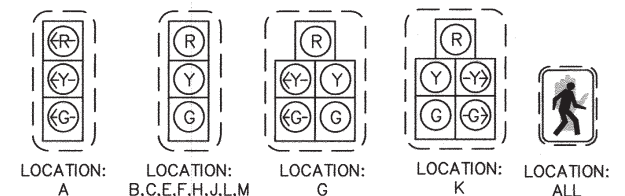
**TRAFFIC SIGNAL NOTES:**

- IF THE ASSIGNED RIGHT-OF-WAY FOR ANY TRAFFIC MOVEMENT IS TO REMAIN IN EFFECT DURING THE NEXT CALLED PHASE, THE SIGNAL INDICATIONS FOR THAT TRAFFIC MOVEMENT WILL NOT CHANGE DURING THE CLEARANCE INTERVAL.
- IF THE ASSIGNED RIGHT-OF-WAY FOR ANY TRAFFIC MOVEMENT IS TO CHANGE DURING THE NEXT CALLED PHASE, THE SIGNAL INDICATION FOR THAT TRAFFIC MOVEMENT WILL DISPLAY THE APPROPRIATE CLEARANCE INTERVALS.
- THE CONTROLLER SHALL OPERATE IN THE STANDARD NEMA DUAL-RING CONFIGURATION.
- FLASHING OPERATION IS FOR EMERGENCY ONLY. THE SIGNAL SHALL PROVIDE STOP AND GO OPERATION 24 HOURS DAILY.
- ALL SIGNAL POSTS AND POLES SHALL BE PLACED A MINIMUM OF 1.2m FROM THE EDGE OF THE CURB.
- EACH LOOP DETECTOR GROUP SHALL BE CONNECTED TO A SINGLE LOOP AMPLIFIER CHANNEL.
- ALL DETECTOR SETTINGS TO BE IMPLEMENTED AT THE CONTROLLER ONLY.
- DETECTORS  $\Delta_9$  &  $\Delta_{10}$  SHALL CALL ø6 THEN SWITCH TO EXTEND ø1.
- DETECTORS  $\Delta_{12}$  &  $\Delta_{13}$  SHALL CALL ø3 THEN SWITCH TO EXTEND ø8.
- DETECTORS  $\Delta_9$  &  $\Delta_{10}$  5 SECOND DELAY SHALL BE ENABLED DURING ASSOCIATED GREEN ONLY.
- DETECTORS  $\Delta_{16}$  &  $\Delta_{17}$  5 SECOND DELAY SHALL BE DISABLED DURING ASSOCIATED GREEN.
- UNLESS OTHERWISE NOTED, LOOP DETECTORS SHALL BE PLACED IN THE CENTER OF THE LANE.
- PAVEMENT MARKINGS (NOT SHOWN) AND WINDING DETAILS FOR BICYCLE DETECTORS SHALL CONFORM TO THE BICYCLE DETECTOR DETAIL SHEET.
- EXCLUSIVE PEDESTRIAN PHASE IS TO BE ACTIVATED BY PUSH BUTTON ONLY.
- ø7 NOT USED.
- UNION ST. SOUTHBOUND RIGHT TURN SHALL OPERATE AS AN OVERLAP DEPENDENT ON ø4 AND ø3.
- KIING ST. EASTBOUND RIGHT TURN SHALL OPERATE AS AN OVERLAP DEPENDENT ON ø2 AND ø3.
- EMERGENCY PREEMPTION SHALL BE ON A FIRST COME FIRST SERVE BASIS.
- UPON PREEMPTION ACTIVATION, PHASE(S) BEING SERVICED SHALL IMMEDIATELY TIMEOUT (I.E., YELLOW AND ALL RED) AS DESIGNED, EXCEPT FOR WHEN PHASE(S) CALLED BY PREEMPTION ARE CURRENTLY IN SERVICE. WHEN PHASE(S) CURRENTLY IN SERVICE MATCH PHASES CALLED BY PREEMPTION, SIGNAL INDICATIONS ARE MAINTAINED; HOWEVER PREEMPTION OPERATION (I.E. TIMING) SUPERSEDES NORMAL SIGNAL CONTROL.
- UPON ACTIVATION OF THE PREEMPTION MODE, THE CONFIRMATION BEACON SHALL BE ILLUMINATED.
- UPON TERMINATION OF THE PREEMPTION MODE, THE SIGNAL SHALL RETURN TO THE BEGINNING OF ø2 AND ø6.
- ADDITIONAL PULL BOXES REQUIRED FOR THE INTERCONNECT SYSTEM, NOT ACCOUNTED FOR IN THE MAJOR ITEMS LIST, SHALL BE PAID FOR UNDER ITEM 811.31. PULL BOXES SPECIFICALLY REQUIRED FOR THE TRAFFIC SIGNAL ARE INCLUDED IN THE MAJOR ITEMS LIST.

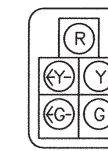
\*TIMING SHALL BE VARIABLE AND BASED ON DURATION OF FLASHING OPTICAL SIGNAL FROM APPROACHING EMERGENCY VEHICLE TRANSMITTER.

DETECTOR DATA							
DETECTOR GROUP	NO. SECTION/ SIZE	NO. OF TURNS	OPERATIONS	CALL DELAY (SECONDS)	CALL PHASE	SWITCH & EXTEND PHASE	LOOP CONNECTION
$\Delta_1$	3 - 1.8m x 1.8m	3	PRESENCE	0	ø5	-	PARALLEL
$\Delta_2$	1 - 1.8m x 1.8m	D-2	PRESENCE/ BICYCLE	0	ø5	-	PARALLEL
$\Delta_3$	3 - 1.8m x 1.8m	3	PRESENCE	0	ø2	-	PARALLEL
$\Delta_4$	1 - 1.8m x 1.8m	D-2	PRESENCE/ BICYCLE	0	ø2	-	PARALLEL
$\Delta_5$	3 - 1.8m x 1.8m	3	PRESENCE	5	ø2	-	PARALLEL
$\Delta_6$	1 - 1.8m x 1.8m	D-2	PRESENCE/ BICYCLE	5	ø2	-	PARALLEL
$\Delta_7$	3 - 1.8m x 1.8m	3	PRESENCE	0	ø6	ø1	PARALLEL
$\Delta_8$	1 - 1.8m x 1.8m	D-2	PRESENCE/ BICYCLE	0	ø6	-	PARALLEL
$\Delta_9$	3 - 1.8m x 1.8m	3	PRESENCE	5	ø6	ø1	PARALLEL
$\Delta_{10}$	1 - 1.8m x 1.8m	D-2	PRESENCE/ BICYCLE	5	ø6	-	PARALLEL
$\Delta_{11}$	2 - 1.8m x 1.8m	4	PULSE	0	ø6	-	PARALLEL
$\Delta_{12}$	3 - 1.8m x 1.8m	3	PRESENCE	0	ø3	ø8	PARALLEL
$\Delta_{13}$	1 - 1.8m x 1.8m	D-2	PRESENCE/ BICYCLE	0	ø3	ø8	PARALLEL
$\Delta_{14}$	3 - 1.8m x 1.8m	3	PRESENCE	0	ø8	-	PARALLEL
$\Delta_{15}$	1 - 1.8m x 1.8m	D-2	PRESENCE/ BICYCLE	0	ø8	-	PARALLEL
$\Delta_{16}$	3 - 1.8m x 1.8m	3	PRESENCE	5	ø4	-	PARALLEL
$\Delta_{17}$	1 - 1.8m x 1.8m	D-2	PRESENCE/ BICYCLE	5	ø4	-	PARALLEL
$\Delta_{18}$	3 - 1.8m x 1.8m	3	PRESENCE	0	ø4	-	PARALLEL
$\Delta_{19}$	1 - 1.8m x 1.8m	D-2	PRESENCE/ BICYCLE	0	ø4	-	PARALLEL

EXIST. SIGNAL HOUSINGS TO BE RETAINED  
R&S EXIST. SIGNAL INDICATIONS  
INSTALL NEW LED SIGNAL INDICATIONS



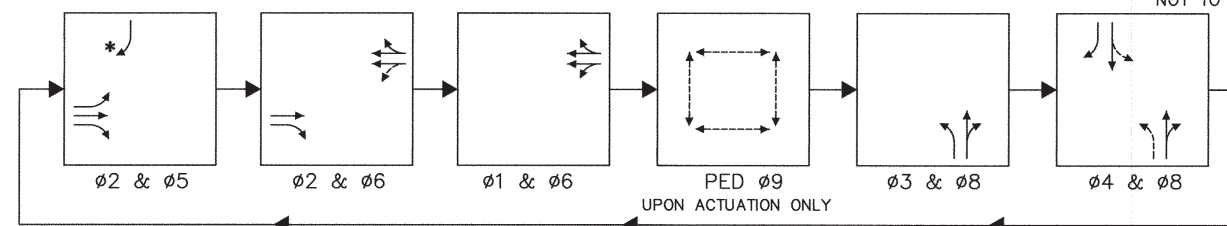
PROP. SIGNAL HEAD



LOCATION: D

- NOTES: 1.) ALL PROPOSED SIGNAL HEADS SHALL HAVE TUNNEL VISORS & 125mm BACKPLATES.  
2.) ALL PROPOSED SIGNAL LENSES SHALL BE 300mm DIA.  
3.) ALL PROPOSED RED, AMBER, GREEN, AND PEDESTRIAN INDICATIONS SHALL BE LED TYPE.  
4.) ALL PROPOSED PEDESTRIAN SIGNAL INDICATIONS SHALL DISPLAY INTERNATIONAL SYMBOLS - HAND/PERSON WALKING.

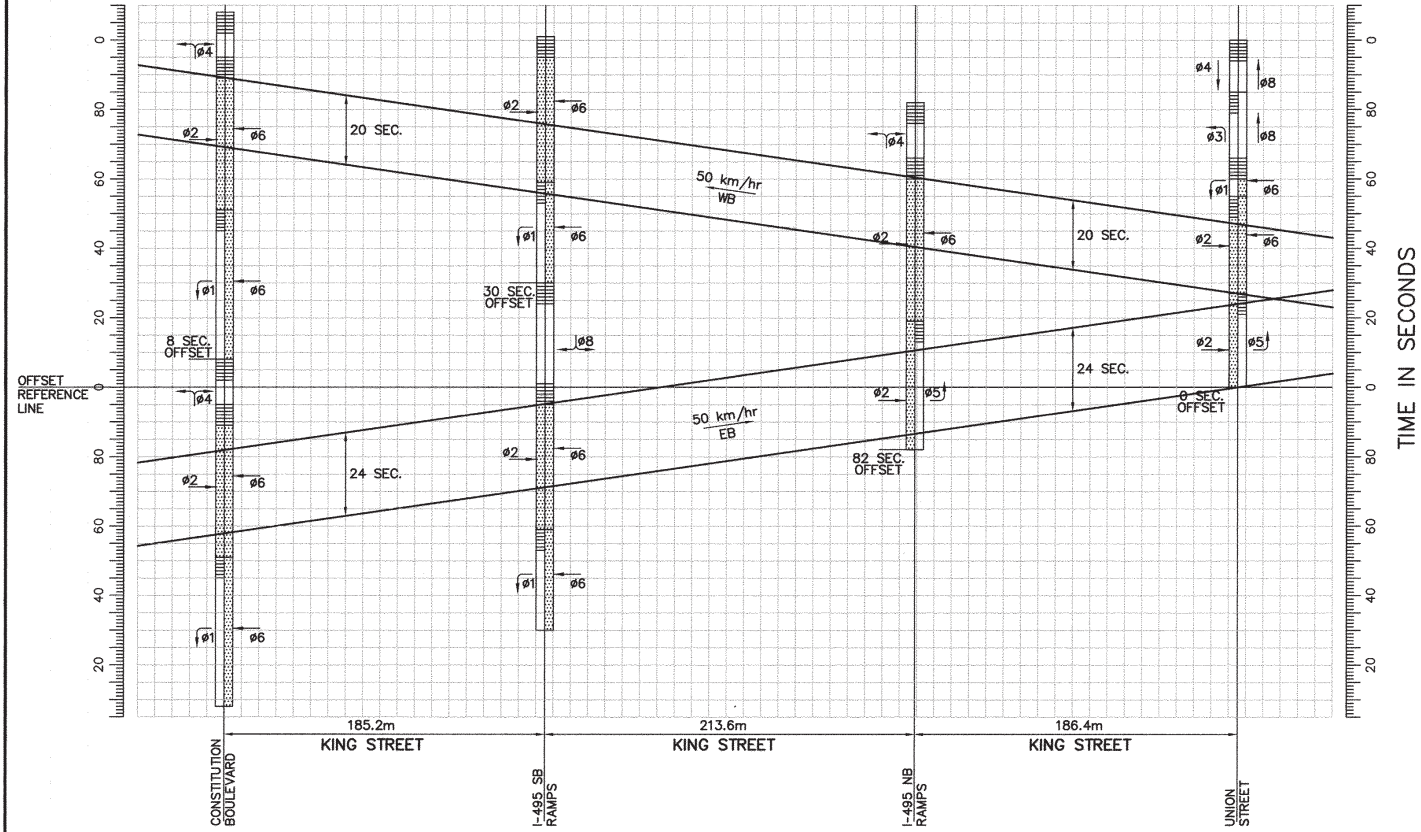
**PREFERENTIAL SIGNAL PHASING**



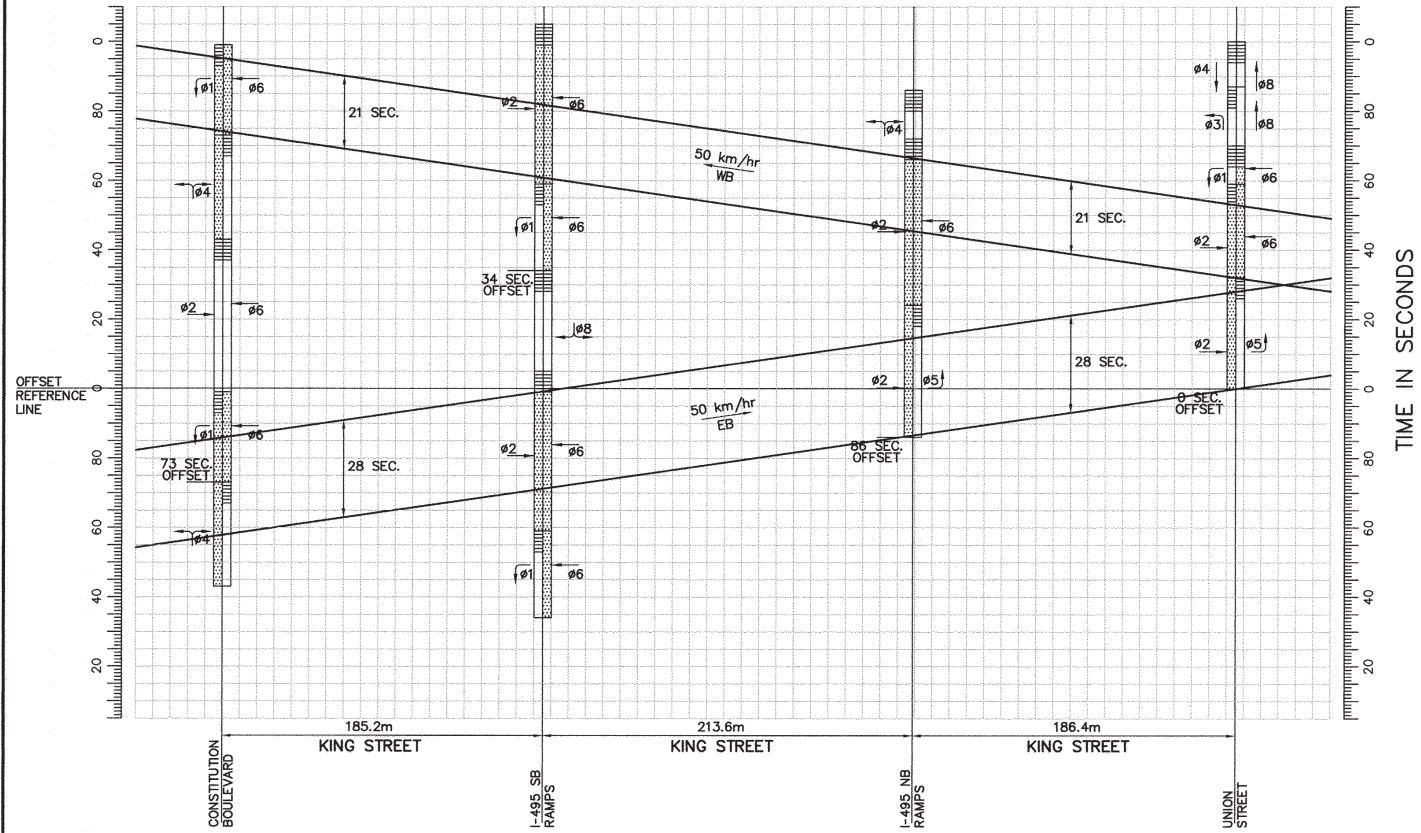
**SIGNAL HEAD DATA**  
NOT TO SCALE

\*TO OPERATE AS AN OVERLAP PHASE

**PLAN 1 - WEEKDAY AM PEAK  
 KING STREET  
 100 SECOND CYCLE**



**PLAN 2 - WEEKDAY PM PEAK  
 KING STREET  
 100 SECOND CYCLE**



**LOCATION 1 - KING ST./CONSTITUTION BLVD.  
 COORDINATION DATA  
 (ALL ENTRIES IN SECONDS)**

	PLAN 1	PLAN 2	PLAN 3
CYCLE LENGTH	100 SEC.	100 SEC.	85 SEC.
OFFSET	8	73	33
SPLIT $\phi 1$ & $\phi 6$	43	26	13
SPLIT $\phi 2$ & $\phi 6$	44	44	52
SPLIT $\phi 4$	13	30	20
COORDINATED PHASE	$\phi 2$ & $\phi 6$	$\phi 1$ & $\phi 6$	$\phi 2$ & $\phi 6$

**LOCATION 3 - KING ST./I-495 NB RAMP  
 COORDINATION DATA  
 (ALL ENTRIES IN SECONDS)**

	PLAN 1	PLAN 2	PLAN 3
CYCLE LENGTH	100 SEC.	100 SEC.	85 SEC.
OFFSET	39	39	39
SPLIT $\phi 2$ & $\phi 5$	37	38	31
SPLIT $\phi 2$ & $\phi 6$	47	48	41
SPLIT $\phi 4$	16	14	13
COORDINATED PHASE	$\phi 2$ & $\phi 6$	$\phi 2$ & $\phi 6$	$\phi 2$ & $\phi 6$

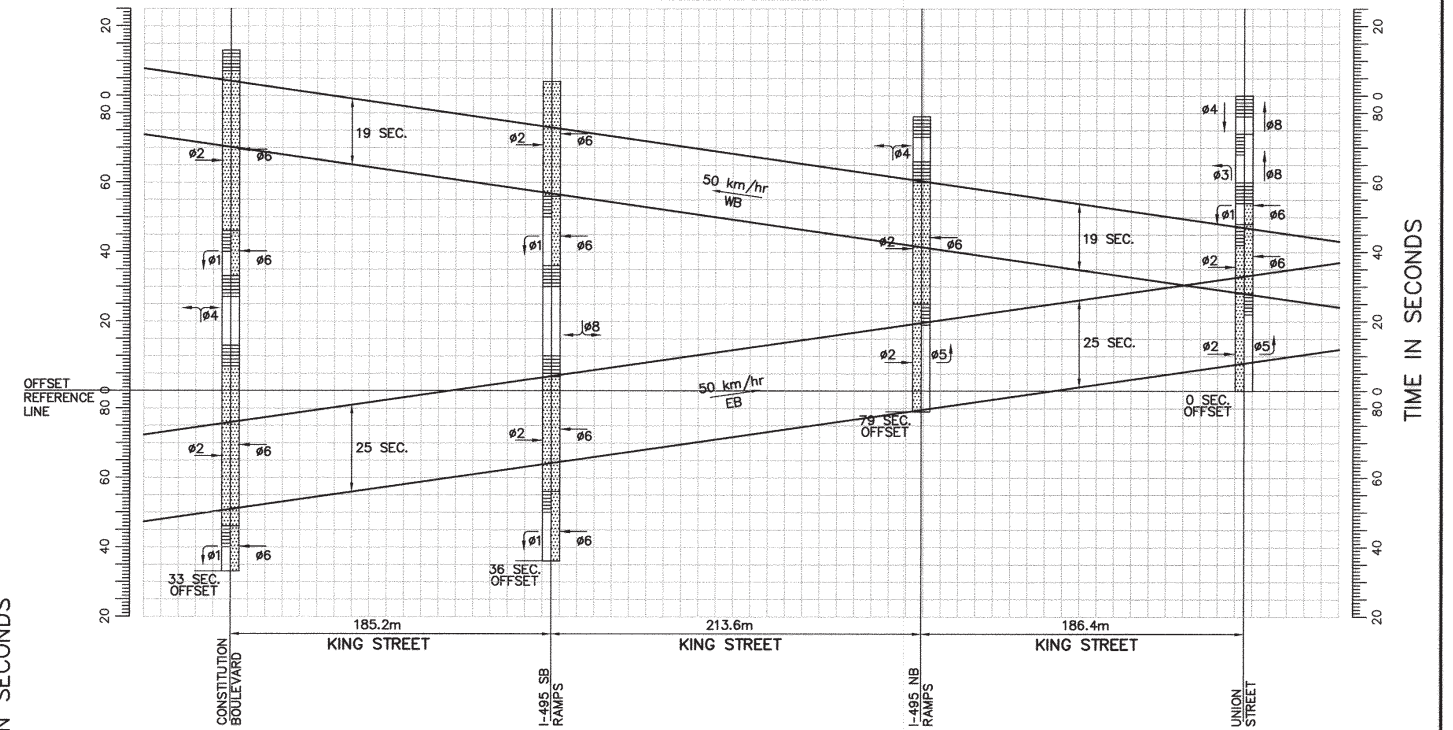
**LOCATION 2 - KING ST./I-495 SB RAMP  
 COORDINATION DATA  
 (ALL ENTRIES IN SECONDS)**

	PLAN 1	PLAN 2	PLAN 3
CYCLE LENGTH	100 SEC.	100 SEC.	85 SEC.
OFFSET	30	34	36
SPLIT $\phi 1$ & $\phi 6$	29	25	20
SPLIT $\phi 2$ & $\phi 6$	42	46	39
SPLIT $\phi 8$	29	29	26
COORDINATED PHASE	$\phi 2$ & $\phi 6$	$\phi 2$ & $\phi 6$	$\phi 2$ & $\phi 6$

**LOCATION 4 - KING ST./UNION ST.  
 COORDINATION DATA  
 (ALL ENTRIES IN SECONDS)**

	PLAN 1	PLAN 2	PLAN 3
CYCLE LENGTH	100 SEC.	100 SEC.	85 SEC.
OFFSET	0	0	0
SPLIT $\phi 2$ & $\phi 5$	27	32	28
SPLIT $\phi 2$ & $\phi 6$	28	27	20
SPLIT $\phi 1$ & $\phi 6$	11	11	12
SPLIT $\phi 3$ & $\phi 8$	19	17	14
SPLIT $\phi 4$ & $\phi 8$	15	13	11
COORDINATED PHASE	$\phi 2$ & $\phi 6$	$\phi 2$ & $\phi 6$	$\phi 2$ & $\phi 6$

**PLAN 3 - OFF PEAK  
 KING STREET  
 85 SECOND CYCLE**

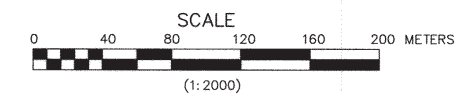


**DAILY & WEEKLY PROGRAM**

	MONDAY THRU FRIDAY	SATURDAY	SUNDAY
PLAN 1	0600-1000	-	-
PLAN 2	1500-1900	-	-
PLAN 3	1000-1500 1900-2300	0900-2100	1000-1900
FREE OPERATION	ALL OTHER TIME PERIODS	ALL OTHER TIME PERIODS	ALL OTHER TIME PERIODS

**LEGEND**

- COORDINATED PHASE(S) GREEN TIME
- NON-COORDINATED PHASE(S) GREEN TIME
- CLEARANCE TIME (YELLOW + RED)
- PHASE MOVEMENT



**COORDINATION NOTES:**

1. OFFSET TO BEGINNING OF FIRST COORDINATED PHASE TO TURN GREEN.
2. ALL COORDINATION PHASE TIMES INCLUDE YELLOW AND RED CLEARANCE TIME.
3. COORDINATED PHASE DETECTORS SHALL BE DISABLED DURING COORDINATION.
4. COORDINATION MODE SHALL BE CYCLE. FIXED FORCE OFFS SHALL BE IN EFFECT DURING COORDINATION.
5. OFFSET SEEKING SHALL BE THE SHORTWAY METHOD.
6. MAXIMUM GREEN #1 FOR FREE OPERATION. MAXIMUM GREEN #2 IN EFFECT DURING COORDINATION.

# STONEFIELD

## Waiver Request Memorandum

RE: **Primrose Schools Franchising Co.**  
**Map 303, Parcels 46 & 47**  
**700-712 Union Street**  
**Town of Franklin, Norfolk County, Massachusetts**

DATE: September 23, 2022

The following zoning relief is requested:

TOWN SITE ZONING CODE – WAIVER RELIEF	
REQUIRED	JUSTIFICATION
STORMWATER REINFORCED CONCRETE PIPING <i>Per Stormwater Management (§300-11.B(2)a)</i>	High Density Polyethylene pipe is proposed in place of reinforced concrete.
LIGHT SPILLAGE NOT PERMITTED BEYOND PROPERTY LINES <i>Per Site Plan and design review (§185-31.C.(4)e)</i>	Light spillage beyond the property line is proposed along the site's driveway entrance.

Should you have any questions regarding the information presented or would like additional information to be provided, please do not hesitate to contact our office.

Best regards,



Joshua H. Kline, PE  
**Stonefield Engineering and Design**