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PRINCIPALS
Robert J. Michaud, P.E.
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MEMORANDUM

DATE: August 19, 2013

TO: Mr. Patrick Maguire
Activitas, Inc.
16 School Street
Dedham, MA 02026

FROM: Robert J. Michaud, P.E. – Managing Principal
Daniel A. Dumais, E.I.T. – Senior Transportation Engineer

RE: **Traffic Impact Assessment – Manor Fields Recreation Facility**
478 Sprague Street, Dedham, MA

MDM Transportation Consultants, Inc. (MDM) has prepared this initial traffic impact assessment (TIA) for the proposed Manor Fields Recreation Facility to be located at 478 Sprague Street in Dedham, Massachusetts. The location of the site relative to adjacent roadways is shown in **Figure 1**. This memorandum includes documentation of existing (baseline) traffic conditions, estimated trip generation characteristics of the redevelopment, an assessment of traffic impacts associated with the proposed site programming, a preliminary parking needs assessment, and evaluation of preliminary design recommendations.

In summary, the proposed Manor Fields Recreation Facility is expected to generate traffic that is not expected to materially impact roadway operations or capacity along Sprague Street. Peak parking demand demands for the Site are estimated at 173 spaces based on ITE *Parking Generation*. The preliminary on-site parking supply estimate of 200-220 spaces is expected to accommodate the peak parking requirements for the Site under typical peak operating conditions. The proposed site driveway will satisfy minimum recommended sight line criteria (SSD and ISD), and is proposed to incorporate features that facilitate pedestrian safety and integration with planned paths. MDM recommends access and on-site circulation related improvements that will enhance traffic operations and/or travel safety

Figure 1

Site Location

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Date: July 2013
Dwg No. 722 TIAS.dwg

DEVELOPMENT PROGRAM ASSUMPTIONS

Development programming for the 25 acre Site is assumed to include twelve acres of usable park with following desirable land uses; two multi-purpose turf fields, tennis courts (2), outdoor basketball courts (2), bocce/ pickle ball, Dog Park (1 acre), playground, walking trails, concession stand, and a two bay storage garage. The multi-purpose field layout may have lights and may allow conversion of full size fields to smaller (half-size) fields as needed for practice and junior play as needs arise. The preliminary site layout envisions approximately 200-220 surface parking spaces within the site. A primary access/egress driveway is proposed along Sprague Street just west of the 480 Sprague Street property.

Specific programming (scheduling) assumptions for use of the fields have not been identified at this time but are assumed for initial planning purposes to include a multitude of sporting events, club practices, and school team practices that may be scheduled for daytime and nighttime periods throughout the year.

EXISTING (BASELINE) TRAFFIC CONDITIONS

An overview of existing/baseline conditions, traffic volumes and a review of the sight line criteria are provided below.

Sprague Street

Sprague Street is classified by the Massachusetts Department of Transportation (MassDOT) as an Urban Minor Arterial roadway under local Town jurisdiction. Sprague Street is generally an east-west roadway. Sprague Street provides a connection from the Neponset Valley Parkway to the east and East Street to the west. Sprague Street has a variable roadway width and provides one travel lane in each direction. The regulatory speed limit is 25 mph in the immediate site vicinity and 35 mph just east of the Site. Land use along Sprague Street in the study area include a mix of commercial, warehouse, and restaurant uses, residential homes, and a school.

Baseline Traffic Data

Daily traffic volumes along Sprague Street in the immediate site vicinity (east of Durham Road) were obtained by mechanical methods using a radar recorder (RR). The results of the counts are summarized in **Table 1**, and are discussed below. A review of MassDOT permanent count station data for the area indicated that June is an above-average traffic month (approximately 5 percent above average season conditions). In order to provide a slightly conservative analysis, no seasonal adjustment (reduction) of the data was made to the June traffic volume counts. Traffic count data and seasonal adjustment calculations are provided in the **Attachments**.

TABLE 1
EXISTING TRAFFIC VOLUME SUMMARY
SPRAGUE STREET EAST OF DURHAM ROAD

Time Period	Daily Volume (vpd)[1]	Percent Daily Traffic[2]	Peak Hour Volume (vph)[3]	Peak Flow Direction[4]	Peak Hour Directional Volume (vph)
Weekday Evening Peak Hour	9,680	8%	809	56% WB	449
Saturday Afternoon Peak Hour	7,070	7%	527	56% EB	296

[1]Two-way daily traffic expressed in vehicles per day without seasonal adjustment.
[2]The percent of daily traffic that occurs during the peak hour.
[3]Two-way peak-hour volume expressed in vehicles per hour.
[4]EB = Eastbound, WB = Westbound

As summarized in **Table 1,** the weekday daily traffic volume on Sprague Street between Durham Road and Coventry Road is approximately 9,681 vehicles per day (vpd) on a weekday and 7,072 vpd on a Saturday. Peak hour traffic flow on Sprague Street from approximately 527 to 809 vehicles per hour (vph) representing approximately 7-8 percent of daily traffic flow. Vehicle flow is slightly skewed towards the westbound direction during the weekday evening peak hour (5:00 – 6:00 PM) and slightly skewed towards the eastbound direction during the Saturday afternoon peak hour (3:00 – 4:00 PM). The 2013 Existing traffic volume networks are provided in the **Attachments.**

Measured Travel Speeds

Vehicle speeds were obtained for the Sprague Street eastbound and westbound travel directions by using an ATR machine equipped with speed radar. **Table 2** summarizes the average and 85th percentile speeds for Sprague Street adjacent to the Site. The speed data provides a basis for determining appropriate sight line criteria for the site driveway(s). Field data are provided in the **Attachments.**

TABLE 2
SPEED STUDY RESULTS – SPRAGUE STREET

	Travel Speeds		
Travel Direction	**Posted[1]**	**Mean[2]**	**85th Percentile[3]**
Eastbound	25	32	37
Westbound	35	34	39

[1]Regulatory Posted Speed (mph)
[2]Arithmetic mean (mph)
[3]The speed at or below which 85 percent of the vehicles are traveling (mph).

As summarized in **Table 2**, the mean (average) travel speed on Sprague Street traveling eastbound is 32 mph and the 85th percentile travel speed is 37 mph. In the westbound direction, the mean travel speed is 34 mph and the 85th percentile travel speed is 39 mph. The observed average travel speeds in the both directions are consistent with regulatory speed limits while the 85th percentile speeds are higher than the regulatory speed limits, specifically in the eastbound direction.

SIGHT LINE ANALYSIS

The evaluation documents existing sight distances for vehicles exiting the proposed site driveway onto Sprague Street with comparison to recommended guidelines for the regulatory posted speed limit and observed travel speeds in the project area.

The American Association of State Highway and Transportation Officials' (AASHTO) standards[1] reference two types of sight distance which are relevant at the proposed site driveway intersection with Sprague Street: stopping sight distance (SSD) and intersection sight distance (ISD). Sight lines for critical vehicle movements at the Sprague Street and site driveway intersection were compared to minimum SSD and ISD for the regulatory speed limit and observed travel speeds along Sprague Street in the site vicinity.

Stopping Sight Distance

Sight distance is the length of roadway visible to the motorist to a fixed object. The minimum sight distance available on a roadway should be sufficiently long enough to enable a below-average operator, traveling at or near a regulatory speed limit, to stop safely before reaching a stationary object in its path, in this case, a vehicle exiting from the site driveway onto Sprague Street. The SSD criteria are defined by AASHTO based on design and operating speeds, anticipated driver behavior and vehicle performance, as well as physical roadway conditions. SSD includes the length of roadway traveled during the perception and reaction time of a driver to an object, and the distance traveled during brake application on wet, level pavements. Adjustment factors are applied to account for roadway grades.

SSD was estimated in the field using AASHTO standards for driver's eye (3.5 feet) and object height equivalent to the taillight height of a passenger car (2.0 feet) for the eastbound and westbound Sprague Street approaches to the site driveway. **Table 3** presents a summary of the available SSD for the Sprague Street roadway segments approaching the proposed site driveway and AASHTO's recommended SSD for the posted (regulatory) speed limit and observed travel speeds. Stopping sight distance calculations are provided in the **Attachments**.

[1] *A policy on Geometric Design of Highways and Streets, 6th Edition*, American Association of State Highway and Transportation Officials, Washington D.C. (2011).

TABLE 3
STOPPING SIGHT DISTANCE SUMMARY
SPRAGUE STREET APPROACHES TO PROPOSED SITE DRIVEWAY

Approach/ Travel Direction	Available Stopping Sight Distance	AASHTO Recommended[1]		
		Posted Speed[2]	Average Observed Travel Speed[3]	85th Percentile Observed Travel Speed[4]
Eastbound	350± Feet	155 Feet	220 Feet	270 Feet
Westbound	>500 Feet	250 Feet	240 Feet	290 Feet

[1]Recommended sight distance based on AASHTO, A Policy on Geometric Design of Highways and Streets. Based on driver height of eye of 3.5 feet to object height of 2.0 feet and adjustments for grades as required.
[2]Regulatory Posted Speed = 25 mph EB & 30 mph WB
[3]Average Speed: 32 mph EB & 34 WB.
[4]85th Percentile travel speed: 37 mph EB, 39 mph WB.

As summarized in **Table 3** analysis results indicate that with clearing of sight lines during the construction of the proposed Site Driveway the available sight lines will exceed AASHTO's recommended SSD criteria for both travel directions along Sprague Street based on the regulatory speed limit and observed travel speeds.

Intersection Sight Distance

Clear sight lines provide sufficient sight distance for a stopped driver on a minor-road approach to depart from the intersection and enter or cross the major road. As stated under AASHTO's Intersection Sight Distance (ISD) considerations, "*...If the available sight distance for an entering ...vehicle is at least equal to the appropriate stopping sight distance for the major road, then drivers have sufficient sight distance to avoid collisions...To enhance traffic operations, intersection sight distances that exceed stopping sight distances are desirable along the major road.*" AASHTO's ISD criteria are defined into several "cases". Each case depends on the type of traffic control at the intersection (e.g. no control, *Yield* sign, *Stop* sign, and signal control), and the specific vehicle maneuver in question (crossing, right- or left-turn). AASHTO Cases B1 (left turns) and B2 (right turns) from the proposed site driveway were utilized in determining the recommended intersection sight distance summarized in **Table 4** below.

Available ISD was estimated in the field using AASHTO standards for driver's eye (3.5 feet), object height (3.5 feet) and decision point (14.5 feet from edge of travel way) for the eastbound and westbound directions along Sprague Street. **Table 4** presents a summary of the available ISD for the departure from the proposed site driveway and AASHTO's recommended ISD for the regulatory speed limit and observed travel speeds.

TABLE 4
INTERSECTION SIGHT DISTANCE SUMMARY
PROPOSED SITE DRIVE DEPARTURE TO SPRAGUE STREET

View Direction	Available Intersection Sight Distance	AASHTO Minimum[1] Posted Speed[2]	Average Observed Travel Speed[3]	85th Percentile Observed Travel Speed[4]
Looking East	>500 Feet	250 Feet	240 Feet	290 Feet
Looking West	350± Feet	155 Feet	220 Feet	270 Feet

[1]Recommended sight distance based on AASHTO, A Policy on Geometric Design of Highways and Streets. Based on driver height of eye of 3.5 feet and an object height of 3.5 feet. Minimum value as noted represents SSD per AASHTO guidance.
[2]Regulatory Posted Speed = 25 mph EB & 30 mph WB
[3]Average Speed: 32 mph EB & 34 WB.
[4]85th Percentile travel speed: 37 mph EB, 39 mph WB.

The results of the ISD analysis presented in **Table 4** indicate that with clearing of sight lines during the construction of the proposed Site Driveway the available ISD looking east and west from the proposed site driveway onto Cross Street will satisfy the recommended minimum sight line requirements. MDM recommends that any new plantings (shrubs, bushes) or physical landscape features (rock wall, etc.) to be located within the driveway sight lines, should also be maintained at a height of 2 feet or less above the adjacent existing roadway grade to ensure unobstructed lines of sight.

PROJECTED FUTURE TRAFFIC CONDITIONS

Evaluation of the proposed development impacts requires the establishment of a future baseline analysis condition. This section estimates future roadway and traffic conditions with and without the proposed development. For this evaluation, a five-year planning horizon (year 2018) was selected consistent with industry standard guidelines.

To determine the impact of site-generated traffic volumes on the roadway network under future conditions, baseline traffic volumes in the study area were projected to a future year condition. Traffic volumes on the roadway network at that time, in the absence of the development (that is, the No-Build condition), includes existing traffic, new traffic due to general background traffic growth, and traffic related to specific developments by others that are currently under review at the local and/or state level. Consideration of these factors resulted in the development of No-Build traffic volumes. Anticipated site-generated traffic volumes were then superimposed upon these No-Build traffic-flow networks to develop future Build conditions.

The following sections provide an overview of the future traffic volumes.

Background Growth

Background traffic includes demand generated by other planned developments in the area as well as demand increases caused by external factors. External factors are general increases in traffic not attributable to a specific development and are determined using historical data.

Nearby permanent count station data published by MassDOT indicates a declining (-1.4 percent per year) growth rate. For purposes of this evaluation, a 0.5 percent growth rate was used (2.5 percent increase over a 5-year horizon). This growth rate is higher than historic rates, and, as such, is also expected to account for any small fluctuation in hourly traffic as may occur from time to time in the study area and traffic associated with other potential small developments or vacancies in the area. The traffic volumes and growth rate calculations are provided in the **Attachments**.

A field visit identified a major vacancy in the immediate area:

- ***480 Sprague Street:*** An adjacent 228,560± sf warehouse located on a 17.83 acre parcel at 480 Sprague Street. At the time of the traffic data collection approximately 177,866 sf of warehouse space was vacant; therefore, traffic associated with this vacancy was estimated using ITE standard rates and trips were added to the traffic volume networks based on existing travel patterns. The site-specific trip tracings are provided in the **Attachments**.

2018 No-Build Traffic Volume Networks

In summary, to account for future traffic growth in the study area, future No-Build traffic volumes are developed by increasing the existing (2012) volumes by approximately 2.5 percent (0.5-percent compounded annually over 5 years), as well as traffic associated with the adjacent 480 Sprague Street warehouse vacancy. The resulting 2018 No-Build traffic volumes are provided in the **Attachments**.

Preliminary Design Characteristics

Preliminary design kickoff meetings for the "Park" indentified the following desirable land uses with vehicular access/ egress via Sprague Street and pedestrian connections via Sprague Street and the neighborhood

- Multi-Sport Rectangular Athletic Fields anticipated to be used for soccer, football and field hockey in the fall and lacrosse and soccer in the spring (2)
- Tennis Courts (4)
- Basketball Courts (2)
- Bocce/ Pickle Ball Court
- Dog Park (1± acre)
- Playground
- Walking Trails
- Two bay garage (ancillary storage)
- Concession Stand

Traffic generation estimates for the site are based on trip rates published by the Institute of Transportation Engineers (ITE)[2] for Land Use Code's (LUC's). For planning purposes, the following land uses as defined by ITE reasonably reflects the nature of likely programming at site and are defined as follows:

City Park (LUC 411): *"City parks are owned and operated by a city. The city parks surveyed vary widely as to location, type and number of facilities. Seasonal use of the individual sites differs widely as a result of the varying facilities and local conditions, such as weather. For example, some of the sites are used primarily for boating or swimming; others are used for softball games. Soccer complex (Land Use 488) is a related use."*

Soccer Complex (LUC 488:) *"Soccer complexes are outdoor parks that are used for non-professional soccer games. They may consist of multiple fields, and the size of each field within the land use may vary to accommodate games for different age groups. Ancillary amenities may include a fitness trail, activities shelter, aquatic center, picnic grounds, basketball and tennis courts and a playground."*

[2] *Trip Generation, 9th Edition,* Institute of Transportation Engineers, Washington, D.C. (2012)

Tennis Courts (LUC 490): *"Tennis Courts are indoor or outdoor facilities specifically designed for playing tennis. Tennis courts can either be public or private facilities and do not typically include any ancillary facilities other than limited spectator seating. Racquet/tennis club (Land Use 491) is a related use."*

Site Traffic

Vehicle trip generation for the proposed park was estimated based on the following operating conditions:

- *City Park Use* – Assumes the use of the Site as a 12-acre City Park (LUC 411). This scenario represents the day-to-day use of the entire park space for general recreational uses including the athletic fields/ courts, Dog Park, playground, and walking trials.

- *Peak Field Use* – Assumes two (2) active athletic fields (LUC 488), the use of the Site as a 12-acre City Park (LUC 411), four (4) active tennis courts (LUC 490, and two (2) active basketball courts (assumes half of LUC 488 rate per court). This scenario represents the possibility of having activity on two athletic fields, four tennis courts, two basketball courts and the use of the remaining space for general recreational use including dog park, playground, bocce/ pickle ball, and walking trials.

The trip generation estimates for the Site based on *City Park Use* and *Peak Field Use* is summarized in **Table 5**. For reference, the ITE Trip Generation Calculations are provided in the **Attachments.**

TABLE 5
TRIP-GENERATION SUMMARY

Period/Direction	Site Trips	
	City Park Use[1]	Peak Field Use[2]
Weekday Evening Peak Hour		
Entering	24	67
Exiting	18	44
Total	42	111
Saturday Peak Hour of Generator		
Entering	27	76
Exiting	27	81
Total	54	157

Source: ITE *Trip Generation*, Ninth Edition; 2009.
[1]Based on ITE LUC 411 (City Park) trip rates applied to 12 Acres.
[2]Based on ITE LUC 411 (City Park) trip rates applied to 12 Acres, ITE LUC 488 (Soccer Complex) trip rates applied to 2 fields, ITE LUC 490 (Tennis Courts) trip rates applied to 4 courts and 2 Basketball Courts rates = 1 Soccer Field (ITE LUC 488).

As summarized in **Table 5**,

- *City Park Use* – Under day-to-day conditions as a City Park the traffic generation for the site is estimated at 42 total vehicle-trips (24 entering and 18 exiting) during the weekday evening peak hour and 54 vehicle-trips (27 entering and 27 exiting) during the Saturday afternoon peak hour.

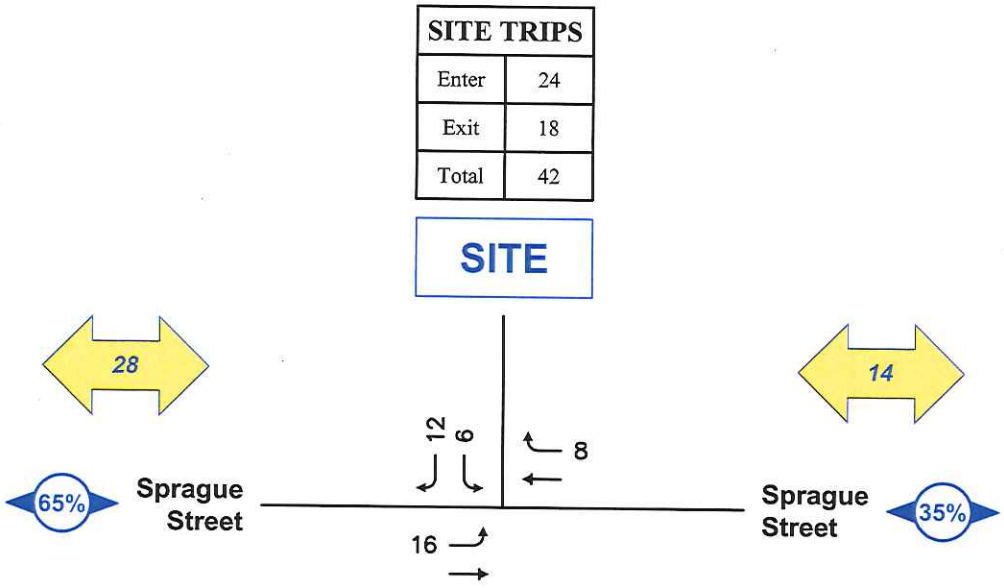
- *Peak Field Use* – Under peak field use conditions the traffic generation for the site is estimated at 111 total vehicle-trips (67 entering and 44 exiting) during the weekday evening peak hour and 157 vehicle-trips (76 entering and 81 exiting) during the Saturday afternoon peak hour.

Trip Assignment

The estimated site trips presented in **Table 5** are assigned to area roadways based on (a) population distribution of Dedham residents and (b) likely (shortest travel time) routes for various population blocks in the town. Detailed trip distribution calculations are provided in the **Attachments**. The estimated trip distribution patterns and site-generated trip tracings for the weekday evening and Saturday afternoon peak hours are presented in **Figure 2** and **Figure 3**, respectively.

Build Traffic Volumes

Build condition traffic volumes are derived by adding traffic associated with the proposed Manor Fields Recreation Facility as shown in **Figure 2** and **Figure 3** to the No-Build traffic volumes provided in the **Attachments**. The 2018 Build condition traffic-volume networks for the weekday evening and Saturday midday peak hours are presented in **Figure 4** and **Figure 5**.



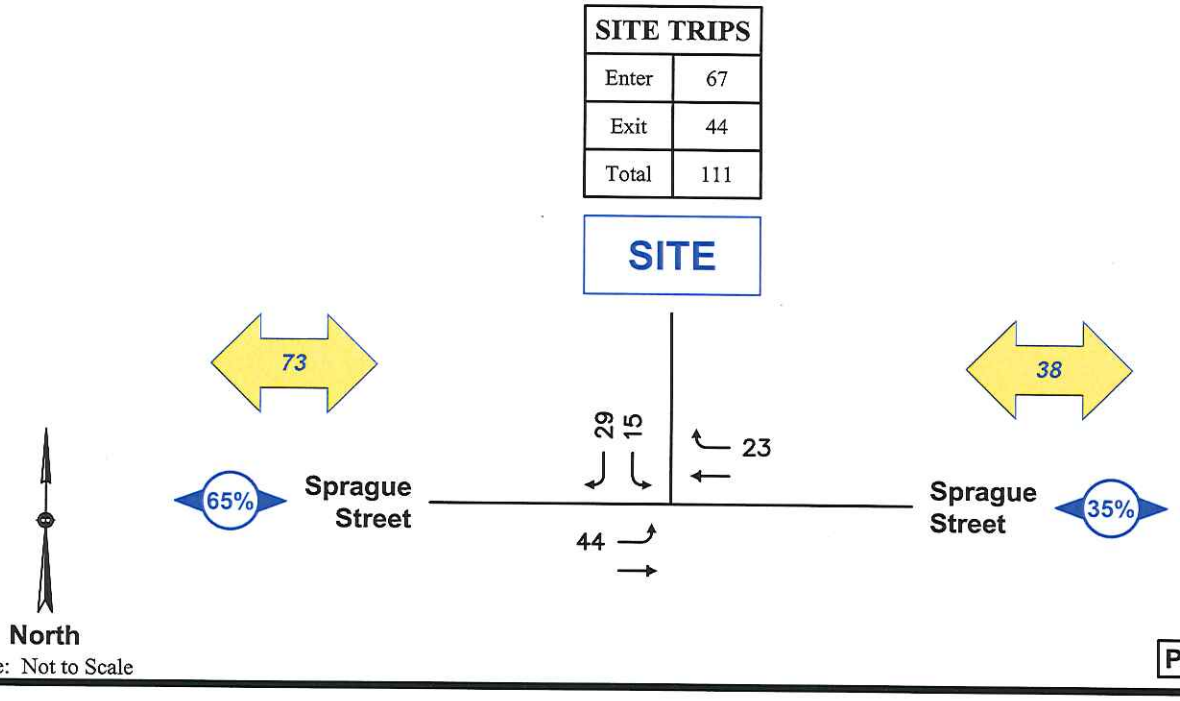


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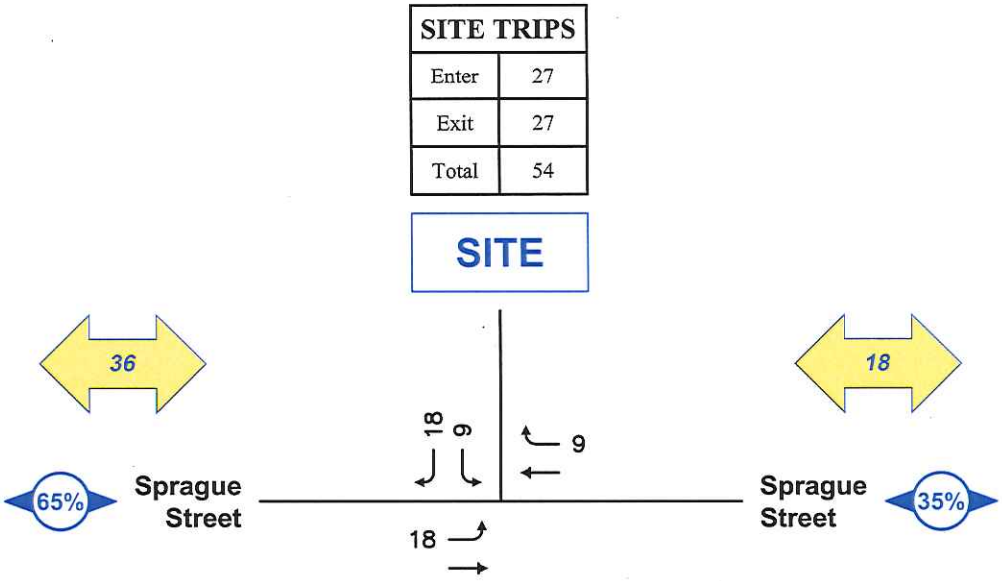
Figure 2

Site Generated Trips
Weekday Evening
Peak Hour Traffic Volumes

Date: July 2013
Dwg No. 722 TIAS.dwg



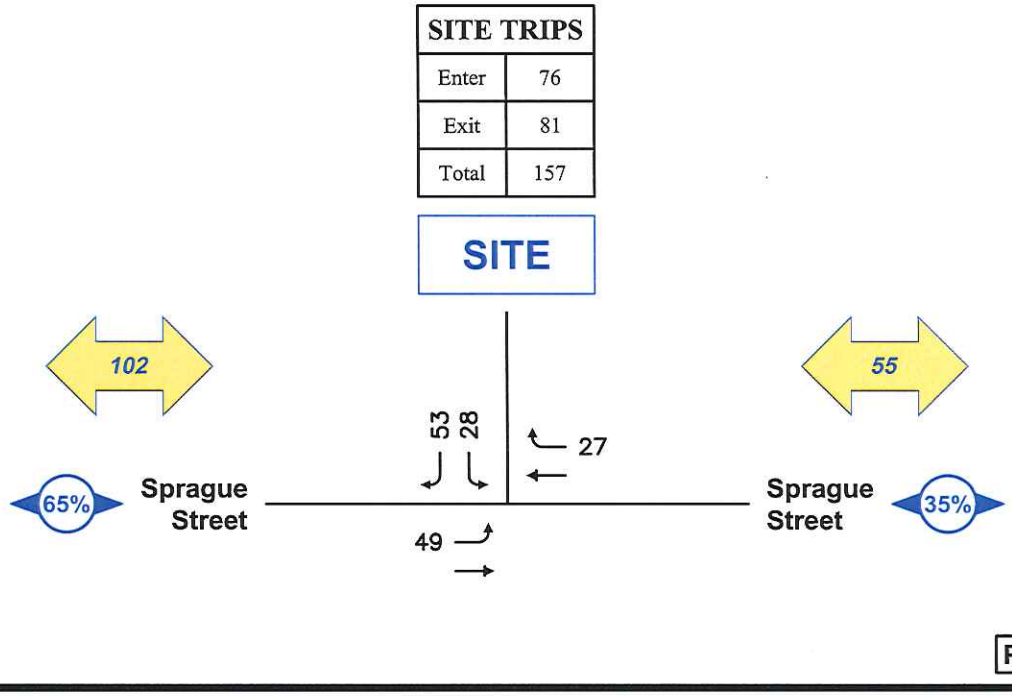


Figure 3

Site Generated Trips
Saturday Afternoon
Peak Hour Traffic Volumes

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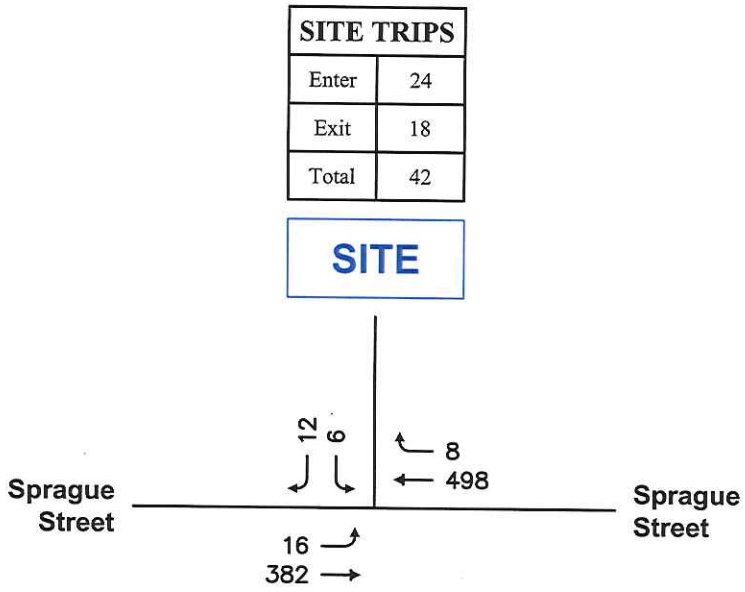
Date: July 2013
Dwg No. 722 TIAS.dwg



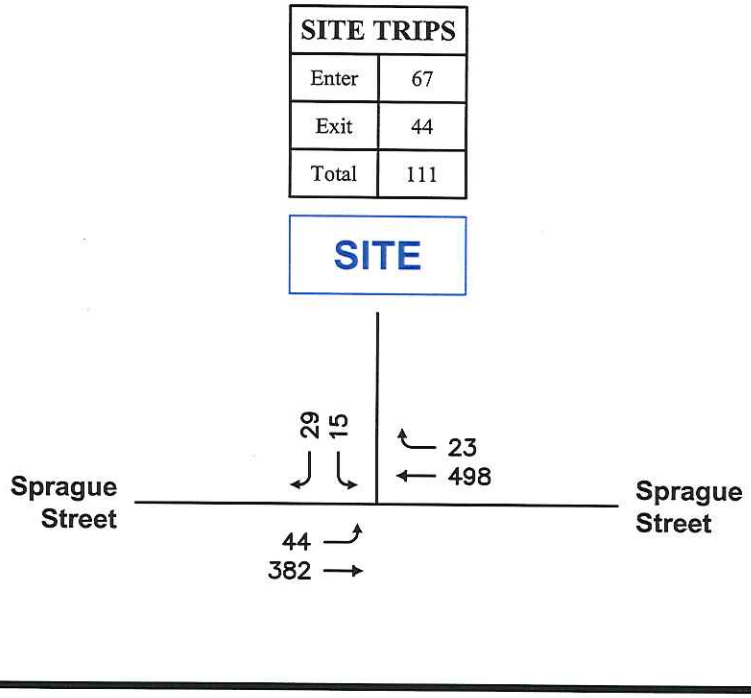


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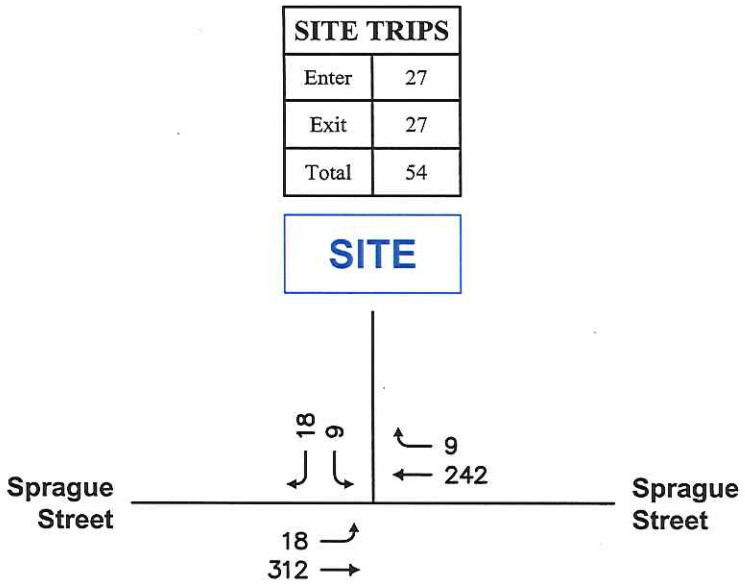
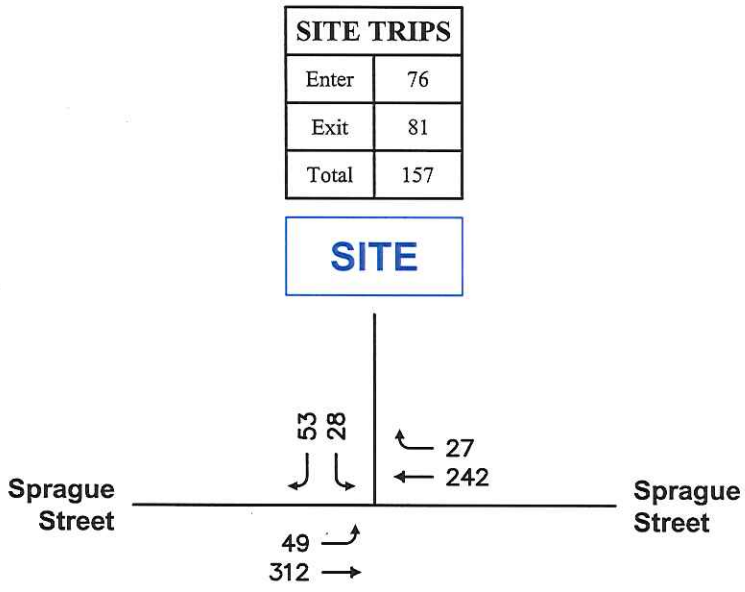
Figure 4

2018 Build Conditions
Weekday Evening
Peak Hour Traffic Volumes

Date: July 2013
Dwg No. 722 TIAS.dwg





Scale: Not to Scale

Figure 5

2018 Build Conditions
Saturday Afternoon
Peak Hour Traffic Volumes

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Date: July 2013
Dwg No. 722 TIAS.dwg

OPERATIONS ANALYSIS

This section provides an overview of the qualitative assessment of impact from the project as well as an overview of operational analysis conducted using industry standard methodology.

Industry Standard Analysis Methodology

Intersection capacity analyses are presented in this section for Build conditions. Capacity analyses, conducted in accordance with EEA/MassDOT guidelines, provide an index of how well the roadway facilities serve the traffic demands placed upon them. The operational results provide the basis for recommended access and roadway improvements in the following section.

Capacity analysis of intersections is developed using the Synchro® computer software, which implements the methods of the 2010 Highway Capacity Manual (HCM). The resulting analysis presents a level-of-service (LOS) designation for individual intersection movements. The LOS is a letter designation that provides a qualitative measure of operating conditions based on several factors including roadway geometry, speeds, ambient traffic volumes, traffic controls, and driver characteristics. Since the LOS of a traffic facility is a function of the traffic flows placed upon it, such a facility may operate at a wide range of LOS, depending on the time of day, day of week, or period of year. A range of six levels of service are defined on the basis of average delay, ranging from LOS A (the least delay) to LOS F (delays greater than 50 seconds for unsignalized movements). The specific control delays and associated LOS designations are presented in the **Attachments**.

Industry Standard Analysis Results

Level-of-Service (LOS) analyses were conducted for the future 2018 Build conditions for the proposed site driveway intersection with Sprague Street. The results of the intersection capacity are summarized below in **Table 6**. Detailed analysis results are presented in the **Attachments.**

TABLE 6
INTERSECTION CAPACITY ANALYSIS RESULTS
SPRAGUE STREET AT PROPOSED SITE DRIVEWAY

	2018 Build Condition (City Park Use)				2018 Build Condition (Peak Field Use)			
Period/ Approach	v/c[1]	Delay[2]	LOS[3]	95th Q[4]	v/c[1]	Delay[2]	LOS[3]	95th Q[4]
Weekday Evening Peak Hour								
Eastbound	0.02	9	A	<25	0.05	9	A	<25
SB L/R Exit	0.05	14	B	<25	0.12	16	C	<25
Saturday Afternoon Peak Hour								
Eastbound	0.01	8	A	<25	0.04	8	A	<25
SB L/R Exit	0.05	11	B	<25	0.15	12	B	<25

[1]Volume-to-capacity ratio
[2]Average control delay per vehicle (in seconds)
[3]Level of service
[4]95th Percentile Queue Length (feet)

As summarized in **Table 6,** under Peak Field Use conditions the unsignalized intersection of Sprague Street and Proposed Site Driveway will operate well below capacity at LOS C or better during the weekday evening and Saturday afternoon peak hours with minimal queues. Furthermore, travel along Sprague Street will continue to operate unimpeded with minimal delay.

Traffic Signal Warrant

A preliminary peak hour traffic signal warrant analyses was conducted for the Sprague Street/ Proposed Site Drive intersection in accordance with the Manual on Uniform Traffic Control Devices (MUTCD)[3]. Specifically, the warrant reviewed for this report is based on MUTCD *Warrant 3: Peak Hour.* The traffic signal warrant was reviewed based on the following conditions: existing traffic volumes on Sprague Street and estimated trips for the proposed City Park under peak field use.

The preliminary peak hour traffic signal warrant indicated that projected traffic conditions at this location do not justify the need for traffic signal control. A summary of the peak hour traffic signal warrant analysis is summarized in the **Attachments.**

[3] *Manual on Uniform Traffic Control Devices, 2009 Edition,* ATSSA /ITE/AASHTO, 2009.

Left Turn Lane Warrant

Preliminary left turn warrant analyses were conducted for the Sprague Street/ Proposed Site Drive intersection in accordance with the Association of State Highway and Transportation Officials' (AASHTO)[4]. The traffic signal warrant was reviewed based on the following two conditions: City Park Use and Peak Field Use.

The preliminary left turn lane warrant analysis indicated that projected traffic conditions at this location do not justify the need for left turn lane under normal City Park usage of the facility while a left turn lane is marginally justified for Peak Field usage of the facility. MDM notes that the eastbound Sprague Street approach is approximately 18 feet wide which will allow for by-pass movements of projected vehicle queues under peak field use, therefore, an exclusive left turn lane is not required. A summary of the left turn warrant analysis is summarized in the **Attachments**.

[4] *Ibid*

PARKING CHARACTERISTICS

An on-site parking supply of approximately 200-220 spaces is proposed to accommodate the proposed development, based on early planning discussions. Parking demand estimates for the proposed programming at the Site are based on the closest corresponding land use published in the ITE *Parking Generation*[5]. The results of the parking projections are summarized in **Table 7**.

TABLE 7
PEAK PARKING DEMAND – ITE Basis

Operating Scenario	Projected Peak Parking Demand
City Park (Peak Rate)[1]	34
Soccer Complex – 2 Fields (85th Percentile)[2]	139
Total	173

[1]ITE LUC 411(City Park) peak parking rates applied to 12 acres.
[2]ITE LUC 488 (Soccer Complex) 85th percentile parking demands, applied to 2 fields.

As summarized in **Table 7**, the peak parking demands for the Site are estimated at 173 spaces under Peak Field usage of the facility. The preliminary on-site parking supply estimate of 200-220 spaces is expected to accommodate the peak parking requirements for the Site under typical peak operating conditions.

MDM notes that additional parking demands in excess of the 200 – 220 space on-site supply spaces may occur on occasion if special events such as regional/multiple team tournament play are scheduled; however, these scenarios should be subject to a traffic and parking management plan for "special events" under which off-site parking and shuttles may be identified as required. MDM recommends that the Town explore additional "overflow" parking to accommodate this atypical special event demand if applicable.

[5]*Parking Generation*, Fourth Edition; Institute of Transportation Engineers; Washington, DC; 2008.

CONCLUSIONS AND RECOMMENDATIONS

The proposed Manor Fields Recreation Facility is expected to generate traffic that is not expected to materially impact roadway operations or capacity along Sprague Street. Peak parking demand demands for the Site are estimated at 173 spaces based on ITE *Parking Generation*. The preliminary on-site parking supply estimate of 200-220 spaces is expected to accommodate the peak parking requirements for the Site under typical peak operating conditions.

The proposed site driveway will satisfy minimum recommended sight line criteria (SSD and ISD), and is proposed to incorporate features that facilitate pedestrian safety and integration with planned paths.

MDM finds that the following access and on-site circulation related improvements will enhance traffic operations and/or travel safety:

Site Access/ Pedestrian Accommodations

- *Sprague Street at Site Driveway.* MUTCD compliant signs and pavement markings are recommended at the driveway. Signs and pavement markings should including a "STOP" sign (R1-1) and STOP line pavement markings. The driveway corner radii should be designed to accommodate the largest anticipated delivery vehicle, and emergency apparatus (i.e. fire trucks).

- *Sight Line Triangles.* Sight lines should be cleared during the construction of the proposed Site Driveway. MDM recommends that any new plantings (shrubs, bushes) or physical landscape features (rock wall, etc.) to be located within the driveway sight lines, should also be maintained at a height of 2 feet or less above the adjacent existing roadway grade to ensure unobstructed lines of sight.

- *Sidewalk Connections.* Pedestrian sidewalk connections should be provided to the existing sidewalk system along Sprague Street, to the local neighborhood as well as connecting to the proposed parking field and entranceways.

- *On-site Circulation.* The on-site roadways, parking fields, and athletic fields should be designed to accommodate delivery vehicles and emergency apparatus as required.

- *Emergency Access/Egress.* A secondary gated emergency-access/egress driveway should be explored in more detail. A connection to the adjacent #480 Sprague Street warehouse facility may be feasible and it appears that easements may already be in place for said use by the Town. Specific driveway restrictions and controls are subject to discussions with the Town's Police, Fire, and Emergency personnel.

- *Special Event Plan.* The Town should explore additional "overflow" parking if special events such as regional/multiple team tournament play are scheduled; under which off-site parking and shuttles would need to be identified as required. Traffic management options could include staggering of game start times for league play to manage parking demand and to avoid concurrent game start times in cases of multi-field use.

Attachments

- ☐ Traffic Volume Data
- ☐ Speed Data
- ☐ Seasonal Data
- ☐ Sight Distance Calculations
- ☐ Trip Generation Calculations
- ☐ Trip Distribution Calculations
- ☐ No-Build Traffic Volumes
- ☐ Capacity Analyses
- ☐ Traffic Signal Warrant Analysis
- ☐ Left Turn Lane Warrant Analysis
- ☐ Parking Calculations

□ Traffic Volume Data

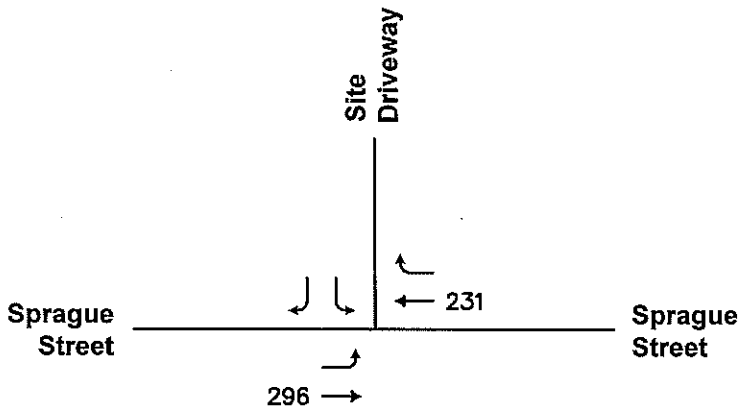
North
Scale: Not to Scale

MDM TRANSPORTATION CONSULTANTS, INC.
Planners & Engineers

Attachments

2013 Existing Conditions Weekday Evening Peak Hour Traffic Volumes

Date: July 2013
Dwg No. 722 TIAS.dwg



Scale: Not to Scale

MDM TRANSPORTATION CONSULTANTS, INC.
Planners & Engineers

Attachments

2013 Existing Conditions Saturday Afternoon Peak Hour Traffic Volumes

Date: July 2013
Dwg No. 722 TIAS.dwg

MDM Transportation Consultants, Inc.

28 Lord Road, Suite 280
Marlborough, MA 01752
508-303-0370
www.mdmtrans.com

E/W: Sprague Street
between Durham Rd and Coventry Rd
Dedham, MA

Site Code: 07220619
Station ID:

Latitude: 0' 0.0000 Undefined

722 Sprague Street (Volume)

Start Time	19-Jun-13 Wed	Eastbound Morning	Eastbound Afternoon	Hour Totals Morning	Hour Totals Afternoon	Westbound Morning	Westbound Afternoon	Hour Totals Morning	Hour Totals Afternoon	Combined Totals Morning	Combined Totals Afternoon
12:00		*	*			*	*				
12:15		*	*			*	*				
12:30		*	*			*	*				
12:45		*	*	0	0	*	*	0	0	0	0
01:00		*	*			*	*				
01:15		*	*			*	*				
01:30		*	58			*	82				
01:45		*	62	0	120	*	63	0	145	0	265
02:00		*	64			*	71				
02:15		*	73			*	74				
02:30		*	64			*	86				
02:45		*	57	0	258	*	95	0	326	0	584
03:00		*	107			*	88				
03:15		*	91			*	91				
03:30		*	59			*	100				
03:45		*	73	0	330	*	94	0	373	0	703
04:00		*	103			*	94				
04:15		*	69			*	120				
04:30		*	80			*	110				
04:45		*	98	0	350	*	106	0	430	0	780
05:00		*	81			*	117				
05:15		*	89			*	118				
05:30		*	82			*	98				
05:45		*	106	0	358	*	95	0	428	0	786
06:00		*	76			*	91				
06:15		*	77			*	94				
06:30		*	72			*	73				
06:45		*	73	0	298	*	64	0	322	0	620
07:00		*	51			*	49				
07:15		*	62			*	43				
07:30		*	56			*	48				
07:45		*	35	0	204	*	48	0	188	0	392
08:00		*	49			*	59				
08:15		*	50			*	48				
08:30		*	45			*	43				
08:45		*	42	0	186	*	45	0	195	0	381
09:00		*	37			*	33				
09:15		*	45			*	51				
09:30		*	24			*	22				
09:45		*	17	0	123	*	33	0	139	0	262
10:00		*	25			*	18				
10:15		*	23			*	29				
10:30		*	18			*	17				
10:45		*	16	0	82	*	24	0	88	0	170
11:00		*	19			*	21				
11:15		*	17			*	10				
11:30		*	13			*	14				
11:45		*	22	0	71	*	22	0	67	0	138
Total		0	2380			0	2701			0	5081
Percent	0.0%	0.0%	100.0%			0.0%	100.0%			0.0%	100.0%
Combined Total		2380				2701				5081	

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E/W: Sprague Street
between Durham Rd and Coventry Rd
Dedham, MA

Site Code: 07220619
Station ID:

Latitude: 0' 0.0000 Undefined

722 Sprague Street (Volume)

Start Time	20-Jun-13 Thu	Eastbound Morning	Eastbound Afternoon	Hour Totals Morning	Hour Totals Afternoon	Westbound Morning	Westbound Afternoon	Hour Totals Morning	Hour Totals Afternoon	Combined Totals Morning	Combined Totals Afternoon
12:00		20	60			12	71				
12:15		14	66			15	79				
12:30		7	68			13	62				
12:45		3	75	44	269	7	71	47	283	91	552
01:00		3	52			8	65				
01:15		6	71			3	80				
01:30		3	69			4	66				
01:45		2	74	14	266	5	67	20	278	34	544
02:00		0	66			4	73				
02:15		3	68			3	82				
02:30		1	71			3	86				
02:45		2	73	6	278	5	81	15	322	21	600
03:00		1	63			1	84				
03:15		8	85			2	77				
03:30		1	67			2	75				
03:45		5	78	15	293	3	100	8	336	23	629
04:00		3	77			4	82				
04:15		7	82			6	94				
04:30		6	96			2	97				
04:45		14	72	30	327	6	102	18	375	48	702
05:00		32	86			9	109				
05:15		24	87			12	127				
05:30		44	84			16	110				
05:45		56	103	156	360	27	103	64	449	220	809
06:00		59	83			38	95				
06:15		60	69			45	87				
06:30		69	80			57	74				
06:45		108	68	296	300	55	77	195	333	491	633
07:00		101	65			61	64				
07:15		101	53			56	47				
07:30		100	71			60	42				
07:45		99	55	401	244	88	56	265	209	666	453
08:00		97	53			62	49				
08:15		93	43			67	52				
08:30		103	45			79	43				
08:45		91	43	384	184	55	41	263	185	647	369
09:00		88	38			59	43				
09:15		61	33			60	47				
09:30		58	44			64	41				
09:45		69	42	276	157	49	31	232	162	508	319
10:00		57	31			42	38				
10:15		65	46			55	55				
10:30		63	26			57	26				
10:45		55	17	240	120	71	15	225	134	465	254
11:00		56	23			66	17				
11:15		52	21			69	19				
11:30		57	9			63	13				
11:45		49	13	214	66	63	13	261	62	475	128
Total		2076	2864			1613	3128			3689	5992
Percent	0.0%	42.0%	58.0%			34.0%	66.0%			38.1%	61.9%
Combined Total		4940				4741				9681	

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E/W: Sprague Street
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Site Code: 07220619
Station ID:

Latitude: 0' 0.0000 Undefined

722 Sprague Street (Volume)

Start Time	21-Jun-13 Fri	Eastbound Morning	Eastbound Afternoon	Hour Totals Morning	Hour Totals Afternoon	Westbound Morning	Westbound Afternoon	Hour Totals Morning	Hour Totals Afternoon	Combined Totals Morning	Combined Totals Afternoon
12:00		11	67			12	84				
12:15		11	67			10	70				
12:30		10	71			9	85				
12:45		5	71	37	276	3	69	34	308	71	584
01:00		5	81			5	68				
01:15		9	80			1	79				
01:30		9	73			7	82				
01:45		1	75	24	309	3	81	16	310	40	619
02:00		3	86			4	79				
02:15		2	62			1	74				
02:30		1	67			2	97				
02:45		1	74	7	289	4	79	11	329	18	618
03:00		1	96			3	101				
03:15		2	96			3	99				
03:30		2	71			1	108				
03:45		3	87	8	350	4	92	11	400	19	750
04:00		6	95			2	101				
04:15		6	77			7	90				
04:30		10	79			5	90				
04:45		15	82	37	333	8	121	22	402	59	735
05:00		27	73			15	131				
05:15		33	80			18	125				
05:30		45	89			17	99				
05:45		43	87	148	329	26	99	76	454	224	783
06:00		61	72			34	94				
06:15		78	91			36	87				
06:30		67	66			66	81				
06:45		102	79	308	308	59	83	195	345	503	653
07:00		101	56			51	79				
07:15		127	57			68	71				
07:30		90	58			67	51				
07:45		87	39	405	210	63	53	249	254	654	464
08:00		95	40			68	46				
08:15		94	65			75	56				
08:30		86	50			71	48				
08:45		102	49	377	204	64	54	278	204	655	408
09:00		98	52			64	63				
09:15		91	46			61	43				
09:30		76	34			56	34				
09:45		56	29	321	161	51	57	232	197	553	358
10:00		52	43			60	39				
10:15		57	35			62	44				
10:30		49	63			59	45				
10:45		48	30	206	171	70	26	251	154	457	325
11:00		68	27			64	28				
11:15		82	37			75	28				
11:30		67	25			62	25				
11:45		66	22	283	111	83	19	284	100	567	211
Total		2161	3051			1659	3457			3820	6508
Percent	0.0%	41.5%	58.5%			32.4%	67.6%			37.0%	63.0%
Combined Total		5212				5116				10328	

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Site Code: 07220619
Station ID:

Latitude: 0' 0.0000 Undefined

722 Sprague Street (Volume)

Start Time	22-Jun-13 Sat	Eastbound Morning	Eastbound Afternoon	Hour Totals Morning	Hour Totals Afternoon	Westbound Morning	Westbound Afternoon	Hour Totals Morning	Hour Totals Afternoon	Combined Totals Morning	Combined Totals Afternoon
12:00		19	53			12	71				
12:15		14	59			12	67				
12:30		19	47			18	73				
12:45		15	57	67	216	6	66	48	277	115	493
01:00		7	47			9	67				
01:15		14	52			12	68				
01:30		7	53			6	58				
01:45		7	57	35	209	12	73	39	266	74	475
02:00		5	47			3	74				
02:15		9	55			7	71				
02:30		4	61			5	83				
02:45		1	58	19	221	7	61	22	289	41	510
03:00		6	63			4	58				
03:15		1	63			3	54				
03:30		6	85			5	62				
03:45		7	85	20	296	2	57	14	231	34	527
04:00		3	58			3	61				
04:15		7	51			3	69				
04:30		1	62			4	68				
04:45		8	36	19	207	9	56	19	254	38	461
05:00		10	66			6	67				
05:15		12	57			10	53				
05:30		16	45			8	62				
05:45		18	48	56	216	13	57	37	239	93	455
06:00		20	47			9	53				
06:15		33	43			18	54				
06:30		27	50			28	50				
06:45		28	55	108	195	37	33	92	190	200	385
07:00		32	52			20	48				
07:15		46	49			35	39				
07:30		29	37			53	46				
07:45		35	50	142	188	42	49	150	182	292	370
08:00		32	39			34	39				
08:15		37	39			25	47				
08:30		40	25			36	34				
08:45		38	30	147	133	55	25	150	145	297	278
09:00		52	33			37	32				
09:15		55	35			53	27				
09:30		45	28			67	24				
09:45		58	25	210	121	46	32	203	115	413	236
10:00		56	27			48	27				
10:15		62	29			45	7				
10:30		74	27			67	15				
10:45		47	25	239	108	44	30	204	79	443	187
11:00		55	32			69	21				
11:15		59	23			59	22				
11:30		67	19			65	21				
11:45		55	16	236	90	53	19	246	83	482	173
Total		1298	2200			1224	2350			2522	4550
Percent	0.0%	37.1%	62.9%			34.2%	65.8%			35.7%	64.3%
Combined Total		3498				3574				7072	

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Dedham, MA

Site Code: 07220619
Station ID:

Latitude: 0' 0.0000 Undefined

722 Sprague Street (Volume)

Start Time	23-Jun-13 Sun	Eastbound Morning	Eastbound Afternoon	Hour Totals Morning	Hour Totals Afternoon	Westbound Morning	Westbound Afternoon	Hour Totals Morning	Hour Totals Afternoon	Combined Totals Morning	Combined Totals Afternoon
12:00		13	53			14	68				
12:15		10	66			11	71				
12:30		9	54			11	60				
12:45		13	62	45	235	9	50	45	249	90	484
01:00		12	59			13	59				
01:15		14	57			4	60				
01:30		7	57			9	47				
01:45		3	45	36	218	10	52	36	218	72	436
02:00		3	40			2	67				
02:15		3	52			2	44				
02:30		2	59			6	57				
02:45		5	52	13	203	7	57	17	225	30	428
03:00		7	49			6	44				
03:15		1	57			4	52				
03:30		4	57			3	64				
03:45		3	58	15	221	3	64	16	224	31	445
04:00		1	70			3	65				
04:15		4	58			6	60				
04:30		4	53			4	59				
04:45		2	52	11	233	3	58	16	242	27	475
05:00		3	51			7	53				
05:15		7	58			2	39				
05:30		6	45			13	57				
05:45		7	46	23	200	7	55	29	204	52	404
06:00		9	46			8	44				
06:15		10	46			10	40				
06:30		14	52			12	47				
06:45		15	42	48	186	19	42	49	173	97	359
07:00		24	37			17	41				
07:15		28	43			18	45				
07:30		19	34			21	27				
07:45		17	36	88	150	16	42	72	155	160	305
08:00		26	36			26	37				
08:15		22	37			25	47				
08:30		24	32			30	30				
08:45		34	38	106	143	35	31	116	145	222	288
09:00		34	36			38	30				
09:15		63	35			37	32				
09:30		38	33			40	36				
09:45		42	25	177	129	29	23	144	121	321	250
10:00		45	21			49	15				
10:15		42	23			53	22				
10:30		36	21			53	20				
10:45		48	14	171	79	50	12	205	69	376	148
11:00		33	12			35	17				
11:15		68	21			47	13				
11:30		58	24			69	23				
11:45		65	8	224	65	56	13	207	66	431	131
Total		957	2062			952	2091			1909	4153
Percent	0.0%	31.7%	68.3%			31.3%	68.7%			31.5%	68.5%
Combined Total		3019				3043				6062	

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E/W: Sprague Street
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Dedham, MA

Site Code: 07220619
Station ID:

Latitude: 0' 0.0000 Undefined

722 Sprague Street (Volume)

Start Time	24-Jun-13 Mon	Eastbound Morning	Eastbound Afternoon	Hour Totals Morning	Hour Totals Afternoon	Westbound Morning	Westbound Afternoon	Hour Totals Morning	Hour Totals Afternoon	Combined Totals Morning	Combined Totals Afternoon
12:00		8	66			5	64				
12:15		5	51			5	62				
12:30		3	59			7	74				
12:45		10	84	26	260	3	68	20	268	46	528
01:00		2	62			4	87				
01:15		3	62			6	83				
01:30		4	58			1	48				
01:45		5	57	14	239	4	68	15	286	29	525
02:00		2	57			4	73				
02:15		3	84			2	70				
02:30		5	71			3	72				
02:45		0	70	10	282	3	78	12	293	22	575
03:00		1	70			3	91				
03:15		3	87			3	69				
03:30		1	73			6	82				
03:45		2	56	7	286	2	92	14	334	21	620
04:00		2	67			4	83				
04:15		8	79			4	104				
04:30		10	73			4	89				
04:45		20	85	40	304	6	106	18	382	58	686
05:00		25	71			7	87				
05:15		27	77			16	115				
05:30		42	70			15	92				
05:45		46	66	140	284	24	107	62	401	202	685
06:00		52	87			29	91				
06:15		62	94			44	85				
06:30		75	82			58	84				
06:45		78	66	267	329	53	72	184	332	451	661
07:00		84	66			63	65				
07:15		90	51			56	70				
07:30		94	50			49	51				
07:45		100	60	368	227	81	44	249	230	617	457
08:00		93	54			52	53				
08:15		97	27			73	61				
08:30		99	45			71	47				
08:45		94	33	383	159	69	25	265	186	648	345
09:00		77	23			53	40				
09:15		61	32			50	28				
09:30		69	30			58	31				
09:45		64	13	271	98	53	24	214	123	485	221
10:00		68	23			47	35				
10:15		58	23			52	20				
10:30		63	17			37	16				
10:45		58	28	247	91	54	26	190	97	437	188
11:00		57	20			67	23				
11:15		54	27			65	15				
11:30		63	16			70	13				
11:45		54	14	228	77	73	17	275	68	503	145
Total		2001	2636			1518	3000			3519	5636
Percent	0.0%	43.2%	56.8%			33.6%	66.4%			38.4%	61.6%
Combined Total		4637				4518				9155	

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E/W: Sprague Street
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Dedham, MA

Site Code: 07220619
Station ID:

Latitude: 0' 0.0000 Undefined

722 Sprague Street (Volume)

Start Time	25-Jun-13 Tue	Eastbound Morning	Eastbound Afternoon	Hour Totals Morning	Hour Totals Afternoon	Westbound Morning	Westbound Afternoon	Hour Totals Morning	Hour Totals Afternoon	Combined Totals Morning	Combined Totals Afternoon
12:00		4	79			9	65				
12:15		9	74			11	86				
12:30		11	84			8	72				
12:45		4	80	28	317	6	72	34	295	62	612
01:00		3	67			1	64				
01:15		4	76			9	65				
01:30		5	70			4	78				
01:45		0	47	12	260	3	51	17	258	29	518
02:00		3	59			3	75				
02:15		3	62			4	61				
02:30		2	84			1	72				
02:45		1	59	9	264	2	67	10	275	19	539
03:00		1	72			2	90				
03:15		3	74			1	90				
03:30		1	76			2	96				
03:45		3	85	8	307	4	90	9	366	17	673
04:00		2	80			1	105				
04:15		4	86			4	99				
04:30		10	72			5	108				
04:45		17	74	33	312	7	98	17	410	50	722
05:00		33	76			4	112				
05:15		34	72			18	116				
05:30		44	76			24	95				
05:45		47	78	158	302	19	122	65	445	223	747
06:00		61	70			44	98				
06:15		68	72			46	97				
06:30		72	62			55	65				
06:45		88	66	289	270	59	58	204	318	493	588
07:00		88	57			55	67				
07:15		88	63			53	71				
07:30		91	50			65	61				
07:45		112	51	379	221	82	49	255	248	634	469
08:00		97	43			75	52				
08:15		96	43			67	52				
08:30		114	37			62	42				
08:45		94	41	401	164	59	50	263	196	664	360
09:00		85	26			70	47				
09:15		76	34			60	39				
09:30		63	33			52	40				
09:45		52	30	276	123	51	22	233	148	509	271
10:00		64	33			58	21				
10:15		68	39			50	44				
10:30		73	15			58	23				
10:45		51	16	256	103	52	25	218	113	474	216
11:00		50	19			65	18				
11:15		45	26			65	14				
11:30		58	12			70	15				
11:45		70	8	223	65	71	17	271	64	494	129
Total		2072	2708			1596	3136			3668	5844
Percent	0.0%	43.3%	56.7%			33.7%	66.3%			38.6%	61.4%
Combined Total		4780				4732				9512	

MDM Transportation Consultants, Inc.

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Marlborough, MA 01752
508-303-0370
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E/W: Sprague Street
between Durham Rd and Coventry Rd
Dedham, MA

Site Code: 07220619
Station ID:

Latitude: 0' 0.0000 Undefined

722 Sprague Street (Volume)

Start Time	26-Jun-13 Wed	Eastbound Morning	Eastbound Afternoon	Hour Totals Morning	Hour Totals Afternoon	Westbound Morning	Westbound Afternoon	Hour Totals Morning	Hour Totals Afternoon	Combined Totals Morning	Combined Totals Afternoon
12:00		9	*			13	*				
12:15		7	*			7	*				
12:30		3	*			8	*				
12:45		6	*	25	0	4	*	32	0	57	0
01:00		2	*			5	*				
01:15		3	*			4	*				
01:30		5	*			4	*				
01:45		0	*	10	0	4	*	17	0	27	0
02:00		1	*			4	*				
02:15		1	*			2	*				
02:30		2	*			3	*				
02:45		2	*	6	0	3	*	12	0	18	0
03:00		2	*			4	*				
03:15		4	*			1	*				
03:30		3	*			4	*				
03:45		2	*	11	0	2	*	11	0	22	0
04:00		4	*			3	*				
04:15		5	*			1	*				
04:30		9	*			8	*				
04:45		23	*	41	0	4	*	16	0	57	0
05:00		25	*			8	*				
05:15		33	*			13	*				
05:30		39	*			18	*				
05:45		48	*	145	0	35	*	74	0	219	0
06:00		53	*			31	*				
06:15		64	*			34	*				
06:30		67	*			62	*				
06:45		72	*	256	0	56	*	183	0	439	0
07:00		95	*			50	*				
07:15		90	*			66	*				
07:30		99	*			62	*				
07:45		93	*	377	0	78	*	256	0	633	0
08:00		100	*			63	*				
08:15		117	*			73	*				
08:30		86	*			54	*				
08:45		85	*	388	0	48	*	238	0	626	0
09:00		81	*			67	*				
09:15		75	*			39	*				
09:30		69	*			58	*				
09:45		48	*	273	0	60	*	224	0	497	0
10:00		58	*			46	*				
10:15		67	*			61	*				
10:30		54	*			62	*				
10:45		45	*	224	0	60	*	229	0	453	0
11:00		45	*			72	*				
11:15		45	*			46	*				
11:30		*	*	*	*	*	*	*	*	*	*
11:45		*	*	*	*	*	*	*	*	*	*
Total		1846	0			1410	0			3048	0
Percent	0.0%	100.0%	0.0%			100.0%	0.0%			100.0%	0.0%
Combined Total		1846				1410				3048	
Total		12411	17901			9972	19863			22175	37764
Percent		40.9%	59.1%			33.4%	66.6%			37.0%	63.0%
Combined Total		30312				29835				59939	
ADT		ADT 8,745		AADT 8,745							

□ Speed Data

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Site Code: 07220619
Station ID:

Latitude: 0' 0.0000 Undefined

722 Sprague Street (Speed)

Eastbound

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	85th Percent
06/20/13	0	0	1	8	23	9	3	0	0	0	0	0	0	0	44	38
01:00	0	0	2	4	4	2	2	0	0	0	0	0	0	0	14	39
02:00	0	0	0	2	3	1	0	0	0	0	0	0	0	0	6	35
03:00	0	0	1	1	7	5	1	0	0	0	0	0	0	0	15	38
04:00	0	0	2	4	13	9	2	0	0	0	0	0	0	0	30	38
05:00	0	0	1	14	68	58	14	1	0	0	0	0	0	0	156	39
06:00	1	2	7	47	144	81	12	1	1	0	0	0	0	0	296	38
07:00	3	6	20	100	170	94	8	0	0	0	0	0	0	0	401	37
08:00	1	0	6	74	215	82	5	1	0	0	0	0	0	0	384	36
09:00	0	0	10	73	135	54	4	0	0	0	0	0	0	0	276	36
10:00	1	1	19	56	120	42	1	0	0	0	0	0	0	0	240	36
11:00	1	3	7	54	106	36	6	0	1	0	0	0	0	0	214	36
12 PM	2	2	19	59	138	44	3	2	0	0	0	0	0	0	269	36
13:00	4	3	10	69	128	45	7	0	0	0	0	0	0	0	266	36
14:00	3	0	6	55	145	58	11	0	0	0	0	0	0	0	278	37
15:00	0	2	9	81	134	61	6	0	0	0	0	0	0	0	293	36
16:00	3	1	7	68	157	83	8	0	0	0	0	0	0	0	327	37
17:00	3	2	18	63	195	70	9	0	0	0	0	0	0	0	360	36
18:00	1	3	11	60	156	67	2	0	0	0	0	0	0	0	300	36
19:00	4	5	6	53	110	55	9	0	2	0	0	0	0	0	244	37
20:00	2	1	13	39	95	30	3	1	0	0	0	0	0	0	184	36
21:00	1	1	8	33	82	28	4	0	0	0	0	0	0	0	157	36
22:00	0	3	7	33	58	15	4	0	0	0	0	0	0	0	120	35
23:00	0	0	3	12	31	16	3	0	1	0	0	0	0	0	66	38
Total	30	35	193	1062	2437	1045	127	6	5	0	0	0	0	0	4940	

Percentiles

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

Statistics

Mean Speed(Average) :	32 MPH
10 MPH Pace Speed :	28-37 MPH
Number in Pace :	3463
Percent in Pace :	70.1%
Number of Vehicles > 25 MPH :	4682
Percent of Vehicles > 25 MPH :	94.8%

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722 Sprague Street (Speed)

Eastbound

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	85th Percent
06/21/13	0	0	3	9	19	5	0	1	0	0	0	0	0	0	37	36
01:00	0	1	0	7	10	4	2	0	0	0	0	0	0	0	24	37
02:00	0	0	0	0	4	3	0	0	0	0	0	0	0	0	7	38
03:00	0	0	1	2	3	1	1	0	0	0	0	0	0	0	8	39
04:00	1	1	0	3	19	11	2	0	0	0	0	0	0	0	37	38
05:00	0	1	1	15	47	65	19	0	0	0	0	0	0	0	148	40
06:00	2	1	19	67	142	64	10	2	1	0	0	0	0	0	308	37
07:00	2	2	16	73	185	111	16	0	0	0	0	0	0	0	405	37
08:00	0	2	10	75	198	88	4	0	0	0	0	0	0	0	377	37
09:00	0	0	12	85	167	54	2	0	1	0	0	0	0	0	321	36
10:00	0	1	9	49	97	43	7	0	0	0	0	0	0	0	206	37
11:00	0	1	13	73	127	66	2	1	0	0	0	0	0	0	283	37
12 PM	1	5	12	67	144	46	1	0	0	0	0	0	0	0	276	35
13:00	4	3	22	80	147	51	1	1	0	0	0	0	0	0	309	35
14:00	1	3	12	65	147	56	5	0	0	0	0	0	0	0	289	36
15:00	3	3	15	68	191	65	5	0	0	0	0	0	0	0	350	36
16:00	3	1	20	61	166	75	7	0	0	0	0	0	0	0	333	37
17:00	2	1	14	69	164	72	5	1	0	0	1	0	0	0	329	37
18:00	7	1	9	70	158	55	8	0	0	0	0	0	0	0	308	36
19:00	5	1	13	56	99	34	2	0	0	0	0	0	0	0	210	35
20:00	3	2	5	56	106	30	2	0	0	0	0	0	0	0	204	35
21:00	0	4	11	37	78	27	4	0	0	0	0	0	0	0	161	36
22:00	1	2	13	37	83	30	5	0	0	0	0	0	0	0	171	36
23:00	0	0	4	24	62	18	2	1	0	0	0	0	0	0	111	36
Total	35	36	234	1148	2563	1074	112	7	2	0	1	0	0	0	5212	

Percentiles

15th Percentile :	26 MPH
50th Percentile :	32 MPH
85th Percentile :	36 MPH
95th Percentile :	39 MPH

Statistics

Mean Speed(Average) :	32 MPH
10 MPH Pace Speed :	28-37 MPH
Number in Pace :	3649
Percent in Pace :	70.0%
Number of Vehicles > 25 MPH :	4907
Percent of Vehicles > 25 MPH :	94.1%

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Station ID:

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722 Sprague Street (Speed)

Eastbound

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	85th Percent
06/22/13	1	0	3	12	30	17	2	2	0	0	0	0	0	0	67	38
01:00	0	1	2	4	16	9	3	0	0	0	0	0	0	0	35	38
02:00	0	0	1	2	9	7	0	0	0	0	0	0	0	0	19	37
03:00	0	0	0	4	7	6	2	0	0	1	0	0	0	0	20	40
04:00	0	0	1	6	5	7	0	0	0	0	0	0	0	0	19	37
05:00	0	2	1	6	24	17	6	0	0	0	0	0	0	0	56	39
06:00	1	1	0	10	46	39	10	1	0	0	0	0	0	0	108	39
07:00	1	0	6	14	63	48	10	0	0	0	0	0	0	0	142	38
08:00	1	1	6	34	75	28	2	0	0	0	0	0	0	0	147	36
09:00	0	3	8	34	119	42	4	0	0	0	0	0	0	0	210	36
10:00	1	0	10	36	123	63	6	0	0	0	0	0	0	0	239	37
11:00	4	2	8	55	116	44	6	1	0	0	0	0	0	0	236	36
12 PM	2	0	7	43	119	45	0	0	0	0	0	0	0	0	216	36
13:00	1	0	11	49	105	38	4	1	0	0	0	0	0	0	209	36
14:00	1	0	3	30	129	55	3	0	0	0	0	0	0	0	221	37
15:00	1	1	12	76	154	45	7	0	0	0	0	0	0	0	296	36
16:00	3	1	9	38	90	57	8	1	0	0	0	0	0	0	207	38
17:00	1	1	15	40	117	41	1	0	0	0	0	0	0	0	216	36
18:00	1	0	11	36	99	43	4	1	0	0	0	0	0	0	195	37
19:00	2	1	8	37	101	34	4	0	1	0	0	0	0	0	188	36
20:00	0	1	8	32	61	26	5	0	0	0	0	0	0	0	133	37
21:00	3	2	3	35	58	18	2	0	0	0	0	0	0	0	121	35
22:00	1	4	11	17	51	20	4	0	0	0	0	0	0	0	108	36
23:00	0	2	11	18	38	19	2	0	0	0	0	0	0	0	90	36
Total	25	23	155	668	1755	768	95	7	1	1	0	0	0	0	3498	

Percentiles

15th Percentile :	27 MPH
50th Percentile :	32 MPH
85th Percentile :	37 MPH
95th Percentile :	40 MPH

Statistics

Mean Speed(Average) :	33 MPH
10 MPH Pace Speed :	29-38 MPH
Number in Pace :	2461
Percent in Pace :	70.4%
Number of Vehicles > 25 MPH :	3295
Percent of Vehicles > 25 MPH :	94.2%

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722 Sprague Street (Speed)

Eastbound

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	85th Percent
06/23/13	0	1	4	9	21	8	1	0	1	0	0	0	0	0	45	36
01:00	1	3	3	3	19	7	0	0	0	0	0	0	0	0	36	36
02:00	0	0	1	2	4	5	1	0	0	0	0	0	0	0	13	39
03:00	0	0	0	3	5	6	1	0	0	0	0	0	0	0	15	39
04:00	0	0	1	2	5	3	0	0	0	0	0	0	0	0	11	37
05:00	0	0	0	4	11	6	1	1	0	0	0	0	0	0	23	38
06:00	0	2	2	8	15	18	2	1	0	0	0	0	0	0	48	38
07:00	0	0	4	11	48	20	4	1	0	0	0	0	0	0	88	37
08:00	2	0	5	20	48	24	6	1	0	0	0	0	0	0	106	38
09:00	2	0	4	28	81	56	6	0	0	0	0	0	0	0	177	38
10:00	0	1	10	23	82	53	2	0	0	0	0	0	0	0	171	37
11:00	0	2	7	35	110	60	10	0	0	0	0	0	0	0	224	38
12 PM	3	3	4	44	129	48	3	1	0	0	0	0	0	0	235	36
13:00	0	1	6	36	121	45	8	1	0	0	0	0	0	0	218	37
14:00	3	1	4	36	107	50	2	0	0	0	0	0	0	0	203	37
15:00	3	3	10	37	120	44	4	0	0	0	0	0	0	0	221	36
16:00	0	4	6	45	125	47	6	0	0	0	0	0	0	0	233	36
17:00	2	0	6	49	106	33	3	1	0	0	0	0	0	0	200	36
18:00	2	1	6	35	99	37	6	0	0	0	0	0	0	0	186	36
19:00	1	1	15	31	70	27	4	1	0	0	0	0	0	0	150	36
20:00	1	7	15	33	74	11	2	0	0	0	0	0	0	0	143	34
21:00	0	4	12	40	52	17	4	0	0	0	0	0	0	0	129	35
22:00	0	2	4	14	38	18	3	0	0	0	0	0	0	0	79	37
23:00	0	0	5	13	25	21	1	0	0	0	0	0	0	0	65	37
Total	20	36	134	561	1515	664	80	8	1	0	0	0	0	0	3019	

Percentiles	15th Percentile :	27 MPH
	50th Percentile :	32 MPH
	85th Percentile :	37 MPH
	95th Percentile :	40 MPH
Statistics	Mean Speed(Average) :	32 MPH
	10 MPH Pace Speed :	29-38 MPH
	Number in Pace :	2114
	Percent in Pace :	70.0%
	Number of Vehicles > 25 MPH :	2829
	Percent of Vehicles > 25 MPH :	93.7%

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722 Sprague Street (Speed)

Eastbound

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	85th Percent
06/24/13	0	0	2	8	8	7	1	0	0	0	0	0	0	0	26	37
01:00	0	0	1	0	9	3	1	0	0	0	0	0	0	0	14	38
02:00	0	0	1	1	3	4	1	0	0	0	0	0	0	0	10	39
03:00	0	0	1	2	1	3	0	0	0	0	0	0	0	0	7	38
04:00	0	0	1	5	10	23	1	0	0	0	0	0	0	0	40	39
05:00	0	0	3	11	76	47	3	0	0	0	0	0	0	0	140	38
06:00	3	1	12	41	127	75	7	1	0	0	0	0	0	0	267	37
07:00	3	2	13	71	191	78	10	0	0	0	0	0	0	0	368	37
08:00	4	0	19	73	189	89	9	0	0	0	0	0	0	0	383	37
09:00	2	1	10	59	152	43	4	0	0	0	0	0	0	0	271	36
10:00	0	3	16	53	122	52	1	0	0	0	0	0	0	0	247	36
11:00	1	6	25	58	95	39	4	0	0	0	0	0	0	0	228	36
12 PM	3	2	6	59	130	54	6	0	0	0	0	0	0	0	260	36
13:00	3	2	16	66	110	37	5	0	0	0	0	0	0	0	239	36
14:00	2	7	13	57	143	56	3	1	0	0	0	0	0	0	282	36
15:00	8	0	5	64	158	49	2	0	0	0	0	0	0	0	286	36
16:00	1	0	10	46	170	70	7	0	0	0	0	0	0	0	304	37
17:00	4	5	8	36	159	65	7	0	0	0	0	0	0	0	284	37
18:00	0	6	18	73	144	83	5	0	0	0	0	0	0	0	329	37
19:00	2	1	7	46	108	60	3	0	0	0	0	0	0	0	227	37
20:00	0	0	11	35	75	36	2	0	0	0	0	0	0	0	159	36
21:00	0	1	6	23	52	14	2	0	0	0	0	0	0	0	98	35
22:00	3	2	3	19	46	17	1	0	0	0	0	0	0	0	91	36
23:00	0	1	11	10	39	16	0	0	0	0	0	0	0	0	77	36
Total	39	40	218	916	2317	1020	85	2	0	0	0	0	0	0	4637	

Percentiles	15th Percentile :	26 MPH
	50th Percentile :	32 MPH
	85th Percentile :	36 MPH
	95th Percentile :	39 MPH
Statistics	Mean Speed(Average) :	32 MPH
	10 MPH Pace Speed :	29-38 MPH
	Number in Pace :	3259
	Percent in Pace :	70.3%
	Number of Vehicles > 25 MPH :	4340
	Percent of Vehicles > 25 MPH :	93.6%

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Station ID:

Latitude: 0' 0.0000 Undefined

722 Sprague Street (Speed)

Eastbound

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	85th Percent
06/25/13	0	0	6	8	10	3	1	0	0	0	0	0	0	0	28	35
01:00	0	2	1	2	2	5	0	0	0	0	0	0	0	0	12	38
02:00	0	0	0	2	4	2	1	0	0	0	0	0	0	0	9	39
03:00	0	0	1	0	4	2	1	0	0	0	0	0	0	0	8	39
04:00	1	0	4	4	7	14	3	0	0	0	0	0	0	0	33	39
05:00	0	0	4	19	50	72	12	1	0	0	0	0	0	0	158	39
06:00	0	1	10	54	122	94	8	0	0	0	0	0	0	0	289	38
07:00	6	3	10	53	206	97	4	0	0	0	0	0	0	0	379	37
08:00	1	1	16	89	199	88	7	0	0	0	0	0	0	0	401	36
09:00	0	0	17	78	122	56	3	0	0	0	0	0	0	0	276	36
10:00	1	1	8	44	135	63	4	0	0	0	0	0	0	0	256	37
11:00	1	2	13	67	104	34	1	1	0	0	0	0	0	0	223	35
12 PM	3	3	14	106	148	40	3	0	0	0	0	0	0	0	317	35
13:00	1	2	11	74	122	45	5	0	0	0	0	0	0	0	260	36
14:00	2	0	7	53	135	62	4	1	0	0	0	0	0	0	264	37
15:00	0	0	2	75	159	66	5	0	0	0	0	0	0	0	307	36
16:00	3	1	7	62	154	70	14	1	0	0	0	0	0	0	312	37
17:00	3	3	9	66	142	76	3	0	0	0	0	0	0	0	302	37
18:00	6	1	12	45	137	60	8	0	1	0	0	0	0	0	270	37
19:00	1	2	6	36	110	62	4	0	0	0	0	0	0	0	221	37
20:00	4	1	3	31	83	41	1	0	0	0	0	0	0	0	164	37
21:00	0	1	4	32	58	28	0	0	0	0	0	0	0	0	123	36
22:00	2	0	5	25	48	21	2	0	0	0	0	0	0	0	103	36
23:00	0	2	0	12	38	11	2	0	0	0	0	0	0	0	65	36
Total	35	26	170	1037	2299	1112	96	4	1	0	0	0	0	0	4780	

Percentiles	15th Percentile :	27 MPH
	50th Percentile :	32 MPH
	85th Percentile :	37 MPH
	95th Percentile :	39 MPH
Statistics	Mean Speed(Average) :	32 MPH
	10 MPH Pace Speed :	29-38 MPH
	Number in Pace :	3352
	Percent in Pace :	70.1%
	Number of Vehicles > 25 MPH :	4549
	Percent of Vehicles > 25 MPH :	95.2%

Summary	15th Percentile :	27 MPH
	50th Percentile :	32 MPH
	85th Percentile :	37 MPH
	95th Percentile :	39 MPH
Statistics	Mean Speed(Average) :	32 MPH

MDM Transportation Consultants, Inc.

28 Lord Road, Suite 280
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508-303-0370
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E/W: Sprague Street
between Durham Rd and Coventry Rd
Dedham, MA

Site Code: 07220619
Station ID:

Latitude: 0' 0.0000 Undefined

722 Sprague Street (Speed)

Westbound

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	85th Percent
06/20/13	2	1	2	5	16	16	5	0	0	0	0	0	0	0	47	39
01:00	0	0	0	2	8	8	1	1	0	0	0	0	0	0	20	39
02:00	0	0	0	0	4	9	2	0	0	0	0	0	0	0	15	40
03:00	0	0	0	0	4	2	1	1	0	0	0	0	0	0	8	43
04:00	0	0	1	0	4	4	5	4	0	0	0	0	0	0	18	46
05:00	0	5	0	1	11	25	20	2	0	0	0	0	0	0	64	43
06:00	1	0	13	22	66	63	27	3	0	0	0	0	0	0	195	40
07:00	3	6	5	30	98	84	37	2	0	0	0	0	0	0	265	40
08:00	2	5	11	31	101	86	26	1	0	0	0	0	0	0	263	39
09:00	0	4	10	27	81	93	17	0	0	0	0	0	0	0	232	39
10:00	1	4	10	41	83	74	9	3	0	0	0	0	0	0	225	38
11:00	0	2	9	34	114	84	15	3	0	0	0	0	0	0	261	38
12 PM	0	3	13	43	121	91	12	0	0	0	0	0	0	0	283	38
13:00	1	2	17	37	120	80	19	2	0	0	0	0	0	0	278	38
14:00	4	3	7	60	123	102	19	4	0	0	0	0	0	0	322	38
15:00	3	3	16	49	114	117	30	4	0	0	0	0	0	0	336	39
16:00	1	2	11	33	154	145	28	1	0	0	0	0	0	0	375	39
17:00	0	3	18	66	191	145	26	0	0	0	0	0	0	0	449	38
18:00	4	1	12	26	160	108	20	1	0	1	0	0	0	0	333	38
19:00	0	0	7	19	90	79	11	3	0	0	0	0	0	0	209	39
20:00	2	2	12	16	72	69	9	3	0	0	0	0	0	0	185	39
21:00	1	2	7	23	76	46	7	0	0	0	0	0	0	0	162	38
22:00	0	2	6	18	62	42	4	0	0	0	0	0	0	0	134	38
23:00	2	0	0	7	22	22	8	1	0	0	0	0	0	0	62	40
Total	27	50	187	590	1895	1594	358	39	0	1	0	0	0	0	4741	

Percentiles	15th Percentile :	28 MPH
	50th Percentile :	33 MPH
	85th Percentile :	39 MPH
	95th Percentile :	42 MPH
Statistics	Mean Speed(Average) :	34 MPH
	10 MPH Pace Speed :	30-39 MPH
	Number in Pace :	3156
	Percent in Pace :	66.6%
	Number of Vehicles > 25 MPH :	4477
	Percent of Vehicles > 25 MPH :	94.4%

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722 Sprague Street (Speed)

Westbound

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	85th Percent
06/21/13	0	0	1	5	13	10	5	0	0	0	0	0	0	0	34	40
01:00	0	0	0	1	7	3	4	1	0	0	0	0	0	0	16	43
02:00	0	0	3	0	3	4	1	0	0	0	0	0	0	0	11	39
03:00	0	0	1	1	3	4	2	0	0	0	0	0	0	0	11	41
04:00	1	0	1	2	7	5	4	1	1	0	0	0	0	0	22	43
05:00	0	1	1	6	19	30	15	3	1	0	0	0	0	0	76	42
06:00	1	1	8	32	65	65	19	4	0	0	0	0	0	0	195	39
07:00	0	1	7	30	84	100	24	2	1	0	0	0	0	0	249	39
08:00	0	3	9	35	88	110	30	3	0	0	0	0	0	0	278	40
09:00	0	0	12	30	100	79	10	1	0	0	0	0	0	0	232	38
10:00	0	4	14	29	112	81	11	0	0	0	0	0	0	0	251	38
11:00	3	2	24	49	124	63	18	1	0	0	0	0	0	0	284	38
12 PM	3	10	18	62	117	84	14	0	0	0	0	0	0	0	308	38
13:00	3	2	18	44	131	91	16	5	0	0	0	0	0	0	310	38
14:00	1	16	16	61	108	111	14	2	0	0	0	0	0	0	329	38
15:00	4	6	20	59	159	126	24	2	0	0	0	0	0	0	400	38
16:00	2	6	21	40	176	129	26	2	0	0	0	0	0	0	402	38
17:00	3	8	16	55	152	189	26	5	0	0	0	0	0	0	454	39
18:00	7	4	20	45	140	109	18	2	0	0	0	0	0	0	345	38
19:00	2	1	7	34	103	90	15	2	0	0	0	0	0	0	254	38
20:00	4	3	6	18	84	71	16	2	0	0	0	0	0	0	204	39
21:00	0	0	6	37	88	54	11	1	0	0	0	0	0	0	197	38
22:00	2	2	9	30	54	44	12	0	1	0	0	0	0	0	154	38
23:00	1	1	4	15	48	26	4	1	0	0	0	0	0	0	100	38
Total	37	71	242	720	1985	1678	339	40	4	0	0	0	0	0	5116	

Percentiles

15th Percentile :	27 MPH
50th Percentile :	33 MPH
85th Percentile :	38 MPH
95th Percentile :	41 MPH

Statistics

Mean Speed(Average) :	34 MPH
10 MPH Pace Speed :	30-39 MPH
Number in Pace :	3325
Percent in Pace :	65.0%
Number of Vehicles > 25 MPH :	4766
Percent of Vehicles > 25 MPH :	93.2%

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722 Sprague Street (Speed)

Westbound

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	85th Percent
06/22/13	0	0	1	12	18	15	2	0	0	0	0	0	0	0	48	38
01:00	0	0	3	9	11	15	1	0	0	0	0	0	0	0	39	38
02:00	0	0	2	3	6	7	3	1	0	0	0	0	0	0	22	41
03:00	0	0	0	1	4	5	3	0	0	1	0	0	0	0	14	43
04:00	0	0	0	3	7	4	4	1	0	0	0	0	0	0	19	42
05:00	1	0	1	7	9	12	4	3	0	0	0	0	0	0	37	41
06:00	0	1	2	10	24	36	15	3	1	0	0	0	0	0	92	41
07:00	1	2	5	10	47	66	16	2	1	0	0	0	0	0	150	40
08:00	1	1	5	20	47	62	12	2	0	0	0	0	0	0	150	39
09:00	1	1	2	22	81	81	13	1	0	1	0	0	0	0	203	39
10:00	1	4	9	18	77	80	14	1	0	0	0	0	0	0	204	39
11:00	2	2	3	19	94	105	20	1	0	0	0	0	0	0	246	39
12 PM	0	0	10	33	119	85	28	1	1	0	0	0	0	0	277	39
13:00	2	0	5	29	137	77	16	0	0	0	0	0	0	0	266	38
14:00	4	2	16	37	115	90	20	5	0	0	0	0	0	0	289	39
15:00	1	0	5	20	90	90	25	0	0	0	0	0	0	0	231	39
16:00	1	4	9	34	103	81	22	0	0	0	0	0	0	0	254	39
17:00	1	1	6	31	98	82	19	0	1	0	0	0	0	0	239	39
18:00	1	2	6	14	82	70	13	1	1	0	0	0	0	0	190	39
19:00	0	2	8	24	80	57	9	2	0	0	0	0	0	0	182	38
20:00	0	1	6	20	62	43	12	0	1	0	0	0	0	0	145	39
21:00	1	3	10	24	48	28	1	0	0	0	0	0	0	0	115	37
22:00	1	1	2	10	36	22	7	0	0	0	0	0	0	0	79	38
23:00	0	1	6	13	29	31	2	1	0	0	0	0	0	0	83	38
Total	19	28	122	423	1424	1244	281	25	6	2	0	0	0	0	3574	

Percentiles

15th Percentile :	28 MPH
50th Percentile :	34 MPH
85th Percentile :	39 MPH
95th Percentile :	42 MPH

Statistics

Mean Speed(Average) :	34 MPH
10 MPH Pace Speed :	31-40 MPH
Number in Pace :	2413
Percent in Pace :	67.5%
Number of Vehicles > 25 MPH :	3405
Percent of Vehicles > 25 MPH :	95.3%

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Station ID: .

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722 Sprague Street (Speed)

Westbound

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	85th Percent
06/23/13	0	0	2	3	24	13	3	0	0	0	0	0	0	0	45	38
01:00	1	0	2	5	17	9	1	1	0	0	0	0	0	0	36	38
02:00	0	0	0	1	5	8	3	0	0	0	0	0	0	0	17	41
03:00	0	0	1	2	5	5	2	1	0	0	0	0	0	0	16	41
04:00	0	0	4	2	4	4	1	1	0	0	0	0	0	0	16	39
05:00	0	0	2	2	10	10	4	1	0	0	0	0	0	0	29	41
06:00	1	0	0	3	10	18	13	2	1	1	0	0	0	0	49	43
07:00	0	0	1	7	29	24	9	2	0	0	0	0	0	0	72	40
08:00	1	3	4	9	41	48	9	1	0	0	0	0	0	0	116	39
09:00	2	0	2	9	41	69	19	2	0	0	0	0	0	0	144	40
10:00	0	0	5	17	78	74	25	6	0	0	0	0	0	0	205	40
11:00	0	0	4	19	75	87	19	2	1	0	0	0	0	0	207	39
12 PM	2	3	4	32	101	91	16	0	0	0	0	0	0	0	249	38
13:00	2	0	5	20	88	87	14	2	0	0	0	0	0	0	218	39
14:00	2	2	2	19	93	85	22	0	0	0	0	0	0	0	225	39
15:00	3	1	8	16	98	76	20	1	1	0	0	0	0	0	224	39
16:00	1	0	4	20	109	94	14	0	0	0	0	0	0	0	242	38
17:00	4	0	8	19	79	81	12	1	0	0	0	0	0	0	204	39
18:00	1	3	4	20	76	60	8	0	1	0	0	0	0	0	173	38
19:00	2	0	5	21	69	47	8	2	1	0	0	0	0	0	155	38
20:00	0	3	4	25	65	41	6	1	0	0	0	0	0	0	145	38
21:00	0	2	15	28	51	21	4	0	0	0	0	0	0	0	121	36
22:00	0	0	0	7	29	29	4	0	0	0	0	0	0	0	69	39
23:00	1	0	4	11	15	30	4	1	0	0	0	0	0	0	66	39
Total	23	17	90	317	1212	1111	240	27	5	1	0	0	0	0	3043	

Percentiles

15th Percentile :	29 MPH
50th Percentile :	34 MPH
85th Percentile :	39 MPH
95th Percentile :	42 MPH

Statistics

Mean Speed(Average) :	34 MPH
10 MPH Pace Speed :	31-40 MPH
Number in Pace :	2093
Percent in Pace :	68.8%
Number of Vehicles > 25 MPH :	2913
Percent of Vehicles > 25 MPH :	95.7%

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722 Sprague Street (Speed)

Westbound

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	85th Percent
06/24/13	0	0	0	1	7	9	2	1	0	0	0	0	0	0	20	40
01:00	0	0	1	1	4	4	5	0	0	0	0	0	0	0	15	42
02:00	0	0	0	0	2	7	2	0	1	0	0	0	0	0	12	42
03:00	0	0	1	0	8	4	1	0	0	0	0	0	0	0	14	38
04:00	0	1	0	0	4	9	3	1	0	0	0	0	0	0	18	42
05:00	0	0	2	1	16	26	16	1	0	0	0	0	0	0	62	42
06:00	2	0	6	22	68	60	23	2	1	0	0	0	0	0	184	40
07:00	0	2	6	28	94	91	28	0	0	0	0	0	0	0	249	39
08:00	2	5	16	30	96	88	26	2	0	0	0	0	0	0	265	39
09:00	0	0	16	19	61	97	20	1	0	0	0	0	0	0	214	39
10:00	1	4	13	31	74	59	8	0	0	0	0	0	0	0	190	38
11:00	0	2	15	52	97	96	12	1	0	0	0	0	0	0	275	38
12 PM	0	2	7	40	111	93	14	1	0	0	0	0	0	0	268	38
13:00	1	7	10	43	121	86	16	2	0	0	0	0	0	0	286	38
14:00	0	2	9	49	114	102	17	0	0	0	0	0	0	0	293	38
15:00	4	3	16	43	101	119	44	3	1	0	0	0	0	0	334	40
16:00	0	2	8	47	160	142	21	2	0	0	0	0	0	0	382	38
17:00	0	1	16	49	161	144	26	4	0	0	0	0	0	0	401	39
18:00	4	1	13	36	122	125	30	1	0	0	0	0	0	0	332	39
19:00	1	3	8	24	96	83	14	1	0	0	0	0	0	0	230	38
20:00	2	1	8	27	79	54	14	1	0	0	0	0	0	0	186	38
21:00	0	1	7	13	50	42	10	0	0	0	0	0	0	0	123	39
22:00	0	0	5	15	39	33	5	0	0	0	0	0	0	0	97	38
23:00	1	1	2	8	28	24	4	0	0	0	0	0	0	0	68	38
Total	18	38	185	579	1713	1597	361	24	3	0	0	0	0	0	4518	

Percentiles

15th Percentile :	28 MPH
50th Percentile :	34 MPH
85th Percentile :	39 MPH
95th Percentile :	42 MPH

Statistics

Mean Speed(Average) :	34 MPH
10 MPH Pace Speed :	31-40 MPH
Number in Pace :	3003
Percent in Pace :	66.5%
Number of Vehicles > 25 MPH :	4277
Percent of Vehicles > 25 MPH :	94.7%

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722 Sprague Street (Speed)

Westbound

Start Time	1 15	16 20	21 25	26 30	31 35	36 40	41 45	46 50	51 55	56 60	61 65	66 70	71 75	76 999	Total	85th Percent
06/25/13	0	2	0	6	13	7	4	2	0	0	0	0	0	0	34	41
01:00	0	0	0	3	5	3	4	2	0	0	0	0	0	0	17	44
02:00	0	0	1	0	3	2	4	0	0	0	0	0	0	0	10	43
03:00	0	0	0	1	2	2	3	1	0	0	0	0	0	0	9	44
04:00	1	0	0	0	6	6	2	1	1	0	0	0	0	0	17	43
05:00	2	1	1	6	16	26	12	1	0	0	0	0	0	0	65	41
06:00	0	1	17	32	63	76	14	1	0	0	0	0	0	0	204	39
07:00	1	3	11	21	96	90	29	4	0	0	0	0	0	0	255	40
08:00	1	1	14	31	90	92	31	2	1	0	0	0	0	0	263	40
09:00	0	0	15	34	88	72	19	4	1	0	0	0	0	0	233	39
10:00	1	0	15	35	80	74	13	0	0	0	0	0	0	0	218	38
11:00	0	1	12	61	117	61	19	0	0	0	0	0	0	0	271	38
12 PM	1	5	17	57	129	71	12	1	2	0	0	0	0	0	295	37
13:00	1	1	18	57	90	75	15	1	0	0	0	0	0	0	258	38
14:00	1	2	7	31	114	102	16	2	0	0	0	0	0	0	275	39
15:00	0	0	11	45	142	140	27	1	0	0	0	0	0	0	366	39
16:00	2	3	15	50	152	152	36	0	0	0	0	0	0	0	410	39
17:00	2	2	16	47	195	158	25	0	0	0	0	0	0	0	445	38
18:00	2	1	10	34	121	124	23	3	0	0	0	0	0	0	318	39
19:00	1	1	6	26	102	89	19	3	1	0	0	0	0	0	248	39
20:00	1	1	7	21	87	67	11	1	0	0	0	0	0	0	196	38
21:00	0	0	3	15	83	40	6	1	0	0	0	0	0	0	148	38
22:00	0	2	5	13	40	44	8	0	0	1	0	0	0	0	113	39
23:00	1	1	0	8	30	20	4	0	0	0	0	0	0	0	64	38
Total	18	28	201	634	1864	1593	356	31	6	1	0	0	0	0	4732	

Percentiles	15th Percentile :	28 MPH
	50th Percentile :	33 MPH
	85th Percentile :	39 MPH
	95th Percentile :	42 MPH
Statistics	Mean Speed(Average) :	34 MPH
	10 MPH Pace Speed :	30-39 MPH
	Number in Pace :	3148
	Percent in Pace :	66.5%
	Number of Vehicles > 25 MPH :	4485
	Percent of Vehicles > 25 MPH :	94.8%
Summary	15th Percentile :	28 MPH
	50th Percentile :	34 MPH
	85th Percentile :	39 MPH
	95th Percentile :	42 MPH
Statistics	Mean Speed(Average) :	34 MPH

- Seasonal Data

SECTION I - CONTINUOUS COUNTING STATION MONTHLY AVERAGE DAILY TRAFFIC

STATION 6189 - DEDHAM - RTE.I-95 (128) - NORTH OF RTE.109

YR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR	June to Year	
02	132,469	136,300	141,622	146,991	152,409	153,621	151,215	154,364	149,347	148,919	139,825	133,862	145,079	0.94	
	0%	-6%	-1%	-2%	-1%	1%	7%	-3%	0%	0%	-2%	-5%	-1%		
03	132,869	127,688	140,369	143,667	150,423	154,490	161,686	150,385	*149,000*	148,371	137,218	127,774	143,662	0.93	
	-4%	4%	2%	3%	-1%	-2%	-5%	2%	-3%	-4%	3%	6%	0%		
04	127,155	132,718	143,627	147,475	149,584	151,877	*153,000*	152,795	*144,000*	*142,000*	141,068	135,276	143,381	0.94	
	9%	0%	-5%	-4%	-3%	1%	-10%	-4%	-1%	-2%	-7%	-2%	-2%		
05	138,000	132,174	136,654	142,226	145,240	152,638	138,350	146,758	142,964	139,299	131,242	132,683	139,852	0.92	
												Growth	-1.21%	0.93	Sub Averag

STATION 6237 - STOUGHTON- RTE.24 - SOUTH OF RTE.139

YR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR		
07	109,615	111,572	112,484	115,980	119,936	116,929	121,703	126,023	121,444	119,422	112,828	106,138	116,173	0.99	
	-3%	-2%	0%	0%	-3%	-4%	-4%	-5%	-5%	-10%	-9%	-3%	-4%		
08	106,506	109,466	113,000	116,334	116,114	112,255	116,319	119,958	114,921	107,967	103,064	103,411	111,610	0.99	
	-5%	0%	-3%	-2%	1%	6%	-1%	0%	4%	7%	1%	-3%	0%		
09	100,715	109,418	110,081	113,701	116,977	118,963	115,714	119,670	118,963	115,354	103,847	99,822	111,935	0.94	
												Growth	-1.82%	0.98	Sub Averag

STATION 6386 - BRAINTREE - RTE.I-93 (1) - BTWN. RTE.37 AND S.E.X-WAY

YR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	YEAR		
02	*210,000*	*210,000*	*215,000*	*209,000*	210,257	223,872	222,442	227,924	221,399	205,341	198,251	201,459	212,912	0.95	
	-2%	0%	1%	2%	3%	0%	6%	4%	2%	7%	11%	3%	3%		
03	206,804	210,234	217,914	213,858	216,176	223,521	235,530	237,870	*226,667*	218,752	219,661	208,187	219,598	0.98	
	-15%	-17%	-19%	-14%	-15%	-14%	-16%	-9%	-9%	-8%	-7%	-2%	-12%		
05	176,239	173,769	177,470	184,594	183,455	192,039	197,624	215,923	207,127	201,913	205,258	204,144	193,296	1.01	
	11%	13%	17%	12%	13%	10%	4%	-2%	-7%	-5%	-7%	-7%	4%		
06	195,603	195,729	207,324	206,970	207,066	210,445	206,381	212,625	193,313	192,000	191,000	189,000	200,621	0.95	
												Growth	-1.26%	0.97	Sub Averag

Average Adjusment Factor 0.95

Average Yearly Growth Calculated -1.4%

Yearly Growth Factor Used 0.5%

ITALICS = ESTIMATED DATA

MADT

□ Sight Distance Calculations

Stopping Sight Distance

Posted Speed Limit

		SPEED (MPH)	BRAKE REACTION DISTANCE (FT)	BRAKING DISTANCE (FT)	CALCULATED STOPPING SIGHT DISTANCE (FT)
Direction 1	EB	25	91.875	60.0	151.9
Direction 2	WB	35	128.625	117.6	246.2

INPUTS	Direction 1	Direction 2
Travel Direction	EB	WB
Speed	25	35
t	2.5	2.5
a	11.2	11.2

Stopping Sight Distance (SSD) - Source: AASHTO

SSD = Reaction Distance + Brake Distance

Reaction Distance = 1.47 x t x V

Brake Distance = 1.075 x V^2 / a

Where:
t = reaction time (sec)
V = travel speed (mph)
a - deceleration rate (ft/sec^2)

Stopping Sight Distance

Observed Average Travel Speed

		SPEED (MPH)	BRAKE REACTION DISTANCE (FT)	BRAKING DISTANCE (FT)	CALCULATED STOPPING SIGHT DISTANCE (FT)
Direction 1	EB	32	117.6	98.3	215.9
Direction 2	WB	34	124.95	111.0	235.9

INPUTS	Direction 1	Direction 2
Travel Direction	EB	WB
Speed	32	34
t	2.5	2.5
a	11.2	11.2

Stopping Sight Distance (SSD) - Source: AASHTO

SSD = Reaction Distance + Brake Distance

Reaction Distance = 1.47 x t x V

Brake Distance = 1.075 x V^2 / a

Where:
t = reaction time (sec)
V = travel speed (mph)
a - deceleration rate (ft/sec^2)

Stopping Sight Distance

Observed 85th Percentile Travel Speed

		SPEED (MPH)	BRAKE REACTION DISTANCE (FT)	BRAKING DISTANCE (FT)	CALCULATED STOPPING SIGHT DISTANCE (FT)
Direction 1	EB	37	135.975	131.4	267.4
Direction 2	WB	39	143.325	146.0	289.3

INPUTS	Direction 1	Direction 2
Travel Direction	EB	WB
Speed	37	39
t	2.5	2.5
a	11.2	11.2

Stopping Sight Distance (SSD) - Source: AASHTO

SSD = Reaction Distance + Brake Distance

Reaction Distance = 1.47 x t x V

Brake Distance = 1.075 x V^2 / a

Where:
t = reaction time (sec)
V = travel speed (mph)
a - deceleration rate (ft/sec^2)

□ Trip Generation Calculations

Institute of Transportation Engineers (ITE) 9th Edition
Land Use Code (LUC) 411 - City Park

Average Vehicle Trips Ends vs: Acres
Independent Variable (X): 12

AVERAGE WEEKDAY DAILY

T = 1.89 * (X) (Use Caution - Small Sample Size)
T = 1.89 * 12
T = 22.68
T = 24 vehicle trips
with 50% (12 vph) entering and 50% (12 vph) exiting.

WEEKDAY DAILY

(Weekday PM/Saturday Midday)*Saturday Daily (Use Caution - Small Sample Size)

$$\frac{3.5}{4.5} * \frac{y}{22.75} \quad y=17.69$$

T = y * (X)
T = 214 vehicle trips
with 50% (107 vph) entering and 50% (107 vph) exiting.

WEEKDAY MORNING PEAK HOUR OF ADJACENT STREET TRAFFIC

T = 4.5 * (X) (Use Caution - Small Sample Size)
T = 0.40 * 12
T = 54.00
T = 54 vehicle trips
with 56% (30 vph) entering and 44% (24 vph) exiting.

WEEKDAY EVENING PEAK HOUR OF ADJACENT STREET TRAFFIC

T = 3.5 * (X)
T = 3.5 * 12
T = 42.00
T = 42 vehicle trips
with 57% (24 vph) entering and 43% (18 vph) exiting.

SATURDAY DAILY

T = 22.75 * (X) (Use Caution - Small Sample Size)
T = 22.75 * 12
T = 273.00
T = 274 vehicle trips
with 50% (137 vph) entering and 50% (137 vph) exiting.

SATURDAY MIDDAY PEAK HOUR OF GENERATOR

T = 4.5 * (X) (Use Caution - Small Sample Size)
T = 4.5 * 12
T = 54.00
T = 54 vehicle trips
with 50% (27 vph) entering and 50% (27 vph) exiting.

Institute of Transportation Engineers (ITE) 9th Edition
Land Use Code (LUC) 488 - Soccer Complex

Average Vehicle Trips Ends vs: Number of Fields
Independent Variable (X): 2

AVERAGE WEEKDAY DAILY

T = 71.33 * (X)
T = 71.33 * 2
T = 142.66
T = 142 vehicle trips
with 50% (**71** vpd) entering and 50% (**71** vpd) exiting.

WEEKDAY MORNING PEAK HOUR OF ADJACENT STREET TRAFFIC

T = 1.12 * (X)
T = 1.12 * 2
T = 2.24
T = 2 vehicle trips
with 57% (**1** vph) entering and 43% (**1** vph) exiting.

WEEKDAY EVENING PEAK HOUR OF ADJACENT STREET TRAFFIC

T = 17.70 * (X)
T = 17.70 * 2
T = 35.40
T = 35 vehicle trips
with 67% (**23** vph) entering and 33% (**12** vph) exiting.

SATURDAY DAILY

T = 117.43 * (X)
T = 117.43 * 0
T = 234.86
T = 234 vehicle trips
with 50% (**117** vpd) entering and 50% (**117** vpd) exiting.

SATURDAY MIDDAY PEAK HOUR OF GENERATOR

T = 30.34 * (X)
T = 30.34 * 2
T = 60.68
T = 61 vehicle trips
with 48% (**29** vph) entering and 52% (**32** vph) exiting.

Institute of Transportation Engineers (ITE) 9th Edition
Land Use Code (LUC) 488 - Soccer Complex

Average Vehicle Trips Ends vs: Number of Fields
Independent Variable (X): 1

AVERAGE WEEKDAY DAILY

T = 71.33 * (X)
T = 71.33 * 1
T = 71.33
T = 72 vehicle trips
with 50% (**36** vpd) entering and 50% (**36** vpd) exiting.

WEEKDAY MORNING PEAK HOUR OF ADJACENT STREET TRAFFIC

T = 1.12 * (X)
T = 1.12 * 1
T = 1.12
T = 1 vehicle trips
with 57% (**1** vph) entering and 43% (**0** vph) exiting.

WEEKDAY EVENING PEAK HOUR OF ADJACENT STREET TRAFFIC

T = 17.70 * (X)
T = 17.70 * 1
T = 17.70
T = 18 vehicle trips
with 67% (**12** vph) entering and 33% (**6** vph) exiting.

SATURDAY DAILY

T = 117.43 * (X)
T = 117.43 * 0
T = 117.43
T = 118 vehicle trips
with 50% (**59** vpd) entering and 50% (**59** vpd) exiting.

SATURDAY MIDDAY PEAK HOUR OF GENERATOR

T = 30.34 * (X)
T = 30.34 * 1
T = 30.34
T = 30 vehicle trips
with 48% (**14** vph) entering and 52% (**16** vph) exiting.

Institute of Transportation Engineers (ITE) 9th Edition
Land Use Code (LUC) 490 - Tennis Courts

Average Vehicle Trips Ends vs: Number of Fields
Independent Variable (X): 4

Average Weekday Daily

T = 31.04 * (X)
T = 31.04 * 4
T = 124.16
T = 124 vehicle trips
with 50% (**62** vpd) entering and 50% (**62** vpd) exiting.

Weekday Morning Peak Hour Of Adjacent Street Traffic

T = 1.67 * (X)
T = 1.67 * 0
T = 6.68
T = 6 vehicle trips
with 50% (**3** vpd) entering and 50% (**3** vpd) exiting.

Weekday Evening Peak Hour Of Adjacent Street Traffic

T = 3.88 * (X)
T = 3.88 * 4
T = 15.52
T = 16 vehicle trips
with 50% (**8** vph) entering and 50% (**8** vph) exiting.

SATURDAY Daily

T = 27.83 * (X)
T = 27.83 * 4
T = 111.32
T = 112 vehicle trips
with 50% (**56** vpd) entering and 50% (**56** vpd) exiting.

Saturday Midday Peak Hour Of Generator

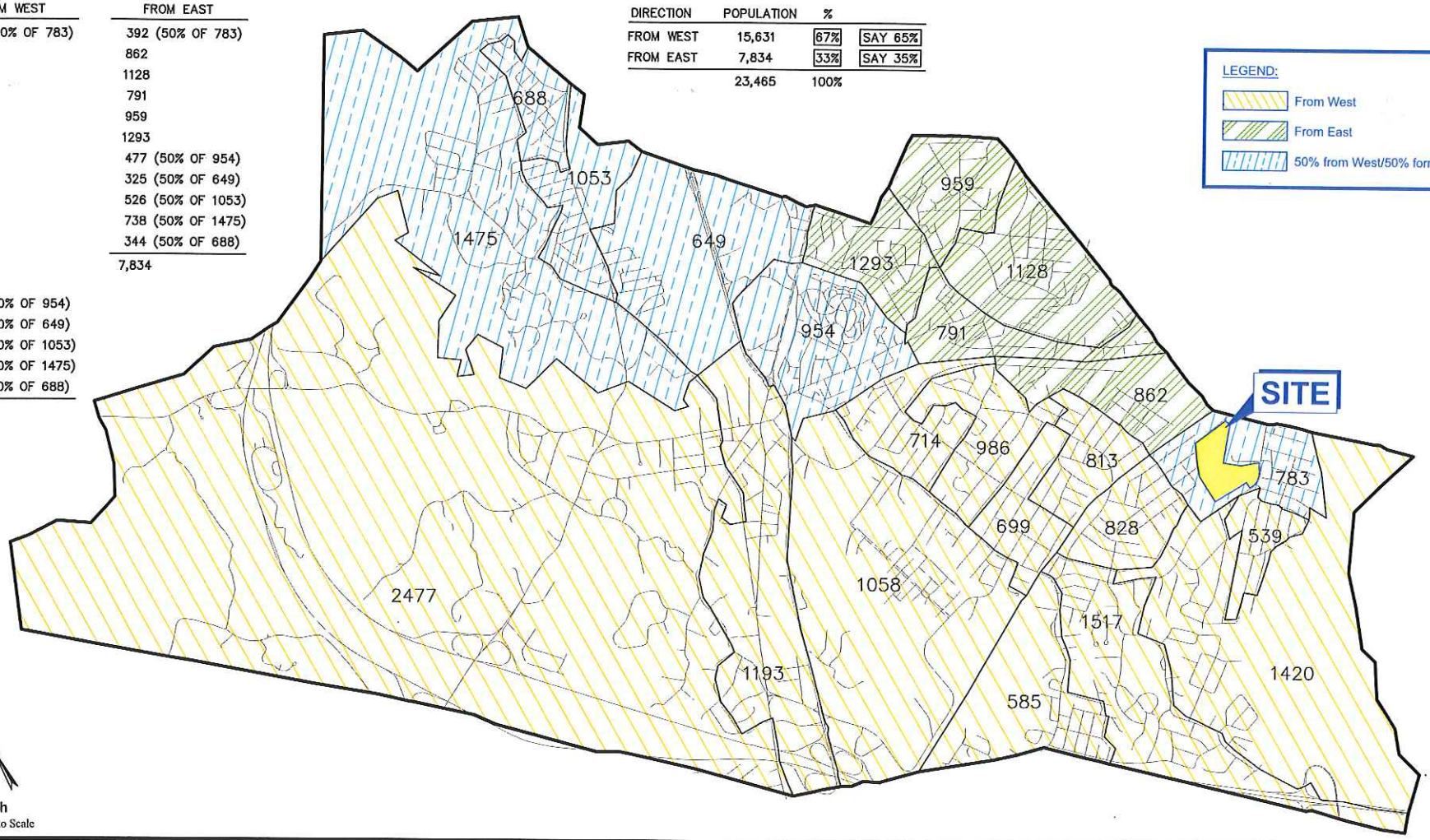
T = 3.00 * (X)
T = 3.00 * 4
T = 12.00
T = 12 vehicle trips
with 48% (**6** vph) entering and 52% (**6** vph) exiting.

□ Trip Distribution Calculations

FROM WEST
392 (50% OF 783)
539
1420
1517
828
813
699
986
714
585
1058
1193
2477
477 (50% OF 954)
325 (50% OF 649)
526 (50% OF 1053)
738 (50% OF 1475)
344 (50% OF 688)
15,631

FROM EAST
392 (50% OF 783)
862
1128
791
959
1293
477 (50% OF 954)
325 (50% OF 649)
526 (50% OF 1053)
738 (50% OF 1475)
344 (50% OF 688)
7,834

DIRECTION	POPULATION	%	
FROM WEST	15,631	67%	SAY 65%
FROM EAST	7,834	33%	SAY 35%
	23,465	100%	



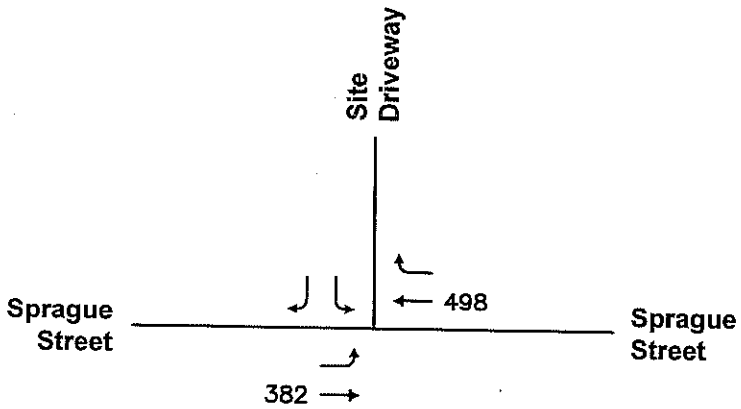
MDM TRANSPORTATION CONSULTANTS, INC.
Planners & Engineers

Attachments

Trip Distribution
Based on Dedham Population

Date: August 2013
Dwg No. 722 Population Map.dwg

□ No-Build Traffic Volumes



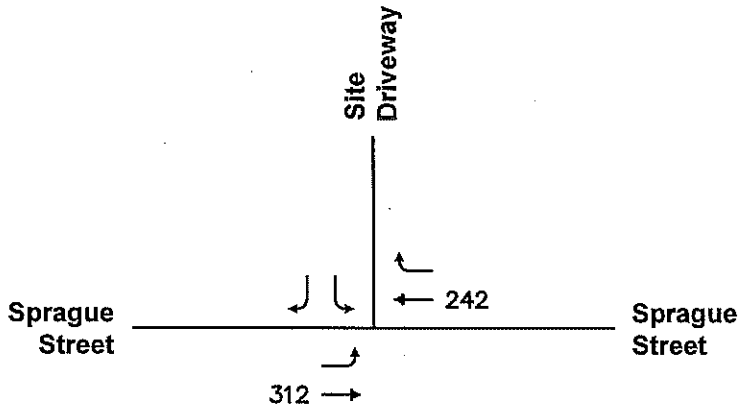
North
Scale: Not to Scale

MDM TRANSPORTATION CONSULTANTS, INC.
Planners & Engineers

Attachments

2018 No-Build Conditions
Weekday Evening
Peak Hour Traffic Volumes

Date: July 2013
Dwg No. 722 TIAS.dwg



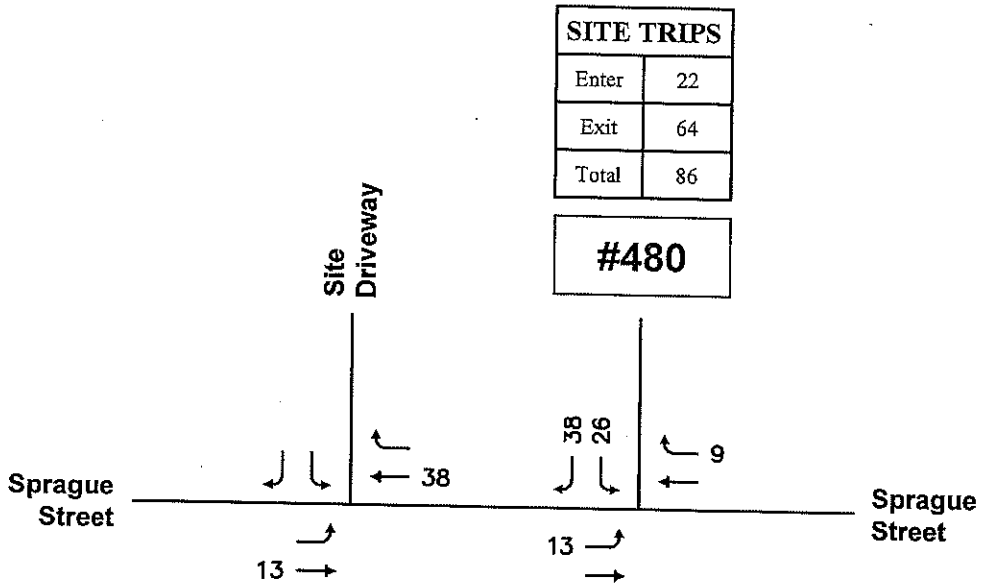
North
Scale: Not to Scale

MDM TRANSPORTATION CONSULTANTS, INC.
Planners & Engineers

Attachments

2018 No-Build Conditions
Saturday Afternoon
Peak Hour Traffic Volumes

Date: July 2013
Dwg No. 722 TIAS.dwg



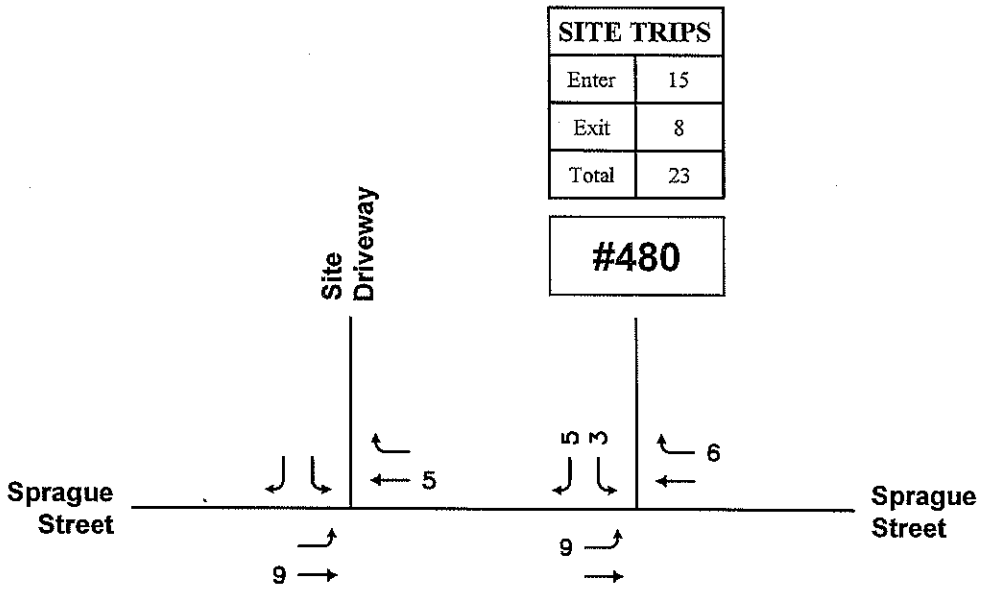
Scale: Not to Scale

MDM TRANSPORTATION CONSULTANTS, INC.
Planners & Engineers

Attachments

480 Sprague Street
Weekday Evening
Peak Hour Traffic Volumes

Date: July 2013
Dwg No. 722 TIAS.dwg



MDM TRANSPORTATION CONSULTANTS, INC.
Planners & Engineers

Attachments

480 Sprague Street
Saturday Afternoon
Peak Hour Traffic Volumes

Date: July 2013
Dwg No. 722 TIAS.dwg

Institute of Transportation Engineers (ITE) 9th Edition
Land Use Code (LUC) 150 - Warehousing

Average Vehicle Trips Ends vs: 1000 Sq. Feet Gross Floor Area
Independent Variable (X): 178

Average Weekday Daily

Ln T = 0.86 Ln (X) + 2.24
Ln T = 0.86 Ln 178 + (2.24)
Ln T = 6.70
T = 808.91
T = 808 vehicle trips
with 50% (404 vph) entering and 50% (404 vph) exiting.

Weekday Morning Peak Hour Of Adjacent Street Traffic

Ln T = 0.55 Ln (X) + 1.88
Ln T = 0.55 Ln 178 + (1.88)
Ln T = 4.73
T = 113.25
T = 113 vehicle trips
with 79% (89 vph) entering and 21% (24 vph) exiting.

Weekday Evening Peak Hour Of Adjacent Street Traffic

Ln T = 0.64 Ln (X) + 1.14
Ln T = 0.64 Ln 178 + (1.14)
Ln T = 4.46
T = 86.13
T = 86 vehicle trips
with 25% (22 vph) entering and 75% (64 vph) exiting.

Saturday Daily

T = 1.23 * (X) (Small Sample Size - Use with Caution)
T = 1.23* 178
T = 218.78
T = 218 vehicle trips
with 50% (109 vpd) entering and 50% (109 vpd) exiting.

Saturday Midday Peak Hour Of Generator

T = 0.13 * (X) (Small Sample Size - Use with Caution)
T = 0.13* 178
T = 23.12
T = 23 vehicle trips
with 64% (15 vph) entering and 36% (8 vph) exiting.

□ Capacity Analysis

LEVEL OF SERVICE METHODOLOGY

Capacity analysis of intersections is developed using the Synchro® computer software, which implements the methods of the 2010 Highway Capacity Manual (HCM). The resulting analysis presents a level-of-service (LOS) designation for individual intersection movements and (for signalized intersections) for the entire intersection. The LOS is a letter designation that provides a qualitative measure of operating conditions based on several factors including roadway geometry, speeds, ambient traffic volumes, traffic controls, and driver characteristics. Since the LOS of a traffic facility is a function of the traffic flows placed upon it, such a facility may operate at a wide range of LOS, depending on the time of day, day of week, or period of year. A range of six levels of service are defined on the basis of average delay, ranging from LOS A (the least delay) to LOS F (delays greater than 50 seconds for unsignalized movements, and greater than 80 seconds for signalized movements).

Signalized Intersection Performance Measures

The six LOS designations for signalized intersections may be described as follows:

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

The LOS for signalized intersections are calculated using the operational analysis methodology of the 2010 *Highway Capacity Manual*.[1] This method assesses the effects of signal type, timing, phasing, and progression; vehicle mix; and geometrics on delay. LOS designations are based on the criterion of control or signal delay per vehicle. Control or signal delay is a measure of driver discomfort, frustration, and fuel consumption, and includes initial deceleration delay approaching the traffic signal, queue move-up time, stopped delay and final acceleration delay. **Table A1** summarizes the relationship between LOS and control delay. The tabulated control delay criterion may be applied in assigning LOS designations to individual lane groups, to individual intersection approaches, or to entire intersections.

Table A1
LEVEL-OF-SERVICE CRITERIA
FOR SIGNALIZED INTERSECTIONS[1]

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

[1]Source: *Highway Capacity Manual 2010;* Transportation Research Board; Washington, DC; 2010.

[1]*Highway Capacity Manual* 2010; Transportation Research Board; Washington, DC; 2010.

Unsignalized Intersection Performance Measures

The six LOS designations for unsignalized intersections may be described as follows:

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

The LOS designations of unsignalized intersections are determined by application of a procedure described in the 2010 *Highway Capacity Manual.*[2] LOS is measured in terms of average control delay. Mathematically, control delay is a function of the capacity and degree of saturation of the lane group and/or approach under study and is a quantification of motorist delay associated with traffic control devices such as traffic signals and STOP signs. Control delay includes the effects of initial deceleration delay approaching a STOP sign, stopped delay, queue move-up time, and final acceleration delay from a stopped condition. Definitions for LOS at unsignalized intersections are also given in the *Highway Capacity Manual 2010.* **Table A2** summarizes the relationship between LOS and average control delay.

Table A2
LEVEL-OF-SERVICE CRITERIA FOR UNSIGNALIZED INTERSECTIONS[1]

Average Control Delay (seconds per vehicle)	Level of Service	
	v/c ≤ 1	v/c > 1
≤ 10.0	A	F
10.1 to 15.0	B	F
15.1 to 25.0	C	F
25.1 to 35.0	D	F
35.1 to 50.0	E	F
>50.0	F	F

[1]Source: *Highway Capacity Manual 2010,* Transportation Research Board; Washington, DC; 2010.

[2] ibid

Intersection	
Intersection Delay, s/veh	0.4

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	16	382	498	8	6	12
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
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	2	2	0	0	0
Mvmt Flow	17	402	524	8	6	13

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	533	0	-	0	964	528
Stage 1	-	-	-	-	528	-
Stage 2	-	-	-	-	436	-
Follow-up Headway	2.2	-	-	-	3.5	3.3
Pot Capacity-1 Maneuver	1045	-	-	-	286	554
Stage 1	-	-	-	-	596	-
Stage 2	-	-	-	-	656	-
Time blocked-Platoon, %		-	-	-		
Mov Capacity-1 Maneuver	1045	-	-	-	280	554
Mov Capacity-2 Maneuver	-	-	-	-	280	-
Stage 1	-	-	-	-	596	-
Stage 2	-	-	-	-	642	-

Approach	EB	WB	SB
HCM Control Delay, s	0.3	0	14
HCM LOS			B

Minor Lane / Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1045	-	-	-	418
HCM Lane V/C Ratio	0.016	-	-	-	0.045
HCM Control Delay (s)	8.501	0	-	-	14
HCM Lane LOS	A	A			B
HCM 95th %tile Q(veh)	0.049	-	-	-	0.142

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	1.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	44	382	498	23	15	29
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
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	2	2	0	0	0
Mvmt Flow	46	402	524	24	16	31

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	548	0	-	0	1031	536
Stage 1	-	-	-	-	536	-
Stage 2	-	-	-	-	495	-
Follow-up Headway	2.2	-	-	-	3.5	3.3
Pot Capacity-1 Maneuver	1032	-	-	-	261	549
Stage 1	-	-	-	-	591	-
Stage 2	-	-	-	-	617	-
Time blocked-Platoon, %		-	-	-		
Mov Capacity-1 Maneuver	1032	-	-	-	246	549
Mov Capacity-2 Maneuver	-	-	-	-	246	-
Stage 1	-	-	-	-	591	-
Stage 2	-	-	-	-	582	-

Approach	EB	WB	SB
HCM Control Delay, s	0.9	0	15.6
HCM LOS			C

Minor Lane / Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1032	-	-	-	387
HCM Lane V/C Ratio	0.045	-	-	-	0.12
HCM Control Delay (s)	8.652	0	-	-	15.6
HCM Lane LOS	A	A			C
HCM 95th %tile Q(veh)	0.141	-	-	-	0.404

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	0.7

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	18	312	242	9	9	18
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
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	2	2	0	0	0
Mvmt Flow	19	328	255	9	9	19

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	264	0	-	0	625	259
Stage 1	-	-	-	-	259	-
Stage 2	-	-	-	-	366	-
Follow-up Headway	2.2	-	-	-	3.5	3.3
Pot Capacity-1 Maneuver	1312	-	-	-	452	785
Stage 1	-	-	-	-	789	-
Stage 2	-	-	-	-	706	-
Time blocked-Platoon, %		-	-	-		
Mov Capacity-1 Maneuver	1312	-	-	-	444	785
Mov Capacity-2 Maneuver	-	-	-	-	444	-
Stage 1	-	-	-	-	789	-
Stage 2	-	-	-	-	693	-

Approach	EB	WB	SB
HCM Control Delay, s	0.4	0	11
HCM LOS			B

Minor Lane / Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1312	-	-	-	625
HCM Lane V/C Ratio	0.014	-	-	-	0.045
HCM Control Delay (s)	7.784	0	-	-	11
HCM Lane LOS	A	A			B
HCM 95th %tile Q(veh)	0.044	-	-	-	0.143

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

Intersection	
Intersection Delay, s/veh	2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Vol, veh/h	49	312	242	27	28	53
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
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	2	2	0	0	0
Mvmt Flow	52	328	255	28	29	56

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	283	0	-	0	701	269
Stage 1	-	-	-	-	269	-
Stage 2	-	-	-	-	432	-
Follow-up Headway	2.2	-	-	-	3.5	3.3
Pot Capacity-1 Maneuver	1291	-	-	-	408	775
Stage 1	-	-	-	-	781	-
Stage 2	-	-	-	-	659	-
Time blocked-Platoon, %		-	-	-		
Mov Capacity-1 Maneuver	1291	-	-	-	388	775
Mov Capacity-2 Maneuver	-	-	-	-	388	-
Stage 1	-	-	-	-	781	-
Stage 2	-	-	-	-	627	-

Approach	EB	WB	SB
HCM Control Delay, s	1.1	0	12.3
HCM LOS			B

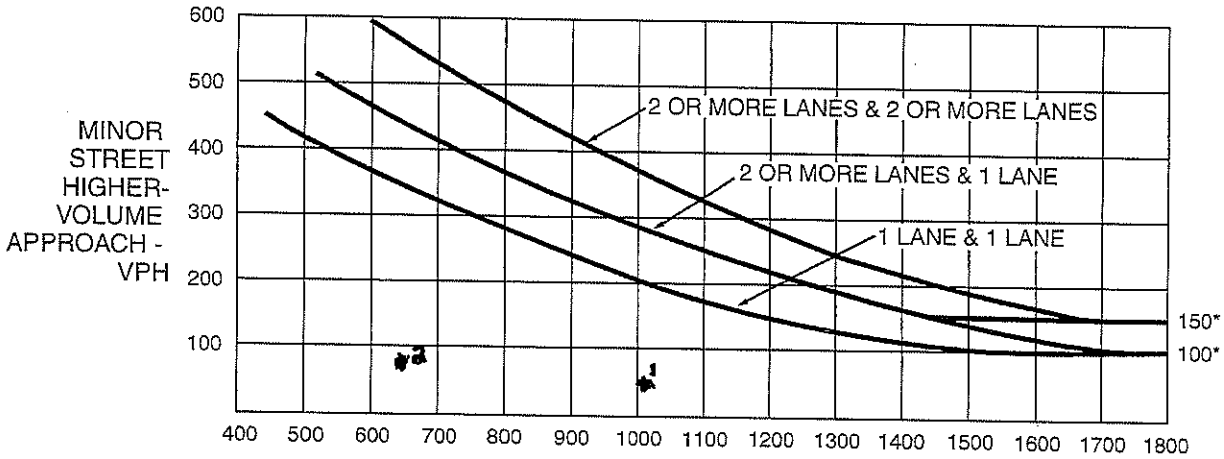
Minor Lane / Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1291	-	-	-	576
HCM Lane V/C Ratio	0.04	-	-	-	0.148
HCM Control Delay (s)	7.905	0	-	-	12.3
HCM Lane LOS	A	A			B
HCM 95th %tile Q(veh)	0.125	-	-	-	0.517

Notes

~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined

□ Traffic Signal Warrant Analysis

Figure 4C-3. Warrant 3, Peak Hour



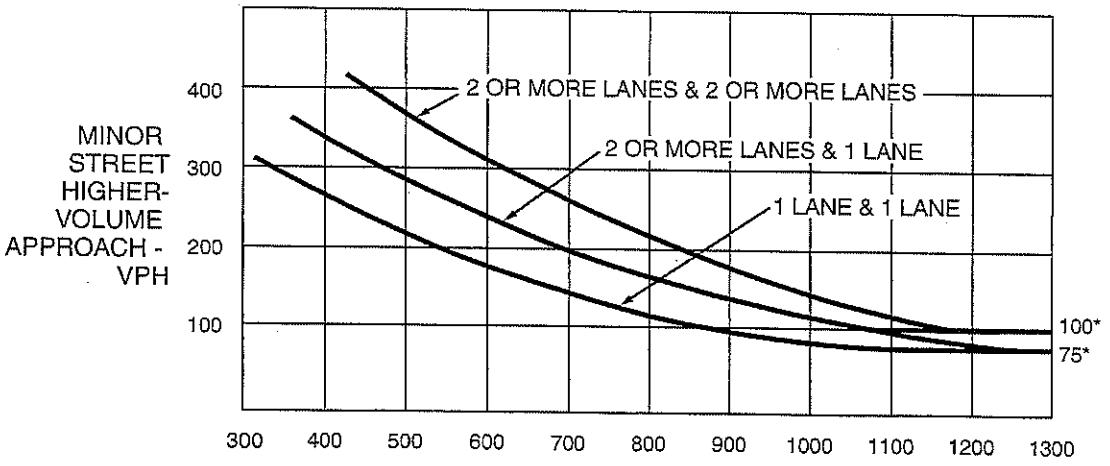
*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

*1 = Weekday Evening Peak Hour – warrant not met

*2 = Saturday Afternoon Peak Hour – warrant not met

Figure 4C-4. Warrant 3, Peak Hour (70% Factor)

(COMMUNITY LESS THAN 10,000 POPULATION OR ABOVE 40 MPH ON MAJOR STREET)



*Note: 100 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 75 vph applies as the lower threshold volume for a minor-street approach with one lane.

□ Left Turn Lane Warrant Analysis

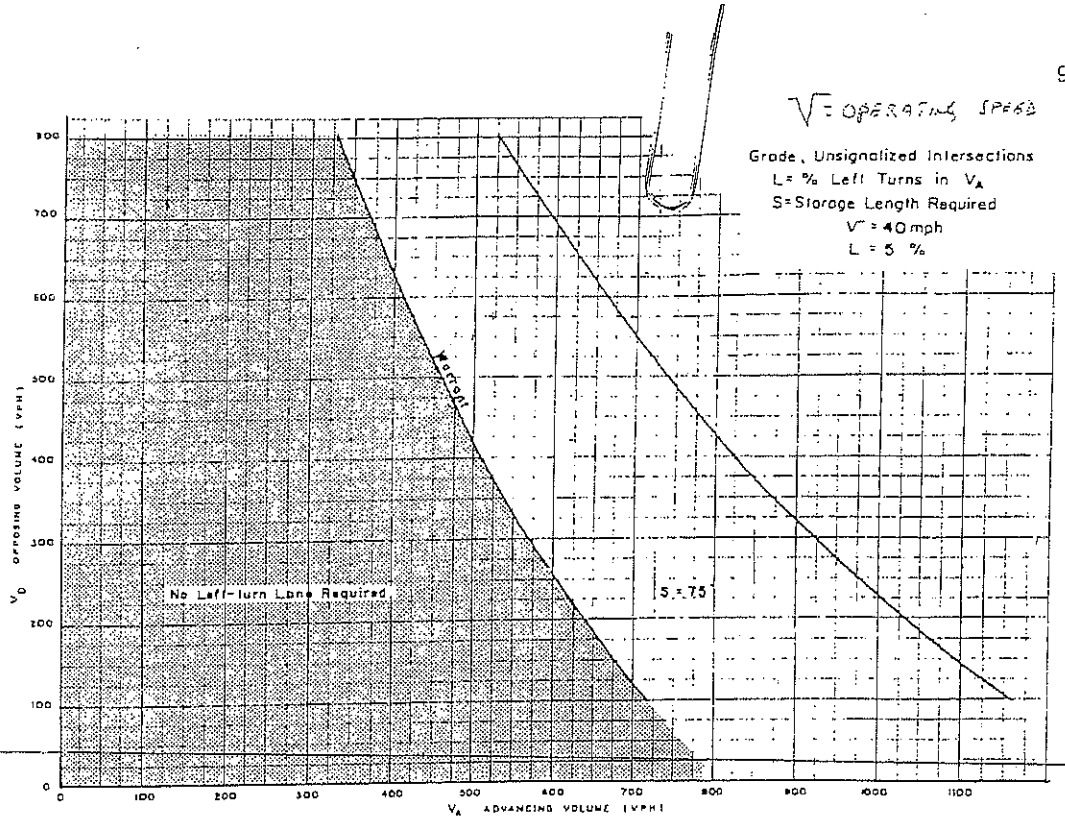


Figure 2. Warrant for left-turn storage lanes on two-lane highways.

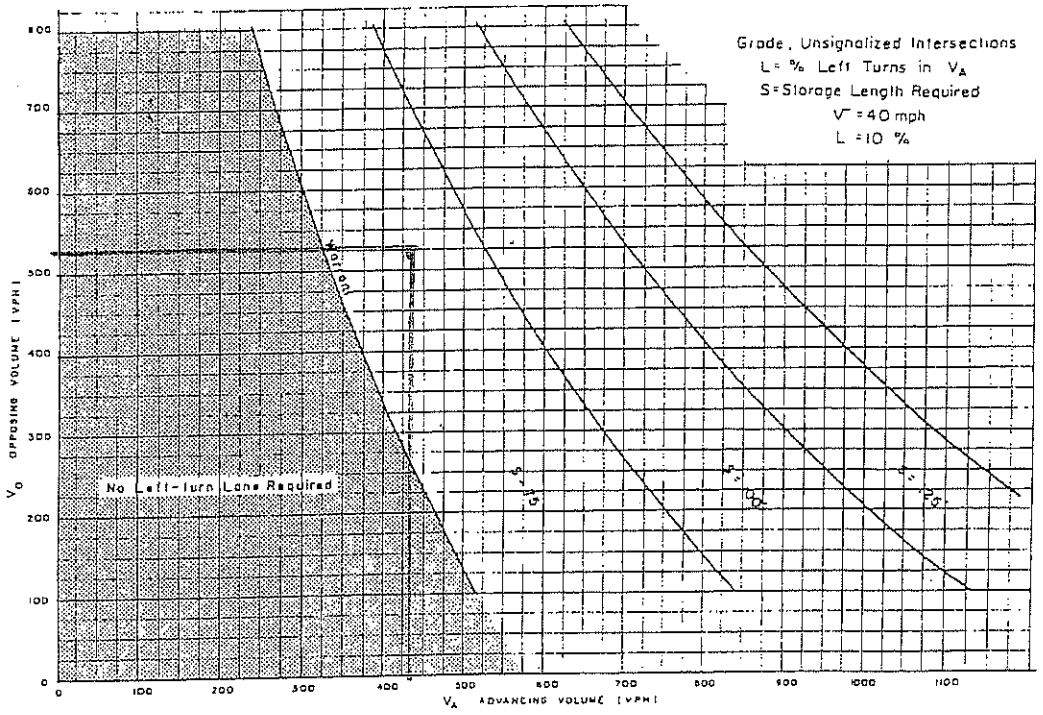


Figure 3. Warrant for left-turn storage lanes on two-lane highways.

Site Driveway @ Sprague Street

2018 Build Conditions PM Peak Hour

V_O = 521

V_A = 426

Left = $\frac{44}{426}$ = 10.3%

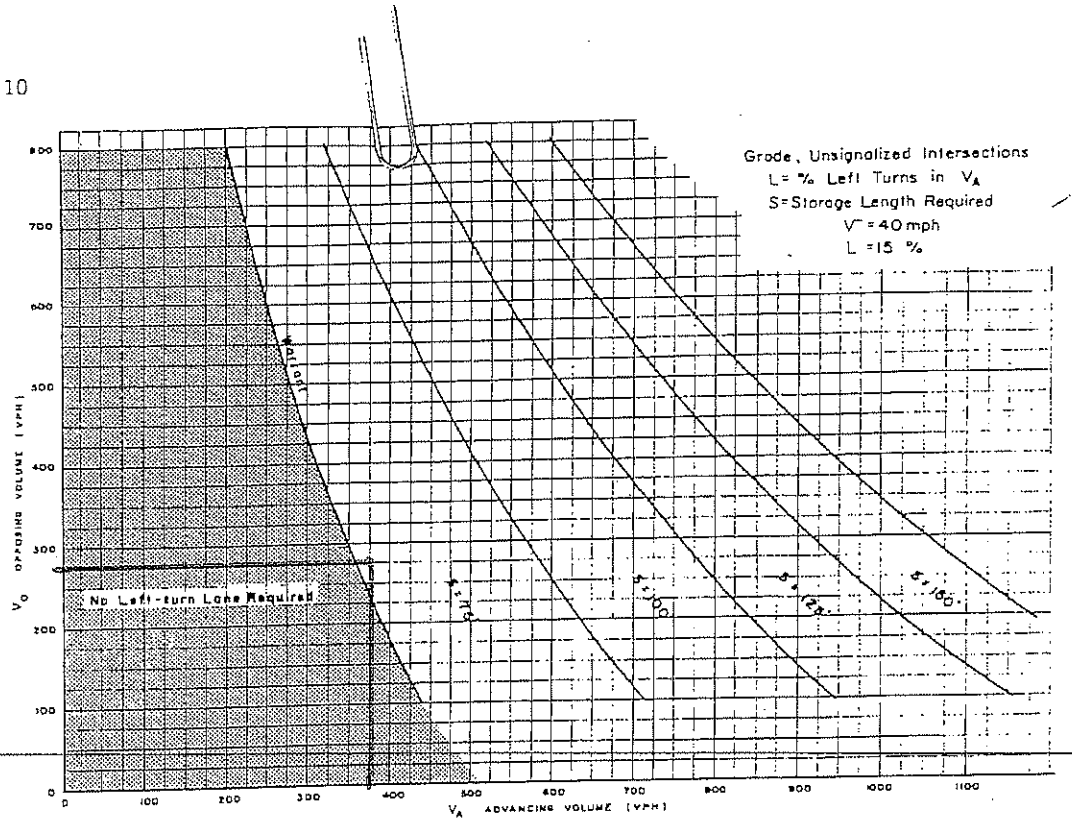


Figure 4. Warrant for left-turn storage lanes on two-lane highways.

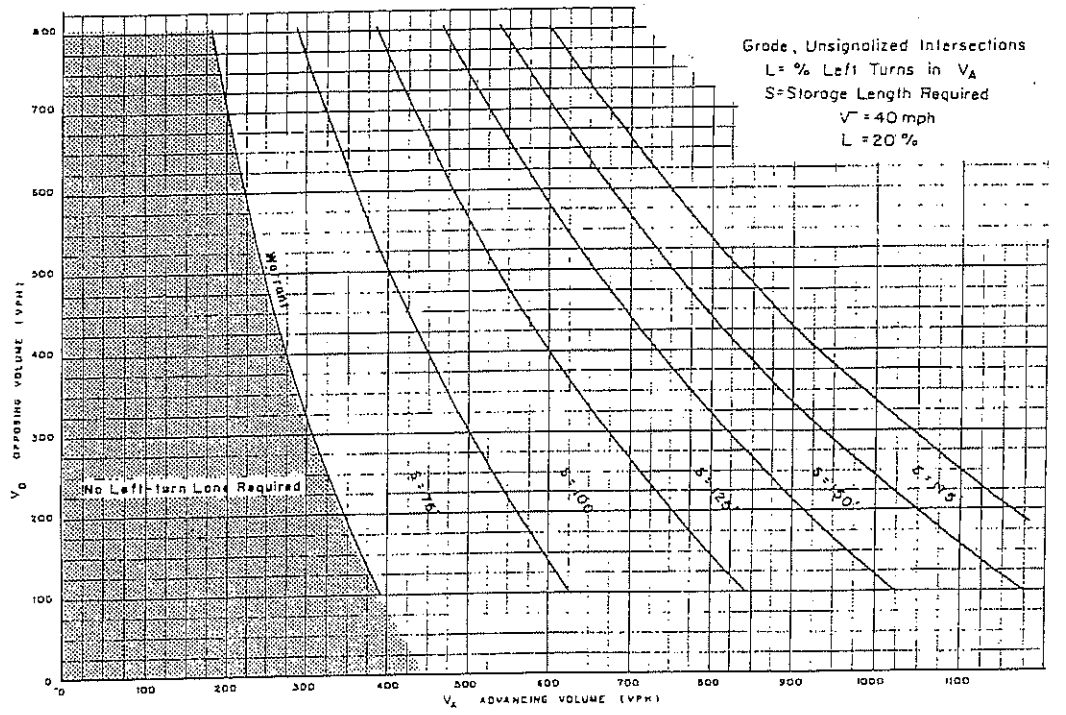


Figure 5. Warrant for left-turn storage lanes on two-lane highways.

Site Driveway @ Sprague Street

2018 Build conditions Saturday Afternoon Peak Hr

$V_o = 269$

$V_A = 361$

$\%_{Lefts} = \frac{49}{21.1} = 13.5\%$

V = OPERATING SPEED

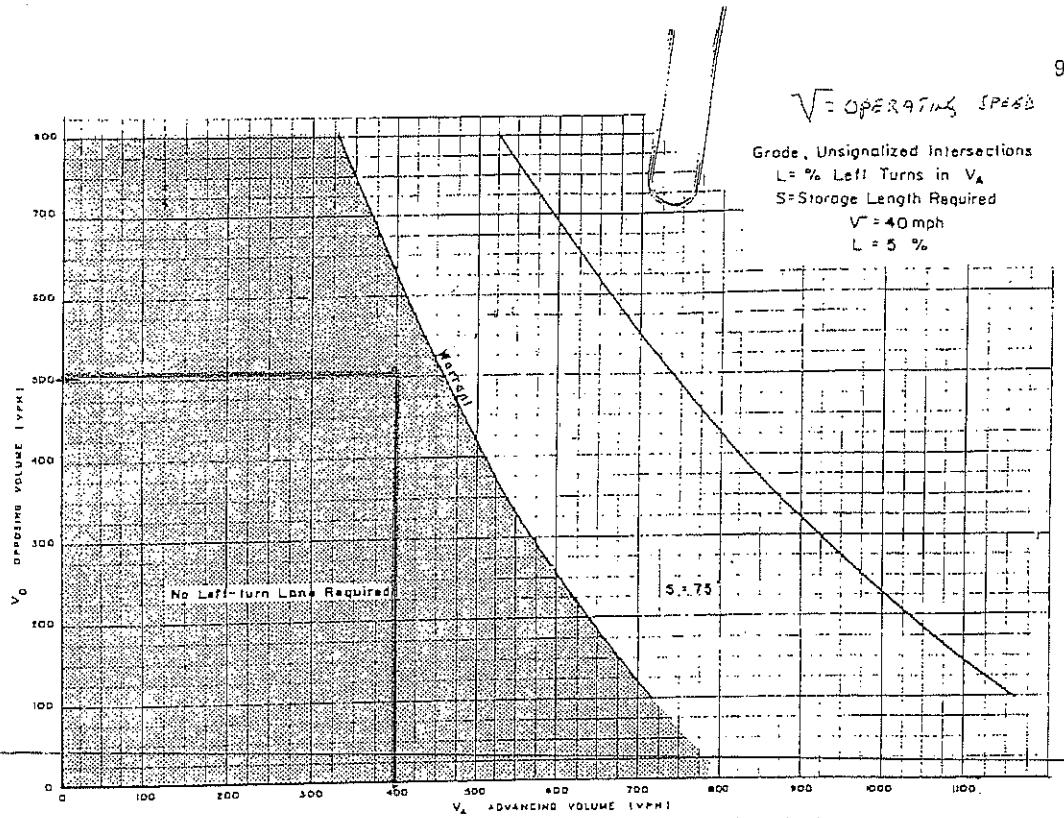


Figure 2. Warrant for left-turn storage lanes on two-lane highways.

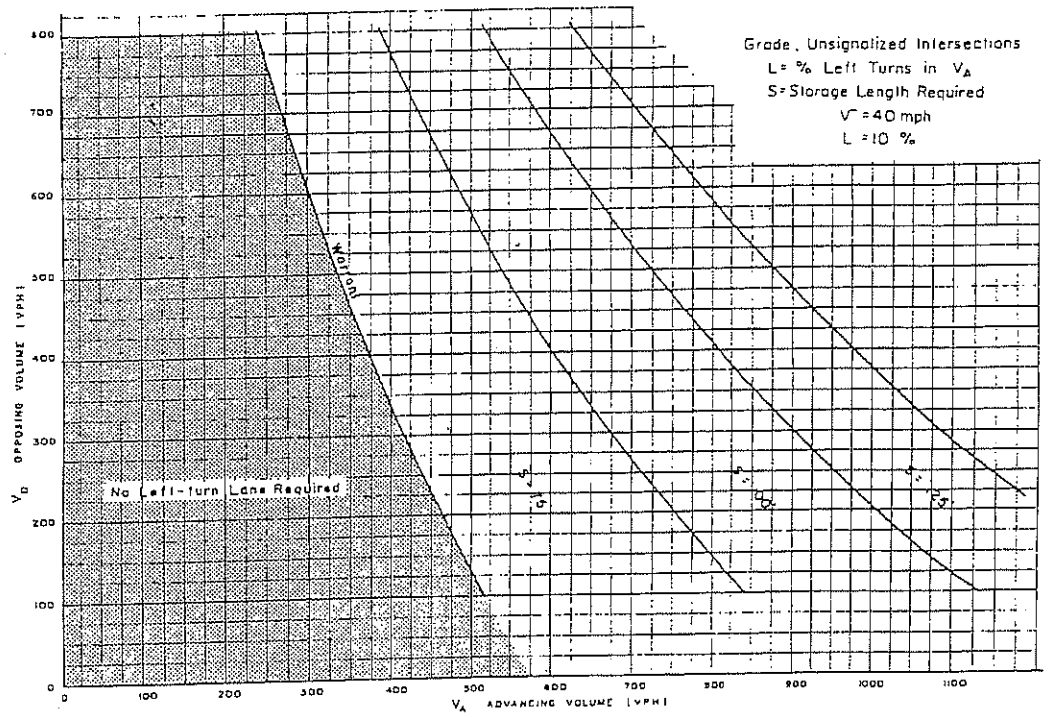


Figure 3. Warrant for left-turn storage lanes on two-lane highways.

Site Drive @ Sprague St

2018 Build PM – Park Trips only

$V_O = 506$

$V_A = 398$

% Lefts $= \frac{16}{398} = 4.0\%$

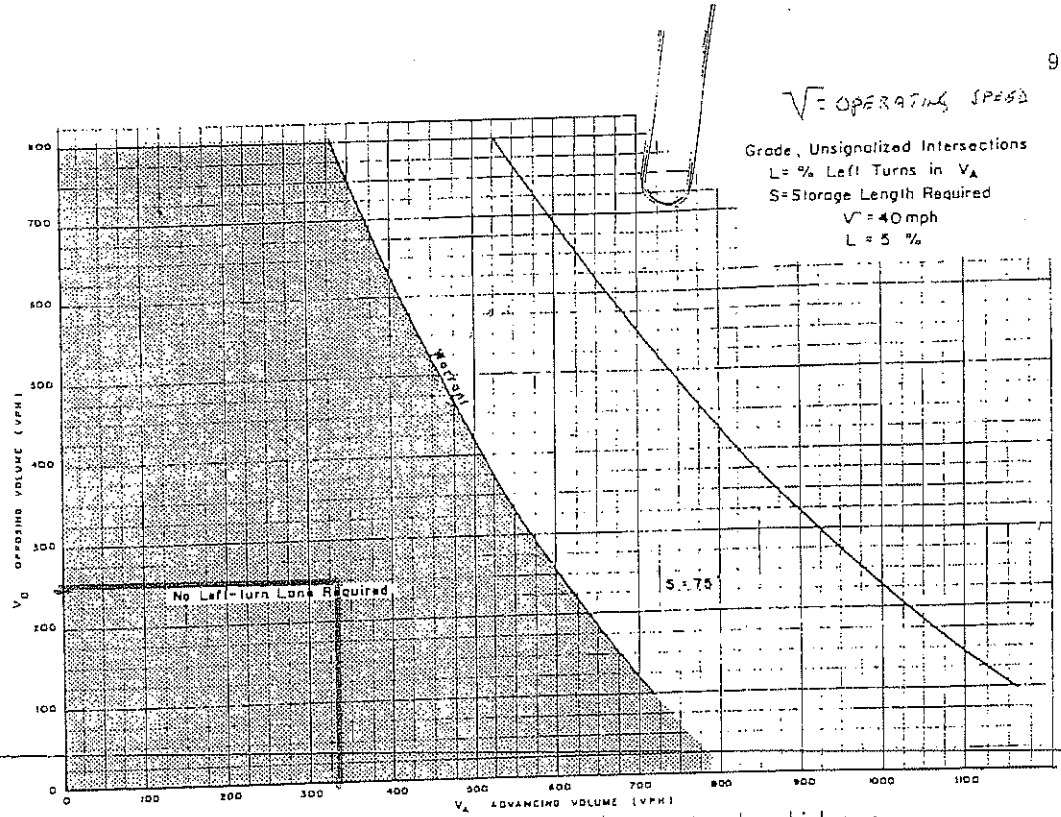


Figure 2. Warrant for left-turn storage lanes on two-lane highways.

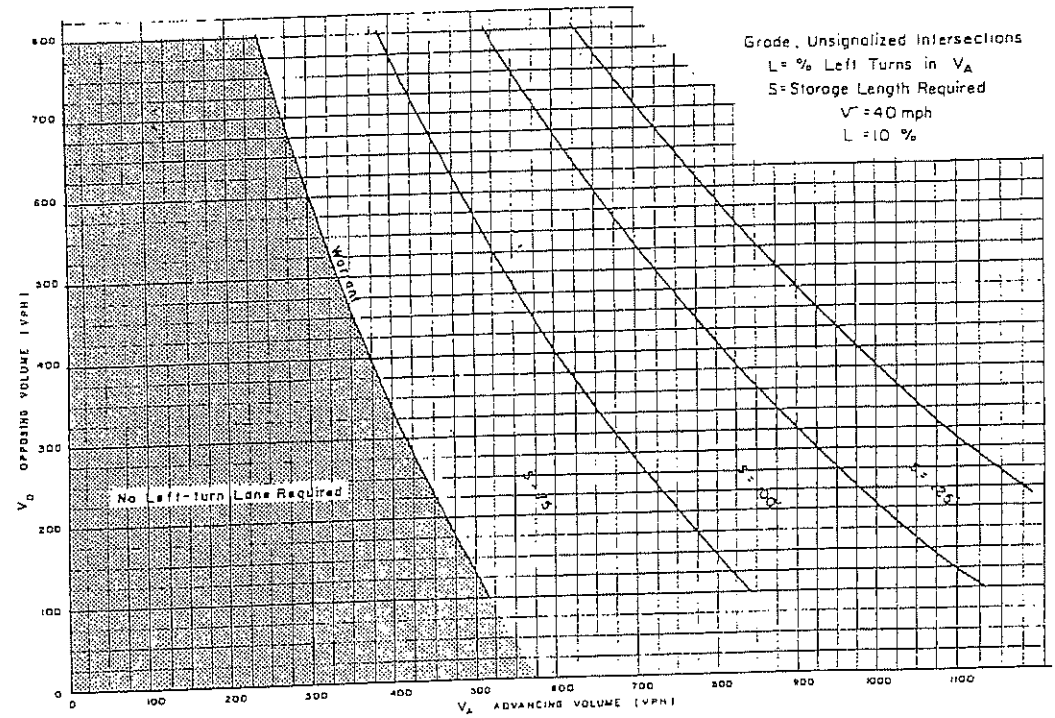


Figure 3. Warrant for left-turn storage lanes on two-lane highways.

Site Drive @ Sprague Street
2018 Build Saturday - Park Trips only

$V_O = 257$

$V_A = 330$

%Lefts = 5.5%

□ Parking Calculations

Land Use: 488
Soccer Complex

Description

Soccer complexes are outdoor parks that are used for non-professional soccer games. They may consist of one or more fields, and the size of each field within the land use may vary to accommodate games for different age groups. Ancillary amenities may include a fitness trail, activities shelter, aquatic center, picnic grounds, basketball and tennis courts and a playground.

Database Description

The database consisted of all suburban sites.

- Average parking supply ratio: 38 spaces per field (12 study sites).

The majority of the sites included in this land use provided only a single-hour count between the hours of 1:00 and 8:00 p.m. One site with four soccer fields was observed for three nonconsecutive hours between 11:00 a.m. and 12:00 p.m. and 2:00 and 4:00 p.m. The peak parking demand for this site occurred between 3:00 and 4:00 p.m. Another site with two soccer fields was observed for two consecutive hours between 7:00 and 9:00 p.m. The peak parking demand for this site occurred between 8:00 and 9:00 p.m. More continuous time studies are needed to better define peaking characteristics for this land use.

Study Sites/Years

Portland, OR (2005); Beaverton, OR (2006); Silverton, OR (2006); Clackamas, OR (2007); Happy Valley, OR (2007); Hillsboro, OR (2007); Redmond, WA (2007); Beaverton, OR (2008); Corvallis, OR (2008); Lake Oswego, OR (2008); Redmond, WA (2008); West Linn, OR (2008); Beaverton, OR (2009)

4th Edition Source Number

1101

Land Use: 411
City Park

Description

City parks are owned and operated by a city. City parks vary widely as to location, type and number of facilities, including boating or swimming facilities, ball fields, camp sites and picnic facilities. Seasonal use of the individual sites differs widely as a result of the varying facilities and local conditions, such as weather. For example, some of the sites are used primarily for boating or swimming; others are used for softball games.

Database Description

The database consisted of two suburban sites.

Site one (surveyed on two Saturdays for six nonconsecutive hours between 9:00 a.m. and 7:00 p.m.):

- Size: 25 acres with three softball fields, two soccer fields, an outdoor group area and an administration building.
- Parking supply ratio: 15.0 spaces per acre.
- Saturday peak parking demand ratio: 5.10 vehicles per acre (for both days).
- Saturday peak parking demand occurred between 1:00 and 2:00 p.m. (for both days).

Site two (surveyed on a Saturday between 2:00 and 5:00 p.m. and for a single hour on a Sunday between 1:00 and 2:00 p.m.):

- Size: 10 acres with a playground, picnic area, and hiking trail.
- Parking supply ratio: 2.6 spaces per acre.
- Saturday peak parking demand ratio: 2.30 vehicles per acre.
- Saturday peak parking demand occurred between 4:00 and 5:00 p.m.
- Sunday peak parking demand ratio: 2.80 vehicles per acre.

Data were collected in February and September.

Study Sites/Years

Santa Barbara, CA (2001); Santa Barbara, CA (2003); Santa Barbara, CA (2007)

4th Edition Source Number

1015