TRANSPORTATION IMPACT ASSESSMENT

WESTON QUARRY MIXED-USE DEVELOPMENT
WESTON, MASSACHUSETTS

Prepared for:

Boston Properties
Boston, Massachusetts

January 2017

Prepared by:

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Dear Reviewer:

This letter shall certify that this *Transportation Impact Assessment* has been prepared under my direct supervision and responsible charge. I am a Registered Professional Engineer (P.E.) in the Commonwealth of Massachusetts (Massachusetts P.E. No. 38871, Civil) and hold Certification as a Professional Traffic Operations Engineer (PTOE) from the Transportation Professional Certification Board, Inc. of the Institute of Transportation Engineers (ITE) (PTOE Certificate No. 993). I am also a Fellow of the Institute of Transportation Engineers (FITE).

Sincerely,

VANASSE & ASSOCIATES, INC.

Jeffrey S. Dirk

Jeffrey S. Dirk, P.E., PTOE, FITE
Principal

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EXECUTIVE SUMMARY

Vanasse & Associates, Inc. (VAI) has conducted a Transportation Impact Assessment (TIA) in order to determine the potential impacts on the transportation infrastructure associated with the proposed Weston Quarry mixed-use development to be located at 133 Boston Post Road (Route 20) in Weston, Massachusetts (hereafter referred to as the "Project"). The Project consists of two (2) primary components: 1) an expansion of the existing corporate office park located at 133 Boston Post Road that is currently occupied by Biogen and Monster; and 2) a residential development that will be located to the north of the office park. In addition, the Project will be designed to incorporate a future intermodal center that will consist of a new Massachusetts Bay Transportation Authority (MBTA) Commuter Rail station with accompanying parking that will be accessed from Jones Road.

The Project will require the issuance of a State Highway Access Permit from the Massachusetts Department of Transportation (MassDOT) for access to Boston Post Road (Route 20), a State Highway under the jurisdiction of MassDOT.

This assessment was prepared in consultation with the Town of Weston, the Cities of Newton and Waltham, and MassDOT; was performed in accordance with MassDOT's *Transportation Impact Assessment (TIA) Guidelines*; and was conducted pursuant to the standards of the Traffic Engineering and Transportation Planning professions for the preparation of such reports. Based on this assessment, we have concluded the following with respect to the Project:

1. Using trip-generation statistics published by the Institute of Transportation Engineers (ITE),[1] the Project is predicted to generate approximately 4,848 vehicle trips on an average weekday (two-way, 24-hour volume), with approximately 571 vehicle trips expected during the weekday morning peak-hour and 565 vehicle trips expected during the weekday evening peak-hour;

2. The Project will not have a significant impact (increase) on motorist delays or vehicle queuing over Existing or anticipated future conditions without the Project (No-Build conditions), with the majority of the movements at the study intersections shown to continue to operate at level-of-service (LOS) D or better with the addition of Project-related traffic, where an LOS "D" or better is considered to represent "acceptable" traffic operations;

[1] *Trip Generation*, 9th Edition; Institute of Transportation Engineers; Washington, DC; 2012.

3. Side street movements at the unsignalized intersections along Route 20, Boston Post Road and Route 117 were identified to be operating at or over capacity independent of the Project as a result of the relatively large volume of conflicting traffic on these roadways during the weekday commuter peak-hours;

4. With the exception of the Route 20/Boston Post Road/Wellesley Street and Boston Post Road/School Street/Church Street intersections, no apparent safety deficiencies were noted with respect to the motor vehicle crash history at the study intersections. The Route 20/Boston Post Road/Wellesley Street and Boston Post Road/School Street/ Church Street intersections were identified as having a motor vehicle crash rate that exceeds the MassDOT average crash rate for an unsignalized intersection, with the Route 20/Boston Post Road/Wellesley Street intersection also identified as a as a high crash cluster location for 2012-2014. Specific safety-related improvements have been identified for these intersections that will be undertaken in conjunction with the Project (discussion follows); and

5. Lines of sight to and from the ways that will provide access to the Project site from Route 20 (office component) and Church Street (residential component) were found to exceed the required minimum distance for the intersections to function in a safe manner based on the appropriate approach speed along these roadways.

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

RECOMMENDATIONS

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

Project Access

Access to the Project will be provided as follows: for the office component, access will be provided by way of the existing driveway that serves 133 Boston Post Road and intersects the north side of Route 20 under traffic signal control. For the residential component, access will be provided by way of a new roadway that will intersect the east side of Church Street. The following recommendations are offered with respect to the design and operation of the ways that serve the Project site:

- The access roadways, driveways and internal circulating ways serving the Project site should be a minimum of 24-feet in width for two-way travel and a minimum of 20-feet in width for one-way operation, or as required to accommodate fire truck turning maneuvers pursuant to the requirements of NFPA® 1.[2]

[2] *National Fire Protection Association (NFPA)® 1, Fire Code*, Seventh Edition; NFPA; Quincy, Massachusetts; 2015; as amended per 527 CMR.

- Fire lanes should be a minimum of 20-feet in width and constructed of bituminous asphaltic concrete or other stabilized surface material that can support travel by the largest anticipated responding emergency vehicle pursuant to the requirements of NFPA® 1.

- Vehicles exiting the Project site to Church Street should be placed under STOP-sign control with marked STOP-lines provided, with the existing traffic control signal retained at the Route 20/133 Boston Post Road intersection.

- All signs and pavement markings to be installed within the Project shall conform to the applicable standards of the *Manual on Uniform Traffic Control Devices* (MUTCD).[3]

- Sidewalks should be provided within the Project site linking the proposed buildings and other amenities, and should include a connection to the location of the proposed MBTA Commuter Rail Station.

- Marked crosswalks with Americans with Disabilities Act (ADA) compliant wheelchair ramps should be provided at all pedestrian crossings.

- Signs and landscaping located within intersection sight triangle areas of the ways serving the Project site should be designed and maintained so as not to restrict lines of sight.

- Snow windrows within the sight triangle areas of the ways serving the Project site should be promptly removed where such accumulations would exceed 2.5 feet in height.

- A school bus waiting area should be provided at an appropriate location within the residential component of the Project defined in consultation with the Town.

Off-Site

Route 20 at 133 Boston Post Road

The addition of Project-related traffic to the signalized intersection of Route 20 at the driveway to 133 Boston Post Road was shown to result in a degradation in overall operating conditions during both the weekday morning (LOS A to LOS D) and evening (LOS B to LOS C) peak hours over 2024 No-Build conditions, with the Route 20 eastbound movement predicted to operate at its design capacity (defined as LOS "E") during the weekday morning peak-hour. In order to off-set the impact of the Project and improve operating conditions at the intersection, the Proponent will design and implement an optimal traffic signal timing and phasing plan. With the implementation of these improvements, all movements at the intersection were shown to operate at LOS D or better during the peak hours.

Route 20 at School Street

The addition of Project-related traffic to the signalized intersection of Route 20 at School Street was shown to result in a degradation in overall operating conditions during the weekday evening peak-hour (LOS D to LOS E), with individual movements at the intersection identified to be operating at or over capacity (defined as LOS "E" or "F", respectively) independent of the Project. The Town of Weston identified the need for geometric improvements at this intersection

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

in conjunction with an *Intersection Improvement Study* that was completed in 2013.[4] The identified improvements included the following measures:

- Widen the Route 20 approaches to provide a left-turn/through travel lane, a through travel lane and a right turn lane in the eastbound direction, and a left-turn/through travel lane and a through/right-turn lane in the westbound direction.
- Widen the School Street northbound approach to provide a left-turn lane and a through/right-turn lane.
- Prohibit left-turn movements from the School Street southbound approach.
- Replace the existing traffic signal system to accommodate the proposed intersection geometry.

In order to advance the identified improvements, the Proponent will undertake the following improvements at the Route 20/School Street intersection:

1. Design and implement an optimal traffic signaling timing and phasing plan, including the upgrade or replacement of traffic signal equipment as may be necessary to implement the improvements and/or to comply with current ADA and safety standards; and
2. Prepare a Functional Design Report (FDR) and accompanying MassDOT 25 Percent Design Plans for the intersection improvements identified as a part of the 2013 study undertaken by the Town (intersection improvement Alternative 3 defined above).

The Proponent will complete the aforementioned improvements prior to the issuance of the first Certificate of Occupancy for the Project. The FDR and MassDOT 25 Percent Design Plans will be provided to the Town for use in obtaining state funding for the construction of the improvements. With implementation of the traffic signal timing and phasing improvements, overall intersection operations were shown to improve to LOS D during both the weekday morning and evening peak-hours.

Route 20 at Wellesley Street and Boston Post Road

The Boston Post Road and Wellesley Street approaches to Route 20 were identified to be operating with excessive delay (LOS F) during both the weekday morning and evening peak hours independent of the Project as a result of the large volume of conflicting traffic travelling along Route 20 during these periods. In addition, this intersection was found to have a motor vehicle crash rate that exceeds the MassDOT average crash rate for an unsignalized intersection and was also identified by MassDOT as a high crash cluster location for 2012-2014. Recognizing these conditions, this intersection was included as a part of the 2013 *Intersection Improvement Study* that was undertaken by the Town, which identified the following improvements for the intersection:

- Reconstruct the intersection to provide a traditional four-way intersection with Windsor Way intersecting Wellesley Street south of Route 20.
- Widen Route 20 to provide two travel lanes approaching the intersection with a left-turn lane provided in the westbound direction and channelized right-turn lanes provided on both approaches.

[4] *Intersection Improvement Study – 3 Locations*, Weston, MA; VHB; June 2013.

- Modify the Boston Post Road approach to provide two travel lanes and to reduce the radius of the channelized right-turn lane.
- Modify the Wellesley Street approach to provide a left-turn/through travel lane and a channelized right-turn lane.
- Monitor the reconstructed intersection to determine if and when the installation of a traffic control signal is warranted.

In an effort to advance the identified improvements at this location that are warranted as a result of existing conditions unrelated to the Project, the Proponent will: i) facilitate the completion of a Road Safety Audit (RSA) in order to identify both short-term and long-term improvements for this intersection; ii) provide detailed design plans up to and including the MassDOT 100 Percent Design/PS&E Submission for the identified short-term improvements; and iii) provide funding toward the implementation of the short-term improvements identified in conjunction with the RSA. The RSA and FDR/MassDOT 25 Percent Design Submission for the identified short-term improvements will be completed prior to the issuance of the first Certificate of Occupancy for the Project.

Boston Post Road at School Street and Church Street

One or more movements from School Street and Church Street approaching Boston Post Road were identified to be operating with excessive delay (LOS F) during both the weekday morning and evening peak hours independent of the Project as a result of the large volume of conflicting traffic travelling along Boston Post Road during these periods. In addition, this intersection was found to have a motor vehicle crash rate that exceeds the MassDOT average crash rate for an unsignalized intersection. Recognizing these conditions, this intersection was included as a part of the 2013 *Intersection Improvement Study* that was undertaken by the Town, which identified the following improvements for the intersection:

- Modify the Church Street approach to provide separate left and right-turn lanes.
- Remove the channelized right-turn lane from Church Street to Boston Post Road westbound.
- Provide a left-turn lane on the Boston Post Road eastbound approach.

In an effort to advance the identified improvements at this location that are warranted as a result of existing conditions unrelated to the Project, the Proponent will: i) facilitate the completion of an RSA in order to identify both short-term and long-term improvements for the intersection; ii) provide detailed design plans for the identified improvements; and iii) provide funding toward the construction of the improvements. The RSA and design plans for the identified improvements will be completed prior to the issuance of the first Certificate of Occupancy for the Project.

Route 117 at Church Street

Operating conditions for the right-turn movement during the weekday morning peak-hour and the left-turn movement during the weekday evening peak-hour from the Church Street approach to Route 117 were shown to operate over their design capacity (LOS "F") independent of the Project as a result of the relatively large volume of conflicting traffic travelling along Route 117. In an effort to advance improvements at this intersection, Proponent will conduct a detailed Traffic

Signal Warrants Analysis (TSWA) for the intersection in accordance with the methodology established in the MUTCD.[5] Should it be determined that the intersection meets the necessary criteria to justify the installation of a traffic control signal and if requested by the Town, the Proponent will prepare conceptual improvement plans depicting the modifications to the intersection necessary to support the installation of a traffic signal. As an interim improvement measure, the Proponent will restripe the Route 117 westbound approach to provide a left-turn lane while maintaining one through travel lane per direction. The TSWA and restriping of the Route 117 westbound approach will be completed prior to the issuance of the first Certificate of Occupancy for the Project.

Route 117 at Lexington Street

Operating conditions for all movements from the Lexington Street approach to Route 117 were shown to operate over their design capacity (LOS "F") independent of the Project as a result of the relatively large volume of conflicting traffic travelling along Route 117. Project-related traffic volume increases along Lexington Street are anticipated to range from six (6) to seven (7) vehicles during the peak hours. In an effort to improve operating conditions at this intersection and recognizing the relatively minor impact of the Project on the critical movements, the Proponent will restripe the Route 117 eastbound approach to provide a left-turn lane and the Lexington Street approach to provide separate left and right-turn lanes. The improvements to Lexington Street may require the modification or removal of the raised island approaching Route 117.

In addition, the Proponent will conduct a detailed TSWA for the intersection in accordance with the methodology established in the MUTCD. Should it be determined that the intersection meets the necessary criteria to justify the installation of a traffic control signal and if requested by the Town, the Proponent will prepare conceptual improvement plans depicting the modifications to the intersection necessary to support the installation of a traffic signal.

Transportation Demand Management

The Project site is ideally situated to take advantage of available public transportation opportunities, including the future MBTA Commuter Rail station that will be incorporated into the Project. In an effort to encourage the use of alternative modes of transportation to single-occupant vehicles, the following Transportation Demand Management (TDM) measures will be implemented as a part of the Project:

- The property manager will employ a Transportation Coordinator for the Project, which employee will be full-time and may have other duties and responsibilities;
- The property manager, acting on behalf of the residents and tenants of the Project, will join the Route 128 Business Council Transportation Management Association (TMA) and will become a MassRIDES employer partner to facilitate and encourage healthy transportation options for employees and residents of the Project, and to coordinate a carpool/vanpool matching program;
- Information regarding public transportation services, maps, schedules and fare information will be posted in a central location within each building and/or otherwise made available to residents and employees;

[5] Ibid 3.

- A "welcome packet" will be provided to new residents and employees detailing available public transportation services, bicycle and walking alternatives, and commuter options available through MassRIDES' and their NuRide program which rewards individuals that choose to walk, bicycle, carpool, vanpool or that use public transportation to travel to and from work;

- Residents and employees will be made aware of the Emergency Ride Home (ERH) program available through the Route 128 Business Council and MassRIDES, which reimburses employees of a participating worksite that is registered for ERH and that carpool, take transit, bicycle, walk or vanpool to work;

- A minimum of five (5) carpool/vanpool parking spaces will be provided on-site;

- A minimum of four (4) electrical vehicle (EV) charging stations will be provided on-site with sufficient infrastructure capacity provided to accommodate future expansion to a minimum of 10 EV spaces;

- A minimum of four (4) spaces will be designated for carsharing (ZipCar or similar) or alternatively fueled vehicles;

- Pedestrian accommodations will be incorporated within the Project site consisting of sidewalks and pedestrian paths linking buildings and parking to on-site amenities and the future Commuter Rail Station;

- A mail drop will be provided in a central location within each building; and

- Secure bicycle parking will be provided, including both exterior bicycle racks conveniently located throughout the Project site and weather protected bicycle parking in a secure area.

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

INTRODUCTION

Vanasse & Associates, Inc. (VAI) has conducted a Transportation Impact Assessment (TIA) in order to determine the potential impacts on the transportation infrastructure associated with the proposed Weston Quarry mixed-use development to be located at 133 Boston Post Road (Route 20) in Weston, Massachusetts (hereafter referred to as the "Project"). This study evaluates the following specific areas as they relate to the Project: i) access requirements; ii) potential off-site improvements; and iii) safety considerations; and identifies and analyzes existing traffic conditions and future traffic conditions, both with and without the Project, along Route 20, Church Street and North Avenue/Main Street (Route 117), and at 10 intersections located along these roadways through which Project-related traffic will travel.

PROJECT DESCRIPTION

The Project will entail the construction of a mixed-use development at the Weston Quarry site located at 133 Boston Post Road (Route 20) in Weston, Massachusetts. The Project consists of two (2) primary components: 1) an expansion of the existing corporate office park located at 133 Boston Post Road that is currently occupied by Biogen and Monster by up to 250,000± square feet (sf); and 2) a residential development that will be located to the north of the office park and will include up to 345 apartment units. In addition, the Project will be designed to incorporate a future intermodal center that will consist of a new Massachusetts Bay Transportation Authority (MBTA) Commuter Rail station with structured parking that will be accessed from Jones Road.

The Project site encompasses approximately 74± acres of land bounded by the MBTA Fitchburg Line Commuter Rail tracks and a former railroad right-of-way to the north; Route 20, residential properties, low-lying wetland areas, and areas of open and wooded space to the south and west; and the MBTA Commuter Rail and Route 20 to the east. Figure 1 depicts the Project site location in relation to the existing roadway network.

Access to the Project will be provided as follows: for the office component, access will be provided by way of the existing driveway that serves 133 Boston Post Road and intersects the north side of Route 20 under traffic signal control. For the residential component, access will be provided by way of a new roadway that will intersect the east side of Church Street. Access to the parking garage and the "kiss-and-drop" area that will serve the future Commuter Rail station will be provided by way of Jones Road.

The Project will include up to 960 additional parking spaces to serve the office expansion component, or an approximate parking ratio of 4.0 parking spaces per 1,000 sf, with up to 488 parking spaces to be provided to serve the residential component, or an approximate parking ratio of 1.3 parking spaces per residential unit.

The Project will require the issuance of a State Highway Access Permit from the Massachusetts Department of Transportation (MassDOT) for access to Boston Post Road (Route 20), a State Highway under the jurisdiction of MassDOT.

STUDY METHODOLOGY

This study was prepared in consultation with the Town of Weston, the Cities of Newton and Waltham, and MassDOT; was performed in accordance with MassDOT's *Transportation Impact Assessment (TIA) Guidelines* and the standards of the Traffic Engineering and Transportation Planning professions for the preparation of such reports; and was conducted in three distinct stages.

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

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

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

EXISTING CONDITIONS

A comprehensive field inventory of existing conditions within the study area was conducted in October and November 2016. The field investigation consisted of an inventory of existing roadway geometrics; pedestrian and bicycle facilities; public transportation services; traffic volumes; and operating characteristics; as well as posted speed limits and land use information within the study area. The study area that was assessed for the Project consisted of Boston Post Road (Route 20), Church Street and North Avenue/Main Street (Route 117), and the following specific intersections which are listed below and depicted on Figure 2, with Figure 3 indicating roadway jurisdiction and functional classification:

1. Route 20 at 133 Boston Post Road (Biogen/Monster)
2. Route 20 at Boston Post Road, Wellesley Street
3. Route 20 at School Street
4. Boston Post Road at School Street and Church Street
5. Church Street at Conant Road and Town House Road
6. Church Street at Transfer Station Drive
7. North Avenue (Route 117) at Church Street
8. Route 117 at Lexington Street
9. Main Street (Route 117) at Jones Road
10. Route 117 at Bear Hill Road

The following describes the study area roadways and intersections as observed in October 2016.

Roadways

Boston Post Road (Route 20)

- Two to four-lane urban principal arterial roadway under MassDOT jurisdiction
- Traverses study area in a general east-west direction
- Provides two 12-foot wide travel lanes separated by a double-yellow centerline with 3 to 5-foot wide marked shoulders between the I-95/Route 128 interchange and a point just west of 133 Boston Post Road, and two 12 to 14-foot wide travel lanes with 4 to 9-foot shoulders to the west, with additional travel lanes provided at major intersections
- A sidewalk is provided along the north side between the I-95/Route 128 interchange and School Street

- Illumination is provided intermittently by way of street lights mounted on wood poles
- Posted speed limit within the study area varies from 35 to 40 miles per hour (mph)
- Land use consists of the Project site, residential and commercial properties, religious and cultural uses, and areas of open space

Church Street

- Two-lane urban collector roadway under Town jurisdiction
- Traverses study area in a general northeast-southwest direction between Boston Post Road and North Avenue
- Provides two 10 to 16-foot wide travel lanes separated by a single-yellow centerline with 1 to 4-foot wide marked shoulders and on-street parking provided opposite the First Parish Church
- A sidewalk is provided along the west side of the roadway between Boston Post Road and 53 Church Street, along both sides between 53 Church Street and Old Road, along the east side between Old Road and the Commuter Rail tracks (Kendal Green Station), and along the west side between the Commuter Rail tracks and North Avenue
- Illumination is provided intermittently by way of street lights mounted on wood poles
- Posted speed limit varies between 25 and 30 mph
- Land use consists of residential and commercial properties, religious and cultural uses, Lanson Park, Weston Town Hall, Weston Transfer Station, the Kendall Green MBTA Commuter Rail station, and areas of open space

North Avenue/Main Street (Route 117)

- Two-lane urban minor arterial roadway under Town/City jurisdiction
- Traverses study area in a general east-west direction and is known as North Avenue in Weston and Main Street in Waltham
- Provides two 11 to 14-foot wide travel lanes separated by a double-yellow centerline with 2 to 6-foot wide marked shoulders and additional turn lanes provided at major intersections
- A sidewalk is provided along the north side between Church Street and Lexington Street, and along one or both sides from a point west of Jones Road to Bear Hill Road, and along both sides east of Bear Hill Road
- Illumination is provided intermittently by way of street lights mounted on wood poles
- Posted speed limit is 30 mph
- Land use consists of residential and commercial properties, and areas of open space

Intersections

Table 1 and Figure 4 summarize existing lane use, traffic control, and pedestrian and bicycle accommodations at the study area intersections as observed in October and November 2016.

Table 1
STUDY AREA INTERSECTION DESCRIPTION

Intersection	Traffic Control Type[a]	No. of Travel Lanes Provided	Shoulder Provided? (Yes/No/Width)	Pedestrian Accommodations? (Yes/No/Description)	Bicycle Accommodations? (Yes/No/Description)
Rte. 20/ 133 Boston Post Rd. (Biogen/Monster)	TS	2 general purpose lanes on Rte. 20, 1 left-turn lane and 1 left/right-turn lane on 133 Boston Post Rd.	Yes - 3 to 5-feet on Rte. 20	Yes – north side of Rte. 20 east of intersection and both sides of 133 Boston Post Rd.; crosswalk for crossing 133 Boston Post Rd.; ped. signal equipment and concurrent ped. phase provided	Yes - Shared traveled-way[b]
Rte. 20/ Boston Post Rd./ Wellesley St.	S	1 lane on all approaches with raised island separating the directions of travel on Wellesley St. and Boston Post Rd. approaches	Yes - 7 to 9 feet on Rte. 20, 2-feet on Wellesley St. and 4-feet on Boston Post Rd.	Yes – north side of Rte. 20 and east side of Boston Post Rd.	Yes - Shared traveled-way
Rte. 20/School St.	TS	1 left/through lane on Rte. 20 eastbound, 2 general purpose lanes on Rte. 20 westbound and 1 lane on School St.	Yes – 4 to 5-feet along Rte. 20 and 1-2 feet on School St.	Yes – north side of Rte. 20 east of intersection and east side of School St.; crosswalk provided for crossing Rte. 20 east leg; ped. signal equipment and exclusive ped. phase provided	Yes - Shared traveled-way
Boston Post Rd./ School St./ Church St.	S	1 lane on all approaches	Yes - 3 to 6-feet on Boston Post Rd., 1-2 feet on School St, and 4 to 5-feet on Church St.; perpendicular, on-street parking is provided along the north side of Church St. north of the intersection	Yes – both sides of Boston Post Rd. west of intersection, north side to the east, both sides of Church St. and east side of School St.; crosswalks provided for crossing School St. and Boston Post Rd. east leg	Yes - Shared traveled-way
Church St./ Conant Rd./ Town House Rd.	S	1 lane on all approaches; Town House Rd. is one-way eastbound (toward Church St.)	Yes – 1 to 4 feet on Church St.	Yes – west side of Church St., south side of Town House Rd. and north side of Conant Rd.; crosswalks provided for crossing Town House Rd. and Conant Rd.	Yes - Shared traveled-way
Church St./ Transfer Station Dr.	S	1 lane on all approaches; at-grade Commuter Rail crossing immediately north of Transfer Station Dr.	Yes – 1 foot on Church St.; parking for Kendal Green Station provided along south side of Transfer Station Dr.	Yes – east side of Church St.	No

See notes at end of table.

Table 1 (Continued)
STUDY AREA INTERSECTION DESCRIPTION

Intersection	Traffic Control Type[a]	No. of Travel Lanes Provided	Shoulder Provided? (Yes/No/Width)	Pedestrian Accommodations? (Yes/No/Description)	Bicycle Accommodations? (Yes/No/Description)
Rte. 117/ Church St.	S	1 lane on Rte. 117; separate left and right-turn lanes on Church St.	Yes – 3-6 feet on Rte. 117 and 1-foot on Church St.	Yes – north side of Rte. 117 and west side of Church St.	Yes - Shared traveled-way on Rte. 117
Rte. 117/ Lexington St.	S	1 lane on all approaches	Yes – 3-6 feet on Rte. 117 and 1-foot on Lexington St.	Yes – north side of Rte. 117 west of intersection and east side of Lexington St.; crosswalk provided across Lexington St.	Yes - Shared traveled-way on Rte. 117
Rte. 117/ Jones Rd.	S	1 general purpose lane on Rte. 117 eastbound, 1 left-turn lane and 1 through lane on Rte. 117 westbound, and separate left and right-turn lanes on Jones Rd.; a flashing traffic signal is present (flashing "yellow" for Rte. 117 and flashing "red" for Jones Rd.	Yes – 5 to 6-feet on Rte. 117	Yes – north side of Rte. 117 west of intersection, south side of Rte. 117 east of intersection and west side of Jones Rd.; crosswalk provided for crossing Jones Rd.	Yes - Shared traveled-way
Rte. 117/ Bear Hill Rd.	TS	1 left-turn/through lane and 1 through lane on Rte. 117 eastbound, 1 through lane and 1 through/right-turn lane on Rte. 117 westbound, and separate left and right-turn lanes on Bear Hill Rd.	Yes – 2-feet on Rte. 117 and 1-foot on Bear Hill Rd.	Yes – both sides of Rte. 117 and east side of Bear Hill Rd.; crosswalks provided across Bear Hill Rd. and Rte. 117 west leg	Yes - Shared traveled-way

[a]TS = traffic signal control; S = STOP-sign control; Y = YIELD-sign control; R = rotary/roundabout control; NC = no control present.
[b]Combined shoulder and travel lane width equal to or exceed 14 feet.

EXISTING TRAFFIC VOLUMES

In order to determine existing traffic-volume demands and flow patterns within the study area, automatic traffic recorder (ATR) counts, manual turning movement counts (TMCs) and vehicle classification counts were completed in October 2016. The ATR counts were conducted over a 48-hour period on Route 20 and Church Street within the study area in order to record weekday daily traffic conditions over an extended period, with weekday morning (7:00 to 9:00 AM) and evening (4:00 to 6:00 PM) peak period manual TMCs performed at the study intersections. These time periods were selected for analysis purposes as they are representative of the peak traffic volume hours for both the Project and the adjacent roadway network.

Traffic Volume Adjustments

In order to evaluate the potential for seasonal fluctuation of traffic volumes within the study area, traffic volume data from MassDOT Continuous Count Station No. 4065 located on I-95 south of the Route 2 interchange in Lexington were reviewed.[6] Based on a review of this data, it was determined that traffic volumes for the month of October are approximately 9.0 percent above average month conditions. As such, the raw traffic count data that forms the basis of the assessment was not adjusted downward to average-month conditions in order to provide a conservative (above average) analysis condition. The 2016 Existing traffic volumes are summarized in Table 2, with the weekday morning and evening peak-hour traffic volumes graphically depicted on Figures 5 and 6, respectively. Note that the peak-hour traffic volumes presented in Table 2 were obtained from the aforementioned figures.

Table 2
2016 EXISTING TRAFFIC VOLUMES

		Weekday Morning Peak-Hour (8:00 – 9:00 AM)			Weekday Evening Peak-Hour (4:30 – 5:30 PM)		
Location	AWT[a]	VPH[b]	K Factor[c]	Directional Distribution	VPH	K Factor	Directional Distribution
Route 20, east of 133 Boston Post Road	24,745	2,460	9.9	62.9% EB	2,601	10.5	55.4% WB
Church Street, south of Transfer Station Driveway	5,260	531	10.1	85.1% NB	688	13.1	80.7% SB

[a]Average weekday traffic in vehicles per day.
[b]Vehicles per hour.
[c]Percent of daily traffic occurring during the peak-hour.
NB = northbound; SB = southbound; EB = eastbound; WB = westbound.

As can be seen in Table 2, Route 20 in the vicinity of the Project site was found to accommodate approximately 24,745 vehicles on an average weekday (two-way, 24-hour volume), with approximately 2,460 vehicles per hour (vph) during the weekday morning peak-hour and 2,601 vph during the weekday evening peak-hour. Church Street south of the transfer station driveway was found to accommodate approximately 5,260 vehicles on an average weekday, with approximately 531 vph during the weekday morning peak-hour and 688 vph during the weekday evening peak-hour.

PEDESTRIAN AND BICYCLE FACILITIES

A comprehensive field inventory of pedestrian and bicycle facilities within the study area was undertaken in October and November 2016. The field inventory consisted of a review of the location of sidewalks and pedestrian crossing locations along the study roadways and at the study intersections, as well as the location of existing and planned future bicycle facilities. As detailed on Figure 4, sidewalks are generally provided along one or both sides of the study area roadways,

[6]MassDOT Traffic Volumes for the Commonwealth of Massachusetts; 2015; Continuous Count Station 4065 – I-95, south of Route 2, Lexington, MA.

with marked crosswalks provided as shown. Pedestrian phasing and signal equipment are provided at the signalized study intersections.

In general, the majority of the study area roadways provide sufficient width (combined travel lane and shoulder) to support bicycle travel in a shared traveled-way configuration.[7]

PUBLIC TRANSPORTATION

At present, public transportation services are not directly accessible to the Project site but are provided within the study area by the MBTA. The MBTA operates fixed-route bus service along Route 117 in Waltham by way of Route 70, *Cedarwood, Market Place Drive, or Central Square Waltham-University Park*, and Route 170, *Central Square, Waltham – Dudley Square*. The closest stop to the Project site for the Route 70 and Route 170 buses is located off Market Place Drive, which is east of the Route 117 bridge over I-95/Route 128. In addition, the MBTA provides Commuter Rail service to North Station in Boston on the Fitchburg Line, with a station located off Church Street just north of the driveway to the Weston Transfer Station (Kendal Green Station). The public transportation schedules and fare information is provided in the Appendix.

In conjunction with the Project, accommodations are being provided to allow for the relocation of Kendal Green Station to the Project site, and would include the construction of a modern, Americans with Disabilities Act (ADA) compliant platform area and an accompanying parking facility that would be accessed from Jones Road. The Project has been designed to provide pedestrian and bicycle access to the new station from within the development, connections that will extend to both Route 20 and Church Street.

In addition, Biogen Idec currently operates a shuttle service for employees (BIIB Coach) that includes five (5) routes along I-95 from Hampton, New Hampshire; I-93 from Londonderry, New Hampshire; I-90 from Worcester; Route 3 from Plymouth; and Route 20 from Marlborough; with service to Biogen Idec's corporate headquarters in Cambridge. The Route 20 shuttle provides a stop in Weston.

SPOT SPEED MEASUREMENTS

Vehicle travel speed measurements were performed on Route 20 east of 133 Boston Post Road and on Church Street south of the Weston Transfer Station driveway in conjunction with the ATR counts. Table 3 summarizes the vehicle travel speed measurements.

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

Table 3
VEHICLE TRAVEL SPEED MEASUREMENTS

	Route 20		Church Street	
	Eastbound	Westbound	Northbound	Southbound
Mean Travel Speed (mph)	35	33	28	31
85th Percentile Speed (mph)	40	42	34	34
Posted Speed Limit (mph)	35	35	25	25

mph = miles per hour.

As can be seen in Table 3, the mean vehicle travel speed along Route 20 in the vicinity of the Project site was found to be approximately 34 mph. The average measured 85th percentile vehicle travel speed, or the speed at which 85 percent of the observed vehicles traveled at or below, was found to be approximately 41 mph, which is 6 mph above the posted speed limit in this area of Route 20 (35 mph). The 85th percentile speed is used as the basis of engineering design and in the evaluation of sight distances, and is often used in establishing posted speed limits.

The mean vehicle travel speed along Church Street in the vicinity of the Weston Transfer Station was found to be approximately 30 mph, with the average measured 85th percentile vehicle travel speed found to be 34 mph, which is 9 mph above the posted speed limit in this area (25 mph).

MOTOR VEHICLE CRASH DATA

Motor vehicle crash information for the study area intersections was provided by the MassDOT Highway Division Safety Management/Traffic Operations Unit for the most recent five-year period available (2010 through 2014, inclusive) in order to examine motor vehicle crash trends occurring within the study area. The data is summarized by intersection, type, severity, and day of occurrence, and presented in Table 4.

As can be seen in Table 4, with the exception of the Route 20/Boston Post Road/Wellesley Street and Boston Post Road/School Street/Church Street intersections, the study area intersections were found to have experienced an average of five (5) or fewer reported motor vehicle crash per year over the five-year review period and were found to have a motor vehicle crash rate below both the MassDOT statewide and District averages for a signalized or an unsignalized intersection, as appropriate, for the MassDOT Highway Division District in which the intersections are located (Districts 4 and 6).

The unsignalized intersection of Route 20 at Boston Post Road and Wellesley Street was found to have 78 reported motor vehicle crashes over the 5-year review period, or an average of approximately 16 crashes per year, the majority of which occurred on a weekday, resulted in property damage only and were reported as angle or rear-end type collisions. The unsignalized intersection of Boston Post Road at School Street and Church Street was found to have 43 reported motor vehicle crashes over the 5-year review period, or an average of approximately nine (9) crashes per year, the majority of which occurred on a weekday, resulted in property

damage only and were reported as angle-type collisions. Both intersections were found to have a motor vehicle crash rate that is above the MassDOT statewide and District averages for an unsignalized intersection. In addition, a review of the MassDOT statewide High Crash Location List indicated that the Route 20/Boston Post Road/Wellesley Street is included on MassDOT's Highway Safety Improvement Program (HSIP) listing as a high crash cluster location for 2012-2014. The Town of Weston initiated a study in 2013 that resulted in recommendations for specific improvements at the Route 20/Boston Post Road/Wellesley Street and Boston Post Road/School Street/Church Street intersections.[8] Elements of the recommended improvement measures have been incorporated into the transportation improvement program for the Project.

No fatal motor vehicle crashes were reported to have occurred at the study area intersections over the five-year review period. The detailed MassDOT Crash Rate Worksheets and high crash location mapping are provided in the Appendix.

[8] Ibid 4.

Table 4
MOTOR VEHICLE CRASH DATA SUMMARY[a]

	Weston								Waltham	
	Route 20/ 133 Boston Post Rd.	Route 20/ Boston Post Rd./ Wellesley St.	Route 20/ School St.	Boston Post Rd./ School St./ Church St.	Church St./ Conant Rd./ Town House Rd.	Church St./ Transfer Station Dr.	Route 117/ Church St.	Route 117/ Lexington St.	Route 117/ Jones Rd.	Route 117/ Bear Hill Rd.
Traffic Control Type:[b]	TS	U	TS	U	U	U	U	U	U	TS
Year:										
2010	2	14	3	7	0	0	0	3	1	4
2011	4	13	2	13	1	0	2	2	1	3
2012	2	15	6	6	0	0	1	7	0	1
2013	2	26	5	7	2	0	1	3	2	1
2014	1	10	8	10	0	0	1	4	0	2
Total	11	78	24	43	3	0	5	19	4	11
Average	2.20	15.60	4.80	8.60	0.60	0.00	1.00	3.80	0.80	2.20
Rate[c]	0.20	1.57	0.54	1.15	0.16	0.00	0.14	0.52	0.13	0.24
MassDOT Crash Rate:[d]	0.77/0.70	0.58/0.53	0.77/0.70	0.58/0.53	0.58/0.53	0.58/0.53	0.58/0.53	0.58/0.53	0.58/0.56	0.77/0.73
Significant?[e]	No	Yes	No	Yes	No	No	No	No	No	No
Type:										
Angle	1	36	1	23	0	0	1	10	2	4
Rear-End	3	32	18	15	1	0	3	3	1	4
Head-On	0	0	1	0	0	0	0	0	0	0
Sideswipe	6	5	2	2	0	0	0	0	0	2
Fixed Object	0	0	0	0	1	0	0	3	0	0
Pedestrian/Bicycle	0	1	1	1	0	0	1	1	1	1
Unknown/Other	1	4	1	2	1	0	0	2	4	11
Total	11	78	24	43	3	0	5	19		
Day of Week:										
Monday through Friday	10	70	20	41	3	0	5	16	3	9
Saturday	1	4	3	1	0	0	0	2	0	1
Sunday	0	4	1	1	0	0	0	1	1	1
Total	11	78	24	43	3	0	5	19	4	11
Severity:										
Property Damage Only	9	65	19	39	3	0	3	13	3	9
Personal Injury	2	13	5	4	0	0	2	6	1	2
Fatality	0	0	0	0	0	0	0	0	0	0
Total	11	78	24	43	3	0	5	19	4	11

[a]Source: MassDOT Safety Management/Traffic Operations Unit records, 2010 through 2014.
[b]Traffic Control Type: U = unsignalized; TS = traffic signal.
[c]Crash rate per million vehicles entering the intersection.
[d]Statewide/District crash rate.
[e]The intersection crash rate is significant if it is found to exceed the MassDOT crash rate for the MassDOT Highway Division District in which the Project is located (Districts 4 and 6).

FUTURE CONDITIONS

Traffic volumes in the study area were projected to the year 2024, which reflects a seven-year planning horizon from current year consistent with MassDOT's *Transportation Impact Assessment (TIA) Guidelines*. Independent of the Project, traffic volumes on the roadway network in the year 2024 under No-Build conditions include all existing traffic and new traffic resulting from background traffic growth. Anticipated Project-generated traffic volumes superimposed upon the 2024 No-Build traffic volumes reflect 2024 Build traffic volume conditions with the Project.

FUTURE TRAFFIC GROWTH

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

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

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

Specific Development by Others

The Planning Departments for the Town of Weston and the Cities of Newton and Waltham were contacted in order to determine if there were any projects planned within the study area that would have an impact on future traffic volumes at the study intersections. Based on these discussions, the following projects were identified for inclusion in this assessment:

- ***Warehouse Development, 124-132 West Street, Waltham, Massachusetts.*** This project will entail the construction of a 10,000± sf warehouse to be located at 124-132 West Street in Waltham, Massachusetts.

- ***Office Expansion Project, 830 Winter Street, Waltham, Massachusetts.*** This project will entail a 150,000± sf expansion of the existing research and development building located at 830 Winter Street in Waltham, Massachusetts.

- ***Hotel Development, 265 Second Avenue, Waltham, Massachusetts.*** This project will entail the construction of a 190-room hotel to be located at 265 Second Avenue in Waltham, Massachusetts.

- ***Hotel Development, 135 Second Avenue, Waltham, Massachusetts.*** This project will entail the construction of a 135-room hotel to be located at 135 Second Avenue in Waltham, Massachusetts.

- ***Proposed Mixed-Use Development, 1265 Main Street, Waltham, Massachusetts.*** This project includes the continued build-out of the mixed-use development located at 1265 Main Street in Waltham, Massachusetts (former Polaroid office and manufacturing facility). Phase 1 of the project is complete and included the Market Basket Supermarket, Marshalls Department Store, C & J Clark America, Inc. headquarters building, Daryl Christopher Aveda Lifestyle Salon & Spa, and several restaurants. Phase 2 of the project will encompass 1,825,000± sf of space that will include 850,000± sf of office space, a 300-room hotel, 200,000± sf of retail/restaurant space and a 150,000± sf health and wellness center, with the potential for a 350-unit residential community (not included in the current assessment that was prepared for the project). At the time that the traffic counts that form the basis of this assessment were completed (October 2016), the C & J Clark America, Inc. headquarters building was vacant (120,000± sf of office space) and Phase 2 had not yet commenced.

Traffic volumes associated with the aforementioned specific development projects by others were obtained from the respective traffic studies or using trip-generation information available from the Institute of Transportation Engineers (ITE)[9] for the appropriate land use, and were assigned onto the study area roadway network based on existing traffic patterns where no other information was available. No other developments were identified at this time that are expected to result in an increase in traffic within the study area beyond the general background traffic growth rate.

General Background Traffic Growth

Traffic-volume data compiled from MassDOT Permanent Count Station No. 4065 located on I-95 south of the Route 2 interchange in Lexington was reviewed in order to determine general background traffic growth trends. Based on a review of this data, it was determined that traffic volumes within the study area experienced a general decline between 2005 and 2015 of approximately 1.2 percent per year. In order to provide a conservative (high) analysis scenario and a prudent planning condition for the Project, a 1.0 percent per year compounded annual background traffic growth rate was used in order to account for future traffic growth and presently unforeseen development within the study area.

[9] Ibid 1

Roadway Improvement Projects

MassDOT, the Town of Weston and the City of Waltham were consulted in order to determine if there were any planned future roadway improvement projects expected to be complete by 2024 within the study area. Based on these discussions, the following roadway improvement project was identified in within the study area:

- ***Route 20 Resurfacing in Weston and Waltham (MassDOT Project Number 608528).*** This project is being undertaken by MassDOT and entails the resurfacing and related improvements along Route 20 in Weston and Waltham. These improvements are currently at the preliminary design stage; a construction date and funding source have not yet been established.

Several improvements were identified along the Main Street (Route 117) corridor within the study area of this assessment that are associated with the mixed-use development located at 1265 Main Street in Waltham. These improvements include the following and are reflected in both the 2024 No-Build and 2024 Build condition analyses (the horizon years that include the remaining build-out of the mixed-use development):

- ***Route 117 Bridge and Associated Improvements*** – Replace the existing 4-lane bridge over I-95/Route 28 with a new 7-lane bridge that would include new sidewalks and bicycle lanes, and widen Route 117 approaches to the bridge. The proposed lane use on the expanded bridge would be as follows: Route 117 westbound – two left-turn lanes, one through lane and one through/right-turn lane; Route 117 eastbound – one left-turn lane, one through lane and one through/right-turn lane.

- ***Route 117/Green Street/Bear Hill Road*** – Realign Green Street to align with Bear Hill Road and place the intersection under traffic signal control with the following lane use assignments: Route 117 westbound - two left-turn lanes, one through lane and one through/right-turn lane; Route 117 eastbound – one left-turn lane, two through lanes and one channelized right-turn lane; Green Street – one left-turn lane, one through lane and one right-turn lane; Bear Hill Road – one left-turn lane and one shared through/right-turn lane.

- ***Route 20/Green Street Connector*** – Extend Green Street to the I-95/Route 128/Route 20 interchange, to include the installation of a traffic control signal at the Green Street Connector/Route 20 westbound intersection.

- ***I-95/Route 128 Northbound On-Ramp from Route 117*** – Construct a new on-ramp to I-95/Route 128 from Route 117 along the east side of the Route 117 bridge and opposite Stow Street to permit direct access from Route 117 to I-95/Route 128 northbound.

In addition, as mentioned previously, the Town of Weston commissioned an assessment of potential improvement measures at the intersections of Boston Post Road at School Street and Church Street, Route 20 at Boston Post Road and Wellesley Street and Route 20 at School Street.[10] This study identified the following improvement strategies at the subject intersections:

[10] Ibid 4.

- ***Boston Post Road/School Street/Church Street*** – Geometric improvements to include the addition of separate left and right-turn lanes on the Church Street approach; removing the channelized right-turn lane from Church Street to Boston Post Road westbound; and providing a left-turn lane on the Boston Post Road eastbound approach.

- ***Route 20 at Boston Post Road and Wellesley Street*** – Reconstruct the intersection to provide a traditional four-way intersection with Windsor Way intersecting Wellesley Street south of Route 20. Route 20 would provide two travel lanes approaching the intersection with a left-turn lane provided in the westbound direction and channelized right-turn lanes provided on both approaches. The Boston Post Road approach would provide two travel lanes and the Wellesley Street approach would provide a left-turn/through travel lane and a channelized right-turn lane. The installation of a traffic control signal at the improved intersection was discussed but not favored by MassDOT, who has jurisdiction over the intersection.

- ***Route 20 at School Street*** – Reconstruct the intersection and replace the traffic control signal. Geometric improvements would include widening Route 20 to provide a left-turn/through travel lane, a through travel lane and a right turn lane in the eastbound direction, and a left-turn/through travel lane and a through/right-turn lane in the westbound direction. The School Street northbound approach would be widened to provide a left-turn lane and a through/right-turn lane. The School Street southbound approach would continue to provide one general-purpose travel lane; however, left-turn movements would be prohibited.

These improvements are not currently funded and, as such, were not included in the future conditions analyses that are presented herein.

No other roadway improvement projects aside from routine maintenance activities were identified to be planned within the study area at this time.

No-Build Traffic Volumes

The 2024 No-Build condition peak-hour traffic-volumes were developed by applying the 1.0 percent per year compounded annual background traffic growth rate to the 2016 Existing peak-hour traffic volumes and then adding the peak-hour traffic volumes associated with the identified specific development projects by others. The resulting 2024 No-Build weekday morning and evening peak-hour traffic volumes are shown on Figures 7 and 8, respectively.

PROJECT-GENERATED TRAFFIC

Design year (2024) Build traffic volumes for the study area roadways were determined by estimating Project-generated traffic volumes and assigning those volumes on the study roadways. The following sections describe the methodology used to develop the anticipated traffic characteristics of the Project.

As proposed, the Project will entail the construction of up to 250,000± sf of additional office space that will be accessed from Route 20 and located at 133 Boston Post Road, and up to 345 apartment units that will be accessed from Church Street. In order to develop the traffic

characteristics of the Project, trip-generation statistics published by the ITE[11] for similar land uses as those proposed were used. ITE Land Use Codes (LUCs) 220, *Apartment*, and 710, *General Office Building*, were used to establish the base traffic characteristics of the Project.

Transit Use

The Project will be designed to incorporate a future intermodal center that will consist of a new MBTA Commuter Rail station (relocation of Kendal Green Station) with structured parking that will be accessed from Jones Road. For the purpose of this analysis and **given the uncertainty with respect to the timing of the completion of the intermodal center, a reduction in the base trip-generation calculations for the Project to account for the use of public transportation services by the residents and employees of the Project was not applied.**

Table 5 summarizes the anticipated trip characteristics of the Project using the aforementioned methodology.

Table 5
TRIP GENERATION SUMMARY

	Vehicle Trips		
Time Period/Direction	(A) Proposed Apartment Community (345 Units)[a]	(B) Proposed Office Expansion (250,000 sf)[b]	(A + B) Total
Average Weekday Daily:			
Entering	1,107	1,317	2,424
Exiting	1,107	1,317	2,424
Total	2,214	2,634	4,848
Weekday Morning Peak Hour:			
Entering	35	350	385
Exiting	138	48	186
Total	173	398	571
Weekday Evening Peak Hour:			
Entering	135	61	196
Exiting	72	297	369
Total	207	358	565

[a]Based on ITE LUC 220, *Apartment.*
[b]Based on ITE LUC 710, *General Office Building.*

[11]Ibid 1.

Project-Generated Trip Summary

As can be seen in Table 5, using the aforementioned methodology, the Project is expected to generate approximately 4,848 vehicle trips on an average weekday (two-way, 24-hour volume or 2,424 vehicles entering and 2,424 vehicles exiting), with approximately 571 vehicle trips 385 vehicles entering and 186 exiting) expected during the weekday morning peak-hour and 565 vehicle trips (196 vehicles entering and 369 exiting) expected during the weekday evening peak-hour.

Trip Distribution and Assignment

Separate trip-distribution patterns were developed for the residential and office components of the Project given the differing nature and purpose of the trips associated with these uses. For the residential component of the Project, the directional distribution was determined based on a review of Journey-to-Work data obtained from the U.S. Census for persons residing in the Town of Weston. For the office component of the Project, the directional distribution was determined based on a review of existing traffic patterns at the driveway serving 133 Boston Post Road. These trip patterns (residential and office) were then further refined based on a review of existing traffic patterns within the study area during the peak periods. The general trip distribution for the residential and office components for the Project are graphically depicted on Figures 9 and 10, respectively. Traffic volumes expected to be generated by the Project were assigned onto the study area roadway network as shown on Figures 11 and 12 for the weekday morning and evening peak hours, respectively.

FUTURE TRAFFIC VOLUMES - BUILD CONDITION

The 2024 Build condition traffic volumes consist of the 2024 No-Build traffic volumes with the additional traffic expected to be generated by the Project added to them. The 2024 Build weekday morning and evening peak-hour traffic volumes are graphically depicted on Figures 13 and 14, respectively.

A summary of peak-hour projected traffic-volume increases outside of the study area that is the subject of this assessment is shown in Table 6. These volumes are based on the expected increases from the Project.

Table 6
PEAK-HOUR TRAFFIC-VOLUME INCREASES

Location/Peak Hour	2016 Existing	2024 No-Build	2024 Build	Traffic Volume Increase Over No-Build	Percent Increase Over No-Build
Route 20, east of 133 Boston Post Road:					
Weekday Morning	2,460	2,707	3,054	347	12.8
Weekday Evening	2,601	2,923	3,258	335	11.5
Route 20, west of School Street:					
Weekday Morning	1,312	1,478	1,538	60	4.1
Weekday Evening	1,465	1,715	1,768	53	3.1
Wellesley Street, south of Route 20:					
Weekday Morning	667	721	761	40	5.5
Weekday Evening	631	683	719	36	5.3
School Street, south of Route 20:					
Weekday Morning	810	878	897	19	2.2
Weekday Evening	934	1,012	1,035	23	2.3
Boston Post Road, west of Church Street:					
Weekday Morning	1,212	1,312	1,367	55	4.2
Weekday Evening	1,425	1,542	1,603	61	4.0
Route 117, west of Church Street:					
Weekday Morning	925	1.077	1,091	14	1.3
Weekday Evening	1,172	1,428	1,445	17	1.2
Route 117, east of Bear Hill Road:					
Weekday Morning	2,022	2,076	2,090	14	0.7
Weekday Evening	2,090	2,640	2,657	17	0.6
Lexington Street, north of Route 117:					
Weekday Morning	891	986	991	5	0.5
Weekday Evening	665	730	736	6	0.8
Bear Hill Road, north of Route 117:					
Weekday Morning	861	1,015	1,020	5	0.5
Weekday Evening	909	1,102	1,108	6	0.5

As shown in Table 6, Project-related traffic-volume increases outside of the study area relative to 2024 No-Build conditions are anticipated to range from 0.5 to 12.8 percent during the peak periods, with vehicle increases shown to range from 5 to 347 vehicles.

TRAFFIC OPERATIONS ANALYSIS

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

METHODOLOGY

Levels of Service

A primary result of capacity analyses is the assignment of level of service to traffic facilities under various traffic-flow conditions.[12] The concept of level of service is defined as a qualitative measure describing operational conditions within a traffic stream and their perception by motorists and/or passengers. A level-of-service definition provides an index to quality of traffic flow in terms of such factors as speed, travel time, freedom to maneuver, traffic interruptions, comfort, convenience, and safety.

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

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

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

Signalized Intersections

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

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

Levels of service for signalized intersections were calculated using the Percentile Delay Method implemented as a part of the Synchro™ 8 software. The Percentile Delay Method assesses the effects of signal type, timing, phasing, and progression; vehicle mix; and geometrics on "percentile" delay. Level-of-service designations are based on the criterion of percentile delay per vehicle and is a measure of: i) driver discomfort; ii) motorist frustration; and iii) fuel consumption; and includes a uniform delay based on percentile volumes using a Poisson arrival pattern, an initial queue move-up time, and a queue interaction delay that accounts for delays resulting from queues extending from adjacent intersections. Table 7 summarizes the relationship between level-of-service and percentile delay, and uses the same numerical delay thresholds as the HCM method. The tabulated percentile delay criterion may be applied in assigning level-of-service designations to individual lane groups, to individual intersection approaches, or to entire intersections.

Table 7
LEVEL-OF-SERVICE CRITERIA
FOR SIGNALIZED INTERSECTIONS

Level of Service	Percentile 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

Unsignalized Intersections

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

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

The levels of service of unsignalized intersections are determined by application of a procedure described in the 2010 *Highway Capacity Manual.*[13] Level of service is measured in terms of average control delay. Mathematically, control delay is a function of the capacity and degree of saturation of the lane group and/or approach under study and is a quantification of motorist delay associated with traffic control devices such as traffic signals and STOP signs. Control delay includes the effects of initial deceleration delay approaching a STOP sign, stopped delay, queue move-up time, and final acceleration delay from a stopped condition. Definitions for level of service at unsignalized intersections are also given in the 2010 *Highway Capacity Manual*. Table 8 summarizes the relationship between level of service and average control delay for two way stop controlled and all-way stop controlled intersections.

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

Table 8
LEVEL-OF-SERVICE CRITERIA FOR UNSIGNALIZED INTERSECTIONS[a]

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

[a]Source: *Highway Capacity Manual*; Transportation Research Board; Washington, DC; 2010; page 19-2.

Vehicle Queue Analysis

Vehicle queue analyses are a direct measurement of an intersection's ability to process vehicles under various traffic control and volume scenarios and lane use arrangements. The vehicle queue analysis was performed using the Synchro™ intersection capacity analysis software which is based upon the methodology and procedures presented in the 2010 *Highway Capacity Manual.* The Synchro™ vehicle queue analysis methodology is a simulation based model which reports the number of vehicles that experience a delay of six seconds or more at an intersection. For signalized intersections, Synchro™ reports both the average (50^{th} percentile) the 95^{th} percentile vehicle queue. For unsignalized intersections, Synchro™ reports the 95^{th} percentile vehicle queue. Vehicle queue lengths are a function of the capacity of the movement under study and the volume of traffic being processed by the intersection during the analysis period. The 95^{th} percentile vehicle queue is the vehicle queue length that will be exceeded only 5 percent of the time, or approximately three minutes out of sixty minutes during the peak one hour of the day (during the remaining fifty-seven minutes, the vehicle queue length will be less than the 95^{th} percentile queue length).

ANALYSIS RESULTS

Level-of-service and vehicle queue analyses were conducted for 2016 Existing, 2024 No-Build and 2024 Build conditions for the intersections within the study area. The results of the intersection capacity and vehicle queue analyses are summarized in Tables 9 and 10. The detailed analysis results are presented in the Appendix.

The following is a summary of the level-of-service and vehicle queue analyses for the intersections within the study area.

Table 9
SIGNALIZED INTERSECTION LEVEL-OF-SERVICE AND VEHICLE QUEUE SUMMARY

Signalized Intersection/Peak-hour/Movement	2016 Existing				2024 No-Build				2024 Build			
	V/C[a]	Delay[b]	LOS[c]	Queue[d] 50th/95th	V/C	Delay	LOS	Queue 50th/95th	V/C	Delay	LOS	Queue 50th/95th
Route 20 at 133 Boston Post Road												
Weekday Morning:												
Route 20 EB LT/TH	0.62	2.9	A	0/7	0.72	4.5	A	6/8	1.12	72.8	E	15/25
Route 20 WB TH/RT	0.56	11.1	B	4/8	0.59	12.2	B	7/10	0.66	12.8	B	10/13
133 Boston Post Road SB LT/RT	0.08	29.4	C	1/2	0.09	32.3	C	1/2	0.24	32.4	C	1/2
Overall	--	**6.2**	**A**	--	--	**7.5**	**A**	--	--	**49.2**	**D**	--
Weekday Evening:												
Route 20 EB LT/TH	0.44	6.7	A	5/7	0.50	7.1	A	6/9	0.68	12.2	B	8/10
Route 20 WB TH/RT	0.75	17.6	B	12/18	0.81	19.4	B	15/22	0.95	34.0	C	25/33
133 Boston Post Road SB LT/RT	0.61	31.2	C	4/6	0.64	33.6	C	5/6	0.81	41.0	D	9/12
Overall	--	**15.8**	**B**	--	--	**16.9**	**B**	--	--	**28.4**	**C**	--
Route 20 at School Street												
Weekday Morning:												
Route 20 EB LT/TH	0.84	37.1	D	14/28	0.96	60.5	E	17/34	1.04	70.8	E	20/38
Route 20 EB RT	0.30	11.2	B	2/5	0.32	12.0	B	2/5	0.32	12.0	B	2/5
Route 20 WB LT/TH/RT	0.41	21.9	C	4/8	0.53	24.2	C	5/9	0.53	24.4	C	5/10
School Street NB LT/TH/RT	0.68	30.4	C	7/16	0.76	34.5	C	8/18	0.77	35.6	D	8/19
School Street SB LT/TH/RT	0.93	50.9	D	11/26	1.02	72.2	E	13/30	1.05	79.0	E	14/31
Overall	--	**33.6**	C	--	--	**44.4**	**D**	--	--	**52.2**	**D**	--
Weekday Evening:												
Route 20 EB LT/TH	0.70	20.6	C	9/30	0.83	30.1	C	12/38	0.85	32.0	C	13/39
Route 20 EB RT	0.21	7.9	A	1/4	0.23	8.6	A	1/4	0.23	8.8	A	1/4
Route 20 WB LT/TH/RT	0.48	17.9	B	4/11	0.67	23.0	C	5/16	0.74	25.7	C	6/18
School Street NB LT/TH/RT	1.20	>80.0	F	10/22	1.31	>80.0	F	12/25	1.33	>80.0	F	12/26
School Street SB LT/TH/RT	0.74	32.6	C	7/16	0.79	35.0	C	8/17	0.80	35.7	D	9/18
Overall	--	**43.7**	**D**	--	--	**53.5**	**D**	--	--	**56.2**	**E**	--

See notes end of table.

Table 9 (Continued)
SIGNALIZED INTERSECTION LEVEL-OF-SERVICE AND VEHICLE QUEUE SUMMARY

Signalized Intersection/Peak-hour/Movement	2016 Existing				2024 No-Build				2024 Build			
	V/C[a]	Delay[b]	LOS[c]	Queue[d] 50th/95th	V/C	Delay	LOS	Queue 50th/95th	V/C	Delay	LOS	Queue 50th/95th
Route 117 at Bear Hill Road and Green Street												
Weekday Morning:												
Route 117 EB LT	--	--	--	--	0.51	45.8	D	3/6	0.53	46.4	D	3/6
Route 117 EB LT/TH	0.49	7.4	A	3/5	--	--	--	--	--	--	--	--
Route 117 EB TH/RT	--	--	--	--	0.50	19.1	B	6/8	0.40	19.3	B	6/8
Route 117 WB LT	--	--	--	--	0.43	42.7	D	2/4	0.43	43.0	D	2/4
Route 117 WB TH/RT	0.68	7.9	A	6/10	0.75	22.1	C	9/12	0.75	22.3	C	9/12
Green Street NB LT	--	--	--	--	0.85	51.1	D	8/18	0.85	52.4	D	8/18
Green Street NB TH	--	--	--	--	0.43	29.0	C	5/10	0.43	29.2	C	5/10
Green Street NB RT	--	--	--	--	0.43	5.5	A	1/5	0.43	5.9	A	1/5
Bear Hill Road SB LT	0.38	28.4	C	5/12	0.43	33.4	C	2/6	0.43	33.8	C	2/6
Bear Hill Road SB TH/RT	--	--	--	--	0.19	15.3	B	1/3	0.20	15.3	B	1/3
Bear Hill Road SB RT	0.14	9.1	A	0/1	--	--	--	--	--	--	--	--
Overall	--	**9.1**	**A**	--	--	**25.4**	**C**	--	--	**25.7**	**C**	--
Weekday Evening:												
Route 117 EB LT	--	--	--	--	0.27	52.8	D	2/3	0.29	53.4	D	2/4
Route 117 EB LT/TH	0.64	15.8	B	5/6	--	--	--	--	--	--	--	--
Route 117 EB TH/RT	--	--	--	--	0.83	43.9	D	12/15	0.84	44.2	D	12/16
Route 117 WB LT	--	--	--	--	0.88	62.7	E	9/13	0.88	62.9	E	9/13
Route 117 WB TH/RT	0.60	14.3	B	6/8	0.68	32.2	C	13/15	0.69	32.3	C	13/15
Green Street NB LT	--	--	--	--	0.75	48.7	D	6/11	0.77	50.0	D	6/11
Green Street NB TH	--	--	--	--	0.09	22.1	C	2/3	0.09	22.1	C	2/3
Green Street NB RT	--	--	--	--	0.33	3.9	A	0/2	0.33	3.9	A	0/2
Bear Hill Road SB LT	0.75	26.0	C	7/16	0.94	60.1	E	15/24	0.94	60.4	E	15/24
Bear Hill Road SB TH/RT	--	--	--	--	0.51	24.2	C	7/11	0.51	24.4	C	8/11
Bear Hill Road SB RT	0.24	6.6	A	1/2	--	--	--	--	--	--	--	--
Overall	--	**16.8**	**B**	--	--	**41.3**	**D**	--	--	**41.5**	**D**	--

[a]Volume-to-capacity ratio.
[b]Percentile delay per vehicle in seconds.
[c]Level-of-Service.
[d]Queue length in vehicles.
NB = northbound; SB = southbound; EB = eastbound; WB = westbound; LT = left-turning movements; TH = through movements; RT = right-turning movements.

Table 10
UNSIGNALIZED INTERSECTION LEVEL-OF-SERVICE AND VEHICLE QUEUE SUMMARY

	2016 Existing				2024 No-Build				2024 Build			
Unsignalized Intersection/Peak Hour/Movement	Demand[a]	Delay[b]	LOS[c]	Queue[d] 95th	Demand	Delay	LOS	Queue 95th	Demand	Delay	LOS	Queue 95th
Route 20 at Boston Post Road and Wellesley Street												
Weekday Morning:												
Route 20 EB LT/TH/RT	802	0.0	A	0	907	0.0	A	0	960	0.0	A	0
Route 20 WB LT/TH/RT	783	3.5	A	2	866	4.0	A	2	898	4.2	A	2
Wellesley Street NB LT/TH/RT	426	>50.0	F	43	461	>50.0	F	NC	496	>50.0	F	NC
Boston Post Road SB LT/TH/RT	326	>50.0	F	NC	353	>50.0	F	NC	444	>50.0	F	NC
Weekday Evening:												
Route 20 EB LT/TH/RT	703	0.0	A	0	822	0.0	A	0	831	0.0	A	0
Route 20 WB LT/TH/RT	1,452	3.7	A	3	1,641	4.5	A	5	1,801	4.8	A	5
Wellesley Street NB LT/TH/RT	219	>50.0	F	28	236	>50.0	F	33	242	>50.0	F	35
Boston Post Road SB LT/TH/RT	82	>50.0	F	NC	89	>50.0	F	NC	127	>50.0	F	NC
Boston Post Road at School Street and Church Street												
Weekday Morning:												
Boston Post Road EB LT/TH/RT	970	3.2	A	1	1,050	3.2	A	2	1,074	3.2	A	2
Boston Post Road WB LT/TH/RT	135	0.9	A	0	146	1.0	A	0	166	1.0	A	0
School Street NB LT/TH/RT	197	>50.0	F	7	213	>50.0	F	11	217	>50.0	F	14
Church Street SB LT/TH	203	>50.0	F	8	220	>50.0	F	12	309	>50.0	F	27
Church Street SB RT	113	9.7	A	1	122	9.9	A	1	151	10.1	B	1
Weekday Evening:												
Boston Post Road EB LT/TH/RT	372	3.1	A	1	402	3.2	A	1	433	3.8	A	1
Boston Post Road WB LT/TH/RT	601	0.1	A	0	650	0.1	A	0	736	0.1	A	0
School Street NB LT/TH/RT	265	>50.0	F	38	287	>50.0	F	NC	302	>50.0	F	NC
Church Street SB LT/TH	219	>50.0	F	10	237	>50.0	F	14	280	>50.0	F	23
Church Street SB RT	386	>50.0	F	17	418	>50.0	F	24	433	>50.0	F	27

See notes at end of table.

Table 10 (Continued)
UNSIGNALIZED INTERSECTION LEVEL-OF-SERVICE AND VEHICLE QUEUE SUMMARY

	2016 Existing				2024 No-Build				2024 Build			
Unsignalized Intersection/Peak Hour/Movement	Demand[a]	Delay[b]	LOS[c]	Queue[d] 95th	Demand	Delay	LOS	Queue 95th	Demand	Delay	LOS	Queue 95th
Church Street at Conant Road and Town House Road												
Weekday Morning:												
Town House Road EB LT/TH/RT	34	21.3	C	1	36	24.3	C	1	36	31.1	D	1
Conant Road EB LT/TH/RT	238	13.7	B	2	279	15.1	C	3	286	19.6	C	4
Church Street NB LT/TH	543	1.2	A	0	588	1.2	A	0	617	1.2	A	1
Church Street SB TH/RT	104	0.0	A	0	113	0.0	A	0	221	0.0	A	0
Weekday Evening:												
Town House Road EB LT/TH/RT	24	17.0	C	1	26	18.6	C	1	26	22.3	C	1
Conant Road EB LT/TH/RT	111	16.0	C	1	120	17.8	C	2	122	21.0	C	2
Church Street NB LT/TH	295	5.4	A	1	319	5.6	A	1	433	5.6	A	1
Church Street SB TH/RT	506	0.0	A	0	548	0.0	A	0	604	0.0	A	0
Church Street at the Transfer Station Drive												
Weekday Morning:												
Transfer Station Drive WB LT/RT	21	13.6	B	1	21	14.3	B	1	21	14.9	B	1
Church Street NB TH/RT	458	0.0	A	0	495	0.0	A	0	525	0.0	A	0
Church Street SB LT/TH	86	1.5	A	0	92	1.5	A	0	100	1.5	A	0
Weekday Evening:												
Transfer Station Drive WB LT/RT	64	14.3	B	1	64	15.1	C	1	64	15.9	C	1
Church Street NB TH/RT	133	0.0	A	0	142	0.0	A	0	158	0.0	A	0
Church Street SB LT/TH	546	0.4	A	0	589	0.4	A	0	619	0.4	A	0
Route 117 at Church Street												
Weekday Morning:												
Route 117 EB TH	657	0.0	A	0	764	0.0	A	0	764	0.0	A	0
Route 117 EB RT	22	0.0	A	0	24	0.0	A	0	27	0.0	A	0
Route 117 WB LT/TH	302	2.0	A	1	349	2.0	A	1	354	2.1	A	1
Church Street NB LT	8	23.0	C	0	9	28.9	D	1	20	32.2	D	1
Church Street NB RT	450	>50.0	F	26	487	>50.0	F	38	506	>50.0	F	41
Weekday Evening:												
Route 117 EB TH	228	0.0	A	0	317	0.0	A	0	317	0.0	A	0
Route 117 EB RT	45	0.0	A	0	49	0.0	A	0	60	0.0	A	0
Route 117 WB LT/TH	1,371	3.5	A	2	1,574	3.7	A	3	1,593	3.8	A	3
Church Street NB LT	29	>50.0	F	6	31	>50.0	F	4	37	>50.0	F	5
Church Street NB RT	109	10.5	B	1	118	11.6	B	1	128	11.8	B	1

See notes at end of table.

Table 10 (Continued)
UNSIGNALIZED INTERSECTION LEVEL-OF-SERVICE AND VEHICLE QUEUE SUMMARY

Unsignalized Intersection/Peak Hour/Movement	2016 Existing				2024 No-Build				2024 Build			
	Demand[a]	Delay[b]	LOS[c]	Queue[d] 95th	Demand	Delay	LOS	Queue 95th	Demand	Delay	LOS	Queue 95th
Route 117 at Lexington Street												
Weekday Morning:												
Route 117 EB LT/TH	1,087	6.2	A	4	1,230	7.3	A	6	1,249	7.4	A	6
Route 117 WB TH/RT	540	0.0	A	0	611	0.0	A	0	615	0.0	A	0
Lexington Street SB LT/RT	89	>50.0	F	16	109	>50.0	F	18	109	>50.0	F	18
Weekday Evening:												
Route 117 EB LT/TH	339	1.8	A	1	437	1.8	A	1	447	1.8	A	1
Route 117 WB TH/RT	876	0.0	A	0	1,033	0.0	A	0	1,048	0.0	A	0
Lexington Street SB LT/RT	569	>50.0	F	51	633	>50.0	F	69	637	>50.0	F	70
Route 117 at Jones Road												
Weekday Morning:												
Route 117 EB TH/RT	657	0.0	A	0	771	0.0	A	0	786	0.0	A	0
Route 117 WB LT	174	10.1	B	1	188	10.9	B	1	188	11.1	B	1
Route 117 WB TH	590	0.0	A	0	666	0.0	A	0	670	0.0	A	0
Jones Road NB LT	6	>50.0	F	0	6	>50.0	F	0	6	>50.0	F	0
Jones Road NB RT	20	13.7	B	1	22	15.4	C	1	22	15.7	C	1
Weekday Evening:												
Route 117 EB TH/RT	436	0.0	A	0	544	0.0	A	0	552	0.0	A	0
Route 117 WB LT	24	8.4	A	0	26	8.8	A	0	26	8.9	A	0
Route 117 WB TH	835	0.0	A	0	989	0.0	A	0	1,004	0.0	A	0
Jones Road NB LT	31	38.7	E	1	34	39.5	E	1	34	40.5	E	1
Jones Road NB RT	231	17.9	C	3	250	25.9	D	5	250	26.6	D	6
Church Street at the Residential Project Site Roadway												
Weekday Morning:												
Project Site Roadway WB LT/RT	--	--	--	--	--	--	--	--	138	20.1	C	2
Church Street NB TH/RT	--	--	--	--	--	--	--	--	590	0.0	A	0
Church Street SB LT/TH	--	--	--	--	--	--	--	--	121	0.6	A	0
Weekday Evening:												
Project Site Roadway WB LT/RT	--	--	--	--	--	--	--	--	72	18.0	C	1
Church Street NB TH/RT	--	--	--	--	--	--	--	--	256	0.0	A	0
Church Street SB LT/TH	--	--	--	--	--	--	--	--	578	0.4	A	0

[a]Demand in vehicles per hour.
[b]Average control delay per vehicle (in seconds).
[c]Level-of-Service.
[d]Queue length in vehicles.
NB = northbound; SB = southbound; EB = eastbound; WB = westbound; LT = left-turning movements; TH = through movements; RT = right-turning movements.
NC = Not calculated.

Signalized Intersections

As can be seen in Table 9, with the exception of the Route 20/School Street intersection during the weekday evening peak-hour, the signalized study area intersections were shown to operate at an overall LOS D or better during both the weekday morning and evening peak hours with the addition of Project-related traffic. Project-related impacts at the signalized study area intersections were identified as follows:

Route 20/133 Boston Post Road – Overall operating conditions at this intersection were shown to degrade from LOS A to LOS D during the weekday morning peak-hour and from LOS B to LOS C during the weekday evening peak-hour with the addition of Project-related traffic. In addition, it was also noted that the LOS for the Route 20 eastbound movement degraded from LOS A to LOS E during the weekday morning peak-hour as a result of the additional traffic associated with the office component of the Project. Vehicle queues at the intersection were predicted to increase by up to 17 vehicles with the addition of Project-related traffic.

Route 20/School Street – Overall operating conditions at this intersection were shown to continue at LOS D during the weekday morning peak-hour and to degrade from LOS D to LOS E during the weekday evening peak-hour with the addition of Project-related traffic. It was noted that specific movements from Route 20 and School Street were identified to be operating at or over capacity (LOS E or F, respectively) independent of the Project. Vehicle queues at the intersection were predicted to increase by up to four (4) vehicles with the addition of Project-related traffic.

Route 117/Bear Hill Rod/Green Street – Overall operating conditions at this intersection were shown to be maintained at LOS C during the weekday morning peak-hour and at LOS D during the weekday evening peak-hour with the addition of Project-related traffic, with no change in LOS predicted to occur for any movement over No-Build conditions. Project-related impacts were identified as an increase in overall motorist delay of less than 1.0 seconds and in vehicle queuing of up to one (1) vehicle.

Unsignalized Intersections

As can be seen in Table 10, the majority of the movements at the unsignalized study area intersections were shown to operate at LOS D or better during the peak hours under all analysis conditions; however, side street movements along Route 20, Boston Post Road and Route 117 were identified to be operating at or over capacity independent of the Project as a result of the relatively large volume of conflicting traffic travelling along these roadways during the weekday commuter peak hours. Project-related impacts at the unsignalized study area intersections were identified as follows:

Route 20/Boston Post Road/Wellesley Street – No changes in LOS with a predicted increase in vehicle queuing of up to two (2) vehicles for those movements where a vehicle queue was reported. All movements from Wellesley Street and Boston Post Road were identified to be operating at LOS F during the peak hours with extended vehicle queueing independent of the Project.

Boston Post Road/School Street/Church Street – The LOS for the Church Street right-turn movement was predicted to degrade from LOS A to LOS B during the weekday morning peak-hour with the addition of Project-related traffic, with vehicle queues at the intersection shown to increase by up to 15 vehicles for those movements where a vehicle queue was reported. All movements from School Street and one or more movements from Church Street were identified

to be operating at LOS F during the peak hours with extended vehicle queueing independent of the Project.

Church Street/Conant Street/Townhouse Road – The LOS for the Townhouse Road approach was predicted to degrade from LOS C to LOS D during the weekday morning peak-hour with the addition of Project-related traffic, with vehicle queues at the intersection shown to increase by up to one (1) vehicle.

Church Street/Transfer Station Drive – No changes in LOS or vehicle queuing are predicted to occur as a result of the Project, with all movements shown to operate at LOS C or better during the peak hours with minimal vehicle queuing (up to one (1) vehicle).

Route 117/Church Street – No changes in LOS with a predicted increase in vehicle queuing of up to three (3) vehicles. Right-turn movements from Church Street during the weekday morning peak-hour and left-turn movements during the weekday evening peak-hour were identified to be operating at LOS F independent of the Project, with vehicle queues during the weekday morning peak-hour extending up to 38 vehicles (vehicle queues during the weekday evening peak-hour were minimal).

Route 117/Lexington Street - No changes in LOS with a predicted increase in vehicle queuing of up to one (1) vehicle. All movements from Lexington Street were identified to be operating at LOS F during the peak hours with extended vehicle queuing independent of the Project.

Route 117/Jones Road - No changes in LOS with a predicted increase in vehicle queuing of up to one (1) vehicle. All movements from Jones Road were identified to be operating at LOS E/F during the peak hours independent of the Project, with vehicle queues of up to five (5) vehicles.

Church Street/Residential Project Site Roadway - All movements at the intersection were shown to operate at LOS C or better during both peak hours with a predicted vehicle queue of up to two (2) vehicles exiting the Project site roadway that will serve the residential component of the Project.

SIGHT DISTANCE EVALUATION

Sight distance measurements were performed at the intersections of Route 20 at the driveway to 133 Boston Post Road and Church Street at the Project site roadway that will serve the residential component of the Project. These measurements were completed in accordance with MassDOT and American Association of State Highway and Transportation Officials (AASHTO)[14] requirements. Both stopping sight distance (SSD) and intersection sight distance (ISD) measurements were performed. In brief, SSD is the distance required by a vehicle traveling at the design speed of a roadway, on wet pavement, to stop prior to striking an object in its travel path. ISD or corner sight distance (CSD) is the sight distance required by a driver entering or crossing an intersecting roadway to perceive an on-coming vehicle and safely complete a turning or crossing maneuver with on-coming traffic. In accordance with AASHTO standards, if the measured ISD is at least equal to the required SSD value for the appropriate design speed, the intersection can operate in a safe manner. Table 11 presents the measured SSD and ISD at the subject intersections.

[14] *A Policy on Geometric Design of Highway and Streets*, 6th Edition; American Association of State Highway and Transportation Officials (AASHTO); Washington D.C.; 2011.

Table 11
SIGHT DISTANCE MEASUREMENTS[a]

Intersection/Sight Distance Measurement	Feet		
	Required Minimum (SSD)	Desirable (ISD)[b]	Measured
Route 20 at 133 Boston Post Road			
Stopping Sight Distance:			
Route 20 approaching from the east	360	--	379
Route 20 approaching from the west	360	--	475
Intersection Sight Distance:			
Looking to the east from 133 Boston Post Road	360	430/500	433
Looking to the west from 133 Boston Post Road	360	430/500	380
Church Street at the Residential Project Site Roadway			
Stopping Sight Distance:			
Church Street approaching from the north	250	--	344
Church Street approaching from the south	250	--	495
Intersection Sight Distance:			
Looking to the north from the Project Site Roadway	250	335/390	331
Looking to the south from the Project Site Roadway	250	335/390	500+

[a]Recommended minimum values obtained from *A Policy on Geometric Design of Highways and Streets*, 6th Edition; American Association of State Highway and Transportation Officials (AASHTO); 2011; and based on a 45 mph approach speed on Route 20 and a 35 mph approach speed on Church Street.

[b]Values shown are the intersection sight distance for a vehicle turning right/left exiting a roadway under STOP control such that motorists approaching the intersection on the major street should not need to adjust their travel speed to less than 70 percent of their initial approach speed.

As can be seen in Table 12, the available sight lines at the intersections of Route 20 at the driveway to 133 Boston Post Road and Church Street at the Project site roadway that will serve the residential component of the Project current exceed the recommended minimum sight distance requirements for safe operation (SSD) based on a 45 mph approach speed along Route 20 and a 35 mph approach speed along Church Street, both of which exceed the posted speed limit on these roadways in the vicinity of the subject intersections and are slightly above the average measured 85th percentile vehicle travel speeds on these roadways.

CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS

VAI has completed a detailed assessment of the potential impacts on the transportation infrastructure associated with the proposed Weston Quarry mixed-use development to be located at 133 Boston Post Road (Route 20) in Weston, Massachusetts. The following specific areas have been evaluated as they relate to the Project: i) access requirements; ii) potential off-site improvements; and iii) safety considerations; under existing and future conditions, both with and without the Project. Based on this assessment, we have concluded the following with respect to the Project:

1. Using trip-generation statistics published by the ITE,[15] the Project is predicted to generate approximately 4,848 vehicle trips on an average weekday (two-way, 24-hour volume), with approximately 571 vehicle trips expected during the weekday morning peak-hour and 565 vehicle trips expected during the weekday evening peak-hour;

2. The Project will not have a significant impact (increase) on motorist delays or vehicle queuing over Existing or anticipated future conditions without the Project (No-Build conditions), with the majority of the movements at the study intersections shown to continue to operate at LOS D or better with the addition of Project-related traffic, where an LOS "D" or better is considered to represent "acceptable" traffic operations;

3. Side street movements at the unsignalized intersections along Route 20, Boston Post Road and Route 117 were identified to be operating at or over capacity independent of the Project as a result of the relatively large volume of conflicting traffic on these roadways during the weekday commuter peak-hours;

4. With the exception of the Route 20/Boston Post Road/Wellesley Street and Boston Post Road/School Street/Church Street intersections, no apparent safety deficiencies were noted with respect to the motor vehicle crash history at the study intersections. The Route 20/Boston Post Road/Wellesley Street and Boston Post Road/School Street/ Church Street intersections were identified as having a motor vehicle crash rate that exceeds the MassDOT average crash rate for an unsignalized intersection, with the Route 20/Boston Post Road/Wellesley Street intersection also identified as a as a high

[15] Ibid 1.

crash cluster location for 2012-2014. Specific safety-related improvements have been identified for these intersections that will be undertaken in conjunction with the Project (discussion follows); and

5. Lines of sight to and from the ways that will provide access to the Project site from Route 20 (office component) and Church Street (residential component) were found to exceed the required minimum distance for the intersections to function in a safe manner based on the appropriate approach speed along these roadways.

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

RECOMMENDATIONS

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

Project Access

Access to the Project will be provided as follows: for the office component, access will be provided by way of the existing driveway that serves 133 Boston Post Road and intersects the north side of Route 20 under traffic signal control. For the residential component, access will be provided by way of a new roadway that will intersect the east side of Church Street. The following recommendations are offered with respect to the design and operation of the ways that serve the Project site:

- The access roadways, driveways and internal circulating ways serving the Project site should be a minimum of 24-feet in width for two-way travel and a minimum of 20-feet in width for one-way operation, or as required to accommodate fire truck turning maneuvers pursuant to the requirements of NFPA® 1.[16]

- Fire lanes should be a minimum of 20-feet in width and constructed of bituminous asphaltic concrete or other stabilized surface material that can support travel by the largest anticipated responding emergency vehicle pursuant to the requirements of NFPA® 1.

- Vehicles exiting the Project site to Church Street should be placed under STOP-sign control with marked STOP-lines provided, with the existing traffic control signal retained at the Route 20/133 Boston Post Road intersection.

- All signs and pavement markings to be installed within the Project shall conform to the applicable standards of the *Manual on Uniform Traffic Control Devices* (MUTCD).[17]

[16]Ibid 2.
[17]Ibid 3.

- Sidewalks should be provided within the Project site linking the proposed buildings and other amenities, and should include a connection to the location of the proposed MBTA Commuter Rail Station.

- Marked crosswalks with Americans with Disabilities Act (ADA) compliant wheelchair ramps should be provided at all pedestrian crossings.

- Signs and landscaping located within intersection sight triangle areas of the ways serving the Project site should be designed and maintained so as not to restrict lines of sight.

- Snow windrows within the sight triangle areas of the ways serving the Project site should be promptly removed where such accumulations would exceed 2.5 feet in height.

- A school bus waiting area should be provided at an appropriate location within the residential component of the Project defined in consultation with the Town.

Off-Site

Route 20 at 133 Boston Post Road

The addition of Project-related traffic to the signalized intersection of Route 20 at the driveway to 133 Boston Post Road was shown to result in a degradation in overall operating conditions during both the weekday morning (LOS A to LOS D) and evening (LOS B to LOS C) peak hours over 2024 No-Build conditions, with the Route 20 eastbound movement predicted to operate at its design capacity (defined as LOS "E") during the weekday morning peak-hour. In order to off-set the impact of the Project and improve operating conditions at the intersection, the Proponent will design and implement an optimal traffic signal timing and phasing plan. As can be seen in Table 12, with the implementation of these improvements, all movements at the intersection were shown to operate at LOS D or better during the peak hours.

Route 20 at School Street

The addition of Project-related traffic to the signalized intersection of Route 20 at School Street was shown to result in a degradation in overall operating conditions during the weekday evening peak-hour (LOS D to LOS E), with individual movements at the intersection identified to be operating at or over capacity (defined as LOS "E" or "F", respectively) independent of the Project. The Town of Weston identified the need for geometric improvements at this intersection in conjunction with the *Intersection Improvement Study* that was completed in 2013.[18] The identified improvements included the following measures:

- Widen the Route 20 approaches to provide a left-turn/through travel lane, a through travel lane and a right turn lane in the eastbound direction, and a left-turn/through travel lane and a through/right-turn lane in the westbound direction.
- Widen the School Street northbound approach to provide a left-turn lane and a through/right-turn lane.
- Prohibit left-turn movements from the School Street southbound approach.
- Replace the existing traffic signal system to accommodate the proposed intersection geometry.

[18]Ibid 4.

In order to advance the identified improvements, the Proponent will undertake the following improvements at the Route 20/School Street intersection:

1. Design and implement an optimal traffic signaling timing and phasing plan, including the upgrade or replacement of traffic signal equipment as may be necessary to implement the improvements and/or to comply with current ADA and safety standards; and
2. Prepare a Functional Design Report (FDR) and accompanying MassDOT 25 Percent Design Plans for the intersection improvements identified as a part of the 2013 study undertaken by the Town (intersection improvement Alternative 3 defined above).

The Proponent will complete the aforementioned improvements prior to the issuance of the first Certificate of Occupancy for the Project. The FDR and MassDOT 25 Percent Design Plans will be provided to the Town for use in obtaining state funding for the construction of the improvements. As can be seen in Table 12, with implementation of the traffic signal timing and phasing improvements, overall intersection operations were shown to improve to LOS D during both the weekday morning and evening peak-hours.

Route 20 at Wellesley Street and Boston Post Road

The Boston Post Road and Wellesley Street approaches to Route 20 were identified to be operating with excessive delay (LOS F) during both the weekday morning and evening peak hours independent of the Project as a result of the large volume of conflicting traffic travelling along Route 20 during these periods. In addition, this intersection was found to have a motor vehicle crash rate that exceeds the MassDOT average crash rate for an unsignalized intersection and was also identified by MassDOT as a high crash cluster location for 2012-2014. Recognizing these conditions, this intersection was included as a part of the 2013 *Intersection Improvement Study* that was undertaken by the Town, which identified the following improvements for the intersection:

- Reconstruct the intersection to provide a traditional four-way intersection with Windsor Way intersecting Wellesley Street south of Route 20.
- Widen Route 20 to provide two travel lanes approaching the intersection with a left-turn lane provided in the westbound direction and channelized right-turn lanes provided on both approaches.
- Modify the Boston Post Road approach to provide two travel lanes and to reduce the radius of the channelized right-turn lane.
- Modify the Wellesley Street approach to provide a left-turn/through travel lane and a channelized right-turn lane.
- Monitor the reconstructed intersection to determine if and when the installation of a traffic control signal is warranted.

In an effort to advance the identified improvements at this location that are warranted as a result of existing conditions unrelated to the Project, the Proponent will: i) facilitate the completion of a Road Safety Audit (RSA) in order to identify both short-term and long-term improvements for this intersection; ii) provide detailed design plans up to and including the MassDOT 100 Percent Design/PS&E Submission for the identified short-term improvements; and iii) provide funding toward the implementation of the short-term improvements identified in conjunction with the RSA. The RSA and FDR/MassDOT 25 Percent Design Submission for the identified short-term

improvements will be completed prior to the issuance of the first Certificate of Occupancy for the Project.

Boston Post Road at School Street and Church Street

One or more movements from School Street and Church Street approaching Boston Post Road were identified to be operating with excessive delay (LOS F) during both the weekday morning and evening peak hours independent of the Project as a result of the large volume of conflicting traffic travelling along Boston Post Road during these periods. In addition, this intersection was found to have a motor vehicle crash rate that exceeds the MassDOT average crash rate for an unsignalized intersection. Recognizing these conditions, this intersection was included as a part of the 2013 *Intersection Improvement Study* that was undertaken by the Town, which identified the following improvements for the intersection:

- Modify the Church Street approach to provide separate left and right-turn lanes.
- Remove the channelized right-turn lane from Church Street to Boston Post Road westbound.
- Provide a left-turn lane on the Boston Post Road eastbound approach.

In an effort to advance the identified improvements at this location that are warranted as a result of existing conditions unrelated to the Project, the Proponent will: i) facilitate the completion of an RSA in order to identify both short-term and long-term improvements for the intersection; ii) provide detailed design plans for the identified improvements; and iii) provide funding toward the construction of the improvements. The RSA and design plans for the identified improvements will be completed prior to the issuance of the first Certificate of Occupancy for the Project.

Route 117 at Church Street

Operating conditions for the right-turn movement during the weekday morning peak-hour and the left-turn movement during the weekday evening peak-hour from the Church Street approach to Route 117 were shown to operate over their design capacity (LOS "F") independent of the Project as a result of the relatively large volume of conflicting traffic travelling along Route 117. In an effort to advance improvements at this intersection, Proponent will conduct a detailed Traffic Signal Warrants Analysis (TSWA) for the intersection in accordance with the methodology established in the MUTCD.[19] Should it be determined that the intersection meets the necessary criteria to justify the installation of a traffic control signal and if requested by the Town, the Proponent will prepare conceptual improvement plans depicting the modifications to the intersection necessary to support the installation of a traffic signal. As an interim improvement measure, the Proponent will restripe the Route 117 westbound approach to provide a left-turn lane while maintaining one through travel lane per direction. The TSWA and restriping of the Route 117 westbound approach will be completed prior to the issuance of the first Certificate of Occupancy for the Project.

[19] Ibid 3.

Route 117 at Lexington Street

Operating conditions for all movements from the Lexington Street approach to Route 117 were shown to operate over their design capacity (LOS "F") independent of the Project as a result of the relatively large volume of conflicting traffic travelling along Route 117. Project-related traffic volume increases along Lexington Street are anticipated to range from six (6) to seven (7) vehicles during the peak hours. In an effort to improve operating conditions at this intersection and recognizing the relatively minor impact of the Project on the critical movements, the Proponent will restripe the Route 117 eastbound approach to provide a left-turn lane and the Lexington Street approach to provide separate left and right-turn lanes. The improvements to Lexington Street may require the modification or removal of the raised island approaching Route 117.

In addition, the Proponent will conduct a detailed TSWA for the intersection in accordance with the methodology established in the MUTCD. Should it be determined that the intersection meets the necessary criteria to justify the installation of a traffic control signal and if requested by the Town, the Proponent will prepare conceptual improvement plans depicting the modifications to the intersection necessary to support the installation of a traffic signal.

Transportation Demand Management

The Project site is ideally situated to take advantage of available public transportation opportunities, including the future MBTA Commuter Rail station that will be incorporated into the Project. In an effort to encourage the use of alternative modes of transportation to single-occupant vehicles, the following Transportation Demand Management (TDM) measures will be implemented as a part of the Project:

- The property manager will employ a Transportation Coordinator for the Project, which employee will be full-time and may have other duties and responsibilities;
- The property manager, acting on behalf of the residents and tenants of the Project, will join the Route 128 Business Council Transportation Management Association (TMA) and will become a MassRIDES employer partner to facilitate and encourage healthy transportation options for employees and residents of the Project, and to coordinate a carpool/vanpool matching program;
- Information regarding public transportation services, maps, schedules and fare information will be posted in a central location within each building and/or otherwise made available to residents and employees;
- A "welcome packet" will be provided to new residents and employees detailing available public transportation services, bicycle and walking alternatives, and commuter options available through MassRIDES' and their NuRide program which rewards individuals that choose to walk, bicycle, carpool, vanpool or that use public transportation to travel to and from work;
- Residents and employees will be made aware of the Emergency Ride Home (ERH) program available through the Route 128 Business Council and MassRIDES, which reimburses employees of a participating worksite that is registered for ERH and that carpool, take transit, bicycle, walk or vanpool to work;

- A minimum of five (5) carpool/vanpool parking spaces will be provided on-site;
- A minimum of four (4) electrical vehicle (EV) charging stations will be provided on-site with sufficient infrastructure capacity provided to accommodate future expansion to a minimum of 10 EV spaces;
- A minimum of four (4) spaces will be designated for carsharing (ZipCar or similar) or alternatively fueled vehicles;
- Pedestrian accommodations will be incorporated within the Project site consisting of sidewalks and pedestrian paths linking buildings and parking to on-site amenities and the future Commuter Rail Station;
- A mail drop will be provided in a central location within each building; and
- Secure bicycle parking will be provided, including both exterior bicycle racks conveniently located throughout the Project site and weather protected bicycle parking in a secure area.

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

Table 12
MITIGATED SIGNALIZED INTERSECTION LEVEL-OF-SERVICE AND VEHICLE QUEUE SUMMARY

Signalized Intersection/Peak-hour/Movement	2024 No-Build V/C[a]	Delay[b]	LOS[c]	Queue[d] 50th/95th	2024 Build V/C	Delay	LOS	Queue 50th/95th	2024 Build with Mitigation V/C	Delay	LOS	Queue 50th/95th
Route 20 at 133 Boston Post Road												
Weekday Morning:												
Route 20 EB LT/TH	0.72	4.5	A	6/8	1.12	72.8	E	15/25	0.99	26.6	C	15/17
Route 20 WB TH/RT	0.59	12.2	B	7/10	0.66	12.8	B	10/13	0.90	31.2	C	14/20
133 Boston Post Road SB LT/RT	0.09	32.3	C	1/2	0.24	32.4	C	1/2	0.25	31.4	C	1/2
Overall	--	**7.5**	**A**	--	--	**49.2**	**D**	--	--	**28.4**	**C**	--
Weekday Evening:												
Route 20 EB LT/TH	0.50	7.1	A	6/9	0.68	12.2	B	8/10	0.65	10.9	B	8/10
Route 20 WB TH/RT	0.81	19.4	B	15/22	0.95	34.4	C	25/33	0.91	28.0	C	24/29
133 Boston Post Road SB LT/RT	0.64	33.6	C	5/6	0.81	41.0	D	9/12	0.85	46.5	D	9/12
Overall	--	**16.9**	**B**	--	--	**28.4**	**C**	--	--	**26.1**	**C**	--
Route 20 at School Street												
Weekday Morning:												
Route 20 EB LT/TH	0.96	60.5	D	17/34	1.04	70.8	E	20/38	1.04	70.8	E	20/38
Route 20 EB RT	0.32	12.0	B	2/5	0.32	12.0	B	2/5	0.32	12.0	B	2/5
Route 20 WB LT/TH/RT	0.53	24.2	C	5/9	0.53	24.4	C	5/10	0.53	24.4	C	5/10
School Street NB LT/TH/RT	0.76	34.5	C	8/18	0.77	35.6	D	8/19	0.77	35.6	D	8/19
School Street SB LT/TH/RT	1.02	72.2	D	13/30	1.05	79.0	E	14/31	1.05	79.0	E	14/31
Overall	--	**44.4**	**C**	--	--	**52.2**	**D**	--	--	**52.2**	**D**	--
Weekday Evening:												
Route 20 EB LT/TH	0.83	30.1	C	12/58	0.85	32.0	C	13/39	0.95	46.5	D	15/40
Route 20 EB RT	0.23	8.6	A	1/4	0.23	8.8	A	1/4	0.25	9.8	A	1/4
Route 20 WB LT/TH/RT	0.67	23.0	B	5/16	0.74	25.7	C	6/18	0.91	40.1	D	7/20
School Street NB LT/TH/RT	1.31	>80.0	F	12/25	1.33	>80.0	F	12/26	1.09	>80.0	F	11/24
School Street SB LT/TH/RT	0.79	35.0	C	8/17	0.80	35.7	D	9/18	0.70	27.8	C	8/17
Overall	--	**53.5**	**D**	--	--	**56.2**	**E**	--	--	**47.1**	**D**	--

[a]Volume-to-capacity ratio.
[b]Percentile delay per vehicle in seconds.
[c]Level-of-Service.
[d]Queue length in vehicles.
NB = northbound; SB = southbound; EB = eastbound; WB = westbound; LT = left-turning movements; TH = through movements; RT = right-turning movements.