Memorandum

To: Town of Sudbury Zoning Board of Appeals

Date: March 1, 2016

Project #: 13125.00

From: Vinod Kalikiri, PE, PTOE

Re: Avalon Sudbury
526-528 Boston Post Road, Sudbury, MA
Traffic Memorandum

On behalf of Sudbury Avalon, Inc. (the "Applicant"), VHB has prepared this traffic memorandum in support of the *Avalon Sudbury* apartment development proposed to be located at 526-528 Boston Post Road in Sudbury, Massachusetts. The residential development will be located on approximately 18 acres of land located at the northwestern corner of a 50-acre parcel that will be redeveloped as a mixed use development (the "Site").

This memorandum is provided to support the Zoning Board of Appeal's review of the *Avalon Sudbury* apartment development for the issuance of a Comprehensive Permit pursuant to MGL Chapter 40B, Sections 20-23. It is noted that VHB has prepared and submitted to the Town of Sudbury a comprehensive Traffic Impact and Access Study (TIAS) dated February 16, 2016 that covers the analysis of impacts associated with the entire mixed-use development. The TIAS incorporates revisions based on the Town's peer review comments. The information included herein serves as a summary of the excerpts from the TIAS that are relevant to the review of the *Avalon Sudbury* apartment development.

Context of Overall Development

The Site is currently occupied by a Raytheon facility that includes a mix of office and research and development space, supported by approximately 2,040 parking spaces. As part of the overall redevelopment, all existing buildings on the Site (with the exception of approximately 15,000± square foot (sf) of ancillary R&D space) would be eventually demolished and a new mixed-use development would be constructed in multiple construction phases. The overall Project described in TIAS consists of the following new development components:

- 80,000± sf of mixed retail use (including a 45,000± sf grocery store);
- A residential development with 250 apartment units (**the subject of this memorandum)**;
- An active adult (age-restricted) residential development with up to 60 housing units; and,
- An assisted living/memory care facility with up to 54 beds.

Trip Generation

The Site currently houses a 563,300± sf office/R&D complex, which consists of office space (421,300± sf), research & development space (112,000± sf) and manufacturing facilities (28,000± sf) in multiple buildings. Raytheon has begun their relocation process and will be winding down their operations at the Site over the next two years. If Raytheon were to vacate the Site entirely and the Proponent were not to construct the proposed mixed-use Project, other office/R&D tenant(s) would be identified to move in and use the entire 563,300± sf space and 2,040± parking spaces that currently exist on the Site. To estimate the effect of such a reuse of the Site, Institute of Transportation Engineers (ITE) *Trip Generation*[1] guidelines were used to calculate the number of vehicle trips that would be generated by a new

[1] Trip Generation Handbook*; 9th Edition* Institute of Transportation Engineers; Washington, DC; 2009.

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re-use tenant. Specifically, ITE Land Use Code (LUC) 710 (General Office Building), ITE LUC 760 (R&D) and LUC 140 (Manufacturing) were used in calculating the trip generation potential of the existing buildings on the Site.

For comparison, the TIAS submitted to the Town also included future conditions daily trip generation estimates using following ITE land use codes.

- Mixed-use retail: ITE LUC 820 (Shopping Center)
- Apartments: ITE LUC 220 (Apartments)
- Active adult residential use: ITE LUC 252 (Senior Adult Housing – Attached)
- Memory care/Assisted living use: ITE LUC 254 (Assisted Living)

The daily trip comparison is summarized in Table 1. Detailed calculations are included in the TIAS.

Table 1: Daily Trip Generation Comparison

	Existing Development on the Site			Future Full Build-out				Increase
Movement	Office Space	R&D	Manufacturing	Mixed-Retail	Avalon Sudbury	Age-restricted Housing	Assisted Living	(Future – Existing)
ITE LUC	*710*	*760*	*140*	*820*	*220*	*252*	*254*	
Size	*421.3 ksf*	*112 ksf*	*28,000 sf*	*80 ksf*	*250 Units*	*60 Units*	*54 Beds*	
Enter	1,960	550	45	2,940	820	100	100	**+ 1,405**
Exit	1,960	550	45	2,940	820	100	100	**+ 1,405**
Total	3,920	1,100	90	5,880	1,640	200	200	**+ 2,810**

Note: All numbers in the table represent "vehicle trips per day"

As shown in Table 1, the daily trip generation for the *Avalon Sudbury* apartment development is a small component (*21-percent*) of the overall future build-out. Additionally, the *Avalon Sudbury* residential trips represent only *36-percent* of the total daily trip generation of the existing buildings on the Site.

Table 2 provides a similar comparison of the *gross* peak hour trip generation. The calculation methodology for the peak hour trip calculation is discussed in detail in the TIAS. For ease of reference, and to understand the contribution of the *Avalon Sudbury* apartment development to the overall peak hour trip generation, Table 2 separates out the apartment trip generation in a separate column. It is noted that the numbers presented in Table 2 do not reflect the effect of trip reduction characteristics that are inherent to mixed-use developments and are hence referred to as *gross trips*. Application of the adjustment factors further reduces the overall trip generation for the Project as discussed in the TIAS.

Table 2: Peak Hour Trip Generation Comparison (Gross Trips)

Movement	Existing Development on the Site	Future Full Build-Out [a]	Avalon Sudbury [b]
Morning Peak Hour			
Enter	665	155	25
Exit	100	185	100
Total	765	340	125
Evening Peak Hour			
Enter	125	350	100
Exit	585	325	55
Total	710	675	155
Saturday Midday Peak Hour			
Enter	100	435	100
Exit	85	395	55
Total	185	830	155

Note: All numbers in the table represent "vehicle trips per hour"
a Represents *gross* trips as they do not reflect adjustments for shared trips between uses and pass-by trip reductions associated with retail uses
b Represents *gross* trips as they do not reflect adjustments for shared trips between uses

Table 2 indicates that even before accounting for the efficiency between the uses in the mixed-use development in the form of internal capture or shared trips, the *Avalon Sudbury* trips represent a small percentage of both the weekday peak hour trip generation for the existing buildings on the Site as well as the overall future build-out. Additional calculations showing the beneficial effect of the internal capture or shared trips and the trip distribution analysis for the residential uses are included in the TIAS.

Signal Warrant Analysis

A traffic signal Warrant analysis was conducted to determine if the projected traffic volumes for the *Avalon Sudbury* apartment development utilizing the primary Site drive at its intersection with Boston Post Road would exceed the thresholds for the installation of a traffic signal at the location.

The Manual on Uniform Traffic Control Devices[2] (MUTCD) is the established standard for Warrant analyses. The Warrants consider the roadway geometry, traffic volume entering the intersection, and speeds. Specifically, the traffic projections were evaluated for following three volume-based Warrants.

2 Manual on Uniform Traffic Control Devices, Federal Highway Administration, Washington DC

Warrant 1 (Eight Hour Vehicular Volume) – Warrant 1 is based on any eight hours of a day where the traffic entering the intersection reaches a threshold that warrants considering signal control.

Warrant 2 (Four Hour Vehicular Volume) – Warrant 2 is for any four hours of a day.

Warrant 3 (Peak Hour) – Warrant 3 is for the peak hour of any given day.

The traffic signal Warrant analysis indicates that the *Avalon Sudbury* apartment development, by itself, does not exceed the thresholds for the installation of a traffic signal at the primary Site driveway's intersection with Boston Post Road. i.e., if the *Avalon Sudbury* apartment development was the only component of the overall redevelopment plan that is constructed, the residential traffic would rely on unsignalized driveway connections to Boston Post Road and no traffic mitigation would be necessary. Details of the Warrant analyses are included in the TIAS.

Proposed Transportation Improvements for the Overall Development

The foregoing trip generation comparison and signal warrant analysis finding indicates that the *Avalon Sudbury* apartment development, in and of itself, does not trigger the need for any significant transportation improvements when compared to the re-use of the existing buildings on the Site by an office/R&D tenant. However, when considered in the context of the overall mixed-use development, the relatively limited traffic impact of the residential use can be mitigated by the implementation of the following significant roadway, traffic control, and multi-modal transportation improvements as part of the overall development. These improvements benefit both the Site traffic as well as the traffic on Boston Post Road that is unrelated to the development. Specifics of each of the improvement measures is included in the TIAS.

- Construction of a new traffic signal on Boston Post Road by aligning the primary Site driveway with the westerly driveway for Sudbury Plaza and Highland Avenue (a private way). This would also include the construction of designated left turn lanes on Boston Post Road, a new actuated pedestrian crosswalk and bicycle accommodations at the intersection; in addition to the Project, these improvements will also benefit the retail plaza and the residents of Highland Avenue on the south side of Boston Post Road;
- Improved safety through the elimination of traffic control by a police officer at the primary Site driveway during the weekday evening peak hour;
- Improved pedestrian accommodations by widening the existing sidewalk on the north side of Boston Post Road along the Site frontage and extending the limits of the existing sidewalk on the south side of Boston Post Road;
- Implementation of a time-based coordinated signal system between the new signalized Site driveway, Nobscot Road and Union Avenue intersections on Boston Post Road to better manage vehicular queues and improve progression of through traffic at multiple intersections;
- Construction of a new emergency preemption signal at the fire station located along the Site frontage and integration of the signal into the new traffic signal at the primary Site driveway;
- Subject of right-of-way availability, addition of five-foot paved shoulders (which could become part of future bike lanes) on either side of Boston Post Road within the limits of the roadway improvements; and,
- Implementation of a robust Traffic Demand Management (TDM) program, underpinned by a significant investment in on-site circulation enhancements.