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Barney Heath
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PUBLIC HEARING/WORKING SESSION V MEMORANDUM

DATE: April 5, 2019

MEETING DATE: April 9, 2019

TO: Land Use Committee of the City Council

FROM: Barney Heath, Director of Planning and Development
Jennifer Caira, Chief Planner for Current Planning
Michael Gleba, Senior Planner

CC: Petitioner

In response to questions raised at the City Council public hearing, the Planning Department is providing the following information for the upcoming public hearing/working session. This information is supplemental to staff analysis previously provided at the Land Use Committee public hearing.

PETITIONS #425-18 & #426-18 156 Oak St., 275-281 Needham St. &., 55 Tower Rd.

Petition #425-18- for a change of zone to BUSINESS USE 4 for land located at 156 Oak Street (Section 51 Block 28 Lot 5A), 275-281 Needham Street (Section 51, Block 28, Lot 6) and 55 Tower Road (Section 51 Block 28 Lot 5), currently zoned MU1

Petition #426-18- for SPECIAL PERMIT/SITE PLAN APPROVAL to allow a mixed-use development greater than 20,000 sq. ft. with building heights of up to 96' consisting of 822 residential units, with ground floor residential units, with restaurants with more than 50 seats, for-profit schools and educational uses, stand-alone ATMs drive-in businesses, open air businesses, hotels, accessory multi-level parking facilities, non-accessory single-level parking facilities, non-accessory multi-level parking facilities, places of amusement, radio or TV broadcasting studios, and lab and research facilities, to allow a waiver of 1,600 parking stalls, to allow a reduction in the overall parking requirement to not less than 1900 stalls, to waive dimensional requirements for parking stalls, to waive end stall maneuvering requirements, to allow driveway entrances and exits in excess of 25', to waive perimeter landscaping requirements, to waive interior landscaping requirements, to waive lighting requirements for parking lots, to waive general lighting, surfacing and maintenance requirements, to waive off-street loading facilities requirements, to waive sign requirements relative to number, size, location or design, to waive the number of signs allowed.

The Land Use Committee (the "Committee") held a public hearing on September 25, 2018 and working sessions on November 13, 2018, December 11, 2018, January 15, 2019 and March 12, 2019 on these petitions. This memo reflects additional information received by the Planning Department as of **April 3, 2019**. A current schedule of meetings on these petitions is also attached **(Attachment A)**.

EXECUTIVE SUMMARY

The petitioner has submitted numerous revisions to the Northland Newton development project, primarily focused on the site design of the project, a reduction in the parking spaces, and a reduction to the number of residential units and retail space. While the change to the program has resulted in a reduction to the traffic impacts of the project, the project will still result in additional traffic overall. The petitioner has previously provided forecast estimates of the number of trips that could be shifted from driving to transit or walking or biking. While the lack of nearby, frequent transit service presents a challenge to reducing vehicular trips, research has shown that dramatic shifts in mode split (the percentage of trips happening by vehicle, transit, walking or biking) can be accomplished through a variety of tools. Planning has concerns with the effectiveness of the petitioner's shuttle proposal as submitted, however staff recommends that the petitioner be held to a performance standard based on the mode split submitted by the petitioner and be given flexibility in how that goal is met. It is important that the performance of the system be closely monitored, particularly at the early stages of the development, and adjusted as necessary.

Project Update

This memorandum is focused on the revised materials related to transportation and traffic aspects of the proposed project. Transportation and traffic related issues were initially discussed at the Land Use Committee's January 15, 2019 hearing. As has been discussed in previous Planning Department memoranda and at intervening hearings, the petitioner subsequently submitted information about possible plan revisions for review by the Planning Department, its peer reviewers and the Land Use Committee. The proposed modifications include:

- reducing the number of residential units from 822 to 800;
- reducing the retail space from 237,000 square feet to 115,000 square feet;
- relocating parking for Buildings 5 and 6, below grade allowing the massing of those buildings to be redesigned as several smaller, individual buildings separated at grade by so-called "laneways," a change that also creates additional open space within these blocks and opportunities for circulation;
- reducing the size of Building 4 and its associated surface parking lot;
- reducing the total number of parking spaces from 1,953 to 1,595;
- relocating the "Mobility Hub" to the center of Building 7;
- eliminating the previously proposed parking and general vehicle access along the perimeter of Village Green, increasing the size of that open space.

The petitioner has also submitted additional information about possible changes (discussed below) to the number of parking stalls and the privately-operated shuttle system it proposes to operate to provide the development with a form of transit service. The Planning Department notes that the petitioner has yet to formally submit revised plans reflecting these modifications.

Traffic

The petitioner submitted updated project trip generation based upon the reduction in the number of units and commercial space (**Attachment B**). Given the reduction in retail the reduction in trips was most significant during the Weekday Midday and Saturday Midday peaks. As shown in the response memo from BETA, dated April 3, 2019 (**Attachment C**) there are still outstanding questions and additional information needed regarding the trip generation. These numbers are important as they factor into Planning's recommendation for structuring the Transportation Demand Management goals and monitoring program.

As noted in the Planning Department's previous transportation-focused memo, the petitioner's traffic studies and BETA's peer review indicate that the proposed development would impact movements to varying degrees at a number of intersections along the Needham Street corridor and other areas in the vicinity during the Weekday AM and PM peak hours and/or the Saturday Midday peak hour; project-generated traffic will also impact intersections during the Weekday Midday peak hour.

In some cases, the Level of Service (LOS) at given intersections will degrade (e.g., from LOS B to LOS C or LOS E to LOS F); in other cases, intersections that already function at LOS F will degrade further, with some delays lasting more than 120 seconds. Additional detail is provided in the attached documents submitted by the petitioner and the Department's peer reviewer.

Parking

As originally designed, the project required 3,409 parking spaces per the Newton Zoning Ordinance (NZO) and the petitioner sought waivers to reduce the number of required spaces by 1,456 for a total of 1,953 which would have provided a ratio of 1.0 parking spaces per residential unit (consistent with MBTA and MassDOT transit-oriented development (TOD) guideline of 0.75-1.0 spaces per unit), with the balance of stalls to be used for the other uses on the site.

In response to a recommendation that it provide details of how the development's "shared parking" would be operated and managed, the petitioner submitted a memorandum (**Attachment D**) addressing that and other aspects of the project's parking facilities. Reflecting the proposed reduction in the number of residential units and commercial space, the document stated that the new mix of uses would require 2,961 parking stalls per the NZO. Given a proposed further reduction in parking stalls to 1,550, the project would now require the waiver of 1,411 required stalls. The petitioner's analysis shows that parking demand peaks in December at 1,596 stalls. The petitioner proposes 1,550 stalls but states that during the peak holiday season spaces otherwise dedicated to residents would be shared with the retail uses. The remainder of the year residential parking would be separate and office, retail, restaurant, and any other commercial uses would share parking.

In its review of that memo **(Attachment C),** BETA agreed that the provision of 800 residential parking

stalls would meet the MBTA/MassDOT TOD guidelines of 1.0 space/unit. Regarding the other uses and the remaining 750 stalls:

- the 149 retail stalls (3 per thousand square feet) meets the guideline of 1.5-3.0 per thousand square feet of retail space;
- the relatively few spaces for the medical office and health club uses exceed the guidelines (3.4 and 3.8 per thousand square feet, respectively) but not significantly;
- although the 298 spaces for office parking (1.7 spaces per thousand square feet) would meet the applicable guideline (1.0-2.5 spaces per thousand square feet), that number might nonetheless be a little low, especially if many office employees were to not use transit;
- the combined weekday demand for the commercial (office and retail) use is 796 spaces which results in a demand of 2.7 vehicles per thousand square feet. This means that if there are more spaces for retail uses these can be used by the office workers.
- The 245 restaurant spaces (6 per thousand square feet) exceed the retail guideline of 1.5-3.0 per thousand square feet. However, that guideline is not restaurant-specific, and this ratio might be acceptable when seen in conjunction with the office parking, especially as those uses likely peak respectively at different times.

Overall, BETA indicated the proposed 1,550 spaces is "in the ball park" though it falls short of the peak demand. Also, BETA recommended that the petitioner provide shared-parking calculations by hour for December for both weekday and weekend to further sharpen the analysis. Planning staff agrees that the number of stalls appears reasonable. The number should not be entirely based upon the peak which will only occur during one month of the year, and the number could possibly be reduced further. A significant reduction runs the risk of impacting the success of the commercial uses or pushing people to rely on Transportation Network Companies (TNCs, i.e. Uber and Lyft), which has the potential to increase the number of trips to and from the site. More importantly the petitioner will need to provide attractive alternatives to driving and financially incentive those as necessary and financially disincentive driving and parking in order to reduce the number of trips during the peak hour.

Oak Street Access

In response to questions from the Committee at the January hearing on transportation, BETA has analyzed alternatives to the Oak Street access proposed by the petitioner (**Attachment F**). BETA studied four alternatives:

- Alternative 1: No Access/Egress at Oak Street
- Alternative 2: Exit Only from site onto Oak Street
- Alternative 3: Entrance Only from Oak Street into site
- Alternative 4: No Left Turns allowed to exit site driveway onto Oak Street

As described in the BETA memo, the Needham Street/Oak Street/Christina Drive intersection would be the most impacted as a result of the four alternatives studied, and in the PM peak hour the level of service (LOS) would decrease from LOS E to LOS F in the Build 2025 condition for all alternatives (BETA's

analysis was based on the original trip generation and not the revised trip generation representing the reduction in residential and retail). Overall intersection delays would also increase between 44 and 64 seconds. Individual intersection movements would experience even more significant increases in delay. The intersections of Needham Street and the project driveways would also experience increased delays as well.

Removing or restricting access from the Oak Street driveway results in negative impacts on the remaining intersections and would not change the number of vehicles traveling on Oak Street. Vehicles traveling west on Oak Street will still travel on Oak Street but would first need to pass through the already constrained Needham/Oak/Christina intersection. Additionally, the Needham Street Area Vision Plan identifies Needham Street as an isolated roadway and includes goals for converting it to a connected roadway, such as the ongoing/long term action to "create new driving and non-driving connections off of Needham Street as opportunities present themselves". The Planning Department finds the Oak Street access to be critical to not further degrading the service along Needham Street. Removing the Oak Street access would not change the number of vehicles traveling through Upper Falls and would only further degrade service along Needham Street. Planning staff is also recommending a monetary payment into a transportation mitigation fund with the intent of using a portion of that money for streetscape improvements and traffic calming in the surrounding neighborhoods.

Proposed Transportation Demand Management (TDM)

The petitioner recognizes that in order to rezone and develop the project as proposed aggressive transportation demand management strategies are critical. The revised Summary of TDM Provisions, submitted on March 28, 2019 (**Attachment F**) includes a TDM program with the following measures: car-free living incentives such as charging separately for parking, pedestrian and bicycle enhancements; a shuttle program with four routes which will commence at the granting of a certificate of occupancy for 400 units; pedestrian improvements; bicycle accommodations; an on-site mobility hub with waiting areas, rest rooms, message boards, café space and a traffic coordinator; car sharing; alternate transportation incentives such as limited commercial parking, subsidized T-passes for car-free residents or employees, and shuttle discount incentives; and a transportation management coordinator who will be designated to manage the implementation of the TDM measures.

The shuttle system (as of the petitioner's submittal on March 28, 2019), which would be centered at the development's Mobility Hub and open to public use at stops along its routes, would be comprised of the following four routes:

- "Newton Circulator" serving the MBTA's Green Line at Newton Highlands and Newton Center and the Newtonville commuter station every 30-45 minutes, depending on the day and time
- "Newton Highlands" serving the Newton Highlands MBTA Green Line station approximately every 20 minutes during the AM and PM commuting peaks
- "Cambridge Express" serving Kendall and Central squares in Cambridge every 60 minutes
- "Boston Express" providing service to the South Boston Seaport District and South Station every 60 minutes.

The current proposal modifies the initial shuttle system by replacing the previously proposed "Needham Commuter" service with a "Newton Highlands" shuttle. The remaining shuttle service is unchanged.

While the above represents a significant investment, Planning staff still has concerns regarding the effectiveness of the proposed shuttle system, particularly the hour-long headways on the Boston and Cambridge routes and the unknown fare structure. To be successful, walking, biking or taking transit will need to be a more attractive option than driving or relying on Uber or Lyft. Additionally, Planning has a strong preference for focusing on supplementing existing transit service rather than providing alternatives to the MBTA.

Additional materials submitted by the petitioner in response to the January transportation discussion and Planning memo did not provide further information justifying the effects of the proposed shuttle system. The petitioner's Traffic Impact and Access Study provides projected trip generations assuming both the existing mode split (based on the City-wide average of 82% of residents' trips and 88% of worker's trips being vehicular trips) and so-called "Build Condition with Robust Shuttle Service" scenario which assumes 30% of the residential and office trips generated by the project will be on transit (more than double what would be expected under Newton's citywide average) and 10% will be walking and biking, leaving 60% of trips occurring in vehicles (significantly less than the 82% and 88%, respectively, that would be expected by those groups under the existing citywide mode split). Consistent with the analyses of the 'robust shuttle service' scenario presented in the traffic study, the shared parking analysis also assumes only 60% of trips will be vehicular for both the residential and office uses, allowing for reduced parking ratios. (**Attachment D**).

While the petitioner has since stated that the actual mode split will likely be somewhere in between the baseline mode split based on the City-wide average and the "Robust Shuttle Service" mode split, Planning staff believe this project should be held to a higher standard and that in order to support the rezoning request the project should be doing everything possible to further the City's transportation goals to reduce reliance on single-occupancy vehicles.

RECOMMENDATION

The City and its residents should have a high level of comfort that the transportation impacts of the development are to be appropriately mitigated, regardless of what tools, systems and/or approaches are implemented by the petitioner.

The City has many stated goals, including those in the Needham Street Area Vision Plan, related to promoting strong TDM measures, increasing access to transit, and improving walking and biking conditions. Given the size of the project and existing conditions along Needham Street, reducing single occupancy vehicle trips during peak commuting hours is critical. The project has the added challenge of providing attractive alternatives to driving while not located proximate to transit. The Northland Newton project suffers from the first/last mile problem that arises when potential transit riders are located more than a comfortable walking distance from transit. This problem is neither new nor unique to this site and many tools have been developed to bridge the gap between fixed transit locations and the places where people live and work.

While Planning staff have concerns with the shuttle system as proposed, research has shown it is feasible to dramatically shift mode splits with interventions such as partnering with transportation management associations (or TMAs, such as the 128 Business Council), providing financial incentives for transit and financial disincentives for driving and parking, and providing employee parking cash-out programs. The transportation field is rapidly changing and evolving and there will likely be more tools available as this project progresses. It will also likely take some trial and error to determine the best tools for reducing driving at this site and it's important that the shuttle not be locked in as the only tool and that there be flexibility in meeting these goals.

For those reasons, and because of the uncertainty intrinsic to the petitioner's shuttle approach, Planning staff, in consultation with BETA, recommends that if this project is approved it be conditioned so that the petitioner is required to meet a certain performance standard but has flexibility in how that standard is met. Planning recommends starting with the mode split provided in the "Robust Shuttle Service" analysis provided by the petitioner, with no more that 60% of peak hour trips being vehicular trips. This percentage can then be applied to the total trips projected for the project to arrive at a maximum number of vehicular trips, which is relatively simple to measure on an annual basis to determine compliance. The maximum number of trips can also ramp up as the project phases in occupancies, based on this mode split. The number can be recalculated each year based on the current occupancy levels for each use. It should also be tied to census data showing the City-wide average mode split and requiring the project to continue to have fewer vehicular trips than the City-wide average. In this scenario, the project is held to the proposed 60% vehicular mode split but if the City as a whole greatly reduces vehicular use below this in the future the project would continue to have to be a percentage lower than the City-wide number. One question that remains is whether the performance standard is adjusted to just apply to residential and office trips, as retail trips are difficult to influence.

The following principles are key factors in setting the project up for success:

- **Implement TDM measures starting day one**. It is important to set behaviors from the beginning with both residents and tenants. If residents and employees have no viable options other than driving for the first few years it will be difficult for them to change behavior later.
- **Set a performance standard based on a mode split and allow the developer to determine the best way to meet it (with input from City staff and transportation professionals).** Based on the Robust Shuttle option submitted by the petitioner, Planning Staff recommends that no more than 60% of peak hour trips be made by vehicles. This should also be tied to mode split data from the census with the vehicular trips decreasing if the overall vehicular trips decrease within the City.
- **Monitor, measure and enforce the performance standard while providing opportunities to adjust.** Require review and sign off by the Directors of Planning and Transportation (in consultation with a peer reviewer) on a TDM work plan for the upcoming year and then measure success at the end of the year. Planning staff recommends that the petitioner provide vehicular trip counts and qualitative surveys of residents and tenants at the end of each year. If trip counts exceed the established threshold based on the mode split, staff will work with the petitioner to adjust the work plan for the upcoming year. If after two consecutive years of not meeting the goal there has not been improvement, Planning staff recommends the petitioner be required

to return to City Council to amend the Special Permit and establish alternative mitigation strategies.

- **Meet the performance standard in perpetuity.** Providing alternatives to driving for the residents and tenants of the project is not a temporary goal and must continue to be met for the life of the project. The tools used to meet that goal over time will likely change and could very well be minimal someday if MBTA service is increased in the area.

In addition to the mode split performance standard, Planning Staff also recommends that the petitioner consider offering a one-time payment into a transportation mitigation fund for improvements in the area. The plan described above includes aggressive goals that go above and beyond the citywide average when it comes to reducing driving, however even if the TDM measures are successful there will continue to be increased delays at intersections in the area. Additionally, TDM measures are primarily successful at changing the behavior of residents and employees, so while visitors to the retailers at the site will hopefully take advantage of alternative methods of transportation, it is unlikely there will be a significant reduction in vehicular use for this group. For those reasons, Planning Staff recommends that the petitioner only be required to meet the performance standard for the morning and evening peak commuting times and not the midday or Saturday peak times that exist along Needham Street. Therefore, Planning Staff also recommends that the petitioner consider offering a one-time lump sum payment into a transportation mitigation fund that will be used to fund improvements such as those listed in **Attachment G.** These mitigations will also further the goals of the Needham Street Area Vision Plan and directly address those elements identified by the community and will help improve pedestrian and bicycle connections along the Greenway and to transit stations, improve signal coordination and prioritization for shuttles and buses on Needham Street, provide traffic calming in nearby neighborhoods, improve the safety and efficiency of nearby intersections, and provide for streetscape enhancements in Upper Falls.

Planning also recommends the petitioner consider offering an additional payment of $275,000 to be made at the time of first occupancy or building permit to fund a Transportation Alternatives Analysis. This feasibility study will analyze options for improved and/or faster MBTA transit service in this area.

The Needham Street Area Vision Plan includes the following actions in the Vision for Transportation that could be satisfied through the use of these funds:

- Manage driving speeds in neighborhoods to at or below the posted speed limit through roadway design and safety education;

  Proposed mitigations include studying speeds and installing traffic calming measures along Upper Falls roadways and the Chestnut Street corridor as well as money for design for an Upper Falls Village Enhancement project similar to efforts underway in West Newton and Newtonville.

- Incorporate principles of accessible/universal design in street, sidewalk, and parking lot design;

  Proposed mitigation identifies funding design for an Upper Falls Village Enhancement project as a priority, which would include pedestrian improvements, streetscape improvements, and other design features.

- Institute transit signal priority between the Newton Highlands station and the Needham border to improve reliability of buses and shuttles;

Identified improvements include providing signal coordination, transit signal prioritization, and providing the infrastructure necessary for the City to remotely control signals along Needham Street after MassDOT hands over ownership of the roadway to the City.

- Advocate for additional MBTA service;

  In addition to the mitigation fund, the Planning Department recommends $275,000 for a Transportation Alternatives Analysis which would study the feasibility of improved/faster transit and will identify key projects for the City to advocate towards with the MBTA.

- Study feasibility of transit options along the Greenway connecting Green Line at Newton Highlands to Needham Heights Commuter Rail;

  The Transportation Alternatives Analysis will also study the feasibility of transit options along the Greenway. Additionally, Planning recommends funds to extend pedestrian and bicycle routes from the Greenway to the Elliot and Newton Highlands Green Line stations.

- Design new development to encourage walking, biking, and transit, including supporting a mix of uses.

  Identified improvements to be included in the mitigation fund include extensions for pedestrian and bicyclists from the Greenway to the Elliot and Newton Highlands stations as well as a feasibility study for connecting pedestrian and bicycle paths across the bridge at Christina Street.

The scope of the proposed TDM strategy focusing on providing robust shuttle service is unprecedented in the City of Newton. If successful, it could serve as a model for new developments and for solving first/last mile problems. Planning staff believe the above recommendation allows for flexibility over time in solving these issues while ensuring compliance and measuring success. However, given the uncertainty inherent in something that has not been tested and acknowledging that impacts will still remain, the additional mitigation fund will also ensure meaningful investments in transportation infrastructure will be made in the community.

ATTACHMENTS

Attachment A	Current schedule for Land Use Committee public hearings, dated February 8, 2019
Attachment B	Petitioner's (VHB) memorandum- "Expanded Revised Building Program Traffic Generation Memorandum," dated March 28, 2019
Attachment C	Petitioner's (VHB) memorandum (re shared parking)- "Right-Sized Parking," dated March 27, 2019
Attachment D	Peer Reviewer's (BETA) memorandum- "Comments on VHB Memoranda March 27 and 28, 2019," dated April 3, 2019
Attachment E	Peer Reviewer's (BETA) memorandum- "Oak Street Alternatives Access Evaluation," dated March 15, 2019

Attachment F Petitioner's memorandum- "Summary of TDM Provisions," dated March 28, 2019

Attachment G Northland Newton Development Transportation Mitigation Fund, City-identified improvements

Note: The following additional transportation-focused materials submitted subsequent to the January 15, 2015 Land Use Committee Hearing can be found on the City's website:

- Petitioner's (VHB) memorandum- "Response to BETA Group, Alta Planning + Design comments," dated February 22, 2019
- Petitioner's (VHB) memorandum- "Revised Building Program and Traffic Generation Memorandum," dated February 14, 2019
- Peer Reviewer's (BETA) memorandum- "Comments on Revised Building Program Traffic Generation Memorandum, February 14, 2019," dated March 6, 2019
- Peer Reviewer's (BETA) memorandum- "Additional Comments on VHB Response to Comments February 22, 2019," dated March 7, 2019

ATTACHMENT A

TENTATIVE LAND USE COMMITTEE SCHEDULE
Updated February 8, 2019

NORTHLAND NEEDHAM STREET/OAK STREET

Special Permit # 426-18 and Request to Rezone #425-18

Land Use Committee Date	**Topic**	**Description**
9/25/2018	Project Overview	Applicant to introduce project and committee to discuss schedule.
11/13/2018	Site Design and Open Space	Review of site plan, including placement of buildings, roads and open space as well as sight lines and shadows.
12/11/2018	Housing and Economic Impacts	Review of proposed residential and commercial program, including: analysis of the number of housing units, including affordability levels; the commercial mix; and the overall fiscal and economic impacts of the proposed project.
1/15/2019	Transportation	Review of the proposed internal street network and circulation including bicycle and pedestrian facilities, and analysis of the traffic impacts, shared parking proposal, and transportation demand management strategy.
2/12/2019	Project Update	Preview of project revisions and discussion of schedule.
3/12/2019	Site Design and Open Space/ Housing and Economic Impacts	Review of revisions and responses to comments regarding Site Design and Open Space and Housing and Economic Impacts.
4/9/2019	Transportation	Review of revisions and responses to comments.
5/14/2019	Architecture and Design Guidelines and Sustainability and Stormwater	Review of design guidelines that will regulate future detailed architectural design of the proposed buildings; review of the sustainability report and stormwater mitigations.
6/11/2019	Mitigations and Conditions	Discussion of necessary mitigation measures and proposed conditions.

ATTACHMENT B

Memorandum

To: Kent Gonzales
Northland Development

Date: March 28, 2019

Project #: 12239.00

From: Randall C. Hart
Principal

Matthew Duranleau, E.I.T.

Re: Expanded Revised Building Program
Traffic Generation Memorandum
The Northland Newton Development
Needham Street
Newton, Massachusetts

Vanasse Hangen Brustlin, Inc. has conducted an expanded analysis of the potential traffic generation involved with the Northland Newton Development on Needham Street in Newton, Massachusetts. A traffic memorandum dated February 12, 2019, was completed that evaluated the change in traffic projections and operations based on the revised building program for the Project. This memorandum expands the traffic generation discussion that was presented in the February 12, 2019 memorandum and includes the expected transit and walk/bike trips to be associated with the revised building program.

The following trip generation discussion follows the format presented in the Transportation Impact and Assessment (TIA) dated October 2018[1] for the Project. The document structure is the same as the trip generation section of the TIA to be consistent with the previous filing and allow for an easy comparison between this memorandum and the TIA, but all tables have been updated based on the revised building program.

Trip Generation

The rate at which any development generates traffic is dependent upon the size, location, and concentration of surrounding developments. As mentioned in the TIAS, the Project is comprised of office, residential, and retail use. The ITE *Trip Generation Manual*[2] categorizes these land uses and provides weekday daily, weekday morning, weekday evening, Saturday daily, and Saturday midday peak hour unadjusted vehicle trip generation estimates for each use. The trip generation estimates for the proposed uses were projected using Land Use Code (LUC) 221 (Mid-Rise Residential), LUC 710 (General Office Building), and LUC 820 (Shopping Center). The trip generation analyses are presented below.

As discussed in the TIAS, the Project is expected to develop a transportation management plan including a robust shuttle service program that includes direct shuttle bus service to nearby transit stations and to key regional hubs in Cambridge and Boston. The inclusion of the shuttle bus service will alter the mode split for the Project, as it is expected that many residents, patrons, employees and some local residents in proximity to the site will take advantage of the shuttle system instead of driving. The level of use of the shuttle system will take time to materialize, but the expectation is that it will become a valuable and well used service in the area. As the actual use is unknown at this stage, trip generation analyses were conducted under two different scenarios in order to provide a thorough understanding of the trip generation potential; one scenario with a more robust shuttle service and potential usage

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1 Transportation Impact and Access Study; The Northland Newton Development; Newton, MA; October 2018; Prepared by VHB.

2 Trip Generation Manual, 10th Edition, Institute of Transportation Engineers, Washington, D.C., 2017.

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and one scenario with a less robust shuttle service (existing mode share) and potentially less usage. The results of both scenarios are presented below.

Project-Generated Trips

Estimating future conditions volumes for the Site involved a review of the existing development on those parcels, along with the additional trip generation expected from the Project development.

Existing Site-Generated Traffic

The planned development parcels currently are occupied by a shopping center containing approximately 62,600 sf of general retail space, the former mill building that contains approximately 180,000 sf of office space, and a vacant 257,000 sf manufacturing building. At the time of the traffic counts, it was estimated that the retail space was fully occupied while the office and manufacturing spaces were fully vacant. Based on discussions with Northland, it is understood that the office space could be tenanted without the Project while it is unlikely that the manufacturing space would be tenanted in the future. Based on that information, the potential site trip generation under the existing conditions was estimated using the ITE methodology. Table 1 summarizes the Project-related trips for the existing uses within the Project Site.

Table 1 Existing Site Trip Generation

	Retail [a]	Office [b]	Total Unadjusted Trips	Total Net Vehicle Trips [c]	Total Pass-By
Weekday Daily					
Enter	2,186	938	3,124	**2,154**	475
Exit	2,186	938	3,124	**2,154**	475
Total	4,372	1,877	6,249	**4,297**	950
Weekday Morning					
Enter	114	168	282	**221**	20
Exit	70	27	97	**56**	20
Total	183	196	379	**277**	40
Weekday Evening					
Enter	184	32	216	**120**	56
Exit	200	167	367	**248**	56
Total	384	199	583	**368**	112
Saturday Daily					
Enter	3,333	199	3,552	**2,380**	745
Exit	3,333	199	3,552	**2,376**	745
Total	6,666	398	7,064	**4,756**	1,490
Saturday Midday					
Enter	222	52	274	**186**	49
Exit	205	44	249	**163**	49
Total	428	95	523	**349**	98

a Based on ITE LUC 820 (Shopping Center) for 62,600 sf
b Based on ITE LUC 710 (General Office Building) for 180,000 sf
c Net vehicle trips includes credit for internal capture, mode shares, and pass-by trips.

As shown in Table 1, the existing trip generation for the Site is able to take credit for shared trips, mode shares beyond vehicular travel, and pass-by trips. This is due to the availability of public transportation, shared trips within the multiple uses on Site, and the benefits of being located within an area with bicycle and pedestrian accommodations. In addition, a portion of the retail trips visiting the Site under existing conditions are assumed to be pass-by trips drawn from the traffic volume roadways adjacent to the Site, as noted in Table 1. The details of these assumed trip credits are discussed in greater detail later in this section.

Unadjusted Project-Generated Traffic

The proposed development will consist of a mixture of residential, office, and supporting retail uses. Specifically, the Site is proposed to include 800 residential units, 180,000 sf of office space to be located in the former mill building, and 115,000 sf of supporting restaurant/retail/active uses. An additional 4,000 sf of community center space is proposed to be provided on Site, but it is assumed that this space will be community oriented for the Site and the adjacent neighborhood and any vehicular traffic generated during the peak hours will be negligible.

As noted above, traffic associated with the residential units was estimated using ITE LUC 221 (Mid-Rise Residential), traffic associated with the office space was estimated using ITE LUC 710 (General Office Building), and traffic associated with the retail uses was estimated with ITE LUC 820 (Shopping Center). The retail uses are expected to be smaller, Main Street style businesses catering to the residential units on-Site and the adjacent neighborhoods as opposed to large big-box style retail stores. Potential uses will include small eating establishments, coffee shops, pharmacies, or gallery uses. While these do not fit the exact description of a traditional ITE "Shopping Center", retail traffic was estimated using this land use code, which results in an overly conservative analysis. The unadjusted vehicle trip estimates for are presented in Table 2.

Table 2 Project Trip Generation – ITE Unadjusted Vehicle Trips

	Residential [a]	Office [b]	Retail [c]	Total Unadjusted Vehicle Trips
Weekday Daily				
Enter	2,179	938	3,306	**6,423**
Exit	2,179	938	3,306	**6,423**
Total	4,358	1,877	6,611	**12,846**
Weekday Morning				
Enter	68	168	130	**366**
Exit	194	27	80	**301**
Total	263	196	209	**668**
Weekday Evening				
Enter	199	32	289	**520**
Exit	127	167	313	**608**
Total	326	199	603	**1,128**
Saturday Daily				
Enter	1,425	199	4,860	**6,483**
Exit	1,425	199	4,860	**6,483**
Total	2,849	398	9,719	**12,966**
Saturday Midday				
Enter	168	52	359	**579**
Exit	175	44	332	**550**
Total	343	95	691	**1,129**

a Based on ITE LUC 221 (Mid-Rise Residential) for 800 residential units.
b Based on ITE LUC 710 (General Office Building) for 180,000 sf
c Based on ITE LUC 820 (Shopping Center) for 115,000 sf

Person Trips

The unadjusted vehicle trips are converted into person trips by applying the average vehicle occupancy (AVO) of 1.13 for residential and office trips and of 1.78 for retail trips, as outlined by the U.S. Department of Transportation[3]. The unadjusted vehicle trips were converted into person trips in order to apply internal capture credits and applicable mode share credits, as described below. Applying these credits to person trips allows for estimates to be made for the total number of Site-generated transit users, walkers, and bicyclists in addition to the total number of Site-generated vehicles.

Internal Capture Trips

Since the proposed development is a mixed-use project, the trip generation characteristics of the Site will be different from a single-use project. Some of the traffic to be generated by the proposed development will be contained on site as "internal" or "shared vehicle" trips. For example, workers at the office space on Site may patron the retail shops after work, or residents who live in the development may also work in the office on Site. While these shared trips represent new traffic to the individual uses, they would not show up as new vehicle trips on the surrounding roadway network.

As described in the ITE Trip Generation Handbook[4] "because of the complementary nature of these land uses, some trips are made among the on-site uses. This capture of trips internal to the site has the net effect of reducing vehicle trip generation between the overall development site and the external street system (compared to the total number of trips generated by comparable land uses developed individually on stand-alone sites) an internal capture rate can generally be defined as the percentage of total person trips generated by a site that are made entirely within the site. The trip origin, destination, and travel path are all within the site."

Based on the methodology outlined in the ITE Trip Generation Handbook, internal capture rates were applied to the gross person trips. The resulting peak-hour person trip estimates for the Project and are presented in Table 3.

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3 Summary of Travel Trends: 2009 National Household Survey, US Department of Transportation, Federal Highway Administration, Washington D.C., 2009

4 Trip Generation Handbook, 3rd Edition, Institute of Transportation Engineers, Washington, D.C., 2017.

Table 3 Project Peak-Hour Person Trips

	Residential [a]	Office [a]	Retail [a]	Total Person Trips
Weekday Morning				
Enter	75	178	220	**473**
Exit	214	22	132	**368**
Total	289	200	352	**841**
Weekday Evening				
Enter	117	19	425	**561**
Exit	86	147	443	**676**
Total	203	166	868	**1,237**
Saturday Midday				
Enter	102	38	566	**706**
Exit	126	39	492	**657**
Total	228	77	1,058	**1,363**

a Person trip generation estimate with internal capture credits applied.

Mode Share

It is expected that residents, visitor, and commuters to the Site will use a variety of transportation options to reach the Site, including private vehicles, walking, bicycling, and public transportation. To determine the number of vehicle trips, walk/bike trips, and transit trips, mode shares have been applied to the Person trips presented in Table 3.

As mentioned previously and described in detail later in the report, the Project will include a robust shuttle service program that includes direct shuttle bus service to nearby transit stations and to regional mobility hubs in Cambridge and Boston. The inclusion of the shuttle bus service will affect the mode split for the Project, as it is expected that many residents, employees, patrons, and the general public will use the shuttle bus service for trips to and from the Site. The level of use of the shuttles by the residents and workers will take time to materialize and the overall usage is not known at this time. As the exact usage will vary and is not known at this time, analysis for two levels of potential mode share has been conducted. To provide a complete understanding of the trip generation potential, two different mode splits were applied to the person trips to develop two different Build scenarios.

The first Build scenario, referred to as "Build Condition with Robust Shuttle Service" assumes a robust shuttle service that includes frequent peak and off-peak connections between the Site, nearby transit stations, and downtown Boston with strong usage expected. Mode shares were estimated with an assumption that there will be strong demand for residents and workers to use the shuttle service.

The second Build scenario, referred to as "Build Condition with Existing Mode Share" assumes that existing mode shares are realized. Mode shares for the Project under this scenario were based on the existing mode shares in the City of Newton according to Journey to Work data from the 2010 US Census, as in this scenario it is assumed that the shuttle service would be used with a similar frequency to transit options that currently exist within the City of Newton. While it is expected that the shuttle service in-place will be robust and will provide frequent peak and off-peak connections, this scenario presents a conservative "worst-case" trip-generation estimate.

The peak hour/peak direction mode share estimates, by use, are presented in Table 4. It should be noted that the level of robustness for the shuttle service was assumed to directly affect the residential and office mode shares, and the retail mode shares but to a lesser degree. It is estimated that patrons to the retail uses onsite will not change their pattern of travel as significantly based on the availability and service levels of the shuttle service. Under both conditions it is assumed that the shuttle service will account for approximately 5% of all retail trips, which includes both patrons to the retail uses and employees of the retail uses. It should also be noted that the walk/bike mode share is expected to be higher with the shuttle service in place as well, as residents and workers will be less likely to have a vehicle on Site with the shuttle service, so for shorter trips in the immediate area they will be more likely to walk or bike than to drive or take transit.

Table 4 Project Mode Share

Use	Vehicle	Transit	Walk/Bike
Build Condition with Robust Shuttle Service [a]			
Residential	60%	30%	10%
Office	60%	30%	10%
Retail	90%	5%	5%
Build Condition with Existing Mode Share [b]			
Residential	82%	13%	5%
Office	88%	7%	5%
Retail	90%	5%	5%

a Peak hour/peak direction mode share estimates developed with the assumption that there will be a strong usage (expected) of the shuttle system

b Peak hour/peak direction mode share estimates based on Journey to Work data from the 2010 US Census data for the City of Newton

The mode shares discussed above were applied to the net-new person trips to generate the adjusted Project trips by mode for the Build Condition with Existing Mode Share and the Build Condition with Robust Shuttle Service, respectively. The local average vehicle occupancy based US Census data for each primary use was then applied to the vehicle mode to reflect the number of vehicle trips generated by the Site.

Pass-By Trips

While the ITE rates provide estimates for all the traffic associated with each land use, not all of the traffic generated by the Project will be new to the area roadways. A portion of the vehicle-trips generated by the retail land use will likely be drawn from the traffic volume roadways adjacent to the Project Site. For example, someone traveling on Needham Street may choose to deviate from their original travel path to visit the site retail, before heading back to continue to their final destination. For this evaluation, ITE pass-by rates for LUC 820 (Shopping Center) were utilized for the retail trip generation and applied to existing trips on Needham Street and Oak Street. Specifically, 34-percent and 26-percent of the Site trip generation was assumed to be drawn from the surrounding roadway network during the weekday evening and Saturday midday peak hours, respectively, as outlined in the ITE Trip Generation Handbook. For all other time periods studied, a 25-percent pass-by rate was assumed.

Project-Generated Trips – Build Condition with Existing Mode Share

The mode share and local average vehicle occupancy rates were applied to convert the person trips into net new transit trips, walk/bike trips, and vehicle trips for the Build Condition with Existing Mode Share. A pass-by reduction was applied to the vehicle trips generated by the retail portion of the Site. Tables 5 and 6 summarize the net new trips by mode and net new vehicle trips by use, respectively.

Table 5 Project-Generated Peak-Hour Trips by Mode – Build Condition with Existing Mode Share

	Vehicle Trips [a]	Transit Trips	Walk/Bike Trips
Weekday Morning			
Enter	282	33	26
Exit	213	37	25
Total	495	70	51
Weekday Evening			
Enter	238	37	31
Exit	326	43	36
Total	564	80	67
Saturday Midday			
Enter	318	44	38
Exit	299	44	37
Total	617	88	75

a Net vehicle trips not including pass-by trips associated with the retail portion.

As shown in Table 5, without a robust shuttle service in place the Project is expected to generate between 70 and 88 transit trips, between 51 and 75 walk/bike trips, and between 495 and 617 vehicle trips during the peak hours studied (including trip generated by the existing Project Site uses). The breakdown of the vehicle trips by use are summarized below in Table 6.

Table 6 Project-Generated Peak-Hour Vehicle Trips by Use – Build Condition with Existing Mode Share

	Residential [a]	Office [b]	Retail [c]	Pass-By [d]	Total Net Vehicle Trips [e]	Existing Vehicle Trips [f]	Total Net New Vehicle Trips
Weekday Morning							
Enter	53	140	89	22	282	221	**61**
Exit	151	17	45	22	213	56	**157**
Total	204	157	134	44	495	277	**218**
Weekday Evening							
Enter	83	15	140	75	238	120	**118**
Exit	61	116	149	75	326	248	**78**
Total	144	131	289	150	564	368	**196**
Saturday Midday							
Enter	72	30	216	70	318	186	**132**
Exit	89	31	179	70	299	163	**136**
Total	161	61	395	140	617	349	**268**

Note: Table 8 only presents the Project-generated vehicle trips. The Project-generated transit trips and walk/bike trips are presented in Table 7.

a New vehicle trips with internal capture and mode share credits applied.

b New vehicle trips with internal capture and mode share credits applied.

c New vehicle trips with internal capture, mode share, and pass-by credits applied.

d Pass-by Credits of 25%, 34%, and 26% applied to weekday morning, weekday evening, and Saturday midday peak hour retail trip generation, respectively.

e Sum of columns a through c.

f Net vehicle trips that can be generated by the Site under existing conditions (from Table 3).

As shown in Table 6, the Project without a robust shuttle service in place is expected to generate a total 495, 564, and 617 vehicle trips during the respective weekday morning, weekday evening, and Saturday midday peak hours. However, these totals include traffic already being generated by the Project Site under existing conditions (as shown in Table 3). After considering this existing traffic generation, the Project without a robust shuttle service in place will result in an additional 218, 196, and 268 vehicle trips compared to existing conductions during the weekday morning, weekday evening, and Saturday midday peak hours, respectively.

Project-Generated Trips – Build Condition with Robust Shuttle Service

Similar to the Build Condition with Existing Mode Share, the mode share and local average vehicle occupancy rates were applied to the person trips to estimate the net new trips by mode for the Build Condition with Robust Shuttle Service, and then a pass-by reduction was applied to the vehicle trips generated by the retail portion of the Site. Tables 7 and 8 summarize the net new trips by mode and net new vehicle trips by use, respectively.

Table 7 Project-Generated Peak-Hour Trips by Mode – Build Condition with Robust Shuttle Service

	Vehicle Trips [a]	Transit Trips	Walk/Bike Trips
Weekday Morning			
Enter	224	87	37
Exit	172	78	30
Total	396	165	67
Weekday Evening			
Enter	213	62	35
Exit	274	92	46
Total	487	154	81
Saturday Midday			
Enter	291	70	42
Exit	267	75	42
Total	558	145	84

a Net vehicle trips not including pass-by trips associated with the retail portion.

As shown in Table 7, with a robust shuttle service in place the Project is expected to generate between 145 and 165 transit trips, between 67 and 84 walk/bike trips, and between 396 and 558 vehicle trips during the peak hours studied (including trip generated by the existing Project Site uses). The breakdown of the vehicle trips by use are summarized below in Table 8.

Table 8 Project-Generated Peak-Hour Vehicle Trips by Use – Build Condition with Robust Shuttle Service

	Residential [a]	Office [b]	Retail [c]	Pass-By [d]	Total Net Vehicle Trips [e]	Existing Vehicle Trips [f]	Total Net New Vehicle Trips
Weekday Morning							
Enter	53	140	89	22	224	221	**3**
Exit	151	17	45	22	172	56	**116**
Total	204	157	134	44	396	277	**119**
Weekday Evening							
Enter	83	15	140	75	213	120	**93**
Exit	61	116	149	75	274	248	**26**
Total	144	131	289	150	487	368	**119**
Saturday Midday							
Enter	72	30	216	70	291	186	**105**
Exit	89	31	179	70	267	163	**104**
Total	161	61	395	140	558	349	**209**

Note: Table 6 only presents the Project-generated vehicle trips. The Project-generated transit trips and walk/bike trips are presented in Table 5.

a New vehicle trips with internal capture and mode share credits applied.

b New vehicle trips with internal capture and mode share credits applied.

c New vehicle trips with internal capture, mode share, and pass-by credits applied.

d Pass-by Credits of 25%, 34%, and 26% applied to weekday morning, weekday evening, and Saturday midday peak hour retail trip generation, respectively.

e Sum of columns a through c.

f Net vehicle trips that can be generated by the Site under existing conditions (from Table 3).

As shown in Table 8, the Project is expected to generate a total 396, 487, and 558 new vehicle trips during the respective weekday morning, weekday evening, and Saturday midday peak hours with a robust shuttle service in place. However, these totals include traffic already being generated by the Project Site under existing conditions (as shown in Table 3). After considering this existing traffic generation, the Project will result in an additional 119, 119, and 209 vehicle trips compared to existing conductions during the weekday morning, weekday evening, and Saturday midday peak hours, respectively.

ATTACHMENT C

MEMORANDUM

Date: April 3, 2019 Job No.: 6329

To: Jennifer Caira, Chief Planner
City of Newton Planning & Development Department
1000 Commonwealth Avenue
Newton Centre, MA 02459

From: Jeffrey Maxtutis

Subject: **Transportation Engineering Peer Review**
Comments on VHB Memoranda March 27 and 28, 2019
The Northland Newton Development
Newton, Massachusetts

The Northland Newton Development is proposing a mixed-use development to be located along Needham Street and Oak Street in Newton, Massachusetts. This review provides comments on the following two Memoranda:

- *Expanded Revised Building Program, Traffic Generation Memorandum, The Northland Newton Development,* VHB, March 28, 2019; and
- *The Northland Newton Development, Right-Sized Parking Memorandum, VHB, March 27, 2019*.

As detailed in the two Memoranda, The Northland Newton Development Build program has changed as follows:

Proposed Development Program

Land Use	Previous Build Program	Revised Build Program	Change
Office Space	180,000 sf	180,000 sf	0 sf
Residential	822 units	800 units	(22 units)
Retail/Restaurant/Flex/Active Space	237,000 sf	115,000 sf	(122,000 sf)
Parking	1,953 spaces	1,550 spaces	(403 spaces)

TRIP GENERATION

Comment 1: In Table 2 – Project Trip Generation - ITE Unadjusted Vehicle Trips, the weekday morning peak hour total unadjusted vehicle trips is shown as 668 trips. BETA has calculated the number of unadjusted vehicle trips in the weekday morning peak hour to be 592 trips. Please confirm and recalculate Build Condition vehicle trips.

Comment 2: Please provide the mode share and internal capture trip generation adjustment calculations.

Comment 3: In Table 8 – Project-Generated Peak-Hour Vehicle Trips by Use – Build Condition with Robust Shuttle Service, the vehicle trip numbers under the Residential, Office and Retail and Pass-By columns are not correct. They are the same numbers shown in Table 6 - Project-Generated Peak-Hour

Vehicle Trips by Use – Build Condition with Existing Mode Share. The numbers in this table should be updated.

PARKING

Comment 4: Please provide the shared-parking calculations by hour for both weekday and weekend.

Comment 5: The following is a summary comparing the proposed project parking spaces by use with MBTA/MassDOT Transit-Oriented Development Policies and Guidelines.

- The 800 residential spaces (1 space/unit) meet the MBTA/MassDOT TOD guideline of 0.75-1.5 spaces/unit.
- The 149 retail spaces (3 spaces/KSF) meets the guideline of 1.5-3.0/KSF
- The 245 restaurant spaces (6.1 spaces/KSF) exceed the retail guideline of 1.5-3.0/KSF. However, the guidelines do not break out restaurants.
- The 51 medical office spaces (3.4 spaces/KSF) exceed the office guideline of between 1.0 and 2.5 spaces/ KSF. However, medical office parking demand is typically higher than general office use.
- The 38 health club spaces (3.8 spaces/KSF) exceed the retail guideline of 1.5-3.0/KSF, but not significantly so and they are relatively few spaces.
- The office use has 298 spaces with a rate of 1.7 spaces/KSF, which meet the guidelines between 1.0 and 2.5 spaces/KSF.
- The proposed 1,550 parking spaces will meet demand, except for the peak December shopping season (1,596 vehicles). The option to use a portion of the residential spaces for shared-parking, if needed, appears reasonable.
- Overall, the proposed 1,550 parking spaces appear adequate to accommodate parking demand for the mix of land uses in a shared-parking operation.

ATTACHMENT D

Memorandum

To: Mr. Barney Heath
Director of Planning

Date: March 27, 2019

Project #: 12239.00

From: VHB, Inc.

Re: The Northland Newton Development
Right-Sized Parking

This memorandum presents an evaluation of the parking for the proposed mixed-use development project on Needham Street. It is an update of a memorandum dated October 12, 2018. This new memorandum reflects a revised building program.

One of the project design goals remains to reduce reliance on personal automobile use. Parking management is an effective tool in influencing travel behavior. Right-sizing the parking supply balances the parking needs of the project while minimizing not only the physical footprint of parking, but also the number of motor vehicle trips that excess parking can incentivize. The objective of this evaluation is to understand how to minimize the amount of parking while meeting the needs of the project residents, workers, customers, and visitors. The evaluation looks at opportunities for sharing parking among uses that have peak parking demand occurring at different times of day and days of the week.

Project Description

The project consists of reuse of the mill building at 156 Oak Street as office space and new construction of residential and commercial space. The expected or possible uses within the project consist of the following.

- 800 residential units
- 180,000 SF of office space
- 50,000 SF of retail space
- 40,000 SF of restaurant space
- 15,000 SF of flexible commercial space[1]
- 10,000 SF of health club
- 4,000 SF of community space

Zoning Requirements

The parking-related Development Standards (Article 5) in Newton's zoning ordinance set forth the minimum number of parking stalls to be supplied for each type of building or land use. The Development Standards also acknowledge that lesser parking is needed when there are multiple uses. The Development Standards include the ability to reduce parking requirements in cases "of a combination, in a single integrated development, of 3 or more uses …".

[1] This flexible commercial space could be used for medical, dental, or general office space. Because medical office space has a higher parking generation rate than general office space, the shared parking evaluation assumes all 15,000 SF is medical office space.

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PO Box 9151
Watertown, MA 02472-4026
P 617.924.1770

Table 1 shows the minimum parking requirements for each individual use and the number of parking spaces based on those individual requirements. The gross parking requirement, without consideration of shared parking or other parking management strategies, is 2,961 spaces.

Table 1 – Parking Requirements per Zoning – Standalone Uses

Use	Size	Parking Ratio per Zoning	No. of Spaces
Residential	800 units	2 spaces per unit	1,600
Retail	50,000 SF *	1 space per 300 SF, plus 1 per every 3 employees in largest shift	200
Restaurant	40,000 SF **	1 space per 3 patron seats, plus 1 per every 3 employees in largest shift	440
Medical Office	15,000 SF	5 spaces per 1,000 SF	75
Health Club	10,000 SF ***	1 space per 150 SF, plus 1 per every 3 employees in largest shift	71
Office	180,000 SF	4.0 spaces per 1,000 SF for first 20,000 SF, plus 3.0 per 1,000 SF for additional SF	560
Community	4,000 SF ****	1 space per 300 SF, plus 1 per every 3 employees in largest shift	15
			2,961

* Estimated 100 employees

** Estimated 1,200 seats and 120 employees

*** Estimated 12 employees

**** Estimated 3 employees

Proposed Parking Supply

The project's proposed parking supply is approximately 1,550 parking spaces among four below-grade parking structures and including at least 100 on-street parking spaces. Most of the parking, more than 900 spaces, is centrally located in a single garage under Block 5 and Block 6. Of the other three garages, two have about 100 spaces and one has about 300 spaces.

Right-Sized Parking Needs

A mixed-use project such as the proposed development needs less parking than that calculated assuming standalone uses. The amount of parking should be reduced to account for several factors, including typical vacancies, the sharing of parking among different uses, and incentives to reduce commuting by personal automobile. It is important to account for these factors and "right-size" the site parking not only to minimize the land and building area used for parking, but also to prevent excess parking from encouraging unnecessary vehicle use.

Two key elements of the parking management strategy are providing only one parking space per dwelling unit and providing a large centralized parking area shared among a variety of users.

Residential Parking

Parking for residents of the project would average one parking space for each of the 800 dwelling units. This is consistent with the target metric of one car per household set in the *Newton 2040* transportation strategy[2] and reflects general trends towards lower automobile ownership as access expands for other transportation options such as bicycling, transit, and on-demand ride services. Also, Northland expects to charge separately for residential parking to create disincentives for car ownership.

Shared Parking

Sharing a common parking supply among all commercial properties allows the amount of parking to be reduced as, for example, restaurant and retail use peaks on evenings and weekends when office use is low.

The calculation of the project's shared parking demand follows the methods outlined by the Urban Land Institute (ULI), the National Parking Association (NPA), and the Institute of Transportation Engineers (ITE). The calculation involves several factors, the first of which is to determine whether all the parking supply can, in fact, be shared. In this case, the residential parking is likely to be reserved for residential tenants and thus not shared with employee and customer parkers.

The shared parking calculation then considers any atypical mode share by users resulting from transportation demand measures. In this case, the automobile mode share for office workers is assumed to be 60 percent, consistent with the analyses of the "robust shuttle service" scenario presented in the traffic analysis. To be conservative, the mode share adjustment is applied only to office workers and not to retail and restaurant workers.

The shared parking calculation also considers trips wholly internal to the project. For example, some of the retail and restaurant patrons are those who live or work on site and therefore the retail component of the project does not need to provide parking for them since their cars are already parked at the residence or office. For this calculation, an internal capture rate of 20 percent is used. That is, when parking space usage is at its peak, 20 percent of retail/restaurant patrons are those living or working on site. The 20 percent figure is consistent with that calculated for the traffic assessment. This adjustment applies to patrons only and not to employees. Also, it is applied only to weekday parking demand, to account for the lack of shared patronage by office workers on weekends.

The last element of the shared parking calculation is consideration of the temporal differences among various parkers. The ULI and ITE provide information about hourly, daily, and monthly parking demand patterns for each of the project uses. The temporal data differentiate between parking occupancy patterns of customers and visitors versus employees.

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[2] *Newton 2040: A Transportation Strategy for Newton*

Table 2 shows the anticipated peak parking demand, weekday and weekend, for each month. **Table 3** shows the peak parking demand, by land use, for the peak month of December. Key findings are:

- Parking demand on weekdays is higher than on weekend days
- December, at 1,596 spaces, is the month with the highest peak parking demand.
- The peak parking demand for other months ranges from 1,507 spaces to 1,542 spaces.

Table 2 – Peak Parking Demand – Shared Parking, by Month

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Weekdays												
Residential	800	800	800	800	800	800	800	800	800	800	800	800
Commercial	707	708	733	719	729	728	715	725	723	738	742	796
Total	1,507	1,508	1,533	1,519	1,529	1,528	1,515	1,525	1,523	1,538	1,542	1,596
Weekends												
Residential	800	800	800	800	800	800	800	800	800	800	800	800
Commercial	531	534	569	554	568	567	567	568	575	554	576	647
Total	1,331	1,334	1,369	1,354	1,368	1,367	1,367	1,378	1,355	1,374	1,376	1,447

Table 3 – Peak Parking Demand – Shared Parking, December Weekday

Use	Size	Shared Parking Demand (weekday midday)
Residential (reserved*)	800 units	800
Retail	50,000 SF	149
Restaurant	40,000 SF	245
Medical Office	15,000 SF	51
Health Club	10,000 SF	38
Office	180,000 SF	298
Community	4,000 SF	15
		1,596

* Residential parking areas assumed to be used only by residents and their visitors, and not shared with commercial tenants/visitors/customers.

Findings and Recommendations

The project site plan is suitable for enabling parking demand management through shared parking in the central garage. The garage is a convenient location for employee and customer/visitor parking and is large enough to allow for an effective program of shared parking.

The analysis of shared parking potential for the project shows that parking demand will occur midday on a weekday in December. The calculated peak parking demand in December is 1,596 spaces. The peak parking demand for other months ranges from 1,507 to 1,542 spaces.

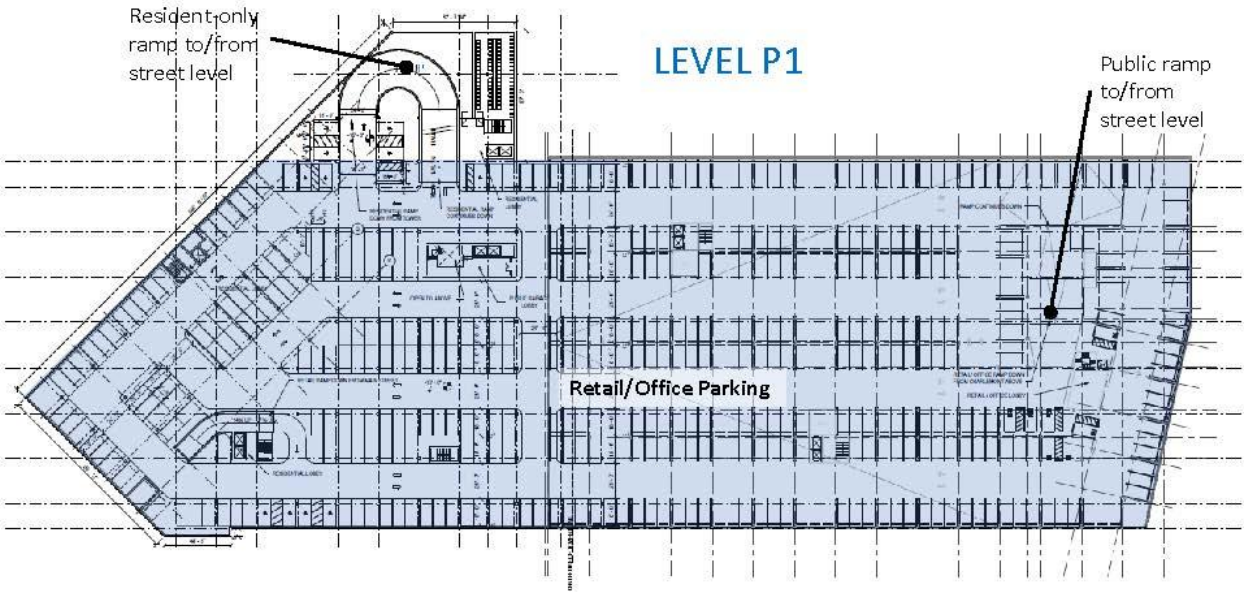
The proposed parking supply of 1,550 spaces is right-sized for the anticipated parking demand. Even with conservative parking assumptions about the use of the flex space (medical office) and the automobile mode share for retail and restaurant employees (100%), the proposed supply would be enough for all but the busiest month of the year.

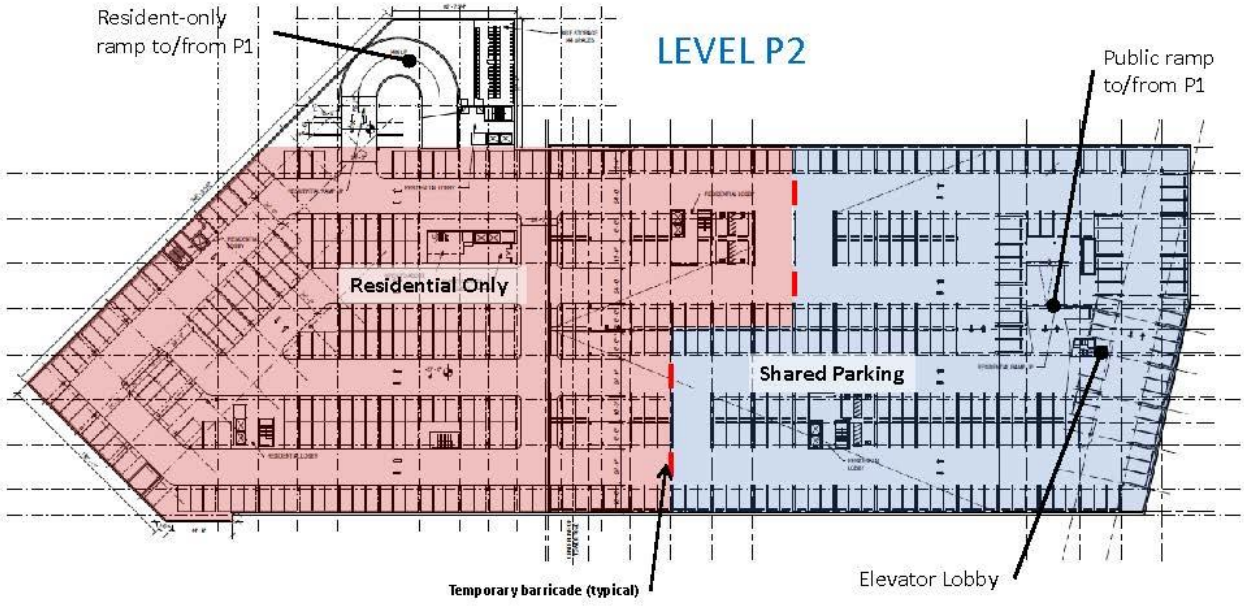
Rather than building more parking to accommodate the potential highest parking days of the year, it is recommended that the project retain the option of implementing a seasonal shared-parking policy for some of the residential parkers. As currently planned, there would be a designated residential parking area on the lower level of the central garage and only residents would park in that section of the garage. It is recommended that should it ever become necessary, some of the designated residential parking supply be temporarily shared by employees, customers, and residents. That way parking spaces vacated by residents during the day could be used to accommodate the peak midday parking demand of employees and customers. Based on the anticipated peak seasonal demand, fewer than 200 of the resident parking spaces in the central garage would need to be temporarily shared. An example of how these shared spaces might be temporarily configured as part of a parking management plan is shown as **Exhibit A**. Allowing for the possibility of seasonal sharing of some residential parking should be incorporated into parking permit agreements with residents.

Overall, we find that the proposed parking supply is appropriate to meet the project's objective of providing for the parking needs of the residents, workers, customers, and visitors without excess parking that encourages more vehicle use.

EXHIBIT A
Seasonal Parking Management Example

The parking garage under Building 5 and Building 6 has two levels. The upper level would be for use by retail/restaurant/office employees and customers. The lower level would normally be for residential parking. This example shows how approximately 200 spaces of the lower level might be used for shared parking among all users.





ATTACHMENT E

IMPROVING COMMUNITIES TOGETHER

MEMORANDUM

Date: March 15, 2019 Job No.: 6329

To: Jennifer Caira, Chief Planner
City of Newton Planning & Development Department
1000 Commonwealth Avenue
Newton Centre, MA 02459

From: Jeffrey J. Maxtutis, AICP

Subject: Oak Street Alternatives Access Evaluation
The Northland Newton Development
Newton, Massachusetts

INTRODUCTION

The Northland Newton Development is proposing a mixed-use development to be located along Needham Street and Oak Street in Newton, Massachusetts. The proposed site plan currently includes a full access driveway on Oak Street. The BETA Group, Inc. was requested by the City of Newton to review the following site access/egress alternatives:

- Alternative 1: No Access/Egress at Oak Street
- Alternative 2: Exit Only from site onto Oak Street
- Alternative 3: Entrance Only from Oak Street into site
- Alternative 4: No Left Turns allowed to exit site driveway onto Oak Street

All other proposed project site access/egress driveways were assumed to remain unchanged for this evaluation. Traffic volumes developed in the following reports were used for this evaluation:

- The Northland Newton Development, Transportation Impact and Access Study, VHB, October 2018
- The Northland Newton Development, Peer Review Response to Comments, Weekday Midday Peak Hour Analyses, VHB, December 10, 2018
- Revised Building Program, The Northland Newton Development, Needham Street, VHB February 14, 2018

Site generated traffic volumes for the weekday AM, Midday and PM peak hours for the 2025 Build condition were re-assigned to the study driveways and intersections for each of the four alternatives. It is noted that Midday peak hour traffic volumes were not available for the Oak Street/Site Driveway and Needham Street/South Site Driveway intersections. Traffic volumes for both the Existing transit mode share (13%) and Robust transit mode share (30%) were analyzed. Intersection capacity analysis was conducted for the following four study intersections:

- Oak Street/Project Site Driveway
- Needham Street/Oak Street/Christina Street
- Needham Street/South Project Site Driveway (Main Street)
- Needham Street/Charlemont Street/North Site Driveway

Analysis details are provided in the Appendix.

EVALUATION

Peak hour traffic volumes to and from the Oak Street project site driveway under the Build 2025 condition were re-assigned to the four study intersections for each of the access alternatives. The peak project vehicle trips at the Oak Street project site driveway for the Build 2025 condition are show below.

	Existing Mode Split			Robust Mode Split		
	In	Out	Total	In	Out	Total
AM	82	66	148	62	50	112
Mid-Day	65	62	127	46	48	94
PM	113	137	250	102	121	223

Project-generated vehicle trips that entered or exited from/to Oak Street were shifted to the Needham Street South Project Driveway (Main Street) and the Needham Street North Project Driveway (Charlemont Street) for each alternative. In general, the access alternatives would increase traffic volumes through the intersection of Needham Street/Oak/Street/Christina Drive. The Oak Street eastbound left-through movement and the Needham Street southbound through-right movement are critical intersection movements that would experience traffic volume increases which exacerbate delay and queueing (see below). It is noted that eliminating or restricting the project access at Oak Street would not change the traffic volumes traveling on Oak Street.

Intersection capacity analysis was performed for each of the four Oak Street access alternatives for Build 2025 weekday AM, Midday and PM peak hours. The analysis results were compared with the Build 2025 condition capacity results with the proposed full access driveway at Oak Street (as reported in the Transportation Impact and Access Study and Revised Building Program Memo).

Table 1 summarizes LOS and vehicle delay results for Oak Street access alternatives with the Existing Mode Splits for the project. The results for the Robust Mode Split are similar and are provided in the Appendix. Volume-to-capacity ratios and vehicle queue length results are also presented in the Appendix for both the Existing and Robust Mode Split conditions.

The signalized intersection of **Needham Street/Oak Street/Christina Drive** would experience the largest impacts as a result of the Oak Street access alternatives. In the PM peak hour, overall intersection LOS would deteriorate to LOS F from LOS E in the Build 2025 condition for all alternatives. Overall intersection vehicle delays would increase between 44 and 64 seconds. Individual intersection movements such as the Oak Street eastbound left-through and Needham Street southbound through-right movements would experience even more significant increases in delay. In the Midday peak hour, the intersection of Needham Street/Oak Street/Christina Drive would continue to operate at LOS F for all alternatives with delay increases ranging from 38 to 47 seconds. In the AM peak hour for the Alternative 1 – No Access at Oak Street, the intersection of Needham Street/Oak Street/Christina Drive would deteriorate from LOS E to LOS F with a 36 second delay increase. The intersection would remain operating at LOS E overall for all other alternatives with delay increases ranging between 11 and 22 seconds.

The signalized intersection of **Needham Street/Charlemont Street/North Site Driveway** would also experience degradation in LOS and increased delay as a result of the Oak Street access alternatives. In the Midday and PM peak hours, LOS would deteriorate from LOS C to LOS D for all alternatives.

Overall intersection delay would increase from 16 to 27 seconds. In the AM peak hour, LOS would remain at LOS B for all alternatives.

The eastbound driveway approach at the unsignalized intersection of **Needham Street/South Site Driveway** would remain operating at LOS F during the PM peak hour with an additional 49 seconds of delay under Alternative 1 – No Access to Oak Street. Delay would not change significantly as a result of the other alternatives for the PM peak hour. In the AM peak hour, all alternatives would improve from LOS D to LOS C.

The unsignalized intersection of Oak Street/Site Driveway would improve under all alternatives as a result of eliminating some or all vehicle movements to and from the site driveway.

SUMMARY

The following study intersections would experience significant impacts in Level of Service and delay as a result of the four Oak Street driveway access/egress alternatives.

Needham Street/Oak Street/Christina Drive

- LOS F for all alternatives in the Midday and PM peak hours, delay increases between 38 and 64 seconds
- LOS F for Alternative 1 in the AM Peak hour, delay increases 36 seconds
- Individual intersection movements such as the Oak Street eastbound left-through and Needham Street southbound through-right movements would experience even more significant increases in delay

Needham Street/Charlemont Street/North Site Driveway

- LOS degrades from LOS C to LOS D for all alternatives in the Midday and PM peak hours, delay increases between 16 to 27 seconds

Needham Street/South Site Driveway

- LOS F for Alternative 1 in the PM peak hour, delay increases 49 seconds

The intersection of **Oak Street/Site Driveway** would improve under all alternatives as a result of eliminating some or all vehicle movements to and from the site driveway. Eliminating or restricting the project access at Oak Street would not change the traffic volumes traveling on Oak Street.

Table 1 - Level of Service Summary - Existing Mode Splits

Intersection	Build 2005		Alternative 1: No Access		Alternative 2: Exit Only		Alternative 3: Enter Only		Alternative 4: No Left-Turns Out	
	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay
Oak Street and Site Driveway (South Bound Driveway Approach)										
AM	C	20	--	--	C	17	--	--	B	12
PM	D	26	--	--	C	20	--	--	B	12
Needham Street, Oak Street, and Christina Drive										
AM	E	58	F	94	E	69	E	80	E	75
Mid-Day	F	89	F	136	F	130	F	130	F	127
PM	E	62	F	126	F	108	F	115	F	106
Needham Street, South Site Driveway (East Bound Driveway Approach)										
AM	D	31	C	23	C	20	C	23	C	21
PM	F	53	F	102	E	38	E	45	F	53
Needham Street, Charlemont Street and North Site Driveway										
AM	B	16	B	18	B	18	B	15	B	15
Mid-Day	C	24	D	50	D	51	D	47	D	47
PM	C	21	D	41	D	41	D	37	D	37

Deterioration in LOS or Significant Increase in Delay

APPENDIX

- Level of Service Summary – Robust Mode Splits
- Intersection Operational Analysis Summary: 2025 Build Traffic-Volume Conditions with Oak Street Access Alternatives (with Existing and Robust Mode Splits)

Level of Service Summary – Robust Mode Splits

Intersection	Build 2005		Alternative 1: No Access		Alternative 2: Exit Only		Alternative 3: Enter Only		Alternative 4: No Left-Turns Out	
	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay
Oak Street and Site Driveway (South Bound Driveway Approach)										
AM	C	18	--	--	C	16	--	--	B	11
PM	C	23	--	--	C	18	--	--	B	12
Needham Street, Oak Street, and Christina Drive										
AM	E	57	F	85	E	77	E	71	E	68
Mid-Day	N/A	N/A	F	128	F	124	F	128	F	129
PM	E	67	F	117	F	104	F	107	F	95
Needham Street, South Site Driveway (East Bound Driveway Approach)										
AM	D	30	C	22	C	19	C	23	C	20
PM	E	47	F	72	D	35	F	66	E	43
Needham Street, Charlemont Street and North Site Driveway										
AM	B	15	B	14	B	16	B	14	B	14
Mid-Day	N/A	N/A	D	46	D	46	D	43	D	43
PM	C	29	D	38	D	39	D	35	C	35

Deterioration in LOS or Significant Increase in Delay

Intersection Operational Analysis Summary: 2025 Build Traffic-Volume Conditions with Oak Street Access Alternatives (with Existing Mode Splits)

Intersection/Peak Hour/Lane Group or Critical Movement	VHB's Traffic Study RTC [a]					Alternative 1: No Access					Alternative 2: Exit Only					Alternative 3: Enter Only					Alternative 4: No Left-Turns Out				
	LOS	Delay	v/c	50th % Queue	95th % Queue	LOS	Delay	v/c	50th % Queue	95th % Queue	LOS	Delay	v/c	50th % Queue	95th % Queue	LOS	Delay	v/c	50th % Queue	95th % Queue	LOS	Delay	v/c	50th % Queue	95th % Queue
5. Oak Street and Site Driveway																									
Weekday AM Peak Hour:																									
Oak St EB L	A	8.6	0.04	--	2	--	--	--	--	--	--	--	--	--	--	A	1.2	0.04	--	3	A	1.2	0.04	--	3
Site Driveway SB Approach	C	19.7	0.24	--	22	--	--	--	--	--	C	16.6	0.16	--	14	--	--	--	--	--	B	11.5	0.06	--	4
Weekday PM Peak Hour:																									
Oak St EB L	A	8.6	0.06	--	5	--	--	--	--	--	--	--	--	--	--	A	1.4	0.05	--	4	A	1.6	0.06	--	5
Site Driveway SB Approach	D	25.5	0.47	--	60	--	--	--	--	--	C	20.2	0.39	--	46	--	--	--	--	--	B	11.9	0.12	--	10
6. Needham Street, Oak Street, and Christina Street																									
Weekday AM Peak Hour:																									
Oak St EB L/T	F	203.3	1.30	~286	#478	F	336.7	1.60	~351	#533	F	233.3	1.36	~290	#466	F	227.1	1.34	~282	#457	F	227.1	1.34	~282	#457
Oak St EB R	A	7.9	0.26	21	73	C	27.6	0.16	24	72	C	27.9	0.17	22	74	C	27.0	0.14	17	63	C	27.0	0.14	17	63
Christina St WB L	E	64.8	0.73	99	#224	F	131.8	1.04	~117	#248	F	83.0	0.89	105	#229	E	75.9	0.86	104	#225	E	75.9	0.86	104	#225
Christina St WB T/R	D	43.8	0.52	158	267	D	41.8	0.61	173	264	D	41.5	0.60	169	259	D	41.5	0.60	171	262	D	41.5	0.60	171	262
Needham St NB L	E	55.2	0.81	85	#225	D	49.1	0.75	63	#159	D	45.8	0.73	58	#146	E	75.3	0.90	95	#233	E	75.3	0.90	95	#233
Needham St NB T/R	C	24.2	0.81	497	877	C	32.8	0.93	635	#1,003	C	32.8	0.93	635	#1,003	C	27.2	0.89	571	#929	C	27.2	0.89	571	#929
Needham St SB L	C	24.4	0.24	14	45	B	18.4	0.31	17	49	B	17.7	0.27	14	42	B	17.7	0.26	16	44	B	17.7	0.26	16	44
Needham St SB T/R	E	62.7	0.97	629	#1,053	F	107.3	1.14	~866	#1,120	E	78.5	1.06	~768	#1,018	F	113.3	1.16	~866	#1,120	F	98.8	1.12	~822	#1,074
Overall Intersection	**E**	**57.9**	--	--	--	**F**	**94.0**	--	--	--	**E**	**69.4**	--	--	--	**E**	**80.0**	--	--	--	**E**	**75.1**	--	--	--
Weekday Midday Peak Hour:																									
Oak St EB L/T	F	185.0	1.28	~288	#491	F	232.1	1.38	~312	#492	F	250.4	1.42	~334	#514	F	199.8	1.30	~288	#465	F	199.8	1.30	~288	#465
Oak St EB R	A	9.3	0.33	28	82	C	24.0	0.18	26	73	C	24.4	0.23	35	89	C	23.8	0.18	24	70	C	23.8	0.18	24	70
Christina St WB L	F	170.3	1.17	~116	#255	F	206.4	1.26	~123	#249	F	266.5	1.40	~131	#258	F	164.0	1.15	~115	241	F	164.0	1.15	~115	#241
Christina St WB T/R	D	35.4	0.46	111	194	C	33.9	0.46	100	171	C	33.9	0.46	100	171	C	33.9	0.46	104	176	C	33.9	0.46	104	176
Needham St NB L	D	51.5	0.83	81	#222	D	46.6	0.79	67	#179	D	46.6	0.79	67	#179	F	88.3	0.98	99	#252	F	88.3	0.98	99	#252
Needham St NB T/R	C	27.7	0.88	491	#965	D	50.2	1.01	~708	#1,017	D	50.2	1.01	~708	#1,017	D	39.5	0.97	605	#953	D	39.5	0.97	605	#953
Needham St SB L	E	70.4	0.70	27	#107	D	43.0	0.66	21	#87	F	80.0	0.83	30	#112	D	54.4	0.77	37	#127	D	54.4	0.77	37	#127
Needham St SB T/R	F	137.6	1.22	~879	#1,207	F	231.6	1.44	~1,051	#1,306	F	204.7	1.38	~981	#1,234	F	233.3	1.44	~1,051	#1,306	F	226.7	1.43	~1,034	#1,289
Overall Intersection	**F**	**88.5**	--	--	--	**F**	**136.1**	--	--	--	**F**	**130.0**	--	--		**F**	**129.9**	--	--	--	**F**	**127.3**	--	--	--
Weekday PM Peak Hour:																									
Oak St EB L/T	F	130.8	1.12	~270	#475	F	263.5	1.44	~363	#550	F	283.5	1.49	~386	#576	F	182.2	1.24	~295	#474	F	214.0	1.32	~335	#520
Oak St EB R	B	10.6	0.33	34	93	C	27.5	0.18	33	83	C	28.2	0.24	47	107	C	27.3	0.17	27	76	C	28.6	0.28	52	122
Christina St WB L	F	88.8	0.86	96	#225	F	164.1	1.12	~115	#242	F	209.4	1.24	~123	#251	F	90.1	0.90	97	#220	F	138.9	1.05	~109	#237
Christina St WB T/R	D	39.0	0.42	118	200	D	38.6	0.47	124	201	D	38.6	0.47	124	201	D	38.7	0.48	127	204	D	38.7	0.48	127	204
Needham St NB L	E	55.3	0.82	89	#226	D	54.4	0.80	75	#189	D	54.4	0.80	75	#189	F	93.6	0.97	108	#262	F	93.6	0.97	108	#262
Needham St NB T/R	C	22.3	0.78	453	800	C	28.4	0.90	594	#959	C	28.4	0.90	594	#959	C	24.5	0.87	542	#833	C	24.5	0.87	542	#833
Needham St SB L	C	25.1	0.31	21	59	C	21.8	0.48	31	84	B	19.4	0.36	22	59	C	20.0	0.40	30	75	C	20.0	0.40	30	75
Needham St SB T/R	F	92.7	1.11	~887	#1,217	F	210.7	1.39	~1,186	#1,448	F	151.6	1.25	~1,008	#1,266	F	209.2	1.38	~1,179	#1,440	F	177.7	1.31	~1,087	#1,347
Overall Intersection	**E**	**62.4**	--	--	--	**F**	**126.4**	--	--	--	**F**	**107.8**	--	--	--	**F**	**114.7**	--	--		**F**	**105.8**	--	--	--

[a] Unsignalized intersection results from VHB's TIAS, signalized intersection results from VHB's 2/14/19 Revised Building Program and Trip Generation Memorandum.

~ volume exceeds capacity, queue is theoretically infinite and blocking problems may occur. Queue shown is maximum after 2 cycles.

95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after 2 cycles. Value is valid if v/c ratio <1.00.

Table 1 (continued) – Intersection Operational Analysis Summary: 2025 Build Traffic-Volume Conditions with Oak Street Access Alternatives (with Existing Mode Splits)

Intersection/Peak Hour/Lane Group or Critical Movement	VHB's Traffic Study & RTC [a]					Alternative 1: No Access					Alternative 2: Exit Only					Alternative 3: Enter Only					Alternative 4: No Left-Turns Out				
	LOS	Delay	v/c	50th % Queue	95th % Queue	LOS	Delay	v/c	50th % Queue	95th % Queue	LOS	Delay	v/c	50th % Queue	95th % Queue	LOS	Delay	v/c	50th % Queue	95th % Queue	LOS	Delay	v/c	50th % Queue	95th % Queue
7. Needham Street and South Site Driveway (Main Street)																									
Weekday AM Peak Hour:																									
Site Driveway EB Approach	D	30.8	0.34	--	35	C	23.0	0.35	--	39	C	19.6	0.22	--	21	C	23.0	0.35	--	39	C	21.3	0.30	--	30
Needham St NB L	A	9.9	0.03	--	2	B	11.3	0.05	--	4	B	10.9	0.05	--	4	B	11.1	0.04	--	3	B	10.9	0.04	--	3
Weekday PM Peak Hour:																									
Site Driveway EB Approach	F	52.5	0.72	--	122	F	101.8	1.01	--	249	E	38.1	0.65	--	106	E	45.3	0.78	--	156	F	53.0	0.78	--	148
Needham St NB L	B	10.5	0.06	--	5	B	13.4	0.13	--	11	B	12.5	0.12	--	10	B	11.8	0.08	--	7	B	12.8	0.10	--	9
9. Needham Street, Charlemont Street, and North Site Driveway (Charlemont Street Extension)																									
Weekday AM Peak Hour:																									
Site Driveway EB L	D	37.3	0.34	26	49	D	42.3	0.47	28	64	D	42.3	0.47	28	64	D	40.4	0.47	27	63	D	40.5	0.47	27	63
Site Driveway EB T/R	A	0.4	0.10	0	0	D	38.0	0.05	0	0	D	37.9	0.03	0	0	D	36.3	0.05	0	0	D	36.3	0.04	0	0
Charlemont St WB L	D	35.5	0.20	14	37	D	39.7	0.25	14	39	D	39.6	0.24	14	39	D	37.9	0.24	13	38	D	37.9	0.24	13	38
Charlemont St WB T/R	A	0.2	0.04	0	0	D	37.8	0.01	0	0	D	37.8	0.01	0	0	D	36.1	0.01	0	0	D	36.2	0.01	0	0
Needham St NB L	A	9.9	0.19	8	46	C	20.1	0.38	19	69	C	20.1	0.38	19	69	B	14.6	0.23	10	41	B	14.5	0.23	10	41
Needham St NB T/R	B	12.6	0.63	154	#727	A	9.4	0.70	181	#582	A	9.4	0.70	181	#582	A	9.8	0.71	179	#603	A	9.8	0.71	179	#603
Needham St SB L	A	8.8	0.06	3	14	B	12.7	0.09	3	13	B	12.7	0.09	3	13	B	11.1	0.08	3	12	B	11.1	0.08	3	12
Needham St SB T/R	B	18.0	0.70	267	#708	C	22.1	0.84	348	#675	C	22.1	0.84	348	#675	B	16.6	0.79	312	#660	B	16.4	0.79	312	#660
Overall Intersection	**B**	**15.5**	--	--	--	**B**	**17.9**	**0.85**	--	--	**B**	**17.6**	**0.85**	--	--	**B**	**15.3**	**0.82**	--	--	**B**	**15.0**	**0.82**	--	--
Weekday Midday Peak Hour:																									
Site Driveway EB L	D	51.9	0.67	70	138	E	58.5	0.82	114	#210	E	58.5	0.82	114	#210	E	56.1	0.81	110	#210	E	56.1	0.81	110	#210
Site Driveway EB T/R	A	0.5	0.13	0	0	C	34.6	0.07	0	0	C	34.4	0.05	0	0	C	33.7	0.07	0	0	C	33.7	0.07	0	0
Charlemont St WB L	D	35.2	0.22	21	53	D	35.6	0.19	22	52	D	35.5	0.19	22	52	C	34.7	0.19	21	52	C	34.7	0.19	21	52
Charlemont St WB T/R	B	18.7	0.16	7	37	C	34.5	0.07	8	37	C	34.5	0.07	8	37	C	33.7	0.07	8	37	C	33.7	0.07	8	37
Needham St NB L	B	19.9	0.37	12	49	D	38.7	0.61	62	#193	D	38.7	0.61	62	#193	D	36.1	0.45	26	94	D	36.1	0.45	26	94
Needham St NB T/R	B	16.0	0.74	248	#829	B	16.9	0.79	331	#786	B	16.9	0.79	331	#786	B	17.3	0.80	328	#786	B	17.3	0.80	328	#786
Needham St SB L	A	9.8	0.02	1	7	C	20.4	0.05	2	7	C	20.4	0.05	2	7	B	19.8	0.05	1	7	B	19.8	0.05	1	7
Needham St SB T/R	C	28.5	0.88	426	#929	F	85.0	1.10	~709	#963	F	85.0	1.10	~709	#963	E	76.3	1.08	~667	#963	E	76.3	1.08	~667	#963
Overall Intersection	**C**	**23.6**	--	--	--	**D**	**50.4**	**1.06**	--	--	**D**	**50.6**	--	--	--	**D**	**46.8**	--	--	--	**D**	**46.9**	--	--	--
Weekday PM Peak Hour:																									
Site Driveway EB L	D	52.0	0.68	73	141	E	60.8	0.83	118	#218	E	60.0	0.83	118	#218	E	58.1	0.82	114	#218	E	58.1	0.82	114	#218
Site Driveway EB T/R	A	0.5	0.14	0	0	C	34.9	0.10	0	0	C	34.6	0.06	0	0	C	34.0	0.10	0	0	C	33.8	0.08	0	0
Charlemont St WB L	C	34.5	0.19	18	48	D	35.9	0.20	20	49	D	35.5	0.17	20	48	C	34.9	0.20	19	48	C	34.6	0.17	19	48
Charlemont St WB T/R	B	18.5	0.15	8	37	C	34.7	0.07	8	37	C	34.7	0.07	8	37	C	33.7	0.07	8	37	C	33.7	0.07	8	37
Needham St NB L	B	13.5	0.26	11	45	D	39.9	0.65	73	#219	D	40.0	0.64	73	#219	C	34.7	0.42	25	89	C	34.7	0.42	25	89
Needham St NB T/R	B	14.4	0.68	214	#719	B	14.5	0.72	282	604	B	14.6	0.72	282	604	B	14.7	0.73	281	604	B	14.7	0.73	281	604
Needham St SB L	A	9.8	0.02	1	7	B	18.3	0.04	2	7	B	18.4	0.04	2	7	B	17.5	0.04	1	7	B	17.5	0.04	1	7
Needham St SB T/R	C	24.1	0.82	371	#808	E	62.0	1.03	~568	#860	E	62.8	1.03	~568	#860	D	54.2	1.00	526	#860	D	54.2	1.00	526	#860
Overall Intersection	**C**	**20.9**	--	--	--	**D**	**40.8**	--	--	--	**D**	**41.2**	--	--	--	**D**	**37.2**	--	--	--	**D**	**37.2**	--	--	--

[a] Unsignalized intersection results from VHB's TIAS, signalized intersection results from VHB's 2/14/19 Revised Building Program and Trip Generation Memorandum.

~ volume exceeds capacity, queue is theoretically infinite and blocking problems may occur. Queue shown is maximum after 2 cycles.

95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after 2 cycles. Value is valid if v/c ratio <1.00.

Table 2 – Intersection Operational Analysis Summary: 2025 Build Traffic-Volume Conditions with Oak Street Access Alternatives (with Robust Shuttle)

Intersection/Peak Hour/Lane Group or Critical Movement	VHB's Traffic Study [a]					Alternative 1: No Access					Alternative 2: Exit Only					Alternative 3: Enter Only					Alternative 4: No Left-Turns Out				
	LOS	Delay	v/c	50th % Queue	95th % Queue	LOS	Delay	v/c	50th % Queue	95th % Queue	LOS	Delay	v/c	50th % Queue	95th % Queue	LOS	Delay	v/c	50th % Queue	95th % Queue	LOS	Delay	v/c	50th % Queue	95th % Queue
5. Oak Street and Site Driveway																									
Weekday AM Peak Hour:																									
Oak St EB L	A	8.5	0.03	--	2	--	--	--	--	--	--	--	--	--	--	A	1.0	0.03	--	3	A	0.9	0.03	--	2
Site Driveway SB Approach	C	17.7	0.18	--	15	--	--	--	--	--	C	16.4	0.16	--	14	--	--	--	--	--	B	11.4	0.05	--	4
Weekday PM Peak Hour:																									
Oak St EB L	A	8.6	0.05	--	5	--	--	--	--	--	--	--	--	--	--	A	1.2	0.04	--	3	A	1.2	0.04	--	3
Site Driveway SB Approach	C	22.8	0.40	--	48	--	--	--	--	--	C	17.9	0.28	--	28	--	--	--	--	--	B	11.8	0.11	--	9
6. Needham Street, Oak Street, and Christina Street																									
Weekday AM Peak Hour:																									
Oak St EB L/T	F	203.0	1.30	~286	#478	F	283.5	1.48	~333	#513	F	286.0	1.49	~341	#523	F	201.4	1.28	~275	#449	F	201.4	1.28	~275	#449
Oak St EB R	A	7.9	0.26	21	71	C	27.2	0.16	24	72	C	27.7	0.18	28	79	C	27.0	0.14	17	63	C	27.0	0.14	17	63
Christina St WB L	E	64.7	0.73	99	#224	F	124.7	1.01	~110	#244	F	129.1	1.03	~116	#247	E	75.9	0.86	104	#225	E	75.9	0.86	104	#225
Christina St WB T/R	D	43.8	0.52	158	267	D	40.8	0.57	161	249	D	40.3	0.57	161	249	D	40.6	0.57	161	248	D	40.6	0.57	161	248
Needham St NB L	D	52.7	0.79	81	#215	E	63.5	0.85	85	#212	D	44.2	0.72	58	#146	E	63.5	0.85	85	#212	E	63.0	0.85	85	#212
Needham St NB T/R	C	23.6	0.81	485	854	C	28.3	0.90	586	#948	C	28.6	0.91	586	#948	C	25.5	0.88	549	#903	C	25.5	0.88	549	#903
Needham St SB L	C	23.6	0.23	14	44	B	17.9	0.27	16	45	B	17.1	0.23	14	39	B	17.4	0.24	16	43	B	17.4	0.24	16	43
Needham St SB T/R	E	60.6	0.97	623	#1,043	F	100.3	1.12	~822	#1,075	E	74.9	1.05	~743	#993	F	97.3	1.11	~811	#1,063	F	86.9	1.09	~776	#1,028
Overall Intersection	**E**	**57.2**	--	--	--	**F**	**85.0**	**1.28**	--	--	**E**	**77.2**	**1.25**	--	--	**E**	**71.2**	**1.22**	--		**E**	**67.7**	**1.20**	--	--
Weekday Midday Peak Hour:																									
Oak St EB L/T	F	217.5	1.36	~309	#515	F	244.0	1.40	~301	#478	F	263.3	1.45	~322	#500	F	249.4	1.42	~309	#485	F	249.4	1.42	~309	#485
Oak St EB R	A	9.7	0.34	31	87	C	23.9	0.18	24	70	C	24.2	0.22	31	84	C	23.9	0.19	25	72	C	23.9	0.18	25	72
Christina St WB L	F	203.2	1.26	~122	#262	F	164.0	1.15	~115	#241	F	210.8	1.27	~123	#250	F	178.1	1.19	~118	#244	F	178.1	1.19	~118	#244
Christina St WB T/R	D	35.9	0.49	118	204	C	34.7	0.52	116	194	C	34.7	0.52	116	194	C	34.8	0.52	120	198	C	34.8	0.52	120	198
Needham St NB L	C	58.9	0.88	89	#241	D	46.6	0.79	67	#179	D	48.9	0.81	70	#186	F	81.3	0.96	95	#244	F	81.3	0.96	95	#244
Needham St NB T/R	E	28.8	0.89	508	#990	D	45.9	1.00	647	#993	D	45.9	1.00	647	#993	D	37.1	0.96	588	#937	D	44.7	0.99	640	#985
Needham St SB L	F	91.9	0.79	29	#113	F	88.3	0.88	37	#127	D	49.4	0.72	28	#105	D	35.1	0.66	32	#110	E	77.1	0.84	36	#125
Needham St SB T/R	F	142.2	1.23	~894	#1,224	F	216.7	1.41	~1,012	#1,267	F	197.5	1.36	~958	#1,210	F	218.4	1.41	~1,012	#1,267	F	214.8	1.40	~1,005	#1,260
Overall Intersection	**F**	**95.8**	--	--	--	**F**	**127.9**	**1.47**	--	--	**F**	**123.8**	**1.45**	--	--	**F**	**128.3**	**1.47**	--	--	**F**	**129.3**	**1.47**	--	
Weekday PM Peak Hour:																									
Oak St EB L/T	F	154.9	1.19	~293	#500	F	256.6	1.42	~360	#547	F	283.6	1.49	~386	#576	F	182.2	1.24	~295	#474	F	182.2	1.24	~295	#474
Oak St EB R	B	11.1	0.34	37	97	C	27.5	0.19	34	85	C	28.1	0.24	46	105	C	27.3	0.17	28	78	C	27.3	0.17	28	78
Christina St WB L	F	101.7	0.92	97	232	F	160.6	1.11	~114	#242	F	209.5	1.24	~124	#252	F	90.1	0.90	97	#220	F	90.1	0.90	97	#220
Christina St WB T/R	D	39.4	0.45	125	210	D	38.6	0.47	124	201	D	38.6	0.47	124	201	D	38.7	0.48	127	204	D	38.7	0.48	127	204
Needham St NB L	E	62.8	0.87	98	#248	D	54.4	0.80	75	#189	D	54.0	0.79	75	#189	F	86.3	0.95	104	#254	F	86.3	0.95	104	#254
Needham St NB T/R	C	23.0	0.79	469	#832	C	28.0	0.90	587	#949	C	26.1	0.88	563	#920	C	23.8	0.86	527	#779	C	23.8	0.86	527	#779
Needham St SB L	C	26.5	0.33	22	61	C	21.5	0.47	31	82	B	18.7	0.33	22	56	B	19.7	0.39	30	73	B	19.7	0.39	30	73
Needham St SB T/R	F	94.7	1.11	~895	#1,225	F	190.8	1.34	~1,125	#1,386	F	141.2	1.22	~972	#1,229	F	192.3	1.34	~1,125	#1,386	F	160.5	1.27	~1,033	#1,291
Overall Intersection	**E**	**66.8**	--	--	--	**F**	**117.3**	**1.40**	--		**F**	**104.0**	**1.34**	--	--	**F**	**107.2**	**1.34**	--	--	**F**	**94.7**	**1.30**	--	--

[a] Unsignalized and signalized intersection results from VHB's TIAS. Weekday Midday from VHB's 12/10/18 Peer Review Response to Comments Memorandum.

~ volume exceeds capacity, queue is theoretically infinite and blocking problems may occur. Queue shown is maximum after 2 cycles.

95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after 2 cycles. Value is valid if v/c ratio <1.00.

Table 2 (continued) – Intersection Operational Analysis Summary: 2025 Build Traffic-Volume Conditions with Oak Street Access Alternatives (with Robust Shuttle)

Intersection/Peak Hour/Lane Group or Critical Movement	VHB's Traffic Study [a]					Alternative 1: No Access					Alternative 2: Exit Only					Alternative 3: Enter Only					Alternative 4: No Left-Turns Out				
	LOS	Delay	v/c	50th % Queue	95th % Queue	LOS	Delay	v/c	50th % Queue	95th % Queue	LOS	Delay	v/c	50th % Queue	95th % Queue	LOS	Delay	v/c	50th % Queue	95th % Queue	LOS	Delay	v/c	50th % Queue	95th % Queue
7. Needham Street and South Site Driveway (Main Street)																									
Weekday AM Peak Hour:																									
Site Driveway EB Approach	D	30.3	0.30	--	30	C	21.9	0.29	--	29	C	18.6	0.19	--	17	C	23.3	0.31	--	32	C	20.2	0.24	--	23
Needham St NB L	A	9.8	0.03	--	2	B	11.0	0.05	--	4	B	10.8	0.04	--	3	B	11.3	0.04	--	3	B	10.8	0.03	--	3
Weekday PM Peak Hour:																									
Site Driveway EB Approach	E	46.8	0.67	--	105	F	72.1	0.89	--	197	D	34.8	0.62	--	96	F	66.2	0.87	--	184	E	43.2	0.70	--	120
Needham St NB L	B	10.4	0.06	--	50	B	12.0	0.11	--	9	B	12.3	0.12	--	10	B	12.9	0.11	--	9	B	12.6	0.10	--	8
9. Needham Street, Charlemont Street, and North Site Driveway (Charlemont Street Extension)																									
Weekday AM Peak Hour:																									
Site Driveway EB L	D	36.6	0.33	25	48	D	39.4	0.39	20	53	D	39.9	0.40	21	54	D	39.6	0.40	20	53	D	39.7	0.40	20	53
Site Driveway EB T/R	A	0.4	0.09	0	0	D	36.2	0.03	0	0	D	36.5	0.02	0	0	D	36.3	0.03	0	0	D	36.3	0.03	0	0
Charlemont St WB L	C	34.8	0.20	13	37	D	38.0	0.25	13	38	D	38.3	0.25	13	39	D	38.1	0.26	13	38	D	38.1	0.25	13	38
Charlemont St WB T/R	A	0.2	0.04	0	0	D	36.0	0.01	0	0	D	36.4	0.01	0	0	D	36.1	0.01	0	0	D	36.2	0.01	0	0
Needham St NB L	A	9.4	0.17	7	41	B	12.8	0.18	8	34	B	16.6	0.29	14	53	B	12.5	0.17	7	32	B	12.5	0.17	7	32
Needham St NB T/R	B	12.7	0.63	154	#725	A	9.6	0.71	170	#582	A	9.4	0.70	172	557	A	9.5	0.71	170	#589	A	9.4	0.71	170	#589
Needham St SB L	A	8.7	0.06	3	13	B	10.8	0.08	3	11	B	12.3	0.09	3	12	B	10.7	0.08	3	11	B	10.6	0.08	3	11
Needham St SB T/R	B	17.6	0.69	259	#685	B	15.2	0.77	293	533	C	20.2	0.82	302	#601	B	15.1	0.77	293	528	B	14.9	0.76	293	528
Overall Intersection	**B**	**15.4**	--	--	--	**B**	**14.1**	**0.80**	--	--	**B**	**16.2**	**0.84**	--	--	**B**	**14.0**	**0.80**	--	--	**B**	**13.8**	**0.79**	--	--
Weekday Midday Peak Hour:																									
Site Driveway EB L	E	58.2	0.77	100	#202	D	54.8	0.79	105	#193	D	54.8	0.79	105	#193	D	54.1	0.78	101	#193	D	54.2	0.78	101	#193
Site Driveway EB T/R	A	0.6	0.15	0	0	C	34.2	0.07	0	0	C	34.1	0.05	0	0	C	33.9	0.07	0	0	C	33.9	0.06	0	0
Charlemont St WB L	C	34.4	0.19	21	54	D	35.3	0.19	22	52	D	35.2	0.19	22	52	C	35.0	0.19	21	52	D	35.0	0.19	21	52
Charlemont St WB T/R	B	18.2	0.13	8	37	C	34.2	0.07	8	37	C	34.2	0.07	8	37	C	33.9	0.07	8	37	C	34.0	0.07	8	37
Needham St NB L	C	34.6	0.57	20	84	D	36.4	0.52	38	#131	D	36.4	0.52	38	#131	D	35.9	0.41	21	80	D	35.9	0.40	21	80
Needham St NB T/R	B	17.4	0.75	296	#814	B	16.6	0.79	316	#786	B	16.6	0.79	316	#786	B	16.7	0.79	312	#786	B	16.7	0.79	312	#786
Needham St SB L	B	11.4	0.03	1	7	B	19.5	0.05	1	7	B	19.5	0.05	1	7	B	19.1	0.05	1	7	B	19.1	0.05	1	7
Needham St SB T/R	D	49.0	0.99	532	#1,001	E	74.5	1.07	~671	#957	E	74.5	1.07	~671	#957	E	67.8	1.05	~589	#957	E	68.2	1.06	~589	#957
Overall Intersection	**C**	**34.3**	--	--	--	**D**	**45.6**	**1.04**	--	--	**D**	**45.8**	**1.04**	--	--	**D**	**43.0**	**1.03**	--	--	**D**	**43.2**	**1.04**	--	--
Weekday PM Peak Hour:																									
Site Driveway EB L	E	59.1	0.79	104	#210	E	57.5	0.81	110	#199	E	57.6	0.81	110	#199	E	55.5	0.80	105	#199	E	55.6	0.80	105	#199
Site Driveway EB T/R	A	0.6	0.17	0	0	C	34.9	0.09	0	0	C	34.7	0.06	0	0	C	34.0	0.09	0	0	C	34.0	0.07	0	0
Charlemont St WB L	C	34.2	0.16	19	50	D	35.9	0.19	20	48	D	35.7	0.17	20	48	C	34.9	0.18	19	48	C	34.8	0.17	19	48
Charlemont St WB T/R	B	18.2	0.13	8	37	C	34.8	0.07	8	37	C	34.8	0.07	8	37	C	33.9	0.07	8	37	C	34.0	0.07	8	37
Needham St NB L	C	33.0	0.54	21	83	D	37.9	0.62	65	#202	D	37.9	0.61	65	#202	C	33.5	0.39	22	80	C	33.6	0.39	22	80
Needham St NB T/R	B	15.3	0.68	253	#641	B	14.2	0.72	271	604	B	14.1	0.72	271	604	B	14.4	0.72	266	604	B	14.3	0.72	266	604
Needham St SB L	B	11.4	0.02	1	7	B	17.8	0.04	1	7	B	17.9	0.04	1	7	B	17.0	0.04	1	7	B	17.0	0.04	1	7
Needham St SB T/R	D	37.4	0.93	471	#893	E	57.3	1.01	541	#851	E	57.7	1.01	541	#851	D	49.5	0.99	494	#851	D	48.9	0.99	494	#851
Overall Intersection	**C**	**28.8**	--	--	--	**D**	**38.3**		--	--	**D**	**38.5**	--	--	--	**C**	**34.8**	**0.98**	--	--	**C**	**34.5**	**0.98**	--	--

[a] Unsignalized and signalized intersection results from VHB's TIAS. Weekday Midday from VHB's 12/10/18 Peer Review Response to Comments Memorandum.

~ volume exceeds capacity, queue is theoretically infinite and blocking problems may occur. Queue shown is maximum after 2 cycles.

95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after 2 cycles. Value is valid if v/c ratio <1.00.

ATTACHMENT F

3/28/19

It is the goal of this plan to mitigate the impacts of the Northland Newton Development, to make the best possible use of this 22 acre site and to allow a truly great project to thrive in the context of significant traffic mitigation through a combination of:

- *A first of its kind shuttle program*
- *Public improvements in the Needham Street Redesign*
- *Programmatic adjustments to reduce the impact of retail space*
- *Mixed uses to keep residents and workers on site*
- *Major enhancements of biking and walking facilities and limitations on parking*
- *Incentives and options for car-free living*
- *Aggressive traffic monitoring and reporting*

SUMMARY OF TDM PROVISIONS

The purpose of this Summary is to review traffic demand management at the Northland Newton Development holistically from program to design to operations. Northland's goal is to provide a development which effectively addresses traffic generation in a forward looking, multi-faceted and flexible program. This Summary recognizes that construction of the development will commence in 2-3 years and the buildout will take perhaps 5 years after that. It would be an error to predict all the changes in public or private transportation on Needham Street which may occur between now and 2027, but Northland believes it is significant to set forth its vision, its commitment and the metrics by which success will be measured.

Northland's commitment for TDM measures offers the following:

(i) Clear goals for achieving success in reducing trip generation

(ii) Specific TDM measures to reduce trip generation in order to meet the stated goals

(iii) Specific metrics to measure progress; and

(iv) Scalability of the TDM program and opportunities for incremental changes to the program to accommodate changes over time.

Positive Impact of the Revised Development Program

Since the original VHB TIAS was submitted in October 2018 the program for the project has been dramatically altered as to traffic generation by the elimination of 70,000 s.f. of retail space and 22 dwelling units. For clarity – the reduction in retail spaces is essentially equivalent to removal of the Marshall's Plaza in its entirety. The resulting change in trip generation is expected to be:

Weekday morning peak	-19%
Weekday afternoon peak	-56%
Saturday midday peak	-55%

The reduction in retail space as suggested by the City's peer review consultant has improved the project planning and as a by-product has led to a significant decrease in trip generation.

Proposed TDM Measures

Northland's proposed TDM program includes the following measures:

1. Car Free Living Incentives

Within the project Northland is striving to provide every available option to lead to either car-free living or multiple options for alternatives to car use.

The project will contain incentives for car-free living including:

- Separate (unbundled) charges for parking spaces except for affordable units;
- Alternative transit modes – see below – including pedestrian enhancements, bicycle routes, shuttle routes as described herein
- Onsite commercial areas – jobs, retail, restaurants

2. Shuttle

Northland will institute a first of its kind shuttle program which will provide four routes of shuttles being:

- Route 1 Newton Circulator
- Route 2 Newton Highlands shuttle
- Route 3 Cambridge Express
- Route 4 Boston Express

Northland intends to commence shuttle operations at the granting of a certificate of occupancy for 400 units. Operating hours of the shuttles are initially established to provide service primarily during commuting hours, and each of the routes is scalable, generally by hours of operation, but also by connections to other shuttles or transit modes. The Newton Highlands service is expected to run on an approximately 20 minute schedule during peak hours.

Northland notes that this shuttle system is of unprecedented scope and scale within our experience. Consistent with the variables cited above as to construction, occupancy, uses mix and future technology, the shuttle system will be scaled to an appropriate level consistent with demand. The upside scaling of the shuttle system is unlimited, as the shuttle may connect to other regional resources such as Founders Park and may intersect with the provision of services to other riders. Northland anticipates that in the next years the shuttles to Needham and Wells Ave. will develop and coordinate to provide improved access for workers making a reverse commute. We expect reverse commuting to be a major public benefit of Northland's shuttle, but we note that reverse commuting will generally not be counted or credited as a reduction in traffic generation from the project.

3. Pedestrian Improvements

Enhancement of the pedestrian experience through and adjacent to the Project is a method of reducing vehicle trips. Needham Street today provides a better pedestrian experience now than it did some years ago, and it will be significantly enhanced by the 2020 Needham Street Redesign Project, while the ambiance within the Project itself will be very pedestrian friendly. Pedestrian enhancements at the perimeter will include:

- Sidewalk improvements along Needham Street as part of the Project

- Signalized crosswalk at Charlemont Street to allow pedestrian access to the East side of Needham Street
- Pedestrian access down Charlemont Street to a new connection to Christina Street
- Removal of the Greenway fence and enhanced access to the Greenway

Within the Project pedestrian-friendly elements to encourage walkability include:

- Wayfinding signage throughout the Project for pedestrian routes
- Slow streets with raised tables to reduce traffic speed
- Seating areas in pocket parks and along sidewalks throughout

In addition, the Needham Street Redesign project and the related Oak/Christina Street project to be implemented starting in 2019-2020 will:

- Update signal timing for pedestrians throughout the corridor
- Add 7 additional crosswalks in the Needham Street/Highland Ave. corridor
- Reconstruct sidewalks

4. Bicycle Accommodations

Accommodations for bicycles will be built into the Project including:

- 1100 secure bicycle parking spaces are planned in the Project, spread among the residential, office and retail/restaurant spaces
- Provision at the Mobility Hub and the other locations within the Project for LimeBikes or any similar successor program
- Bicycle repair stations with air pumps
- Availability of showers for office tenants.
- Enhanced access to the Greenway and Upper Falls
- Wayfinding signage throughout the project for bicycle and shared routes

In addition, the Needham Street Redesign project and the related Oak/Christina Street project to be implemented starting in 2019-2020 will:

- Introduce raised bike lanes throughout the corridor and including over the Charles River bridge
- Provide new traffic signals at Winchester Street at Route 9 WB and EB in addition to the new traffic signal at Charlemont Street.

5. Mobility Hub

Northland intends to construct a Mobility Hub of at the front entrance to the Project. The Mobility Hub will provide both a TDM program and a physical presence allowing for:

- High profile transit hub at the front entrance
- Transit and shuttle waiting room adjacent to the parking area
- Rest rooms
- Message Boards – electronic information boards such as, for example, a "Soofa" sign, digital and static signage, maps, information boards, T schedules; real-time transit information
- Adjacent pick-up and drop-off for shuttles
- Café space
- Designated traffic coordinator and staffing to provide TDM coordination

6. Car Sharing

Northland will seek to have initially 4 Zip-Car or equivalent car sharing vehicles in a defined area at the Project when fully constructed, scaled appropriately for the construction/phasing period. The car sharing vehicles will be in designated parking areas. Car sharing will be monitored to confirm that cars are generally available to support a car-free lifestyle. Wayfinding signage throughout the development and at the car sharing services locations will facilitate use of the vehicles.

7. Alternate Transportation Incentives

To induce greater use of alternate transportation toward the trip reduction goal, financial incentives will be offered to residents. Northland will also work with office and retail employers on-site. The incentives will include a combination of the following items:

- Parking limitations for commercial tenants
- Subsidized T-Passes for residents or employees without cars
- Shuttle discount incentives to induce ridership

8. Program Coordination

A transportation management coordinator will be designated to manage the implementation of the TDM measures, vendor management, customer relations, and data collection. The transportation management coordinator will undertake a marketing program to create awareness and generate interest in the availability of alternative transit options and incentives. Prominent wayfinding signage will be installed to identify the mobility hub and access points for alternative transit resources.

Alternate Transportation Programming

The Mobility Hub and the transportation coordinator can also provide scalable programs for encouraging multi-passenger vehicle trips on the one hand and discouraging car ownership on the other.

Project Use Mix

As a mixed use center the Project's mix of uses is intended and expected to reduce aggregate traffic demand through providing the mix of housing, jobs, services and transit on site. The Project itself is a demand management technique. The visits from office workers to the restaurants or from residents to shops are referred to as "internal capture trips" which are provided a projected reduction in the ITE Trip Generation Handbook.

In addition, the availability of services adjacent to the Project will also reduce traffic trips. For example across the street from the Project is the Bright Horizons day care center, where we anticipate some residents and some office employees will obtain child care by walking across the street. The Project residences could be attractive to workers at the office building at 233 Needham Street, and the enhanced pedestrian amenities from the Needham Street redesign will mean that for purposes of the mix

the Project area is greater than the Project itself. These uses are not internal to the Project but are proximate and serve the same function as "internal capture trips".

Parking

Many of the TDM strategies are designed to reduce not necessarily trips but parking. Northland intends to charge separately for residential parking except for residents of affordable units who are entitled to a space within their rent. The price of parking will be set to keep the demand down to meet the supply.

Northland has presented a Shared Parking Analysis and a Parking Management Plan indicating that the parking in the garages is expected to be sufficient other than at peak December shopping dates for which provisions are made.

Scalability/Adjustments/Review

This Summary describes steps which are intended to be scaled to the construction schedule of the Project. During construction and rent-up the interim goals of implementation are:

- Early opening and operation of the Mobility Hub and information services;
- Coordination with employers for employee transit and parking
- Coordination with the Newton Needham Chamber and N-Squared Innovation District
- Coordination with area businesses including Founders Park, Wells Ave. and Needham Street
- Providing programmed transit services for residents and employees

This Summary is written in 2019, and Northland anticipates the Project to be built out and occupied by about 2025. The final TDM Plan when drafted and the shuttle services in particular are designed as "stand-alone" services which Northland is prepared to provide. However, Northland is aware that the environment is not static, that regional growth, economic growth or contraction, regulatory changes or disruptive technologies may affect underlying facts or create new or additional demand management strategies or, on the other hand, make strategies in this

Summary impractical. Both Founders Park in Needham and parts of Wells Avenue in Newton have zoning requirements to participate in a transportation management association. It is clear that these properties will evolve over time, that coordination among the properties is to the advantage of all and that this plan and the shuttle services provided should be and will be adjusted.

The final TDM Plan should be subject to revisions at not less than three points in time:

1) Prior to the commencement of construction Northland will review prepare the final TDM Plan to reflect elements for which facts or programs may have changed;
2) Prior to the commencement of construction of the final buildings the Project Northland will review the TDM Plan to reflect experience to date and to adjust elements for which facts or programs may have changed.
3) Upon review of the metrics provided for understanding the traffic volumes, shuttle programs and overall TDM effectiveness the program will without doubt be adjusted with successful programs enhanced and less successful programs revised. Northland expects a dynamic management program over a long period of time

Metrics/Post Occupancy Review

Trip Generation Reduction Goal Ultimately Northland views the primary metric of success to be trip generation. As noted above the adjustment of the project program by elimination of 70,000 s.f of retail leads to a dramatic reduction in projected traffic, but further goals are attainable. The VHB revised TIA of March 28, 2019 projects net new traffic using the existing and "robust" mode splits as:

	Existing Mode Split	Robust Shuttle
Weekday a.m. peak	218	119
Weekday p.m. peak	196	119
Saturday midday peak	268	209

These periods can be measured and progress tracked. Northland proposes establishing a target to reduce traffic generation below the projection for existing mode split with an aspiration to achieve the goal of traffic generation reflected in the "robust shuttle" mode split. The implementation of various elements of the TDM plan together with the program changes already implemented will provide a very substantial reduction in traffic generation from the project as filed.

Data Collection The collection of data for the alternate transit utilization is essential to track success against the stated trip generation reduction goals. As part of the TDM plan, data will be collected and analyzed on an annual basis to determine the ongoing success of each of the proposed measures in meeting the plan's goals. Not all will be, and some may be successful at different times and at different points in the life of the development . The creation of alternatives, the monitoring of choices and adaptability will be critical to overall success. These metrics will be the basis for making adjustments in the program elements to improve overall performance.

Annual data collection and analysis will include the following:

- Shuttle ridership on each route
- T-Passes subsidized
- Shuttle discounts offered
- Shared bike utilization on site
- Zip Car Usage on site
- Residential parking passes outstanding
- Office parking usage
- User survey response information

Post Occupancy TDM Reporting One year after issuance of a final certificate of occupancy for the Project Northland will conduct a post occupancy traffic study to document and assess (i) the actual traffic characteristics, volumes, and operating conditions of the Project including safety and crash results; (ii) evaluate the success and refine the elements of the TDM Plan including parking utilization and residential and commercial tenant mode shares; and (iii) assess traffic volumes and operating conditions at the Project site. Traffic counts will be performed under average-month conditions

while public schools are in regular session. The results will be analyzed to review the actual traffic and parking characteristics of the Project and to assess traffic volumes and operating conditions at the Project and the results of the traffic study and review will be provided to the Director of Planning and Development, the Director of the Transportation Division of Public Works for review.

If the results of the traffic study indicate the actual measured traffic volumes associated with the Project as constructed and do not achieve the desired metrics as measured at the Needham Street driveways serving the Project, other than through matters changing the "no-build' condition through unanticipated additional development, then Northland shall meet with the Director of Planning and Development Department and the Director of Transportation for the Department of Public Works to propose corrective measures to the TDM in order to increase use of public transportation, or other alternatives to automobile travel or other methods to achieve the desired metrics.

ATTACHMENT G

NORTHLAND NEWTON PROJECT TRANSPORTATION MITIGATION FUND

City-identified Improvements

Type	Description	Notes
Initial Capital Investments		
Transit/Shuttle	Transportation Alternatives Analysis. Overarching transit improvement study	Feasibility study of improved/faster transit, with costs, of multiple options: 1. Infrastructure improvements @ Winchester for bus lane, 2. Greenway shuttle, 3. Green line extension to Needham, with new stop @ Greenway, 4. Move Eliot Station to CVS @ Rt 9.
Complete Streets	Upper Falls Village Enhancement Project	Design for Upper Falls Village enhancement streetscape/pedestrian improvements.
Bike/Ped	Extend Greenway to New. Highlands	Preferably along tracks, o/w via Curtis/Winchester
Bike/Ped	Extend Greenway to Eliot Station	Path through DPW yard/Eversource property then neighboring on streets
Bike/Ped	Oak/Christina St ped bridge study	feasibility study of Oak/Christina St bridge
Traffic	Install Transit Signal Priority Upgrades	Needham St
Traffic	Study and Install Traffic Calming	Upper Falls roadways and Chestnut corridor
Traffic	Provide Signal Coordination	Rt 9 / Winchester and Centre/Walnut
Traffic	Upgrade Signal Equipment	Chestnut/Oak/Eliot
Traffic	Install New Signal Equipment	Chestnut/Rt 9
Traffic	Study - Road Safety Audit	Centre/Walnut
Traffic	Study - Traffic operations	Newton Highlands MBTA
Traffic	Study - traffic queue	Oak/Needham
Traffic	Study and Install Traffic Calming	Chestnut Corridor
Traffic	Study - emergency vehicle access	via Mechanic St
Traffic	Provide Traffic Management System	Allow for remote access to signals along Needham Street following MassDOT improvements.