

Ref: 8451

June 8, 2021

Ms. Gwen Noyes
Oaktree Development
129 Mount Auburn Street
Cambridge, MA 02138-5766

Re: Traffic Considerations – Thorndike Place Development Changes
Arlington, Massachusetts

Dear Gwen:

Vanasse & Associates, Inc. (VAI) has prepared this analysis to summarize traffic considerations for the Thorndike Place development (the “Project”) based on the proposed changes to the development program which now consists primarily of Senior Independent Living residences. In addition, transportation services from the Arlington Council on Aging that could be provided for the Project have been researched and are summarized in this letter.

Proposed Development Changes

Previously, a development program of 176¹ non-age-restricted apartment units was considered at the site. The newly proposed development program calls for the construction of 12 duplex units and 124 Senior Housing Independent Living units. In order to develop the traffic characteristics of the proposed Project, trip-generation statistics published by the Institute of Transportation Engineers (ITE) for Land Use Code (LUC) 220, Multifamily Housing (Low-Rise) and LUC 252, Senior Adult Housing - Attached were used to provide a starting point for generation of vehicle trips associated with the development. These data were then utilized in conjunction with mode split data from local sources in order to provide an estimate of person trip generation for the Project.

Mode Split Data

Mode split data from U.S. Census and American Community Survey for Census Tract 3561 were used to adjust trip generation. This is the census tract in which the project is located. The mode split characteristics are provided in Table 1.

¹ This total was revised downward to 172 units; however, traffic analyses were conducted with the larger unit count.

Table 1
MODE SPLIT DATA

Mode	Census Tract 3561 Mode Splits ^a (Percentage)
Single Occupancy Vehicle	45
High Occupancy Vehicle	6
Transit	35
Bike	6
Walk	0
Other	<u>8</u>
TOTAL	100

^aFrom from American Community Survey 2018 5-year estimates for Census Tract 3561.

Project-Generated Trips by Mode

The census tract mode split data was then applied to the ITE trip-generation projections for the Duplex units and the Senior Housing projections to determine the project-generated trips by mode. A summary of the expected site-generated trips by mode is provided in Table 2 for LUC 220 and Table 3 for LUC 252. Table 4 summarizes the overall expected site-generated vehicle trips.

Table 2
DUPLEXES TRIP GENERATION SUMMARY

Time Period/ Directional Distribution	Duplex Vehicle Trips ^a	Duplex Person Trips ^b	SOV Trips 45%	HOV Trips 6%	Transit Trips 35%	Bike Trips 6%	Walk Trips 0%	Other Trips 8%	Duplex Total Vehicle Trips ^c
Weekday Daily	88	100	46	6	34	6	0	8	46
<i>Weekday Morning Peak Hour:</i>									
Entering	1	1	1	0	0	0	0	0	1
Exiting	<u>5</u>	<u>6</u>	<u>3</u>	<u>0</u>	<u>2</u>	<u>0</u>	<u>0</u>	<u>1</u>	<u>3</u>
Total	6	7	4	0	2	0	0	1	4
<i>Weekday Evening Peak Hour:</i>									
Entering	4	5	2	0	2	0	0	1	2
Exiting	<u>3</u>	<u>3</u>	<u>2</u>	<u>0</u>	<u>1</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>2</u>
Total	7	8	4	0	3	0	0	1	4

^aBased on ITE LUC 220, Multifamily Housing (Low-Rise); 12 units.

^bITE vehicle trips multiplied by VOR from American Community Survey 2018 5-year estimates for Census Tract 3561; VOR = 1.13

^cSOV+HOV persons trips divided by VOR from American Community Survey 2018 5-year estimates for Census Tract 3561; VOR = 1.13



Table 3
SENIOR HOUSING-INDEPENDENT LIVING TRIP GENERATION SUMMARY

Time Period/ Directional Distribution	Senior Housing Vehicle Trips ^a	Senior Housing Person Trips ^b	SOV Trips 45%	HOV Trips 6%	Transit Trips 35%	Bike Trips 6%	Walk Trips 0%	Other Trips 8%	Senior Housing Total Vehicle Trips ^c
Weekday Daily	474	536	242	32	188	32	0	42	242
<i>Weekday Morning Peak Hour:</i>									
Entering	9	10	5	1	4	0	0	0	5
Exiting	16	18	8	1	6	1	0	2	8
Total	25	28	13	2	10	1	0	2	13
<i>Weekday Evening Peak Hour:</i>									
Entering	18	20	9	1	7	1	0	2	9
Exiting	14	16	7	1	6	1	0	1	7
Total	32	36	16	2	13	2	0	3	16

^aBased on ITE LUC 252, Senior Adult Housing - Attached; 124 units.

^bITE vehicle trips multiplied by VOR from American Community Survey 2018 5-year estimates for Census Tract 3561; VOR = 1.13

^cSOV+HOV persons trips divided by VOR from American Community Survey 2018 5-year estimates for Census Tract 3561; VOR = 1.13

Table 4
TOTAL VEHICLE TRIP GENERATION SUMMARY

Time Period/ Directional Distribution	Duplex Total Vehicle Trips ^a	Senior Housing Total Vehicle Trips ^b	Project Generated Total Vehicle Trips ^c
Weekday Daily	46	242	288
<i>Weekday Morning Peak Hour:</i>			
Entering	1	5	6
Exiting	3	8	11
Total	4	13	17
<i>Weekday Evening Peak Hour:</i>			
Entering	2	9	11
Exiting	2	7	9
Total	4	16	20

^aFrom Table 2.

^bFrom Table 3.

As can be seen in Table 4, the Project is expected to generate 288 vehicle trips on an average weekday (two-way, 24-hour volume), with 17 vehicle trips (6 entering and 11 exiting) expected during the weekday morning peak hour. During the weekday evening peak hour, the Project is expected to generate 20 vehicle trips (11 entering and 9 exiting).

The trip generation of the 176-unit apartment complex program evaluated in the November 2020 Transportation Impact Assessment for Thorndike Place is listed in Table 5 for comparison.



Table 5
PROJECT-GENERATED VEHICLE TRIP GENERATION COMPARISON

Time Period/ Directional Distribution	Current Program Vehicle Trips ^a	Previous Program Vehicle Trips ^b	Increase/Decrease Vehicle Trips	Increase/Decrease Percent
Weekday Daily	288	430	-142	-33
<i>Weekday Morning Peak Hour:</i>				
Entering	6	7	-1	--
<u>Exiting</u>	<u>11</u>	<u>20</u>	<u>-9</u>	<u>--</u>
Total	17	27	-10	-37
<i>Weekday Evening Peak Hour:</i>				
Entering	11	20	-9	--
<u>Exiting</u>	<u>9</u>	<u>13</u>	<u>-4</u>	<u>--</u>
Total	20	33	-13	-39

^aFrom Table 4.

^bFrom November 2020 TIA for Thorndike Place.

As can be seen in Table 5, the Project is expected to generate 142 less vehicle trips on an average weekday (two-way, 24-hour volume) than the previous development program, with 10 less vehicle trips (1 less entering and 9 less exiting) expected during the weekday morning peak hour. During the weekday evening peak hour, the Project is expected to generate 13 less vehicle trips (9 less entering and 4 less exiting) than the previous development program. On a percentage basis, the current program is expected to generate between 33 and 39 percent fewer vehicle trips than the previous program.

Arlington Council on Aging Transportation Services

In an effort to address the desire for some residents to get to locations in town, the Town of Arlington Council on Aging was contacted to determine the scope of transit services that are offered. The Council on Aging provides an on-demand service to any Arlington resident 60 years or older that can call to arrange transportation within the Town of Arlington. They provide van service for everyday life activities such as going to the hairdresser, bank, shopping, or to visit a friend, and for medical appointments. A round trip costs 6 dollars. The service operates two accessible vans that can accommodate up to 8 passengers at a time.

In addition, for medical procedures outside of Arlington, the Council on Aging is partnered with a local cab company to provide this on-demand service. Finally, a new service started in March 2021 that will transport patrons to and from home to all Council on Aging program sites. This charge for this service is \$3 per round trip. This is also an on-demand service.



Ms. Gwen Noyes

June 8, 2021

Page 5 of 5

Conclusions

Based on the change in building program, the site is now expected to generate between 33 and 39 percent fewer vehicle trips than the previous program. This is a significant reduction in vehicle trip generation and is likely to be achieved since the mode split profile is based on current residents of the area and for the senior housing component, does not require the aggressive TDM program of the 176-unit apartment development. With the reduction noted, impacts will be reduced, and intersection delays and queueing will be further minimized. The change to senior housing also permits the use of the Council on Aging transport services, expected to further reduce generation of single-occupant vehicle trips.

If you have any questions on the information or conclusions reached herein, feel free to contact us.

Sincerely,

VANASSE & ASSOCIATES, INC.

A handwritten signature in blue ink, appearing to read "Scott W. Thornton".

Scott W. Thornton, P.E.

Principal

A handwritten signature in blue ink, appearing to read "Derek Roach".

Derek Roach, P.E.

Senior Transportation Engineer

Attachment:

Trip Generation Calculations

cc: File



APPENDIX

CENSUS DATA
TRIP GENERATION CALCULATIONS

CENSUS DATA

COMMUTING CHARACTERISTICS BY SEX

Note: This is a modified view of the original table produced by the U.S. Census Bureau. This download or printed version may have missing information from the original table.

Census Tract 3561, Middlesex County, Massachusetts				
		Total		Male
Label	Estimate	Margin of Error	Estimate	
▼ Workers 16 years and over	2,051	±155	1,048	
▼ MEANS OF TRANSPORTATION TO WORK				
▼ Car, truck, or van	54.5%	±7.2	57.7%	
Drove alone	42.9%	±7.6	45.8%	
▼ Carpooled	11.6%	±4.5	11.9%	
In 2-person carpool	9.6%	±4.2	9.9%	
In 3-person carpool	1.5%	±1.8	1.0%	
In 4-or-more person carpool	0.5%	±0.8	1.0%	
Workers per car, truck, or van	1.13	±0.06	1.13	
Public transportation (excluding taxicab)	31.6%	±6.4	29.4%	
Walked	0.0%	±1.7	0.0%	
Bicycle	6.1%	±2.8	7.8%	
Taxicab, motorcycle, or other means	1.3%	±2.0	0.0%	
Worked at home	6.5%	±3.6	5.1%	
▼ PLACE OF WORK				
▼ Worked in state of residence	98.1%	±1.5	97.9%	
Worked in county of residence	65.1%	±6.2	61.6%	
Worked outside county of residence	33.0%	±6.3	36.3%	
Worked outside state of residence	1.9%	±1.5	2.1%	
▼ Living in a place	100.0%	±1.7	100.0%	
Worked in place of residence	11.2%	±4.0	7.6%	
Worked outside place of residence	88.8%	±4.0	92.4%	
Not living in a place	0.0%	±1.7	0.0%	
▼ Living in 12 selected states	100.0%	±1.7	100.0%	
Worked in minor civil division of residence	11.2%	±4.0	7.6%	
Worked outside minor civil division of residence	88.8%	±4.0	92.4%	
Not living in 12 selected states	0.0%	±1.7	0.0%	
▼ Workers 16 years and over who did not work at home	1,918	±178	995	
▼ TIME LEAVING HOME TO GO TO WORK				
12:00 a.m. to 4:59 a.m.	0.9%	±1.4	0.0%	
5:00 a.m. to 5:29 a.m.	0.4%	±0.7	0.0%	
5:30 a.m. to 5:59 a.m.	3.2%	±2.2	1.7%	
6:00 a.m. to 6:29 a.m.	2.1%	±1.9	2.8%	
6:30 a.m. to 6:59 a.m.	10.5%	±4.2	11.5%	
7:00 a.m. to 7:29 a.m.	17.8%	±5.9	21.6%	
7:30 a.m. to 7:59 a.m.	21.8%	±6.0	22.6%	
8:00 a.m. to 8:29 a.m.	16.1%	±5.0	13.8%	

Table Notes

COMMUTING CHARACTERISTICS BY SEX

Survey/Program:

American Community Survey

Year:

2018

Estimates:

5-Year

Table ID:

S0801

Although the American Community Survey (ACS) produces population, demographic and housing unit estimates, it is the Census Bureau's Population Estimates Program that produces and disseminates the official estimates of the population for the nation, states, counties, cities, and towns and estimates of housing units for states and counties.

Source: U.S. Census Bureau, 2014-2018 American Community Survey 5-Year Estimates

When information is missing or inconsistent, the Census Bureau logically assigns an acceptable value using the response to a related question or questions. If a logical assignment is not possible, data are filled using a statistical process called allocation, which uses a similar individual or household to provide a donor value. The "Allocated" section is the number of respondents who received an allocated value for a particular subject.

Data are based on a sample and are subject to sampling variability. The degree of uncertainty for an estimate arising from sampling variability is represented through the use of a margin of error. The value shown here is the 90 percent margin of error. The margin of error can be interpreted roughly as providing a 90 percent probability that the interval defined by the estimate minus the margin of error and the estimate plus the margin of error (the lower and upper confidence bounds) contains the true value. In addition to sampling variability, the ACS estimates are subject to nonsampling error (for a discussion of nonsampling variability, see ACS Technical Documentation). The effect of nonsampling error is not represented in these tables.

The 12 selected states are Connecticut, Maine, Massachusetts, Michigan, Minnesota, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, Vermont, and Wisconsin.

Workers include members of the Armed Forces and civilians who were at work last week.

While the 2014-2018 American Community Survey (ACS) data generally reflect the February 2013 Office of Management and Budget (OMB) definitions of metropolitan and micropolitan statistical areas; in certain instances the names, codes, and boundaries of the principal cities shown in ACS tables may differ from the OMB definitions due to differences in the effective dates of the geographic entities.

Estimates of urban and rural populations, housing units, and characteristics reflect boundaries of urban areas defined based on Census 2010 data. As a result, data for urban and rural areas from the ACS do not necessarily reflect the results of ongoing urbanization.

Explanation of Symbols:

An "***" entry in the margin of error column indicates that either no sample observations or too few sample observations were available to compute a standard error and thus the margin of error. A statistical test is not appropriate.

An "-" entry in the estimate column indicates that either no sample observations or too few sample observations were available to compute an estimate, or a ratio of medians cannot be calculated because one or both of the median estimates falls in the lowest interval or upper interval of an open-ended distribution, or the margin of error associated with a median was larger than the median itself.

An "-" following a median estimate means the median falls in the lowest interval of an open-ended distribution.

An "+" following a median estimate means the median falls in the upper interval of an open-ended distribution.

An "***" entry in the margin of error column indicates that the median falls in the lowest interval or upper interval of an open-ended distribution. A statistical test is not appropriate.

An "*****" entry in the margin of error column indicates that the estimate is controlled. A statistical test for sampling variability is not appropriate.

An "N" entry in the estimate and margin of error columns indicates that data for this geographic area cannot be displayed because the number of sample cases is too small.

An "(X)" means that the estimate is not applicable or not available.

Supporting documentation on code lists, subject definitions, data accuracy, and statistical testing can be found on the American Community Survey website in the Technical Documentation section.

Sample size and data quality measures (including coverage rates, allocation rates, and response rates) can be found on the American Community Survey website in the Methodology section.

TRIP GENERATION CALCULATIONS

Institute of Transportation Engineers (ITE)
Trip Generation, 10th Edition
Land Use Code (LUC) 220 - Multifamily Housing (Low-Rise)

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

AVERAGE WEEKDAY DAILY

$$T = 7.32 * (X)$$

$$T = 7.32 * 12$$

$$T = 87.84$$

$$T = 88.00$$

$$T = 88 \text{ vehicle trips}$$

with 50% (44 vpd) entering and 50% (44 vpd) exiting.

WEEKDAY MORNING PEAK HOUR OF ADJACENT STREET TRAFFIC

$$T = 0.46 * (X)$$

$$T = 0.46 * 12$$

$$T = 5.52$$

$$T = 6 \text{ vehicle trips}$$

with 23% (1 vph) entering and 77% (5 vph) exiting.

WEEKDAY EVENING PEAK HOUR OF ADJACENT STREET TRAFFIC

$$T = 0.56 * (X)$$

$$T = 0.56 * 12$$

$$T = 6.72$$

$$T = 7.00$$

$$T = 7 \text{ vehicle trips}$$

with 63% (4 vph) entering and 37% (3 vph) exiting.

AVERAGE SATURDAY

$$T = 8.14 * (X)$$

$$T = 8.14 * 12$$

$$T = 97.68$$

$$T = 98.00$$

$$T = 98 \text{ vehicle trips}$$

with 50% (49 vpd) entering and 50% (49 vpd) exiting.

SATURDAY MIDDAY PEAK HOUR OF GENERATOR

$$T = 0.70 * (X)$$

$$T = 0.70 * 12$$

$$T = 8.40$$

$$T = 8 \text{ vehicle trips}$$

with 54% (4 vph) entering and 46% (4 vph) exiting.

Institute of Transportation Engineers (ITE)
Trip Generation, 10th Edition
Land Use Code (LUC) 252 - Senior Adult Housing - Attached

Average Vehicle Trips Ends vs: Dwelling Units
Independent Variable (X): 124

AVERAGE WEEKDAY DAILY

$T = 4.02 * (X) - 25.37$
 $T = 4.02 * 124 - 25.37$
 $T = 473.11$
 $T = 474$ vehicle trips
with 50% (237 vph) entering and 50% (237 vph) exiting.

WEEKDAY MORNING PEAK HOUR OF ADJACENT STREET TRAFFIC

$T = 0.20 * (X) - 0.18$
 $T = 0.20 * 124 - 0.18$
 $T = 24.62$
 $T = 25$ vehicle trips
with 35% (9 vph) entering and 65% (16 vph) exiting.

WEEKDAY EVENING PEAK HOUR OF ADJACENT STREET TRAFFIC

$T = 0.24 * (X) + 2.26$
 $T = 0.24 * 124 + 2.26$
 $T = 32.02$
 $T = 32$ vehicle trips
with 55% (18 vph) entering and 45% (14 vph) exiting.

SATURDAY DAILY

$T = 3.97 * (X) - 60.09$
 $T = 3.97 * 124 - 60.09$
 $T = 432.19$
 $T = 432$ vehicle trips
with 50% (216 vph) entering and 50% (216 vph) exiting.

SATURDAY MIDDAY PEAK HOUR OF GENERATOR

$T = 0.35 * (X) - 1.67$
 $T = 0.35 * 124 - 1.67$
 $T = 41.73$
 $T = 42$ vehicle trips
with 62% (26 vph) entering and 38% (16 vph) exiting.