

THE RESIDENCES AT DARWIN COMMONS
DARWIN LANE – WALPOLE, MA
APPLICATION FOR COMPREHNSIVE PERMIT
UNDER M.G.L. C. 40B

ZONING BOARD OF APPEALS OF THE TOWN OF WALPOLE
COMPREHENSIVE PERMIT REGULATIONS
APRIL 28, 2022

SECTION 3.2.14 – TRAFFIC IMPACT REPORT



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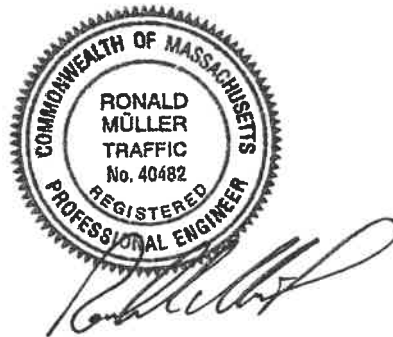
Traffic Assessment

**Residences at Darwin Common
Darwin Lane
Walpole, Massachusetts**

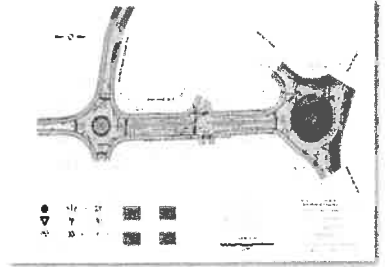
Prepared for:

**Wall Street Development Corp.
2 Warthin Circle
Norwood, MA 02062**

April 12, 2022



Quality



Accuracy



Integrity





Traffic Assessment

To: Mr. Lou Petrozzi
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Reg: Residences at Darwin Common
Darwin Lane
Walpole, MA

From: Kirsten Braun, P.E., Associate
Ron Müller, P.E., Principal

Date: April 12, 2022
Project #: 21029

INTRODUCTION

Ron Müller & Associates (RMA) has conducted this Traffic Assessment for the proposed Residences at Darwin Common townhouse development to be constructed on currently vacant land at the terminus of Darwin Lane in Walpole, Massachusetts. As proposed, the project consists of constructing 28 townhouse units with access via the existing Darwin Lane cul-de-sac. The site is bordered by Eleanor Road to the east, Washington Street to the west and undeveloped land to the south. The site location is shown in Figure 1.

This report has been prepared to estimate the project traffic generation, evaluate the safety of the site access points, and provide a qualitative assessment of the impacts of this traffic on the adjacent streets. As documented in this report, the existing intersection of Darwin Lane and Common Street exceeds the minimum required and desirable sight distances and therefore safe operation can be expected. It is recommended that any proposed landscaping, signs or fencing in the vicinity of the existing intersection be kept low, or set back sufficiently so as not to impede the available sight distances.

Traffic increases on Darwin Lane are expected in the range of 14 to 19 additional vehicles during peak hours, or an increase of about one additional vehicle every three to four minutes. Once distributed onto Common Street, traffic increases are expected in the range of six to 10 additional vehicles during peak hours. These increases are minimal and represent on average about one additional vehicle every six to 10 minutes. Traffic increases during all other hours of the day are expected to be much smaller and well within the daily fluctuation of traffic.

Figure 1
Site Location Map



VEHICLE SPEEDS

Vehicle speed information along Common Street near the site was collected via speed radar detector on Friday, August 6, 2021. A summary of observed travel speeds along Common Street is provided in Table 1.

Table 1
Observed Travel Speeds ^a

Location/Direction	Posted Speed Limit	Average Speed	85 th Percentile Speed ^b
Common Street east of Darwin Lane			
Eastbound	30	35	37
Westbound	35	37	41

^a In miles per hour (mph).

^b Speed at, or below which 85 percent of all observed vehicles travel.

As shown, the average recorded speeds along Common Street just east of Darwin Lane is slightly higher than the posted speed limit of 30 mph eastbound with 35 mph observed, while traveling westbound the average speed is comparable to the posted speed limit of 35 mph with 37 mph observed.

The 85th percentile speeds were recorded to be 37 mph traveling eastbound and 41 mph traveling westbound, both higher than the posted speed limit. The higher 85th percentile speed was accordingly used in the calculation of minimum sight distance requirements, as described below.

SIGHT DISTANCE

To identify potential safety concerns associated with site access and egress, sight distances have been evaluated at the existing intersection of Common Street and Darwin Lane to determine if the available sight distances for vehicles exiting Darwin Lane meet or exceed the minimum distances required for approaching vehicles to safely stop. Sight distances were not evaluated at the proposed driveway intersection with Darwin Lane as the project driveway will be located at the terminus of Darwin Lane. The available sight distances were compared with minimum requirements, as established by the American Association of State Highway and Transportation

Officials (AASHTO).¹ AASHTO is the national standard by which vehicle sight distance is calculated, measured, and reported. The Massachusetts Department of Transportation (MassDOT) and the Executive Office of Energy and Environmental Affairs (EEA) require the use of AASHTO sight distance standards when preparing traffic impact assessments and studies, as stated in their guidelines for traffic impact assessments.

Sight distance is the length of roadway ahead that is visible to the driver. Stopping Sight Distance (SSD) is the minimum distance required for a vehicle traveling at a certain speed to safely stop before reaching a stationary object in its path. The values are based on a driver perception and reaction time of 2.5 seconds and a braking distance calculated for wet, level pavements. When the roadway is either on an upgrade or downgrade, grade correction factors are applied. Stopping sight distance is measured from an eye height of 3.5 feet to an object height of 2 feet above street level, equivalent to the taillight height of a passenger car. The SSD is measured along the centerline of the traveled way of the major road.

Intersection sight distance (ISD) is provided on minor street approaches to allow the drivers of stopped vehicles a sufficient view of the major roadway to decide when to enter the major roadway. By definition, ISD is the minimum distance required for a motorist exiting a minor street to turn onto the major street, without being overtaken by an approaching vehicle reducing its speed from the design speed to 70 percent of the design speed. ISD is measured from an eye height of 3.5 feet to an object height of 3.5 feet above street level. The use of an object height equal to the driver eye height makes intersection sight distances reciprocal (i.e., if one driver can see another vehicle, then the driver of that vehicle can also see the first vehicle). When the minor street is on an upgrade that exceeds 3 percent, grade correction factors are applied.

SSD is generally more important as it represents the minimum distance required for safe stopping while ISD is based only upon acceptable speed reductions to the approaching traffic stream. However, the ISD must be equal to or greater than the minimum required SSD in order to provide safe operations at the intersection. In accordance with the AASHTO manual, *"If the available sight distance for an entering or crossing vehicle is at least equal to the appropriate stopping sight distance for the major road, then drivers have sufficient sight distance to anticipate and avoid collisions. However, in some cases, this may require a major-road vehicle to stop or slow to accommodate the maneuver by a minor-road vehicle. To enhance traffic operations, intersection sight distances that exceed stopping sight distances are desirable along the major road."* Accordingly, ISD should be at least equal to the distance required to allow a driver approaching the minor road to safely stop.

The available sight distances at the existing intersection of Common Street and Darwin Lane were measured and compared to minimum requirements as established by AASHTO. The 85th percentile speeds were used over the posted speed limit to determine minimum required sight distance. The required minimum sight distances are compared to the available distances, as shown in Table 2.

¹*A Policy on Geometric Design of Highways and Streets*; American Association of State Highway and Transportation Officials (AASHTO); 2009.

Table 2
Sight Distance Summary

Location/Direction	Intersection Sight Distance (feet)		
	Measured	Minimum Required ^a	Desirable ^b
Common Street at Darwin Lane:			
East of intersection	500+	316	390
West of Intersection	500+	272	335

^a Values based on AASHTO SSD requirements for an 85th percentile speed of 37 mph traveling eastbound and 41 mph traveling westbound on Common Street.

^b Values based on AASHTO ISD requirements for a posted speed limit of 30 mph traveling eastbound and 35 mph traveling westbound on Common Street.

As shown in the table, both the minimum required and desirable sight distances are exceeded at the existing intersection of Common Street at Darwin Lane and safe operation can therefore be expected. To ensure that maximum sight distances are maintained, it is recommended that any proposed landscaping or signs at the existing intersection be kept low (maximum two feet in height from street level), or set back sufficiently so as not to impede the available sight distances.

TRIP GENERATION

The traffic to be generated by the proposed townhouse development was estimated using the 10th Edition of the Institute of Transportation Engineers (ITE) *Trip Generation Manual*². The site plan prepared by Glossa Engineering, Inc., shows 28 townhouse units being built on site. The townhouse units will be built attached in groups of three to six units. Accordingly, ITE Land Use Code 220 (Multi-Family Housing – Low Rise) was used in estimating the traffic generation characteristics of the project, as shown in Table 3. The trip generation calculations are provided in the Appendix.

² *Trip Generation Manual, 10th Edition*; Institute of Transportation Engineers; Washington, DC; 2017.

Table 3
Trip Generation Summary

<u>Time Period</u>	<u>Residences at Darwin Common ^a</u>
Weekday Daily	170
Weekday AM Peak Hour	
Enter	3
Exit	<u>11</u>
Total	14
Weekday PM Peak Hour	
Enter	12
Exit	<u>7</u>
Total	19

^a ITE Land Use Code 220 (Multi-Family Housing Low Rise) for 28 units.

As shown, the townhouse development is expected to generate 170 weekday daily vehicle trips of which 14 vehicle trips (3 in and 11 out) are expected during the weekday AM peak hour and 19 vehicle trips (12 in and 7 out) are expected during the weekday PM peak hour.

TRIP DISTRIBUTION

The distribution of traffic generated by the project is based on Journey-to-Work data provided by the U.S. Census Bureau for people residing in Walpole. A summary of the Journey-to-Work data is provided in the Appendix. It is accordingly expected that approximately 45 percent of the site traffic will be oriented to/from the east and 55 percent to/from the west on Common Street.

TRAFFIC INCREASES

Using the anticipated trip generation and distribution assumptions above, traffic-volume increases during peak hours are expected in the range of eight to 10 additional vehicles on Common Street west of Darwin Lane and six to nine additional vehicles on Common Street east of Darwin Lane. These increases represent on average about one additional vehicle every six to 10 minutes. Traffic increases during all other hours of the day are expected to be much lower and well within the daily

fluctuation of traffic. As all site traffic will be using Darwin Lane for access to/from the site, traffic increases on Darwin Lane are expected in the range of 14 to 19 additional vehicles, or an increase of about one additional vehicle every three to four minutes, on average.

SITE ACCESS

Access to the 28 townhouse units is proposed via a connection to the existing cul-de-sac on Darwin Lane. As shown on the site plan prepared by Glossa Engineering, Inc. dated August 13, 2021, this driveway is proposed to be 24 feet in width and is more than adequate to accommodate the proposed development. It is recommended that all internal roadways be a minimum of 22 feet wide. It is also recommended that the existing sidewalk along the west side of Darwin Lane be extended to the proposed site driveway and that a sidewalk be constructed along the west side of the main site driveway to provide pedestrian connectivity between the proposed buildings and the existing sidewalk. Finally, it is recommended that a speed hump be installed on the site driveway just before its intersection with the cul-de-sac to slow down vehicles both entering and exiting the site to assure safe operation.

CONCLUSIONS

- The project entails constructing 28 townhouse units. The units will be attached in groups of three to six units. The site will be accessed via a new driveway to be constructed at the existing cul-de-sac at the end of Darwin Lane.
- The development project is expected to generate an additional 14 vehicle trips during the weekday AM peak hour (3 entering and 11 exiting) and 19 additional vehicle trips during the weekday PM peak hour (12 entering and 7 exiting). These additional trips will be realized along Darwin Lane representing an increase in traffic of about one additional vehicle every three to four minutes during peak hours. Smaller increases are expected during all other hours of the day.
- Once distributed onto the adjacent streets, traffic increases as a result of the development of the site are expected in the range of six to 10 additional vehicles on Common Street. On average, these increases are minimal and represent approximately one additional vehicle every six to 10 minutes. Traffic increases during all other hours of the day are expected to be minimal and well within the daily fluctuation of traffic.

- It is recommended that all internal site roadways be a minimum of 22 feet wide and that a sidewalk be constructed along the west side of the main access driveway. This sidewalk should connect with the existing sidewalk along the west side of Darwin Lane.
- A speed hump should be installed on the site driveway just before its intersection with the cul-de-sac to slow down vehicles both entering and exiting the site to assure safe operation.
- The minimum required sight distances as well as the desired sight distances are exceeded at the existing intersection of Common Street and Darwin Lane and therefore safe operation can be expected.
- It is recommended that any landscaping or signs in the vicinity of the existing intersection, if proposed, be kept low to the ground (less than two feet above street level) or set back sufficiently so as not to impede sight distances for drivers exiting Darwin Lane.

APPENDIX

Trip Generation Calculations
Journey-To-Work Data

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

Average Vehicle Trips Ends vs: Dwelling Units
 Independent Variable (X): 28

AVERAGE WEEKDAY DAILY (8-585 Units)

$T = 7.56 * (X) - 40.86$
 $T = 170.82$
 $T = 170$ vehicle trips
 with 50% (85 vpd) entering and 50% (85 vpd) exiting.

WEEKDAY AM PEAK HOUR OF ADJACENT STREET TRAFFIC (8-689 Units)

$\ln T = 0.95 \ln (X) - 0.51$
 $\ln T = 2.66$
 $T = 14.23$
 $T = 14$ vehicle trips
 with 23% (3 vph) entering and 77% (11 vph) exiting.

WEEKDAY PM PEAK HOUR OF ADJACENT STREET TRAFFIC (8-689 Units)

$\ln T = 0.89 \ln (X) - 0.02$
 $\ln T = 2.95$
 $T = 19.02$
 $T = 19$ vehicle trips
 with 63% (12 vph) entering and 37% (7 vph) exiting.

SATURDAY DAILY (48-147 Units)

$T = 14.01 * (X) - 521.69$
 $T = -129.41$
 $T = -130$ vehicle trips
 with 50% (-65 vpd) entering and 50% (-65 vpd) exiting.

SATURDAY MIDDAY PEAK HOUR OF GENERATOR (48-147 Units)

$T = 1.08 * (X) - 33.24$
 $T = -3.00$
 $T = -3$ vehicle trips
 with 50% (-2 vph) entering and 50% (-1 vph) exiting.

Weekday Daily Average Rate

$T = 7.32 * (X)$
 $T = 204.96$
 $T = 200$ vehicle trips
 with 100 vpd entering and 100 vpd exiting.

Weekday AM Peak Hour Average Rate

$T = 0.46 * (X)$
 $T = 12.88$
 $T = 13$ vehicle trips
 with 3 vph entering and 10 vph exiting.

Weekday PM Peak Hour Average Rate

$T = 0.56 * (X)$
 $T = 15.68$
 $T = 16$ vehicle trips
 with 10 vph entering and 6 vph exiting.

Saturday Daily Average Rate

$T = 8.14 * (X)$
 $T = 227.92$
 $T = 230$ vehicle trips
 with 115 vpd entering and 115 vpd exiting.

Saturday Midday Peak Hour Average Rate

$T = 0.70 * (X)$
 $T = 19.60$
 $T = 20$ vehicle trips
 with 10 vph entering and 10 vph exiting.

Residence			Workplace				To/from East on Common St	To/from West on Common St
State	County	MCD	State/U.S. Island Area/Foreign Country	County	MCD	Number	To/from East on Common St	To/from West on Common St
Massachusetts	Norfolk County	Walpole town	Massachusetts	Norfolk County	Walpole town	2,213	0	2213
Massachusetts	Norfolk County	Walpole town	Massachusetts	Suffolk County	Boston city	2,069	1034.5	1034.5
Massachusetts	Norfolk County	Walpole town	Massachusetts	Norfolk County	Norwood town	1,198	599	599
Massachusetts	Norfolk County	Walpole town	Massachusetts	Norfolk County	Dedham town	331	231.7	99.3
Massachusetts	Norfolk County	Walpole town	Massachusetts	Norfolk County	Quincy city	331	331	0
Massachusetts	Norfolk County	Walpole town	Massachusetts	Middlesex County	Newton city	325	243.75	81.25
Massachusetts	Norfolk County	Walpole town	Massachusetts	Norfolk County	Westwood town	321	0	321
Massachusetts	Norfolk County	Walpole town	Massachusetts	Norfolk County	Sharon town	276	276	0
Massachusetts	Norfolk County	Walpole town	Massachusetts	Norfolk County	Needham town	251	150.6	100.4
Massachusetts	Norfolk County	Walpole town	Massachusetts	Norfolk County	Canton town	246	246	0
Massachusetts	Norfolk County	Walpole town	Massachusetts	Norfolk County	Foxborough town	242	121	121
Massachusetts	Norfolk County	Walpole town	Massachusetts	Bristol County	Mansfield town	149	149	0
Massachusetts	Norfolk County	Walpole town	Massachusetts	Norfolk County	Brookline town	136	136	0
Massachusetts	Norfolk County	Walpole town	Massachusetts	Middlesex County	Framingham town	131	0	131
Massachusetts	Norfolk County	Walpole town	Massachusetts	Norfolk County	Braintree Town city	125	125	0
Massachusetts	Norfolk County	Walpole town	Massachusetts	Norfolk County	Weymouth Town city	125	125	0
Massachusetts	Norfolk County	Walpole town	Massachusetts	Norfolk County	Medfield town	102	0	102
Massachusetts	Norfolk County	Walpole town	Massachusetts	Middlesex County	Waltham city	91	91	0
Massachusetts	Norfolk County	Walpole town	Massachusetts	Middlesex County	Cambridge city	87	87	0
Massachusetts	Norfolk County	Walpole town	Massachusetts	Norfolk County	Stoughton town	84	84	0
Massachusetts	Norfolk County	Walpole town	Massachusetts	Middlesex County	Natick town	78	0	78
Massachusetts	Norfolk County	Walpole town	Massachusetts	Middlesex County	Burlington town	73	73	0
Massachusetts	Norfolk County	Walpole town	Massachusetts	Norfolk County	Wellesley town	73	36.5	36.5
Massachusetts	Norfolk County	Walpole town	Massachusetts	Norfolk County	Franklin Town city	71	35.5	35.5
Massachusetts	Norfolk County	Walpole town	Massachusetts	Plymouth County	Brockton city	64	64	0
Massachusetts	Norfolk County	Walpole town	Massachusetts	Worcester County	Westborough town	57	28.5	28.5
Massachusetts	Norfolk County	Walpole town	Massachusetts	Middlesex County	Action town	55	55	0

SAY: 46% 54%