

MEMORANDUM

TO: Ms. Bridget Irish
Cotting School
453 Concord Avenue
Lexington, MA 02421

FROM: Mr. F. Giles Ham, P.E. *FGH*
Vanasse & Associates, Inc.
35 New England Business Center Drive
Suite 140
Andover, MA 01810-1066
(978) 474-8800

DATE: November 27, 2019

RE: 8456

SUBJECT: Traffic Circulation, Access and Parking Study
Cotting School
Lexington, Massachusetts

Vanasse & Associates, Inc. (VAI) has conducted a Traffic Circulation, Access and Parking Study for the Cotting School located at 453 Concord Avenue in Lexington, Massachusetts. This assessment identifies existing parking and traffic conditions and reviews access requirements, circulation, and safety considerations. As part of this assessment field observation of existing conditions, parking demand and overall circulation was completed. Recommendations were made to improve safety conditions, circulation and parking at the school.

PROJECT DESCRIPTION

The Cotting School is a 125-student school which fosters academic achievement, skill development, and social-emotional maturity for its students. There are a total of 84 staff on-site and 152 parking spaces. The school hours are typically between 8:00 AM to 3:00 PM with after-school activities. The school has a 25,355 sf expansion planned for a new gymnasium. In addition, 35 new parking spaces are planned at 489 Concord Avenue adjacent to the school. Total student enrollment is expected to remain relatively constant in the future.

EXISTING CONDITIONS

A comprehensive field inventory of existing conditions at the school was conducted in November 2019. The field investigation consisted of an inventory of existing roadway geometrics, traffic volumes, operating characteristics, parking inventory, as well as safety data. Figure 1 depicts the project study area.

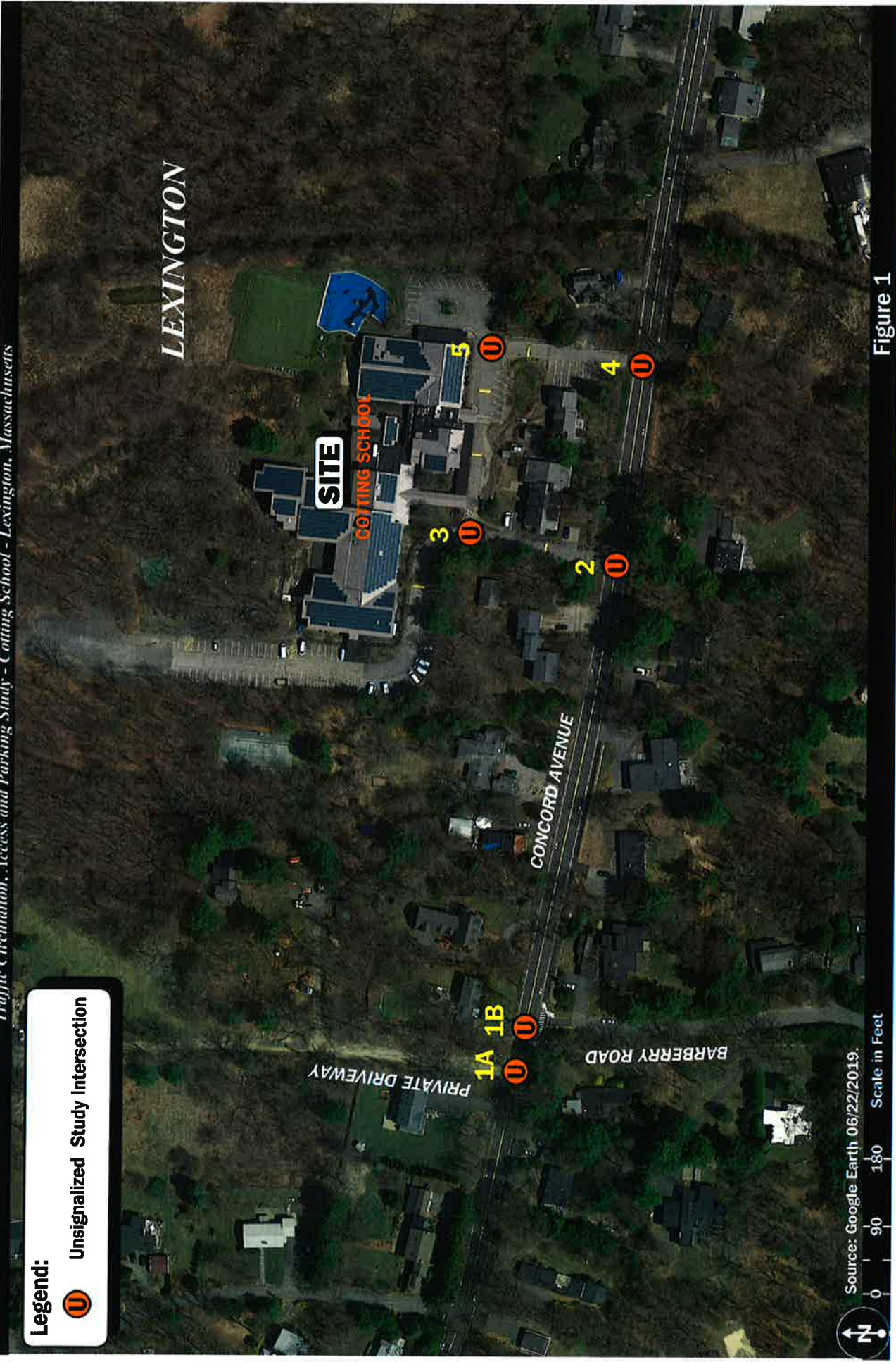
Roadways

Concord Avenue

Within the study area, Concord Avenue is a two-lane roadway under local jurisdiction that traverses the study area in a general east-west direction. Concord Avenue provides one travel lane per direction separated by a double-yellow centerline within the study area. A sidewalk is provided along the south side of



Legend:
⓪ Unsignalized Study Intersection



Source: Google Earth 06/22/2019. Scale in Feet

VAI Vanasse & Associates, Inc.
Transportation Engineers & Planners

Copyright © 2019 by VAI. All Rights Reserved.

Figure 1
Site Location and Study Area Map

Concord Avenue. The posted speed limit along Concord Avenue is 35 miles per hour (mph), with land use consisting primarily of residential properties. Figure 2 depicts the existing roadway geometrics.

Existing Traffic Volumes

In order to establish baseline traffic-volume demands and flow patterns within the study area, an automatic traffic recorder (ATR) count was completed in November 2019 on Concord Avenue in order to record weekday traffic conditions in the vicinity of the school. A summary of the 2019 traffic volumes is presented in Table 1.

**Table 1
2019 EXISTING ROADWAY TRAFFIC-VOLUME SUMMARY**

Location	Weekday Daily Volume (vpd)	Weekday Morning Peak Hour 7:45 – 8:45 AM			Weekday Evening Peak Hour 2:30 – 3:30 PM		
		Volume (vph) ^a	Percent of Daily Traffic	Predominant Flow	Volume (vph) ^a	Percent of Daily Traffic	Predominant Flow
Concord Avenue west of Cotting School	3,300	524	15.8	62.8 WB	263	8.0	61 WB

^aNovember 2019 ATR counts.

Concord Avenue in the vicinity of the project site was found to accommodate approximately 3,300 vehicles on an average weekday (two-way 24-hour volume), with approximately 524 vehicles per hour (vph) during the weekday morning peak hour and 263 vehicles during the afternoon peak hour.

Peak-hour traffic counts (7:00 to 9:00 AM and 2:00 to 4:00 PM) were also conducted at the following locations.

- Concord Avenue at Barberry Road/Private Driveway
- Concord Avenue at Cotting School West Drive
- Cotting School West Drive at Cotting School (internal)
- Concord Avenue at Cotting School East Drive
- Cotting School East Drive at Cotting School (parking)

A summary of the peak-hour traffic counts is presented in Figure 3. As shown in Figure 3, the school generates a total of 208 vehicle trips (140 in/68 out) during the morning peak hour and 170 trips (56 in/114 out) during the afternoon peak hour.

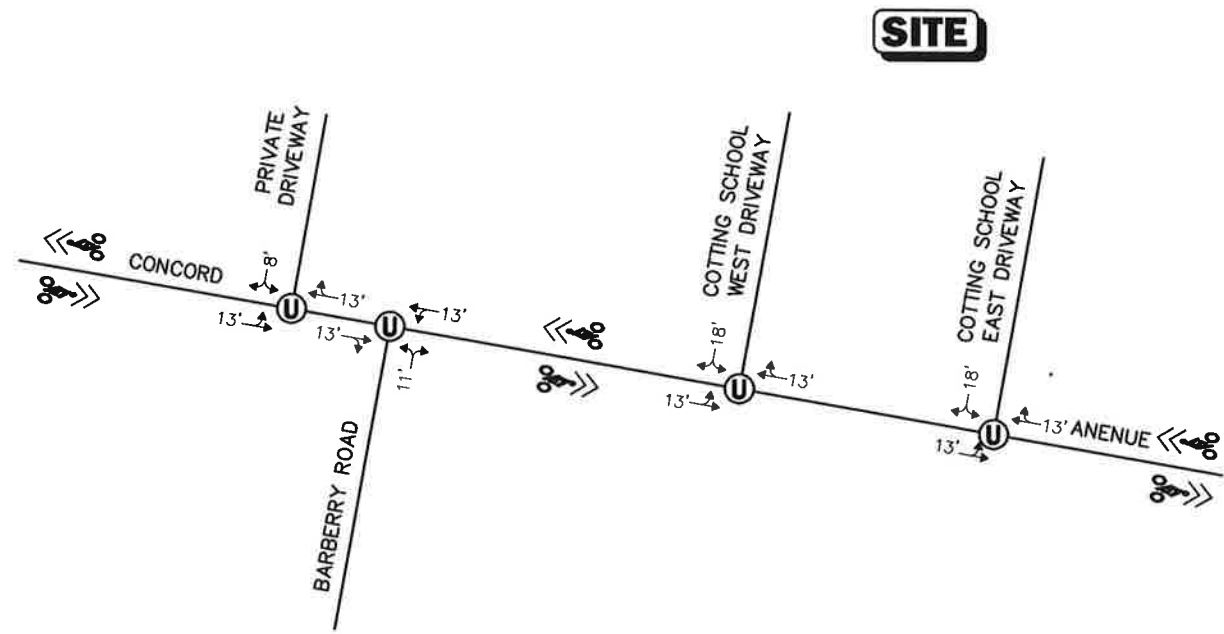
A review of the peak-period traffic counts indicates that the school weekday morning peak hour occurs between 7:45 and 8:45 AM, with the afternoon peak hour occurring between 2:30 and 3:30 PM.



U Unsignalized Intersection

xx' \leftrightarrow Lane Use and Travel Lane Width

$\uparrow\uparrow$ "Sharrow" Marking



 Not To Scale

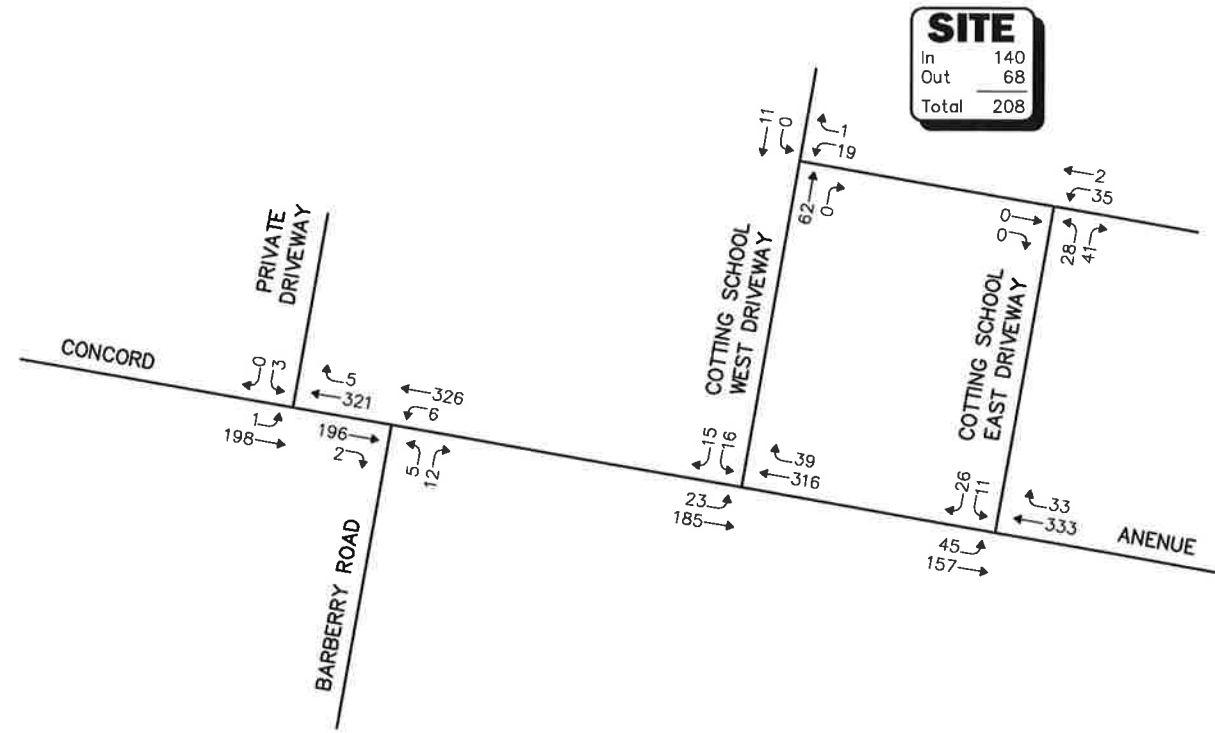
VAI Vanasse & Associates inc

Figure 2

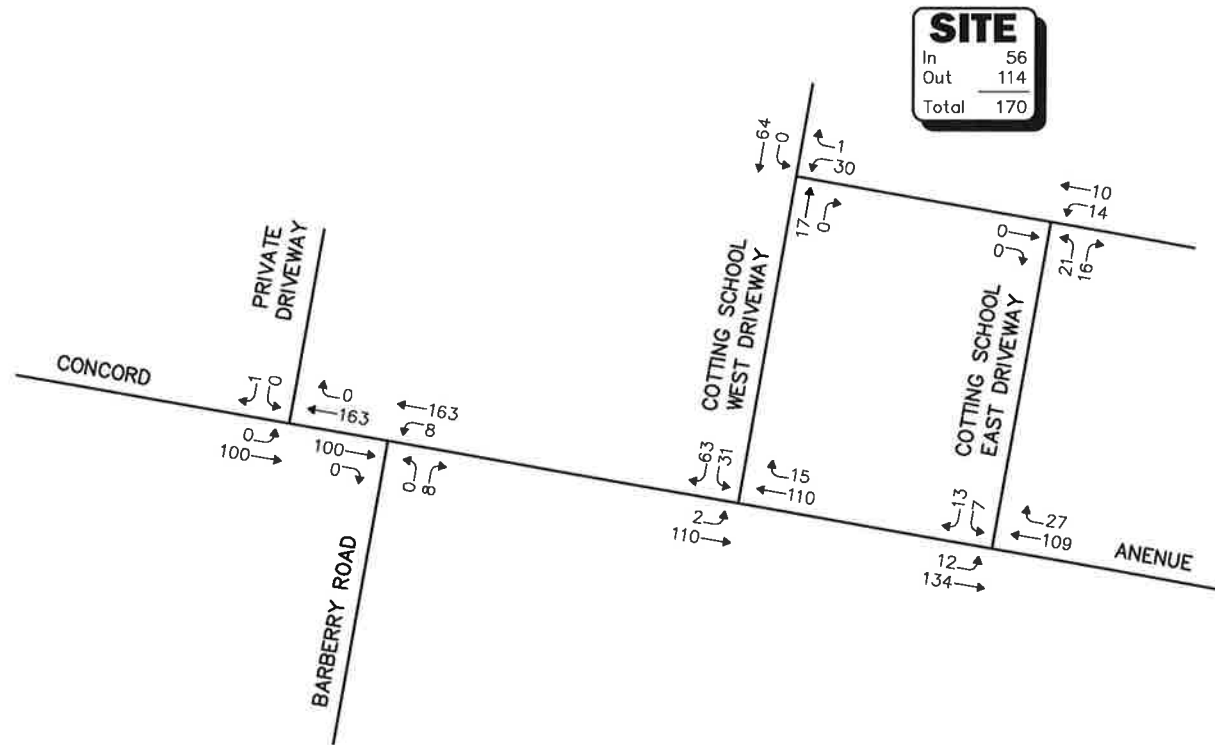
Existing Intersection Lane Use, Travel Lane Width and Pedestrian Facilities

R:\8456\8456NT1.dwg, 11/26/2019 11:58:11 AM

WEEKDAY MORNING PEAK HOUR (7:45 - 8:45 AM)



WEEKDAY EVENING PEAK HOUR (2:30 - 3:30 PM)



Not To Scale **Figure 3**

VAI Vanasse & Associates inc

2019 Existing Peak Hour Traffic Volumes

R:\8456\8456NT1.dwg, 11/26/2019 6:03:01 PM

School Observations

As series of observations of school traffic were conducted during the weekday morning and afternoon periods. Some of the highlights of the observations are as follows:

Morning Period

- The first van arrives at the school at approximately 7:45 AM and queues along Concord Avenue east of the easterly driveway.
- Up to 8 vans were queued on street prior to entering the school at 7:55 AM.
- Wheelchair lift vans drop off in front of the building while all other vans circulate to the east of the school building in a counter-clockwise circulation.
- Overall morning conditions operate well.

Afternoon Period

- Vans start to arrive as early as 2:00 PM and queue on-street.
- By 2:30 PM, 25 vans were observed on-street prior to entering the school.
- Approximately 10 vans queue in front of the school and the east parking lot, while the remaining vans enter the western lot and turn around to queue for pick-ups.
- By 3:00 PM, all vans were on-site and by 3:15 PM, the last van exited the school.

Parking Observations

A total of 152 parking spaces are on-site. This includes 24 parking spaces in the front three lots, 18 spaces in the easterly lot, 9 spaces in the front of the school and 78 spaces in the western lot (including 24 spaces in the unpaved area).

A parking accumulation survey was conducted at the parking lots during the morning and afternoon periods between 8:00 AM and 10:00 AM and between 2:00 PM and 4:00 PM. A summary of the parking demand is presented in Table 2.



**Table 2
PARKING DEMAND SUMMARY**

Weekday Morning			Weekday Afternoon		
Time	Demand	Vacant Spaces	Time	Demand	Vacant Spaces
8:00	113	50	2:00	142	10
8:30	130	22	2:30	141	11
9:00	135	17	3:00	124	28
9:30	140	12	3:30	77	75
10:00	135	17	4:00	68	84

As shown, the morning peak parking demand occurred at 9:30 AM when 140 of the 152 parking spaces were occupied. During the afternoon period, the peak demand was at 2:00 PM when 142 of the 152 parking spaces were occupied.

Based upon the above, while there are available spaces on-site, the lot operates at close to 95 percent of capacity and indicates that additional parking spaces are desired.

Spot Speed Measurements

Vehicle travel speed measurements were performed on Concord Avenue in the vicinity of the driveway to service the new parking lot at 489 Concord Avenue. Table 3 summarizes the vehicle travel speed measurements.

**Table 3
VEHICLE TRAVEL SPEED MEASUREMENTS**

	Concord Avenue	
	Eastbound	Westbound
Mean Travel Speed (mph)	36	34
85 th Percentile Speed (mph)	42	39
Posted Speed Limit (mph)	35	35

mph = miles per hour.

As can be seen in Table 3, the mean (average) vehicle travel speed along Concord Avenue in the vicinity of the project site was found to be approximately 34 to 36 mph. The measured 85th percentile vehicle travel speed, or the speed at which 85 percent of the observed vehicles traveled at or below, was found to be approximately 39 to 42 mph, or 4 to 7 mph above the posted speed limit of 35 mph. The 85th percentile



speed is used as the basis of engineering design and in the evaluation of sight distances, and is often used in establishing posted speed limits.

Sight Distance Evaluation

Sight distance measurements were performed at the proposed driveway to the new parking lot with Concord Avenue in accordance with MassDOT and American Association of State Highway and Transportation Officials (AASHTO)¹ standards. In brief, SSD is the distance required by a vehicle traveling at the design speed of a roadway, on wet pavement, to stop prior to striking an object in its travel path. In accordance with AASHTO and MassDOT standards, at a minimum, sufficient stopping sight distances must be provided at an intersection. Table 4 presents the measured sight distances at the proposed site driveways intersecting with Concord Avenue.

**Table 4
SIGHT DISTANCE MEASUREMENTS**

Intersection/Sight Distance Measurement	Required Minimum (Feet) ^a			Measured (Feet)
	35 mph	40 mph	42 mph	
<i>489 Concord Avenue Driveway Exiting Sight Distance:</i>				
Looking to the west from the driveway	257 ^b	315 ^b	339 ^b	320 ^b
Looking to the east from the driveway	250	305	323	+500

^aRecommended minimum values obtained from *A Policy on Geometric Design of Highways and Streets*, Fifth Edition; American Association of State Highway and Transportation Officials (AASHTO); 2011. Adjusted for Grade

^bAdjusted for grade.

As shown, the proposed driveway meets the required sight distance for up to 40 mph. The sight distance for 42 mph looking west is slightly below the 339 feet requirement and measures to reduce speeds to the 35 mph posted speed limit have been recommended.

RECOMMENDATIONS

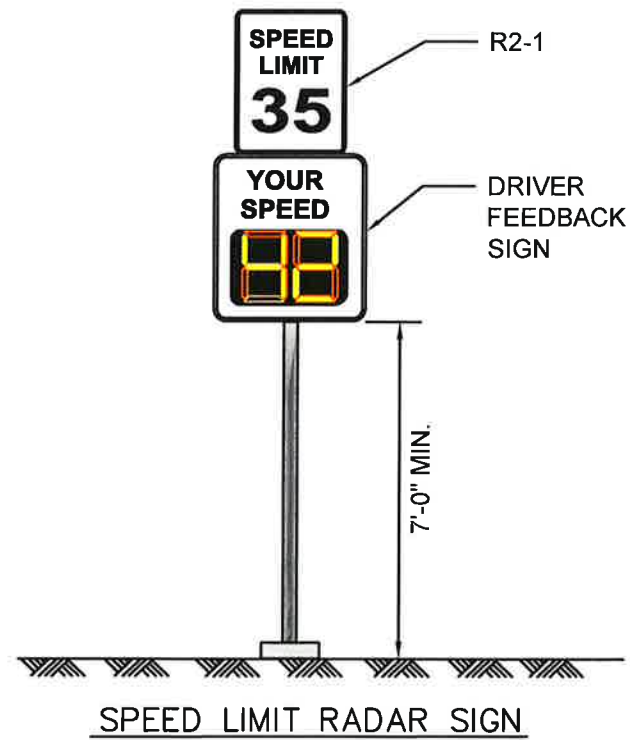
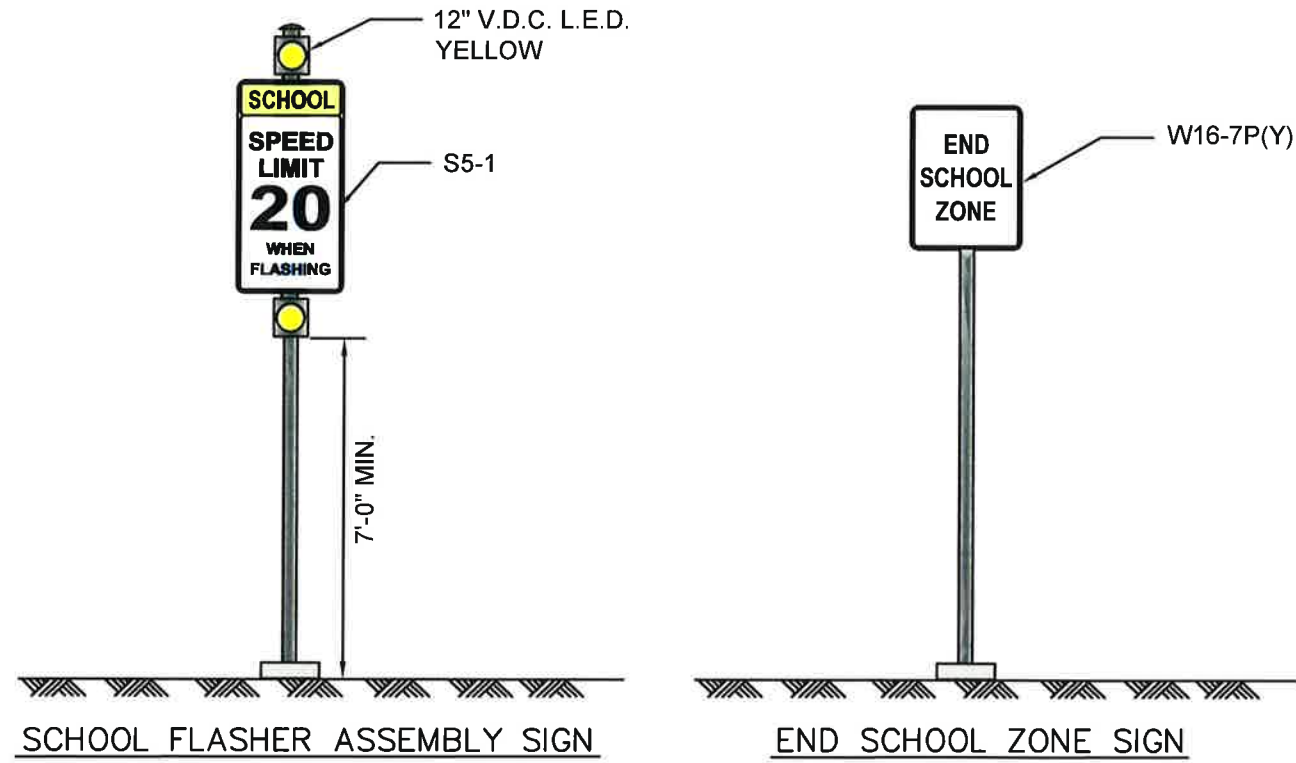
Based upon our review of existing conditions, VAI has made a number of recommendations in order to improve traffic conditions and safety in the area. These improvements are outlined below.

Establish School Zone and Concord Avenue Speed Reduction

Based upon observations of traffic conditions and vehicle speeds, it is recommended that a school zone be established along Concord Avenue which is typical for any school. The Manual on Uniform Traffic Control Devices (MUTCD) establishes standard school zone signs to delineate the beginning and end of the school zone with a 20 mph speed limit during drop-off and pick-up times to alert road users and give proper notice of the school zone. The applicant shall coordinate with the Town to establish the school zone. The school zone signs are depicted in Figure 4.

¹ *A Policy on Geometric Design of Highway and Streets*, 6th Edition; American Association of State Highway and Transportation Officials (AASHTO); 2011.





Note: Location of sign installation to be determined.

Not To Scale

Figure 4

Proposed Signage

In addition, in order to reduce area speeds, it is recommended that speed radar signs be installed prior to the school zone to reduce speeds in the area. Typical speed reduction of 10-20 percent can be expected.

Parking

The parking demand was observed at peak to be between 140 to 142 vehicles or close to 95 percent of capacity. With an additional 35 new spaces proposed, the parking supply will increase to 187 parking spaces and the parking lot will operate at 76 percent of capacity with spaces more readily available.

489 Concord Avenue Driveway

It is recommended that the driveway to 489 Concord Avenue be placed under STOP-sign control with a 20-foot wide driveway created at the approach to Concord Avenue. In addition, the large tree to the east of the driveway and within the right-of-way should be removed to obtain adequate sight lines to the east. In addition, adequate sight distances to the west will exist with the implementation of the speed reduction signs proposed and the driveway will operate safely.

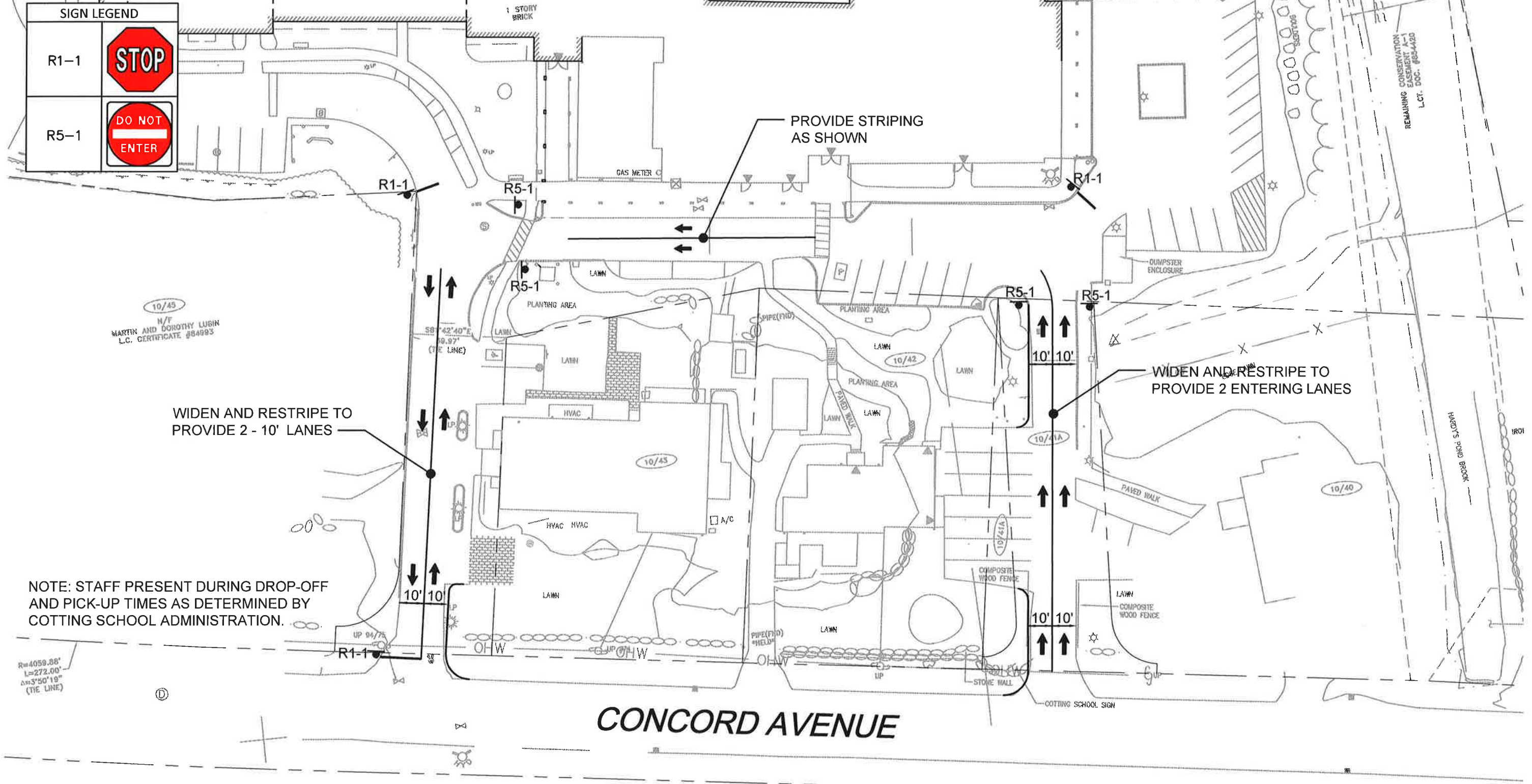
On-Site Circulation

In order to improve on-site circulation, and on-site queue storage, a number of recommendations have been made and include the following, which are depicted in Figure 5.

- Provide a slight widening of the easterly driveway to provide two 10-foot entering lanes. This driveway is proposed to be a one-way entrance and eliminates exiting traffic and the sight distance issues with the vans queued on-street. The two entering lanes also allows for more on-site van queue storage.
- STOP-signs and DO NOT ENTER signs are proposed within the school property to better define traffic control and enforce one-way circulation.
- The westernmost driveway should be slightly widened at Concord Avenue to provide a 20-foot wide driveway and will remain to accommodate two-way traffic flow.

The above recommendations will improve overall traffic and circulation conditions and enhance safety. As with any school plan, the traffic operations plan should be monitored and updated periodically as conditions change. The new circulation plan should be communicated to van drivers and parents to provide a smooth transition to the changes.





Source: Activitas Inc.
 0 20 40 Scale in Feet



Figure 5
 Conceptual Improvement Plan

R:\8456\8456CN2.dwg, 11/26/2019 6:09:50 PM