

I. TRAFFIC ANALYSIS



Preliminary Evaluation of Existing Traffic Observations

Date: 2.24.2025

To: Perkins&Will

From: VHB, Inc.

Re: MSBA Module 3 PDP -
Existing Conditions Report

The City of Salem is conducting a Feasibility Study (FS) relative to improving the existing Salem High School, located at 77 Willson Street, in Salem, Massachusetts. While later stages of design development would address whether project involves a renovation of the existing school, addition to/renovation of the existing school or the construction of a new high school, at the current stage of the FS phase, data is being collected to assess the existing school operations, such as total traffic generation, morning drop-off and the afternoon pick-up operations and site circulation. Also included as part of the review is a limited scope observations of the adjacent Horace Mann Laboratory School (HMLS) that will more or less remain in its current configuration in the future. The purpose of this stage of the analysis is to gather input and data that would help identify constraints and opportunities that could be leveraged during later stage of the FS and the development of a preferred design at the Schematic Design (SD) phase of the project.

This review involved an assessment of existing transportation conditions within the High School/HMLS campus and adjacent streets. The assessment included observations in the field during the morning and afternoon school peak times by VHB staff, traffic data collection by a vendor and provides initial recommendations for further consideration during the development of alternative site circulation concepts. The information presented in this memorandum serves as a precursor to a more detailed study that will be conducted the site to further analyze transportation-related issues and develop specific recommendations to improve transportation accommodations both on- and off-site.

Existing Conditions

An existing conditions evaluation of the Salem High School was conducted on Thursday, December 12 and Monday, December 16, 2024. Observations were conducted while school was in session. The school was operating with a typical schedule during the observation day.

1. The school day at Salem High School begins at 7:45 AM and ends at 2:35 PM each day.
2. The school day at Horace Mann School begins at 7:20 AM and ends at 2:10 PM each day.

The campus is served by three driveways whereas the High School traffic only uses two of the three driveways (see **Figure 1**). One driveway intersects the Willson Street, less than 200 feet southwest of its intersection with Highland Ave. This driveway serves primarily as the main one-way entrance to the High School which provides parent pick-up/drop-off loop and bus access to the Salem High School as well as parking access. The driveway also serves as an entrance & exit for HMLS, and limited areas of the surface parking (labeled as Horace Mann Shared Parking Lot). Throughout the memorandum, this driveway is identified as Driveway A. Approximately 750 feet west on Willson Street, a second driveway is provided. This driveway serves as a one-way exit only from HMLS School pick-up/drop-off. This driveway, referred to throughout the memorandum as Driveway B, is not used by High School traffic.

Approximately 500 feet farther west from Driveway B, a third driveway is provided. This driveway serves as a one-way exit only from the Salem High School pick-up/drop-off and bus access as well as the parking areas. Throughout the memorandum, this driveway is identified



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as Driveway C. The driveways operate as unsignalized intersections that allow specific turning movements entering and/or exiting the campus.

Field Observations

To understand the existing traffic flow and circulation at Salem High School and the adjacent roadways, VHB conducted field observations of all transportation activities at the high school during the critical morning drop-off and afternoon pick-up periods on Thursday, December 12 and Monday, December 16, 2024. VHB staff were on site during the peak periods and observed operational protocols, vehicle queueing, and adjacent street operations. Key takeaways from the observations are provided in the following sections of this memorandum. **Figure 1** shows the existing school circulation, parking and drop-off/pick-up areas surrounding the school for reference. The following outlines each of the parking and drop-off/pick-up areas.

1. **Auto Shop Parking Lot:** The auto shop parking lot serves staff and students using the auto shop located behind the main High School Building. The auto shop parking lot is accessed via Driveway A and egressed via Driveway C.
2. **Salem High School Parking Lot:** The Salem High School parking lot primarily serves staff and students from Salem High School. The Salem High School parking lot is accessed via Driveway A and egressed via Driveway C.
3. **Horace Mann Shared Parking Lot:** The Horace Mann shared parking lot serves staff and students from both Horace Mann School (approximately 70 spaces) and Salem High School. The Horace Mann shared parking lot is accessed via Driveway A and egressed via either Driveway A or C.
4. **Salem High School Bus Pick-up / Drop-off:** The Salem High School Bus Pick-up / Drop-off is located directly in front of Salem High School and parallels the Salem High School Parent Pick-up / Drop-off. The Salem High School Bus Pick-up / Drop-off is accessed via Driveway A and egressed via Driveway C.
5. **Salem High School Parent Pick-up / Drop-off:** The Salem High School Parent Pick-up / Drop-off is located parallel to the Salem High School Bus Pick-up / Drop-off (across a short median). The Salem High School Parent Pick-up / Drop-off is accessed via Driveway A and egressed via Driveway C.
6. **Horace Mann School Bus Pick-up / Drop-off:** The Horace Mann School Bus Pick-up / Drop-off is located between the Horace Mann School and the Horace Mann fields. The Horace Mann School Bus Pick-up / Drop-off is accessed and egressed via Driveway A.
7. **Horace Mann School Parent Pick-up / Drop-off:** The Horace Mann School Parent Pick-up / Drop-off is located between the Horace Mann School and Willson Street. The Horace Mann School Parent Pick-up / Drop-off is accessed via Driveway A and egressed via Driveway B.

In total, the Salem High School campus has approximately 435 parking spaces. Approximately 70 of the spaces are used by HMLS and the remaining 365 are used by Salem High School.

Morning Drop-off Procedure

Figure 2 graphically summarizes the observations conducted during the morning drop-off.

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1. **Salem High School Drop-off:** The Salem High School Drop-off is the busiest around 7:30 AM, at which time the parent drop-off reached its maximum queue of approximately 400 feet.
 - a. The parent drop-off is treated as two lanes which causes occasional blockage of the bypass lane;
 - b. The bus drop-off is a single lane but is occasionally used by parents.
2. **Horace Mann School Drop-off:** The Horace Mann School Drop-off is the busiest around 7:30 AM at which time the parent drop-off reached its maximum queue of approximately 250 feet.
 - a. In this case, the parent and bus drop-offs do not share a lane to arrive at the active drop-off zones, therefore, the queues do not interact or impact each other

Additional Observations:

1. The roadways surrounding Salem High School were also congested during the time that observations were taken; specifically, Willson Street had a queue extending from its intersection with Highland Avenue beyond Driveway B which lasted between 5-10 minutes around 7:45 AM;
2. Nine pedestrians were observed using the footbridge over Highland Avenue during the observations.

Afternoon Pick-off Procedure

Figure 3 graphically summarizes the observations conducted during the afternoon pick-up.

1. **Salem High School Pick-up:** The Salem High School Pick-up is the busiest around 2:35 PM, at which time the parent pick-up reached its maximum queue of approximately 600 feet.
 - a. The parent pick-up is treated as two lanes which causes occasional blockage of the bypass lane;
 - b. The bus pick-up is a single lane but is occasionally used by parents;
 - c. Non-designated areas are also used for active pick-up in the afternoon such as the parking lots or the driveway before the active pick-up area;
 - d. Drivers were observed illegally turning around in the pick-up and exiting via one-way Driveway A.
2. **Horace Mann School Pick-up:** The Horace Mann School Pick-up is the busiest around 1:50 PM, at which time the parent pick-up reached its maximum queue of approximately 400 feet.

The Horace Mann School parent and bus pick-ups do not share a lane to arrive at the active pick-up zones and therefore the queues do not interact or impact each other; however, an exiting queue to driveway A from the Horace Mann School parking lot does impact the parents arriving at the Horace Mann School pick-ups.



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Additional Observations:

- 1. The roadways surrounding Salem High School were less congested during the time that observations were taken in the afternoon; specifically, Willson Street from its intersection with Highland Avenue had one instance of a queue of approximately 300 feet (just past Driveway A) around 2:00 PM. Otherwise, queues along Wilson Street were relatively short;
- 2. Fifteen pedestrians were observed using the footbridge over Highland Avenue during the observations;
- 3. Users of the Salem High School Parking Lot were observed to turn out of the lot and exiting via Driveway A, which is not allowed by the existing signage;
- 4. A queue was observed exiting Driveway A – users may include both exiting vehicles from the Horace Mann School Parking lot and arriving cars to the Horace Mann School pick-up. The queue reached its maximum length at 2:40 PM.

Existing Traffic Counts

In addition to field observations, driveway traffic counts were conducted to determine the existing vehicle trip generation associated with the existing campus. The counts indicated that a total of approximately 3,940 vehicles enter and exit the campus on a daily basis. This include traffic from both the high school and HMLS. During morning peak hour, a total of 660 vehicles entered and 475 vehicles exited the campus. During the afternoon dismissal, 225 vehicles entered and 415 vehicles exited the campus. **Figure 4** summarizes the daily traffic flow into and out of the campus.

The directionality of the turning movements at the driveway intersections on Willson Street indicates that 45-55% of the traffic arrives from/departs to Highland Avenue and the remaining traffic is oriented east on Willson Street. **Figure 5** summarizes the daily traffic flow into and out of the campus as well as the mode of travel distribution of student traffic that was provided by the school district. In addition to traffic volumes and directional distribution, students’ place of residence data was used to develop a scatter diagram showing the areas of the City where most high school students reside (**Figure 6**).

Conclusions

VHB conducted observations at Salem High School on Thursday, December 12 and Monday, December 16, 2024, in support of the preparation of the ongoing feasibility study for the school. The observations were conducted during the morning drop-off and afternoon pick-up periods to document existing operations including student drop-off and pick-up activity, bus operations, and traffic impacts within the school campus and on the adjacent roadways. Traffic count data was also collected during the approximately same time periods. The highlights of the existing conditions observations is as follows:

- 1. The morning drop-off activity aligns with the network peak commuter period and therefore it coincides with significant queues on Willson Street; maximum queue lasted between 5-10 minutes around 7:45 AM;
- 2. The afternoon pick-up activity does not align with the network peak commuter period; therefore, limited if any queues are observed along Willson Street;

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3. Internal to the Salem High School campus, the afternoon pick-up creates significantly more queueing and congestion than the morning drop-off does;
4. During the afternoon pick-up:
 - a. The Salem High School parent pick-up is treated as two lanes, which causes occasional blockage of the bypass lane;
 - b. Likely due to this added congestion, parent vehicles from the High School were observed (1) making unexpected turns, such as exiting via Driveway A, (2) using the bus lane or (3) picking up in non-designated pick-up areas of the campus;

Figure 7 graphically summarizes some preliminary considerations for traffic circulation changes for further review. The elements of Figure 7 are listed below.

1. Maintain one-way traffic for the bus and parent pick-up / drop-off lanes;
2. Consider two-way operation of the main drive aisles connecting to Driveways A and C;
3. Consider two-way operation of roadway west of Horace Mann School athletic field;
4. Study to determine if two-way operation is appropriate of roadway north of Horace Mann School Parking lot;
5. Reconfigure Driveway A and the one-way couplet to reduce driver confusion at this location;
6. Consider studying the potential for and benefits of a new Driveway access on Highland Avenue and the implications of such an access improvement to the on-going MassDOT corridor improvement project along Highland Avenue.

Some of these initial observations may likely not be feasible upon further review, but are noted in this summary for completeness purposes. A further refined existing conditions review will be prepared when a more detailed transportation study is prepared for the Project during later stages of design development and permitting.

Figure 1: Current Traffic Circulation
Salem High School | Salem, Massachusetts


December 18, 2024



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Figure 2: Morning Drop-Off Operations and Queues

Salem High School | Salem, Massachusetts



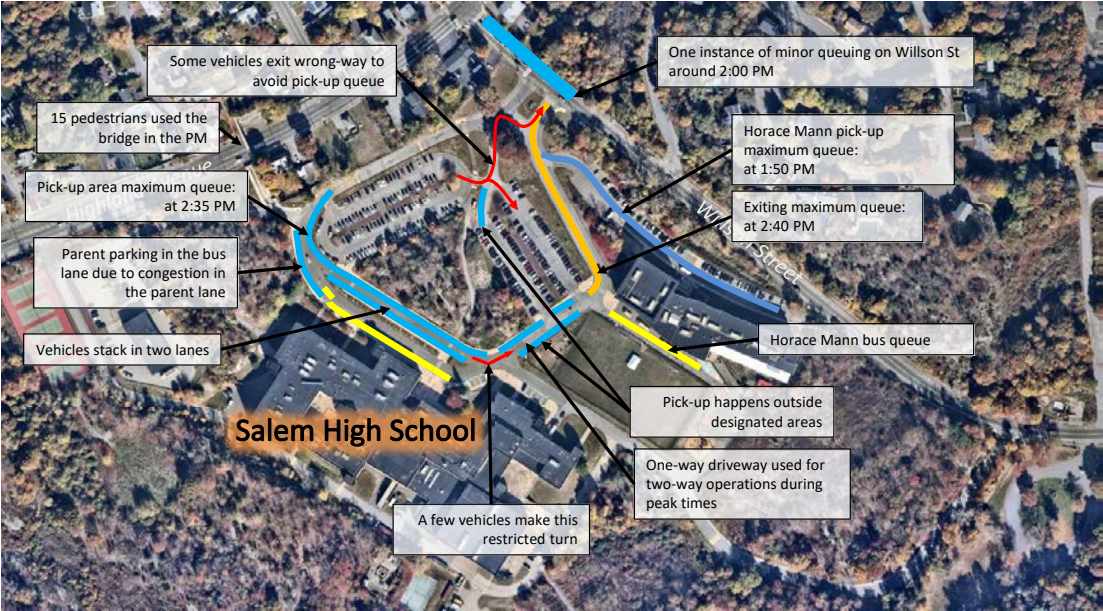
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School Start Times:
 High School – 7:45am
 Horace Mann School – 7:20am

Figure 3: Afternoon Pick-Up Operations and Queues
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School End Times:
High School – 2:35pm
Horace Mann School – 2:10pm

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Figure 4: Daily Traffic Generation
Salem High School | Salem, Massachusetts

vhb
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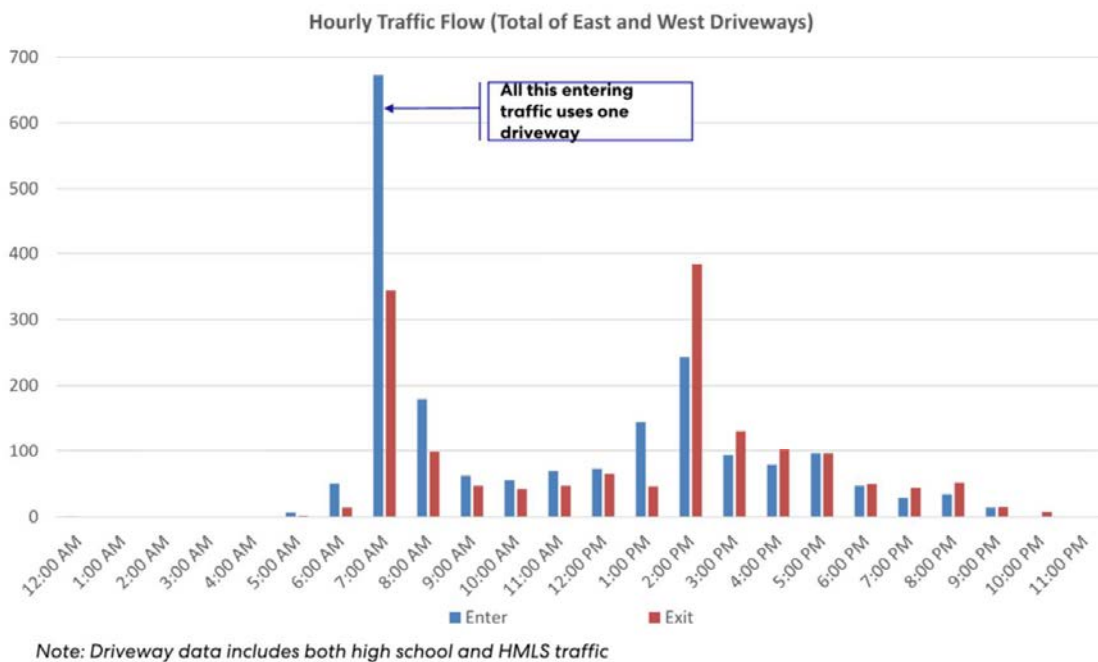


Figure 5: Directional Distribution & Mode of Travel
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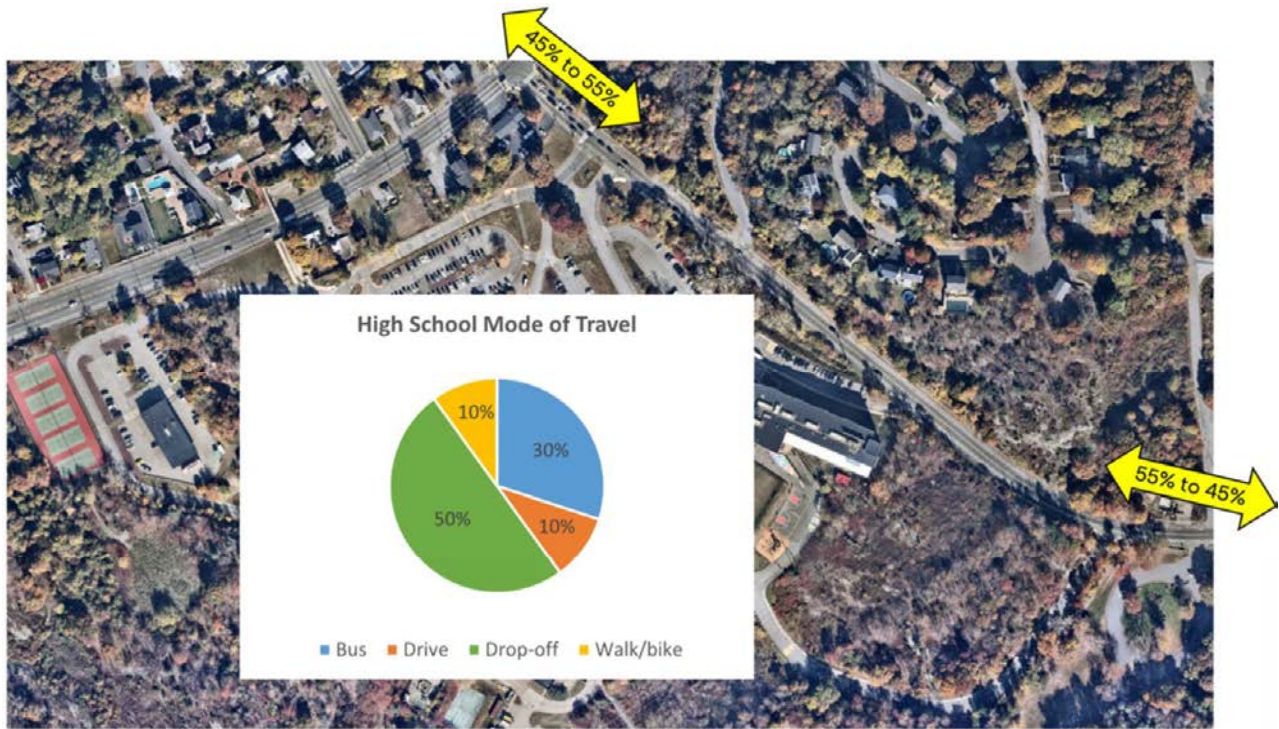


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Figure 6: Distribution of Students in the City
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Grade	2024-25	2034 MSBA Estimate
7		269
8		276
9	280	277
10	229	270
11	223	249
12	217	249
Post High	16	
Total	965	1,590

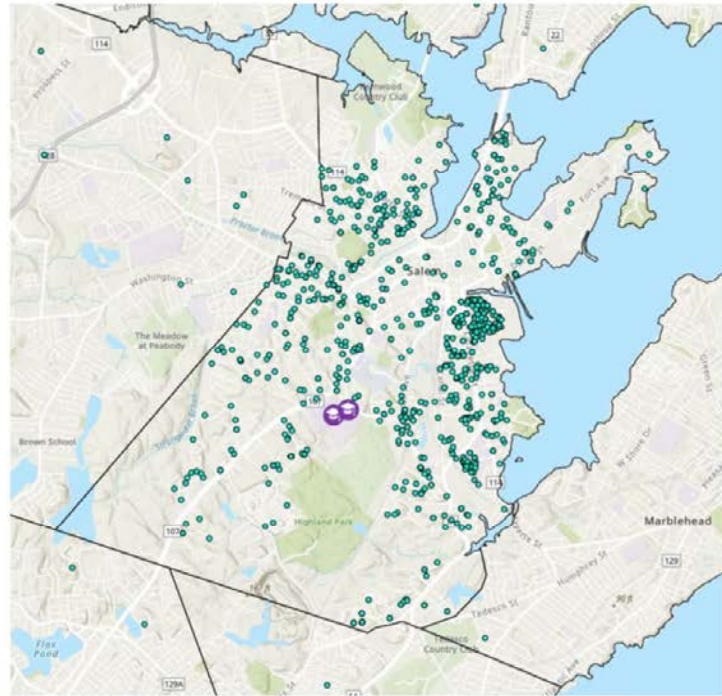
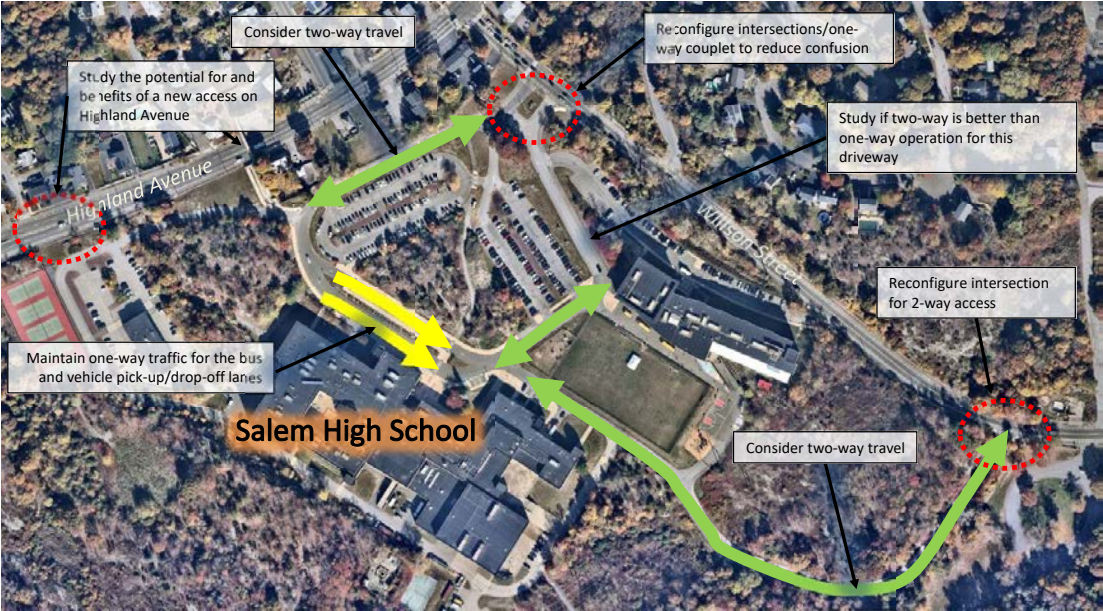


Figure 7: Preliminary Considerations for Further Review
Salem High School | Salem, Massachusetts


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Note: These are preliminary ideas for further consideration during the site plan development. They will require additional operational and feasibility analyses as well as compatibility checks with other site layout and parking impact considerations. Some of these measures may be deemed unsuitable upon further review.

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