PARE PROJECT NO. 16185.00
REPORT

PHASE 1 TRAFFIC IMPACT ANALYSIS FOR THE WESTPORT MIDDLE/HIGH SCHOOL WESTPORT, MASSACHUSETTS

SUBMITTED TO:
TOWN OF WESTPORT
PLANNING BOARD
856 MAIN ROAD
WESTPORT, MA 02790

SUBMITTED BY:
PARE CORPORATION
8 BLACKSTONE VALLEY PLACE
LINCOLN, RI 02865

JUNE 2016

TABLE OF CONTENTS

Figures

Tables

APPENDICES

Introduction

The following represents the phase 1 traffic study completed for the construction of a combined Westport Middle/High School on the existing high school property located at 19 Main Road. The proposed school is expected to house up to 860 students comprised of either grades 5 through 12 or 6 through 12. An alternate plan exists to reconstruct the middle school on its original property, located at 400 Old County Road. However, this option would house grades 5 through 8 with projected enrollments similar to what existed at the middle school prior to its closing in the fall of 2015. As this scenario would match a previously existing condition, it has not been included in this analysis for traffic impact but has been assessed with regard to sight distance and safety. As the site selection and layout design progress, a phase 2 traffic study will be performed to determine the extent of any mitigation that may be required for the final proposal.

The existing parcel, originally designated as the town's high school, has recently extended services to a portion of the middle school students and now houses 526 students between grades 7 and 12. This property is approximately 15 acres in size and the existing structure totals 150,000 square feet. The property currently has four driveways on Main Road. Two driveways comprise the bus loop, intended for one-way southbound circulation. Additionally, an entrance driveway is located at the northern end of the property, across from Old County Road, and a full access driveway is located at the southern end of the property leading to/from the adjacent parking lot. A circulating roadway exists around the rear of the school between the northern and southern driveways.

For the grades 5 through 12 scenario, the proposed middle/high school facility is expected to have an initial enrollment of 860 students. For the grade 6 through 12 alternative, the proposed school facility is expected to have an initial enrollment of 735 students. School hours have not yet been set and therefore are assumed to mimic existing operations from 7:30 a.m. to 2:00 p.m., Monday through Friday. As is typical of Westport schools, arrival will begin approximately 20 minutes prior to the school start time and dismissal is expected to last for approximately 20 minutes, beginning shortly before 2:00 p.m.

Presented within are existing conditions in the vicinity of the project site, a safety analysis of the study area, an analysis of the traffic based on existing, future 2023 no-build and future 2023 build conditions, and proposed mitigation measures and/or recommendations, as necessary. A locus map of the study area is provided in Figure 1 and the existing site layout is shown in Figure 2.

The study area includes Old County Road from its intersection with American Legion Highway (Route 177) to Gifford Road and Main Road from its intersection with Old County Road to its intersection with Charlotte White Road.

Data Collection

Manual turning movement counts were completed on Tuesday, May 24, 2016 from 7:00 a.m. to 9:00 a.m. and from 1:30 p.m. to 6:00 p.m. by Transportation Data Corporation (TDC) at the following intersections:

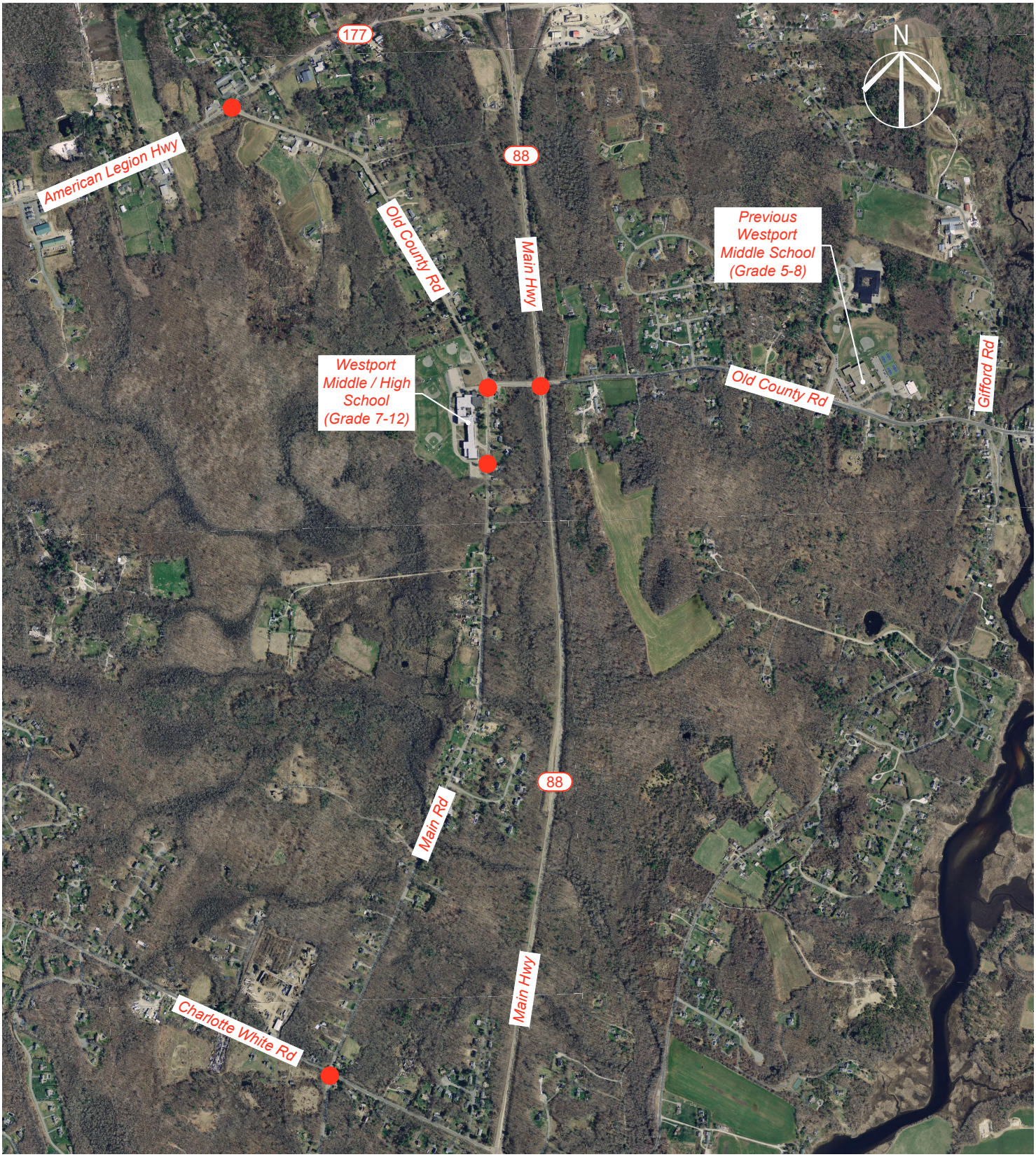
- Old County Road at Main Highway (Route 88)
- Old County Road at American Legion Highway (Route 177)
- Main Road at Old County Road/the school's northern driveway
- Main Road at the school's southern driveway
- Main Road at Charlotte White Road

Automated traffic recorder counts (ATR) have also been taken over a 48-hour period on Main Road in the vicinity of the existing high school.

Crash data for the roadway network in the vicinity of the project site was requested from the Town of Westport Police Department. This data has yet to be received. In lieu of local data, crash data was extracted from the MassDOT crash portal for the most recent three year period available, from January 2012 through December 2014.

A field review of the study area was conducted, with geometric measurements and other field observations recorded at the significant intersections in the vicinity of the project site. The information obtained was used in the analysis of the study area intersections.

The Town of Westport Planning Department was contacted to determine if there are currently any developments proposed within the Town whose trip generation information should be included in the Westport Middle/High School study. The Town indicated that there are currently no proposed developments in the vicinity of the proposed middle/high school aside from the additional sports fields proposed on the south side of Route 177 just west of the middle/high school site.



● = STUDY INTERSECTIONS

Scale: 1"= 1400'

Project No. 16185.00

Date: June 2016

PARE CORPORATION
ENGINEERS - SCIENTISTS - PLANNERS
8 BLACKSTONE VALLEY PLACE
LINCOLN, RI 02865
401-334-4100

Figure 1
Locus Map

Westport Middle/High School
Westport, Massachusetts

Scale: 1"= 200'

Project No. 16185.00 Date: June 2016

PARE CORPORATION
ENGINEERS - SCIENTISTS - PLANNERS
8 BLACKSTONE VALLEY PLACE
LINCOLN, RI 02865
401-334-4100

Figure 2
Existing Site Layout

Westport Middle/High School
Westport, Massachusetts

Existing Roadway Conditions

The study area is defined as the significant roadways and intersections in the vicinity of the proposed site that may be impacted by traffic associated with the construction of the proposed Westport Middle/ High School. Listed below are the roadways and intersections included in the study area for the proposed high school.

Study Area Roadways

- Old County Road from American Legion Highway (Route 177) to Gifford Road
- Main Road from Old County Road to Charlotte White Road

Study Area Intersections

- Old County Road at Route 88 – Signalized
- Old County Road at Route 177 – Unsignalized
- Main Road at Old County Road/the School's Northern Driveway - Unsignalized
- Main Road at the School's Southern driveway - Unsignalized
- Main Road at Charlotte White Road – Unsignalized

Main Road

Main Road is classified as a local road with a posted speed limit that varies from 30 miles per hour to 40 miles per hour throughout the study area. In the vicinity of the existing high school, Main Road consists of two 14-foot wide lanes separated by a double yellow centerline, and a 9-foot wide parallel parking lane on the southbound (western) side of the street. Sidewalks are present along the school property on Main Road adjacent to the southbound lane and extending into the bus drop-off area. Main Road is primarily designated with a land use of residential throughout the study area.

Main Road at School (Looking North)

Old County Road at Main Highway (Route 88)

The intersection of Old County Road and Main Highway (Route 88) forms a four-legged signalized intersection. Route 88 forms the north and south legs of the intersection while Old County Road forms the east and west leg. Old County Road in the vicinity of the intersection consists of two 22-foot lanes, with sidewalk adjacent to the eastbound travel lane. Route 88 is a divided limited access highway. The intersection layout is configured with a 12-foot dedicated left turn lane, a 12-foot through lane, and a 12-foot shared through and right turn lane in each direction. A crosswalk is provided across the southern approach equipped with wheelchair ramps and pedestrian push buttons. At the time of the site visit, the intersection was milled and temporary pavement markings were present.

The signal operates under standard NEMA phasing with protected, lead left-turn phasing for northbound and southbound traffic. The signal allows for an exclusive pedestrian phase and eastbound and westbound movements run concurrently as a single phase.

Route 88 is classified as an urban minor collector that runs in a north/south direction. To the north of the intersection, Route 88 is a divided highway consisting of single 12-foot lanes, with 10-foot shoulders in each direction, divided by a concrete barrier. To the south of the intersection, the roadway is no longer a divided highway, but the lane and shoulder widths are maintained in each direction.

Old County Road at American Legion Highway (Route 177)

The intersection of Old County Road and American Legion Highway (Route 177) forms a three-legged, unsignalized intersection. Route 177 forms the east and west legs of the intersection while the Old County Road forms the southern leg. Old County Road is stop controlled and is equipped with a center island. Route 177 operates with no traffic controls through the intersection. Route 177 is classified as an urban minor collector and consists of two 14-foot travel lanes. Old County Road consists of 13-foot lanes in each direction within the vicinity of the intersection.

Route 177 and Old County Road Intersection

Main Road at Old County Road/the School's Northern Driveway

The intersection of Main Road with Old County Road and the existing high school entrance forms a four-legged unsignalized intersection. Main Road forms the southern leg of the intersection, Old County Road forms the eastern and northern leg, and the existing high school entrance forms the western leg of the intersection. Main Road and the northern leg of Old County Road currently operate with no controls for traffic. The eastern leg of Old County Road is stop controlled for through traffic to the high school and for left turns onto Main Road. Right turning vehicles have a separated right turn lane that yields to traffic traveling northbound on Main Road. A raised center island is provided to divide eastbound and westbound traffic on Old County Road. The Old County Road leg is slightly offset from the existing high school entrance, creating an intersection with an irregular geometry. The high school entrance, a 22-foot wide lane with no striping, is signed as "Enter Only", but there is also a stop sign displayed on the opposite side of the post. Vehicles were observed exiting through this driveway during the dismissal period.

Signs at School's Northern Driveway

At the intersection, the westbound approach along Old County Road consists of two 19-foot wide through lanes, a 20-foot separated right-turn lane and a raised center island. One-foot shoulders are provided on both sides of the street. The southeastern quadrant of the intersection was constructed with a large radius, enabling northbound vehicles on Main Road to travel at high rates of speed eastbound onto Old County Road. The large open layout of the intersection often caused confusion during the hours observed in the morning drop-off period.

Intersection of Main Road, Old County Road and the School's Northern Driveway

Old County Road along the northern leg is classified as a local road and has a posted speed limit of 35 miles per hour. A "School Speed Limit Ahead" (S4-5) sign is present for southbound traffic about 400 feet north of the intersection, but no "School Speed Limit" signs are present throughout the study area. The roadway consists of one 13-foot lane in the southbound direction, and one 16-foot lane in the northbound direction. Both directions are striped with 2-foot shoulders.

Main Road at the School's Southern Driveway
The intersection of Main Road and the existing high school exit forms a three-legged, unsignalized intersection. Main Road forms the north and south legs of the intersection while the existing high school exit forms the west leg.

Main Road in the vicinity of the existing exit consists of two 12-foot wide lanes delineated by a double yellow center line. To the north of the exit, there is a 6-foot wide shoulder along the southbound lane and a 2-foot shoulder along the northbound lane. South of the existing exit, the southbound shoulder decreases to 2 feet wide. The existing exit consists of one 20-foot lane which operates as an exit only. Vehicles intending to park in the southern parking lot have been observed using the exit as an entrance to avoid vehicle queues behind the school during pick-up and drop-off times. The existing high school exit currently operates as stop controlled.

Main Road at Charlotte White Road
The unsignalized intersection of Main Road and Charlotte White Road forms a four-legged intersection. Main Road forms the north and south legs of the intersection while Charlotte White Road forms the east and west legs of the intersection. Main Road within the vicinity of the intersection consists of two 12-foot travel lanes delineated by a double yellow centerline. Charlotte White Road consists of two 11-foot lanes and is delineated by a double yellow centerline. All approaches to the intersection are stop controlled.

Observations
In addition to the elements reviewed for all existing roadway conditions, the following observations were made with regard to traffic operations within the study area and at the existing Westport High School during the field review:

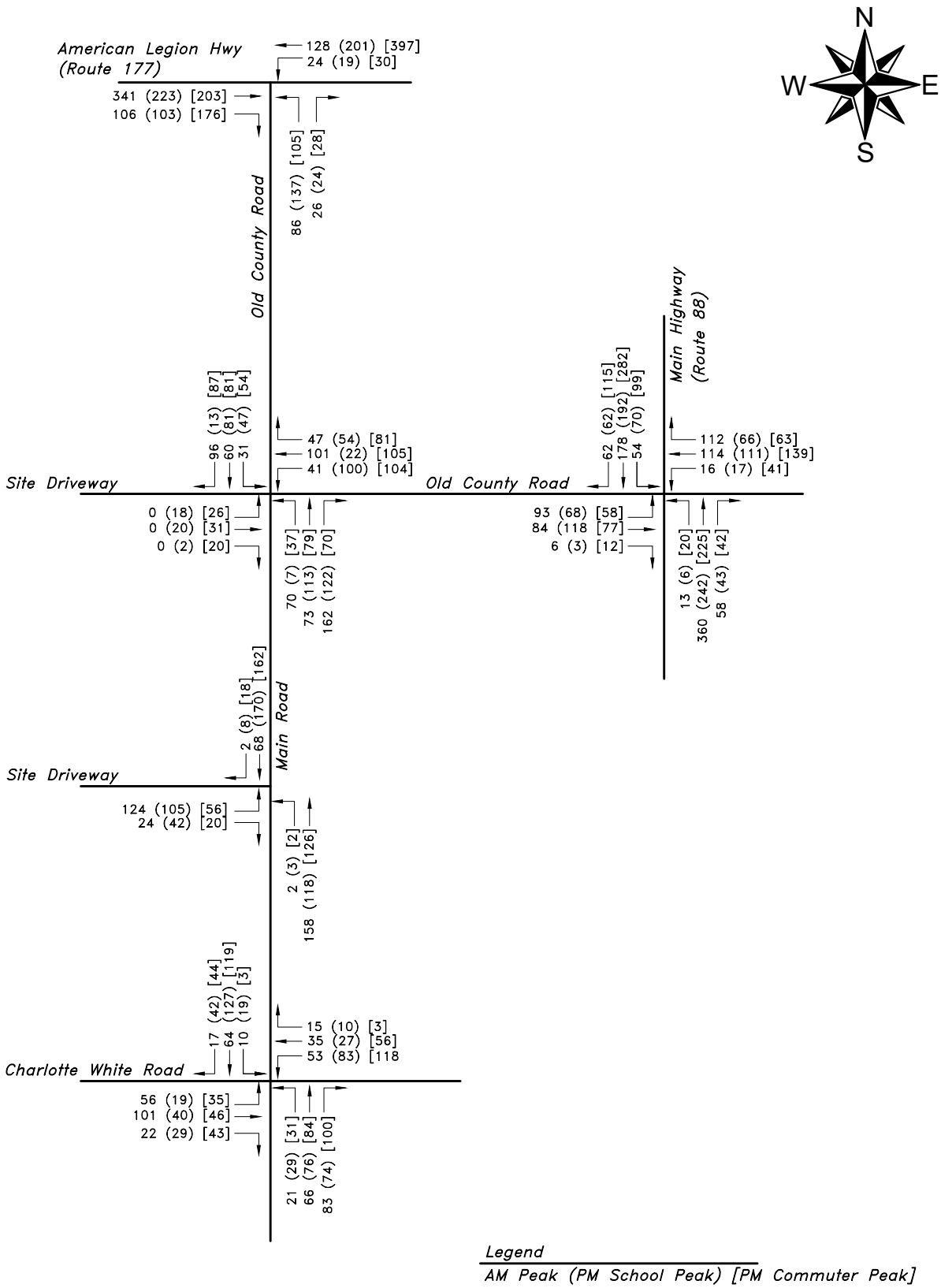
- During the drop-off time (7:00 a.m. - 7:30 a.m.) a delivery truck pulled into the loading dock at 7:23 a.m. disrupting the vehicle circulation and causing queues to back up to the site's northern entrance.
- Students were dropped off by parents outside of the designated drop-off areas, including multiple locations along Main Road and in the bus lane area.
- The intersection of Old County Road, Main Road and the school's northern driveway does not function well.
    - Vehicles making a right turn from Main Road onto Old County Road were often stacked two vehicles wide, due to the open layout of the intersection. These vehicles then needed to merge back to a single lane east of the turn.
    - The east leg of Old County Road and the school's northern driveway are not aligned, forcing westbound through traffic to essentially turn left then right, making it unclear to approaching motorists which way they were going.
- A vehicle was observed exiting the northern parking lot during the drop-off period that interrupted the vehicle circulation.
- During the drop-off time, a rope is placed across the access drive to force vehicles around the perimeter of the northern parking lot. This increases the available queue length to minimize the chance of vehicles backing up onto Main Road or Old County Road. However, vehicles utilize the gravel parking area to bypass the extended queue.

Existing Traffic Volumes

Based on the traffic counts completed, the a.m. peak hour at the intersections in the study area generally occurred between 7:00 a.m. and 8:15 a.m., which coincides with the current/proposed 7:10 a.m. to 7:30 a.m. student arrival. Though somewhat more spread out, the p.m. peak hours of the intersections surrounding the school occurred in two distinct timeframes, from 2:00 p.m. to 3:00 p.m., again overlapping the existing/proposed school release which will be most heavily concentrated between 2:00 p.m. and 2:20 p.m., and from 4:45 p.m. to 6:00 p.m., coinciding with the standard commuter peak combined with community use of the school's fields in the early evenings. Due to the fact that the study area intersections are not part of a coordinated signal system, the peak hour of each individual intersection was analyzed to provide a conservative assessment.

In addition to reviewing the peak hour time frames for each intersection within the study area, the data collected was reviewed with respect to seasonal demands. Monthly data trends from the nearest MassDOT count station (#6210) indicate that volumes in the month of May are approaching the volumes experienced during the summer peak, due to the tourist nature of the area. Additionally, all local schools were in normal session the week counts were completed. For these reasons, no seasonal adjustments were applied to the count data.

Copies of all count data are provided in Appendix A. Existing a.m. peak hour, p.m. school peak hour and p.m. commuter peak hour traffic volumes are shown in Figure 3.



PARE CORPORATION
ENGINEERS - SCIENTISTS - PLANNERS
8 BLACKSTONE VALLEY PLACE
LINCOLN, RI 02865
401-334-4100

PROJECT NO. 16185.00

DATE: JUNE 2016

Figure 3
Existing Traffic Volumes

Westport Middle/High School

Westport, Massachusetts

Safety Analysis

Crash Data

Crash data for the study area was requested from the Westport Police Department. To date, the crash data information has yet to be received from the Department. In place of local data, crash data was extracted from the MassDOT crash portal for the most recent three (3) year period of January 2012 through December 2014. This represents the timeframe before the middle school closed. Crash data was reviewed to determine the presence of safety concerns within the study area.

According to the data reviewed there were 46 total incidents that occurred in the study area. Of these 46 total incidents, 18 incidents occurred on study area roadways not specifically at a study area intersection. Of the 18 incidents, two (2) resulted in non-fatal injuries with a total of two (2) injured persons and none resulted in fatal injuries. The majority of incidents involved a single vehicle striking an object, commonly a tree or a deer. A breakdown of the incidents by type and number of injuries can be seen below in Table 1.

Table 1: Crash Summary for Study Area Roadways

Roadway	Non-Fatal Injuries	Fatal Injuries	Angle	Head-On	Loss of Control	Object	Other	Rear-End	Side-Swipe
Old County Road	1	0	1	0	0	5	0	4	2
Main Road	1	0	1	0	1	3	0	1	0

According to the data received, the remaining 28 incidents occurred at or approaching a particular study area intersection. Of these incidents, seven (7) resulted in non-fatal injuries with a total of 12 injured persons and none resulted in fatal injuries. The single head-on incident involved a vehicle attempting to turn left being struck on a rainy night with a wet roadway surface. A breakdown of the incidents by type and number of injuries can be seen below in Table 2.

Table 2: Crash Summary for Study Area Intersections

Intersection	Non-Fatal Injuries	Fatal Injuries	Angle	Head-On	Loss of Control	Object	Other	Rear-End	Side-Swipe
Old County Rd/ Route 88	6	0	6	0	0	0	0	7	0
Old County Rd/ Route 177	4	0	5	0	0	0	0	2	0
Old County Rd/ Main Rd	1	0	1	1	0	0	0	1	0
Main Rd/ Charlotte White Rd	1	0	1	0	0	3	0	0	1

The data received shows a higher occurrence of angle and rear-end incidents at intersections. These are generally low severity incidents and are the most common types of incidents expected for intersections. There were no trends or intensities of incidents noticed that would require or lend themselves to mitigation. A summary table of all crash data reviewed is provided in Appendix B.

Site Circulation

On-site circulation for the new Westport Middle/High School is expected to mimic the existing patterns. More specifically, in the morning drop-off timeframe, the northern driveway, opposite Old County Road, serves as a one-way entrance. Parents, students and staff then continue around the back of the school and exit the southern driveway. However, during the pick-up timeframe, both driveways will operate as full access. The two driveways near the middle of the property function as a one-way, southerly traversing loop for buses only throughout the day.

Sight Distance

A spot speed study was performed on Main Road in the vicinity of the site, south of the southern driveway. The speed study was conducted at 3:00 p.m. on Wednesday, June 8, 2016. A summary of the results are shown in Table 3. The complete results can be found in Appendix C.

Table 3: Speed Data Results for Main Road

	Posted Speed	Average Speed	True Median (50th Percentile)	85th Percentile	10 MPH Pace	% over Posted
Northbound	30	39	38	45	32-41	90
Southbound	35	37	37	41	32-41	68

Based on the spot speed study performed, a design speed of 45 miles per hour was selected for Main Road. According to the American Association of State Highway and Transportation Officials (AASHTO) publication *A Policy on the Geometric Design of Highways and Streets, Sixth Edition 2011,* the minimum safe stopping sight distance for a 45 mile per hour speed is 360 feet. The minimum safe intersection sight distances for left and right turning vehicles from a minor street are 500 feet and 430 feet respectively. A summary of the sight distance available at each driveway can be seen below in Table 4.

Table 4: Sight Distance Summary

		Required SSD (ft)	Measured SSD (ft)	Required ISD (ft)	Measured ISD (ft)
Northern Driveway	To the North	360	290	500	290
	To the South	360	650	430	650
Southern Driveway	To the North	360	650	500	650
	To the South	360	790	430	790

SSD – Stopping Sight Distance; ISD – Intersection Sight Distance

Though sight distance north and south of both driveways is limited by horizontal curvature of the roadway, all are sufficient in comparison to AASHTO standards except the sight distance to the north of the northern driveway. In addition to horizontal curvature, this line of sight is obstructed by large shrubs/bushes located along the perimeter of the school property.

According to AASHTO, if the intersection sight distances cannot be achieved, but the available sight distance is at least equal to the appropriate stopping sight distance, then drivers have sufficient sight distance to anticipate and avoid collisions. Adequate stopping sight distance to the north of the northern driveway could be achieved with vegetation trimming on the project site.

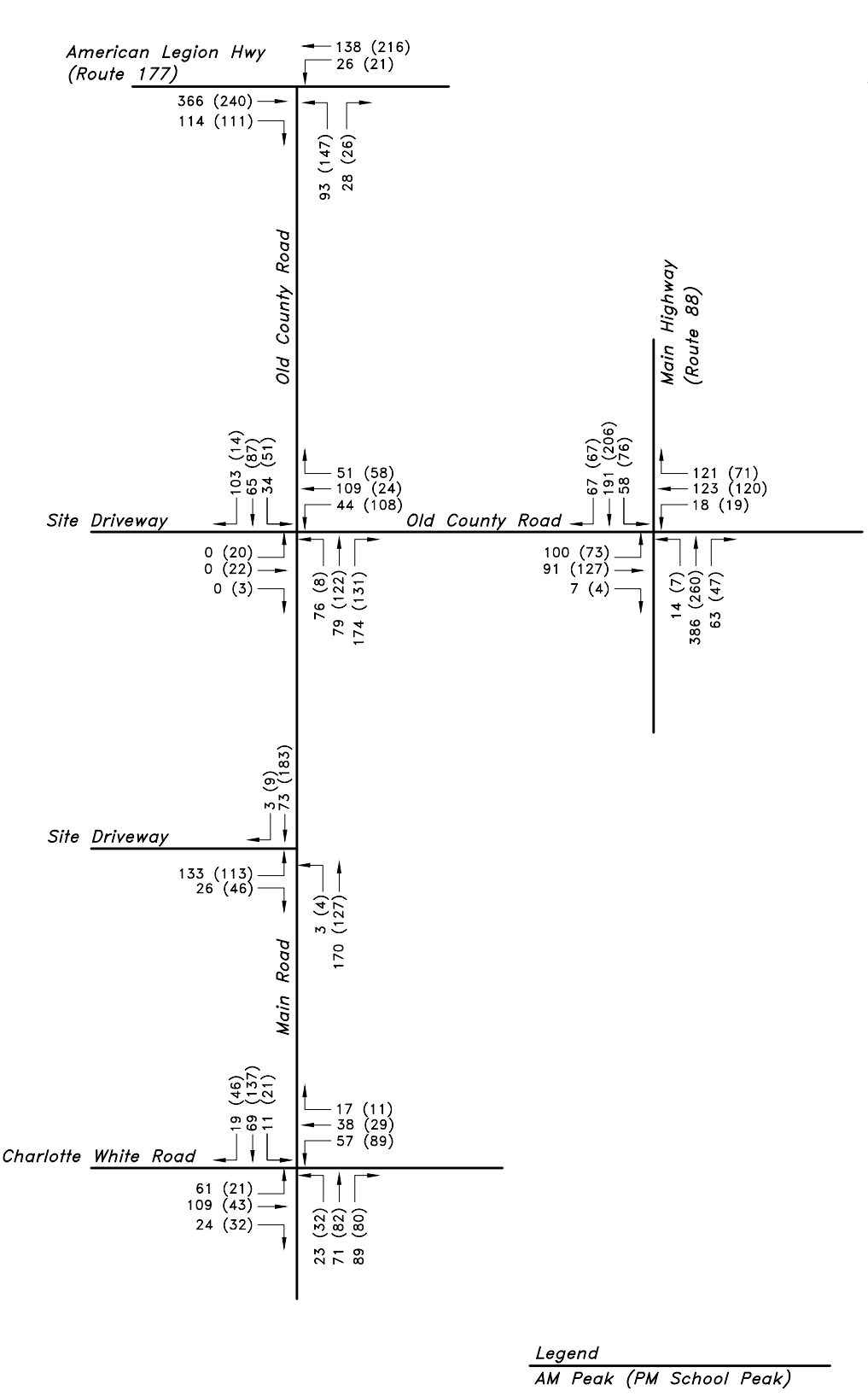
It should also be noted that though no speed study was completed along Old County Road, the sight distance to the east of the site is limited to a distance of 200 feet due to horizontal curvature.

Future Conditions

Future traffic volumes are determined by projecting the existing traffic volumes based on a determined annual growth rate and including known potential developments within the study area. The Town of Westport Planning Department was contacted to determine if there are currently any developments proposed within the vicinity of the site whose trip generation information should be included in the middle/high school study. The Planning Department indicated that there are currently no proposed developments in the vicinity of the existing/proposed site aside from additional sports fields to be located on the south side of Route 177 just west of the middle/high school. The future presence of these fields is expected to defer much of the early evening traffic away from the middle/high school site. For this reason, no volumes were added to the p.m. commuter peak hour under the future conditions.

To account for background growth along the roadways within the vicinity of the project site, the existing traffic volumes were projected over a seven-year horizon from 2016 to 2023. Recent census data was reviewed to determine the appropriate growth rate. The census data showed an average growth rate of almost 1.0% per year from 2000 to 2010 for the Town. To provide a conservative analysis of the project area, a growth rate of 1.0% per year was used for the seven-year projection.

A copy of the available census data is provided in Appendix D. Figure 4 provides the 2023 future no-build volumes for both the a.m. peak hour and p.m. school peak hour.



PARE CORPORATION
ENGINEERS - SCIENTISTS - PLANNERS
8 BLACKSTONE VALLEY PLACE
LINCOLN, RI 02865
401-334-4100

PROJECT NO. 16185.00

DATE: JUNE 2016

Figure 4
Future (2023) No-Build Traffic Volumes

Westport Middle/High School
Westport, Massachusetts

Build Conditions

The future 2023 build condition represents the future 2023 no-build condition plus potential traffic expected from the proposed Westport Middle/High School.

Trip Generation

The proposed Westport Middle/High School has an expected enrollment of up to 860 students and 146 faculty/staff members. This represents an increase in staff of 35 individuals and an increase in students of 334. The additional students are expected to be predominantly younger grades, and the number of student driver trips is not expected to increase. The number of new trips expected was estimated using student travel information provided by the Westport School Department. Based on information from the Westport School Department, the following mode distribution exists:

- 10% of students drive themselves to school;
- 10% of students are dropped off/picked up by parents: and
- 80% of students utilize the school bus services.

Additionally, the school noted that they currently run 15 buses, averaging 28 students per bus. Further, it was observed by Pare Corporation staff that some students carpool. A modest carpool rate of 1.25 students per car was used for this study.

A summary of the trip generation for the proposed site during both the a.m. peak hour and p.m. school peak hour is provided in Table 5. Complete trip generation calculations are provided in Appendix E.

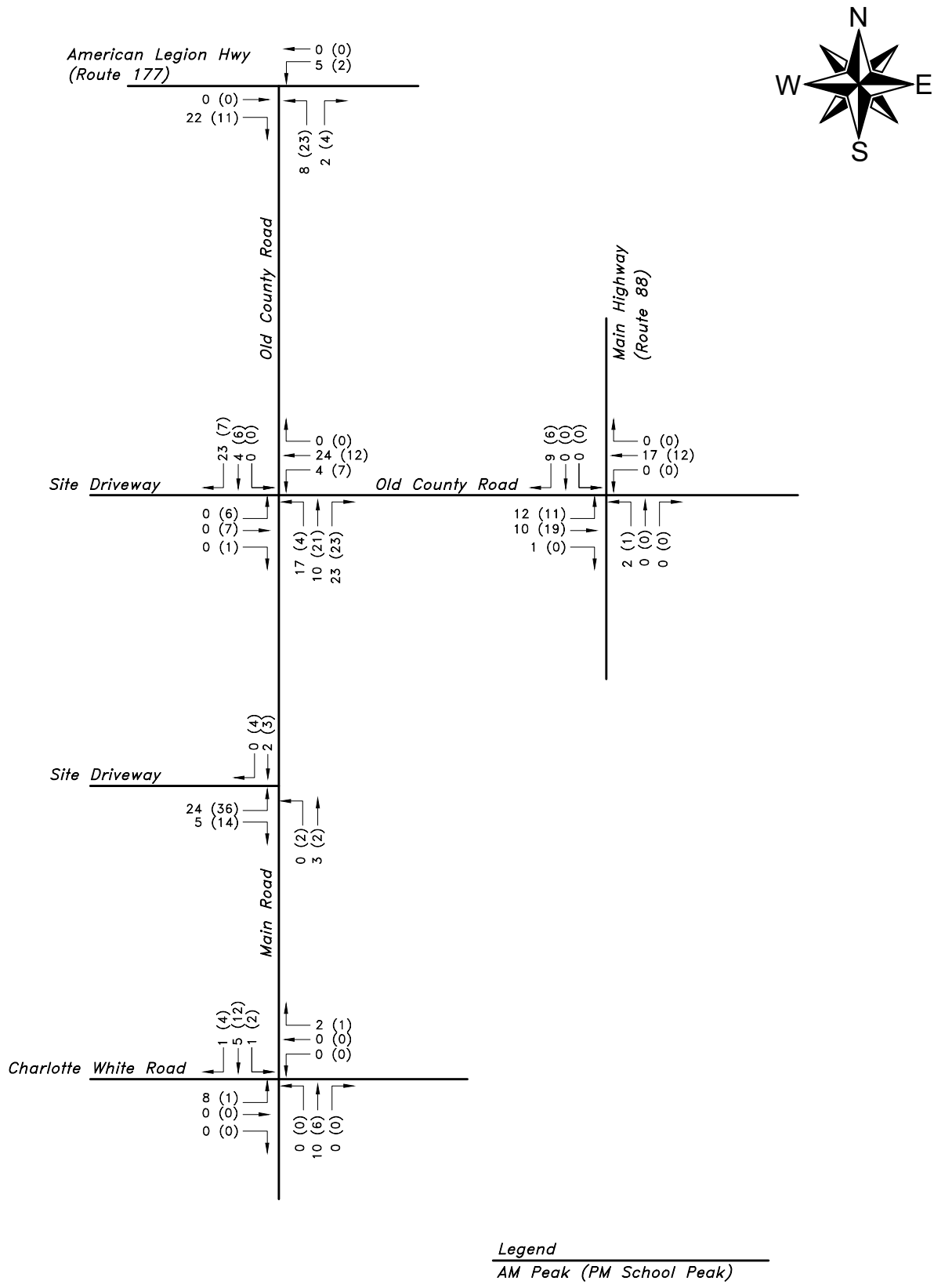
Table 5: Trip Generation Summary

Bus Trips	Drop-off/ Pick-ups	Student Drivers	Faculty Trips	Trips Entering Site		Trips Exiting Site	
				AM Peak	PM Peak	AM Peak	PM Peak
11	29	0	35	75	40	40	75

Trip Distribution

Trip distribution was completed for the proposed Westport Middle/High School by adding the proposed traffic into the existing traffic stream based on the existing count volumes at each study area intersection.

Complete trip distribution calculations are provided in Appendix E. The site-generated and future (2023) build volumes are shown in Figures 5 and 6 respectively.



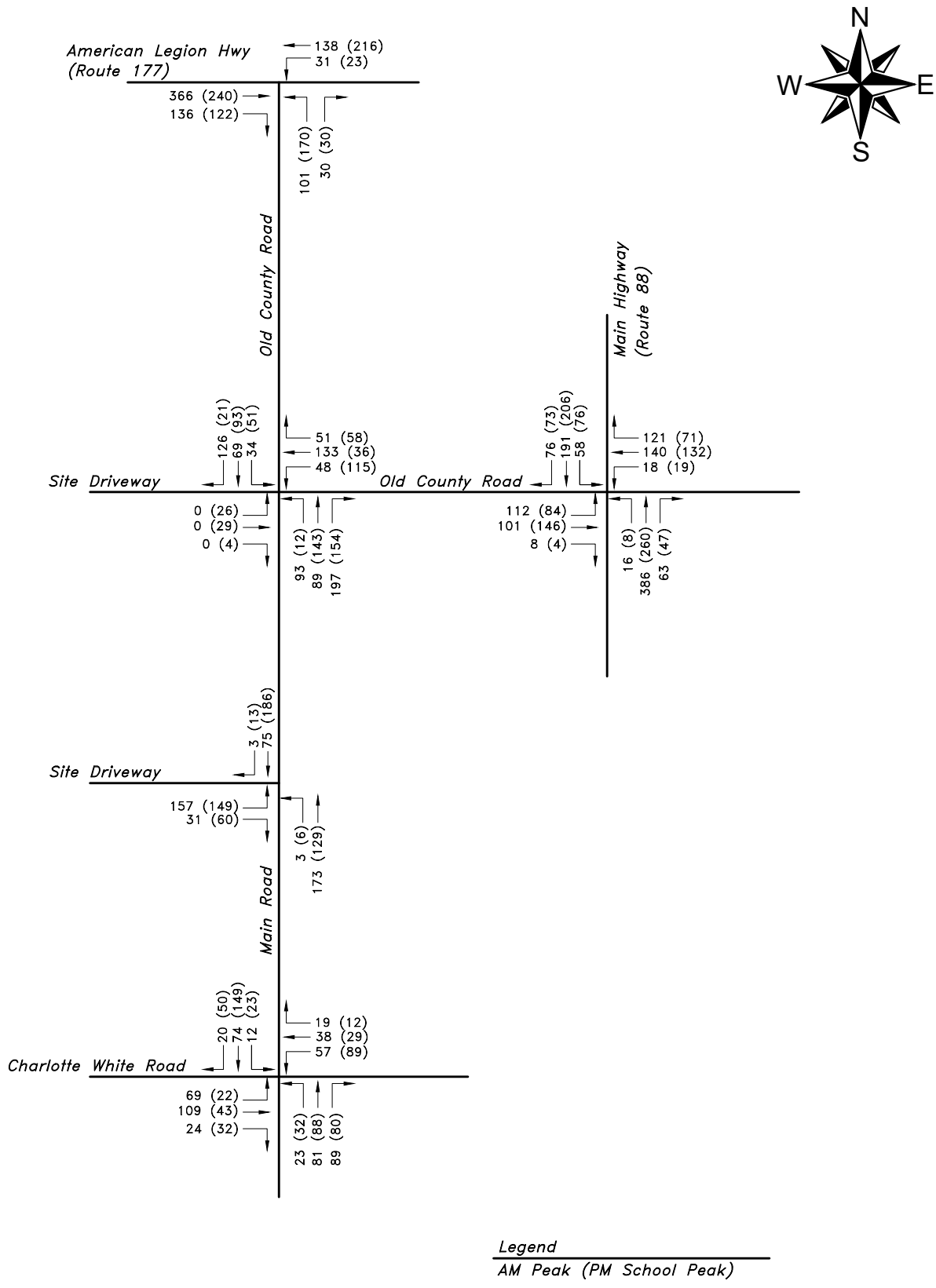
PROJECT NO. 16185.00

DATE: JUNE 2016

Figure 5
Site Generated Traffic Volumes

Westport Middle/High School
Westport, Massachusetts

PARE CORPORATION
ENGINEERS - SCIENTISTS - PLANNERS
8 BLACKSTONE VALLEY PLACE
LINCOLN, RI 02865
401-334-4100



PROJECT NO. 16185.00 DATE: JUNE 2016

Figure 6
Future (2023) Build Traffic Volumes

Westport Middle/High School
Westport, Massachusetts

PARE CORPORATION
ENGINEERS - SCIENTISTS - PLANNERS
8 BLACKSTONE VALLEY PLACE
LINCOLN, RI 02865
401-334-4100

Capacity Analysis – Existing, Future No-Build, and Future Build Conditions

Capacity analysis was completed for all study intersections for existing, future 2023 no-build, and future 2023 build conditions. Capacity analysis characterizes intersections based on their level of service (LOS). LOS is a quality measure describing operational conditions within a traffic stream, generally in terms of service measures such as speed, travel times, traffic interruptions, etc. Six LOS, from A to F, are defined for each type of facility, with A representing the best operating conditions and F representing the worst operating conditions. The LOS criteria for signalized and unsignalized intersections are provided in Table 6 below. Tables 7, 8 and 9 provide the capacity analysis results for all intersections for the a.m., p.m. school and p.m. commuter peak hours respectively. The complete capacity analyses can be found in Appendix F.

Table 6: LOS Criteria for Signalized and Unsignalized Intersections

	Signalized Intersection	**Unsignalized Intersection**
LOS	Delay Time (sec/veh)	Delay Time (sec/veh)
A	≤ 10	0-10
B	> 10-20	> 10-15
C	> 20-35	> 15-25
D	> 35-55	> 25-35
E	> 55-80	> 35-50
F	> 80	> 50

With the maximum proposed build out of the Westport Middle/High School, the LOS at the study area intersections as a whole and by movements is expected to remain the same as the LOS that exists today during the a.m. and p.m. peak hours, with a few exceptions.

At the intersection of Route 88 with Old County Road, the overall intersection is expected to deteriorate from LOS B to LOS C during the a.m. peak hour with less than 3 seconds of added delay. The eastbound approach along Old County Road is expected to deteriorate from LOS C to LOS D with almost 10 seconds of added delay.

At the intersection of Route 177 with Old County Road, Route 177 movements will remain at LOS A during the p.m. school peak hour; however, the northbound approach along Old County Road is expected to deteriorate from LOS D to LOS E with up to 9 seconds of added delay.

At the intersection of Old County Road with Main Road and the school's northern driveway, the westbound approach along Old County Road is expected to deteriorate from LOS C to LOS D in the p.m. school peak hour with less than 12 seconds of added delay.

At the intersection of Main Road and the school's southern driveway, the eastbound approach along the school's driveway is expected to deteriorate from LOS C to LOS E in both the a.m. peak hour and the p.m. school peak hour. The queue at the driveway is not expected to exceed 275 feet, which is approximately the length from the intersection to the school's southern rear entrance.

Based on the analysis, the ultimate buildout scenario with up to 860 students would have minor impacts to the roadway network within the study area. Therefore, separate analysis for the alternate scenario of 735 students was not assessed.

Table 7: A.M. Peak Hour LOS Table

			Existing (2016)		Future (2023) No-Build		Future (2023) Build	
Intersection	**Movement**		**LOS (Delay[1])**	**Queue Length[2]**	**LOS (Delay[1])**	**Queue Length[2]**	**LOS (Delay[1])**	**Queue Length[2]**
Route 88 & Old County Road	NB	L	A (8.8)	10	A (8.6)	10	A (8.7)	11
		T,R	C (20.2)	110	C (20.3)	117	C (20.3)	117
		Approach	B (19.9)		B (19.9)		B (19.9)	
	SB	L	A (9.4)	27	A (9.3)	28	A (9.3)	28
		T,R	B (11.2)	59	B (11.3)	63	B (11.0)	64
		Approach	B (10.9)		B (11.0)		B (10.7)	
	EB	Approach	C (25.0)	108	C (30.8)	123	D (40.6)	#159
	WB	Approach	B (16.8)	129	B (18.3)	144	B (19.5)	156
	Intersection		B (18.1)		B (19.7)		C (22.3)	
Route 177 & Old County Road	NB	Approach	C (18.5)	40	C (20.9)	50	C (23.2)	63
	EB	Approach	N/C	-	N/C	-	N/C	-
	WB	Approach	A (1.4)	3	A (1.4)	3	A (1.7)	3
Old County Road & Main Road/Driveway	NB	Approach	A (1.9)	10	A (1.9)	10	A (2.1)	15
	SB	Approach	A (1.4)	5	A (1.5)	5	A (1.3)	5
	EB	Approach	N/C	-	N/C	-	N/C	-
	WB	Approach	A (6.4)	8	A (6.4)	10	A (6.4)	10
Main Road & Driveway	NB	Approach	A (0.1)	0	A (0.1)	0	A (0.1)	0
	SB	Approach	N/C	-	N/C	-	N/C	-
	EB	Approach	C (19.3)	108	C (23.0)	138	E (37.4)	240
Main Road & Charlotte White Road	NB	Approach	A (9.8)	28	B (10.3)	33	B (10.7)	38
	SB	Approach	A (9.6)	18	A (10.0)	23	B (10.3)	25
	EB	Approach	B (10.5)	35	B (11.2)	43	B (11.7)	48
	WB	Approach	A (9.4)	18	A (9.8)	20	A (10.0)	20

- 95th percentile volume exceeds capacity, queue may be longer

1. Delay shown in seconds per vehicle.
2. Queue Length shown in feet.

Table 8: P.M. School Peak Hour LOS Table

			Existing (2016)		Future (2023) No-Build		Future (2023) Build	
Intersection	**Movement**		**LOS (Delay[1])**	**Queue Length[2]**	**LOS (Delay[1])**	**Queue Length[2]**	**LOS (Delay[1])**	**Queue Length[2]**
Route 88 & Old County Road	NB	L	B (15.3)	11	B (15.1)	13	B (15.1)	14
		T,R	C (26.1)	128	C (26.4)	139	C (26.4)	139
		Approach	B (25.9)		C (26.1)		C (26.1)	
	SB	L	B (15.0)	63	B (14.9)	66	B (14.9)	66
		T,R	B (15.6)	102	B (15.7)	110	B (15.5)	111
		Approach	B (15.5)		B (15.5)		B (15.4)	
	EB	Approach	C (26.5)	#205	C (28.5)	#241	C (32.3)	#298
	WB	Approach	C (21.4)	184	C (22.4)	204	C (23.0)	#233
	Intersection		C (21.7)		C (22.5)		C (23.6)	
Route 177 & Old County Road	NB	Approach	C (22.6)	93	D (27.8)	120	E (36.8)	173
	EB	Approach	N/C	-	N/C	-	N/C	-
	WB	Approach	A (0.7)	3	A (0.7)	3	A (0.8)	3
Old County Road & Main Road/Driveway	NB	Approach	A (0.2)	0	A (0.2)	0	A (0.3)	3
	SB	Approach	A (2.9)	5	A (2.9)	5	A (2.8)	5
	EB	Approach	C (17.5)	15	C (19.2)	18	C (24.9)	30
	WB	Approach	C (16.5)	48	C (19.4)	63	D (31.0)	110
Main Road & Driveway	NB	Approach	A (0.2)	0	A (0.2)	0	A (0.3)	0
	SB	Approach	N/C	-	N/C	-	N/C	-
	EB	Approach	C (18.6)	98	C (22.0)	125	E (43.3)	275
Main Road & Charlotte White Road	NB	Approach	A (9.9)	30	B (10.5)	38	B (10.8)	40
	SB	Approach	B (10.7)	38	B (11.4)	45	B (12.0)	53
	EB	Approach	B (10.1)	20	B (10.6)	25	B (10.8)	25
	WB	Approach	A (9.8)	18	B (10.2)	20	B (10.4)	23

- 95th percentile volume exceeds capacity, queue may be longer

1. Delay shown in seconds per vehicle.
2. Queue Length shown in feet.

Table 9: P.M. Commuter Peak Hour LOS Table

			Existing (2016)	
Intersection	**Movement**		**LOS (Delay[1])**	**Queue Length[2]**
Route 88 & Old County Road	NB	L	A (9.5)	13
		T,R	C (20.9)	74
		Approach	C (20.1)	
	SB	L	B (10.3)	43
		T,R	B (12.8)	96
		Approach	B (12.3)	
	EB	Approach	B (16.2)	79
	WB	Approach	B (16.5)	132
	Intersection		B (15.4)	
Route 177 & Old County Road	NB	Approach	C (22.8)	55
	EB	Approach	N/C	-
	WB	Approach	A (0.6)	3
Old County Road & Main Road/Driveway	NB	Approach	A (1.5)	3
	SB	Approach	A (1.9)	5
	EB	Approach	C (19.5)	38
	WB	Approach	D (28.4)	148
Main Road & Driveway	NB	Approach	A (0.1)	0
	SB	Approach	N/C	-
	EB	Approach	B (12.2)	28
Main Road & Charlotte White Road	NB	Approach	B (10.4)	40
	SB	Approach	A (9.7)	25
	EB	Approach	A (9.5)	18
	WB	Approach	B (10.4)	28

- 95th percentile volume exceeds capacity, queue may be longer
1. Delay shown in seconds per vehicle.
2. Queue Length shown in feet.

NOTE: As discussed previously, the p.m. commuter peak hour was only analyzed under existing conditions, as the construction of town owned sports fields, with access to and from Route 177, is expected to decrease the volume of traffic coming to and from the school site in the early evening.

Conclusions

The crash data reviewed and summarized from January 2012 through December 2014 for the study area revealed a low frequency of incidents (less than 3 per year) at most study area intersections, with the exception of Route 88 and Old County Road, which experienced less than 4 incidents per year, all of which were low severity. There were no trends or concerns of incidents at the existing high school site or at the previous middle school site.

Sight distances reviewed for the existing high school and previous middle school sites indicate that there is sufficient stopping and intersection sight distance, except to the north of the northern driveway at the high school and to the east of the eastern driveway at the middle school. To achieve adequate stopping sight distance in accordance with AASHTO guidelines at the high school's northern driveway would require trimming vegetation on school grounds. At the middle school site, however, the horizontal curvature cannot be overcome without shifting the eastern-most driveway further to the west.

Level of service and delay impacts at the intersections within the study area are expected to be minor. The capacity analysis shows no deterioration in LOS for movements along Route 88, Route 177, Main Road and Charlotte White Road; slight deterioration in LOS for the eastbound approach along Old County Road during the a.m. peak hour and the westbound approach along Old County Road during the p.m. school peak hour; deterioration from LOS D to LOS E for the northbound approach along Old County Road during the p.m. school peak hour; and a drop in LOS for the eastbound approach along the school's southern driveway from LOS C to LOS E during both the a.m. peak hour and the p.m. school peak hour.

In summary, the construction of a co-located Westport Middle/High School on the existing high school site is expected to have minimal impact on the traffic and safety operations within the study area.

Recommendations

While the proposed middle/high school is not expected to have any major effects on the roadways surrounding the facility, additional measures previously discussed could help mitigate any transportation impacts that result from its construction, including:

- Modify signage at the high school's northern driveway to reflect the time restrictions of the entrance only/one-way circulation.
- Adjust school policies or increase enforcement at the high school to dissuade parents from dropping off/picking up on Main Road, as the lack of shoulders, sidewalks and crosswalks makes this an unsafe maneuver.
- If considered for further design, the middle school site driveways should be located farther west to accommodate adequate sight distance.
- At either location, ensure deliveries do not occur during drop-off and pick-up periods.

Though not worsened by the proposed construction scenarios, the intersection of Old County Road with Main Road and the school's northern driveway could be improved by reducing excess pavement width, particularly in the southeast quadrant, and realigning the westbound approach of Old County Road with the school's northern driveway. These improvements could be considered by the town.