



Nitsch Engineering

Traffic Assessment Memorandum

Doherty Memorial High School Feasibility Study

Worcester, MA

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Prepared for:
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Nitsch Engineering Project #13325.

INTRODUCTION

As part of the Feasibility Study for the Doherty Memorial High School project located in Worcester, Massachusetts, has been retained by Lamoureux Pagano Architects (LPA) to observe the existing traffic circulation and queue lengths on adjacent streets during drop-off and pick-up periods at the existing Doherty Memorial High School, and assess the five (5) site improvement options presented by LBA. The five options include:

- A.1 Pods on Park, new construction at existing Doherty High School site;
- A.2 Olmstead Homage, new construction at existing Doherty High School site;
- A.3 Highland Proud, new construction at existing Doherty High School site;
- B.1 New construction on Foley Stadium Site; and
- C.2 New construction on Chandler Magnet School Site.

Nitsch Engineering conducted a site visit to observe the existing traffic circulation and queue lengths on adjacent streets during drop-off and pick-up periods, as well as the parking utilization at the existing Doherty Memorial High School.

Nitsch Engineering also compiled and reviewed existing traffic data from Chandler Street Improvement Project (Prepared by VHB, October 18, 2016), which was provided by the Worcester Department of Public Works. The information was used to provide a qualitative assessment of the potential traffic impacts of the proposed high school in the surrounding area if the Chandler Magnet School site was selected.

Because this assessment focuses strictly on the issues above, traffic operations are secondary to the goals of the report and therefore we did not collect Automatic Traffic Recorder (ATR) counts or Turning Movement Counts (TMC) and evaluation of roadway and intersection capacity analyses and traffic signal warrants was not performed.

Doherty Memorial High School Site Visit

Nitsch Engineering conducted a site visit on Wednesday, May 22, 2019, to observe the site circulation associated with the weekday morning drop-off, weekday afternoon pick-up, and general queue lengths around the school site. The observation occurred during sunny conditions with a temperature of 70 degrees.

Doherty Memorial High School Site Access and Egress

Doherty Memorial High School is located at 299 Highland Street in Worcester, Massachusetts. The school is accessed using three curb cuts on Highland Street. The easternmost curb cut provides access to the two main parking lots at the school. The other two curb cuts provide access to the main office, the visitor parking and a third parking lot. They also are used mainly for the bus drop-off and pick-up.

Doherty Memorial High School Traffic Circulation and Pick-up/Drop-off

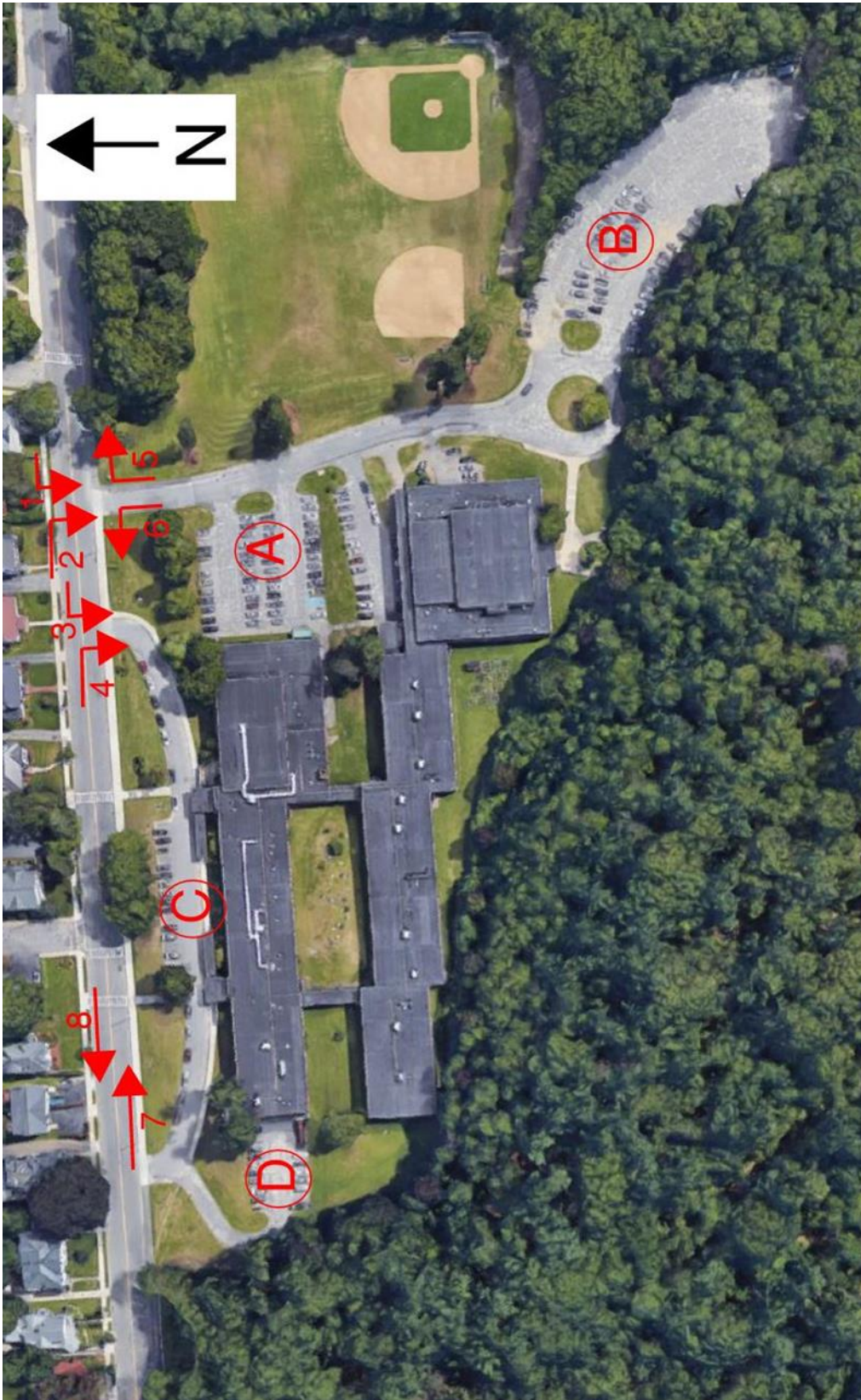
Please refer to the map for actual count locations.

Table 1 – Doherty School Drop-Off Quantity

Time / Movement	1	2	3	4	5	6	7 (Drop-off)	8 (Drop-off)
6:45 AM 7:00 AM	35	13	16 (2 Buses)	18 (5 Buses)	5	0	18	45
7:00 AM 7:15 AM	85	28	43 (6 Buses)	13 (1 Bus)	26	0	0	8
7:15 AM 7:30 AM	43	17	23 (0 Bus)	12 (0 Bus)	16	0	14	8
7:30 AM 7:45 AM	5	1	7 (0 Bus)	4 (0 Bus)	2	0	0	2
TOTAL	168	59	87 (8 Buses)	41 (6 Buses)	49	0	32	63

Table 2 – Doherty School Pick-Up Quantity

Time / Movement	1	2	3	4	5	6	7 (Pickup)	8 (Pickup)
1:15 PM 1:30 PM	2	2	7 (6 Buses)	2 (0 Bus)	3	3	19	8
1:30 PM 1:45 PM	5	3	6 (2 Buses)	1 (0 Bus)	4	0	27	21
1:45 PM 2:00 PM	0	0	1 (0 Bus)	2 (0 Bus)	40	1	40	35
2:00 PM 2:15 PM	1	3	0 (0 Bus)	2 (0 Bus)	40	19	6	3
TOTAL	7	8	14 (8 Buses)	7 (0 Buses)	87	23	92	67



Existing Morning Drop-off Circulation:

The Doherty Memorial High School traffic arrives at Highland Street from 6:45 AM through 7:45 AM. The parents arrive at Highland Street from east and west to drop-off their students along the curb on both sides of Highland Street.

Buses arrive at the main entrance driveway through Highland Street to drop-off students from 6:45 AM through 7:15 AM. A total of fourteen buses drop off students at the school.

Existing Afternoon Pick-up Circulation:

The Doherty Memorial High School traffic arrives at Highland Street from 1:15 PM through 2:15 PM. The parents arrive at Highland Street from east and west and park along the curb on both sides of Highland Street and wait to pick-up their students. We observed queue lengths of approximately 900 feet on both sides of Highland Street during the afternoon pick-up time.

Buses arrive at the main entrance driveway through Highland Street to pick-up students from 1:00 PM through 1:45 PM. A total of fourteen buses pick-up students at the school.

Doherty Memorial High School Parking Supply and Demand

Nitsch Engineering performed a parking supply and demand count on May 22, 2019. The utilization of the lots was taken at 9:30 AM.

Lot A (Faculty/Student)

Total Spaces:84 - Occupied: 79

Accessible: 1(empty)

Note: 12 cars were parked illegally.

Utilization: 107%

Lot B (Student)

Total Spaces:131 - Occupied: 120

Accessible: None

Note: 5 cars were parked illegally, and 5 others were parked behind the building.

Utilization: 99%

Lot C (Faculty/Staff)

Total Spaces:16 - Occupied: 12

Accessible: None

Utilization: 75%

Lot D (Faculty/Staff)

Total Spaces:18 - Occupied: 18

Accessible: None

Note: No pavement markings

Utilization: 100%

Assessment of the Options

Five (5) site improvement options are presented by LBA for Doherty Memorial High School. The five options include:

- Highland Proud, new construction at existing Doherty High School site;
- Olmstead Homage, new construction at existing Doherty High School site;
- Pods on Park, new construction at existing Doherty High School site;
- New construction on Chandler Magnet School Site; and
- New construction on Foley Stadium Site.

Nitsch Engineering reviewed the Site Plans for the above options with attention to traffic-related elements which included:

- On-site circulation;
- Pick-up/drop-off locations;
- On-site vehicle queuing; and
- Site access driveway locations and conflict points.

A.1 Pods on Park, located at existing Doherty High School

The proposed site plan was designed to optimize traffic flow and safety. Given the location of the bus pick-up/drop-off at the main school entrance, buses will circulate counterclockwise through the site to the Drop-off/pick-up area. Busses will enter from Highland Street using the driveway in the north, proceed south to turn left into the bus drive aisle and exit to Highland Street via the same driveway in the north. Given the designated dumpster and loading dock locations, it is expected that the delivery/trash trucks will circulate counterclockwise around the school building. Trucks will enter from Highland Street using the westernmost driveway in the north, circulate counter-clockwise to the rear of the building, and exit to Highland Street via the easternmost driveway in the north.

The separation of bus and parental traffic at the pick-up/drop-off location at the main entrance to the school allows buses to queue without impeding car circulation.

Given the location of passenger car pick-up/drop-off at the main school entrance at the west of the school building, it is expected that cars will enter the site from Highland Street through the westernmost driveway in the north and circulate counter-clockwise north of the playfields and underground parking and around the surface parking lot to the north driveway to exit to Highland Street. The Massachusetts Department of Transportation provides traffic data for roadways around the Commonwealth. According to the most recent data, Highland Street carries approximately 22,800 vehicles per day which is considered an average-volume traffic road and as such, conflicts are not expected for vehicles turning in and out of the school during peak hours.

A.2 Olmstead Homage, located at existing Doherty High School

Given the location of the bus pick-up/drop-off at the main school entrance, buses will circulate counterclockwise through the site and around the playfields and underground parking lot to the building. Busses will enter from Highland Street using the westerly driveway in the north, which is shared with the passenger vehicles, proceed south to turn left into the main drive aisle and exit to Highland Street via the driveway in the north. Given the designated dumpster and loading dock locations, it is expected that the

delivery/trash trucks will circulate counterclockwise around the school building. Trucks will enter from Highland Street using the westernmost driveway in the north, circulate counter-clockwise to the rear of the building, and exit to Highland Street via the easternmost driveway in the north.

Given the location of passenger car pick-up/drop-off at the main school entrance at the west of the school building, it is expected that cars will enter the site from Highland Street through the same westernmost driveway in the north as the buses and circulate counter-clockwise around the parking lot back to the north driveway to exit to Highland Street. The Massachusetts Department of Transportation provides traffic data for roadways around the Commonwealth. According to the most recent data, Highland Street carries approximately 22,800 vehicles per day which is considered an average-volume traffic road and as such, conflicts are not expected for vehicles turning in and out of the school during peak hours.

A.3 Highland Proud, located at existing Doherty High School

The proposed site plan was designed to optimize traffic flow and safety. Given the location of the bus pick-up/drop-off at the main school entrance, buses will circulate counterclockwise through the site to the building. Buses will enter from Highland Street using the Bus Only driveway in the north, proceed south to turn left into the main drive aisle and exit to Highland Street via another Bus Only driveway in the north. Given the designated dumpster and loading dock locations, it is expected that the delivery/trash trucks will circulate counterclockwise around the school building. Trucks will enter from Highland Street using the westernmost driveway in the north, circulate counter-clockwise to the rear of the building, and exit to Highland Street via the easternmost driveway in the north.

The pick-up/drop-off location for the buses at the main entrance to the school allows buses to queue without impeding car circulation.

Given the location of passenger car pick-up/drop-off at the secondary school entrance at the west of the school building, it is expected that cars will enter the site from Highland Street through the westernmost driveway in the north and circulate counter-clockwise around the parking lot back to the north driveway to exit to Highland Street. The Massachusetts Department of Transportation provides traffic data for roadways around the Commonwealth. According to the most recent data, Highland Street carries approximately 22,800 vehicles per day which is considered an average-volume traffic road and as such, conflicts are not expected for vehicles turning in and out of the school during peak hours.

B.1 New construction on Foley Stadium Site

The proposed site plan was designed to optimize traffic flow and safety. Given the location of the bus pick-up/drop-off at the main school entrance, buses will circulate counterclockwise through the site to the Drop-off/pick-up area. Buses will enter from the south on Chandler Street using the driveway in the east, proceed north to turn left into the bus drive aisle and exit south to Chandler Street via the driveway in the west. Given the designated dumpster and loading dock locations, it is expected that the delivery/trash trucks will circulate counterclockwise around the school building. Trucks will enter from the south on Chandler Street using the driveway in the east, circulate counter-clockwise to the rear of the building, and exit south to Chandler Street via the driveway in the east.

The separation of bus and parental traffic at the pick-up/drop-off location at the main entrance to the school allows buses to queue without impeding car circulation.

Given the location of passenger car pick-up/drop-off at the main school entrance, it is expected that cars will enter the site from the south on Chandler Street using the driveway in the east and circulate counter-

clockwise around the school building and surface parking lot to exit south to Chandler Street via the driveway in the west. The Massachusetts Department of Transportation provides traffic data for roadways around the Commonwealth.

Nitsch Engineering used the Institute of Transportation Engineers (ITE) publication *Trip Generation*, 10th Edition to estimate the vehicle trip rates for the proposed high school, and to compare the rates with the existing Chandler Magnet School trip rates should that site be selected for the new high school. Trip generation rates for the high school were based on the Land Use Code (LUC) 530 (High School).

Table 3 - Site Generated Trips

Time	Proposed High School (LUC 530)
Weekday Daily	3130
Entering	1565
Exiting	1565
Weekday Morning Peak	848
Entering	577
Exiting	271
Weekday Evening Peak	509
Entering	163
Exiting	346

According to the most recent data, Chandler Street carries approximately 14,650 vehicles per day. This is considered a low to an average-volume traffic road. However, as illustrated in Table 3, should the Foley Stadium be the selected site for the proposed Doherty High School, the new school will generate approximately 3130 additional daily trips (1565 trips in and 1565 trips out), with 848 additional trips (577 trips in and 271 trips out) during the weekday morning drop-off time and 509 additional trips (163 trips in and 346 trips out) during the weekday afternoon pick-up time. These results indicate that the proposed Doherty High School at the existing Foley Stadium site would place significant additional vehicular congestion at Chandler Street (approximately 25% increase in daily traffic volumes).

C.2 New construction on Chandler Magnet School Site

The proposed site plan was designed to optimize traffic flow and safety. Given the location of the bus pick-up/drop-off at the main school entrance, buses will circulate clockwise through the site to the Drop-off/pick-up area. Busses will enter east using the southern driveway on May Street, proceed west to the bus drive aisle then turn left to exit Chandler Street. Given the designated dumpster and loading dock locations, it is expected that the delivery/trash trucks will circulate counterclockwise around the school building. Trucks will enter from the east using the northern driveway on May Street, circulate counter-clockwise to the rear of the building, and exit to Chandler Street in the south.

The separation of bus and parental traffic at the pick-up/drop-off location at the main entrance to the school allows buses to queue without impeding car circulation.

Given the location of passenger car pick-up/drop-off at the main school entrance, it is expected that cars will enter the site from the east using the northern driveway on May Street and circulate counter-clockwise around the school building to the south driveway to exit to Chandler Street.

Nitsch Engineering used the Institute of Transportation Engineers (ITE) publication *Trip Generation*, 10th Edition to estimate the vehicle trip rates for the proposed high school, and to compare the rates with the existing Chandler Magnet School trip rates should that site be selected for the new high school. Trip generation rates for the high school were based on the Land Use Code (LUC) 530 (High School). Trip generation rates for the elementary school were based on LUC 520 (Elementary School).

Table 4 - Site Generated Trips

Time	Proposed High School (LUC 530)	Existing Elementary School (LUC 520)	New Trips
Weekday Daily	3130	983	2147
Entering	1565	491	1074
Exiting	1565	492	1073
Weekday Morning Peak	848	317	531
Entering	577	171	406
Exiting	271	146	125
Weekday Evening Peak	509	166	343
Entering	163	75	88
Exiting	346	91	255

As illustrated in Table 4 the proposed Doherty High School at the existing Chandler Magnet School site would result in approximately 2147 additional daily trips (1074 trips in and 1073 trips out), with 531 additional trips (406 trips in and 125 trips out) during the weekday morning drop-off time and 343 additional trips (88 trips in and 255 trips out) during the weekday afternoon pick-up time. Reviewing these results with the traffic volumes from Chandler Street Improvement Project indicates that the proposed Doherty High School at the existing Chandler Magnet School site would place significant additional vehicular congestion at both Chandler Street at May Street intersections. Also, the High School has approximately 700 to 800 students that walk to the school. This, in turn, will add to the pedestrian congestion at the crosswalks at these intersections, and the midblock crossing on Chandler Street near the existing Chandler Magnet School.

Assessment

Nitsch Engineering has developed the following evaluation matrix based on the above observations.

Site	Option	Pros	Cons
Existing Doherty High School Site	A.1 Pods on Park - Remove Existing, Build New	<ul style="list-style-type: none"> • Opportunity to improve onsite flow. • Opportunity to improve the safety at the Drop-off area. • Partial separation of cars and buses. • Opportunity for Additional Parking. 	<ul style="list-style-type: none"> • On-street pick-up/drop-off may continue.
	A.2 Olmsted Homage - Remove Existing, Build New	<ul style="list-style-type: none"> • Opportunity to improve onsite flow. • Opportunity for Additional Parking. 	<ul style="list-style-type: none"> • On-street pick-up/drop-off may continue. • No separation of cars and buses. • Parental drop-off/pick-up in the middle of the parking lot; • Reduction of play areas.
	A.3 Highland Proud - Remove Existing, Build New	<ul style="list-style-type: none"> • Opportunity to improve onsite flow. • Opportunity to improve the safety at the Drop-off area. • Opportunity for Additional Parking. • Complete separation of cars and buses. • Improved internal circulation. 	<ul style="list-style-type: none"> • On-street pick-up/drop-off may continue. • Four curb-cuts. • Reduction of play areas.
Foley Stadium Site	B.1 Foley Site - Remove Existing Stadium, Build New High School	<ul style="list-style-type: none"> • Improved onsite flow. • Opportunity to improve the safety at the Drop-off area. • Opportunity for Additional Parking. • Complete separation of cars and buses. • Improved internal circulation. 	<ul style="list-style-type: none"> • Additional traffic; • Side streets may be used for drop-off and pick-up activities.
Chandler Magnet School Site	C.2 Chandler Site - Remove Existing School, Build New High School	<ul style="list-style-type: none"> • Improved onsite flow. • Opportunity to improve the safety at the Drop-off area. • Opportunity for Additional Parking. • Partial separation of cars and buses. • Improved internal circulation. 	<ul style="list-style-type: none"> • Additional traffic; • School traffic during drop-off and pick-up may overlap with Worcester State University traffic. • Side streets may be used for drop-off and pick-up activities.

Conclusions and Recommendations

As part of the Feasibility Study for the Doherty Memorial High School project located in Worcester, Massachusetts, has been retained by Lamoureux Pagano Architects (LPA) to observe the existing traffic circulation and queue lengths on adjacent streets during drop-off and pick-up periods at the existing Doherty Memorial High School, and assess the five (5) site improvement options presented by LBA. The five options include:

- A.1 Pods on Park, new construction at existing Doherty High School site;
- A.2 Olmstead Homage, new construction at existing Doherty High School site;
- A.3 Highland Proud, new construction at existing Doherty High School site;
- B.1 New construction on Foley Stadium Site; and
- C.2 New construction on Chandler Magnet School Site.

Existing Doherty High School Site

Based on our observation we believe that the three options of a new high school at the existing Doherty High School site will provide additional on-site parking and extended queue space to adequately address internal parental circulation. However, the student drop-off and pick-up activities may continue to occur on both sides of Highland Street as well. For the safety of the student crossing the street, a high-intensity Rectangular Rapid Flashing Beacon (RRFB) may need to be installed at the main crosswalk across Highland Street to make drivers more aware of the students and pedestrian at the crosswalk. Also, the additional student population at the proposed school may place additional vehicular congestion at the intersection of Highland Street at Park Avenue as well as the Highland Street at Pleasant Street, June Street, and Newton Avenue roundabout. The full traffic report for the new school, should the existing site be selected, will include analysis of these intersections and provide suitable mitigation measures.

The school should also consider reaching out to parents via social media to increase safety awareness.

Foley Site

The average daily trips along Highland Street may be reduced by as much as 3130 trips per day if the proposed high school is moved from its existing site to either the Chandler Magnet School site or the Foley Stadium site. However, this reduction will only apply to the morning peak hours, since the evening commuter and high school traffic peak hours do not coincide.

Should the proposed Doherty High School be moved to the existing Foley Stadium site, it would place additional vehicular congestion at Chandler Street (approximately 25% increase in daily traffic volumes), which in turn may have an impact at the intersection of Highland Street and Park Avenue as well as the intersections of Pleasant Street at Park Avenue, and Chandler Street at June Street. Also, some parents might opt to drop-off and pick-up their students at the neighborhood streets around the school to avoid traffic congestion. If the impacts are found to be significant, mitigation measures will be required. The mitigations may include:

- New traffic signals and/or retiming the existing ones;
- Roadway improvement measures;
- Regulation changes to the side streets;
- Speed limit reduction; and
- Traffic calming measure.

However, the magnitude of these impacts and the suitable mitigation measures cannot be independently estimated without fully analyzing the intersections as part of a full traffic study.

Chandler Site

Similar to the Foley Site, Should the proposed Doherty High School be moved to the existing Chandler site, it may place additional vehicular congestion at Chandler Street, and at both Chandler Street at May Street intersections, which, if significant, will require mitigation measures similar to the Foley Site. However, again the magnitude of these impacts and the suitable mitigation measures cannot be independently estimated without fully analyzing the intersections as part of a full traffic study. The study will include pedestrian and vehicular access, intersection analysis, site distance analysis, and review of traffic signal warrants to install new or upgrade existing traffic control signals.