MDM TRANSPORTATION CONSULTANTS, INC.
Planners & Engineers

PRINCIPALS
Robert J. Michaud, P.E.
Daniel J. Mills, P.E., PTOE

MEMORANDUM

DATE: November 26, 2025

TO: Ms. Farinacci
Director of Planning and Community Development
Town of Ashland
101 Main Street
Ashland, MA 01721

FROM: Robert J. Michaud, P.E. – Managing Principal
Daniel A. Dumais, P.E. – Senior Project Manager

RE: **Response to Comment – Vanasse & Associates, Inc**
Proposed YMCA Facility
30 Memorial Drive - Ashland, MA

MDM Transportation Consultants, Inc. (MDM) has prepared the following responses to transportation-related comments as issued in a letter by Vanasse & Associates, Inc. dated August 4, 2025. To facilitate review, specific comments are paraphrased with corresponding responses.

May 2025 TIA

Comment T1: "*Given the proximity of the Project site to the Ashland Middle School, a review of traffic volumes between 2:00 and 4:00 PM should be undertaken to verify that the weekday evening peak-hour has been captured in the 4:00 to 6:00 PM data collection period. The ATR data can be used to complete this review.*"

Response T1: Review of ATR data collected along Memorial Drive indicates that the traffic volumes between 2:00 and 4:00 PM are approximately 58% to 63% lower than the weekday evening peak hour. Likewise, a review of turning movement counts collected at the intersection of West Union Street and Memorial Drive as part of the 55 Union Street development indicate that total intersection volume between 2:00 and 4:00 PM are approximately 9% to 24% lower than the weekday evening peak hour.

Comment T2: "*A traffic study was prepared for the multifamily residential development at 61 Waverly Street in February 2025 and the associated peak-hour traffic volumes should be included in the future condition traffic volumes. In addition, traffic volumes associated with following specific development projects by others should also be included in the future condition traffic volumes:*

- *Arbella at Ashland Age-Restricted Residential Development, Memorial Drive (180-unit, age-restricted, multifamily residential development to be located off of Memorial Drive and generally south of the Cirrus Apartments);*
- *Ashland Dog Park, Memorial Drive (dog park to be situated on 1.47± acres of land located off of Memorial Drive west of the Trolley Bike Trail);*
- *55 West Union Street (116 multifamily residential units to be accessed from (2) full-access driveways that will intersect the south side of Memorial Drive approximately 300 feet and 650 feet west of Route 135, respectively).*

The traffic study for the 55 West Union Street was filed with the Town after the preparation of the May 2025 TIA; however, the relationship of this project and its associated driveways to those of the Project should be considered for both developments."

Response T2: Review of the 61 Waverly Street traffic study indicates that the trips generated by the proposed development are accounted for in the background growth rate applied to the Baseline traffic volume data under a future No-Build condition.

Based on discussions with the Town of Ashland Planning the Arbella at Ashland Age-restricted residential development at the time of the TIA was still in litigation. The Traffic Memorandum (TM) conducted for the Arbella at Ashland project dated March 11, 2021, the development is expected to generate approximately 36 vehicle trips during the weekday morning peak hour and 45 vehicle trips during the weekday evening peak hour. Trip tracings based on the TM are provided in the **Attachments**. Additionally, trip tracing for the proposed Dog Park based on ITE trip generation rates and distribution as prepared for the 55 West Union project are provided in the **Attachments**. The 55 West Union Street project was filed after the May TIA; for consideration of the project driveways and impact the trip tracings have been obtained from the TIA prepared for the project. A revised No-Build and Build analysis was conducted for the signalized study intersection of Memorial Drive at Route 135 including traffic from 61 Waverly Street 40B, Arbella at Ashland, and Ashland Dog Park. Given the timing of the 55 West Union Street project this project was added in and analyzed as a Build Sensitivity. The analysis has also been revised to include pedestrian activity at the signalized intersection with pedestrian actuations (see **Comment 4**) based on the pedestrian counts included in the turning movement count data and is summarized below in **Table R1**.

TABLE R1
INTERSECTION CAPACITY ANALYSIS RESULTS
WEST UNION STREET AT MEMORIAL DRIVE

		2032 No-Build (Revised)			2032 Build (Revised)			2032 Build (Sensitivity)		
Period	Approach	v/c[1]	Delay[2]	LOS[3]	v/c	Delay	LOS	v/c	Delay	LOS
Weekday Morning	Eastbound	0.74	20	B	0.75	21	C	0.76	22	C
Peak Hour	Westbound	0.65	23	C	0.62	22	C	0.62	22	C
	Northbound	0.10	15	B	0.10	14	B	0.10	15	B
	Southbound	0.60	40	D	0.71	43	D	0.74	44	D
	OVERALL	**0.74**	**23**	**C**	**0.75**	**25**	**C**	**0.76**	**26**	**C**
Weekday Evening	Eastbound	0.51	12	B	0.54	14	B	0.54	15	B
Peak Hour	Westbound	0.86	28	C	0.91	34	C	0.92	34	C
	Northbound	0.04	12	B	0.05	13	B	0.04	13	B
	Southbound	0.46	28	C	0.68	35	C	0.70	36	D
	OVERALL	**0.86**	**22**	**C**	**0.91**	**28**	**C**	**0.92**	**28**	**C**

[1]Volume-to-capacity ratio
[2]Average control delay per vehicle (in seconds)
[3]Level of service

As summarized in **Table R1**, with the inclusion of trips for the 61 Waverly Street, Arbella at Ashland, and dog park developments under a No-Build analysis the key "gateway" signalized study intersection of West Union Street at Memorial Drive will continue to operate at an overall LOS C or better during the peak hours. Under Build conditions, the proposed YMCA development is expected to result in no material change in operations, delays, and queue lengths at the study area intersections relative to No-Build conditions. Specifically, the study intersections will continue to operate below capacity at LOS C or better and the average and 95th percentile vehicle queues at the signalized study intersections will generally be contained within available storage lanes during the peak hours with the proposed YMCA Facility in place. Likewise, under a Build Sensitivity analysis with the 55 West Union 40B project in place the West Union Street at Memorial Drive signalized intersection will continue to operate at an overall LOS C or better during the peak hours. Therefore, no signal timing or phasing changes are required to accommodate the area projects.

Comment T3: "*The Build condition traffic volumes should be updated to include the traffic volumes associated with the identified specific development project by others.*"

Response T3: Revised No-Build, Build, and Build Sensitivity traffic volume networks are provided in the **Attachments**.

Comment T4: "*The traffic operations analysis should be revised to reflect the updated No-Build and Build condition traffic volumes. In addition, the traffic operations analysis for the Route 135/ Memorial Drive intersection should include pedestrian actuations during the peak hours.*"

Response T4: See **Response 2** which includes the pedestrian actuations.

Comment T5: "*In order to validate the sight distance study, the following information should be reviewed and the sight distance study revised as necessary, including the sight distance study that was provided for the proposed crossing of Memorial Drive:*

1. *The object for the stopping sight distance study should be located within Memorial Drive and aligned opposite the center of the driveway or positioned opposite the nearside curbline extension that is closest to the approaching driver;*

2. *The intersection sight distance profile should be taken from a point along the driveways 14.5 feet from the edge of the traveled-way along Memorial Drive. This will require that separate sight line profiles be provided for each driveway;*

3. *The sight triangles should be added to the intersection sight distance plans for both driveways;*

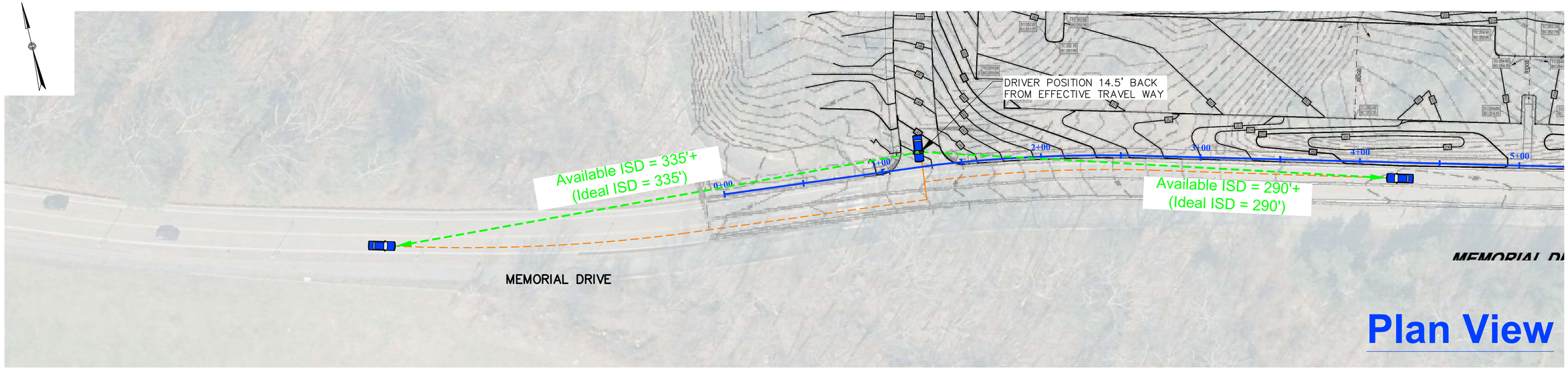
4. *The approach grades along Memorial Drive should be shown on the roadway profiles;*

5. *If the approach grade exceeds 3%, the required minimum stopping sight distance should be adjusted and the supporting calculations provided; and*

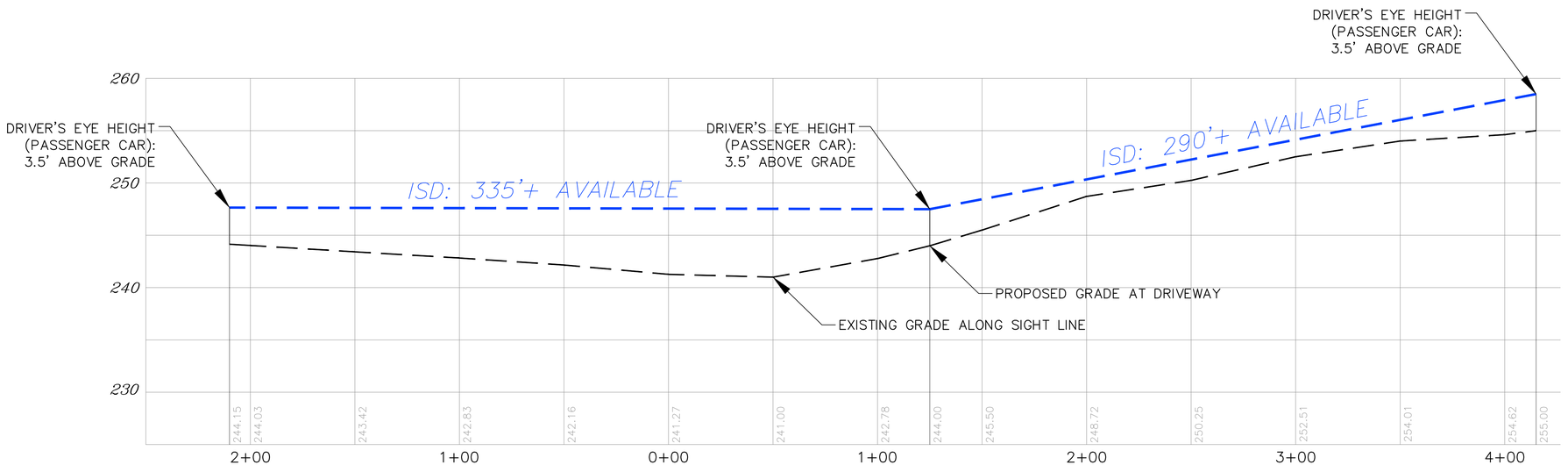
6. *The south (east) Project site driveway is located approximately 340 feet west of Route 135 which would allow a vehicle approaching the driveway from the south (east) to achieve a speed that would approximate the posted speed limit of 30 mph vs. 15 mph which was the assumed approach speed that was used in the study."*

Response T5: Per discussion with the Town of Ashland, the proposed pedestrian crossing of Memorial Drive in the central portion of the Site has been removed. At the Town's request a sidewalk will be provided along the site frontage along Memorial Drive.

Updated sight line plans and profile (see **Exhibit 1** and **Exhibit 2**) were prepared for the proposed site driveways along Memorial Drive. The drivers eye and object (approaching vehicle) have been labeled as 3.5 feet, the drivers eye has been taken from 14.5 feet from the edge of the effective travel way, the grades along Memorial Drive has been considered, the proposed grading has been considered, and the sight line triangles have been provided for the ideal sight lines for the posted speed limit of 30 mph. As shown, the available sight lines looking from the proposed Site driveways onto Memorial Drive from a driver position 14.5 feet back from the effective travel way will exceed the ideal sight line requirements from AASHTO for the posted travel speed (30 mph). The sight line triangles will be provided on the final site plan set by Bohler with a note that "any new plantings (shrubs, bushes) or physical landscape features be located within driveway sight lines should also be maintained at a height of 2 feet or less above the adjacent existing roadway grade to ensure unobstructed lines of sight. Furthermore, snow windrows located within sight triangle areas that exceed 3.5-feet in height or that would otherwise inhibit sight lines shall be promptly removed".



Plan View



Profile View

Site Plan Source: Allen & Major Associates, Inc.

MDM TRANSPORTATION CONSULTANTS, INC.
Planners & Engineers
28 Lord Road, Suite 280
Marlborough, MA 01752

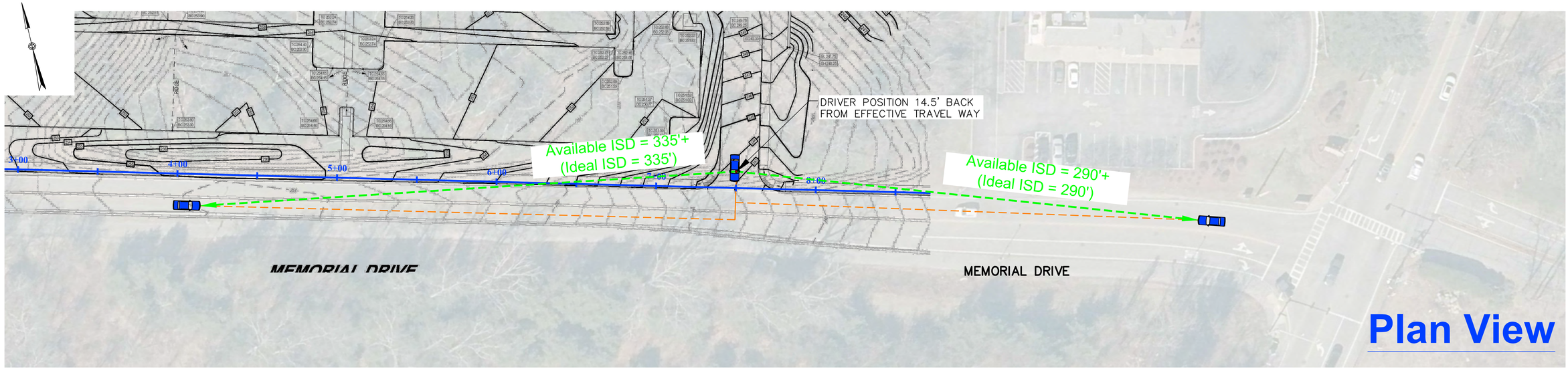
Scale: As Noted
DWG No. 1377 Sight Distance (11/13/2025).dwg

Date: November 2025
Project No. 1377

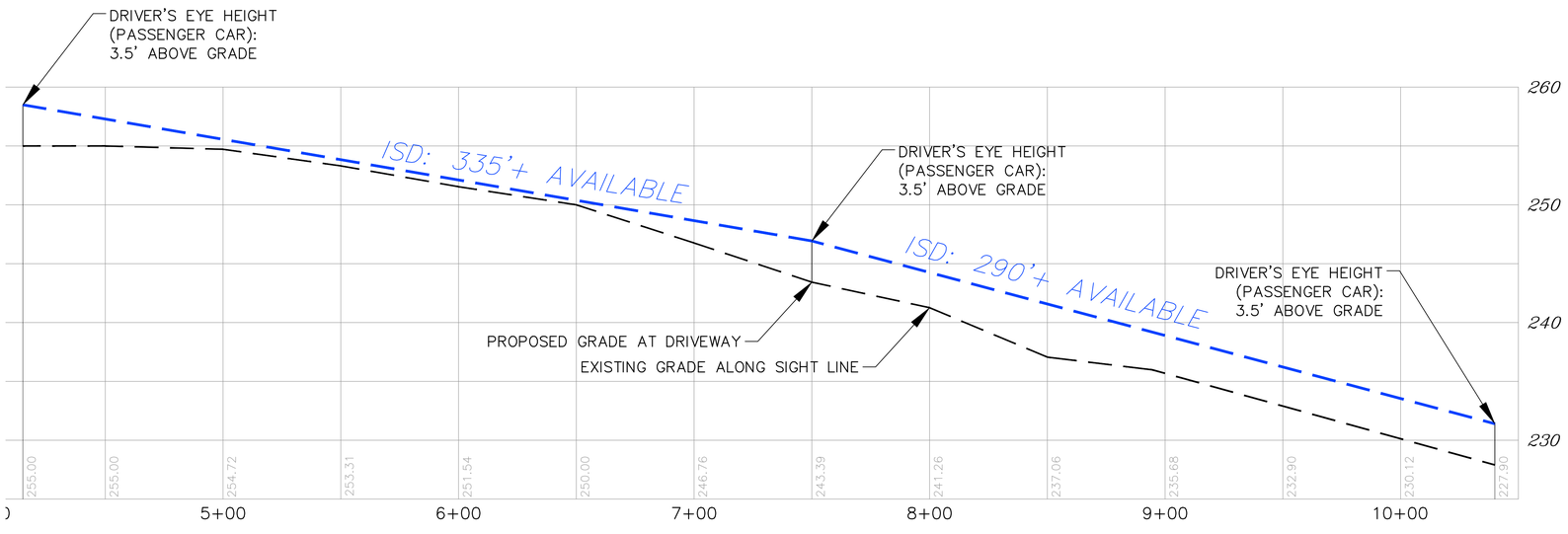
Proposed Development
Ashland, Massachusetts

SCALE
0 15 30 60 90 FEET
0 3 6 12 18

Exhibit 1 - Ideal Intersection Sight Distance Analysis (North Driveway)



Plan View



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DWG No. 1377 Sight Distance (11/13/2025).dwg

Date: November 2025
Project No. 1377

Proposed Development
Ashland, Massachusetts

SCALE
0 15 30 60 90 FEET
0 3 6 12 18

Exhibit 2 - Ideal Intersection Sight Distance Analysis (South Driveway)

For the stopping sight distances (SSD) shown in Table 3 of the TIA, the stopping sight distances were adjusted for grades that exceed a 3% average along the sight line; however, the correct calculation sheets were inadvertently provided. The revised SSD calculation sheets to match the TIA Table are provided in the **Attachments**.

Comment T6: "*A student drop-off/pick-up management plan should be provided as a part of the Planning Board review of the Early Learning Center component of the Project. The plan may take the form of a narrative describing: i) the hours of operation; ii) student arrival and departure times; iii) number of staff that will be on-site during the arrival/departure times; iv) number of students accommodated and if drop-off/pick-up times will be staggered; and v) circulation patterns during drop-off/pick-up or if parking spaces will be utilized.*"

Response T6: Typical operations for pick-up/drop-off activity for the ELC use would generally result in approximately 10 concurrent parent pick-up/drop-off activity. It is anticipated that the ELC staff will actively manage the spaces adjacent to the sidewalk for this activity but that the parents generally walk the children to the ELC which typically takes less than 5 minutes per student per observations at other daycare facilities. The staff are anticipated to park in the main ELC parking area. Based on empirical data the staff demand is estimated at approximately 15 vehicles at full occupancy. This data is highly consistent with the estimated peak demand of 27± parked vehicles for the Daycare use. The ELC will prepare a parent/student handbook prior to occupancy and said plan will be revised as needed to accommodate the use in an efficient manner.

Comment T7: "*We agree with the recommendations that have been provided as a part of the May 2025 TIA and would suggest that the following additional measures be considered as a part of the Project:*"

- *Route 135/Memorial Drive – Pending the outcome of the revised analysis that has been requested as a part of this review, design and implement an optimal timing and phasing plan for the intersection within 6-months of the issuance of a Certificate of Occupancy for the Membership Building or the Early Learning Center, whichever is issued first.*
- *Transportation Demand Management – A Transportation Coordinator, who may have other responsibilities and duties as a part of the Project, should be assigned to manage the TDM program. The elements of the TDM program should be expanded to include the following measures:*
  - *A "welcome packet" should be provided to new employees that includes the contact information for the TC and detailing available public transportation services, bicycle and walking alternatives, and other commuter options;*
  - *Providing information in a central location within both the Membership Building and in the Early Learning Center and on the website for the Project that includes information regarding the MWRTA bus service; and*
  - *Coordinating with the MWRTA to locate a bus stop within the Project site.*
- *Parking Monitoring – Parking occupancy should be monitored as the Project is constructed with*

the following frequency: 1) within 6-months of the issuance of a Certificate of Occupancy for the Membership Building; 2) within 6-months of the issuance of a Certificate of Occupancy for the Early Learning Center; and 3) 12-months after Project completion. The monitoring program should identify the number of parking spaces constructed at the time that the monitoring occurs and the number of parking spaces occupied during the observation period. The observations should occur on an average weekday and on a Saturday under normal operating conditions for the components of the Project. The monitoring should occur between 7:00 AM and 7:00 PM on a weekday and on a Saturday, and should be performed in May/June or September/October to reflect months of the year when the playing fields would also be in use. To the extent that the observed parking occupancy exceeds 90% of the available parking spaces, specific measures to reduce or manage parking should be identified.

- *Special Events – A traffic and parking management plan should be developed for special events to the extent that the Project will host events where the traffic volumes and parking demands would exceed the trip estimates that are presented in the May 2025 TIA. Such a plan is not intended to result in modifications to the Site Plan or other features of the Project, but to establish protocols on scheduling to avoid impacts during school hours and peak travel periods, consideration of the use of buses and carpooling, and other such measures as may be deemed appropriate for the specific event.*

Response T7: The outcome of the revised analysis (see **Response T2**) indicates that no adjustment to the traffic signal phasing or timing is required to accommodate the project. The Proponent agrees to the TDM actions, Parking Monitoring, and Special Events plan as described above.

Site Plan

Comment S1: "*The fire truck turning analysis should include an evaluation of vehicle turning movements entering and exiting from both directions for both driveways.*"

Response S1: The AutoTurn analysis has been expanded by Bohler Engineering (see **Attachments**) to include an evaluation of vehicle turning movements entering and exiting from both direction for both driveways. The analysis indicates that the site has been designed to accommodate the fire apparatus in the event of an emergency situation. The Proponent will continue to work with the fire department with respect to their needs.

Comment S2: "*Additional detail of the fire truck maneuvering in the area to the rear of the Membership Building should be provided to demonstrate the number of backing maneuvers that are required. To simplify review, separate drawings for entering and exiting should be prepared.*"

Response S2: The AutoTurn analysis has been expanded by Bohler Engineering (see **Attachments**) to include an evaluation of vehicle turning movements for the rear of the membership building. The analysis indicates that the site has been designed to accommodate the fire apparatus in the event of an emergency situation. The Proponent will continue to work with the fire department with respect to their needs.

Comment S3: "*The exiting maneuver for the fire truck from the north (west) Project site driveway indicates that the aerial portion of the vehicle will swing beyond the curbline. Verify that no objects are located in the swing area that would exceed 7-feet in height.*"

Response S3: All objects that would exceed 7-feet in height will be set as to not preclude emergency response vehicles. While no conflicts are anticipated based on the fire truck movements, any minor adjustments if required will be shown on the final site plan set by Bohler Engineering.

Comment S4: "*Double-yellow centerline pavement markings should be provided along both driveways between the STOP-line at Memorial Drive and the first intersection within the Project site.*"

Response S4: Double yellow centerline pavement markings between the STOP line at Memorial Drive and first intersection within the Project Site will be added to the final site plan set by Bohler Engineering.

Comment S5: "*The sight triangle areas for the Project site driveway intersections with Memorial Drive should be shown on the Site Plan and should include the following note: "Signs, landscaping and other features located within sight triangle areas shall be designed, installed, and maintained so as not to exceed 2.0-feet in height. Snow accumulation (windrows) located within sight triangle areas that exceed 3.5-feet in height or that would otherwise inhibit sight lines shall be promptly removed.*"

Response S5: The sight line triangles and note will be added to the final site plan set by Bohler Engineering as noted under **Response T5**.

Comment S6: "*Consideration should be given to striping the snow storage area for parking or otherwise delineating this area so as to define the drive aisle.*"

Response S6: The snow storage area will be marked for parking on the final site plan set by Bohler Engineering.

<u>Parking</u>

Comment P1: "*Section 5.1.2, Schedule of Parking Area Requirements, of the Ashland Zoning Bylaw provides parking requirements for "Day care and nursery schools", which specifies that 1.0 parking spaces per employee and 1.0 parking spaces per 5 children be provided. These requirements should be compared to the observed parking demand from the Goddard School that were used in the parking demand calculations.*"

Response P1: Although the ELC is inherently included in other area YMCA facilities including the empirical parking data collected at the Framingham MetroWest YMCA location (and hence the parking rate), as a conservative measure the ELC facility in this case is assumed to independently generate additional parking activity as a "standalone" childcare center. The empirical parking demand rate and time of day distribution reviewed for the Goddard School in Lexington, MA with 150± students and 25± staff at the time of counts on May 4, 2023. The peak parking rate for a standalone daycare was based on parking demand per student applied to 100 students at the ELC. MDM notes that per ITE Parking data, standalone Daycare facilities with 100 students have been shown to generate between 25 and 34 parked vehicles with a 95th confidence interval demand of 28 spaces, which is highly consistent with the empirical data provided by MDM. Based on the zoning requirements, the ELC with 15 staff and 100 students would require approximately 35 spaces as standalone use.

Comment P2: "*The source of the parking distribution by time of day for the day care should be provided as the distribution is different than the data published by the ITE for a day care center. If the data was developed from the observations conducted at the Goddard School, the hours of operation and program at the Goddard School should be provided and compared to the program that will be offered at the Early Learning Center.*"

Response P2: The empirical parking data for the Goddard School is provided in the **Attachments**. The data indicates a peak during the morning drop-off period and afternoon pick-up period, with parking turnover over a short period (5 minutes). The peak parking demand was observed at 36 vehicles parked when broken down in 5-minute intervals. To remain conservative the peak demand of 40 vehicles parked or within the Site from the 1-minute raw data file was used for analysis purposes.

The hours of operation for the Goddard School in Lexington, MA are 7:30 am to 6:00 pm, Monday through Friday. The empirical parking demand rate and time of day distribution reviewed for the Goddard School in Lexington, MA with 150± students and 25± staff at the time of counts on May 4, 2023. The ELC in the proposed facility is anticipated to operate between 7:30 am and 6:00 pm, Monday through Friday, which is consistent with the MetroWest facility in Framingham. Both facilities offer typical traditional daycare services.

Comment P3: "*Details of the amenities offered and sizes of the YMCA facilities that were used to develop the parking demand data for the Membership Building should be provided along with the dates that the observations were performed. In addition, the source of the parking distribution by time of day should also be provided.*"

Response P3: Data was collected at 3 YMCA Facilities in Massachusetts as follows:

1. MetroWest YMCA – Framingham (40,000± sf at time of counts; now 60,000± sf): Amenities include but are not limited to an Aerobic Center, Climbing Walls, Child Watch, Fitness Center, Multi-Purpose Room, Gym, Outdoor Field, Pool, Early Childhood Center, Sauna, Weight Room, Teen Center, Youth Gym, basketball courts, turf space. The existing facility provides approximately 284 marked spaces.
2. Boroughs YMCA – Westborough (69,000± sf): Amenities include but are not limited to an Aerobic Center, Climbing Walls, Child Watch, Fitness Center, Multi-Purpose Room, Gym, Outdoor Field, Pool, Sauna, Weight Room, Seasonal Outdoor Pool, Seasonal Recreational Fields, basketball courts, indoor track, sauna and stream room, group cycling room. The existing facility provides approximately 340 marked spaces.
3. North Suburban YMCA – Woburn (46,000± sf): Amenities include but are not limited to a Wellness Gymnasium, Swimming Pool, Youth Swim and Sports, Steam Rooms, Physical Therapy. The existing facility provides approximately 153 marked spaces.

The parking data was collected at the three (3) YMCA facilities on a weekday and Saturday in January 2007 (week of 6th through 13th). The data was used to create a peak parking demand and time of day distribution. The data is provided in the **Attachments**.

Comment P4: "*The source of the parking demand data and parking distribution by time of day for the playing fields should be provided.*"

Response P4: The recreational fields are anticipated to be used for YMCA programming and not open to outside sports groups; therefore, the use will be ancillary to the YMCA building. That said, for planning purposes the parking was reviewed for the use as a standalone facility within the YMCA campus. The parking demand data for the playing fields was based on empirical parking data collected in Winchester, MA (see **Attachments**). The data is highly consistent with ITE Parking data for a soccer complex (LUC 488) for non-tournament play. Time-of day data for the weekday is not provided in ITE Parking for LUC 488; therefore, time of day distribution was used for Public Park (LUC 411) with adjustments to no use of the recreational fields until after school dismissal. ITE's Saturday time of day factors were used based on the 6th Edition.

Comment P5: "*Explanation for the 85% adjustment factor that was applied to the parking demand calculations should be provided. The observed data should be representative of typical conditions and an adjustment factor should not be applied to the base parking demand unless there are specific trip reduction or parking demand measures that will be implemented as a part of the Project that would justify a reduction in the base demand.*"

Response P5: The ELC, recreational fields, and other uses are ancillary and inherently included in other area YMCA facilities with many if not all of the patrons and employees in common. For planning purposes, the peak parking was estimated for the master plan buildout to include a 65,700 sf YMCA, a 100-student daycare, and two recreational fields first as

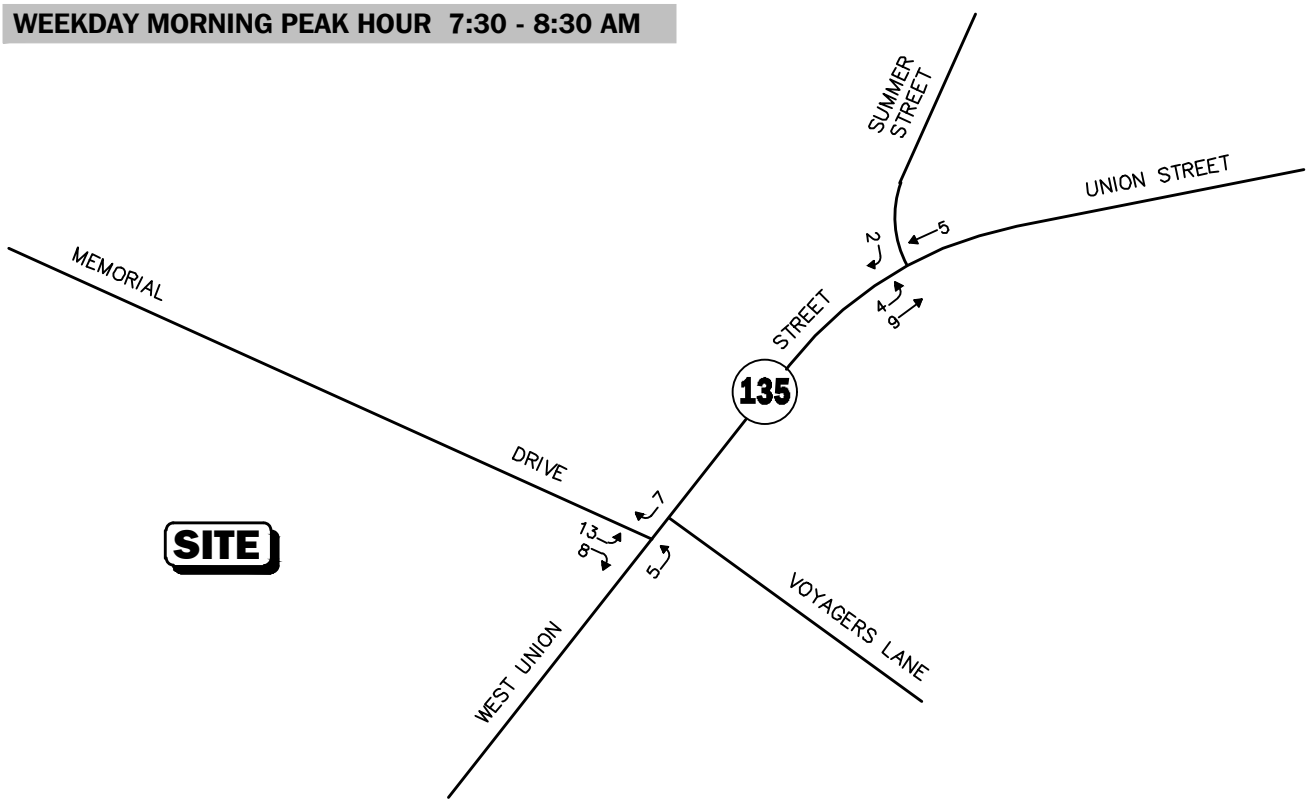
"standalone" uses and then with an adjustment factor of 0.85 to account for a 15% internal parking capture between the uses. Given the need to park for one of the uses, 15% is half the internal capture rate between retail-to-retail uses, which are the closest land use available. Not surprising, an alternative estimate of the peak parking demand just utilizing the empirical parking estimates for the YMCA at 65,700 sf with no reduction indicates peak parking demands that are equivalent to the share parking analysis. With that in mind, the project has been designed to have adequate parking to account for typical average parking demands. The project currently provides 288 parking spaces (262 spaces and an additional 26 non-snow period spaces) which has been shown to be adequate for average on-site parking demands for employees and patrons based on empirical rates; however, field use and programming may need to be actively managed to avoid overlap of peak parking demands on weekends so that effective on-site parking supply during non-winter periods (approximately 288 spaces) is not exceeded. Parking supply during non-winter periods of up to 288 spaces would utilize the proposed snow storage zone, which may effectively provide additional parking capacity for approximately 26 vehicles. The YMCA is committed to providing a parking management plan and monitoring (see **Response T7**) of the parking supply as the programming is constructed and comes online so that the parking activity is adequately accommodated on-site.

ATTACHMENTS

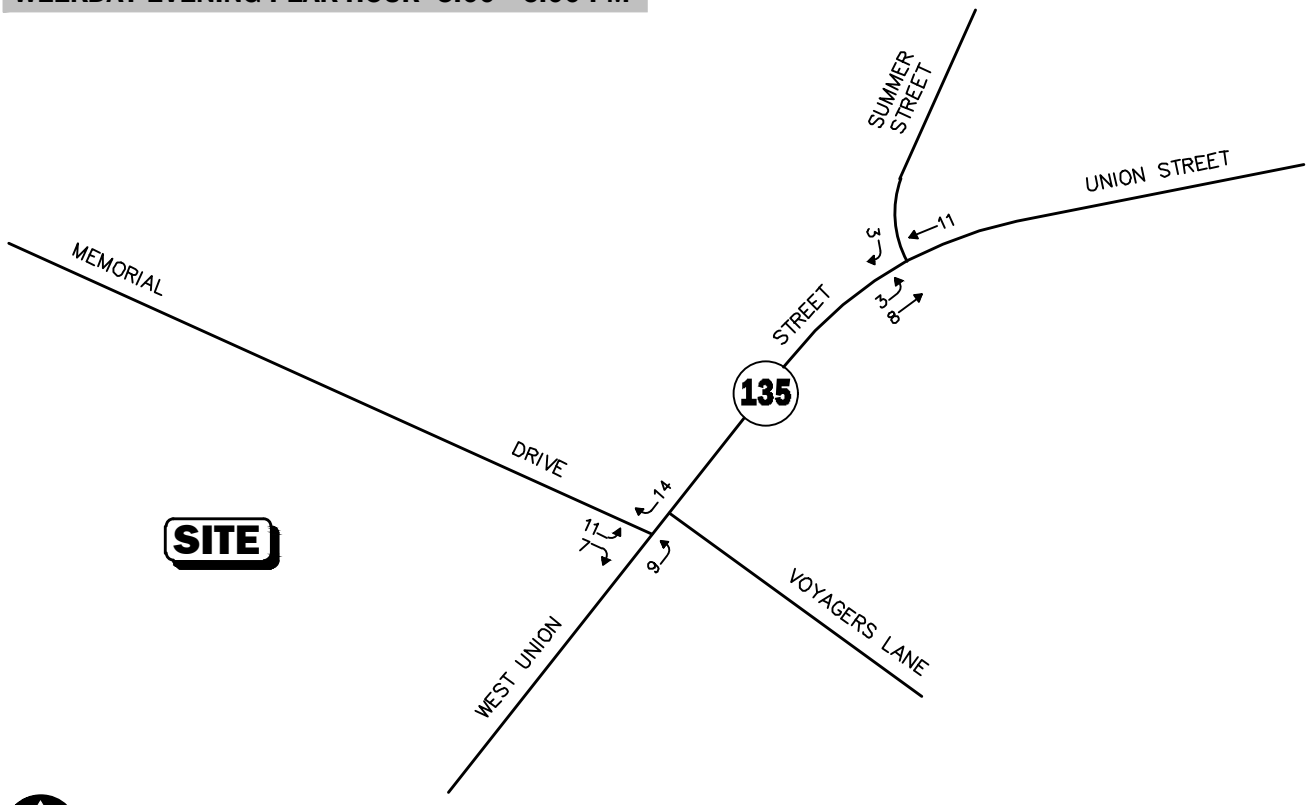
- Background Projects
- Traffic Volume Networks
- Sight Distance Calculations
- AutoTURN® Analysis
- Parking Analysis
- Capacity Analysis

- Background Projects

WEEKDAY MORNING PEAK HOUR 7:30 - 8:30 AM



WEEKDAY EVENING PEAK HOUR 5:00 - 6:00 PM



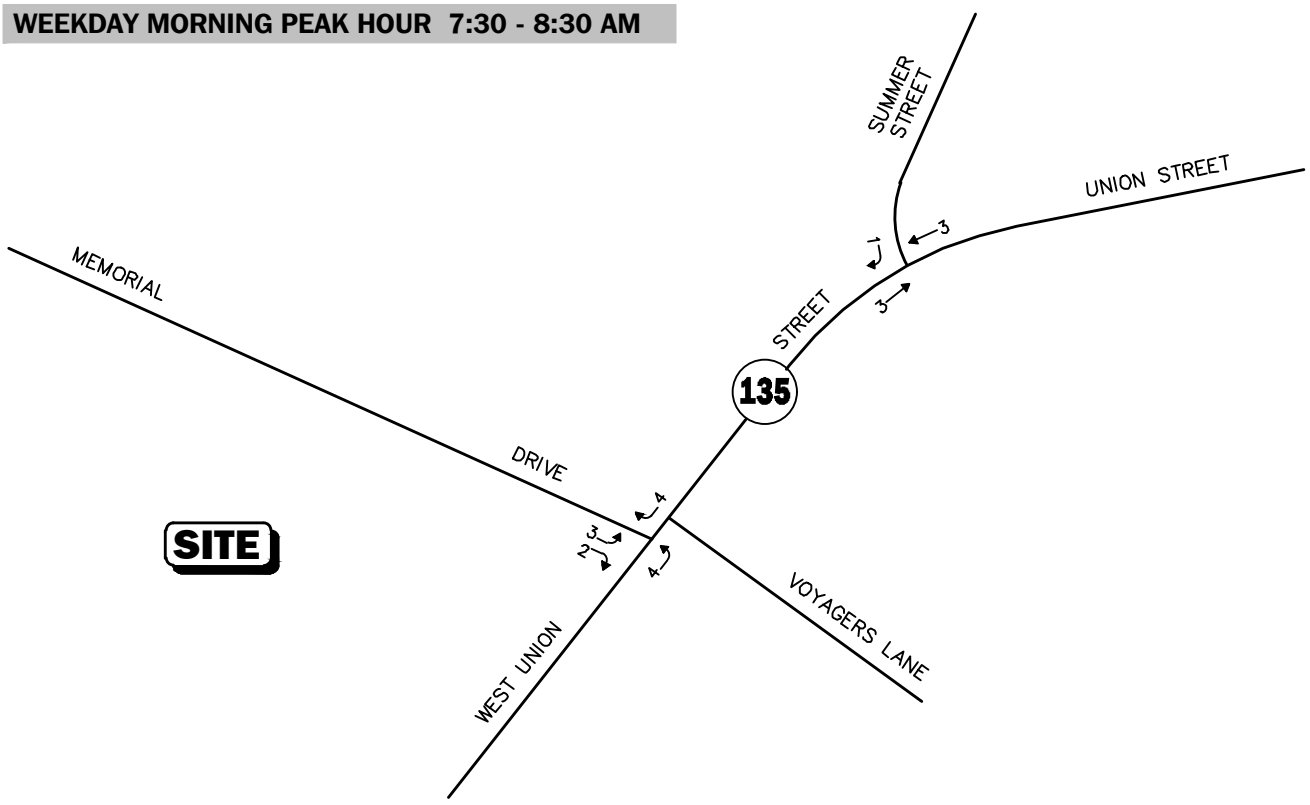
Not To Scale

Figure A-5

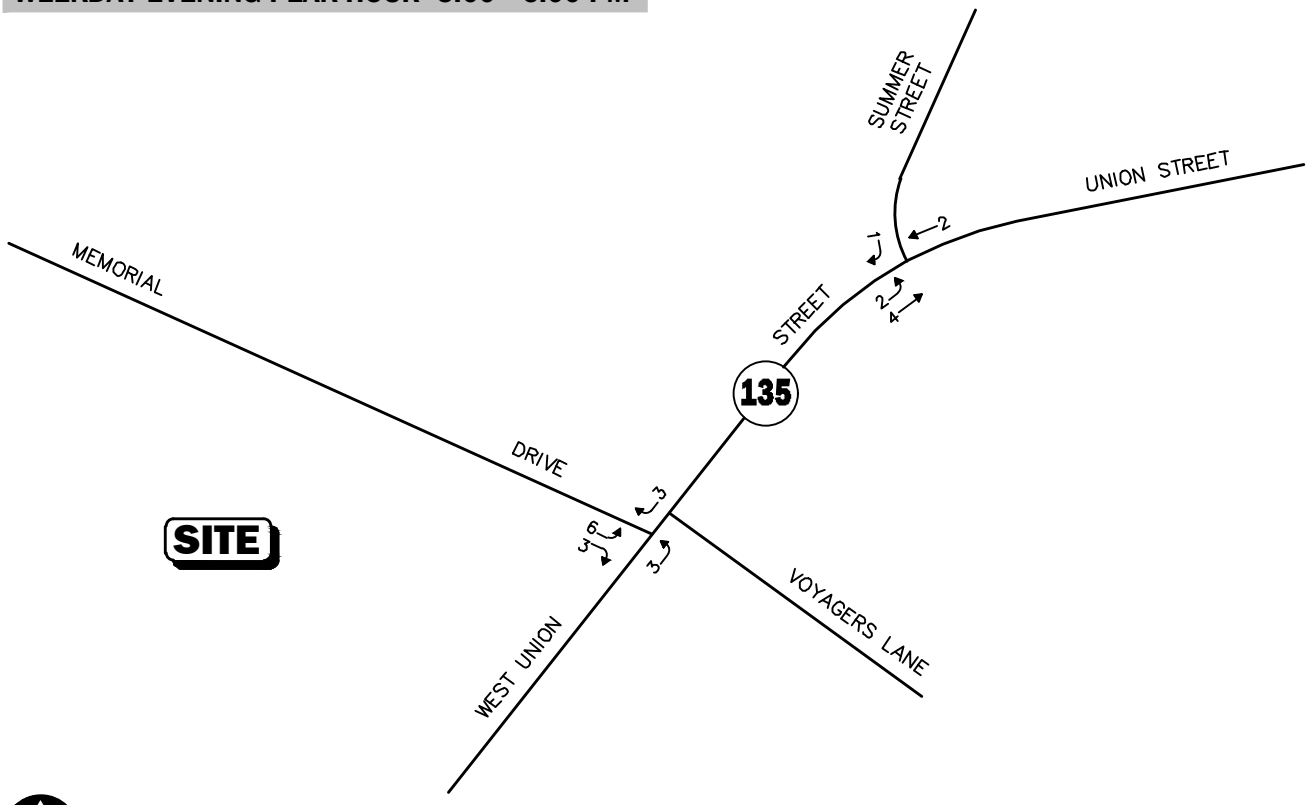
Proposed Residential Development
Arbella
Peak-Hour Traffic Volumes

Vanasse & Associates inc

WEEKDAY MORNING PEAK HOUR 7:30 - 8:30 AM



WEEKDAY EVENING PEAK HOUR 5:00 - 6:00 PM



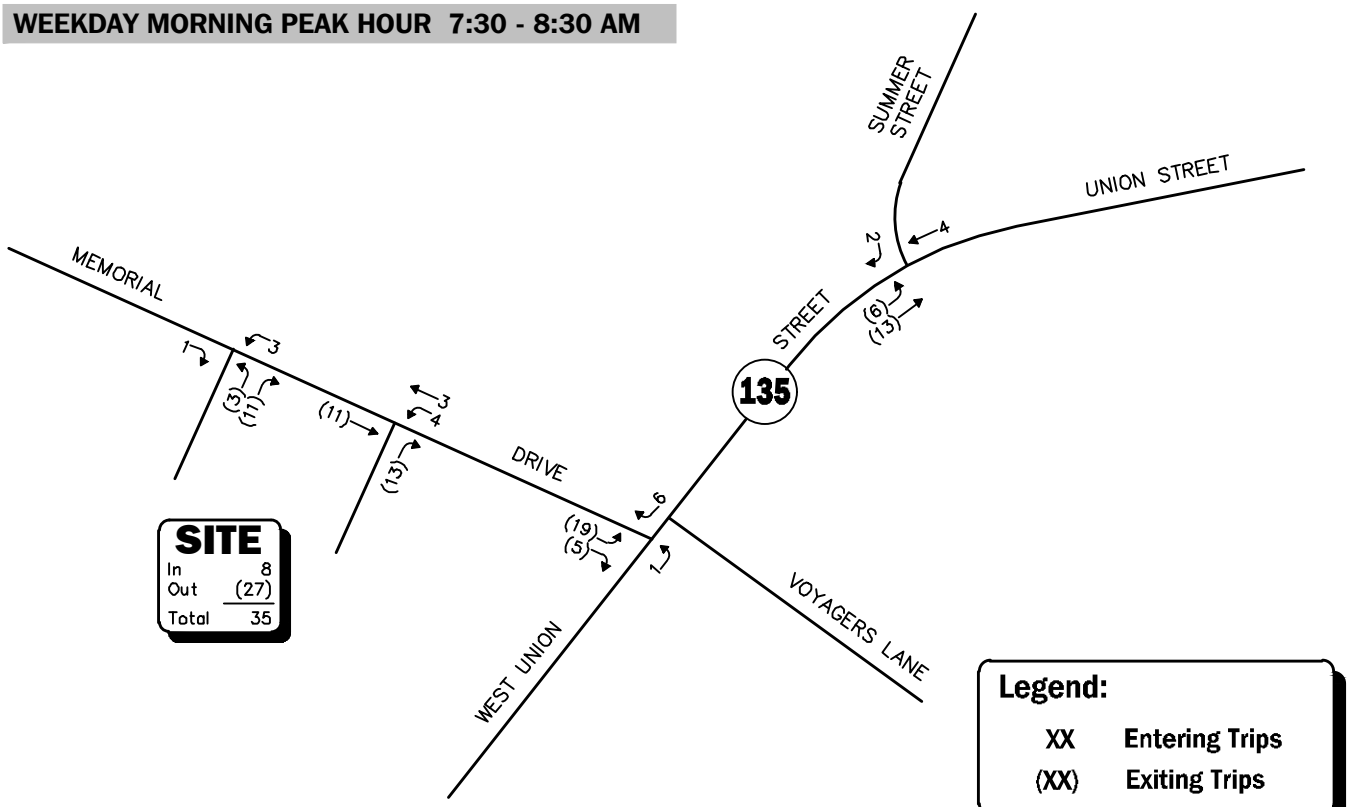
Not To Scale

Figure A-6

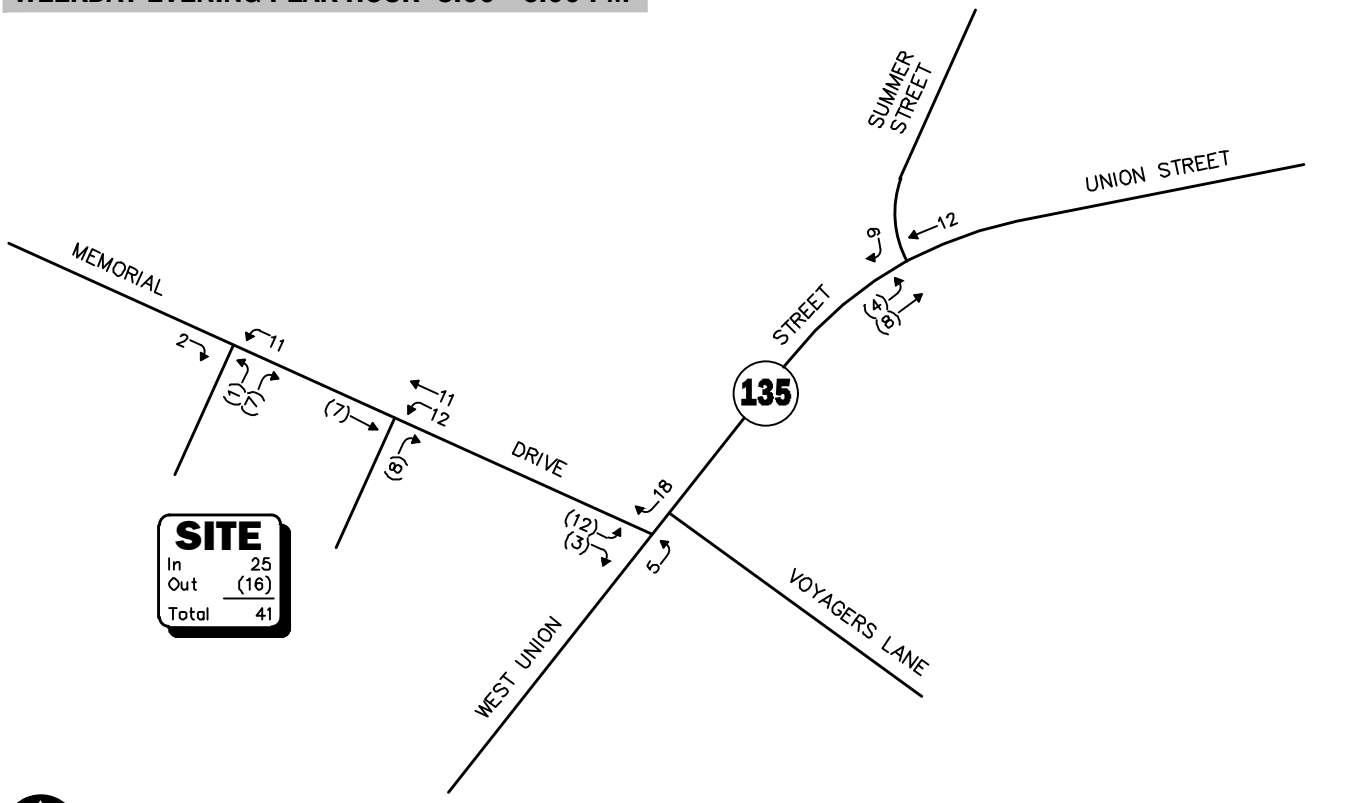
Proposed Ashland Dog Park
Memorial Drive
Peak-Hour Traffic Volumes

Vanasse & Associates inc

WEEKDAY MORNING PEAK HOUR 7:30 - 8:30 AM



WEEKDAY EVENING PEAK HOUR 5:00 - 6:00 PM



Not To Scale

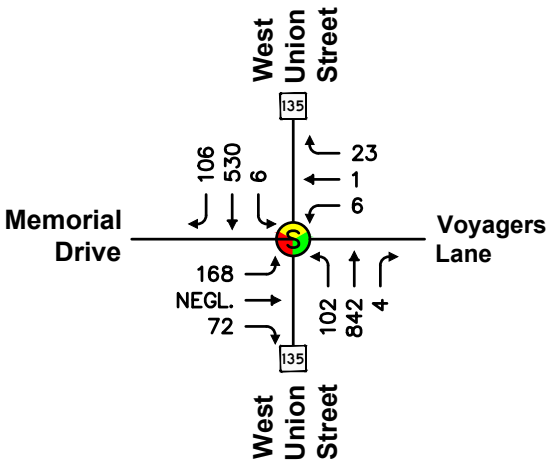
Figure 6

Project-Generated Peak-Hour Traffic Volumes
55 West Union

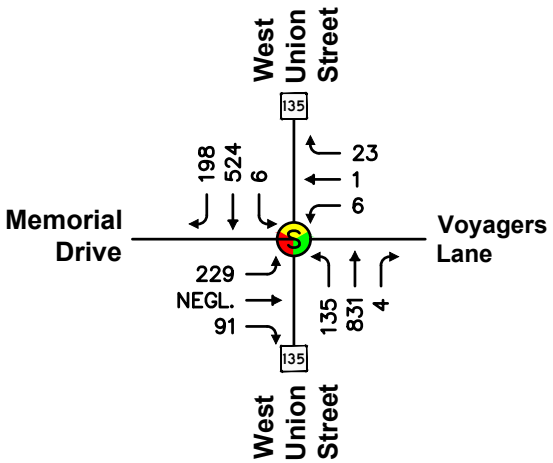
Vanasse & Associates inc

□ Traffic Volume Networks

2032 No-Build

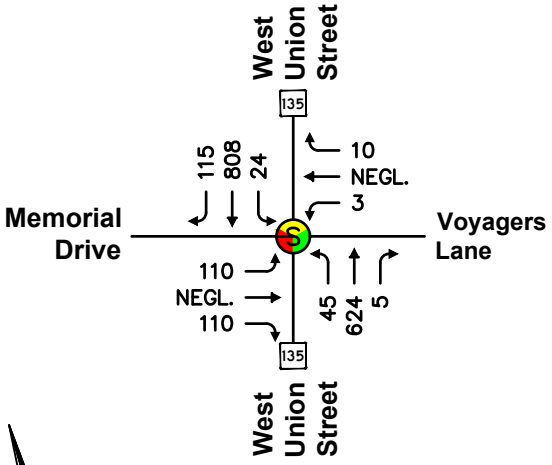


2032 Build

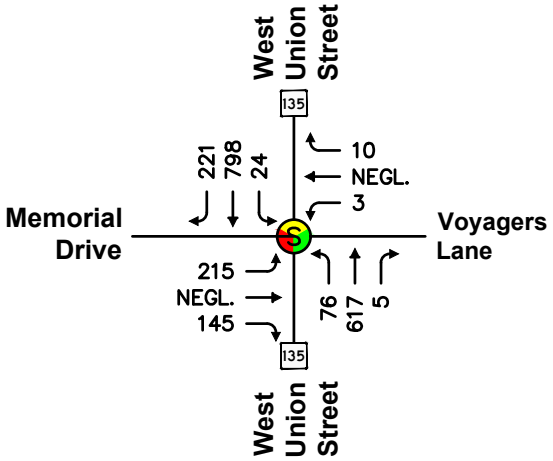


Weekday Morning Peak Hour

2032 No-Build



2032 Build



North

Scale: Not to Scale

NOTES:
NEGL. = Negligible
S = Signalized Intersection

Weekday Evening Peak Hour

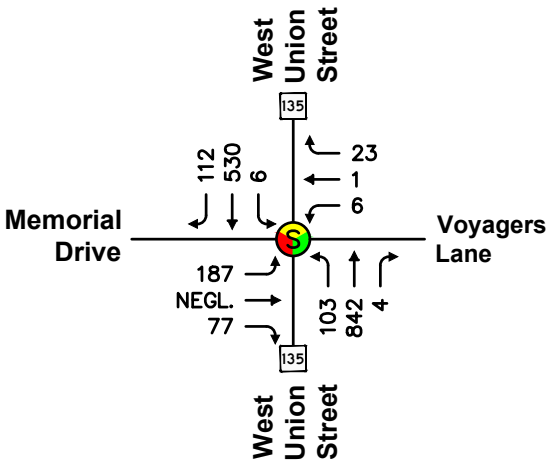
Attachment

MDM TRANSPORTATION CONSULTANTS, INC.
Planners & Engineers

2032 No-Build & Build Conditions
Revised
Weekday Peak Hour Volumes

Date: November 2025
Dwg No. 1377 TIA.dwg

2032 No-Build



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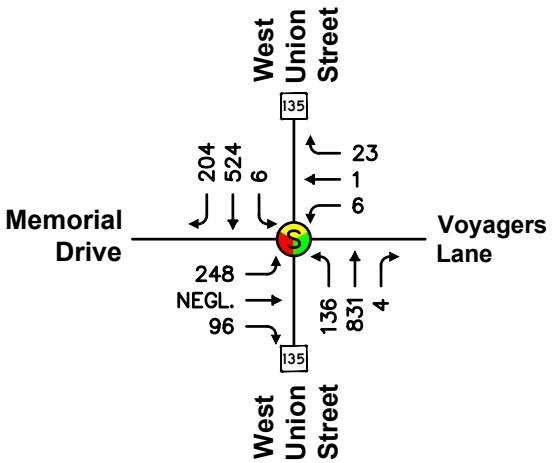
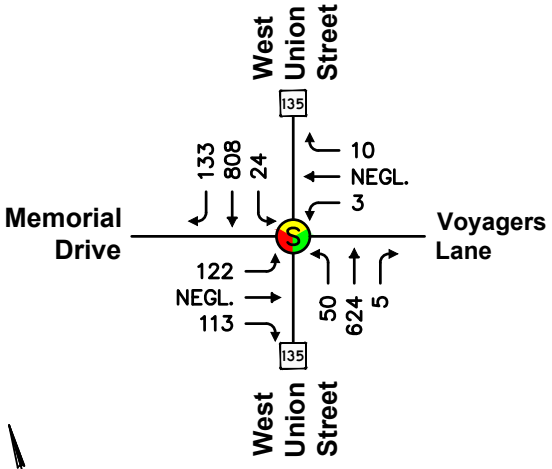
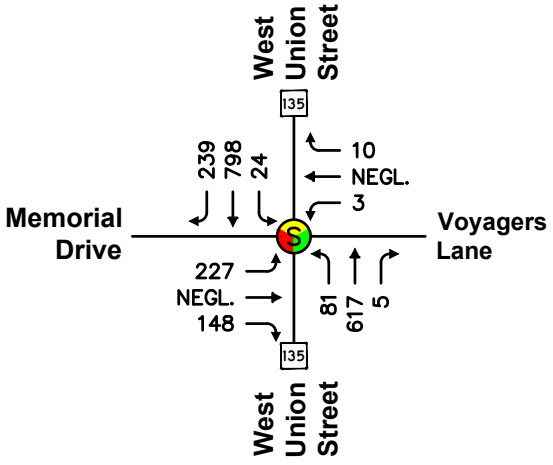


Weekday Morning Peak Hour

2032 No-Build



2032 Build



North
Scale: Not to Scale

NOTES:
NEGL. = Negligible
S = Signalized Intersection

Weekday Evening Peak Hour

Attachment

MDM TRANSPORTATION CONSULTANTS, INC.
Planners & Engineers

2032 No-Build & Build Conditions (Sensitivity With 55 Union) Weekday Peak Hour Volumes

Date: November 2025
Dwg No. 1377 TIA.dwg

□ Sight Distance Calculations

Stopping Sight Distance - Posted

Site Driveway North

		SPEED (MPH)	BRAKE REACTION DISTANCE (FT)	BRAKING DISTANCE (FT)	CALCULATED STOPPING SIGHT DISTANCE (FT)
Direction 1	SB	30	110.25	86.3	196.5
Direction 2	NB	30	110.25	97.5	207.7

INPUTS	Direction 1	Direction 2
Travel Direction	SB	NB
Speed	30	30
Grade	0	-0.04
t	2.5	2.5
a	11.2	11.2

Stopping Sight Distance (SSD) - Source: AASHTO

SSD = Reaction Distance + Brake Distance

Reaction Distance = 1.47 x t x V

Brake Distance = V^2 / (30 x ((a/32.2)+G))

Where:
t = reaction time (sec)
V = travel speed (mph)
G= roadway grade
a - deceleration rate (ft/sec^2)

Stopping Sight Distance - 85th Percentile

Site Driveway North

		SPEED (MPH)	BRAKE REACTION DISTANCE (FT)	BRAKING DISTANCE (FT)	CALCULATED STOPPING SIGHT DISTANCE (FT)
Direction 1	SB	38	139.65	138.4	278.0
Direction 2	NB	37	135.975	148.2	284.2

INPUTS	Direction 1	Direction 2
Travel Direction	SB	NB
Speed	38	37
Grade	0	-0.04
t	2.5	2.5
a	11.2	11.2

Stopping Sight Distance (SSD) - Source: AASHTO

SSD = Reaction Distance + Brake Distance

Reaction Distance = 1.47 x t x V

Brake Distance = V^2 / (30 x ((a/32.2)+G))

Where:
t = reaction time (sec)
V = travel speed (mph)
G= roadway grade
a - deceleration rate (ft/sec^2)

Stopping Sight Distance - Posted

Site Driveway South

		SPEED (MPH)	BRAKE REACTION DISTANCE (FT)	BRAKING DISTANCE (FT)	CALCULATED STOPPING SIGHT DISTANCE (FT)
Direction 1	SB	30	110.25	97.5	207.7
Direction 2	NB	30	110.25	77.4	187.6

INPUTS	Direction 1	Direction 2
Travel Direction	SB	NB
Speed	30	30
Grade	-0.04	0.04
t	2.5	2.5
a	11.2	11.2

Stopping Sight Distance (SSD) - Source: AASHTO

SSD = Reaction Distance + Brake Distance

Reaction Distance = 1.47 x t x V

Brake Distance = V^2 / (30 x ((a/32.2)+G))

Where:
t = reaction time (sec)
V = travel speed (mph)
G= roadway grade
a - deceleration rate (ft/sec^2)

Stopping Sight Distance - 85th Percentile

Site Driveway South

		SPEED (MPH)	BRAKE REACTION DISTANCE (FT)	BRAKING DISTANCE (FT)	CALCULATED STOPPING SIGHT DISTANCE (FT)
Direction 1	EB	38	139.65	156.4	296.0
Direction 2	WB	37	135.975	117.7	253.6

INPUTS	Direction 1	Direction 2
Travel Direction	EB	WB
Speed	38	37
Grade	-0.04	0.04
t	2.5	2.5
a	11.2	11.2

Stopping Sight Distance (SSD) - Source: AASHTO

SSD = Reaction Distance + Brake Distance

Reaction Distance = 1.47 x t x V

Brake Distance = V^2 / (30 x ((a/32.2)+G))

Where:
t = reaction time (sec)
V = travel speed (mph)
G= roadway grade
a - deceleration rate (ft/sec^2)

Intersection Sight Distance Calculations

Source: *A Policy on Geometric Design of Highways and Street, 7th Edition;* AASHTO; 2018.

Passenger Car
ISD = 1.47 * V * t

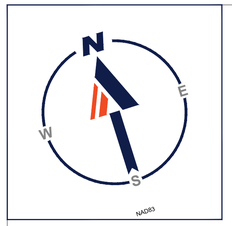
V = speed
t = time gap

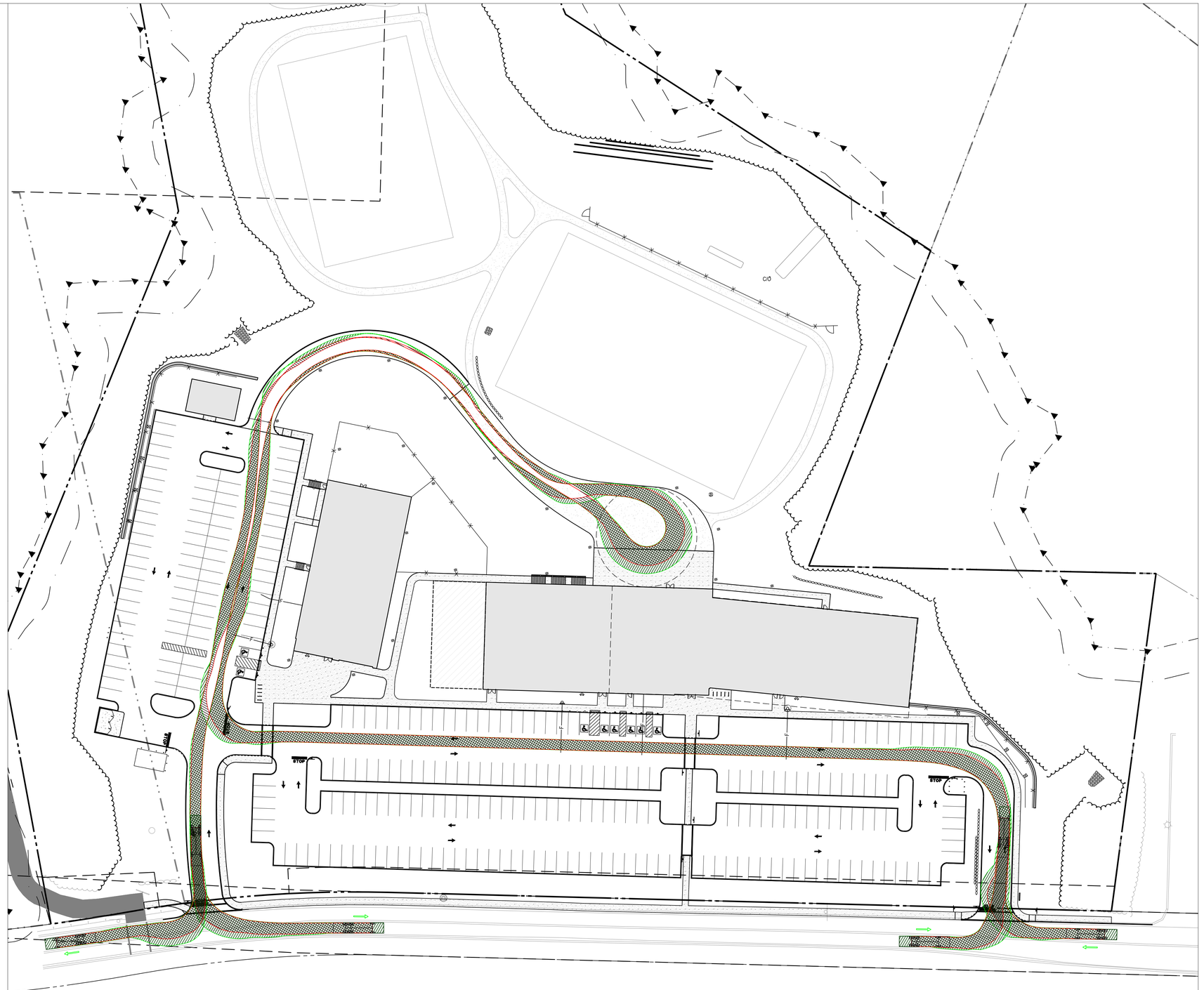
t = 7.5 s for a passenger car for Left Turn from a Stop
t = 6.5 s for a passenger car for Right Turn from a Stop

Memorial Drive at Site Driveway

		Speed Limit		Ideal ISD	SAY
Looking North (left-turn from a stop)	ISD = 1.47*	30	* 7.5 =	330.75	**335 feet**
Looking South (right-turn from a stop)	ISD = 1.47*	30	* 6.5 =	286.65	**290 feet**

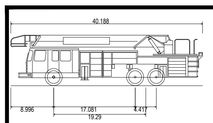
□ AutoTURN® Analysis





LEGEND

- EXISTING HYDRANT
- PROPOSED HYDRANT
- TRUCK WHEEL PATH
- FIRE TRUCK BODY



PIERCE ENFORCER 100' ASCENDANT AERIAL TOWER FIRE TRUCK

Overall Width	8.270ft
Overall Body Height	10.601ft
Min Body Ground Clearance	1.199ft
Track Width	8.000ft
Lock-to-lock time	6.00s
Max Steering Angle (Virtual)	45.00°

TRUCK TURN INFORMATION SHOWN FOR INFORMATION PURPOSES ONLY AND IS BASED ON THE RESULTS OF MODELING A VEHICLE TURN SIMULATION IN AUTOTURN VEHICLE SIMULATION SOFTWARE

THIS PLAN TO BE UTILIZED FOR SITE LAYOUT PURPOSES ONLY

REFER TO GENERAL NOTES SHEET FOR NOTES

40 20 10 0 40
SCALE: 1" = 40'

REVISIONS

#	DATE	DESCRIPTION
1	6/24/25	NOI AND SMP
2	9/19/25	PEER REVIEW COMMENTS
3	10/20/25	E&S CONTROLS, PED. ACCESS

TEAM HOYT
COMMUNITY YMCA

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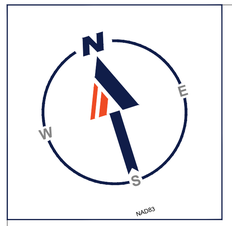
50 WASHINGTON ST., SUITE 2000
WESTBOROUGH, MA 01581
Phone: (508) 480-9900
www.BohlerEngineering.com

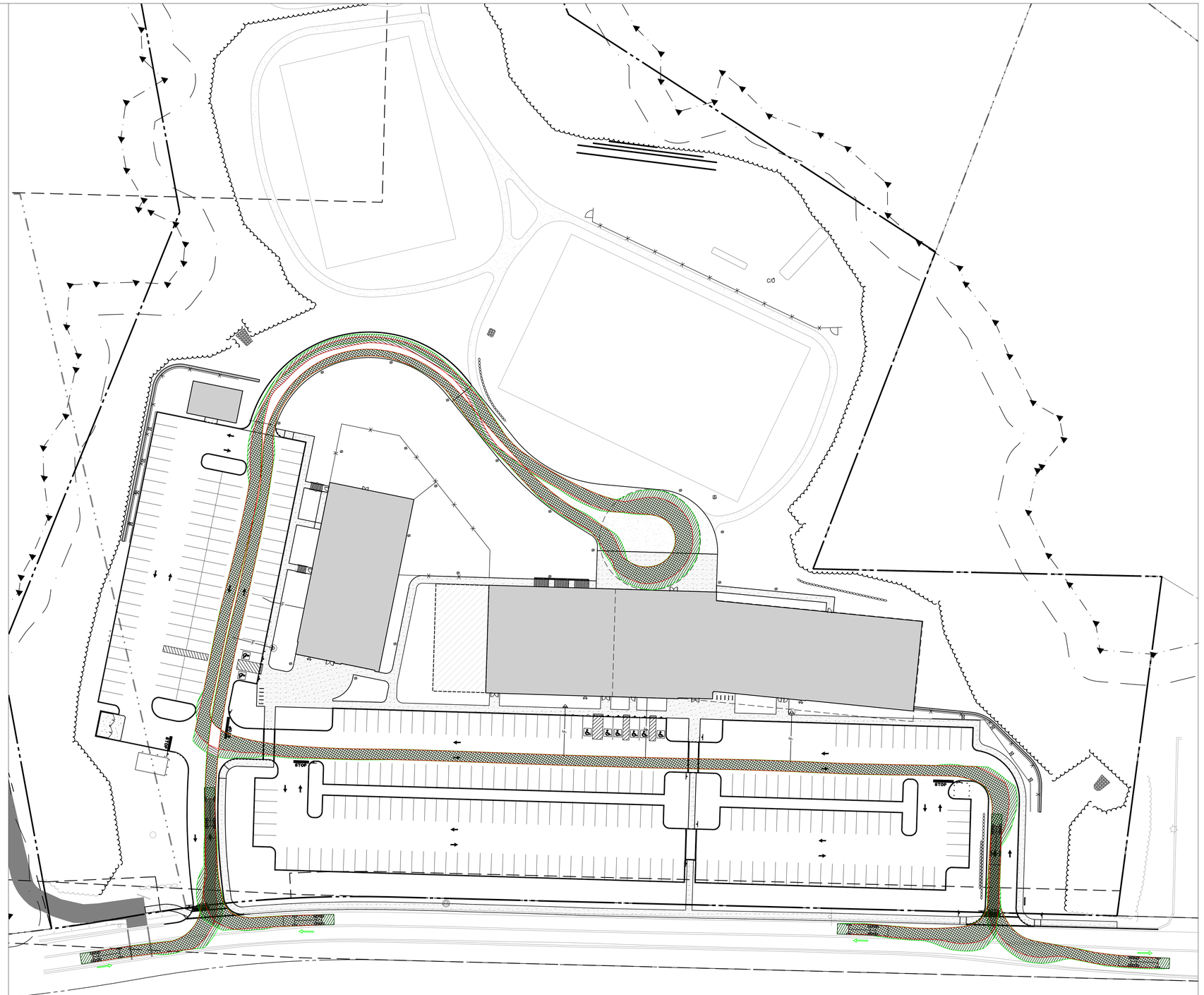
ISSUED FOR PERMIT

FIRE TRUCK TURNING PLAN A

SCALE	PROJECT #	DATE ISSUED
AS NOTED	MAA240220.01	06.24.2025

EX-101





LEGEND

● EXISTING HYDRANT

○ PROPOSED HYDRANT

🟥 TRUCK WHEEL PATH

🟩 FIRE TRUCK BODY

PIERCE ENFORCER 100' ASCENDANT AERIAL TOWER FIRE TRUCK	
Overall Length	40.188ft
Overall Width	8.270ft
Overall Body Height	10.601ft
Min Body Ground Clearance	1.199ft
Track Width	8.000ft
Lock-to-lock time	6.00s
Max Steering Angle (Virtual)	45.00°

TRUCK TURN INFORMATION SHOWN FOR INFORMATION PURPOSES ONLY AND IS BASED ON THE RESULTS OF MODELING A VEHICLE TURN SIMULATION IN AUTOTURN VEHICLE SIMULATION SOFTWARE

THIS PLAN TO BE UTILIZED FOR SITE LAYOUT PURPOSES ONLY

REFER TO GENERAL NOTES SHEET FOR NOTES

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#	DATE	DESCRIPTION
1	6/24/25	NOI AND SMP
2	9/19/25	PEER REVIEW COMMENTS
3	10/20/25	E&S CONTROLS, PED. ACCESS

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BOHLER

50 WASHINGTON ST., SUITE 2000
WESTBOROUGH, MA 01581
Phone: (508) 480-9900

www.BohlerEngineering.com

ISSUED FOR
PERMIT

FIRE TRUCK TURNING
PLAN B

SCALE	PROJECT #	DATE ISSUED
AS NOTED	MAA240220.01	06.24.2025

EX-102

- Parking Analysis
  - YMCA Data

YMCA Parking Observations
Weekday

Weekday YMCA Parking Observations

	Framingham	Westborough	Woburn	Average	
	1/9/2007	1/11/2007	1/11/2007	% Full	Index
7:00 AM	52	70	57	**0.28**	0.36
7:30 AM	59	73	56	**0.29**	0.37
8:00 AM	72	95	56	**0.34**	0.43
8:30 AM	77	106	65	**0.38**	0.48
9:00 AM	120	157	104	**0.58**	0.74
9:30 AM	163	215	139	**0.79**	1.00
10:00 AM	166	223	134	**0.79**	1.00
10:30 AM	170	200	141	**0.79**	1.00
11:00 AM	157	189	136	**0.75**	0.95
11:30 AM	140	154	119	**0.65**	0.82
12:00 PM	117	146	91	**0.54**	0.68
12:30 PM	95	158	74	**0.48**	0.60
1:00 PM	92	141	63	**0.43**	0.55
1:30 PM	96	129	60	**0.42**	0.53
2:00 PM	84	108	57	**0.37**	0.47
2:30 PM	76	108	42	**0.33**	0.41
3:00 PM	81	110	38	**0.33**	0.41
3:30 PM	84	120	79	**0.43**	0.55
4:00 PM	85	151	97	**0.50**	0.64
4:30 PM	111	179	120	**0.62**	0.79
5:00 PM	101	186	134	**0.64**	0.82
5:30 PM	108	190	132	**0.66**	0.83
6:00 PM	142	162	129	**0.68**	0.86
6:30 PM	131	173	135	**0.68**	0.87
7:00 PM	120	177	133	**0.67**	0.84
Supply	198	340	153		

YMCA Parking Observations
Saturday

Saturday YMCA Parking Observations

	Framingham	Westborough	Woburn	Average	
	1/6/2007	1/6/2007	1/13/2007	% Full	Index
7:00 AM	12	57	28	**0.14**	0.15
7:30 AM	32	97	43	**0.24**	0.26
8:00 AM	42	134	81	**0.38**	0.41
8:30 AM	107	194	105	**0.60**	0.64
9:00 AM	149	240	124	**0.76**	0.81
9:30 AM	152	269	150	**0.85**	0.91
10:00 AM	162	275	172	**0.92**	0.99
10:30 AM	159	289	174	**0.93**	1.00
11:00 AM	131	251	159	**0.81**	0.87
11:30 AM	139	230	129	**0.74**	0.80
12:00 PM	111	151	116	**0.59**	0.63
12:30 PM	98	123	110	**0.53**	0.56
1:00 PM	97	117	89	**0.47**	0.51
1:30 PM	89	106	75	**0.42**	0.45
2:00 PM	101	101	87	**0.46**	0.49
2:30 PM	89	92	87	**0.43**	0.46
3:00 PM	84	107	95	**0.45**	0.49
3:30 PM	82	118	100	**0.47**	0.51
4:00 PM	91	105	111	**0.50**	0.54
4:30 PM	92	111	136	**0.56**	0.60
5:00 PM	90	104	119	**0.51**	0.55
5:30 PM	90	88	97	**0.45**	0.48
6:00 PM	71	82	77	**0.37**	0.40
6:30 PM	57	54	58	**0.28**	0.30
7:00 PM	22	46	47	**0.18**	0.20
Supply	198	340	153		

Peak Hour Parking Rate

	Framingham	Westborough	Woburn	Average	85th
Observed					
Peak Weekday Hour	10:30 AM	9:30 AM	10:30 AM		
Usage	170	223	141		
Size (1000 sqft)	40	62	46		
Rate (vh/ 1000 sqft)	4.25	3.60	3.07	3.64	4.16
Peak Weekend Hour	10:00 AM	10:00 AM	10:00 AM		
Usage	162	289	174		
Size (1000 sqft)	40	62	46		
Rate (vh/ 1000 sqft)	4.05	4.66	3.78	4.16	4.59

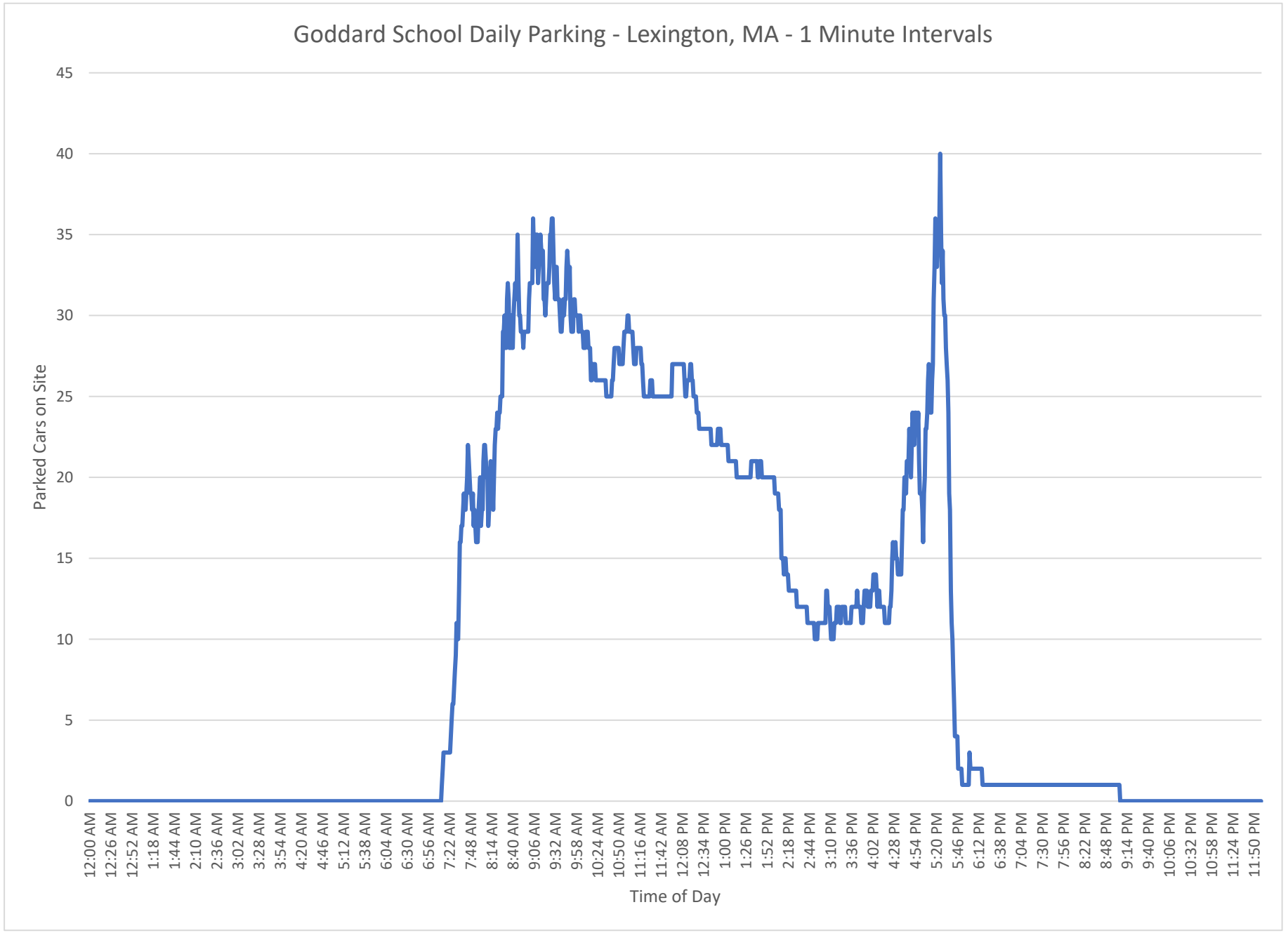
- Parking Analysis
  - Daycare Data

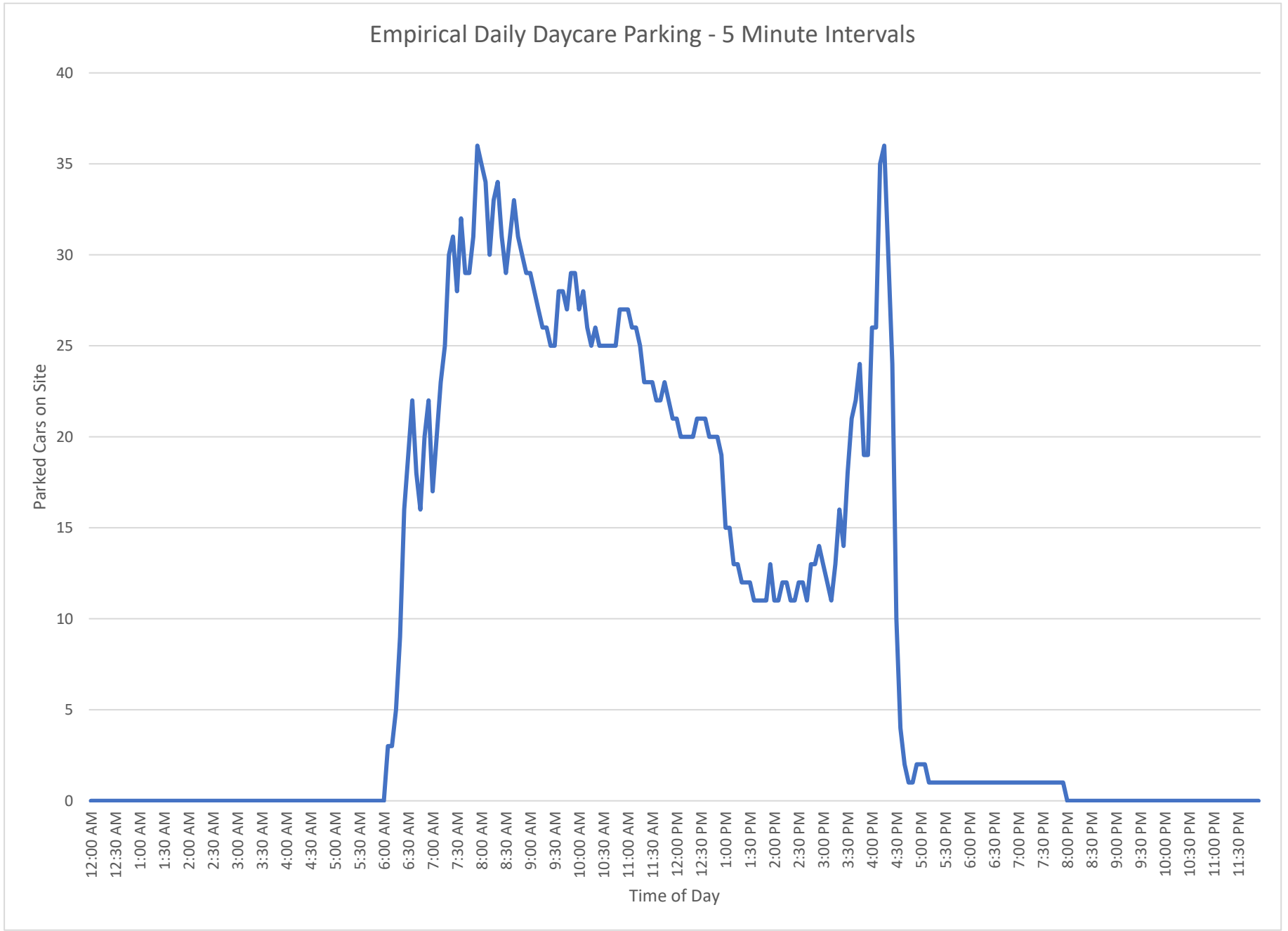
Godard School Parking Data
Lexington, MA
4-May-23

Approximate Enrollment - 150 Students
Approximate Staff - 25 Staff

DayCare Empirical Parking - Percent of Peak Calcs

	Max	% of Peak
12:00 AM	0	0.0
1:00 AM	0	0.0
2:00 AM	0	0.0
3:00 AM	0	0.0
4:00 AM	0	0.0
5:00 AM	0	0.0
6:00 AM	0	0.0
7:00 AM	22	0.6
8:00 AM	35	0.9
9:00 AM	36	0.9
10:00 AM	30	0.8
11:00 AM	30	0.8
12:00 PM	27	0.7
1:00 PM	22	0.6
2:00 PM	20	0.5
3:00 PM	13	0.3
4:00 PM	24	0.6
5:00 PM	40	1.0
6:00 PM	3	0.1
7:00 PM	0	0.0
8:00 PM	0	0.0
9:00 PM	0	0.0
10:00 PM	0	0.0
11:00 PM	0	0.0


Goddard School Daily Parking - Lexington, MA - 1 Minute Intervals
Parked Cars on Site
45
40
35
30
25
20
15
10
5
0
12:00 AM
12:26 AM
12:52 AM
1:18 AM
1:44 AM
2:10 AM
2:36 AM
3:02 AM
3:28 AM
3:54 AM
4:20 AM
4:46 AM
5:12 AM
5:38 AM
6:04 AM
6:30 AM
6:56 AM
7:22 AM
7:48 AM
8:14 AM
8:40 AM
9:06 AM
9:32 AM
9:58 AM
10:24 AM
10:50 AM
11:16 AM
11:42 AM
12:08 PM
12:34 PM
1:00 PM
1:26 PM
1:52 PM
2:18 PM
2:44 PM
3:10 PM
3:36 PM
4:02 PM
4:28 PM
4:54 PM
5:20 PM
5:46 PM
6:12 PM
6:38 PM
7:04 PM
7:30 PM
7:56 PM
8:22 PM
8:48 PM
9:14 PM
9:40 PM
10:06 PM
10:32 PM
10:58 PM
11:24 PM
11:50 PM
Time of Day


Empirical Daily Daycare Parking - 5 Minute Intervals
Parked Cars on Site
40
35
30
25
20
15
10
5
0
12:00 AM
12:30 AM
1:00 AM
1:30 AM
2:00 AM
2:30 AM
3:00 AM
3:30 AM
4:00 AM
4:30 AM
5:00 AM
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8:00 PM
8:30 PM
9:00 PM
9:30 PM
10:00 PM
10:30 PM
11:00 PM
11:30 PM
Time of Day

- Parking Analysis
  - Soccer Data

Land Use: 488 Soccer Field

Description

A soccer field is an indoor or outdoor facility that is used for non-professional soccer games. It may consist of multiple fields. The size of each field within the land use may vary to accommodate games for different age groups. On-site amenities may include stadium seating and vendors selling food or merchandise.

Land Use Subcategory

The subcategories used for this land use relate to the types of events at the site rather than to physical characteristics of the site itself. Event types include practices, league games, and local/regional tournaments. The data are categorized into tournament and non-tournament subcategories, as defined below:

- Tournament—Event takes place on both Saturday and Sunday and often starts on Friday and extends into Monday. Tournament participants play multiple games per day over multiple days. Each field is the site of multiple consecutive games throughout the day that run concurrent with games at the other on-site fields.
- Non-Tournament—Event includes team practices and routine league games. The site might host multiple games on multiple days with multiple teams, but the participants are not required to travel a long distance to the site and the scheduled game intensity does not match that of a regional or local tournament.

Time-of-Day Distribution for Parking Demand

The following table presents a time-of-day distribution of parking demand for one study site with non-tournament events on a Saturday and a Sunday.

Hour Beginning	Percent of Peak Parking Demand	
	Saturday	Sunday
12:00–4:00 a.m.	—	—
5:00 a.m.	—	—
6:00 a.m.	—	—
7:00 a.m.	38	38
8:00 a.m.	98	100
9:00 a.m.	85	60
10:00 a.m.	91	98
11:00 a.m.	93	96
12:00 p.m.	100	74
1:00 p.m.	90	73
2:00 p.m.	71	71
3:00 p.m.	9	44
4:00 p.m.	5	12
5:00 p.m.	3	2
6:00 p.m.	—	—
7:00 p.m.	—	—
8:00 p.m.	—	—
9:00 p.m.	—	—
10:00 p.m.	—	—
11:00 p.m.	—	—

Additional Data

The sites were surveyed in the 2000s, the 2010s, and the 2020s in Hawaii, New York, Oregon, and Washington.

Source Numbers

401, 517, 622

Empirical Data
Winchester Soccer Club
Observations Conducted on Saturday, June 9, 2012

Field/Beginning of Observation Period	# Active Fields	# Teams	# Players	# Coaches	# Spectators	# Parked Vehicles	# Players/Field	# Players/Team	# Parked Cars/Field
Leonard & Muraco Field									
10:15 AM	3	6	69	17	106	62	**23**	**12**	**21**
11:30 AM	5	10	110	27	113	163	**22**	**11**	**20**
12:45 PM	3	6	45	18	156	186	**15**	**8**	**23**
2:15 PM	4	8	80	24	122	177	**20**	**10**	**25**
Lynch Field									
10:15 AM	2	4	41	9	39	39	**21**	**10**	**20**
Manchester Field									
8:45 AM	2	4	40	8	33	40	**20**	**10**	**20**
10:15 AM	1	2	24	4	23	27	**24**	**12**	**27**
2:15 PM	1	2	32	4	18	21	**32**	**16**	**21**
3:45 PM	2	4	61	7	48	42	**31**	**15**	**21**

Average	**22**	parked vehicles/field
85th Percentile	**25**	parked vehicles/field
Max	**27**	parked vehicles/field

Land Use: 411 Public Park

Description

A public park is owned and operated by a municipal, county, state, or federal agency. Park facilities in the study sites range from passive amenities such as walking trails and picnic tables to active amenities such as basketball courts, playgrounds, skate parks, softball fields, horseshoe pits, and even a roller-skating rink.

Time-of-Day Distribution for Parking Demand

The following table presents a time-of-day distribution of parking demand on a weekday (one study site), a Saturday (three study sites) and a Sunday (one study site) in a general urban/suburban setting.

Hour Beginning	Percent of Peak Parking Demand		
	Weekday	Saturday	Sunday
12:00–4:00 a.m.	—	—	—
5:00 a.m.	—	—	—
6:00 a.m.	—	—	—
7:00 a.m.	28	20	17
8:00 a.m.	33	25	28
9:00 a.m.	56	67	31
10:00 a.m.	61	82	36
11:00 a.m.	68	98	67
12:00 p.m.	93	90	76
1:00 p.m.	70	100	96
2:00 p.m.	86	97	100
3:00 p.m.	100	88	96
4:00 p.m.	91	80	79
5:00 p.m.	93	61	57
6:00 p.m.	95	57	53
7:00 p.m.	—	—	—
8:00 p.m.	—	—	—
9:00 p.m.	—	—	—
10:00 p.m.	—	—	—
11:00 p.m.	—	—	—

- [ ] Capacity Analysis

Revised Analysis

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	102	842	4	6	530	106	6	1	23	168	0	72
Future Volume (vph)	102	842	4	6	530	106	6	1	23	168	0	72
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	200		0	0		50	0		0	0		0
Storage Lanes	1		0	0		1	0		1	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.999			0.997	0.850			0.850			0.850
Flt Protected	0.950				0.999			0.958			0.950	
Satd. Flow (prot)	1752	1808	0	0	1653	1490	0	1820	1615	0	1752	1583
Flt Permitted	0.245				0.990			0.958			0.950	
Satd. Flow (perm)	452	1808	0	0	1638	1490	0	1820	1615	0	1752	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					1	126			126			82
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		500			500			250			225	
Travel Time (s)		11.4			11.4			5.7			5.1	
Peak Hour Factor	0.93	0.93	0.92	0.92	0.93	0.93	0.92	0.92	0.92	0.93	0.92	0.93
Heavy Vehicles (%)	3%	5%	0%	0%	9%	3%	0%	0%	0%	3%	0%	2%
Adj. Flow (vph)	110	905	4	7	570	114	7	1	25	181	0	77
Shared Lane Traffic (%)						10%						
Lane Group Flow (vph)	110	909	0	0	588	103	0	8	25	0	181	77
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2	1	1	2	1	1	2	1
Detector Template	Left	Thru		Left	Thru	Right	Left	Thru		Left	Thru	
Leading Detector (ft)	20	100		20	100	20	20	100	20	20	100	20
Trailing Detector (ft)	0	0		0	0	0	0	0	0	0	0	0
Detector 1 Position(ft)	0	0		0	0	0	0	0	0	0	0	0
Detector 1 Size(ft)	20	6		20	6	20	20	6	20	20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	5.0	0.0	0.0	5.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA		Perm	NA	Perm	Split	NA	Prot	Split	NA	pt+ov
Protected Phases	5	2			6		8	8	8	4	4	4 5

Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Heavy Vehicles (%)	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Enter Blocked Intersection	
Lane Alignment	
Median Width(ft)	
Link Offset(ft)	
Crosswalk Width(ft)	
Two way Left Turn Lane	
Headway Factor	
Turning Speed (mph)	
Number of Detectors	
Detector Template	
Leading Detector (ft)	
Trailing Detector (ft)	
Detector 1 Position(ft)	
Detector 1 Size(ft)	
Detector 1 Type	
Detector 1 Channel	
Detector 1 Extend (s)	
Detector 1 Queue (s)	
Detector 1 Delay (s)	
Detector 2 Position(ft)	
Detector 2 Size(ft)	
Detector 2 Type	
Detector 2 Channel	
Detector 2 Extend (s)	
Turn Type	
Protected Phases	9

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Permitted Phases	2			6		6						
Detector Phase	5	2		6	6	6	8	8	8	4	4	4 5
Switch Phase												
Minimum Initial (s)	6.0	10.0		10.0	10.0	10.0	6.0	6.0	6.0	6.0	6.0	
Minimum Split (s)	12.0	16.0		16.0	16.0	16.0	12.0	12.0	12.0	12.0	12.0	
Total Split (s)	15.0	80.0		65.0	65.0	65.0	15.0	15.0	15.0	30.0	30.0	
Total Split (%)	10.2%	54.4%		44.2%	44.2%	44.2%	10.2%	10.2%	10.2%	20.4%	20.4%	
Maximum Green (s)	9.0	74.0		59.0	59.0	59.0	9.0	9.0	9.0	24.0	24.0	
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)	-3.0	-3.0			-3.0	-3.0		-3.0	-3.0		-3.0	
Total Lost Time (s)	3.0	3.0			3.0	3.0		3.0	3.0		3.0	
Lead/Lag	Lead			Lag	Lag	Lag						
Lead-Lag Optimize?	Yes			Yes	Yes	Yes						
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	Min		Min	Min	Min	None	None	None	None	None	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)	78.1	78.1			63.5	63.5		9.5	9.5		19.7	32.6
Actuated g/C Ratio	0.68	0.68			0.56	0.56		0.08	0.08		0.17	0.29
v/c Ratio	0.25	0.74			0.65	0.12		0.05	0.10		0.60	0.15
Control Delay	11.3	20.6			26.1	2.5		57.7	0.8		54.6	5.9
Queue Delay	0.0	0.0			0.0	0.0		0.0	0.0		0.0	0.0
Total Delay	11.3	20.6			26.1	2.5		57.7	0.8		54.6	5.9
LOS	B	C			C	A		E	A		D	A
Approach Delay		19.6			22.6			14.6			40.1	
Approach LOS		B			C			B			D	
90th %ile Green (s)	9.0	74.0		59.0	59.0	59.0	7.5	7.5	7.5	24.0	24.0	
90th %ile Term Code	Max	Max		Max	Max	Max	Gap	Gap	Gap	Max	Max	
70th %ile Green (s)	9.0	74.0		59.0	59.0	59.0	6.4	6.4	6.4	19.7	19.7	
70th %ile Term Code	Max	Max		Max	Max	Max	Gap	Gap	Gap	Gap	Gap	
50th %ile Green (s)	8.7	73.7		59.0	59.0	59.0	6.0	6.0	6.0	17.0	17.0	
50th %ile Term Code	Gap	Hold		Max	Max	Max	Min	Min	Min	Gap	Gap	
30th %ile Green (s)	8.1	73.1		59.0	59.0	59.0	0.0	0.0	0.0	13.5	13.5	
30th %ile Term Code	Gap	Hold		Max	Max	Max	Skip	Skip	Skip	Gap	Gap	
10th %ile Green (s)	6.9	71.9		59.0	59.0	59.0	0.0	0.0	0.0	10.5	10.5	
10th %ile Term Code	Gap	Hold		Max	Max	Max	Skip	Skip	Skip	Gap	Gap	
Queue Length 50th (ft)	26	407			312	0		6	0		124	0
Queue Length 95th (ft)	85	#1104			#720	24		26	0		241	31
Internal Link Dist (ft)		420			420			170			145	
Turn Bay Length (ft)	200					50						
Base Capacity (vph)	448	1246			910	883		195	286		423	550
Starvation Cap Reductn	0	0			0	0		0	0		0	0
Spillback Cap Reductn	0	0			0	0		0	0		0	0
Storage Cap Reductn	0	0			0	0		0	0		0	0
Reduced v/c Ratio	0.25	0.73			0.65	0.12		0.04	0.09		0.43	0.14

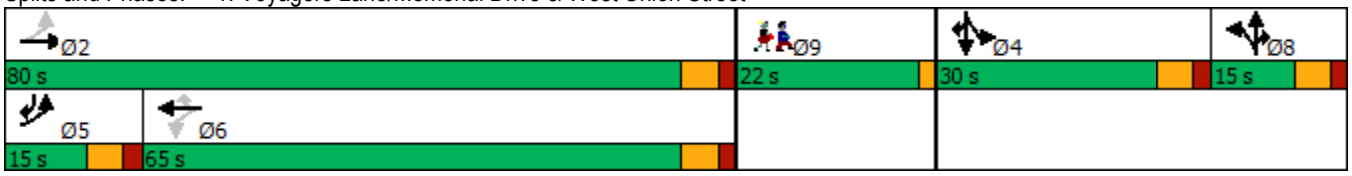
Intersection Summary

Lane Group	Ø9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	5.0
Minimum Split (s)	22.0
Total Split (s)	22.0
Total Split (%)	15%
Maximum Green (s)	20.0
Yellow Time (s)	2.0
All-Red Time (s)	0.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	7.0
Flash Dont Walk (s)	13.0
Pedestrian Calls (#/hr)	4
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
90th %ile Green (s)	20.0
90th %ile Term Code	Ped
70th %ile Green (s)	0.0
70th %ile Term Code	Skip
50th %ile Green (s)	0.0
50th %ile Term Code	Skip
30th %ile Green (s)	0.0
30th %ile Term Code	Skip
10th %ile Green (s)	0.0
10th %ile Term Code	Skip
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

Area Type: Other
Cycle Length: 147
Actuated Cycle Length: 114.3
Natural Cycle: 100
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.74
Intersection Signal Delay: 23.2 Intersection LOS: C
Intersection Capacity Utilization 100.9% ICU Level of Service G
Analysis Period (min) 15
90th %ile Actuated Cycle: 145.5
70th %ile Actuated Cycle: 118.1
50th %ile Actuated Cycle: 114.7
30th %ile Actuated Cycle: 98.6
10th %ile Actuated Cycle: 94.4
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: Voyagers Lane/Memorial Drive & West Union Street



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	45	624	5	24	808	115	3	0	10	110	0	110
Future Volume (vph)	45	624	5	24	808	115	3	0	10	110	0	110
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	200		0	0		50	0		0	0		0
Storage Lanes	1		0	0		1	0		1	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.999				0.850			0.850			0.850
Flt Protected	0.950				0.999			0.950			0.950	
Satd. Flow (prot)	1805	1879	0	0	1862	1599	0	1805	1615	0	1805	1599
Flt Permitted	0.076				0.970			0.950			0.950	
Satd. Flow (perm)	144	1879	0	0	1808	1599	0	1805	1615	0	1805	1599
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						126			126			122
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		500			500			250			225	
Travel Time (s)		11.4			11.4			5.7			5.1	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	0%	1%	0%	0%	2%	1%	0%	0%	0%	0%	0%	1%
Adj. Flow (vph)	50	693	6	27	898	128	3	0	11	122	0	122
Shared Lane Traffic (%)												
Lane Group Flow (vph)	50	699	0	0	925	128	0	3	11	0	122	122
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2	1	1	2	1	1	2	1
Detector Template	Left	Thru		Left	Thru	Right	Left	Thru		Left	Thru	
Leading Detector (ft)	20	100		20	100	20	20	100	20	20	100	20
Trailing Detector (ft)	0	0		0	0	0	0	0	0	0	0	0
Detector 1 Position(ft)	0	0		0	0	0	0	0	0	0	0	0
Detector 1 Size(ft)	20	6		20	6	20	20	6	20	20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	5.0	0.0	0.0	5.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA		Perm	NA	Perm	Split	NA	Prot	Split	NA	pt+ov
Protected Phases	5	2			6		8	8	8	4	4	4 5

Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Heavy Vehicles (%)	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Enter Blocked Intersection	
Lane Alignment	
Median Width(ft)	
Link Offset(ft)	
Crosswalk Width(ft)	
Two way Left Turn Lane	
Headway Factor	
Turning Speed (mph)	
Number of Detectors	
Detector Template	
Leading Detector (ft)	
Trailing Detector (ft)	
Detector 1 Position(ft)	
Detector 1 Size(ft)	
Detector 1 Type	
Detector 1 Channel	
Detector 1 Extend (s)	
Detector 1 Queue (s)	
Detector 1 Delay (s)	
Detector 2 Position(ft)	
Detector 2 Size(ft)	
Detector 2 Type	
Detector 2 Channel	
Detector 2 Extend (s)	
Turn Type	
Protected Phases	9

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Permitted Phases	2			6		6						
Detector Phase	5	2		6	6	6	8	8	8	4	4	4 5
Switch Phase												
Minimum Initial (s)	6.0	10.0		10.0	10.0	10.0	6.0	6.0	6.0	6.0	6.0	
Minimum Split (s)	12.0	16.0		16.0	16.0	16.0	12.0	12.0	12.0	12.0	12.0	
Total Split (s)	15.0	80.0		65.0	65.0	65.0	15.0	15.0	15.0	30.0	30.0	
Total Split (%)	10.2%	54.4%		44.2%	44.2%	44.2%	10.2%	10.2%	10.2%	20.4%	20.4%	
Maximum Green (s)	9.0	74.0		59.0	59.0	59.0	9.0	9.0	9.0	24.0	24.0	
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)	-3.0	-3.0			-3.0	-3.0		-3.0	-3.0		-3.0	
Total Lost Time (s)	3.0	3.0			3.0	3.0		3.0	3.0		3.0	
Lead/Lag	Lead			Lag	Lag	Lag						
Lead-Lag Optimize?	Yes			Yes	Yes	Yes						
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	Min		Min	Min	Min	None	None	None	None	None	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)	77.3	77.3			63.6	63.6		9.3	9.3		15.7	28.4
Actuated g/C Ratio	0.72	0.72			0.60	0.60		0.09	0.09		0.15	0.27
v/c Ratio	0.19	0.51			0.86	0.13		0.02	0.04		0.46	0.24
Control Delay	9.9	11.9			31.1	3.7		54.7	0.3		50.2	6.1
Queue Delay	0.0	0.0			0.0	0.0		0.0	0.0		0.0	0.0
Total Delay	9.9	11.9			31.1	3.7		54.7	0.3		50.2	6.1
LOS	A	B			C	A		D	A		D	A
Approach Delay		11.7			27.8			12.0			28.1	
Approach LOS		B			C			B			C	
90th %ile Green (s)	9.0	74.0		59.0	59.0	59.0	6.5	6.5	6.5	20.1	20.1	
90th %ile Term Code	Max	Hold		Max	Max	Max	Gap	Gap	Gap	Gap	Gap	
70th %ile Green (s)	8.3	73.3		59.0	59.0	59.0	6.0	6.0	6.0	14.6	14.6	
70th %ile Term Code	Gap	Hold		Max	Max	Max	Min	Min	Min	Gap	Gap	
50th %ile Green (s)	7.5	72.5		59.0	59.0	59.0	0.0	0.0	0.0	11.7	11.7	
50th %ile Term Code	Gap	Hold		Max	Max	Max	Skip	Skip	Skip	Gap	Gap	
30th %ile Green (s)	6.8	71.8		59.0	59.0	59.0	0.0	0.0	0.0	10.1	10.1	
30th %ile Term Code	Gap	Hold		Max	Max	Max	Skip	Skip	Skip	Gap	Gap	
10th %ile Green (s)	6.0	71.0		59.0	59.0	59.0	0.0	0.0	0.0	8.0	8.0	
10th %ile Term Code	Min	Hold		Max	Max	Max	Skip	Skip	Skip	Gap	Gap	
Queue Length 50th (ft)	5	114			372	0		2	0		69	0
Queue Length 95th (ft)	41	591			#1255	39		13	0		167	43
Internal Link Dist (ft)		420			420			170			145	
Turn Bay Length (ft)	200					50						
Base Capacity (vph)	296	1391			1077	1004		208	297		468	573
Starvation Cap Reductn	0	0			0	0		0	0		0	0
Spillback Cap Reductn	0	0			0	0		0	0		0	0
Storage Cap Reductn	0	0			0	0		0	0		0	0
Reduced v/c Ratio	0.17	0.50			0.86	0.13		0.01	0.04		0.26	0.21

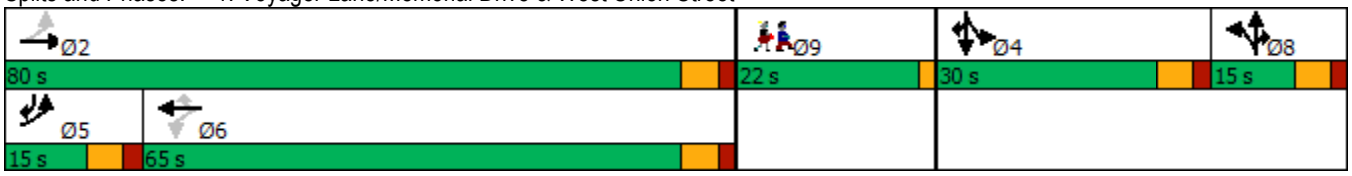
Intersection Summary

Lane Group	Ø9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	5.0
Minimum Split (s)	22.0
Total Split (s)	22.0
Total Split (%)	15%
Maximum Green (s)	20.0
Yellow Time (s)	2.0
All-Red Time (s)	0.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	7.0
Flash Dont Walk (s)	13.0
Pedestrian Calls (#/hr)	2
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
90th %ile Green (s)	20.0
90th %ile Term Code	Ped
70th %ile Green (s)	0.0
70th %ile Term Code	Skip
50th %ile Green (s)	0.0
50th %ile Term Code	Skip
30th %ile Green (s)	0.0
30th %ile Term Code	Skip
10th %ile Green (s)	0.0
10th %ile Term Code	Skip
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

Area Type: Other
Cycle Length: 147
Actuated Cycle Length: 106.7
Natural Cycle: 120
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.86
Intersection Signal Delay: 21.9 Intersection LOS: C
Intersection Capacity Utilization 81.3% ICU Level of Service D
Analysis Period (min) 15
90th %ile Actuated Cycle: 140.6
70th %ile Actuated Cycle: 111.9
50th %ile Actuated Cycle: 96.2
30th %ile Actuated Cycle: 93.9
10th %ile Actuated Cycle: 91
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: Voyager Lane/Memorial Drive & West Union Street



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	135	831	4	6	524	198	6	1	23	229	0	91
Future Volume (vph)	135	831	4	6	524	198	6	1	23	229	0	91
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	200		0	0		50	0		0	0		0
Storage Lanes	1		0	0		1	0		1	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.999				0.850			0.850			0.850
Flt Protected	0.950				0.999			0.958			0.950	
Satd. Flow (prot)	1752	1808	0	0	1743	1568	0	1820	1615	0	1752	1583
Flt Permitted	0.263				0.989			0.958			0.950	
Satd. Flow (perm)	485	1808	0	0	1726	1568	0	1820	1615	0	1752	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						126			126			98
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		500			500			250			225	
Travel Time (s)		11.4			11.4			5.7			5.1	
Peak Hour Factor	0.93	0.93	0.92	0.92	0.93	0.93	0.92	0.92	0.92	0.93	0.92	0.93
Heavy Vehicles (%)	3%	5%	0%	0%	9%	3%	0%	0%	0%	3%	0%	2%
Adj. Flow (vph)	145	894	4	7	563	213	7	1	25	246	0	98
Shared Lane Traffic (%)												
Lane Group Flow (vph)	145	898	0	0	570	213	0	8	25	0	246	98
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2	1	1	2	1	1	2	1
Detector Template	Left	Thru		Left	Thru	Right	Left	Thru		Left	Thru	
Leading Detector (ft)	20	100		20	100	20	20	100	20	20	100	20
Trailing Detector (ft)	0	0		0	0	0	0	0	0	0	0	0
Detector 1 Position(ft)	0	0		0	0	0	0	0	0	0	0	0
Detector 1 Size(ft)	20	6		20	6	20	20	6	20	20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	5.0	0.0	0.0	5.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA		Perm	NA	Perm	Split	NA	Prot	Split	NA	pt+ov
Protected Phases	5	2			6		8	8	8	4	4	4 5

Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Heavy Vehicles (%)	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Enter Blocked Intersection	
Lane Alignment	
Median Width(ft)	
Link Offset(ft)	
Crosswalk Width(ft)	
Two way Left Turn Lane	
Headway Factor	
Turning Speed (mph)	
Number of Detectors	
Detector Template	
Leading Detector (ft)	
Trailing Detector (ft)	
Detector 1 Position(ft)	
Detector 1 Size(ft)	
Detector 1 Type	
Detector 1 Channel	
Detector 1 Extend (s)	
Detector 1 Queue (s)	
Detector 1 Delay (s)	
Detector 2 Position(ft)	
Detector 2 Size(ft)	
Detector 2 Type	
Detector 2 Channel	
Detector 2 Extend (s)	
Turn Type	
Protected Phases	9

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Permitted Phases	2			6		6						
Detector Phase	5	2		6	6	6	8	8	8	4	4	4 5
Switch Phase												
Minimum Initial (s)	6.0	10.0		10.0	10.0	10.0	6.0	6.0	6.0	6.0	6.0	
Minimum Split (s)	12.0	16.0		16.0	16.0	16.0	12.0	12.0	12.0	12.0	12.0	
Total Split (s)	15.0	80.0		65.0	65.0	65.0	15.0	15.0	15.0	30.0	30.0	
Total Split (%)	10.2%	54.4%		44.2%	44.2%	44.2%	10.2%	10.2%	10.2%	20.4%	20.4%	
Maximum Green (s)	9.0	74.0		59.0	59.0	59.0	9.0	9.0	9.0	24.0	24.0	
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)	-3.0	-3.0			-3.0	-3.0		-3.0	-3.0		-3.0	
Total Lost Time (s)	3.0	3.0			3.0	3.0		3.0	3.0		3.0	
Lead/Lag	Lead			Lag	Lag	Lag						
Lead-Lag Optimize?	Yes			Yes	Yes	Yes						
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	Min		Min	Min	Min	None	None	None	None	None	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)	78.2	78.2			63.2	63.2		9.5	9.5		23.4	36.8
Actuated g/C Ratio	0.66	0.66			0.53	0.53		0.08	0.08		0.20	0.31
v/c Ratio	0.32	0.75			0.62	0.24		0.06	0.10		0.71	0.17
Control Delay	12.6	22.5			26.7	9.0		58.9	0.8		58.3	5.9
Queue Delay	0.0	0.0			0.0	0.0		0.0	0.0		0.0	0.0
Total Delay	12.6	22.5			26.7	9.0		58.9	0.8		58.3	5.9
LOS	B	C			C	A		E	A		E	A
Approach Delay		21.2			21.8			14.9			43.3	
Approach LOS		C			C			B			D	
90th %ile Green (s)	9.0	74.0		59.0	59.0	59.0	7.5	7.5	7.5	24.0	24.0	
90th %ile Term Code	Max	Max		Max	Max	Max	Gap	Gap	Gap	Max	Max	
70th %ile Green (s)	9.0	74.0		59.0	59.0	59.0	6.4	6.4	6.4	24.0	24.0	
70th %ile Term Code	Max	Max		Max	Max	Max	Gap	Gap	Gap	Max	Max	
50th %ile Green (s)	9.0	74.0		59.0	59.0	59.0	6.0	6.0	6.0	22.5	22.5	
50th %ile Term Code	Max	Hold		Max	Max	Max	Min	Min	Min	Gap	Gap	
30th %ile Green (s)	9.0	74.0		59.0	59.0	59.0	0.0	0.0	0.0	17.8	17.8	
30th %ile Term Code	Max	Hold		Max	Max	Max	Skip	Skip	Skip	Gap	Gap	
10th %ile Green (s)	8.1	73.1		59.0	59.0	59.0	0.0	0.0	0.0	14.0	14.0	
10th %ile Term Code	Gap	Hold		Max	Max	Max	Skip	Skip	Skip	Gap	Gap	
Queue Length 50th (ft)	41	465			311	34		6	0		177	0
Queue Length 95th (ft)	109	#1083			618	109		26	0		#343	38
Internal Link Dist (ft)		420			420			170			145	
Turn Bay Length (ft)	200					50						
Base Capacity (vph)	451	1199			921	896		188	279		407	566
Starvation Cap Reductn	0	0			0	0		0	0		0	0
Spillback Cap Reductn	0	0			0	0		0	0		0	0
Storage Cap Reductn	0	0			0	0		0	0		0	0
Reduced v/c Ratio	0.32	0.75			0.62	0.24		0.04	0.09		0.60	0.17

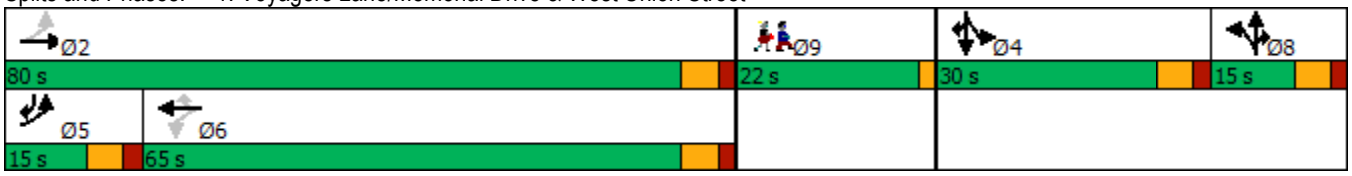
Intersection Summary

Lane Group	Ø9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	5.0
Minimum Split (s)	22.0
Total Split (s)	22.0
Total Split (%)	15%
Maximum Green (s)	20.0
Yellow Time (s)	2.0
All-Red Time (s)	0.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	7.0
Flash Dont Walk (s)	13.0
Pedestrian Calls (#/hr)	4
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
90th %ile Green (s)	20.0
90th %ile Term Code	Ped
70th %ile Green (s)	0.0
70th %ile Term Code	Skip
50th %ile Green (s)	0.0
50th %ile Term Code	Skip
30th %ile Green (s)	0.0
30th %ile Term Code	Skip
10th %ile Green (s)	0.0
10th %ile Term Code	Skip
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

Area Type: Other
Cycle Length: 147
Actuated Cycle Length: 118.3
Natural Cycle: 110
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.75
Intersection Signal Delay: 24.8 Intersection LOS: C
Intersection Capacity Utilization 101.2% ICU Level of Service G
Analysis Period (min) 15
90th %ile Actuated Cycle: 145.5
70th %ile Actuated Cycle: 122.4
50th %ile Actuated Cycle: 120.5
30th %ile Actuated Cycle: 103.8
10th %ile Actuated Cycle: 99.1
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: Voyagers Lane/Memorial Drive & West Union Street



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	76	617	5	24	798	221	3	0	10	215	0	145
Future Volume (vph)	76	617	5	24	798	221	3	0	10	215	0	145
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	200		0	0		50	0		0	0		0
Storage Lanes	1		0	0		1	0		1	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.999				0.850			0.850			0.850
Flt Protected	0.950				0.999			0.950			0.950	
Satd. Flow (prot)	1805	1879	0	0	1862	1599	0	1805	1615	0	1805	1599
Flt Permitted	0.060				0.969			0.950			0.950	
Satd. Flow (perm)	114	1879	0	0	1806	1599	0	1805	1615	0	1805	1599
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						126			126			161
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		500			500			250			225	
Travel Time (s)		11.4			11.4			5.7			5.1	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	0%	1%	0%	0%	2%	1%	0%	0%	0%	0%	0%	1%
Adj. Flow (vph)	84	686	6	27	887	246	3	0	11	239	0	161
Shared Lane Traffic (%)												
Lane Group Flow (vph)	84	692	0	0	914	246	0	3	11	0	239	161
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2	1	1	2	1	1	2	1
Detector Template	Left	Thru		Left	Thru	Right	Left	Thru		Left	Thru	
Leading Detector (ft)	20	100		20	100	20	20	100	20	20	100	20
Trailing Detector (ft)	0	0		0	0	0	0	0	0	0	0	0
Detector 1 Position(ft)	0	0		0	0	0	0	0	0	0	0	0
Detector 1 Size(ft)	20	6		20	6	20	20	6	20	20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	5.0	0.0	0.0	5.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA		Perm	NA	Perm	Split	NA	Prot	Split	NA	pt+ov
Protected Phases	5	2			6		8	8	8	4	4	4 5

Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Heavy Vehicles (%)	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Enter Blocked Intersection	
Lane Alignment	
Median Width(ft)	
Link Offset(ft)	
Crosswalk Width(ft)	
Two way Left Turn Lane	
Headway Factor	
Turning Speed (mph)	
Number of Detectors	
Detector Template	
Leading Detector (ft)	
Trailing Detector (ft)	
Detector 1 Position(ft)	
Detector 1 Size(ft)	
Detector 1 Type	
Detector 1 Channel	
Detector 1 Extend (s)	
Detector 1 Queue (s)	
Detector 1 Delay (s)	
Detector 2 Position(ft)	
Detector 2 Size(ft)	
Detector 2 Type	
Detector 2 Channel	
Detector 2 Extend (s)	
Turn Type	
Protected Phases	9

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Permitted Phases	2			6		6						
Detector Phase	5	2		6	6	6	8	8	8	4	4	4 5
Switch Phase												
Minimum Initial (s)	6.0	10.0		10.0	10.0	10.0	6.0	6.0	6.0	6.0	6.0	
Minimum Split (s)	12.0	16.0		16.0	16.0	16.0	12.0	12.0	12.0	12.0	12.0	
Total Split (s)	15.0	80.0		65.0	65.0	65.0	15.0	15.0	15.0	30.0	30.0	
Total Split (%)	10.2%	54.4%		44.2%	44.2%	44.2%	10.2%	10.2%	10.2%	20.4%	20.4%	
Maximum Green (s)	9.0	74.0		59.0	59.0	59.0	9.0	9.0	9.0	24.0	24.0	
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)	-3.0	-3.0			-3.0	-3.0		-3.0	-3.0		-3.0	
Total Lost Time (s)	3.0	3.0			3.0	3.0		3.0	3.0		3.0	
Lead/Lag	Lead			Lag	Lag	Lag						
Lead-Lag Optimize?	Yes			Yes	Yes	Yes						
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	Min		Min	Min	Min	None	None	None	None	None	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)	77.9	77.9			63.3	63.3		9.3	9.3		22.2	35.7
Actuated g/C Ratio	0.68	0.68			0.56	0.56		0.08	0.08		0.19	0.31
v/c Ratio	0.34	0.54			0.91	0.26		0.02	0.04		0.68	0.26
Control Delay	16.9	14.6			40.0	9.4		58.0	0.3		55.2	5.1
Queue Delay	0.0	0.0			0.0	0.0		0.0	0.0		0.0	0.0
Total Delay	16.9	14.6			40.0	9.4		58.0	0.3		55.2	5.1
LOS	B	B			D	A		E	A		E	A
Approach Delay		14.9			33.5			12.7			35.1	
Approach LOS		B			C			B			D	
90th %ile Green (s)	9.0	74.0		59.0	59.0	59.0	6.5	6.5	6.5	24.0	24.0	
90th %ile Term Code	Max	Hold		Max	Max	Max	Gap	Gap	Gap	Max	Max	
70th %ile Green (s)	9.0	74.0		59.0	59.0	59.0	6.0	6.0	6.0	24.0	24.0	
70th %ile Term Code	Max	Hold		Max	Max	Max	Min	Min	Min	Max	Max	
50th %ile Green (s)	9.0	74.0		59.0	59.0	59.0	0.0	0.0	0.0	19.1	19.1	
50th %ile Term Code	Max	Hold		Max	Max	Max	Skip	Skip	Skip	Gap	Gap	
30th %ile Green (s)	8.2	73.2		59.0	59.0	59.0	0.0	0.0	0.0	16.4	16.4	
30th %ile Term Code	Gap	Hold		Max	Max	Max	Skip	Skip	Skip	Gap	Gap	
10th %ile Green (s)	6.6	71.6		59.0	59.0	59.0	0.0	0.0	0.0	12.9	12.9	
10th %ile Term Code	Gap	Hold		Max	Max	Max	Skip	Skip	Skip	Gap	Gap	
Queue Length 50th (ft)	14	168			477	34		2	0		147	0
Queue Length 95th (ft)	81	618			#1286	136		14	0		312	48
Internal Link Dist (ft)		420			420			170			145	
Turn Bay Length (ft)	200					50						
Base Capacity (vph)	260	1297			1004	944		194	286		437	621
Starvation Cap Reductn	0	0			0	0		0	0		0	0
Spillback Cap Reductn	0	0			0	0		0	0		0	0
Storage Cap Reductn	0	0			0	0		0	0		0	0
Reduced v/c Ratio	0.32	0.53			0.91	0.26		0.02	0.04		0.55	0.26

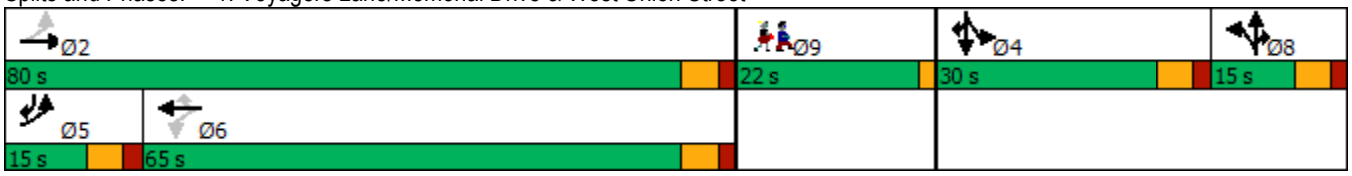
Intersection Summary

Lane Group	Ø9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	5.0
Minimum Split (s)	22.0
Total Split (s)	22.0
Total Split (%)	15%
Maximum Green (s)	20.0
Yellow Time (s)	2.0
All-Red Time (s)	0.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	7.0
Flash Dont Walk (s)	13.0
Pedestrian Calls (#/hr)	2
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
90th %ile Green (s)	20.0
90th %ile Term Code	Ped
70th %ile Green (s)	0.0
70th %ile Term Code	Skip
50th %ile Green (s)	0.0
50th %ile Term Code	Skip
30th %ile Green (s)	0.0
30th %ile Term Code	Skip
10th %ile Green (s)	0.0
10th %ile Term Code	Skip
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

Area Type: Other
Cycle Length: 147
Actuated Cycle Length: 113.9
Natural Cycle: 140
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.91
Intersection Signal Delay: 27.5 Intersection LOS: C
Intersection Capacity Utilization 88.4% ICU Level of Service E
Analysis Period (min) 15
90th %ile Actuated Cycle: 144.5
70th %ile Actuated Cycle: 122
50th %ile Actuated Cycle: 105.1
30th %ile Actuated Cycle: 101.6
10th %ile Actuated Cycle: 96.5
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: Voyagers Lane/Memorial Drive & West Union Street



Sensitivity Analysis

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	103	842	4	6	530	112	6	1	23	187	0	77
Future Volume (vph)	103	842	4	6	530	112	6	1	23	187	0	77
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	200		0	0		50	0		0	0		0
Storage Lanes	1		0	0		1	0		1	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.999			0.997	0.850			0.850			0.850
Flt Protected	0.950				0.999			0.958			0.950	
Satd. Flow (prot)	1752	1808	0	0	1653	1490	0	1820	1615	0	1752	1583
Flt Permitted	0.239				0.990			0.958			0.950	
Satd. Flow (perm)	441	1808	0	0	1638	1490	0	1820	1615	0	1752	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)					1	126			126			83
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		500			500			250			225	
Travel Time (s)		11.4			11.4			5.7			5.1	
Peak Hour Factor	0.93	0.93	0.92	0.92	0.93	0.93	0.92	0.92	0.92	0.93	0.92	0.93
Heavy Vehicles (%)	3%	5%	0%	0%	9%	3%	0%	0%	0%	3%	0%	2%
Adj. Flow (vph)	111	905	4	7	570	120	7	1	25	201	0	83
Shared Lane Traffic (%)						10%						
Lane Group Flow (vph)	111	909	0	0	589	108	0	8	25	0	201	83
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2	1	1	2	1	1	2	1
Detector Template	Left	Thru		Left	Thru	Right	Left	Thru		Left	Thru	
Leading Detector (ft)	20	100		20	100	20	20	100	20	20	100	20
Trailing Detector (ft)	0	0		0	0	0	0	0	0	0	0	0
Detector 1 Position(ft)	0	0		0	0	0	0	0	0	0	0	0
Detector 1 Size(ft)	20	6		20	6	20	20	6	20	20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	5.0	0.0	0.0	5.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA		Perm	NA	Perm	Split	NA	Prot	Split	NA	pt+ov
Protected Phases	5	2			6		8	8	8	4	4	4 5

Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Heavy Vehicles (%)	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Enter Blocked Intersection	
Lane Alignment	
Median Width(ft)	
Link Offset(ft)	
Crosswalk Width(ft)	
Two way Left Turn Lane	
Headway Factor	
Turning Speed (mph)	
Number of Detectors	
Detector Template	
Leading Detector (ft)	
Trailing Detector (ft)	
Detector 1 Position(ft)	
Detector 1 Size(ft)	
Detector 1 Type	
Detector 1 Channel	
Detector 1 Extend (s)	
Detector 1 Queue (s)	
Detector 1 Delay (s)	
Detector 2 Position(ft)	
Detector 2 Size(ft)	
Detector 2 Type	
Detector 2 Channel	
Detector 2 Extend (s)	
Turn Type	
Protected Phases	9

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Permitted Phases	2			6		6						
Detector Phase	5	2		6	6	6	8	8	8	4	4	4 5
Switch Phase												
Minimum Initial (s)	6.0	10.0		10.0	10.0	10.0	6.0	6.0	6.0	6.0	6.0	
Minimum Split (s)	12.0	16.0		16.0	16.0	16.0	12.0	12.0	12.0	12.0	12.0	
Total Split (s)	15.0	80.0		65.0	65.0	65.0	15.0	15.0	15.0	30.0	30.0	
Total Split (%)	10.2%	54.4%		44.2%	44.2%	44.2%	10.2%	10.2%	10.2%	20.4%	20.4%	
Maximum Green (s)	9.0	74.0		59.0	59.0	59.0	9.0	9.0	9.0	24.0	24.0	
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)	-3.0	-3.0			-3.0	-3.0		-3.0	-3.0		-3.0	
Total Lost Time (s)	3.0	3.0			3.0	3.0		3.0	3.0		3.0	
Lead/Lag	Lead			Lag	Lag	Lag						
Lead-Lag Optimize?	Yes			Yes	Yes	Yes						
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	Min		Min	Min	Min	None	None	None	None	None	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)	78.0	78.0			63.4	63.4		9.5	9.5		20.8	33.7
Actuated g/C Ratio	0.68	0.68			0.55	0.55		0.08	0.08		0.18	0.29
v/c Ratio	0.26	0.74			0.65	0.12		0.05	0.10		0.64	0.16
Control Delay	11.6	21.3			26.8	2.9		58.0	0.8		55.8	6.4
Queue Delay	0.0	0.0			0.0	0.0		0.0	0.0		0.0	0.0
Total Delay	11.6	21.3			26.8	2.9		58.0	0.8		55.8	6.4
LOS	B	C			C	A		E	A		E	A
Approach Delay		20.2			23.1			14.7			41.3	
Approach LOS		C			C			B			D	
90th %ile Green (s)	9.0	74.0		59.0	59.0	59.0	7.5	7.5	7.5	24.0	24.0	
90th %ile Term Code	Max	Max		Max	Max	Max	Gap	Gap	Gap	Max	Max	
70th %ile Green (s)	9.0	74.0		59.0	59.0	59.0	6.4	6.4	6.4	21.3	21.3	
70th %ile Term Code	Max	Max		Max	Max	Max	Gap	Gap	Gap	Gap	Gap	
50th %ile Green (s)	8.7	73.7		59.0	59.0	59.0	6.0	6.0	6.0	18.5	18.5	
50th %ile Term Code	Gap	Hold		Max	Max	Max	Min	Min	Min	Gap	Gap	
30th %ile Green (s)	8.1	73.1		59.0	59.0	59.0	0.0	0.0	0.0	14.6	14.6	
30th %ile Term Code	Gap	Hold		Max	Max	Max	Skip	Skip	Skip	Gap	Gap	
10th %ile Green (s)	7.0	72.0		59.0	59.0	59.0	0.0	0.0	0.0	11.3	11.3	
10th %ile Term Code	Gap	Hold		Max	Max	Max	Skip	Skip	Skip	Gap	Gap	
Queue Length 50th (ft)	28	426			323	0		6	0		140	0
Queue Length 95th (ft)	85	#1104			#744	28		26	0		266	36
Internal Link Dist (ft)		420			420			170			145	
Turn Bay Length (ft)	200					50						
Base Capacity (vph)	438	1235			901	876		193	284		419	552
Starvation Cap Reductn	0	0			0	0		0	0		0	0
Spillback Cap Reductn	0	0			0	0		0	0		0	0
Storage Cap Reductn	0	0			0	0		0	0		0	0
Reduced v/c Ratio	0.25	0.74			0.65	0.12		0.04	0.09		0.48	0.15

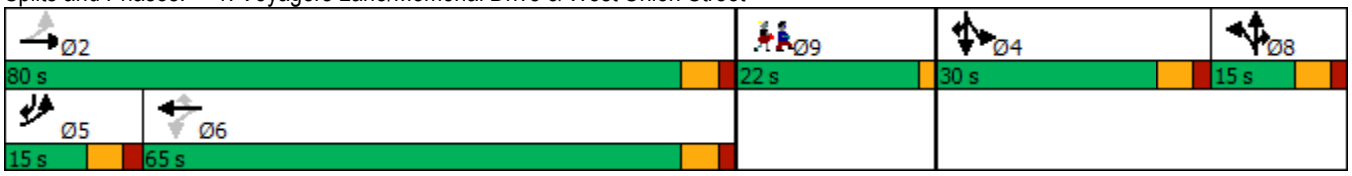
Intersection Summary

Lane Group	Ø9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	5.0
Minimum Split (s)	22.0
Total Split (s)	22.0
Total Split (%)	15%
Maximum Green (s)	20.0
Yellow Time (s)	2.0
All-Red Time (s)	0.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	7.0
Flash Dont Walk (s)	13.0
Pedestrian Calls (#/hr)	4
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
90th %ile Green (s)	20.0
90th %ile Term Code	Ped
70th %ile Green (s)	0.0
70th %ile Term Code	Skip
50th %ile Green (s)	0.0
50th %ile Term Code	Skip
30th %ile Green (s)	0.0
30th %ile Term Code	Skip
10th %ile Green (s)	0.0
10th %ile Term Code	Skip
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

Area Type: Other
Cycle Length: 147
Actuated Cycle Length: 115.3
Natural Cycle: 110
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.74
Intersection Signal Delay: 24.1 Intersection LOS: C
Intersection Capacity Utilization 102.1% ICU Level of Service G
Analysis Period (min) 15
90th %ile Actuated Cycle: 145.5
70th %ile Actuated Cycle: 119.7
50th %ile Actuated Cycle: 116.2
30th %ile Actuated Cycle: 99.7
10th %ile Actuated Cycle: 95.3
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: Voyagers Lane/Memorial Drive & West Union Street



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	50	624	5	24	808	133	3	0	10	122	0	113
Future Volume (vph)	50	624	5	24	808	133	3	0	10	122	0	113
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	200		0	0		50	0		0	0		0
Storage Lanes	1		0	0		1	0		1	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.999				0.850			0.850			0.850
Flt Protected	0.950				0.999			0.950			0.950	
Satd. Flow (prot)	1805	1879	0	0	1862	1599	0	1805	1615	0	1805	1599
Flt Permitted	0.070				0.970			0.950			0.950	
Satd. Flow (perm)	133	1879	0	0	1808	1599	0	1805	1615	0	1805	1599
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						126			126			126
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		500			500			250			225	
Travel Time (s)		11.4			11.4			5.7			5.1	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	0%	1%	0%	0%	2%	1%	0%	0%	0%	0%	0%	1%
Adj. Flow (vph)	56	693	6	27	898	148	3	0	11	136	0	126
Shared Lane Traffic (%)												
Lane Group Flow (vph)	56	699	0	0	925	148	0	3	11	0	136	126
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2	1	1	2	1	1	2	1
Detector Template	Left	Thru		Left	Thru	Right	Left	Thru		Left	Thru	
Leading Detector (ft)	20	100		20	100	20	20	100	20	20	100	20
Trailing Detector (ft)	0	0		0	0	0	0	0	0	0	0	0
Detector 1 Position(ft)	0	0		0	0	0	0	0	0	0	0	0
Detector 1 Size(ft)	20	6		20	6	20	20	6	20	20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	5.0	0.0	0.0	5.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA		Perm	NA	Perm	Split	NA	Prot	Split	NA	pt+ov
Protected Phases	5	2			6		8	8	8	4	4	4 5

Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Heavy Vehicles (%)	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Enter Blocked Intersection	
Lane Alignment	
Median Width(ft)	
Link Offset(ft)	
Crosswalk Width(ft)	
Two way Left Turn Lane	
Headway Factor	
Turning Speed (mph)	
Number of Detectors	
Detector Template	
Leading Detector (ft)	
Trailing Detector (ft)	
Detector 1 Position(ft)	
Detector 1 Size(ft)	
Detector 1 Type	
Detector 1 Channel	
Detector 1 Extend (s)	
Detector 1 Queue (s)	
Detector 1 Delay (s)	
Detector 2 Position(ft)	
Detector 2 Size(ft)	
Detector 2 Type	
Detector 2 Channel	
Detector 2 Extend (s)	
Turn Type	
Protected Phases	9

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Permitted Phases	2			6		6						
Detector Phase	5	2		6	6	6	8	8	8	4	4	4 5
Switch Phase												
Minimum Initial (s)	6.0	10.0		10.0	10.0	10.0	6.0	6.0	6.0	6.0	6.0	
Minimum Split (s)	12.0	16.0		16.0	16.0	16.0	12.0	12.0	12.0	12.0	12.0	
Total Split (s)	15.0	80.0		65.0	65.0	65.0	15.0	15.0	15.0	30.0	30.0	
Total Split (%)	10.2%	54.4%		44.2%	44.2%	44.2%	10.2%	10.2%	10.2%	20.4%	20.4%	
Maximum Green (s)	9.0	74.0		59.0	59.0	59.0	9.0	9.0	9.0	24.0	24.0	
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)	-3.0	-3.0			-3.0	-3.0		-3.0	-3.0		-3.0	
Total Lost Time (s)	3.0	3.0			3.0	3.0		3.0	3.0		3.0	
Lead/Lag	Lead			Lag	Lag	Lag						
Lead-Lag Optimize?	Yes			Yes	Yes	Yes						
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	Min		Min	Min	Min	None	None	None	None	None	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)	77.6	77.6			63.6	63.6		9.3	9.3		16.6	29.5
Actuated g/C Ratio	0.72	0.72			0.59	0.59		0.09	0.09		0.15	0.27
v/c Ratio	0.21	0.52			0.87	0.15		0.02	0.04		0.49	0.24
Control Delay	10.5	12.3			32.3	4.9		55.3	0.3		50.5	5.9
Queue Delay	0.0	0.0			0.0	0.0		0.0	0.0		0.0	0.0
Total Delay	10.5	12.3			32.3	4.9		55.3	0.3		50.5	5.9
LOS	B	B			C	A		E	A		D	A
Approach Delay		12.2			28.6			12.1			29.0	
Approach LOS		B			C			B			C	
90th %ile Green (s)	9.0	74.0		59.0	59.0	59.0	6.5	6.5	6.5	21.6	21.6	
90th %ile Term Code	Max	Hold		Max	Max	Max	Gap	Gap	Gap	Gap	Gap	
70th %ile Green (s)	8.7	73.7		59.0	59.0	59.0	6.0	6.0	6.0	15.6	15.6	
70th %ile Term Code	Gap	Hold		Max	Max	Max	Min	Min	Min	Gap	Gap	
50th %ile Green (s)	7.8	72.8		59.0	59.0	59.0	0.0	0.0	0.0	12.6	12.6	
50th %ile Term Code	Gap	Hold		Max	Max	Max	Skip	Skip	Skip	Gap	Gap	
30th %ile Green (s)	7.0	72.0		59.0	59.0	59.0	0.0	0.0	0.0	10.8	10.8	
30th %ile Term Code	Gap	Hold		Max	Max	Max	Skip	Skip	Skip	Gap	Gap	
10th %ile Green (s)	6.0	71.0		59.0	59.0	59.0	0.0	0.0	0.0	8.5	8.5	
10th %ile Term Code	Min	Hold		Max	Max	Max	Skip	Skip	Skip	Gap	Gap	
Queue Length 50th (ft)	6	121			387	5		2	0		77	0
Queue Length 95th (ft)	46	605			#1275	54		13	0		184	43
Internal Link Dist (ft)		420			420			170			145	
Turn Bay Length (ft)	200					50						
Base Capacity (vph)	286	1377			1067	995		206	296		464	577
Starvation Cap Reductn	0	0			0	0		0	0		0	0
Spillback Cap Reductn	0	0			0	0		0	0		0	0
Storage Cap Reductn	0	0			0	0		0	0		0	0
Reduced v/c Ratio	0.20	0.51			0.87	0.15		0.01	0.04		0.29	0.22

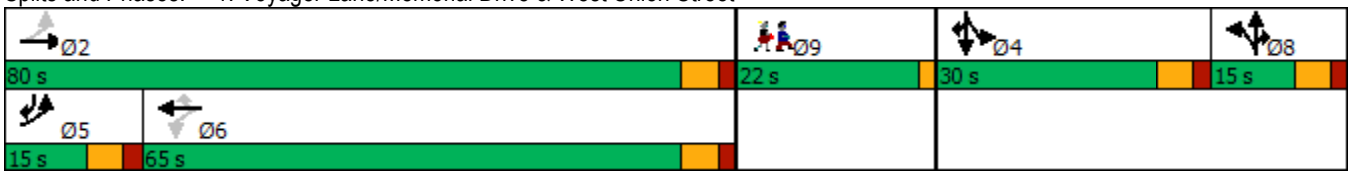
Intersection Summary

Lane Group	Ø9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	5.0
Minimum Split (s)	22.0
Total Split (s)	22.0
Total Split (%)	15%
Maximum Green (s)	20.0
Yellow Time (s)	2.0
All-Red Time (s)	0.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	7.0
Flash Dont Walk (s)	13.0
Pedestrian Calls (#/hr)	2
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
90th %ile Green (s)	20.0
90th %ile Term Code	Ped
70th %ile Green (s)	0.0
70th %ile Term Code	Skip
50th %ile Green (s)	0.0
50th %ile Term Code	Skip
30th %ile Green (s)	0.0
30th %ile Term Code	Skip
10th %ile Green (s)	0.0
10th %ile Term Code	Skip
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

Area Type: Other
Cycle Length: 147
Actuated Cycle Length: 107.8
Natural Cycle: 120
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.87
Intersection Signal Delay: 22.6 Intersection LOS: C
Intersection Capacity Utilization 82.0% ICU Level of Service D
Analysis Period (min) 15
90th %ile Actuated Cycle: 142.1
70th %ile Actuated Cycle: 113.3
50th %ile Actuated Cycle: 97.4
30th %ile Actuated Cycle: 94.8
10th %ile Actuated Cycle: 91.5
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: Voyager Lane/Memorial Drive & West Union Street



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	136	831	4	6	524	204	6	1	23	248	0	96
Future Volume (vph)	136	831	4	6	524	204	6	1	23	248	0	96
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	200		0	0		50	0		0	0		0
Storage Lanes	1		0	0		1	0		1	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.999				0.850			0.850			0.850
Flt Protected	0.950				0.999			0.958			0.950	
Satd. Flow (prot)	1752	1808	0	0	1743	1568	0	1820	1615	0	1752	1583
Flt Permitted	0.260				0.989			0.958			0.950	
Satd. Flow (perm)	480	1808	0	0	1726	1568	0	1820	1615	0	1752	1583
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						126			126			103
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		500			500			250			225	
Travel Time (s)		11.4			11.4			5.7			5.1	
Peak Hour Factor	0.93	0.93	0.92	0.92	0.93	0.93	0.92	0.92	0.92	0.93	0.92	0.93
Heavy Vehicles (%)	3%	5%	0%	0%	9%	3%	0%	0%	0%	3%	0%	2%
Adj. Flow (vph)	146	894	4	7	563	219	7	1	25	267	0	103
Shared Lane Traffic (%)												
Lane Group Flow (vph)	146	898	0	0	570	219	0	8	25	0	267	103
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2	1	1	2	1	1	2	1
Detector Template	Left	Thru		Left	Thru	Right	Left	Thru		Left	Thru	
Leading Detector (ft)	20	100		20	100	20	20	100	20	20	100	20
Trailing Detector (ft)	0	0		0	0	0	0	0	0	0	0	0
Detector 1 Position(ft)	0	0		0	0	0	0	0	0	0	0	0
Detector 1 Size(ft)	20	6		20	6	20	20	6	20	20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	5.0	0.0	0.0	5.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA		Perm	NA	Perm	Split	NA	Prot	Split	NA	pt+ov
Protected Phases	5	2			6		8	8	8	4	4	4 5

Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Heavy Vehicles (%)	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Enter Blocked Intersection	
Lane Alignment	
Median Width(ft)	
Link Offset(ft)	
Crosswalk Width(ft)	
Two way Left Turn Lane	
Headway Factor	
Turning Speed (mph)	
Number of Detectors	
Detector Template	
Leading Detector (ft)	
Trailing Detector (ft)	
Detector 1 Position(ft)	
Detector 1 Size(ft)	
Detector 1 Type	
Detector 1 Channel	
Detector 1 Extend (s)	
Detector 1 Queue (s)	
Detector 1 Delay (s)	
Detector 2 Position(ft)	
Detector 2 Size(ft)	
Detector 2 Type	
Detector 2 Channel	
Detector 2 Extend (s)	
Turn Type	
Protected Phases	9

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Permitted Phases	2			6		6						
Detector Phase	5	2		6	6	6	8	8	8	4	4	4 5
Switch Phase												
Minimum Initial (s)	6.0	10.0		10.0	10.0	10.0	6.0	6.0	6.0	6.0	6.0	
Minimum Split (s)	12.0	16.0		16.0	16.0	16.0	12.0	12.0	12.0	12.0	12.0	
Total Split (s)	15.0	80.0		65.0	65.0	65.0	15.0	15.0	15.0	30.0	30.0	
Total Split (%)	10.2%	54.4%		44.2%	44.2%	44.2%	10.2%	10.2%	10.2%	20.4%	20.4%	
Maximum Green (s)	9.0	74.0		59.0	59.0	59.0	9.0	9.0	9.0	24.0	24.0	
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)	-3.0	-3.0			-3.0	-3.0		-3.0	-3.0		-3.0	
Total Lost Time (s)	3.0	3.0			3.0	3.0		3.0	3.0		3.0	
Lead/Lag	Lead			Lag	Lag	Lag						
Lead-Lag Optimize?	Yes			Yes	Yes	Yes						
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	Min		Min	Min	Min	None	None	None	None	None	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)	78.1	78.1			63.1	63.1		9.5	9.5		24.5	37.9
Actuated g/C Ratio	0.65	0.65			0.53	0.53		0.08	0.08		0.21	0.32
v/c Ratio	0.33	0.76			0.62	0.25		0.06	0.10		0.74	0.18
Control Delay	12.9	23.1			27.2	9.3		59.0	0.8		59.6	5.8
Queue Delay	0.0	0.0			0.0	0.0		0.0	0.0		0.0	0.0
Total Delay	12.9	23.1			27.2	9.3		59.0	0.8		59.6	5.8
LOS	B	C			C	A		E	A		E	A
Approach Delay		21.7			22.2			14.9			44.6	
Approach LOS		C			C			B			D	
90th %ile Green (s)	9.0	74.0		59.0	59.0	59.0	7.5	7.5	7.5	24.0	24.0	
90th %ile Term Code	Max	Max		Max	Max	Max	Gap	Gap	Gap	Max	Max	
70th %ile Green (s)	9.0	74.0		59.0	59.0	59.0	6.4	6.4	6.4	24.0	24.0	
70th %ile Term Code	Max	Max		Max	Max	Max	Gap	Gap	Gap	Max	Max	
50th %ile Green (s)	9.0	74.0		59.0	59.0	59.0	6.0	6.0	6.0	24.0	24.0	
50th %ile Term Code	Max	Hold		Max	Max	Max	Min	Min	Min	Max	Max	
30th %ile Green (s)	9.0	74.0		59.0	59.0	59.0	0.0	0.0	0.0	19.7	19.7	
30th %ile Term Code	Max	Hold		Max	Max	Max	Skip	Skip	Skip	Gap	Gap	
10th %ile Green (s)	8.1	73.1		59.0	59.0	59.0	0.0	0.0	0.0	15.6	15.6	
10th %ile Term Code	Gap	Hold		Max	Max	Max	Skip	Skip	Skip	Gap	Gap	
Queue Length 50th (ft)	43	484			319	37		6	0		195	0
Queue Length 95th (ft)	110	#1083			618	114		26	0		#390	39
Internal Link Dist (ft)		420			420			170			145	
Turn Bay Length (ft)	200					50						
Base Capacity (vph)	444	1187			912	888		186	278		403	575
Starvation Cap Reductn	0	0			0	0		0	0		0	0
Spillback Cap Reductn	0	0			0	0		0	0		0	0
Storage Cap Reductn	0	0			0	0		0	0		0	0
Reduced v/c Ratio	0.33	0.76			0.63	0.25		0.04	0.09		0.66	0.18

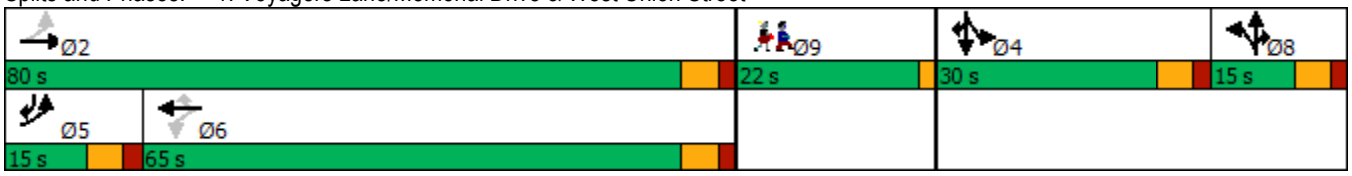
Intersection Summary

Lane Group	Ø9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	5.0
Minimum Split (s)	22.0
Total Split (s)	22.0
Total Split (%)	15%
Maximum Green (s)	20.0
Yellow Time (s)	2.0
All-Red Time (s)	0.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	7.0
Flash Dont Walk (s)	13.0
Pedestrian Calls (#/hr)	4
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
90th %ile Green (s)	20.0
90th %ile Term Code	Ped
70th %ile Green (s)	0.0
70th %ile Term Code	Skip
50th %ile Green (s)	0.0
50th %ile Term Code	Skip
30th %ile Green (s)	0.0
30th %ile Term Code	Skip
10th %ile Green (s)	0.0
10th %ile Term Code	Skip
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

Area Type: Other
Cycle Length: 147
Actuated Cycle Length: 119.3
Natural Cycle: 120
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.76
Intersection Signal Delay: 25.6 Intersection LOS: C
Intersection Capacity Utilization 102.3% ICU Level of Service G
Analysis Period (min) 15
90th %ile Actuated Cycle: 145.5
70th %ile Actuated Cycle: 122.4
50th %ile Actuated Cycle: 122
30th %ile Actuated Cycle: 105.7
10th %ile Actuated Cycle: 100.7
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: Voyagers Lane/Memorial Drive & West Union Street



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	81	617	5	24	798	239	3	0	10	227	0	148
Future Volume (vph)	81	617	5	24	798	239	3	0	10	227	0	148
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	200		0	0		50	0		0	0		0
Storage Lanes	1		0	0		1	0		1	0		1
Taper Length (ft)	25			25			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.999				0.850			0.850			0.850
Flt Protected	0.950				0.999			0.950			0.950	
Satd. Flow (prot)	1805	1879	0	0	1862	1599	0	1805	1615	0	1805	1599
Flt Permitted	0.060				0.969			0.950			0.950	
Satd. Flow (perm)	114	1879	0	0	1806	1599	0	1805	1615	0	1805	1599
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)						126			126			164
Link Speed (mph)		30			30			30			30	
Link Distance (ft)		500			500			250			225	
Travel Time (s)		11.4			11.4			5.7			5.1	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Heavy Vehicles (%)	0%	1%	0%	0%	2%	1%	0%	0%	0%	0%	0%	1%
Adj. Flow (vph)	90	686	6	27	887	266	3	0	11	252	0	164
Shared Lane Traffic (%)												
Lane Group Flow (vph)	90	692	0	0	914	266	0	3	11	0	252	164
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		16			16			16			16	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Number of Detectors	1	2		1	2	1	1	2	1	1	2	1
Detector Template	Left	Thru		Left	Thru	Right	Left	Thru		Left	Thru	
Leading Detector (ft)	20	100		20	100	20	20	100	20	20	100	20
Trailing Detector (ft)	0	0		0	0	0	0	0	0	0	0	0
Detector 1 Position(ft)	0	0		0	0	0	0	0	0	0	0	0
Detector 1 Size(ft)	20	6		20	6	20	20	6	20	20	6	20
Detector 1 Type	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel												
Detector 1 Extend (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	5.0	0.0	0.0	5.0
Detector 2 Position(ft)		94			94			94			94	
Detector 2 Size(ft)		6			6			6			6	
Detector 2 Type		Cl+Ex			Cl+Ex			Cl+Ex			Cl+Ex	
Detector 2 Channel												
Detector 2 Extend (s)		0.0			0.0			0.0			0.0	
Turn Type	pm+pt	NA		Perm	NA	Perm	Split	NA	Prot	Split	NA	pt+ov
Protected Phases	5	2			6		8	8	8	4	4	4 5

Lane Group	Ø9
Lane Configurations	
Traffic Volume (vph)	
Future Volume (vph)	
Ideal Flow (vphpl)	
Storage Length (ft)	
Storage Lanes	
Taper Length (ft)	
Lane Util. Factor	
Frt	
Flt Protected	
Satd. Flow (prot)	
Flt Permitted	
Satd. Flow (perm)	
Right Turn on Red	
Satd. Flow (RTOR)	
Link Speed (mph)	
Link Distance (ft)	
Travel Time (s)	
Peak Hour Factor	
Heavy Vehicles (%)	
Adj. Flow (vph)	
Shared Lane Traffic (%)	
Lane Group Flow (vph)	
Enter Blocked Intersection	
Lane Alignment	
Median Width(ft)	
Link Offset(ft)	
Crosswalk Width(ft)	
Two way Left Turn Lane	
Headway Factor	
Turning Speed (mph)	
Number of Detectors	
Detector Template	
Leading Detector (ft)	
Trailing Detector (ft)	
Detector 1 Position(ft)	
Detector 1 Size(ft)	
Detector 1 Type	
Detector 1 Channel	
Detector 1 Extend (s)	
Detector 1 Queue (s)	
Detector 1 Delay (s)	
Detector 2 Position(ft)	
Detector 2 Size(ft)	
Detector 2 Type	
Detector 2 Channel	
Detector 2 Extend (s)	
Turn Type	
Protected Phases	9

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Permitted Phases	2			6		6						
Detector Phase	5	2		6	6	6	8	8	8	4	4	4 5
Switch Phase												
Minimum Initial (s)	6.0	10.0		10.0	10.0	10.0	6.0	6.0	6.0	6.0	6.0	
Minimum Split (s)	12.0	16.0		16.0	16.0	16.0	12.0	12.0	12.0	12.0	12.0	
Total Split (s)	15.0	80.0		65.0	65.0	65.0	15.0	15.0	15.0	30.0	30.0	
Total Split (%)	10.2%	54.4%		44.2%	44.2%	44.2%	10.2%	10.2%	10.2%	20.4%	20.4%	
Maximum Green (s)	9.0	74.0		59.0	59.0	59.0	9.0	9.0	9.0	24.0	24.0	
Yellow Time (s)	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	
All-Red Time (s)	2.0	2.0		2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	
Lost Time Adjust (s)	-3.0	-3.0			-3.0	-3.0		-3.0	-3.0		-3.0	
Total Lost Time (s)	3.0	3.0			3.0	3.0		3.0	3.0		3.0	
Lead/Lag	Lead			Lag	Lag	Lag						
Lead-Lag Optimize?	Yes			Yes	Yes	Yes						
Vehicle Extension (s)	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	
Recall Mode	None	Min		Min	Min	Min	None	None	None	None	None	
Walk Time (s)												
Flash Dont Walk (s)												
Pedestrian Calls (#/hr)												
Act Effct Green (s)	77.9	77.9			63.3	63.3		9.3	9.3		22.9	36.5
Actuated g/C Ratio	0.68	0.68			0.55	0.55		0.08	0.08		0.20	0.32
v/c Ratio	0.36	0.54			0.92	0.28		0.02	0.04		0.70	0.26
Control Delay	18.3	14.8			41.2	10.2		58.0	0.3		55.8	5.1
Queue Delay	0.0	0.0			0.0	0.0		0.0	0.0		0.0	0.0
Total Delay	18.3	14.8			41.2	10.2		58.0	0.3		55.8	5.1
LOS	B	B			D	B		E	A		E	A
Approach Delay		15.2			34.2			12.7			35.8	
Approach LOS		B			C			B			D	
90th %ile Green (s)	9.0	74.0		59.0	59.0	59.0	6.5	6.5	6.5	24.0	24.0	
90th %ile Term Code	Max	Hold		Max	Max	Max	Gap	Gap	Gap	Max	Max	
70th %ile Green (s)	9.0	74.0		59.0	59.0	59.0	6.0	6.0	6.0	24.0	24.0	
70th %ile Term Code	Max	Hold		Max	Max	Max	Min	Min	Min	Max	Max	
50th %ile Green (s)	9.0	74.0		59.0	59.0	59.0	0.0	0.0	0.0	20.3	20.3	
50th %ile Term Code	Max	Hold		Max	Max	Max	Skip	Skip	Skip	Gap	Gap	
30th %ile Green (s)	8.4	73.4		59.0	59.0	59.0	0.0	0.0	0.0	17.6	17.6	
30th %ile Term Code	Gap	Hold		Max	Max	Max	Skip	Skip	Skip	Gap	Gap	
10th %ile Green (s)	6.8	71.8		59.0	59.0	59.0	0.0	0.0	0.0	13.8	13.8	
10th %ile Term Code	Gap	Hold		Max	Max	Max	Skip	Skip	Skip	Gap	Gap	
Queue Length 50th (ft)	15	178			492	41		2	0		157	0
Queue Length 95th (ft)	89	618			#1286	154		14	0		#342	48
Internal Link Dist (ft)		420			420			170			145	
Turn Bay Length (ft)	200					50						
Base Capacity (vph)	258	1287			996	938		192	285		433	629
Starvation Cap Reductn	0	0			0	0		0	0		0	0
Spillback Cap Reductn	0	0			0	0		0	0		0	0
Storage Cap Reductn	0	0			0	0		0	0		0	0
Reduced v/c Ratio	0.35	0.54			0.92	0.28		0.02	0.04		0.58	0.26

Intersection Summary

Lane Group	Ø9
Permitted Phases	
Detector Phase	
Switch Phase	
Minimum Initial (s)	5.0
Minimum Split (s)	22.0
Total Split (s)	22.0
Total Split (%)	15%
Maximum Green (s)	20.0
Yellow Time (s)	2.0
All-Red Time (s)	0.0
Lost Time Adjust (s)	
Total Lost Time (s)	
Lead/Lag	
Lead-Lag Optimize?	
Vehicle Extension (s)	3.0
Recall Mode	None
Walk Time (s)	7.0
Flash Dont Walk (s)	13.0
Pedestrian Calls (#/hr)	2
Act Effct Green (s)	
Actuated g/C Ratio	
v/c Ratio	
Control Delay	
Queue Delay	
Total Delay	
LOS	
Approach Delay	
Approach LOS	
90th %ile Green (s)	20.0
90th %ile Term Code	Ped
70th %ile Green (s)	0.0
70th %ile Term Code	Skip
50th %ile Green (s)	0.0
50th %ile Term Code	Skip
30th %ile Green (s)	0.0
30th %ile Term Code	Skip
10th %ile Green (s)	0.0
10th %ile Term Code	Skip
Queue Length 50th (ft)	
Queue Length 95th (ft)	
Internal Link Dist (ft)	
Turn Bay Length (ft)	
Base Capacity (vph)	
Starvation Cap Reductn	
Spillback Cap Reductn	
Storage Cap Reductn	
Reduced v/c Ratio	

Intersection Summary

Area Type: Other
Cycle Length: 147
Actuated Cycle Length: 114.7
Natural Cycle: 140
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 0.92
Intersection Signal Delay: 28.2 Intersection LOS: C
Intersection Capacity Utilization 93.2% ICU Level of Service F
Analysis Period (min) 15
90th %ile Actuated Cycle: 144.5
70th %ile Actuated Cycle: 122
50th %ile Actuated Cycle: 106.3
30th %ile Actuated Cycle: 103
10th %ile Actuated Cycle: 97.6
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: Voyagers Lane/Memorial Drive & West Union Street