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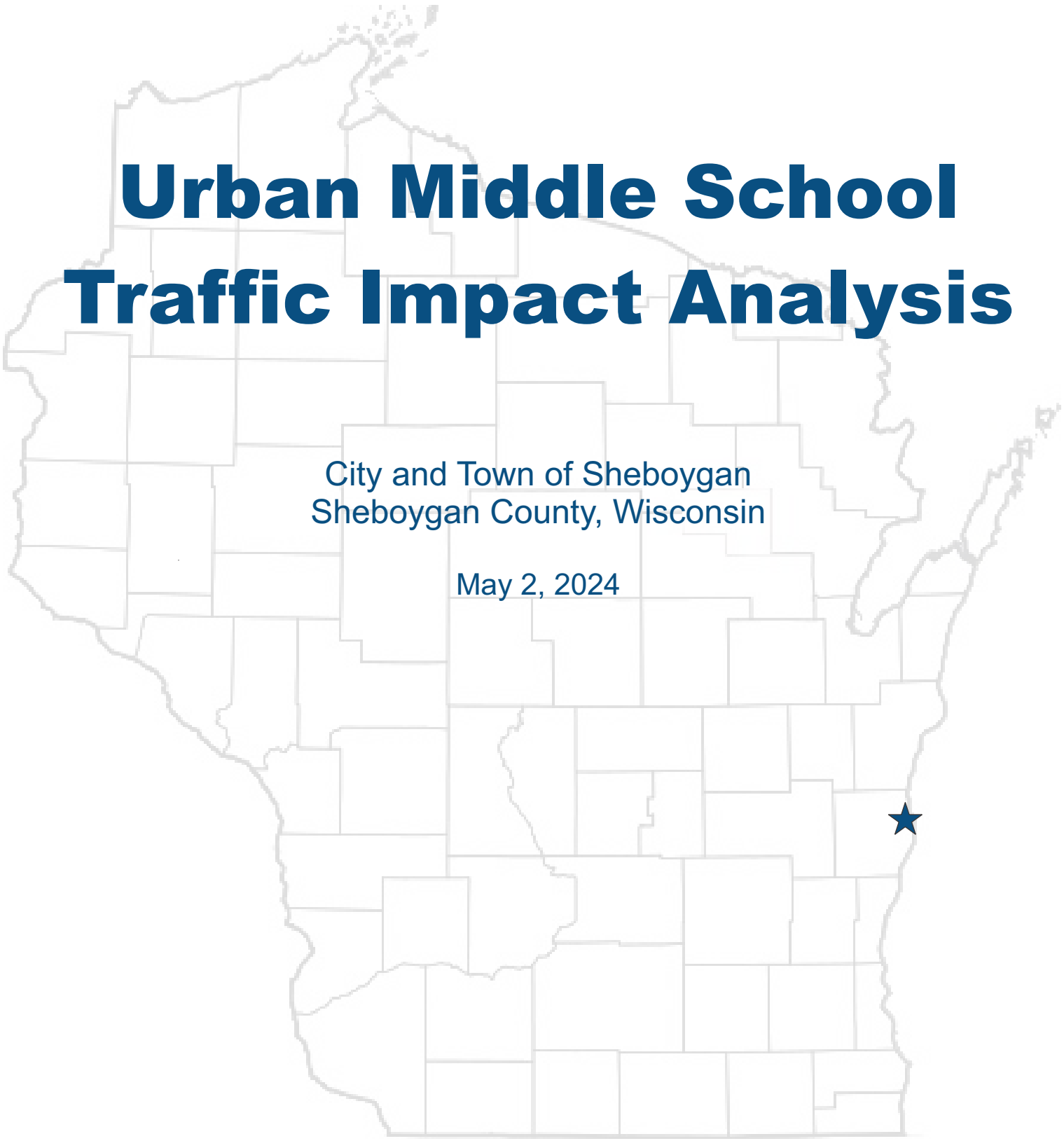
Urban Middle School Traffic Impact Analysis

City and Town of Sheboygan
Sheboygan County, Wisconsin

May 2, 2024

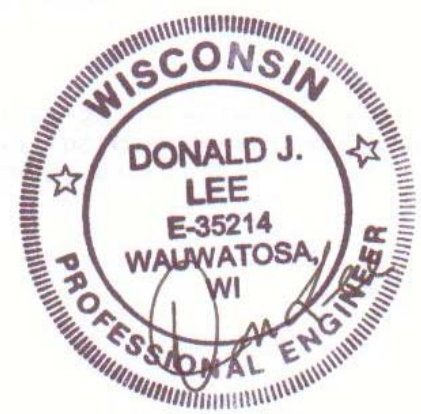


TRAFFIC IMPACT STUDY FOR:

URBAN MIDDLE SCHOOL

CITY & TOWN OF SHEBOYGAN, SHEBOYGAN COUNTY, WISCONSIN

DATE SUBMITTED: May 2, 2024



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"I certify that this Traffic Impact Analysis has been prepared by me or under my immediate supervision and that I have experience and training in the field of traffic and transportation engineering."

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Urban Middle School
Traffic Impact Analysis
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CHAPTER I – INTRODUCTION & EXECUTIVE SUMMARY

PART A – PURPOSE OF REPORT AND STUDY OBJECTIVES

The Sheboygan Area School District is planning to rebuild the Urban Middle School on a parcel of soon to be owned school district land immediately north of Mill Road and west of Najacht Road, about 1 mile northwest of the existing school. An athletic field and basketball courts, to the southwest of the new school, are also planned as part of the overall site. The existing and proposed facilities are located in the City of Sheboygan, Sheboygan County, Wisconsin. A small portion of the proposed school is also located in the Town of Sheboygan.

As part of the proposed middle school plans, the school district has requested a traffic impact analysis be conducted to determine the additional traffic expected to be generated by the proposed middle school and to identify roadway modifications, if any, attributed to the new school for the opening year (2027) traffic scenario. Traffic volumes from the identified offsite developments, located to the north of the site along STH 42, were also included in the background traffic volumes used in this study.

This report documents the procedures, findings, and conclusions of the traffic impact analysis. The analysis identifies recommended modifications based on existing intersection geometrics, background traffic volumes and additional traffic expected to be generated by the anticipated middle school within the limits of the study area.

PART B – EXECUTIVE SUMMARY

The executive summary includes a description of the study area, description of the proposed middle school and conclusions based on the findings of the TIA.

B1. Location of Study Site with Respect to Area Roadway Network

A street map illustrating the location of the existing and proposed schools is shown in Exhibit 1-1. A copy of the conceptual site plan for the proposed middle school is illustrated in Exhibit 1-2. As identified by the study team, the study area for the proposed middle school includes the following intersections:

- Najacht Road with Enterprise Drive (existing one-way stop control)
- Mill Road with STH 42 (existing one-way stop control)
- Mill Road with Lisa Avenue (existing one-way stop control)
- Mill Road with Najacht Road (existing one-way stop control)
- Eisner Avenue with North 21st Street (existing all-way stop control)
- Pigeon River Elementary School Entry with North 21st Street (existing one-way stop control)

In addition to the existing intersections listed above, the following additional proposed intersections are expected to be included in the study area:

- Najacht Road with the proposed north/bus driveway
- Najacht Road with the proposed middle drop-off entrance driveway
- Najacht Road with the proposed south driveway

Finally, the following intersections at the existing Urban Middle School were also evaluated to provide a picture of the existing school operation:

- North Avenue with North 13th Street (existing all-way stop control)
- North Avenue with North 12th Street (existing all-way stop control)

- North 13th Street with the school north access driveway (existing one-way stop control)
- North 12th Street with the school south access driveway (existing one-way stop control)

B2. Development Description

The new Urban Middle School is proposed to be constructed on a parcel of land immediately north of Mill Road and west of Najacht Road and is expected to accommodate the following:

Existing Student Population

- Student population – 595 students

Planning Level Population

- Student population – 650 students

The new middle school is expected to accommodate students from the northeast portion of the overall school district footprint. This boundary is not expected to change from the current status. A map showing the limits of the student population for the Urban Middle School is provided in the appendix.

The proposed middle school construction is planned to begin in the spring of the year 2026 with completion by the beginning of the year 2027/2028 school year.

B3. Site Generated Traffic

The traffic volumes expected to be generated by the new middle school were calculated based on data provided by the school district. According to the school district, 67-percent of the current student population is dropped off at the school with an additional 7-percent of the population utilizing the Shoreline Metro to travel to/from school. The remaining population takes the school buses provided by the district or walks to school. To account for the relocation approximately 1 mile north and in an attempt to be conservative with the assumptions used, it was assumed that about half of the students currently walking would be driven by their parents and the remaining population would be absorbed in the future busing or shuttle service. Based on these assumptions, it was determined that 74-percent of the future student population would be dropped off at the new school site during the weekday morning arrival peak hour.

As a sensitivity analysis, the traffic volumes expected to be generated by the new middle school were also based on the trip rates for a middle school (LU522) as published in the Institute of Transportation Engineer's (ITE) *Trip Generation Manual, 11th Edition*. Trip rates were calculated based on the peak hour of generator instead of the peak hour of adjacent street traffic to account for the worst-case school traffic conditions. Based on the ITE rates, the expected new trips were about 38-percent lower than those calculated based on the data provided by the school district. The calculations and analysis using the ITE rates were provided as a point of comparison.

Under full build (highest student population) conditions and based on data provided by the school district, the proposed middle school is expected to generate 700 new trips (385 entering/315 exiting) during a typical weekday morning arrival peak hour. During a typical weekday afternoon dismissal peak hour, the proposed middle school is expected to generate 340 new trips (165 entering/175 exiting). During a typical weekday evening special event peak hour, the proposed middle school is expected to generate 210 new trips (105 entering/105 exiting). On a typical weekday, the proposed middle school is expected to generate approximately 1,890 new trips (945 entering/945 exiting) under full build conditions.

B4. Offsite Development

Several offsite developments have been identified within the limits of the study area which were taken from the previously approved Northtown Development TIA dated March 22, 2022. The offsite developments are those that are either constructed or are under construction but were not included in the existing traffic volumes used for this study. The offsite developments identified were included in the aforementioned previously approved Northtown Development TIA and are included in the background Traffic volumes in this study as described further in this document. The offsite developments are listed below.

- Northtown Development Full Build (east of 40th Street):
  - Single-Family Residential – 186 units
  - Multifamily Residential – 460 units
  - Retail – 187,000 sf
  - General Office – 68,500 sf
  - Hotel – 90 rooms
- Restaurant Offsite Development (between the IH 43 and 40th Street):
  - Sit Down Restaurant – 7,818 sf
- Residential Offsite Development (west of 40th Street and north of restaurant):
  - Multifamily Residential – 84 units

B5. Proposed Access

As shown in Exhibit 1-2, three new driveways are proposed along the west side of Najacht Road (east side of the proposed school) to accommodate the parent drop off/pickup area, the bus drop off/pickup area and teacher parking lot and the parent/main parking lot. The main parking lot, located to the south of the school, is expected to accommodate 170 parking spaces. A smaller parking lot, accommodating 60 parking spaces, is proposed on the north side of the school for teachers/staff. The middle driveway is proposed as the main driveway to drop off/pickup students in front of the school, where 18 additional parking spaces, including handicap spaces, are provided. Finally, a bus drop-off lane is proposed on the north side of the school to accommodate bus staging with the buses expected to enter the site, loop around the staff parking lot, and exit the site at the same driveway.

B6. Existing & Background Traffic – Recommended Modifications

The study area intersections were analyzed based on the procedures set forth in the *Highway Capacity Manual* (HCM), *6th Edition*. Intersection operation is defined by "level of service." Level of Service (LOS) is a quantitative measure that refers to the overall quality of flow at an intersection ranging from very good, represented by LOS 'A,' to very poor, represented by LOS 'F.' For the purpose of this study, LOS D or better was used to define acceptable peak hour operating conditions.

The existing and background (with offsite development) traffic volumes do not include any school modifications. The analysis was conducted using existing intersection geometrics and traffic control. No modifications are recommended to accommodate the existing and background (with offsite development) traffic volumes. *Modifications are for jurisdictional consideration and are not legally binding. The City of Sheboygan and the Town of Sheboygan reserve the right to determine alternative solutions.*

Higher delays (LOS F) are expected at the Mill Road intersection with STH 42 during the weekday morning arrival, weekday afternoon discharge and weekday evening special event peak hours under background traffic volume conditions. However, traffic signals are not expected to be warranted at the intersection under the background traffic conditions. The intersection should be monitored, and traffic signals considered once traffic volumes increase in the future.

Except as noted, all intersections are currently operating at LOS D or better during the weekday peak periods.

B7. Full Build Traffic – Recommended Modifications

Full build traffic volumes include the full build of the proposed middle school site including future year student population projections. The following modifications, shown in Exhibit 1-3, are recommended to accommodate the full build traffic volume conditions. *Modifications are for jurisdictional consideration and are not legally binding. The City of Sheboygan and the Town of Sheboygan reserve the right to determine alternative solutions.*

School Site (General)

- Consider providing additional stacking space along the pick-up lane in front of the school.

Najacht Road (General)

- Widen the street within the limits of the two south driveways to allow for a dedicated through lane and a dedicated left-turn lane into the site driveways.
- Consider extending the sidewalks along the east side of the street within the limits of the school to the north property line to allow for connection to potential future pedestrian accommodations to the north.

Mill Road (General)

- Consider providing sidewalks along the north side of the street within the limits of the school to the west property line to allow for connection to potential future pedestrian accommodations.

Node 100 – Najacht Road intersection with Enterprise Drive

- No modifications recommended.

Node 200 – Mill Road intersection with STH 42

- Three modification options are recommended for consideration (see discussion below):
- Option 1 - Maintain two-way stop control.
    - No modifications recommended but higher delays and queueing expected.
- Option 2 – Provide fully actuated traffic signal control.
- Option 3 - Construct a dual lane roundabout with two lane approaches on the north and south approaches and single lane approaches on the east and west approaches.

Node 300 – Mill Road intersection with Lisa Avenue

- No modifications recommended.

Node 400 – Mill Road intersection with Najacht Road

- Provide continental-style pedestrian crosswalk pavement markings and pedestrian crossing signs along the west and north approaches of the intersection.

Node 500 – 21st Street/Mill Road intersection with Eisner Avenue

- Three modification options are recommended for consideration (see discussion below):
- Option 1 - Maintain all-way stop control.
    - Provide a dedicated left-turn lane and a shared through/right-turn lane on the north approach (currently a single shared lane).
    - Provide a shared through /left-turn lane and a dedicated right-turn lane on the east approach (currently a wide single shared lane).
    - Provide a shared through /left-turn lane and a dedicated right-turn lane on the south approach (currently a single shared lane).
    - Provide continental-style pedestrian crosswalk pavement markings and pedestrian crossing signs along the east and north approaches of the intersection.
    - Higher delays and queueing expected.
- Option 2 – Provide fully actuated traffic signal control.
    - No modifications recommended on the north or west approaches.
    - Provide a shared through /left-turn lane and a dedicated right-turn lane on the east approach by widening the bike lane (currently a wide single shared lane with a bike lane).
    - Provide a shared through /left-turn lane and a dedicated right-turn lane on the south approach (currently a single shared lane).
    - Provide pedestrian crosswalk pavement markings along all approaches of the intersection.
- Option 3 - Construct a single lane roundabout at the intersection.

Node 600 – 21st Street with Pigeon River School Driveway

- No modifications recommended.

Node 800 – Najacht Road intersection with North/Bus Exit Driveway

- Provide a full access driveway with stop sign control on the west approach.

Node 900 – Najacht Road intersection with Middle Driveway

- Provide a full access driveway with stop sign control on the west approach.
- Widen the south approach of Najacht Road to allow for a dedicated through lane and a dedicated left-turn lane into the site driveway.
- Provide continental-style pedestrian crosswalk pavement markings and pedestrian crossing signs along the north and west approaches of the intersection.

Node 1000 – Najacht Road intersection with South Driveway

- Provide a full access driveway with stop sign control.
- Widen the south approach of Najacht Road to allow for a dedicated through lane and a dedicated left-turn lane into the site driveway.

Higher delays (LOS E/F) are expected at the Mill Road/21st Street intersection with Eisner Avenue under the current all-way stop control, even with additional lanes, during the weekday

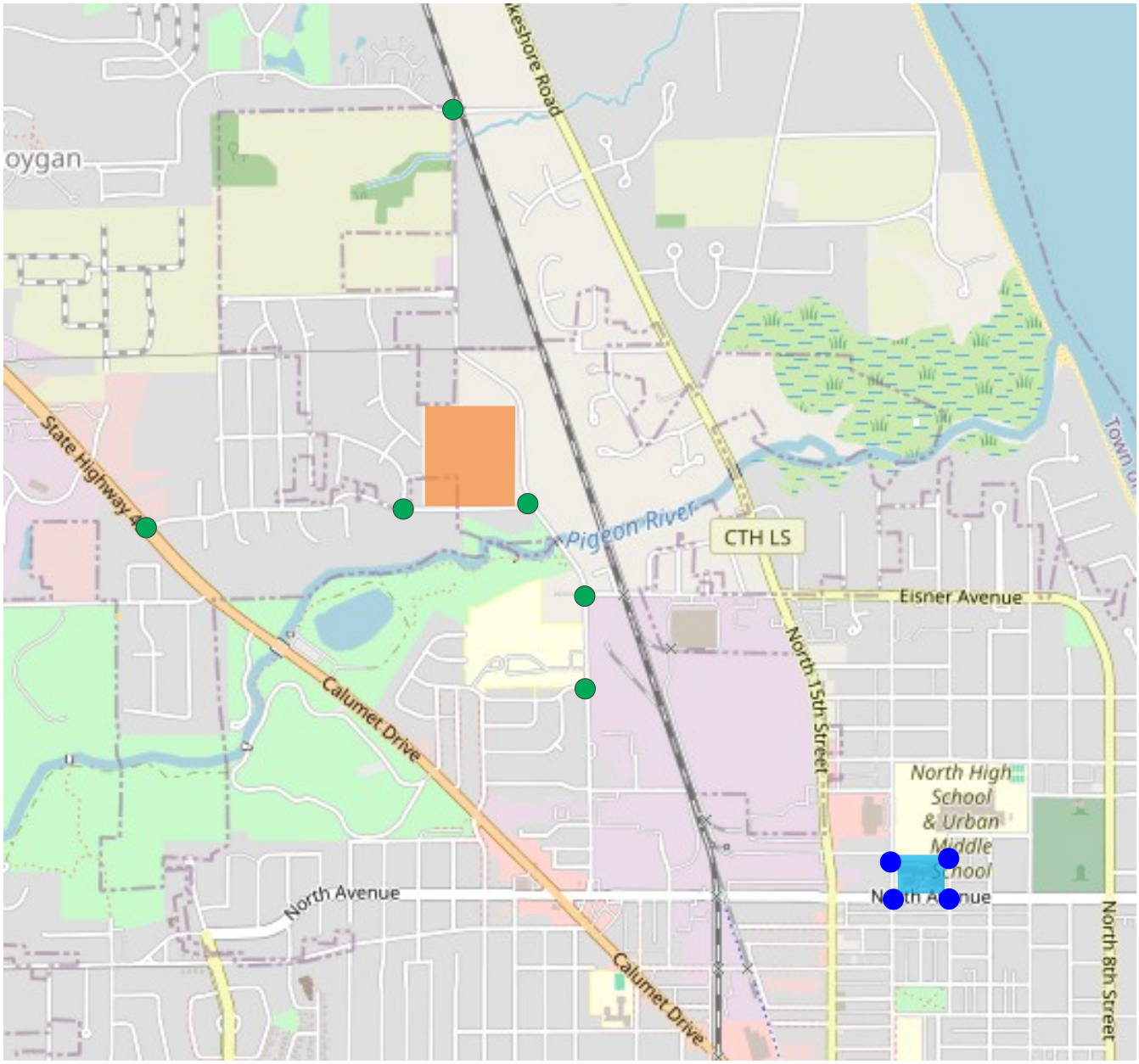
morning arrival peak hour under full build traffic volume conditions. In addition, higher delays (LOS E/F) are expected at the Mill Road intersection with STH 42 during the weekday morning arrival, weekday afternoon discharge and weekday evening special event peak hours under full build traffic volume conditions. However, the highest delays at both intersections are expected during the typical morning arrival and afternoon discharge peak periods (for most schools this occurs for approximately 15 to 30 minutes). During these surge time periods, longer queues can also be expected under the current all-way stop control at the Mill Road/21st Street intersection with Eisner Avenue with queue lengths up to 18 vehicles expected on the east approach of the intersection during the typical weekday. To alleviate these longer delays and queue lengths, a higher-level traffic control application could be considered at both intersections; specifically, traffic signal control or roundabout control.

A traffic signal warrant analysis was completed, and traffic signal control is close to being warranted at the Mill Road/21st Street intersection with Eisner Avenue and is warranted at the Mill Road intersection with STH 42 based on the Peak Hour Warrant and based on the traffic volumes projections calculated for this study. Per the WisDOT Facilities Development Manual (FDM), if an intersection warrants traffic signal control, a modern roundabout should also be evaluated. Therefore, roundabout control was also considered at both intersections. Based on intersection operations and the analysis completed for this study, both traffic signal control and roundabout control are viable alternatives at the two intersections. The decision to provide traffic signal or roundabout control is best made by the local communities. Since cost is a typical major consideration, it is noted that the traffic signal option is likely to cost much less than the roundabout option. Under both scenarios, right-of-way will likely be required to allow for appropriate design standards to be met. However, it is likely that the roundabout alternative will require the greatest amount of right-of-way. In general (not based on a detailed cost estimate), the typical cost of a single-lane roundabout in comparison to a signalized intersection is about two to three times the cost of a new signalized intersection with geometric modifications, dependent on right-of-way needs and complexity of the designs.

The parent drop-off/pick-up area is expected to accommodate up to about 40 parked vehicles adjacent to the school within the drop-off/pick-up area. In order to accommodate a minimum of 85 vehicles which are expected to arrive prior to the final school bell, without modifying the site plan, more than half the vehicles arriving prior to the school bell will be required to queue up within the northbound left-turn lanes into the site on Najacht Road, with some parents required to park in the southern parking lot once the left-turn lane fills up. With no on-street parking available adjacent to the site, adequate parking supply should be considered for these additional vehicles during the school discharge peak period to allow for adequate operations within the overall site and to lessen or avoid any spill backs onto the adjacent transportation network to the south of the school.

B8. Conclusion

To accommodate the full build out of the proposed middle school, recommended modifications are expected to be necessary to the transportation network. Except as noted, all movements at the study area intersections are expected to operate safely and efficiently with the modifications identified in this TIA with the proposed middle school site.



LEGEND

- Existing Site Study Intersections
- Proposed Site Study Intersections
- Urban Middle School Existing Site
- Urban Middle School Proposed Site

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EXHIBIT 1-1
PROJECT OVERVIEW MAP

SHEBOYGAN, WISCONSIN

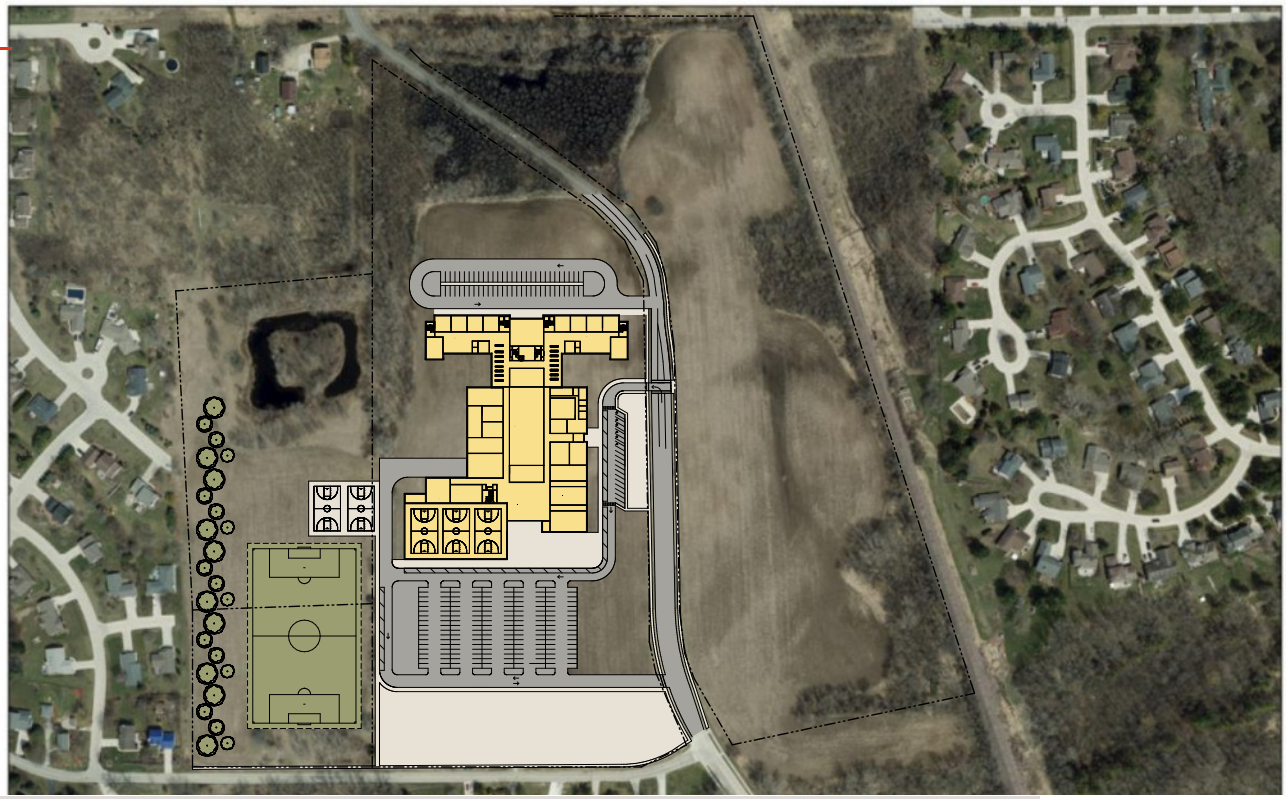

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EXHIBIT 1-2
CONCEPTUAL SITE PLAN

SHEBOYGAN, WISCONSIN

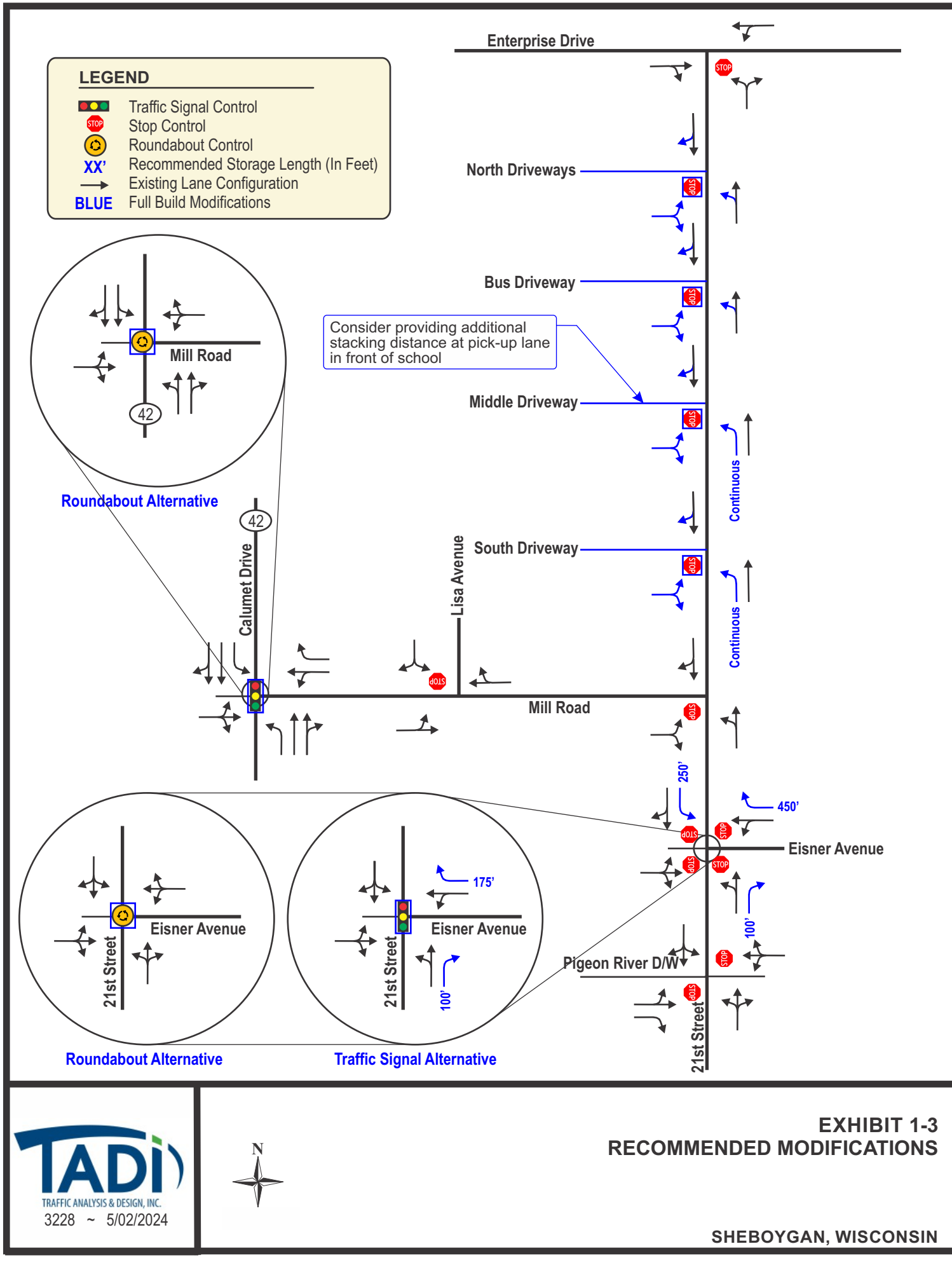

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EXHIBIT 1-3
RECOMMENDED MODIFICATIONS

SHEBOYGAN, WISCONSIN

CHAPTER II – PROPOSED DEVELOPMENT

PART A – DEVELOPMENT SITE

A1. Development Description and Site Location

The Sheboygan Area School District is planning to rebuild the Urban Middle School on a parcel of soon to be owned school district land immediately north of Mill Road and west of Najacht Road, about 1 mile northwest of the existing school. An athletic field and basketball courts, to the southwest of the new school, are also planned as part of the overall site. The existing and proposed facilities are located in the City of Sheboygan, Sheboygan County, Wisconsin. A small portion of the proposed school is also located in the Town of Sheboygan. A street map illustrating the locations of the existing and proposed schools is shown in Exhibit 2-1.

A2. Land Use and Intensity

The proposed middle school site is currently being utilized for agricultural uses. The overall site is bordered by residential uses to the east, west and north with a few additional residential houses immediately to the south along the south side of Mill Road. An environmental corridor (Pigeon River) also exists to the south, immediately south of the aforementioned houses.

A3. Site Plan

A copy of the conceptual site plan for the proposed middle school is illustrated in Exhibit 2-2. The proposed building is generally located in the middle portion of the overall site. Three new driveways are proposed along the west side of Najacht Road (east side of the proposed school) to accommodate the parent drop off/pickup area, the bus drop off/pickup area and teacher parking lot and the parent/main parking lot. The main parking lot, located to the south of the school, is expected to accommodate 170 parking spaces. A smaller parking lot, accommodating 60 parking spaces, is proposed on the north side of the school for teachers/staff. The middle driveway is proposed as the main driveway to drop off/pickup students in front of the school, where 18 additional parking spaces, including handicap spaces, are provided. Finally, a bus drop-off lane is proposed on the north side of the school to accommodate bus staging with the buses expected to enter the site, loop around the staff parking lot, and exit the site at the same driveway. An athletic field and basketball courts, to the southwest of the new school, are also planned as part of the overall site.

A4. Development Phasing and Timing

The new Urban Middle School is proposed to be constructed on a parcel of land immediately north of Mill Road and west of Najacht Road and is expected to accommodate the following:

Existing Student Population

- Student population – 595 students

Planning Level Population

- Student population – 650 students

The new middle school is expected to accommodate students from the northeast portion of the overall school district footprint. This boundary is not expected to change from the current status. A map showing the limits of the student population for the Urban Middle School is provided in the appendix.

The proposed middle school construction is planned to begin in the spring of the year 2026 with completion by the beginning of the year 2027/2028 school year.

PART B – STUDY AREA

B1. Influence Area

The proposed middle school is expected to draw from the local area based on the Sheboygan Area School District Middle School boundary plans which include accommodating the student populations from the following elementary schools:

- Pigeon Rive Elementary
- Grant Elementary
- Cooper Elementary (split with Horace Mann Middle School)
- Jefferson Elementary (split with Horace Mann Middle School)

A map showing the limits of the Urban Middle School boundary is included in the appendix of this report.

B2. Area of Significant Traffic Impact

As identified by the study team, the study area for the proposed middle school includes the following intersections:

- Najacht Road with Enterprise Drive (existing one-way stop control)
- Mill Road with STH 42 (existing one-way stop control)
- Mill Road with Lisa Avenue (existing one-way stop control)
- Mill Road with Najacht Road (existing one-way stop control)
- Eisner Avenue with North 21st Street (existing all-way stop control)
- Pigeon River Elementary School Entry with North 21st Street (existing one-way stop control)

In addition to the existing intersections listed above, the following additional proposed intersections are expected to be included in the study area:

- Najacht Road with the proposed north/bus driveway
- Najacht Road with the proposed middle drop-off entrance driveway
- Najacht Road with the proposed south driveway

Finally, the following intersections at the existing Urban Middle School were also evaluated to provide a picture of the existing school operation:

- North Avenue with North 13th Street (existing all-way stop control)
- North Avenue with North 12th Street (existing all-way stop control)
- North 13th Street with the school north access driveway (existing one-way stop control)
- North 12th Street with the school south access driveway (existing one-way stop control)

PART C – SITE ACCESSIBILITY

C1. Study Area Roadways

The study area roadways for the existing site include the following:

North Avenue is a two-lane divided east/west minor arterial with a posted speed limit of 25 miles per hour (mph) within the limits of the study area. According to WisDOT, the Year 2021 average annual daily traffic volumes (AADT's) on North Avenue were

approximately 7,800-vpd west of North 13th Street. Sidewalks exist along both sides of North Avenue within the limits of the study area.

North 13th Street is a two-lane undivided north/south local street with a posted speed limit of 25-mph. No AADT's are currently available for North 13th Street. Sidewalks exist along both sides of North 13th Street within the limits of the study area.

North 12th Street is a two-lane undivided north/south local street with a posted speed limit of 25-mph. No AADT's are currently available for North 12th Street. Sidewalks exist along both sides of North 12th Street within the limits of the study area.

The study area roadways for the proposed site are discussed below:

STH 42 is a four-lane undivided north/south principal arterial with a posted speed limit of 40-mph within the limits of the Mill Road intersection and 35-mph further to the south. The WisDOT Year 2021 AADT's on STH 42 were approximately 15,400-vpd north of Mill Road and 14,300-vpd immediately south. Sidewalks do not currently exist along either side of STH 42 within the limits of the study area.

Mill Road is a two-lane undivided east/west major collector street with a posted speed limit of 25-mph from STH 42 to the west up to Eisner Avenue on the east. An advisory 15-mph speed limit is also posted within a curve section between Lisa Avenue and Kennedy Circle. The WisDOT Year 2021 AADT's on Main Street were approximately 3,400-vpd immediately east of STH 42. Sidewalks do not currently exist along either side of Mill Road between STH 42 and Najacht Road; however, they do exist along both sides of Mill Road between Najacht Road and Eisner Avenue.

Eisner Avenue is a two-lane undivided east/west major collector street with a posted speed limit of 25-mph within the limits of the study area. The WisDOT Year 2021 AADT's on Eisner Avenue were approximately 4,200-vpd east of 21st Street. Sidewalks exist along only the north side of Eisner Avenue within the limits of the study area.

21st Street is a two-lane undivided north/south major collector street with a posted speed limit of 25-mph within the limits of the study area. The WisDOT Year 2021 AADT's on 21st Street were approximately 2,800-vpd south of Eisner Avenue. Sidewalks exist along only the west side of 21st Street within the limits of the study area.

Najacht Road is a two-lane undivided north/south local collector street with a posted speed limit of 35-mph between Enterprise Drive to the north and Mill Road to the south. No AADT's are currently available for Najacht Road. Sidewalks exist along both sides of Najacht Road from Mill Road up to a point about 325 feet to the north.

Enterprise Drive is a two-lane undivided east/west local collector street with a posted speed limit of 25-mph within the limits of the study area. No AADT's are currently available for Enterprise Drive. Sidewalks do not currently exist along either side of Enterprise Drive within the limits of the study area.

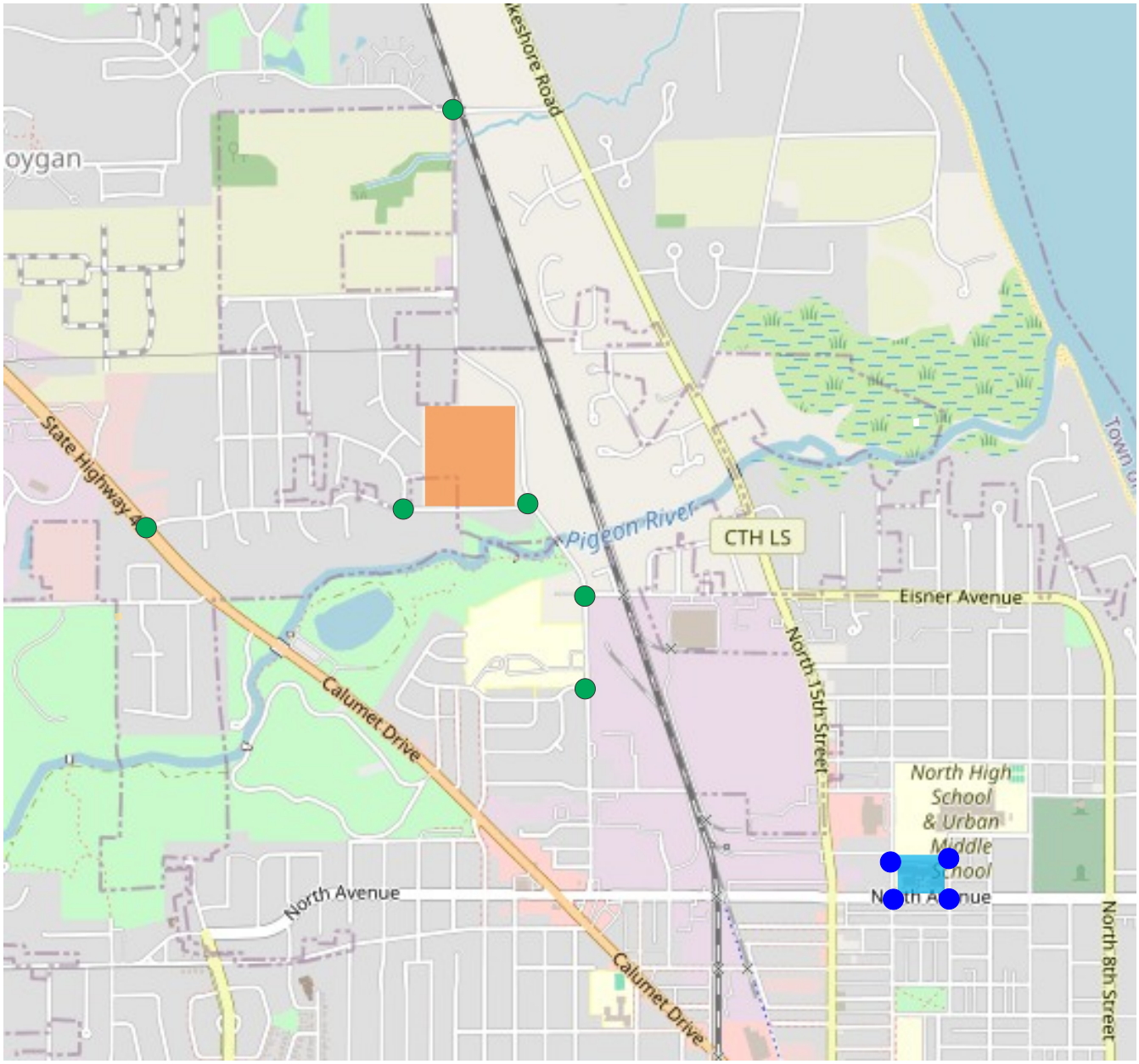
C2. Alternative Modes of Transportation

Sidewalks are provided along several of the streets adjacent to the existing and proposed schools as described above. No on-street bicycle facilities were identified along any of the roadways.

Shoreline Metro operates one route through the limits of the existing Urban Middle School area. Route 5 travels adjacent to the existing school along North 13th Street. All routes run with 30-minute headways from approximately 5:15 am to 5:15 pm. There are currently no public transit

routes planned within the limits of the proposed school location; however, it was assumed that a future shuttle service would provide for similar ridership to/from the school in the future.

Limited school busing is also provided within the school district. For the purposes of this study, it was assumed that up to five buses (four school buses plus one metro bus) will provide busing for students to the Urban Middle School.



LEGEND

- Existing Site Study Intersections
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EXHIBIT 2-1
PROJECT OVERVIEW MAP

SHEBOYGAN, WISCONSIN

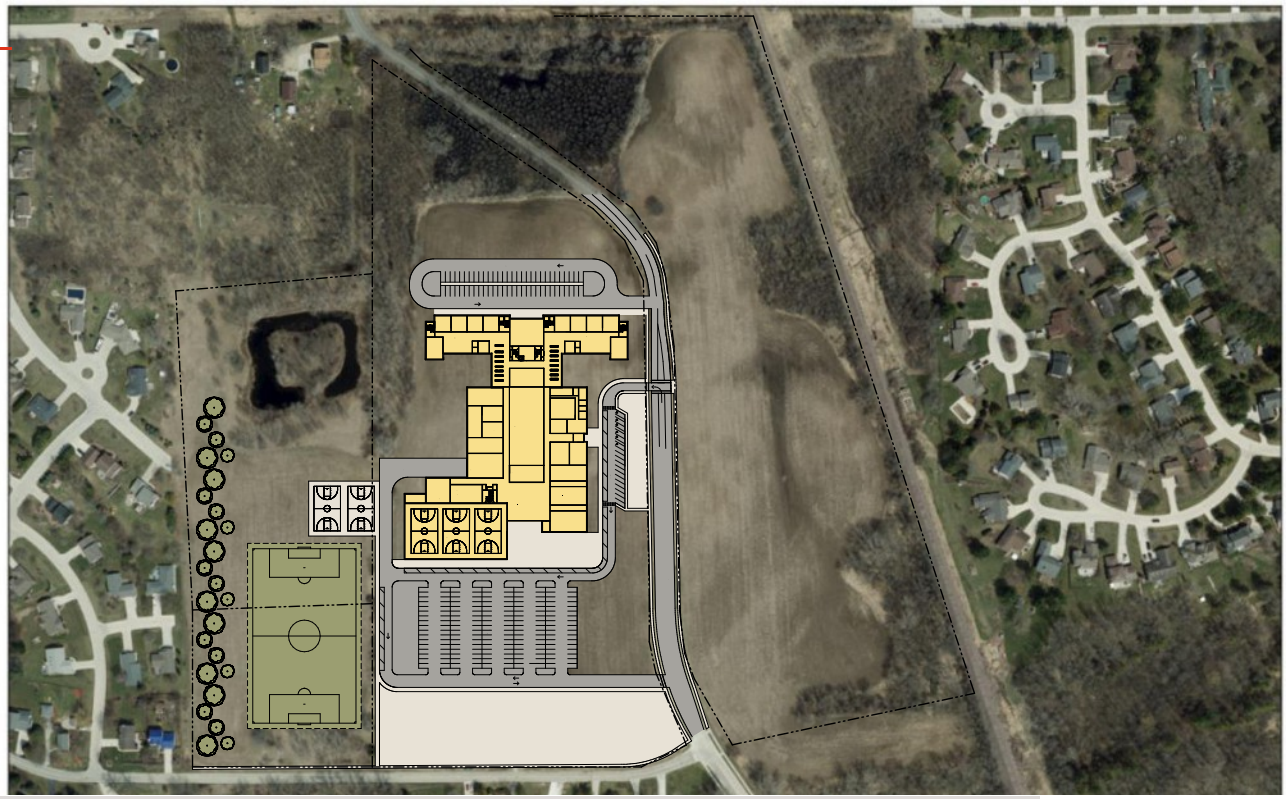

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EXHIBIT 2-2
CONCEPTUAL SITE PLAN

SHEBOYGAN, WISCONSIN

CHAPTER III – ANALYSIS OF EXISTING CONDITIONS

PART A – PHYSICAL CHARACTERISTICS

Exhibits 3-1A&B show the existing transportation detail for the study area intersections at the existing middle school and proposed middle school sites, respectively. More specifically, the exhibits illustrate intersection lane configurations, intersection traffic controls, posted speed limits, and approximate intersection spacing.

PART B – TRAFFIC VOLUMES

The weekday morning school arrival and weekday afternoon school discharge peak hours are expected to drive the improvements needed to adequately accommodate the middle school, as they represent the highest trip generation for the site. Therefore, in mid-March of 2024, TADI conducted weekday morning arrival peak hour (6:45 to 7:45 am) and weekday afternoon peak period (2:30 to 6:00 pm) turning movement traffic counts at the study area intersections. The count hours were chosen to coincide with the middle school bell schedule. It is noted that the Pigeon River Elementary School bell schedule (8:45 am to 3:45 pm) falls outside the peak hours coinciding with the Urban Middle School bell schedule.

Based on the turning movement counts and the Urban Middle School bell schedule; the weekday morning and weekday afternoon peak school hours were identified as being 6:45 to 7:45 am and 2:30 to 3:30 pm; respectively. These peak hours coincide with the expected school start and end times of 7:40 am and 3:03 pm, respectively. A separate weekday evening special event peak hour, identified as 4:30 to 5:30 pm, was also evaluated as part of the study. This peak hour is expected to coincide with a boy's middle school basketball game. The existing traffic volumes at the existing middle school, balanced along the study area corridors, are shown in Exhibit 3-2A. The existing traffic volumes at the proposed school location, balanced along the study area corridors, are shown in Exhibit 3-2B. The background traffic volumes, which include the identified offsite developments, were added on top of the existing traffic volumes, as described in *Chapter IV – Part B*, and are shown in Exhibit 3-2C. The traffic counts used to determine peak hour factors and truck percentages have been included in the appendix of this study.

PART C – CAPACITY LEVEL OF SERVICE

C1. Level of Service Definitions

The study area intersections were analyzed based on the procedures set forth in the *Highway Capacity Manual* (HCM), *6th Edition.* Intersection operation is defined by "level of service." Level of service (LOS) is a quantitative measure that refers to the overall quality of flow at an intersection ranging from very good, represented by LOS 'A,' to very poor, represented by LOS 'F.' For the purpose of this study, LOS D was used to define acceptable peak hour operating conditions. Peak hour factors (PHF's) in the modeling software were adjusted down slightly to calibrate the models to actual queues observed during data collection. The same PHF's at the existing middle school intersection were utilized at the intersections adjacent to the new middle school to allow for a more accurate build condition. Descriptions of the various levels of service are as follows:

> *LOS A* is the highest level of service that can be achieved. Under this condition, intersection approaches appear quite open, turning movements are easily made, and nearly all drivers find freedom of operation. At signalized and unsignalized intersections, average delays are less than 10 seconds.
>
> *LOS B* represents stable operation. At signalized intersections, average vehicle delays are 10 to 20 seconds. At unsignalized intersections, average delays are 10 to 15 seconds.

LOS C still represents stable operation, but periodic backups of a few vehicles may develop behind turning vehicles. Most drivers begin to feel restricted, but not objectionably so. At signalized intersections, average vehicle delays are 20 to 35 seconds. At unsignalized intersections, average delays are 15 to 25 seconds.

LOS D represents increasing traffic restrictions as the intersection approaches instability. Delays to approaching vehicles may be substantial during short peaks within the peak period, but periodic clearance of long lines occurs, thus preventing excessive backups. At signalized intersections, average vehicle delays are 35 to 55 seconds. At unsignalized intersections, average delays are 25 to 35 seconds.

LOS E represents the capacity of the intersection. At signalized intersections, average vehicle delays are 55 to 80 seconds. At unsignalized intersections, average delays are 35 to 50 seconds.

LOS F represents jammed conditions where the intersection is over capacity and acceptable gaps for unsignalized intersections in the mainline traffic flow are minimal. At signalized intersections, average vehicle delays exceed 80 seconds. At unsignalized intersections, average delays exceed 50 seconds.

C2. Existing Traffic Operations

Exhibit 3-3A shows the existing traffic peak hour operating conditions at the study area intersections at the existing school location. The existing traffic analysis at the existing school location was conducted using the existing lane configurations shown in Exhibit 3-1A and the existing traffic volumes shown in Exhibit 3-2A.

Exhibit 3-3B shows the existing traffic peak hour operating conditions at the study area intersections at the proposed school location. The existing traffic analysis at the proposed location was conducted using the existing lane configurations shown in Exhibit 3-1B and the existing traffic volumes shown in Exhibit 3-2B.

As shown in Exhibit 3-3A, for the existing school location, all movements are currently operating acceptably at LOS D or better at the study area intersections under the existing traffic volume conditions during the weekday morning and weekday afternoon peak periods except the eastbound and westbound movements at the North Avenue intersection with 13th Street which are currently operating unacceptably at LOS E and longer queues (about 10 vehicles) during the typical weekday afternoon discharge peak hour under existing traffic volume conditions.

As shown in Exhibit 3-3B, for the proposed school location without the new school traffic included, all movements are currently operating acceptably at LOS D or better at the study area intersections under the existing traffic volumes conditions during the weekday morning, weekday afternoon and weekday evening special event peak periods.

C3. Background Traffic Operations

Exhibit 3-3C shows the background (with offsite development) traffic peak hour operating conditions at the study area intersections at the proposed school location. The background traffic analysis at the proposed school location was conducted using the existing lane configurations shown in Exhibit 3-1A and the background traffic volumes shown in Exhibit 3-2C, which include the previously approved offsite developments.

As shown in Exhibit 3-3C, for the proposed school location without the new school traffic included but with the previously approved offsite developments, all movements are expected to continue to operate acceptably at LOS D or better at the study area intersections under the background traffic volumes conditions during the weekday morning, weekday afternoon and

weekday evening special event peak periods except the eastbound and westbound left-turn movements at the STH 42 intersection with Mill Road which are expected to operate at LOS E/F during the typical weekday morning arrival, weekday afternoon discharge and weekday evening special event peak hours under background traffic conditions.

C4. Existing Traffic and Pedestrian/Student Observations

As described above, operational deficiencies (LOS E, up to 12 seconds over the LOS D threshold) exist at the North Avenue intersection with 13th Street during the weekday afternoon discharge peak hour under full build traffic volume conditions. In addition, longer queues are also currently being experienced during this surge time period with queue lengths of 9 to 11 vehicles on the west approach of the intersection. TADI observed weekday morning arrival and afternoon dismissal operations during the data collection on a typical school day in mid-March of 2024. During these observation periods the interaction between vehicles and students as well as the current queuing being experienced by parents during the school arrival and departure peak periods was observed along North Avenue, 12th Street and 13th Street. The following observations were recorded from two site visits conducted in mid-March as part of this study:

School Arrival

- Morning arrival school bell at 7:40 am.
- The longest queues and heaviest vehicular traffic occurred between 7:19 and 7:31 am with a slight surge also occurring for about 1 minute at 7:36 am.
- Most vehicles dropped off students on the west side of 12th Street, east side of 13th Street and north side of North Avenue; however, a good number of parents also dropped off students on the opposite sides of each of these streets (east side of 12th Street, west side of 13th Street and south side of North Avenue) requiring students to cross the streets to get to the school site. Many students crossed where they were dropped off; that is, not at cross walks but at a mid-block point.
- Parents also dropped off students at other locations to the east and west of the school on North Avenue and to the south of North Avenue along 12th Street and 13th Street. For these students, most crossed North Avenue at the all-way stop sign-controlled intersections at 12th Street and 13th Street.

School Dismissal

- Afternoon dismissal school bell at 3:03 pm.
- The longest queues (up to 11 vehicles eastbound and westbound on North Avenue) and heaviest vehicular traffic occurred between 3:07 and 3:15 pm.
- Most children and parents were out of the area by 3:17 pm.
- Parents parked and picked up their students on all adjacent streets due to the limited pick-up space adjacent to the school.
- Many students crossed 12th Street, 13th Street and North Avenue midblock running between vehicles to go directly to their parent's parked vehicles.

PART D – SOURCES OF DATA

The following sources of data were obtained for use in conducting this traffic study:

- Turning movement traffic counts – TADI

- Existing transportation details – TADI along with Google Earth
- On-Site Development information – Bray Architects and Sheboygan Area School District
- Off-Site Development information – Town of Sheboygan

LEGEND

- STOP Stop Control
- → Existing Lane Configuration
- *XX'* Distance Between Roadways (in Feet)

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N
NOT TO SCALE

EXHIBIT 3-1A
EXISTING TRANSPORTATION DETAIL
EXISTING MIDDLE SCHOOL SITE

SHEBOYGAN, WISCONSIN

LEGEND

- STOP Stop Control
- → Existing Lane Configuration
- XX' Existing Storage Length (in Feet)
- +++ Railroad Tracks
- ***XX'*** Distance Between Roadways (in Feet)

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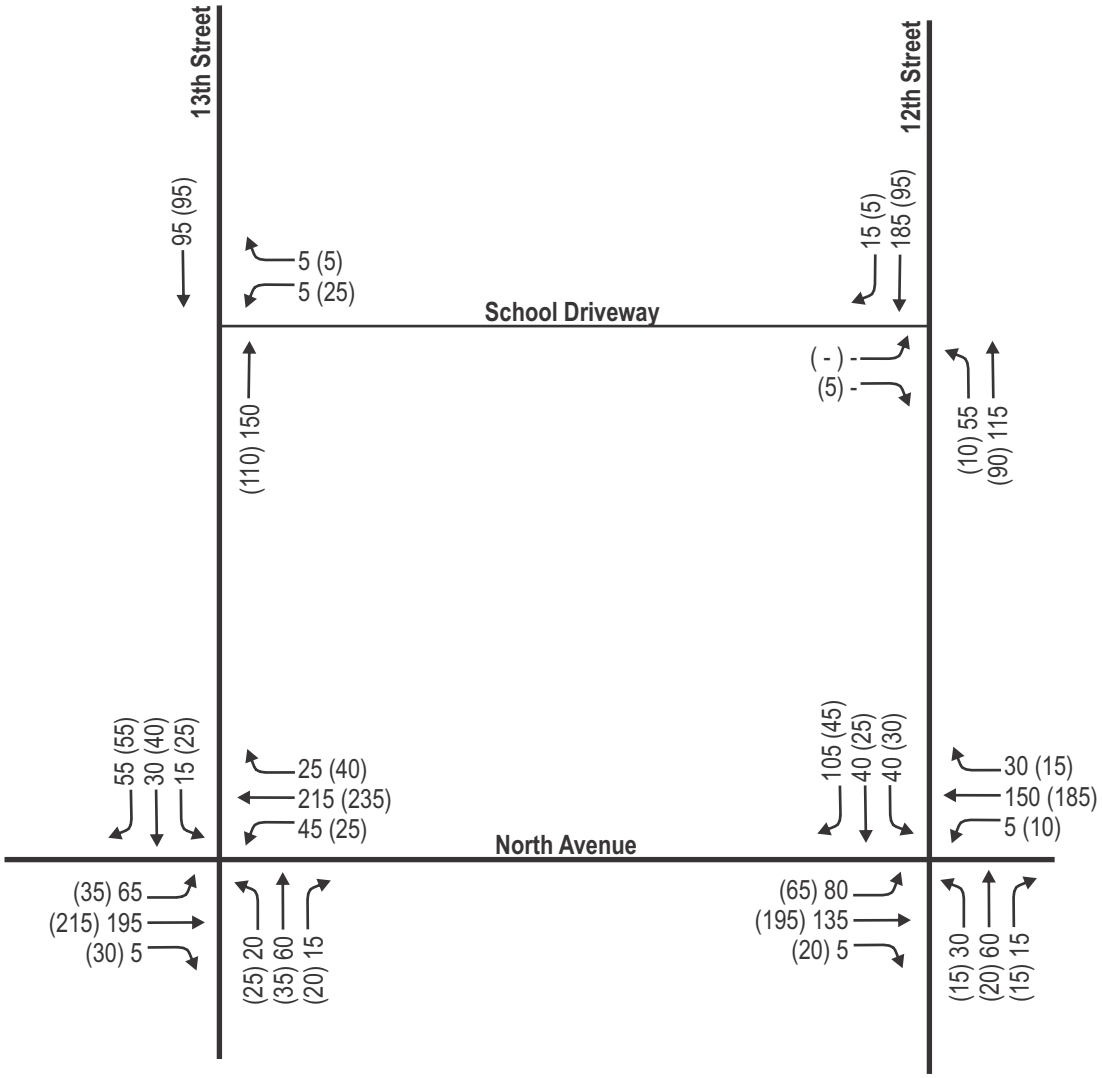
N

NOT TO SCALE

EXHIBIT 3-1B
EXISTING TRANSPORTATION DETAIL
PROPOSED MIDDLE SCHOOL SITE

SHEBOYGAN, WISCONSIN



LEGEND

XX	AM Peak Hour Volumes (6:45-7:45 AM)
(XX)	PM Peak Hour Volumes (2:30-3:30 PM)
-	Negligible Traffic Volumes (Fewer than 3 vph)

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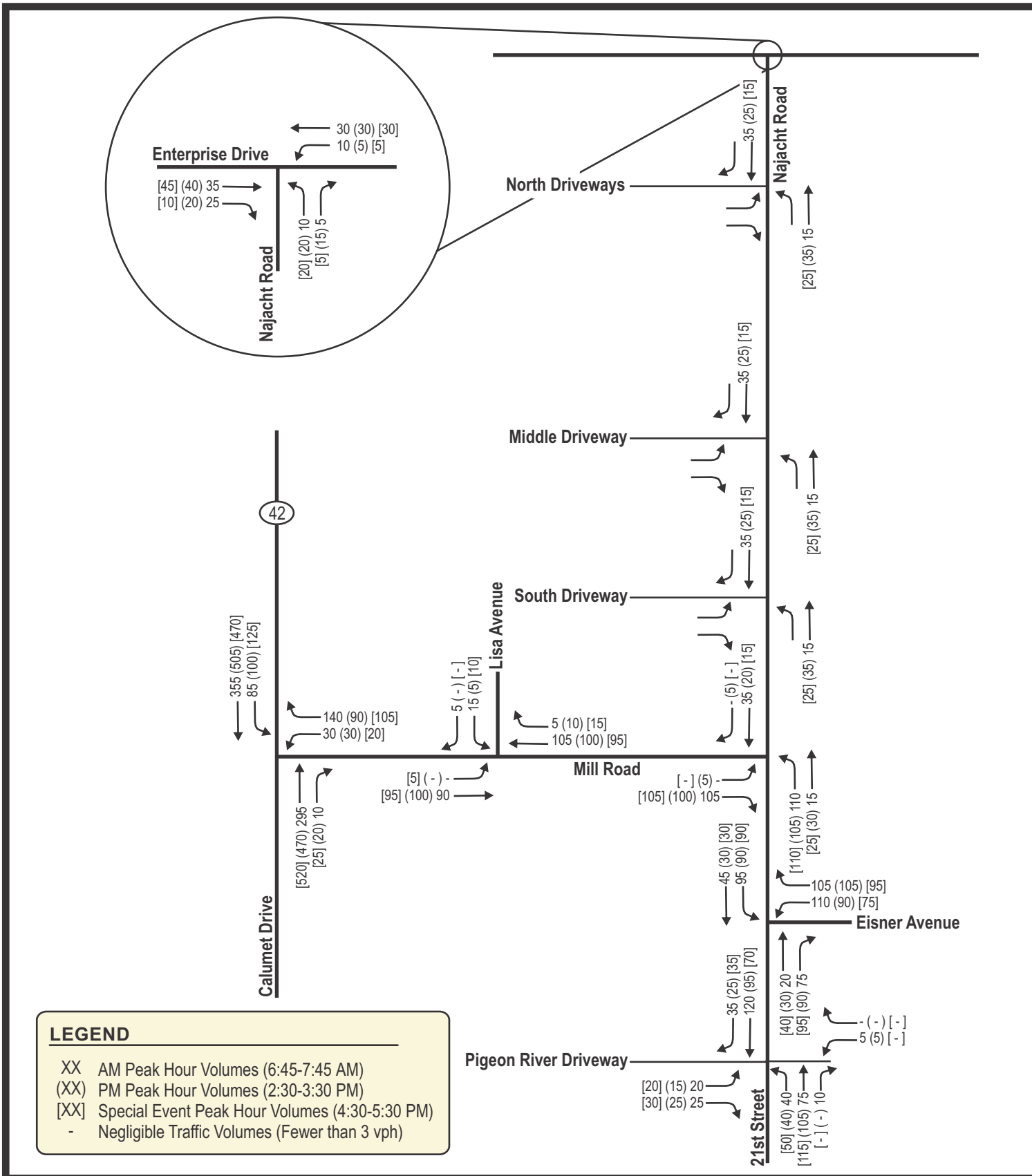
EXHIBIT 3-2A
EXISTING TRAFFIC VOLUMES
EXISTING MIDDLE SCHOOL SITE

SHEBOYGAN, WISCONSIN



LEGEND

XX	AM Peak Hour Volumes (6:45-7:45 AM)
(XX)	PM Peak Hour Volumes (2:30-3:30 PM)
[XX]	Special Event Peak Hour Volumes (4:30-5:30 PM)
-	Negligible Traffic Volumes (Fewer than 3 vph)

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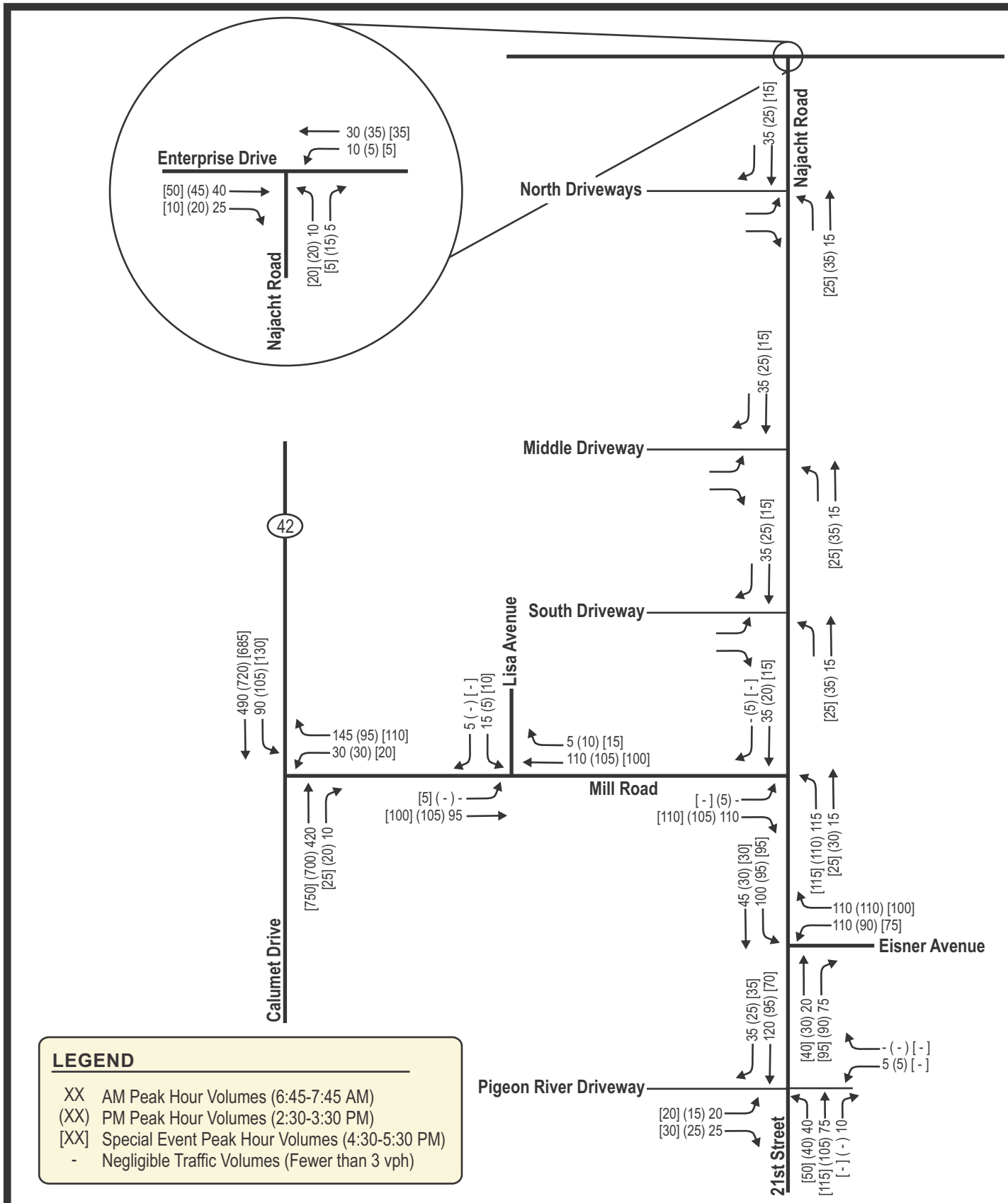
EXHIBIT 3-2B
EXISTING TRAFFIC VOLUMES
PROPOSED MIDDLE SCHOOL SITE

SHEBOYGAN, WISCONSIN



LEGEND

XX	AM Peak Hour Volumes (6:45-7:45 AM)
(XX)	PM Peak Hour Volumes (2:30-3:30 PM)
[XX]	Special Event Peak Hour Volumes (4:30-5:30 PM)
-	Negligible Traffic Volumes (Fewer than 3 vph)

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EXHIBIT 3-2C
BACKGROUND TRAFFIC VOLUMES
PROPOSED MIDDLE SCHOOL SITE
INCLUDES PREVIOUSLY APPROVED OFFSITE DEVELOPMENTS

SHEBOYGAN, WISCONSIN

Exhibit 3-3A
Existing Traffic Peak Hour Operating Conditions
With Existing Geometrics and Traffic Control

Intersection	Peak Hour	Metric	Level of Service (LOS) per Movement by Approach											
			Eastbound			Westbound			Northbound			Southbound		
			↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Node 10: 13th Street & North Avenue *All-Way Stop Control*		*Lanes->*	*1*		*1*	*1*		*1*	*1*		*1*	*1*		*1*
	AM	LOS	D		A	D		A	B		B	B		B
		Delay	31.7		8.7	30.6		9.0	14.1		10.3	12.4		11.5
		Queue	195'		25'	190'		25'	30'		25'	25'		25'
	PM	LOS	E		A	E		A	B		B	B		B
		Delay	42.7		9.6	46.2		9.8	14.4		11.1	14.2		12.1
		Queue	245'		25'	265'		25'	25'		25'	30'		25'
Node 20: 12th Street & North Avenue *All-Way Stop Control*		*Lanes->*	*1*		*1*	*1*		*1*	*1*		*1*	*1*		*1*
	AM	LOS	C		A	C		A	B		A	B		B
		Delay	23.9		8.9	16.3		9.5	13.8		9.8	13.0		12.2
		Queue	135'		25'	70'		25'	35'		25'	30'		35'
	PM	LOS	D		A	C		A	B		A	B		B
		Delay	29.6		8.4	18.3		8.5	11.7		9.9	12.3		10.4
		Queue	200'		25'	105'		25'	25'		25'	25'		25'
Node 30: 13th Street & North Driveway *One-Way Stop Control*		*Lanes->*	-			*1*			*1*			*1*		
	AM	LOS	-			B			*			*		
		Delay	-			10.5			*			*		
		Queue	-			25'			*			*		
	PM	LOS	-			B			*			*		
		Delay	-			11.1			*			*		
		Queue	-			25'			*			*		
Node 40: 12th Street & North Driveway *One-Way Stop Control*		*Lanes->*	*1*			-			*1*		-	-		*1*
	AM	LOS	B			-			A		-	-		*
		Delay	12.5			-			8.2		-	-		*
		Queue	25'			-			25'		-	-		*
	PM	LOS	A			-			A		-	-		*
		Delay	9.6			-			7.6		-	-		*
		Queue	25'			-			25'		-	-		*

(-) indicates a movement that is prohibited or does not exist; (*) indicates a freeflow movement.
Delay is reported in seconds. Queue is the maximum of the 50th & 95th percentile queue, measured in feet.

Exhibit 3-3B
Existing Traffic Peak Hour Operating Conditions
With Existing Geometrics and Traffic Control

Intersection	Peak Hour	Metric	Level of Service (LOS) per Movement by Approach											
			Eastbound			Westbound			Northbound			Southbound		
			↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Node 100: Najacht Road & Enterprise Drive *One-Way Stop Control*		*Lanes->*	-	*1*		*1*		-		*1*			-	
	AM	LOS	-	*		A		-		A			-	
		Delay	-	*		7.5		-		9.3			-	
		Queue	-	*		25'		-		25'			-	
	PM	LOS	-	*		A		-		A			-	
		Delay	-	*		7.4		-		9.4			-	
		Queue	-	*		25'		-		25'			-	
	Spec Event	LOS	-	*		A		-		A			-	
		Delay	-	*		7.3		-		9.1			-	
		Queue	-	*		25'		-		25'			-	
Node 200: Mill Road & STH 42 *Two-Way Stop Control*		*Lanes->*	*1*			*1*		*1*	*1*		*2*	*1*		*2*
	AM	LOS	C			D		B	A		*	A		*
		Delay	21.7			26.5		11.0	8.4		*	8.6		*
		Queue	25'			25'		25'	25'		*	25'		*
	PM	LOS	D			D		B	A		*	A		*
		Delay	25.0			34.4		10.9	8.7		*	9.0		*
		Queue	25'			25'		25'	25'		*	25'		*
	Spec Event	LOS	D			D		B	A		*	A		*
		Delay	25.3			33.4		11.1	8.4		*	9.2		*
		Queue	25'			25'		25'	25'		*	25'		*
Node 300: Mill Road & Lisa Avenue *One-Way Stop Control*		*Lanes->*	*1*		-	-		*1*		-			*1*	
	AM	LOS	A		-	-		*		-			B	
		Delay	7.6		-	-		*		-			10.6	
		Queue	25'		-	-		*		-			25'	
	PM	LOS	A		-	-		*		-			A	
		Delay	7.5		-	-		*		-			9.7	
		Queue	25'		-	-		*		-			25'	
	Spec Event	LOS	A		-	-		*		-			A	
		Delay	7.5		-	-		*		-			9.7	
		Queue	25'		-	-		*		-			25'	
Node 400: Mill Road & Najacht Road *One-Way Stop Control*		*Lanes->*	*1*			-			*1*		-	-		*1*
	AM	LOS	A			-			A		-	-		*
		Delay	9.3			-			7.6		-	-		*
		Queue	25'			-			25'		-	-		*
	PM	LOS	A			-			A		-	-		*
		Delay	9.1			-			7.5		-	-		*
		Queue	25'			-			25'		-	-		*
	Spec Event	LOS	A			-			A		-	-		*
		Delay	8.9			-			7.4		-	-		*
		Queue	25'			-			25'		-	-		*
Node 500: 21st Street/Mill Road & Eisner Avenue *All-Way Stop Control*		*Lanes->*	*1*			*1*			*1*		*1*	*1*		
	AM	LOS	A			B			A		A	B		
		Delay	8.3			11.6			8.8		8.7	10.7		
		Queue	25'			60'			25'		25'	35'		
	PM	LOS	A			A			A		A	A		
		Delay	7.8			9.3			8.3		8.0	9.2		
		Queue	25'			30'			25'		25'	25'		
	Spec Event	LOS	A			A			A		A	A		
		Delay	7.8			8.8			8.2		7.8	8.9		
		Queue	25'			30'			25'		25'	25'		
Node 600: 21st Street & Pigeon River School Driveway *Two-Way Stop Control*		*Lanes->*	*1*		*1*	*1*			*1*			*1*		
	AM	LOS	C		B	B			A			A		
		Delay	15.0		10.6	12.6			7.9			7.5		
		Queue	25'		25'	25'			25'			25'		
	PM	LOS	B		A	B			A			A		
		Delay	12.3		9.2	12.4			7.7			7.6		
		Queue	25'		25'	25'			25'			25'		
	Spec Event	LOS	B		A	B			A			A		
		Delay	11.5		8.9	10.3			7.6			7.5		
		Queue	25'		25'	25'			25'			25'		

(-) indicates a movement that is prohibited or does not exist; (*) indicates a freeflow movement.
Delay is reported in seconds. Queue is the maximum of the 50th & 95th percentile queue, measured in feet.

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EXHIBIT 3-3B
EXISTING TRAFFIC OPERATIONS
PROPOSED MIDDLE SCHOOL SITE

SHEBOYGAN, WISCONSIN

Exhibit 3-3C
Background (includes Off-site Development) Traffic Peak Hour Operating Conditions
With Existing Geometrics and Traffic Control

Intersection	Peak Hour	Metric	Level of Service (LOS) per Movement by Approach											
			Eastbound			Westbound			Northbound			Southbound		
			?	?	?	?	?	?	?	?	?	?	?	?
Node 100: Najacht Road & Enterprise Drive *One-Way Stop Control*		*Lanes->*	-	*1*		*1*		-	*1*			-		
	AM	LOS	-	*		A		-	A			-		
		Delay	-	*		7.5		-	9.4			-		
		Queue	-	*		25'		-	25'			-		
	PM	LOS	-	*		A		-	A			-		
		Delay	-	*		7.4		-	9.5			-		
		Queue	-	*		25'		-	25'			-		
	Spec Event	LOS	-	*		A		-	A			-		
		Delay	-	*		7.3		-	9.2			-		
		Queue	-	*		25'		-	25'			-		
Node 200: Mill Road & STH 42 *Two-Way Stop Control*		*Lanes->*	*1*			*1*		*1*	*1*	*2*		*1*	*2*	
	AM	LOS	D			E		B	A	*		A	*	
		Delay	33.8			47.2		12.3	9.0	*		9.3	*	
		v/c	-			0.34		-	-	-		-	-	
		Queue	25'			35'		30'	25'	*		25'	*	
	PM	LOS	E			F		B	A	*		B	*	
		Delay	47.1			86.3		12.5	9.5	*		10.3	*	
		v/c	0.04			0.46		-	-	-		-	-	
		Queue	25'			50'		25'	25'	*		25'	*	
	Spec Event	LOS	E			F		B	A	*		B	*	
		Delay	46.0			72.5		12.7	9.1	*		10.4	*	
		v/c	0.04			0.30		-	-	-		-	-	
		Queue	25'			30'		25'	25'	*		25'	*	
Node 300: Mill Road & Lisa Avenue *One-Way Stop Control*		*Lanes->*	*1*		-	-		*1*		-			*1*	
	AM	LOS	A		-	-		*		-			B	
		Delay	7.6		-	-		*		-			10.7	
		Queue	25'		-	-		*		-			25'	
	PM	LOS	A		-	-		*		-			A	
		Delay	7.5		-	-		*		-			9.8	
		Queue	25'		-	-		*		-			25'	
	Spec Event	LOS	A		-	-		*		-			A	
		Delay	7.5		-	-		*		-			9.8	
		Queue	25'		-	-		*		-			25'	
Node 400: Mill Road & Najacht Road *One-Way Stop Control*		*Lanes->*	*1*			-			*1*		-	-		*1*
	AM	LOS	A			-			A		-	-		*
		Delay	9.4			-			7.7		-	-		*
		Queue	25'			-			25'		-	-		*
	PM	LOS	A			-			A		-	-		*
		Delay	9.1			-			7.5		-	-		*
		Queue	25'			-			25'		-	-		*
	Spec Event	LOS	A			-			A		-	-		*
		Delay	8.9			-			7.4		-	-		*
		Queue	25'			-			25'		-	-		*
Node 500: 21st Street/Mill Road & Eisner Avenue *All-Way Stop Control*		*Lanes->*	*1*			*1*			*1*		*1*	*1*		
	AM	LOS	A			B			A		A	B		
		Delay	8.4			11.8			8.8		8.8	10.9		
		Queue	25'			60'			25'		25'	40'		
	PM	LOS	A			A			A		A	A		
		Delay	7.9			9.4			8.4		8.1	9.3		
		Queue	25'			35'			25'		25'	25'		
	Spec Event	LOS	A			A			A		A	A		
		Delay	7.8			8.8			8.2		7.9	9.0		
		Queue	25'			30'			25'		25'	25'		
Node 600: 21st Street & Pigeon River School Driveway *Two-Way Stop Control*		*Lanes->*	*1*		*1*		*1*			*1*			*1*	
	AM	LOS	C		B		B			A			A	
		Delay	15.0		10.6		12.6			7.9			7.5	
		Queue	25'		25'		25'			25'			25'	
	PM	LOS	B		A		B			A			A	
		Delay	12.3		9.2		12.4			7.7			7.6	
		Queue	25'		25'		25'			25'			25'	
	Spec Event	LOS	B		A		B			A			A	
		Delay	11.5		8.9		10.3			7.6			7.5	
		Queue	25'		25'		25'			25'			25'	

(-) indicates a movement that is prohibited or does not exist; (*) indicates a freeflow movement.
Delay is reported in seconds. Queue is the maximum of the 50th & 95th percentile queue, measured in feet.

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EXHIBIT 3-3C
BACKGROUND TRAFFIC OPERATIONS
PROPOSED MIDDLE SCHOOL SITE
ICLUDES PREVIOUSLY APPROVED OFFSITE DEVELOPMENTS

SHEBOYGAN, WISCONSIN

CHAPTER IV – FORECASTED TRAFFIC

PART A – TRAFFIC FORECASTING

To address any potential future traffic impacts along study area roadways and at the intersections adjacent to the proposed middle school, it is necessary to identify the hourly and daily volume of traffic generated by the proposed middle school. The traffic volumes expected to be generated by the new middle school are based on data provided by the school district. According to the school district, 67-percent of the current student population is dropped off at the school with an additional 7-percent of the population utilizing the Shoreline Metro to travel to/from school. The remaining population takes the school buses provided by the district or walks to school. To account for the relocation approximately 1 mile north and in an attempt to be conservative with the assumptions used, it was assumed that about half of the students currently walking would be driven by their parents and the remaining population would be absorbed in the future busing or shuttle service. Based on these assumptions, it was determined that 74-percent of the future student population would be dropped off at the new school site during the weekday morning arrival peak hour. Since afternoon activities can vary, the weekday afternoon discharge peak hour utilized the ITE rates, as discussed in the next section, and prorated them up to reflect the higher morning volumes calculated based on data provided by the school district.

As a sensitivity analysis, the traffic volumes expected to be generated by the new middle school were also based on the trip rates for a middle school (LU522) as published in the Institute of Transportation Engineer's (ITE) *Trip Generation Manual, 11th Edition*. Trip rates were calculated based on the peak hour of generator instead of the peak hour of adjacent street traffic to account for the worst-case school traffic conditions. Based on the ITE rates, the expected new trips were about 38-percent lower than those calculated based on the data provided by the school district. The calculations and analysis using the ITE rates were provided as a point of comparison.

A1. Trip Generation

The expected trip generation for the proposed middle school new site is shown in Exhibit 4-3A. As shown, under full build (highest student population) conditions, the proposed middle school is expected to generate 700 new trips (385 entering/315 exiting) during a typical weekday morning arrival peak hour. During a typical weekday afternoon discharge peak hour, the proposed middle school is expected to generate 340 new trips (165 entering/175 exiting). During a typical weekday evening special event peak hour, the proposed middle school is expected to generate 210 new trips (105 entering/105 exiting). On a typical weekday, the proposed middle school is expected to generate approximately 1,890 new trips (945 entering/945 exiting) under full build conditions.

For the sensitivity analysis, the expected trip generation for the proposed middle school new site based on ITE rates is shown in Exhibit 4-3B. As shown, under full build (highest student population) conditions, the proposed middle school is expected to generate 515 new trips (285 entering/230 exiting) during a typical weekday morning arrival peak hour. During a typical weekday afternoon discharge peak hour utilizing ITE rates, the proposed middle school is expected to generate 245 new trips (120 entering/125 exiting). During a typical weekday evening special event peak hour utilizing ITE rates, the proposed middle school is expected to generate 210 new trips (105 entering/105 exiting). On a typical weekday, the proposed middle school is expected to generate approximately 1,370 new trips (685 entering/685 exiting) under full build conditions utilizing ITE rates.

A2. Mode Split

Pedestrians and bicyclists are expected to continue to use their respective modes to access the proposed middle school. However, with the proposed school site located in the northwest quadrant of the school population boundary and to assume a worst case (highest traffic generation) scenario, it was assumed that all of the student population will access the site via parent drop off/pick-up or school bus.

A3. Trip Distribution

The trip distribution for the proposed middle school, listed below and shown in table format in Exhibits 4-3A&B, was determined based on the existing Sheboygan Area School District school populations which are expected to feed the proposed middle school. A map showing the limits of the middle school boundary is included in the appendix of this report.

- 5-percent to/from the north on Najacht Road
- 5-percent to/from the west on Mill Road
- 27-percent to/from the south on 21st Street
- 63-percent to/from the east on Eisner (via 8th or 15th Streets)

It is noted that since the school is located immediately east of STH 42, it was assumed that some parents drop off their children on the way to work and would therefore not return home via the distribution percentages listed above. Therefore, to provide a conservative analysis, about one third of the parents entering the proposed school site using the distribution percentages listed above during the typical weekday morning peak period were assumed to exit the site via Mill Road to the west to access STH 42.

A4. Trip Assignment

Traffic for the proposed middle school was distributed to the study area intersections based on the above trip distribution. The full build new trips for the proposed middle school were assigned to the study area and are shown in Exhibit 4-5A.

To provide for a conservative, highest traffic volume condition, additional bus trips were included in addition to the trip generation assumptions listed above. The bus trips are shown Exhibit 4-5B.

As previously described above, a sensitivity analysis was also performed utilizing the ITE rates to determine the new trips for the proposed school location. The full build new trips (Sensitivity Analysis – ITE rates) for the proposed middle school were assigned to the study area and are shown in Exhibit 4-5C.

New trips for the identified offsite developments were taken directly from the previously approved Northtown Development TIA dated March 22, 2022, and are shown in Exhibits 4-8A&B.

PART B – BACKGROUND & BUILD TRAFFIC

The identified offsite new trips, Exhibits 4-8A&B, were added to the existing traffic volumes to determine the background traffic volumes and are shown in Exhibit 3-2C.

The expected maximum school capacity new trips and bus trips, Exhibits 4-5A&B, were added to the background traffic volumes to determine the full build traffic volumes and are shown in Exhibit 4-11A.

The expected maximum school capacity new trips (Sensitivity Analysis – ITE rates) and bus trips, Exhibits 4-5B&C, were added to the background traffic volumes to determine the full build (Sensitivity Analysis – ITE rates) traffic volumes and are shown in Exhibit 4-11B.

Exhibit 4-3A

On-Site Trip Generation Table[1]

Land Use	ITE Code	Proposed Size	Weekday Daily	AM Peak In	AM Peak Out	AM Peak Total	PM Peak In	PM Peak Out	PM Peak Total	Special Peak In	Special Peak Out	Special Peak Total
Middle School	522	650 Students	1,890 TADI	385 (55%)	315 (45%)	700	165 (48%)	175 (52%)	340 TADI	105 (50%)	105 (50%)	210 TADI
Total New Trips			**1,890**	**385**	**315**	**700**	**165**	**175**	**340**	**105**	**105**	**210**
Total Parking	**5%**	**of Reduction Total**		**20**	**15**	**35**	**10**	**10**	**20**	**105**	**105**	**210**
Total Drop Off	**95%**	**of Reduction Total**		**365**	**300**	**665**	**155**	**165**	**320**	**0**	**0**	**0**

[1] *AM peak volumes based on 74% of student population utilizing cars with a 33% reducdtion included for carpooling/multi-student families. PM peak prorated based on comparison of AM values to Trip Gen Manual, 11th Edition as shown in Exhibit 4-3B.*

Due to school land use, utilizedITE data for "Peak Hour of Generator" instead of "Peak Hour of Adjacent Street" for highest volume calculation

TRIP DISTRIBUTION (New Trips)

North on Najacht Road	5%	2% more out to Mill/STH 42 in AM	80	20	10		5	10		5	5
West on Mill Road	5%		390	20	115		10	10		5	5
South on 21st Street	27%	9% more out to Mill/STH 42 in AM	425	105	55		45	45		30	30
East on Eisner (via 8th or 15th Streets)	63%	21% more out to Mill/STH 42 in AM	995	240	135		105	110		65	65
	100%		***1890***	***385***	***315***		***165***	***175***		***105***	***105***

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EXHIBIT 4-3A
PROPOSED MIDDLE SCHOOL
TRIP GENERATION & DISTRIBUTION TABLES

SHEBOYGAN, WISCONSIN

Exhibit 4-3B

On-Site Trip Generation Table[1] - Sensitivity Analysis (ITE Rates)

Land Use	ITE Code	Proposed Size	Weekday Daily	AM Peak In	AM Peak Out	AM Peak Total	PM Peak In	PM Peak Out	PM Peak Total	Special Peak In	Special Peak Out	Special Peak Total
Middle School	522	650 Students	1,370 (2.10)	285 (55%)	230 (45%)	515 FCE	120 (48%)	125 (52%)	245 (0.36)	105 (50%)	105 (50%)	210 TADI
Total New Trips			**1,370**	**285**	**230**	**515**	**120**	**125**	**245**	**105**	**105**	**210**
Total Parking	**5%**	**of Reduction Total**		**15**	**10**	**25**	**5**	**5**	**10**	**105**	**105**	**210**
Total Drop Off	**95%**	**of Reduction Total**		**270**	**220**	**490**	**115**	**120**	**235**	**0**	**0**	**0**

[1] *ITE Trip Rates (X.XX) and/or Fitted Curve Equations (FCE) are from the ITE Trip Generation Manual, 11th Edition.*

Due to school land use, utilized rates and FCE for "Peak Hour of Generator" instead of "Peak Hour of Adjacent Street" for highest volume calculation

TRIP DISTRIBUTION (New Trips)

North on Najacht Road	5%	2% more out to Mill/STH 42 in AM	55	15	5	5	5	5	5	
West on Mill Road	5%		285	15	90	5	5	5	5	
South on 21st Street	27%	9% more out to Mill/STH 42 in AM	310	75	40	35	35	30	30	
East on Eisner (via 8th or 15th Streets)	63%	21% more out to Mill/STH 42 in AM	720	180	95	75	80	65	65	
	100%		***1370***	***285***	***230***	***120***	***125***	***105***	***105***	

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EXHIBIT 4-3B
PROPOSED MIDDLE SCHOOL
TRIP GENERATION & DISTRIBUTION TABLES
SENSITIVITY ANALYSIS - ITE RATES

SHEBOYGAN, WISCONSIN

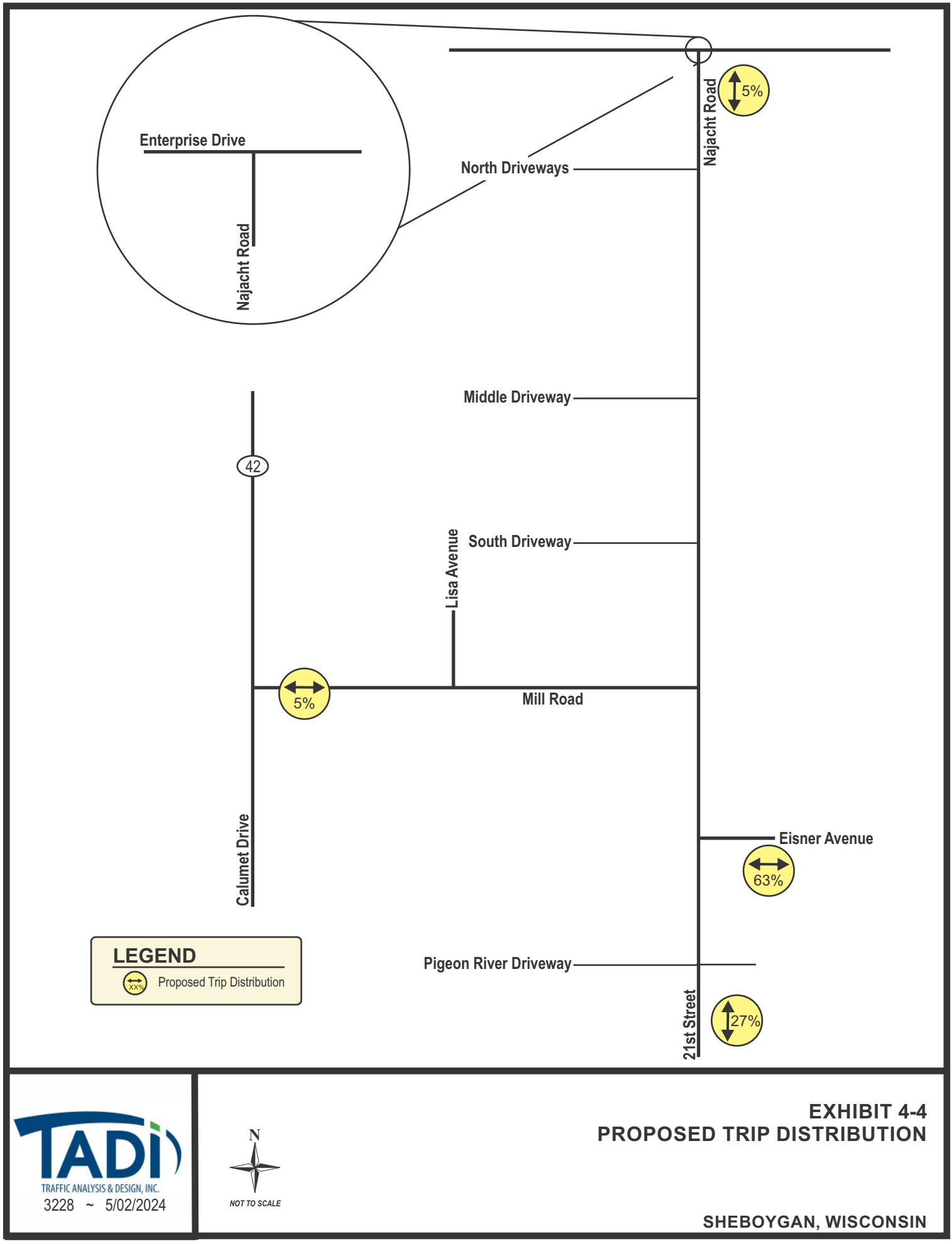

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EXHIBIT 4-4
PROPOSED TRIP DISTRIBUTION

SHEBOYGAN, WISCONSIN

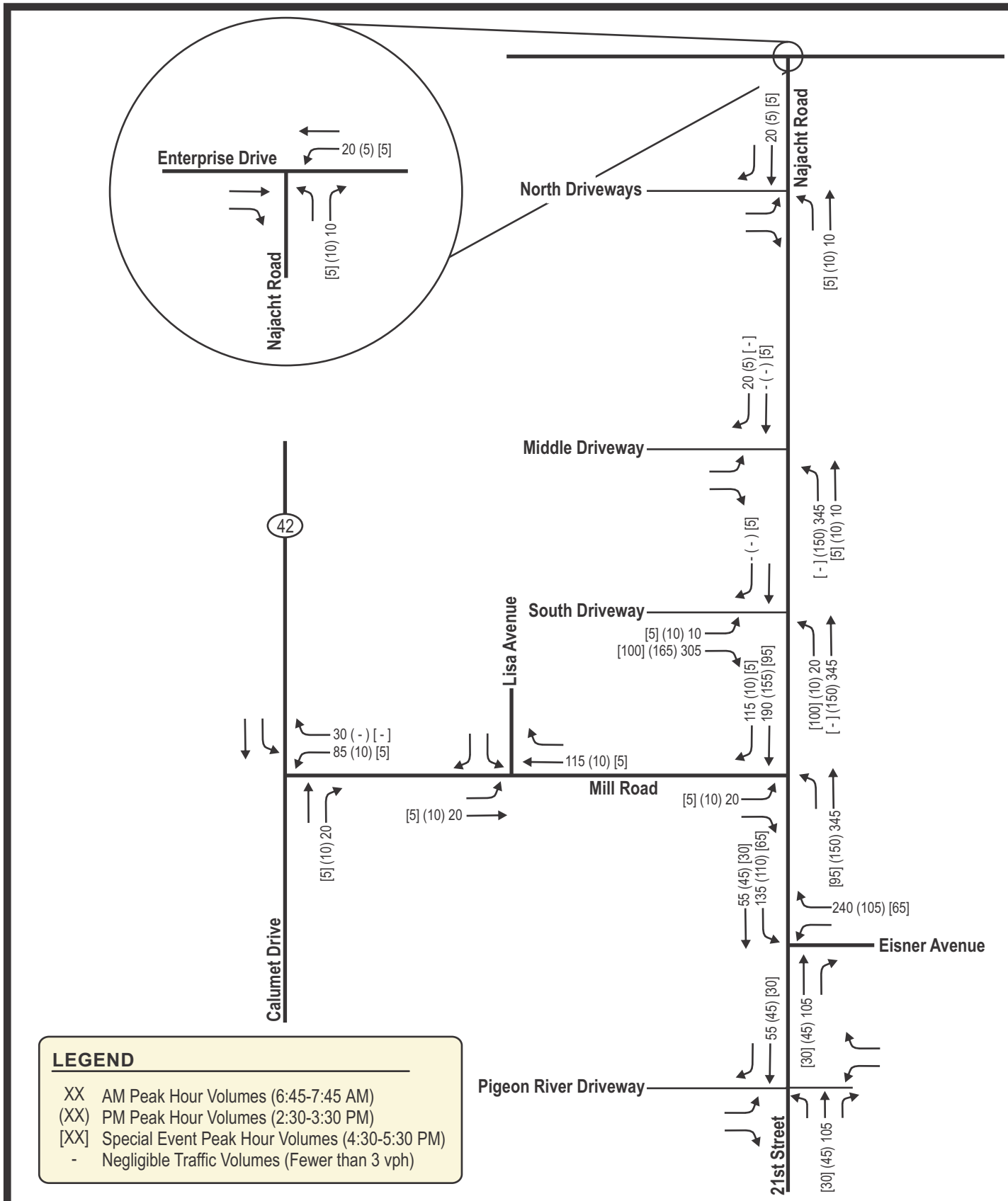

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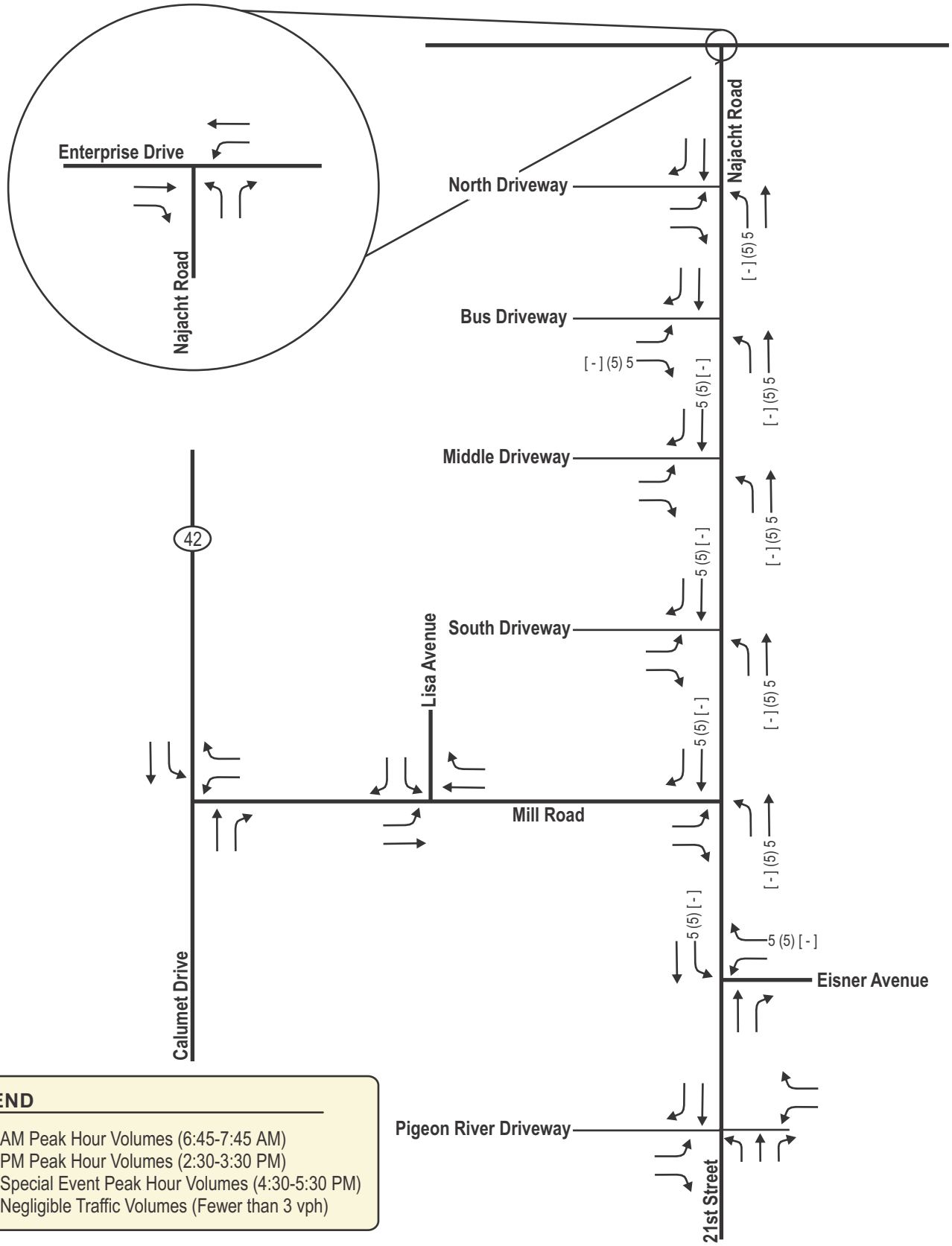
EXHIBIT 4-5A
PROPOSED MIDDLE SCHOOL NEW TRIPS STUDENTS/PARENTS

SHEBOYGAN, WISCONSIN



LEGEND

XX	AM Peak Hour Volumes (6:45-7:45 AM)
(XX)	PM Peak Hour Volumes (2:30-3:30 PM)
[XX]	Special Event Peak Hour Volumes (4:30-5:30 PM)
-	Negligible Traffic Volumes (Fewer than 3 vph)

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EXHIBIT 4-5B
PROPOSED MIDDLE SCHOOL NEW TRIPS
BUSES

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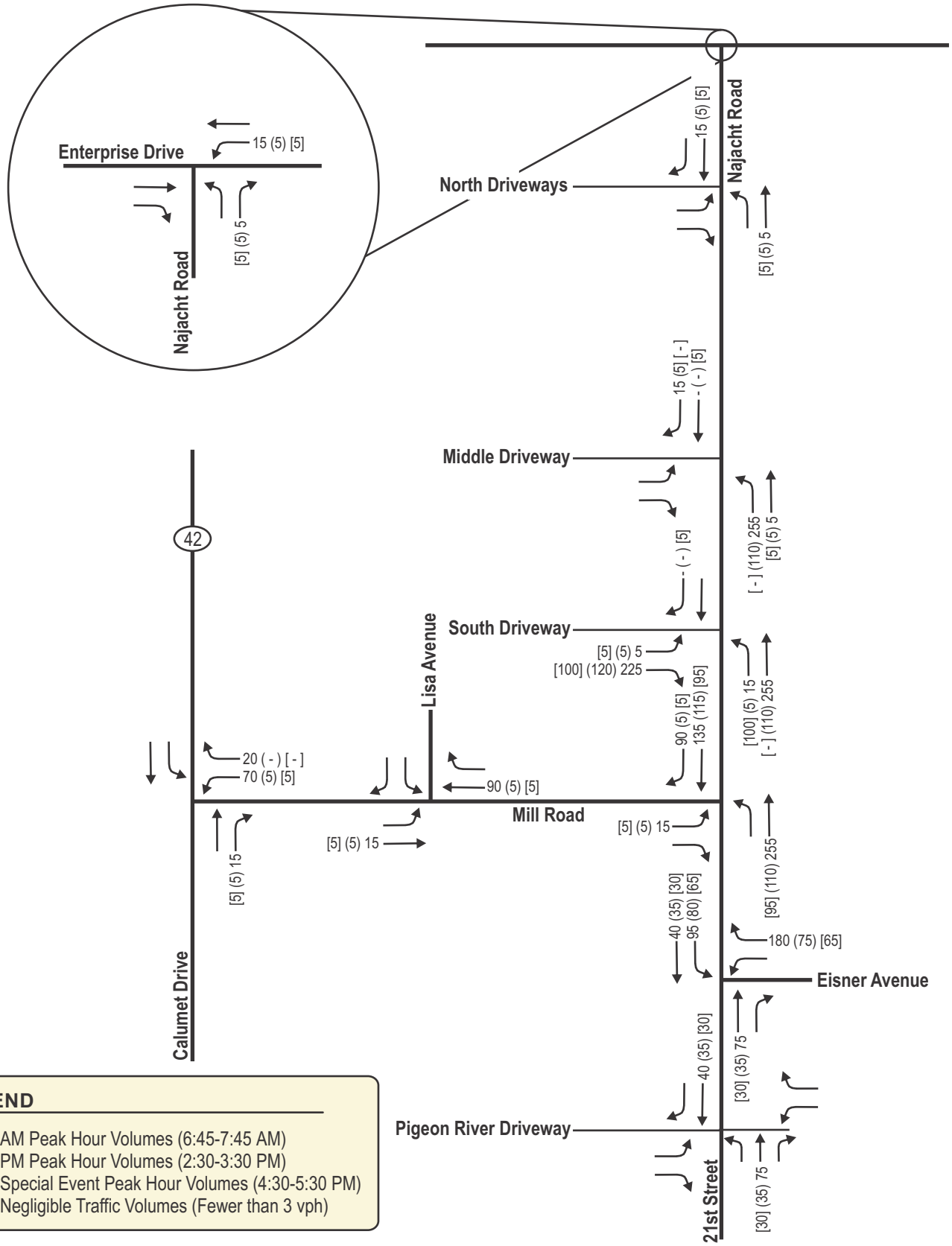

LEGEND

XX	AM Peak Hour Volumes (6:45-7:45 AM)
(XX)	PM Peak Hour Volumes (2:30-3:30 PM)
[XX]	Special Event Peak Hour Volumes (4:30-5:30 PM)
-	Negligible Traffic Volumes (Fewer than 3 vph)

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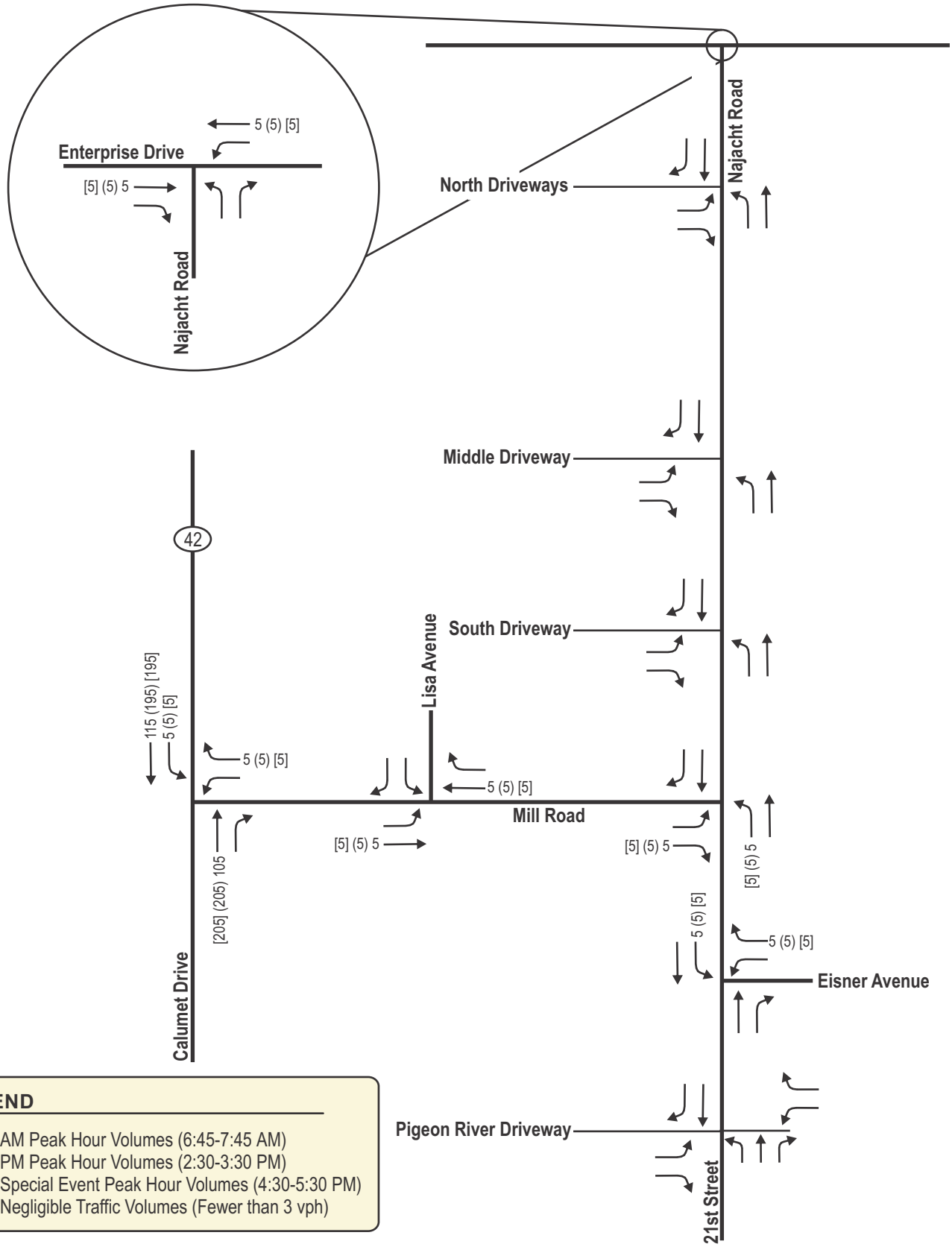
EXHIBIT 4-5C
PROPOSED MIDDLE SCHOOL NEW TRIPS
STUDENTS/PARENTS
SENSITIVITY ANAYSIS - ITE RATES

SHEBOYGAN, WISCONSIN



LEGEND

XX	AM Peak Hour Volumes (6:45-7:45 AM)
(XX)	PM Peak Hour Volumes (2:30-3:30 PM)
[XX]	Special Event Peak Hour Volumes (4:30-5:30 PM)
-	Negligible Traffic Volumes (Fewer than 3 vph)

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EXHIBIT 4-8A
NORTHTOWN OFFSITE DRIVEWAY TRIPS

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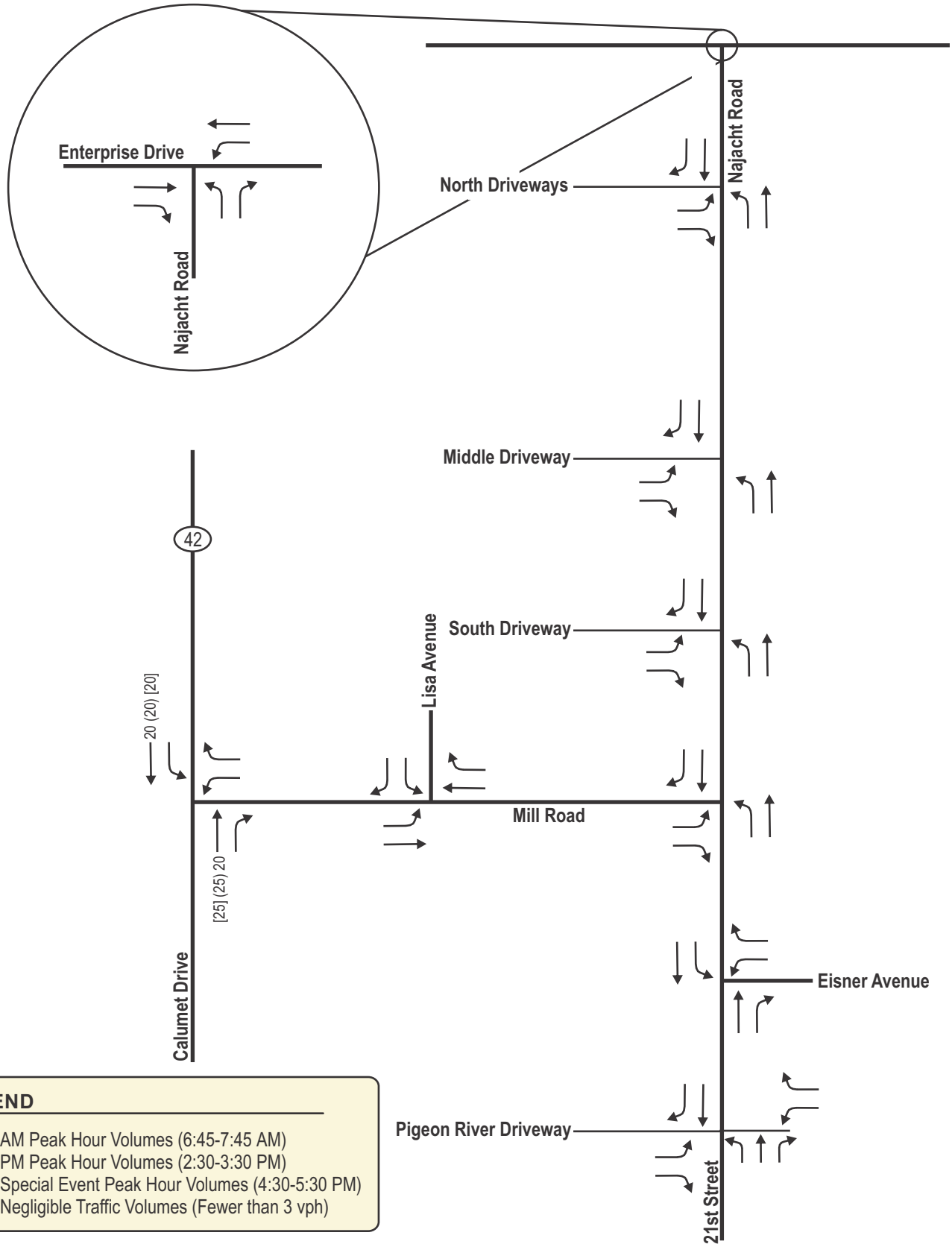

LEGEND

XX	AM Peak Hour Volumes (6:45-7:45 AM)
(XX)	PM Peak Hour Volumes (2:30-3:30 PM)
[XX]	Special Event Peak Hour Volumes (4:30-5:30 PM)
-	Negligible Traffic Volumes (Fewer than 3 vph)

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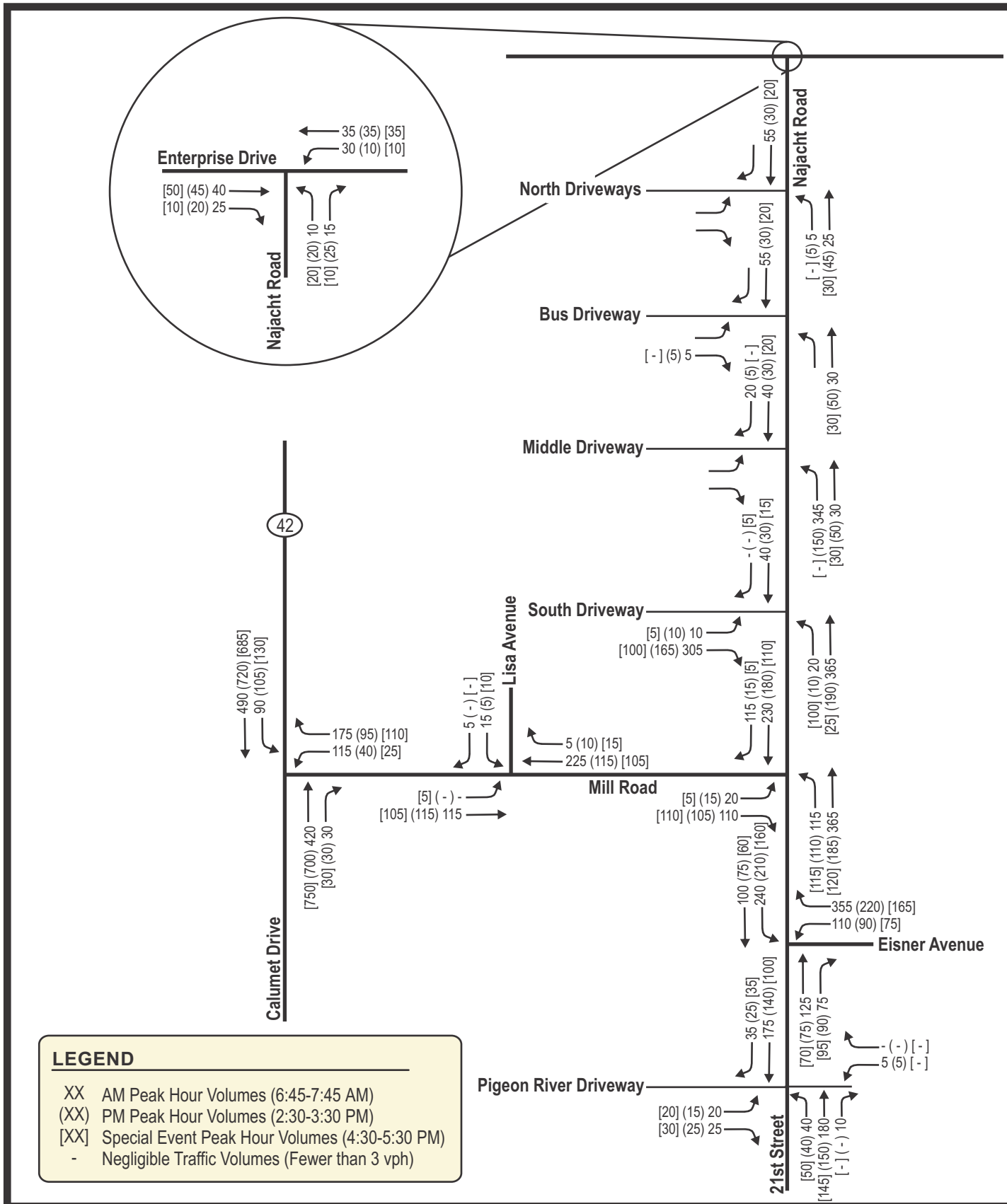
EXHIBIT 4-8B
STH 42 & I-43 OTHER OFFSITE DRIVEWAY TRIPS

SHEBOYGAN, WISCONSIN



LEGEND

XX	AM Peak Hour Volumes (6:45-7:45 AM)
(XX)	PM Peak Hour Volumes (2:30-3:30 PM)
[XX]	Special Event Peak Hour Volumes (4:30-5:30 PM)
-	Negligible Traffic Volumes (Fewer than 3 vph)

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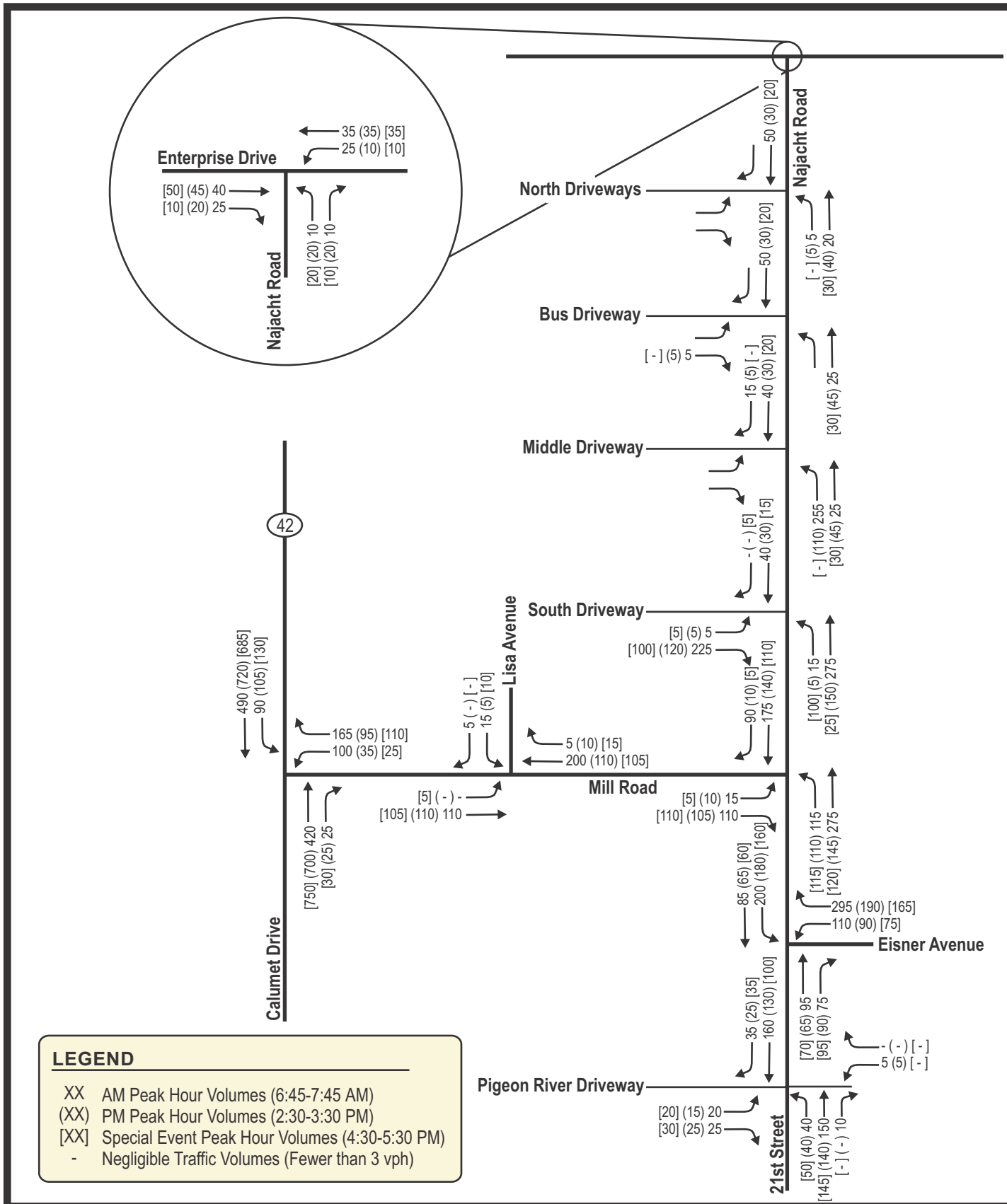
EXHIBIT 4-11A
FULL BUILD TRAFFIC VOLUMES

SHEBOYGAN, WISCONSIN



LEGEND

XX	AM Peak Hour Volumes (6:45-7:45 AM)
(XX)	PM Peak Hour Volumes (2:30-3:30 PM)
[XX]	Special Event Peak Hour Volumes (4:30-5:30 PM)
-	Negligible Traffic Volumes (Fewer than 3 vph)

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EXHIBIT 4-11B
FULL BUILD TRAFFIC VOLUMES
SENSITIVITY ANALYSIS - ITE RATES

SHEBOYGAN, WISCONSIN

CHAPTER V – TRAFFIC AND IMPROVEMENT ANALYSIS

PART A – SITE ACCESS

Three new driveways are proposed along the west side of Najacht Road (east side of the proposed school) to accommodate the parent drop off/pickup area, the bus drop off/pickup area and teacher parking lot and the parent/main parking lot. The main parking lot, located to the south of the school, is expected to accommodate 170 parking spaces. A smaller parking lot, accommodating 60 parking spaces, is proposed on the north side of the school for teachers/staff. The middle driveway is proposed as the main driveway to drop off/pickup students in front of the school, where 18 additional parking spaces, including handicap spaces, are provided. Finally, a bus drop-off lane is proposed on the north side of the school to accommodate bus staging with the buses expected to enter the site, loop around the staff parking lot, and exit the site at the same driveway.

PART B – CAPACITY LEVEL OF SERVICE ANALYSIS

B1. Full Build Traffic Operating Conditions – No Modifications

Exhibits 5-1A&B show the full build traffic peak hour operating conditions at the study area intersections under the two trip generation assumptions as previously described. The full build traffic analysis was conducted using existing intersection configurations except with the addition of the new access driveways.

As shown in Exhibit 5-1A, all movements are expected to continue to operate at LOS D or better conditions at the study area intersections under the full build traffic volume conditions during the weekday morning, weekday afternoon and weekday evening special event peak periods except the eastbound and westbound left-turn movements (LOS E/F) at the STH 42 intersection with Mill Road during the weekday morning arrival, weekday afternoon discharge and weekday evening special event peak hours and the westbound and southbound movements (LOS F) at the 21st Street/Mill Road intersection with Eisner Avenue during the weekday morning arrival and weekday afternoon discharge peak hours.

As shown in Exhibit 5-1B for comparison purposes, all movements are expected to continue to operate at LOS D or better conditions at the study area intersections under the full build (Sensitivity Analysis – ITE rates) traffic volume conditions during the weekday morning, weekday afternoon and weekday evening special event peak periods except the eastbound and westbound left-turn movements (LOS E/F) at the STH 42 intersection with Mill Road during the weekday morning arrival, weekday afternoon discharge and weekday evening special event peak hours and the westbound and southbound movements (LOS E/F) at the 21st Street/Mill Road intersection with Eisner Avenue during the weekday morning arrival peak hour.

B2. Background Traffic Operating Conditions – With Modifications

No modifications to the existing transportation system to accommodate the background traffic conditions are recommended at the existing study area intersections. Recommended modifications are summarized in *Chapter VI – Recommendations and Conclusion*.

As shown in Exhibit 5-2, all movements are expected to operate at LOS D or better conditions during the weekday morning, weekday afternoon and weekday evening special event peak periods under the background traffic volume conditions with modifications except the eastbound and westbound left-turn movements at the STH 42 intersection with Mill Road which are expected to continue to operate at LOS E/F during the typical weekday morning arrival, weekday afternoon discharge and weekday evening special event peak hours. Traffic signals are not expected to be warranted at this intersection under background traffic conditions.

B3. Full Build Traffic Operating Conditions – With Modifications

Modifications to the existing transportation system to accommodate the full build traffic conditions, including traffic signals at the STH 42 intersection with Mill Road and at the 21st Street/Mill Road intersection with Eisner Avenue, are recommended at the existing study area intersections. Recommended modifications are summarized in *Chapter VI – Recommendations and Conclusion*.

As shown in Exhibit 5-3, all movements are expected to improve to operate at LOS D or better conditions during the weekday morning, weekday afternoon and weekday evening special event peak periods under the full build traffic volume conditions with modifications.

PART C – QUEUEING ANALYSIS

To estimate storage length requirements for turn bays at the study area intersections with modifications, a queuing analysis has been conducted. Note that the 95th percentile probable queue lengths were used for the design of turn bay storage at stop sign and traffic signal-controlled intersections. The following is a list of where the results of the queuing analysis can be found.

- Existing Traffic Expected Maximum Queues (Existing Middle School Site) – Exhibit 3-3A
- Existing Traffic Expected Maximum Queues (Proposed Middle School Site) – Exhibit 3-3B
- Full Build Traffic Expected Maximum Queues – Exhibits 5-3 & 5-6A
- 21st Street/Mill Road & Eisner Avenue – Full Build Traffic Expected Maximum Queue Comparison – Exhibits 5-4 & 5-6B
- STH 42 & Mill Road– Full Build Traffic Expected Maximum Queue Comparison – Exhibits 5-5 & 5-6C

PART D – WARRANT ANALYSIS

Warrants should be viewed as guidelines to help decide whether traffic signal controls may be installed. Meeting warrants does not translate to a legal requirement for their installation. Completed warrant analysis worksheets are included in the appendix of this report. Due to the type of development and the peak hour data collection collected as part of this study, only Warrant 3 (Peak Hour) was evaluated as a part of this study. The Peak Hour warrant was considered as it is typically used for proposed facilities that have peak discharge characteristics such as schools or factories with high volume shift changes.

Traffic signal warrants were investigated at the 21st Street/Mill Road intersection with Eisner Avenue and at the STH 42 intersection with Mill Road under full build traffic volumes in accordance with the *MUTCD 11th Edition*. 21st Street/Mill Road was analyzed as a major street with one lane on each approach and Eisner Avenue was analyzed as a minor street with one lane. STH 42 was analyzed as a major street with two or more lanes on each approach and Mill Road was analyzed as a minor street with one lane. The posted speed limit is 25-mph along the 21st Street and Mill Road corridors and therefore urban warrant thresholds were utilized. However, since the speed limit along STH 42 is posted at 40-mph, the rural warrant thresholds were used for that intersection.

The warrant analysis was conducted based on the weekday peak hour turning movement counts collected as part of this study at the two intersections in mid-March of 2024. Based on the warrant analysis, the Peak Hour warrant is not expected to be met at the 21st Street/Mill Road intersection with Eisner Avenue. Specifically, neither of the peak hours are met for Warrant 3. It

is noted however, that with an increase of about 5-percent in traffic of the mainline and sideroad volumes, the Peak Hour warrant would be expected to be met during the typical weekday morning arrival peak hour. In addition, with a railroad line located immediately east of the intersection and with queue lengths expected to extend beyond the railroad tracks under full build traffic volume conditions, traffic signal control should be considered to allow for reasonable queue lengths on the east approach. At the STH 42 intersection with Mill Road, the weekday morning peak hour is expected to be met under full build conditions, even without offsite traffic added to the build volumes. Therefore, traffic signal control could be considered at either intersection.

PART E – TRAFFIC CONTROL COMPARISON

Because operational deficiencies are expected to remain at the 21st Street/Mill Road intersection with Eisner Avenue and at the STH 42 intersection with Mill Road under full build traffic volumes under the existing stop control conditions, alternate control conditions were considered.

At the 21st Street/Mill Road intersection with Eisner Avenue, three possible modification scenarios were considered: specifically, all-way stop control with additional lanes, traffic signal control with additional lanes and single lane roundabout control. In addition, at the STH 42 intersection with Mill Road three possible modification scenarios were considered: specifically, two-way stop control, traffic signal control and single lane roundabout control. Additional turn lanes were not considered at the STH 42 intersection with Mill Road.

Comparison tables have been provided to show the operation at the two intersections under the three possible modification scenarios. As shown in Exhibit 5-3, at the 21st Street/Mill Road intersection with Eisner Avenue, under all-way stop control higher delays are expected at the westbound and southbound movements (LOS E/F) during the weekday morning arrival peak hour and all other movements are expected to operate at LOS D or better during all three peak periods. Longer queues are also expected under the all-way stop control alternative with queues on the east approach (for the westbound to northbound right-turn movements) expected to extend beyond the existing railroad tracks located about 375-feet east of the intersection. Under traffic signal and roundabout control, all movements are expected to operate at LOS D or better during all three peak periods under full build traffic conditions with reasonable queue lengths. Due to the expected long queue lengths under all-way stop control, especially potentially beyond the railroad tracks, only the traffic signal and roundabout options were considered viable options.

As shown in Exhibit 5-4, at the STH 42 intersection with Mill Road, under two-way stop control higher delays are expected at the eastbound and westbound movements (LOS E/F) during the weekday morning arrival, weekday afternoon discharge and weekday evening special event peak hours and all other movements are expected to operate at LOS D or better during all three peak periods. Under traffic signal and roundabout control, all movements are expected to operate at LOS B or better during all three peak periods under full build traffic conditions with reasonable queue lengths. For this intersection, all three options, existing two-way stop control, traffic signal control and roundabout control were considered viable options.

Under the traffic signal and roundabout scenarios at both intersections, right-of-way will likely be required for the roundabout control option to allow for appropriate design standards to be met. In addition, at the 21st Street/Mill Road intersection with Eisner Avenue under traffic signal control, right-of-way is also expected to be required. However, it is likely that the roundabout alternative will require the greatest amount of right-of-way. It is also noted that, in general, the typical cost of a single-lane roundabout in comparison to a signalized intersection is about two to three times the cost of a new signalized intersection with geometric modifications, dependent on

right-of-way needs and complexity of the designs. Concepts showing the alternatives are shown in Exhibits 5-7A&B.

PART F – PARKING CONSIDERATIONS

A sperate parking analysis was also completed for a special event occurrence at the proposed middle school. A back-to-back boy's middle school basketball game event was utilized as a typical high attendance special event with the first game (7th Graders) occurring from 3:30 to 4:30 pm and another game (8th Graders) from 4:30 to 5:30 pm on the same evening. With players, coaches, officials, and families; the expected attendance for this event (both games) is approximately 150 people (100 spectator total attendance). The highest attended event, a spring or fall concert, 350 people are estimated to attend the event. The following table shows the expected parking demands for these two events with the highest demand for the sporting event falling around 5:30 pm when the second game is ending. However, for a worst-case sporting event scenario, it was assumed that all vehicles were entering and exiting during the same peak period from 4:30 to 5:30 pm.

Table 1
Parking Analysis
Proposed Middle School Site

	Supply	Demand	Excess (shortage)
Spaces Available in lots	*248**		
Expected sporting event spaces needed		*105*	
Subtotal			*143*
Expected concert event spaces needed		*235*	
Subtotal			*13*

* Available spaces include 170 spaces in the south lot, 60 spaces in the north lot and 18 spaces near the school entrance.

As shown in Table 1, parking within the school site is expected to include a total of 248 parking spaces, including 170 spaces in the south parking lot, 60 spaces in the north parking lot and 18 spaces near the school entrance on the east side of the building. For a typical sporting event, with a potential demand of 105 parking spaces for the attendees of both games, an excess supply of approximately 143 parking spaces is expected. In addition, during a spring or fall concert event, with a potential demand of 235 parking spaces for the attendees of a concert, an excess supply of approximately 13 parking spaces is expected.

PART G – OTHER CONSIDERATIONS

G1. Pedestrian and Bicycle Considerations

Sidewalks are provided along several of the streets adjacent to the proposed school; specifically, along both sides of Mill Road between Najacht Road and Eisner Avenue and along both sides of Najacht Road from Mill Road up to a point about 325 feet to the north. Sidewalks also exist along the north side of Eisner Avenue, immediately east of 21st Street and along the west side of 21st Street, south of Eisner Avenue. No on-street bicycle facilities were identified along any of the roadways.

Pedestrians and bicyclist users are expected to continue to use their respective modes to access the proposed middle school; therefore, additional pedestrian accommodations are recommended to provide an additional level of safety for the proposed school. As listed in the next chapter, additional sidewalks are recommended within the limits of the proposed school site and continental-style pedestrian crosswalk pavement markings should be considered at the

intersections adjacent to the school where sidewalks are present including at the following intersections:

- Mill Road intersection with Najacht Road
- 21st Street/Mill Road intersection with Eisner Avenue
- Najacht Road intersection with Middle Driveway
- Najacht Road intersection with South Driveway

G2. School Bus Considerations

As previously described, the school bus drop-off/pick-up area located on the north side of the school is expected to accommodate space for six buses. According to the school district, two to four buses are expected to be necessary to accommodate the busing needs for the middle school; however, to be conservative, five buses were used in the analysis. The school bus drop-off/pick-up area is expected to be adequate to allow for safe loading and unloading of students.

G3. Parent Drop-off/Pick-Up Considerations

The parent drop-off/pick-up area is proposed to be located on the east and south sides of the school and is expected to accommodate up to about 40 parked vehicles adjacent to the school within the drive-through lane area, assuming that all vehicles pull up to the southern/western-most point of the sidewalk area. During the weekday morning drop-off peak period, operations are expected to flow smoothly as drop off during the school arrival peak period tends to occur over a longer time period with a short parking/drop-off duration required while at the drive-through area. However, during the afternoon peak discharge period, parents tend to arrive earlier (up to 30 minutes early) and queue within the pick-up area prior to the final school bell. Based on the trip generation calculations used in this study based on data provided by the school district, approximately 170 vehicles are expected to pick-up their students during the afternoon discharge peak period, with about half of those expected prior to the bell, based on other school studies completed in Wisconsin. In order to accommodate those 85 vehicles which are expected to arrive prior to the final school bell, without modifying the site plan, more than half the vehicles arriving prior to the school bell will be required to queue up within the northbound left-turn lanes into the site on Najacht Road, with some parents required to park in the southern parking lot once the left-turn lane fills up. With no on-street parking available adjacent to the site, adequate parking supply should be considered for these additional vehicles during the school discharge peak period to allow for adequate operations within the overall site and to lessen or avoid any spill backs onto the adjacent transportation network to the south of the school.

As previously stated, a sensitivity analysis was also completed using ITE trip generation rates to determine the expected new traffic at the proposed site. Based on this comparison analysis, approximately 120 vehicles would be expected to pick-up their students during the afternoon discharge peak period, with about half of those expected prior to the bell, based on other school studies completed in Wisconsin. Even using these lower trip generation calculations, to accommodate those 60 vehicles, some parents will be required to queue up within the northbound left-turn lanes into the site on Najacht Road or will be required to park in the parking lot as the pick-up lane can only accommodate up to 40 vehicles.

Exhibit 5-1A
Full Build Traffic Peak Hour Operating Conditions
With Existing Geometrics and Traffic Control

Intersection	Peak Hour	Metric	Level of Service (LOS) per Movement by Approach											
			Eastbound			Westbound			Northbound			Southbound		
			↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Node 100: Najacht Road & Enterprise Drive *One-Way Stop Control*		*Lanes->*	-	*1*		*1*	-		*1*			-		
	AM	LOS	-	*		A	-		A			-		
		Delay	-	*		7.6	-		9.5			-		
		Queue	-	*		25'	-		25'			-		
	PM	LOS	-	*		A	-		A			-		
		Delay	-	*		7.5	-		9.6			-		
		Queue	-	*		25'	-		25'			-		
	Spec Event	LOS	-	*		A	-		A			-		
		Delay	-	*		7.4	-		9.2			-		
		Queue	-	*		25'	-		25'			-		
Node 200: Mill Road & STH 42 *Two-Way Stop Control*		*Lanes->*	*1*			*1*		*1*	*1*		*2*	*1*		*2*
	AM	LOS	E			F		B	A		*	A		*
		Delay	35.8			243.5		13.2	9.0		*	9.4		*
		v/c	0.03			1.29		-	-		-	-		-
		Queue	25'			260'		40'	25'		*	25'		*
	PM	LOS	E			F		B	A		*	B		*
		Delay	47.6			109.0		12.6	9.5		*	10.3		*
		v/c	0.04			0.61		-	-		-	-		-
		Queue	25'			70'		25'	25'		*	25'		*
	Spec Event	LOS	E			F		B	A		*	B		*
		Delay	46.5			79.1		12.7	9.1		*	10.5		*
		v/c	0.04			0.37		-	-		-	-		-
		Queue	25'			35'		25'	25'		*	25'		*
Node 300: Mill Road & Lisa Avenue *One-Way Stop Control*		*Lanes->*	*1*		-	-		*1*		-			*1*	
	AM	LOS	A		-	-		*		-			B	
		Delay	8.1		-	-		*		-			12.8	
		Queue	25'		-	-		*		-			25'	
	PM	LOS	A		-	-		*		-			B	
		Delay	7.7		-	-		*		-			11.0	
		Queue	25'		-	-		*		-			25'	
	Spec Event	LOS	A		-	-		*		-			A	
		Delay	7.5		-	-		*		-			9.9	
		Queue	25'		-	-		*		-			25'	
Node 400: Mill Road & Najacht Road *One-Way Stop Control*		*Lanes->*	*1*			-			*1*		-	-		*1*
	AM	LOS	D			-			A		-	-		*
		Delay	33.7			-			9.5		-	-		*
		Queue	110'			-			25'		-	-		*
	PM	LOS	C			-			A		-	-		*
		Delay	16.6			-			8.6		-	-		*
		Queue	50'			-			25'		-	-		*
	Spec Event	LOS	A			-			A		-	-		*
		Delay	9.8			-			7.7		-	-		*
		Queue	25'			-			25'		-	-		*
Node 500: 21st Street/Mill Road & Eisner Avenue *All-Way Stop Control*		*Lanes->*	*1*			*1*			*1*		*1*	*1*		*1*
	AM	LOS	B			F			C		B	F		
		Delay	12.6			180.2			18.6		13.4	88.8		
		v/c	-			1.35			-		-	1.19		
		Queue	25'			805'			60'		25'	400'		
	PM	LOS	B			F			B		B	F		
		Delay	11.3			52.7			13.5		12.8	56.3		
		v/c	-			0.95			-		-	0.96		
		Queue	25'			330'			30'		35'	320'		
	Spec Event	LOS	A			B			A		A	B		
		Delay	8.4			10.3			9.0		8.3	11.0		
		Queue	25'			45'			25'		25'	45'		
Node 600: 21st Street & Pigeon River School Driveway *Two-Way Stop Control*		*Lanes->*	*1*	*1*		*1*			*1*			*1*		
	AM	LOS	C	B		C			A			A		
		Delay	22.7	11.6		17.3			8.2			7.9		
		Queue	25'	25'		25'			25'			25'		
	PM	LOS	C	B		C			A			A		
		Delay	16.8	10.0		16.6			8.1			7.8		
		Queue	25'	25'		25'			25'			25'		
	Spec Event	LOS	B	A		B			A			A		
		Delay	12.3	9.1		10.8			7.6			7.6		
		Queue	25'	25'		25'			25'			25'		
Node 700: Najacht Road & North Driveway *One-Way Stop Control*		*Lanes->*	*1*			-			*1*		-	-		*1*
	AM	LOS	A			-			A		-	-		*
		Delay	9.0			-			7.4		-	-		*
		Queue	25'			-			25'		-	-		*
	PM	LOS	A			-			A		-	-		*
		Delay	9.0			-			7.3		-	-		*
		Queue	25'			-			25'		-	-		*
	Spec Event	LOS	A			-			A		-	-		*
		Delay	8.6			-			7.3		-	-		*
		Queue	25'			-			25'		-	-		*
Node 800: Najacht Road & Bus Driveway *One-Way Stop Control*		*Lanes->*	*1*			-			*1*		-	-		*1*
	AM	LOS	B			-			A		-	-		*
		Delay	10.0			-			7.4		-	-		*
		Queue	25'			-			25'		-	-		*
	PM	LOS	A			-			A		-	-		*
		Delay	9.8			-			7.3		-	-		*
		Queue	25'			-			25'		-	-		*
	Spec Event	LOS	A			-			A		-	-		*
		Delay	8.6			-			7.3		-	-		*
		Queue	25'			-			25'		-	-		*
Node 900: Najacht Road & Middle Driveway *One-Way Stop Control*		*Lanes->*	*1*			-			*1*		-	-		*1*
	AM	LOS	C			-			A		-	-		*
		Delay	23.5			-			8.9		-	-		*
		Queue	25'			-			50'		-	-		*
	PM	LOS	B			-			A		-	-		*
		Delay	12.3			-			7.8		-	-		*
		Queue	25'			-			25'		-	-		*
	Spec Event	LOS	A			-			A		-	-		*
		Delay	8.6			-			7.3		-	-		*
		Queue	25'			-			25'		-	-		*
Node 1000: Najacht Road & South Driveway *One-Way Stop Control*		*Lanes->*	*1*			-			*1*		-	-		*1*
	AM	LOS	B			-			A		-	-		*
		Delay	13.5			-			7.4		-	-		*
		Queue	90'			-			25'		-	-		*
	PM	LOS	B			-			A		-	-		*
		Delay	10.5			-			7.4		-	-		*
		Queue	35'			-			25'		-	-		*
	Spec Event	LOS	A			-			A		-	-		*
		Delay	9.0			-			7.4		-	-		*
		Queue	25'			-			25'		-	-		*

(-) indicates a movement that is prohibited or does not exist; (*) indicates a freeflow movement.
Delay is reported in seconds. Queue is the maximum of the 50th & 95th percentile queue, measured in feet.

TRAFFIC ANALYSIS & DESIGN, INC.
3228 ~ 5/02/2024

EXHIBIT 5-1A
FULL BUILD TRAFFIC OPERATIONS WITHOUT MODIFICATIONS

SHEBOYGAN, WISCONSIN

Exhibit 5-1B
Full Build (Sensitivity Analysis) Traffic Peak Hour Operating Conditions
With Existing Geometrics and Traffic Control

Intersection	Peak Hour	Metric	Level of Service (LOS) per Movement by Approach											
			Eastbound			Westbound			Northbound			Southbound		
			↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Node 100: Najacht Road & Enterprise Drive *One-Way Stop Control*		*Lanes->*	-	*1*		*1*		-		*1*			-	
	AM	LOS	-	*		A		-		A			-	
		Delay	-	*		7.6		-		9.6			-	
		Queue	-	*		25'		-		25'			-	
	PM	LOS	-	*		A		-		A			-	
		Delay	-	*		7.5		-		9.6			-	
		Queue	-	*		25'		-		25'			-	
	Spec Event	LOS	-	*		A		-		A			-	
		Delay	-	*		7.4		-		9.2			-	
		Queue	-	*		25'		-		25'			-	
Node 200: Mill Road & STH 42 *Two-Way Stop Control*		*Lanes->*		*1*			*1*		*1*		*2*		*1*	*2*
	AM	LOS		E			F	B	A		*		A	*
		Delay		35.0			181.4	12.9	9.0		*		9.4	*
		v/c		0.03			1.11	-	-		-		-	-
		Queue		25'			205'	40'	25'		*		25'	*
	PM	LOS		E			F	B	A		*		B	*
		Delay		47.1			97.7	12.6	9.5		*		10.3	*
		v/c		0.04			0.54	-	-		-		-	-
		Queue		25'			60'	25'	25'		*		25'	*
	Spec Event	LOS		E			F	B	A		*		B	*
		Delay		46.5			79.1	12.7	9.1		*		10.5	*
		v/c		0.04			0.37	-	-		-		-	-
		Queue		25'			35'	25'	25'		*		25'	*
Node 300: Mill Road & Lisa Avenue *One-Way Stop Control*		*Lanes->*	*1*		-	-		*1*		-			*1*	
	AM	LOS	A		-	-		*		-			B	
		Delay	8.0		-	-		*		-			12.3	
		Queue	25'		-	-		*		-			25'	
	PM	LOS	A		-	-		*		-			B	
		Delay	7.7		-	-		*		-			10.9	
		Queue	25'		-	-		*		-			25'	
	Spec Event	LOS	A		-	-		*		-			A	
		Delay	7.5		-	-		*		-			9.9	
		Queue	25'		-	-		*		-			25'	
Node 400: Mill Road & Najacht Road *One-Way Stop Control*		*Lanes->*		*1*			-			*1*	-	-		*1*
	AM	LOS		C			-			A	-	-		*
		Delay		18.0			-			8.9	-	-		*
		Queue		55'			-			25'	-	-		*
	PM	LOS		B			-			A	-	-		*
		Delay		13.1			-			8.3	-	-		*
		Queue		35'			-			25'	-	-		*
	Spec Event	LOS		A			-			A	-	-		*
		Delay		9.7			-			7.7	-	-		*
		Queue		25'			-			25'	-	-		*
Node 500: 21st Street/Mill Road & Eisner Avenue *All-Way Stop Control*		*Lanes->*		*1*			*1*			*1*	*1*			*1*
	AM	LOS		B			F			B	B			E
		Delay		11.3			94.4			14.6	12.2			42.1
		v/c		-			1.10			-	-			0.92
		Queue		25'			515'			40'	25'			245'
	PM	LOS		B			D			B	B			D
		Delay		10.4			28.6			11.9	11.6			27.6
		Queue		25'			205'			25'	30'			180'
	Spec Event	LOS		A			B			A	A			B
		Delay		8.4			10.3			9.0	8.3			11.0
		Queue		25'			45'			25'	25'			40'
Node 600: 21st Street & Pigeon River School Driveway *Two-Way Stop Control*		*Lanes->*	*1*	*1*		*1*			*1*				*1*	
	AM	LOS	C	B		C			A				A	
		Delay	20.4	11.3		15.9			8.1				7.8	
		Queue	25'	25'		25'			25'				25'	
	PM	LOS	C	A		C			A				A	
		Delay	16.0	9.9		15.9			8.0				7.8	
		Queue	25'	25'		25'			25'				25'	
	Spec Event	LOS	B	A		B			A				A	
		Delay	12.3	9.1		10.8			7.6				7.6	
		Queue	25'	25'		25'			25'				25'	
Node 700: Najacht Road & North Driveway *One-Way Stop Control*		*Lanes->*		*1*			-			*1*	-	-		*1*
	AM	LOS		A			-			A	-	-		*
		Delay		9.0			-			7.4	-	-		*
		Queue		25'			-			25'	-	-		*
	PM	LOS		A			-			A	-	-		*
		Delay		8.9			-			7.3	-	-		*
		Queue		25'			-			25'	-	-		*
	Spec Event	LOS		A			-			A	-	-		*
		Delay		8.6			-			7.3	-	-		*
		Queue		25'			-			25'	-	-		*
Node 800: Najacht Road & Bus Driveway *One-Way Stop Control*		*Lanes->*		*1*			-			*1*	-	-		*1*
	AM	LOS		A			-			A	-	-		*
		Delay		9.9			-			7.4	-	-		*
		Queue		25'			-			25'	-	-		*
	PM	LOS		A			-			A	-	-		*
		Delay		9.8			-			7.3	-	-		*
		Queue		25'			-			25'	-	-		*
	Spec Event	LOS		A			-			A	-	-		*
		Delay		8.6			-			7.3	-	-		*
		Queue		25'			-			25'	-	-		*
Node 900: Najacht Road & Middle Driveway *One-Way Stop Control*		*Lanes->*		*1*			-			*1*	-	-		*1*
	AM	LOS		C			-			A	-	-		*
		Delay		16.0			-			8.3	-	-		*
		Queue		25'			-			30'	-	-		*
	PM	LOS		B			-			A	-	-		*
		Delay		11.0			-			7.7	-	-		*
		Queue		25'			-			25'	-	-		*
	Spec Event	LOS		A			-			A	-	-		*
		Delay		8.6			-			7.3	-	-		*
		Queue		25'			-			25'	-	-		*
Node 1000: Najacht Road & South Driveway *One-Way Stop Control*		*Lanes->*		*1*			-			*1*	-	-		*1*
	AM	LOS		B			-			A	-	-		*
		Delay		11.1			-			7.4	-	-		*
		Queue		50'			-			25'	-	-		*
	PM	LOS		A			-			A	-	-		*
		Delay		9.7			-			7.3	-	-		*
		Queue		25'			-			25'	-	-		*
	Spec Event	LOS		A			-			A	-	-		*
		Delay		9.0			-			7.4	-	-		*
		Queue		25'			-			25'	-	-		*

(-) indicates a movement that is prohibited or does not exist; (*) indicates a freeflow movement.
Delay is reported in seconds. Queue is the maximum of the 50th & 95th percentile queue, measured in feet.

TRAFFIC ANALYSIS & DESIGN, INC.
3228 ~ 5/02/2024

EXHIBIT 5-1B
FULL BUILD TRAFFIC OPERATIONS SENSITIVITY ANALYSIS - ITE RATES WITHOUT MODIFICATIONS

SHEBOYGAN, WISCONSIN

Exhibit 5-2
Background (includes Off-site Development) Traffic Peak Hour Operating Conditions
With Modified Geometrics and Traffic Control

Intersection	Peak Hour	Metric	Level of Service (LOS) per Movement by Approach											
			Eastbound			Westbound			Northbound			Southbound		
			↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Node 100: Najacht Road & Enterprise Drive *One-Way Stop Control*		*Lanes->*	-	*1*		*1*		-		*1*			-	
	AM	LOS	-	*		A		-		A			-	
		Delay	-	*		7.5		-		9.4			-	
		Queue	-	*		25'		-		25'			-	
	PM	LOS	-	*		A		-		A			-	
		Delay	-	*		7.4		-		9.5			-	
		Queue	-	*		25'		-		25'			-	
	Spec Event	LOS	-	*		A		-		A			-	
		Delay	-	*		7.3		-		9.2			-	
		Queue	-	*		25'		-		25'			-	
Node 200: Mill Road & STH 42 *Two-Way Stop Control*		*Lanes->*	*1*			*1*		*1*	*1*		*2*	*1*	*2*	
	AM	LOS	D			E		B	A		*	A	*	
		Delay	33.8			47.2		12.3	9.0		*	9.3	*	
		v/c	-			0.34		-	-		-	-	-	
		Queue	25'			35'		30'	25'		*	25'	*	
	PM	LOS	E			F		B	A		*	B	*	
		Delay	47.1			86.3		12.5	9.5		*	10.3	*	
		v/c	0.04			0.46		-	-		-	-	-	
		Queue	25'			50'		25'	25'		*	25'	*	
	Spec Event	LOS	E			F		B	A		*	B	*	
		Delay	46.0			72.5		12.7	9.1		*	10.4	*	
		v/c	0.04			0.30		-	-		-	-	-	
		Queue	25'			30'		25'	25'		*	25'	*	
Node 300: Mill Road & Lisa Avenue *One-Way Stop Control*		*Lanes->*	*1*		-	-		*1*		-			*1*	
	AM	LOS	A		-	-		*		-			B	
		Delay	7.6		-	-		*		-			10.7	
		Queue	25'		-	-		*		-			25'	
	PM	LOS	A		-	-		*		-			A	
		Delay	7.5		-	-		*		-			9.8	
		Queue	25'		-	-		*		-			25'	
	Spec Event	LOS	A		-	-		*		-			A	
		Delay	7.5		-	-		*		-			9.8	
		Queue	25'		-	-		*		-			25'	
Node 400: Mill Road & Najacht Road *One-Way Stop Control*		*Lanes->*	*1*			-			*1*		-	-		*1*
	AM	LOS	A			-			A		-	-		*
		Delay	9.4			-			7.7		-	-		*
		Queue	25'			-			25'		-	-		*
	PM	LOS	A			-			A		-	-		*
		Delay	9.1			-			7.5		-	-		*
		Queue	25'			-			25'		-	-		*
	Spec Event	LOS	A			-			A		-	-		*
		Delay	8.9			-			7.4		-	-		*
		Queue	25'			-			25'		-	-		*
Node 500: 21st Street/Mill Road & Eisner Avenue *All-Way Stop Control*		*Lanes->*	*1*			*1*			*1*		*1*	*1*		
	AM	LOS	A			B			A		A	B		
		Delay	8.4			11.8			8.8		8.8	10.9		
		Queue	25'			60'			25'		25'	40'		
	PM	LOS	A			A			A		A	A		
		Delay	7.9			9.4			8.4		8.1	9.3		
		Queue	25'			35'			25'		25'	25'		
	Spec Event	LOS	A			A			A		A	A		
		Delay	7.8			8.8			8.2		7.9	9.0		
		Queue	25'			30'			25'		25'	25'		
Node 600: 21st Street & Pigeon River School Driveway *Two-Way Stop Control*		*Lanes->*	*1*		*1*	*1*			*1*			*1*		
	AM	LOS	C		B	B			A			A		
		Delay	15.0		10.6	12.6			7.9			7.5		
		Queue	25'		25'	25'			25'			25'		
	PM	LOS	B		A	B			A			A		
		Delay	12.3		9.2	12.4			7.7			7.6		
		Queue	25'		25'	25'			25'			25'		
	Spec Event	LOS	B		A	B			A			A		
		Delay	11.5		8.9	10.3			7.6			7.5		
		Queue	25'		25'	25'			25'			25'		

(-) indicates a movement that is prohibited or does not exist; (*) indicates a freeflow movement.
Delay is reported in seconds. Queue is the maximum of the 50th & 95th percentile queue, measured in feet.

Exhibit 5-3
Full Build Traffic Peak Hour Operating Conditions
With Modified Geometrics and Traffic Control

Intersection	Peak Hour	Metric	Level of Service (LOS) per Movement by Approach											
			Eastbound			Westbound			Northbound			Southbound		
			↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Node 100: Najacht Road & Enterprise Drive *One-Way Stop Control*		*Lanes->*	-	*1*		*1*		-	*1*			-		
	AM	LOS	-	*		A		-	A			-		
		Delay	-	*		7.6		-	9.5			-		
		Queue	-	*		25'		-	25'			-		
	PM	LOS	-	*		A		-	A			-		
		Delay	-	*		7.5		-	9.6			-		
		Queue	-	*		25'		-	25'			-		
	Spec Event	LOS	-	*		A		-	A			-		
		Delay	-	*		7.4		-	9.2			-		
		Queue	-	*		25'		-	25'			-		
Node 200: Mill Road & STH 42 *Traffic Signal Control*		*Lanes->*	*1*			*1*		*1*	*1*		*2*	*1*		*2*
	AM	LOS	B			B		B	A		A	B		A
		Delay	11.5			13.0		13.6	9.4		7.7	11.3		7.9
		Queue	25'			70'		65'	25'		80'	45'		85'
	PM	LOS	B			B		C	A		A	B		A
		Delay	14.0			14.6		15.2	8.0		6.5	10.5		6.4
		Queue	25'			35'		45'	25'		95'	45'		95'
	Spec Event	LOS	B			B		B	A		A	B		A
		Delay	14.4			14.7		15.8	7.1		6.1	10.5		5.8
		Queue	25'			25'		50'	25'		100'	60'		85'
Node 300: Mill Road & Lisa Avenue *One-Way Stop Control*		*Lanes->*	*1*	-		-	*1*		-			*1*		
	AM	LOS	A	-		-	*		-			B		
		Delay	8.1	-		-	*		-			12.8		
		Queue	25'	-		-	*		-			25'		
	PM	LOS	A	-		-	*		-			B		
		Delay	7.7	-		-	*		-			11.0		
		Queue	25'	-		-	*		-			25'		
	Spec Event	LOS	A	-		-	*		-			A		
		Delay	7.5	-		-	*		-			9.9		
		Queue	25'	-		-	*		-			25'		
Node 400: Mill Road & Najacht Road *One-Way Stop Control*		*Lanes->*	*1*			-			*1*	-		-		*1*
	AM	LOS	C			-			A	-		-		*
		Delay	24.5			-			9.5	-		-		*
		Queue	80'			-			25'	-		-		*
	PM	LOS	C			-			A	-		-		*
		Delay	15.5			-			8.6	-		-		*
		Queue	45'			-			25'	-		-		*
	Spec Event	LOS	A			-			A	-		-		*
		Delay	9.7			-			7.7	-		-		*
		Queue	25'			-			25'	-		-		*
Node 500: 21st Street/Mill Road & Eisner Avenue *Traffic Signal Control*		*Lanes->*	*1*			*1*		*1*	*1*		*1*	*1*		
	AM	LOS	C			C		D	A		A	D		
		Delay	22.2			33.7		44.2	9.4		8.6	35.4		
		Queue	25'			85'		160'	55'		25'	185'		
	PM	LOS	B			B		C	A		A	B		
		Delay	15.6			18.3		22.7	6.1		6.0	12.7		
		Queue	25'			70'		100'	30'		25'	125'		
	Spec Event	LOS	A			A		A	A		A	A		
		Delay	8.0			8.7		9.1	7.2		7.3	8.9		
		Queue	25'			40'		50'	25'		25'	80'		
Node 600: 21st Street & Pigeon River School Driveway *Two-Way Stop Control*		*Lanes->*	*1*	*1*		*1*			*1*			*1*		
	AM	LOS	C	B		C			A			A		
		Delay	22.7	11.6		17.3			8.2			7.9		
		Queue	25'	25'		25'			25'			25'		
	PM	LOS	C	B		C			A			A		
		Delay	16.8	10.0		16.6			8.1			7.8		
		Queue	25'	25'		25'			25'			25'		
	Spec Event	LOS	B	A		B			A			A		
		Delay	12.3	9.1		10.8			7.6			7.6		
		Queue	25'	25'		25'			25'			25'		
Node 700: Najacht Road & North Driveway *One-Way Stop Control*		*Lanes->*	*1*			-			*1*	-		-		*1*
	AM	LOS	A			-			A	-		-		*
		Delay	9.0			-			7.4	-		-		*
		Queue	25'			-			25'	-		-		*
	PM	LOS	A			-			A	-		-		*
		Delay	9.0			-			7.3	-		-		*
		Queue	25'			-			25'	-		-		*
	Spec Event	LOS	A			-			A	-		-		*
		Delay	8.6			-			7.3	-		-		*
		Queue	25'			-			25'	-		-		*
Node 800: Najacht Road & Bus Driveway *One-Way Stop Control*		*Lanes->*	*1*			-			*1*	-		-		*1*
	AM	LOS	B			-			A	-		-		*
		Delay	10.0			-			7.4	-		-		*
		Queue	25'			-			25'	-		-		*
	PM	LOS	A			-			A	-		-		*
		Delay	9.8			-			7.3	-		-		*
		Queue	25'			-			25'	-		-		*
	Spec Event	LOS	A			-			A	-		-		*
		Delay	8.6			-			7.3	-		-		*
		Queue	25'			-			25'	-		-		*
Node 900: Najacht Road & Middle Driveway *One-Way Stop Control*		*Lanes->*	*1*			-			*2*	-		-		*1*
	AM	LOS	C			-			A	-		-		*
		Delay	24.2			-			8.9	-		-		*
		Queue	25'			-			50'	-		-		*
	PM	LOS	B			-			A	-		-		*
		Delay	12.2			-			7.9	-		-		*
		Queue	25'			-			25'	-		-		*
	Spec Event	LOS	A			-			A	-		-		*
		Delay	8.6			-			7.3	-		-		*
		Queue	25'			-			25'	-		-		*
Node 1000: Najacht Road & South Driveway *One-Way Stop Control*		*Lanes->*	*1*			-			*2*	-		-		*1*
	AM	LOS	B			-			A	-		-		*
		Delay	13.1			-			7.4	-		-		*
		Queue	85'			-			25'	-		-		*
	PM	LOS	B			-			A	-		-		*
		Delay	10.4			-			7.4	-		-		*
		Queue	35'			-			25'	-		-		*
	Spec Event	LOS	A			-			A	-		-		*
		Delay	9.0			-			7.4	-		-		*
		Queue	25'			-			25'	-		-		*

(-) indicates a movement that is prohibited or does not exist; (*) indicates a freeflow movement.
Delay is reported in seconds. Queue is the maximum of the 50th & 95th percentile queue, measured in feet.

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EXHIBIT 5-3
FULL BUILD TRAFFIC OPERATIONS WITH MODIFICATIONS

SHEBOYGAN, WISCONSIN

Exhibit 5-4
Node 500: 21st Street/Mill Road & Eisner Avenue
Full Build Traffic Peak Hour Operating Conditions Comparison
With Modified Geometrics and Traffic Control

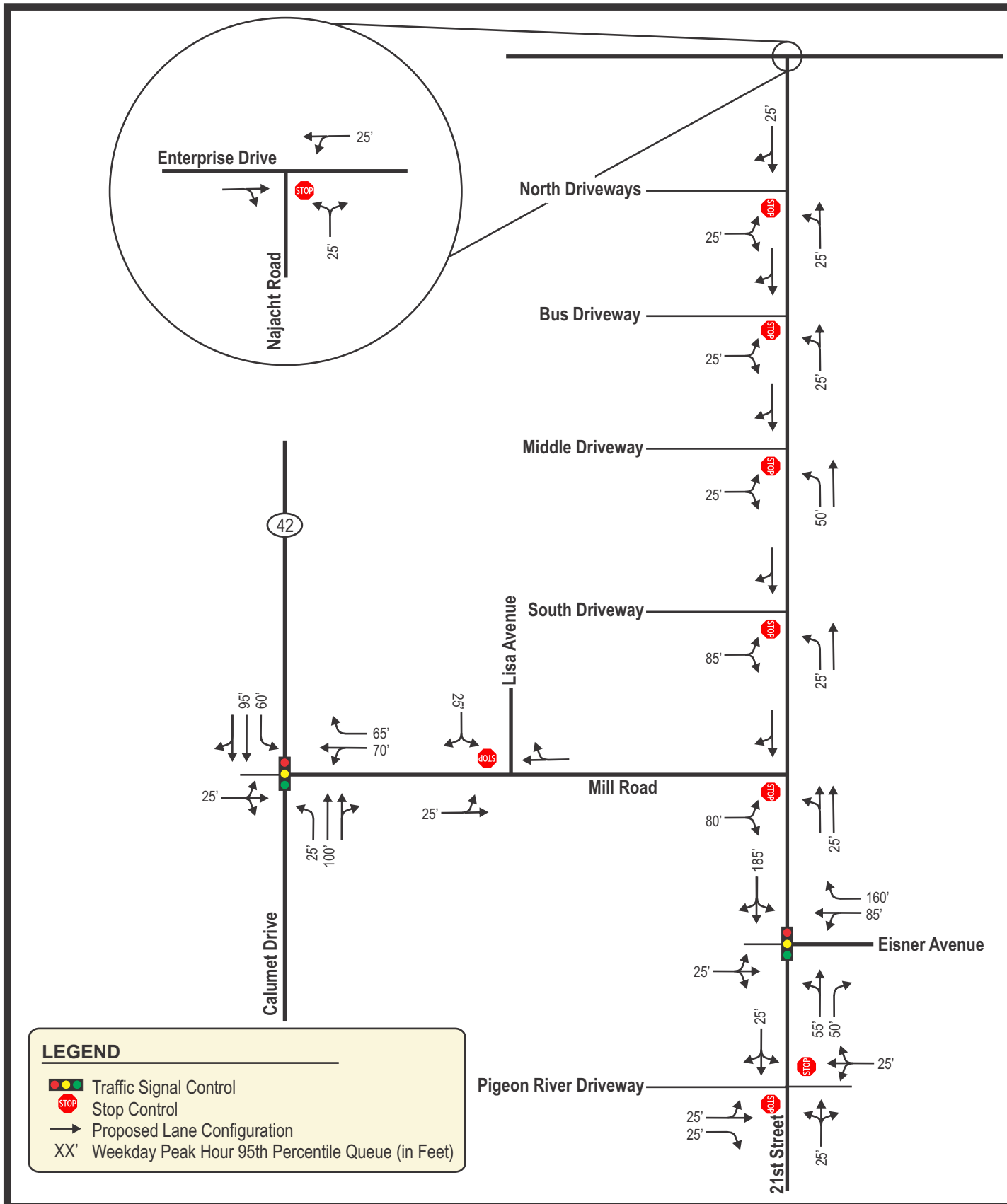
Intersection	Peak Hour	Metric	Level of Service (LOS) per Movement by Approach											
			Eastbound			Westbound			Northbound			Southbound		
			↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
All-Way Stop Control		*Lanes->*	*1*			*1*		*1*	*1*		*1*	*1*		*1*
	AM	LOS	B			C		F	C		B	E		B
		Delay	12.2			15.7		86.2	17.5		12.5	45.3		14.2
		v/c	-			-		1.08	-		-	0.89		-
		Queue	25'			50'		445'	60'		25'	225'		40'
	PM	LOS	B			B		C	B		B	D		B
		Delay	11.2			14.0		21.8	12.7		12.0	30.4		11.9
		Queue	25'			40'		135'	30'		30'	170'		25'
	Spec Event	LOS	A			B		A	A		A	B		A
		Delay	9.0			10.0		9.5	9.1		8.5	11.4		8.9
		Queue	25'			25'		30'	25'		25'	35'		25'
Traffic Signal Control		*Lanes->*	*1*			*1*		*1*	*1*		*1*	*1*		
	AM	LOS	C			C		D	A		A	D		
		Delay	22.2			33.7		44.2	9.4		8.6	35.4		
		Queue	25'			85'		160'	55'		24'	185'		
	PM	LOS	B			B		C	A		A	B		
		Delay	15.6			18.3		22.7	6.1		6.0	12.7		
		Queue	25'			70'		100'	30'		25'	125'		
	Spec Event	LOS	A			A		A	A		A	A		
		Delay	8.0			8.7		9.1	7.2		7.3	8.9		
		Queue	25'			40'		50'	25'		25'	80'		
Roundabout Control		*Lanes->*	*1*			*1*			*1*			*1*		
	AM	LOS	A			C			A			A		
		Delay	5.6			15.2			8.2			8.9		
		Queue	25'			170'			45'			75'		
	PM	LOS	A			A			A			A		
		Delay	5.2			8.5			7.4			7.9		
		Queue	25'			70'			35'			60'		
	Spec Event	LOS	A			A			A			A		
		Delay	3.7			4.8			4.6			4.6		
		Queue	25'			25'			25'			25'		

(-) indicates a movement that is prohibited or does not exist; (*) indicates a freeflow movement.
Delay is reported in seconds. Queue is the maximum of the 50th & 95th percentile queue, measured in feet.

Exhibit 5-5
Node 200: STH 42 & Mill Road
Full Build Traffic Peak Hour Operating Conditions Comparison
With Modified Geometrics and Traffic Control

Intersection	Peak Hour	Metric	Level of Service (LOS) per Movement by Approach											
			Eastbound			Westbound			Northbound			Southbound		
			↗	→	↘	↙	←	↖	↖	↑	↗	↘	↓	↙
Two-Way Stop Control		*Lanes->*	*1*			*1*		*1*	*1*		*2*	*1*		*2*
	AM	LOS	E			F		B	A		*	A		*
		Delay	35.8			243.5		13.2	9.0		*	9.4		*
		v/c	0.03			1.29		-	-		-	-		-
		Queue	25'			260'		40'	25'		*	25'		*
	PM	LOS	E			F		B	A		*	B		*
		Delay	47.6			109.0		12.6	9.5		*	10.3		*
		v/c	0.04			0.61		-	-		-	-		-
		Queue	25'			70'		25'	25'		*	25'		*
	Spec Event	LOS	E			E		B	A		*	B		*
		Delay	46.5			49.1		12.7	9.1		*	10.5		*
		v/c	0.04			0.37		-	-		-	-		-
		Queue	25'			35'		25'	25'		*	25'		*
Traffic Signal Control		*Lanes->*	*1*			*1*		*1*	*1*		*2*	*1*		*2*
	AM	LOS	B			B		B	A		A	B		A
		Delay	11.5			13.0		13.6	9.4		7.7	11.3		7.9
		Queue	25'			70'		65'	25'		80'	45'		85'
	PM	LOS	B			B		B	A		A	B		A
		Delay	14.0			14.6		15.2	8.0		6.5	10.5		6.4
		Queue	25'			35'		45'	25'		95'	45'		95'
	Spec Event	LOS	B			B		B	A		A	B		A
		Delay	14.4			14.7		15.8	7.1		6.1	10.5		5.8
		Queue	25'			25'		50'	25'		100'	60'		85'
Roundabout Control		*Lanes->*	*1*			*1*			*2*			*2*		
	AM	LOS	A			B			A			A		
		Delay	6.9			12.6			5.5			6.6		
		Queue	25'			80'			30'			45'		
	PM	LOS	A			A			A			A		
		Delay	6.9			9.0			6.3			6.2		
		Queue	25'			25'			45'			45'		
	Spec Event	LOS	A			A			A			A		
		Delay	6.3			8.6			6.3			5.7		
		Queue	25'			25'			45'			40'		

(-) indicates a movement that is prohibited or does not exist; (*) indicates a freeflow movement.
Delay is reported in seconds. Queue is the maximum of the 50th & 95th percentile queue, measured in feet.



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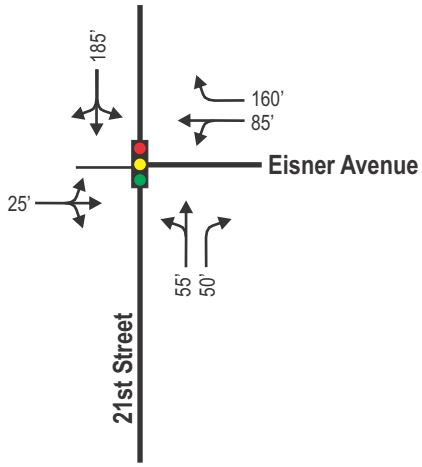
N

NOT TO SCALE

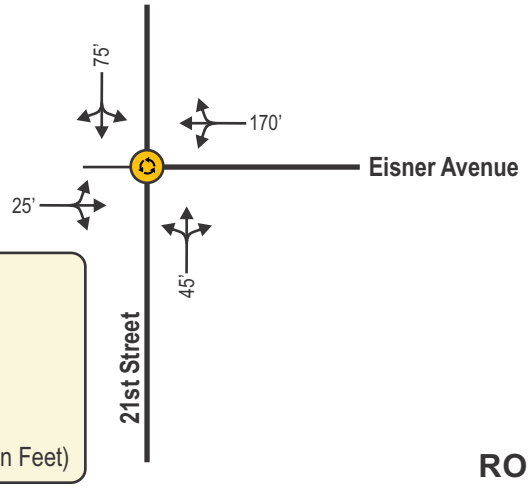
EXHIBIT 5-6A
FULL BUILD TRAFFIC VOLUMES
MAXIMUM QUEUE LENGTHS

SHEBOYGAN, WISCONSIN

ALL-WAY STOP CONTROL



TRAFFIC SIGNAL CONTROL



ROUNDABOUT CONTROL

LEGEND

- Traffic Signal Control
- Stop Control
- Roundabout Control
- Proposed Lane Configuration
- XX' Weekday Peak Hour 95th Percentile Queue (in Feet)

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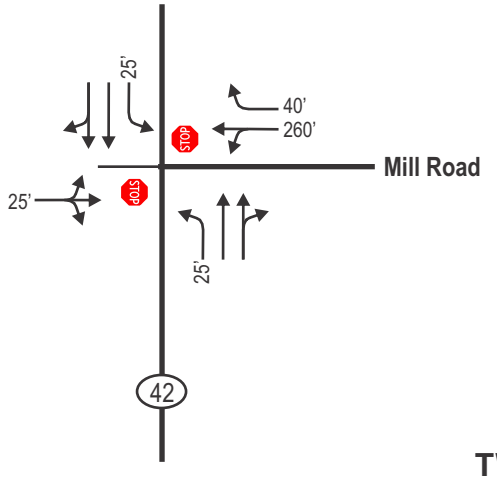
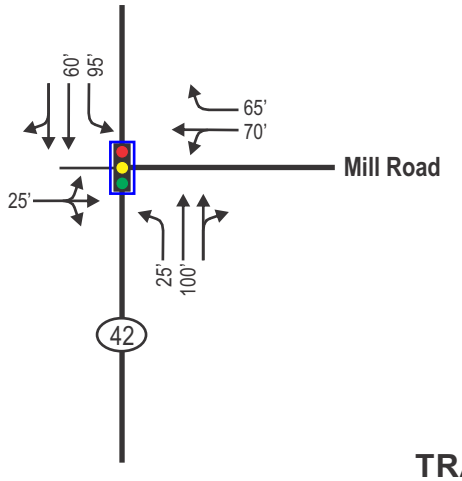
EXHIBIT 5-6B
21st STREET/MILL ROAD & EISNER AVENUE
FULL BUILD TRAFFIC VOLUMES
MAXIMUM QUEUE LENGTH COMPARISON

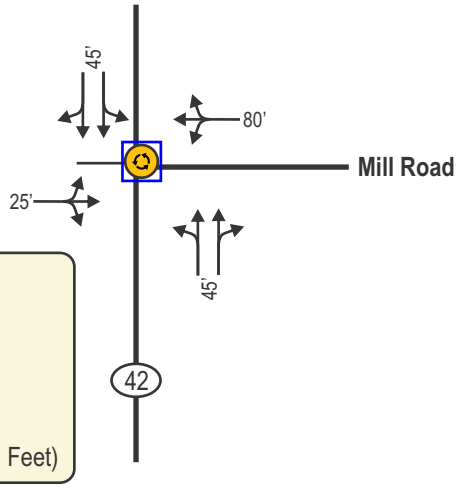
SHEBOYGAN, WISCONSIN



TWO-WAY STOP CONTROL



TRAFFIC SIGNAL CONTROL



LEGEND

- Traffic Signal Control
- Stop Control
- Roundabout Control
- Proposed Lane Configuration
- XX' Weekday Peak Hour 95th Percentile Queue (in Feet)

ROUNDABOUT CONTROL

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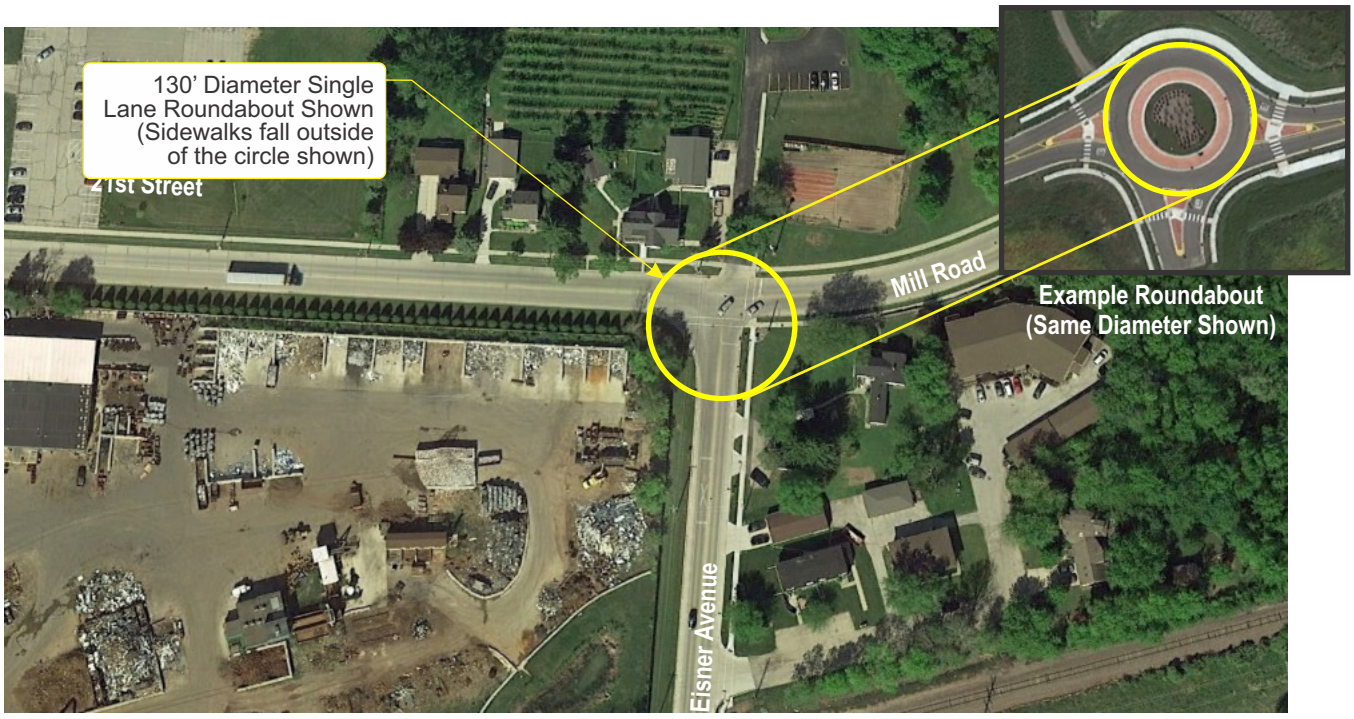
EXHIBIT 5-6C
STH 42 & MILL ROAD
FULL BUILD TRAFFIC VOLUMES
MAXIMUM QUEUE LENGTH COMPARISON

SHEBOYGAN, WISCONSIN

TRAFFIC SIGNAL CONTROL



ROUNDABOUT CONTROL

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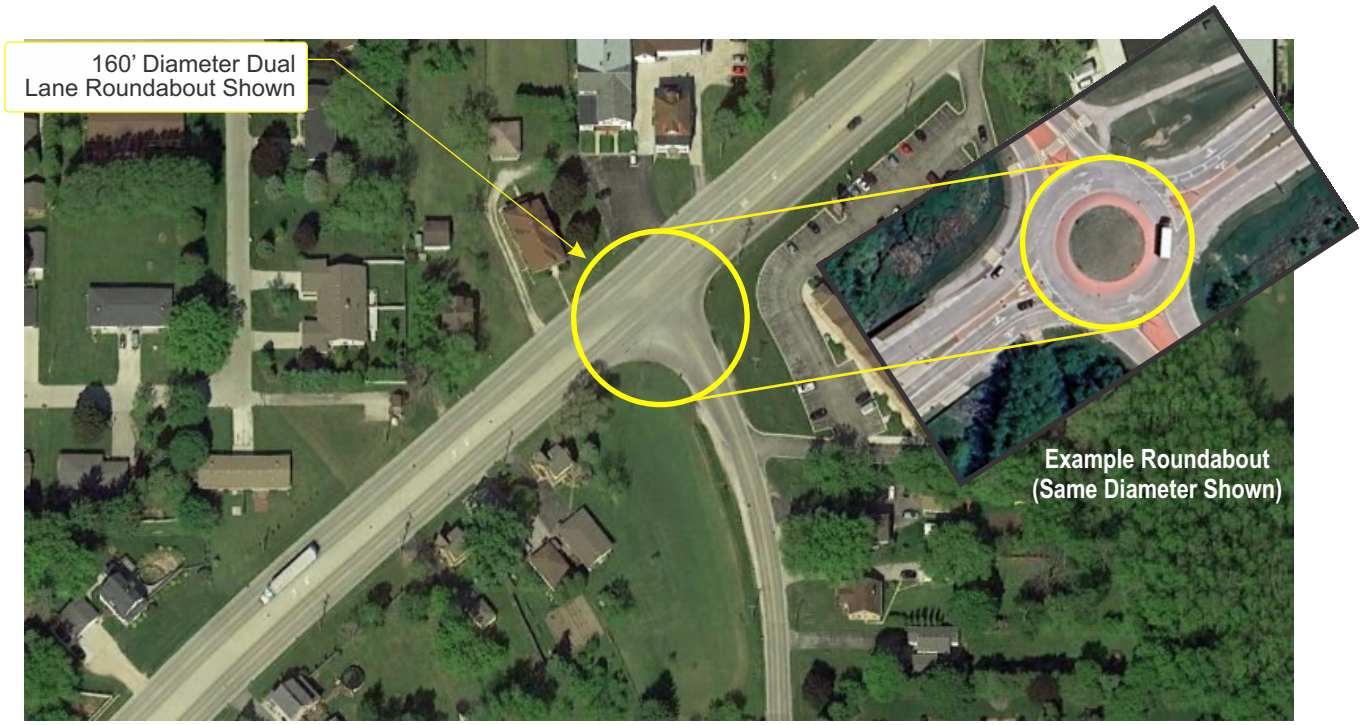
EXHIBIT 5-7A
CONCEPTUAL DRAWINGS
21st STREET/MILL ROAD & EISNER AVENUE

SHEBOYGAN, WISCONSIN

TRAFFIC SIGNAL CONTROL



ROUNDABOUT CONTROL

TADI
TRAFFIC ANALYSIS & DESIGN, INC.
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EXHIBIT 5-7B
CONCEPTUAL DRAWINGS
STH 42 & MILL ROAD

SHEBOYGAN, WISCONSIN

CHAPTER VI – RECOMMENDATIONS AND CONCLUSION

PART A – RECOMMENDATIONS

The study area intersections were analyzed based on the procedures set forth in the *Highway Capacity Manual* (HCM), *6th Edition*. Intersection operation is defined by "level of service." Level of Service (LOS) is a quantitative measure that refers to the overall quality of flow at an intersection ranging from very good, represented by LOS 'A,' to very poor, represented by LOS 'F.' For the purpose of this study, LOS D or better was used to define acceptable peak hour operating conditions.

A1. Existing & Background Traffic – Recommended Modifications

The study area intersections were analyzed based on the procedures set forth in the *Highway Capacity Manual* (HCM), *6th Edition*. Intersection operation is defined by "level of service." Level of Service (LOS) is a quantitative measure that refers to the overall quality of flow at an intersection ranging from very good, represented by LOS 'A,' to very poor, represented by LOS 'F.' For the purpose of this study, LOS D or better was used to define acceptable peak hour operating conditions.

The existing and background (with offsite development) traffic volumes do not include any school modifications. The analysis was conducted using existing intersection geometrics and traffic control. No modifications are recommended to accommodate the existing and background (with offsite development) traffic volumes. *Modifications are for jurisdictional consideration and are not legally binding. The City of Sheboygan and the Town of Sheboygan reserve the right to determine alternative solutions.*

Higher delays (LOS F) are expected at the Mill Road intersection with STH 42 during the weekday morning arrival, weekday afternoon discharge and weekday evening special event peak hours under background traffic volume conditions. However, traffic signals are not expected to be warranted at the intersection under the background traffic conditions. The intersection should be monitored, and traffic signals considered once traffic volumes increase in the future.

Except as noted, all intersections are currently operating at LOS D or better during the weekday peak periods.

B7. Full Build Traffic – Recommended Modifications

Full build traffic volumes include the full build of the proposed middle school site including future year student population projections. The following modifications, shown in Exhibit 1-3, are recommended to accommodate the full build traffic volume conditions. *Modifications are for jurisdictional consideration and are not legally binding. The City of Sheboygan and the Town of Sheboygan reserve the right to determine alternative solutions.*

School Site (General)

- Consider providing additional stacking space along the pick-up lane in front of the school.

Najacht Road (General)

- Widen the street within the limits of the two south driveways to allow for a dedicated through lane and a dedicated left-turn lane into the site driveways.
- Consider extending the sidewalks along the east side of the street within the limits of the school to the north property line to allow for connection to potential future pedestrian accommodations to the north.

Mill Road (General)

- Consider providing sidewalks along the north side of the street within the limits of the school to the west property line to allow for connection to potential future pedestrian accommodations.

Node 100 – Najacht Road intersection with Enterprise Drive

- No modifications recommended.

Node 200 – Mill Road intersection with STH 42

- Three modification options are recommended for consideration (see discussion below):
- Option 1 - Maintain two-way stop control.
    - No modifications recommended but higher delays and queueing expected.
- Option 2 – Provide fully actuated traffic signal control.
- Option 3 - Construct a dual lane roundabout with two lane approaches on the north and south approaches and single lane approaches on the east and west approaches.

Node 300 – Mill Road intersection with Lisa Avenue

- No modifications recommended.

Node 400 – Mill Road intersection with Najacht Road

- Provide continental-style pedestrian crosswalk pavement markings and pedestrian crossing signs along the west and north approaches of the intersection.

Node 500 – 21st Street/Mill Road intersection with Eisner Avenue

- Three modification options are recommended for consideration (see discussion below):
- Option 1 - Maintain all-way stop control.
    - Provide a dedicated left-turn lane and a shared through/right-turn lane on the north approach (currently a single shared lane).
    - Provide a shared through /left-turn lane and a dedicated right-turn lane on the east approach (currently a wide single shared lane).
    - Provide a shared through /left-turn lane and a dedicated right-turn lane on the south approach (currently a single shared lane).
    - Provide continental-style pedestrian crosswalk pavement markings and pedestrian crossing signs along the east and north approaches of the intersection.
    - Higher delays and queueing expected.
- Option 2 – Provide fully actuated traffic signal control.
    - No modifications recommended on the north or west approaches.
    - Provide a shared through /left-turn lane and a dedicated right-turn lane on the east approach by widening the bike lane (currently a wide single shared lane with a bike lane).

  - Provide a shared through /left-turn lane and a dedicated right-turn lane on the south approach (currently a single shared lane).
  - Provide pedestrian crosswalk pavement markings along all approaches of the intersection.

- Option 3 - Construct a single lane roundabout at the intersection.

Node 600 – 21st Street with Pigeon River School Driveway

- No modifications recommended.

Node 800 – Najacht Road intersection with North/Bus Exit Driveway

- Provide a full access driveway with stop sign control on the west approach.

Node 900 – Najacht Road intersection with Middle Driveway

- Provide a full access driveway with stop sign control on the west approach.
- Widen the south approach of Najacht Road to allow for a dedicated through lane and a dedicated left-turn lane into the site driveway.
- Provide continental-style pedestrian crosswalk pavement markings and pedestrian crossing signs along the north and west approaches of the intersection.

Node 1000 – Najacht Road intersection with South Driveway

- Provide a full access driveway with stop sign control.
- Widen the south approach of Najacht Road to allow for a dedicated through lane and a dedicated left-turn lane into the site driveway.

Higher delays (LOS E/F) are expected at the Mill Road/21st Street intersection with Eisner Avenue under the current all-way stop control, even with additional lanes, during the weekday morning arrival peak hour under full build traffic volume conditions. In addition, higher delays (LOS E/F) are expected at the Mill Road intersection with STH 42 during the weekday morning arrival, weekday afternoon discharge and weekday evening special event peak hours under full build traffic volume conditions. However, the highest delays at both intersections are expected during the typical morning arrival and afternoon discharge peak periods (for most schools this occurs for approximately 15 to 30 minutes). During these surge time periods, longer queues can also be expected under the current all-way stop control at the Mill Road/21st Street intersection with Eisner Avenue with queue lengths up to 18 vehicles expected on the east approach of the intersection during the typical weekday. To alleviate these longer delays and queue lengths, a higher-level traffic control application could be considered at both intersections; specifically, traffic signal control or roundabout control.

A traffic signal warrant analysis was completed, and traffic signal control is close to being warranted at the Mill Road/21st Street intersection with Eisner Avenue and is warranted at the Mill Road intersection with STH 42 based on the Peak Hour Warrant and based on the traffic volumes projections calculated for this study. Per the WisDOT Facilities Development Manual (FDM), if an intersection warrants traffic signal control, a modern roundabout should also be evaluated. Therefore, roundabout control was also considered at both intersections. Based on intersection operations and the analysis completed for this study, both traffic signal control and roundabout control are viable alternatives at the two intersections. The decision to provide traffic signal or roundabout control is best made by the local communities. Since cost is a typical major consideration, it is noted that the traffic signal option is likely to cost much less than the roundabout option. Under both scenarios, right-of-way will likely be required to allow for appropriate design standards to be met. However, it is likely that the roundabout alternative will

require the greatest amount of right-of-way. In general (not based on a detailed cost estimate), the typical cost of a single-lane roundabout in comparison to a signalized intersection is about two to three times the cost of a new signalized intersection with geometric modifications, dependent on right-of-way needs and complexity of the designs.

The parent drop-off/pick-up area is expected to accommodate up to about 40 parked vehicles adjacent to the school within the drop-off/pick-up area. In order to accommodate a minimum of 85 vehicles which are expected to arrive prior to the final school bell, without modifying the site plan, more than half the vehicles arriving prior to the school bell will be required to queue up within the northbound left-turn lanes into the site on Najacht Road, with some parents required to park in the southern parking lot once the left-turn lane fills up. With no on-street parking available adjacent to the site, adequate parking supply should be considered for these additional vehicles during the school discharge peak period to allow for adequate operations within the overall site and to lessen or avoid any spill backs onto the adjacent transportation network to the south of the school.

PART B – CONCLUSION

To accommodate the full build out of the proposed middle school, recommended modifications are expected to be necessary to the transportation network. Except as noted, all movements at the study area intersections are expected to operate safely and efficiently with the modifications identified in this TIA with the proposed middle school site.