RSG INC.
RESOURCE SYSTEMS GROUP, INC.

Glens Falls School District Traffic Circulation Study

Technical Report

August 9, 2012

Prepared for
Glens Falls School District *and* Adirondack / Glens Falls Transportation Council

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1.0 INTRODUCTION

Resource Systems Group, Inc. was contracted by the Adirondack / Glens Falls Transportation Council (A/GFTC) to evaluate and address site circulation, vehicle access, and pedestrian safety issues around the Glens Falls High School and Middle School campus. Beginning in the 2012-2013 school year, the arrival departure times of the high school and middle school are to be aligned. The objectives of this study include:

- An evaluation of the current access patterns,
- A projection of access issues under aligned arrival and dismissal times, and
- Proposed short and long term congestion mitigation strategies with improvements to the circulation patterns and bicycle and pedestrian safety considerations.

This report summarizes the methods of data collection, the analysis techniques, a review of the alternatives investigated, and short-term and long-term recommendations. This study has been organized into the following sections:

Section 1.0 – Introduction: Provides background information, explains the goals of this report, states the formal purpose and need of the study and provides a general description of the campus area, school characteristics, and adjacent street network within the City of Glens Falls.

Section 2.0 – Recommendations: The short and long term recommendations are presented early in this report for those that are most interested in the conclusions to be able to quickly and easily reach this information.

Section 3.0 – Traffic Observations: Documents the data collection methodology and presents the observed operational characteristics of the pick-up and drop-off periods.

Section 4.0 – Crash Analysis: Reviews the available crash records and documents any safety hazards near the study area.

Section 5.0 – Effect of Aligned School Times: Discusses the methodology used to project the resulting traffic under aligned school days and reviews the resulting data.

Section 6.0 – Congestion Mitigation Strategies: Presents the investigations into the various short-term and long-term congestion mitigation strategies.

Section 7.0 – Implementation: Identifies the leader and other partners that will participate in or support the implementation of the recommendations.

1.1 Study Area

The study area for the circulation analysis surrounds the Glens Falls School District Campus in west-central Glens Falls, roughly bounded by Quade Street, Sherman Avenue, Clayton Avenue, and Grant Avenue, specifically focusing on the primary school entrance locations for the Middle and High Schools along Quade Street. Additionally, the intersections of Shippey Street and West Notre Dame Street with Empire Avenue were included in the evaluation.

Figure 1: School campus within Glens Falls.

1.1.1 School Characteristics

The Glens Falls School District campus serves as the only public high school and middle school facility in the City of Glens Falls. The High School and Middle School serves grades 9 – 12 and 5 – 8, respectively. The High School serves approximately 770 students and Middle School student population numbers at around 575 pupils. This difference in student population is a combination of unusually high and low class sizes in the High School and Middle School respectively and not indicative of a declining population. In recent years, the population of the city has declined but is currently stable. Future classes, currently in grades 1 – 4, total approximately 650 students.

The school campus hosts a variety of facilities for extracurricular activities. Along with the many classrooms and academic facilities, the campus contains a theater, several athletic fields and practice grounds, including an indoor gymnasium, a joint football and soccer field, an outdoor track, a practice baseball diamond, and batting cages. The nearby Morse Athletic Complex, west of the campus along Sherman Avenue, provides additional recreational opportunities.

Figure 2: Glens Falls School District High School and Middle School Campuses.

1.1.2 Adjacent Street Network

In the study area, Sherman, Western, and Grant Avenues operate similarly to minor arterial streets. As arterials, these roads provide through traffic with a route across the project area. In general, these streets, operating as arterials, focus more on through traffic mobility then the remaining streets in the study area.

The remaining streets in the project area, including Quade Street, Shippey Street, and Clayton, Harrison, and Empire Avenues operate most similarly to the collector street classification. Typically, the corresponding streetscape to this classification emphasizes accessibility to neighboring properties and land uses.

The surrounding street network consists of stop controlled intersections; there are no stop lights in the immediate vicinity of the school campus. In general, the arterial streets are free movements, meaning these streets do not have to stop, at intersections with the neighborhood streets. When these arterials intersect, all approaches are generally required to stop; the same is generally true for the intersection of neighborhood streets. The intersection controls and road classifications are presented in Figure 3.

As an urban school district in a neighborhood setting, the streetscape generally includes two lanes of traffic, parking on one or both sides of the road, and sidewalks on both sides of the road. There are no bike lanes or paths near the school. Sidewalks are notably absent on the south side of Shippey Street, the south side of Grant Avenue bordering the school, the east side of Quade Street north of Shippey Street, and both sides of Clayton Avenue. Additionally, the sidewalk network bounded by Garfield Street, Shippey Street, and Harrison Avenue has several missing walkway segments.

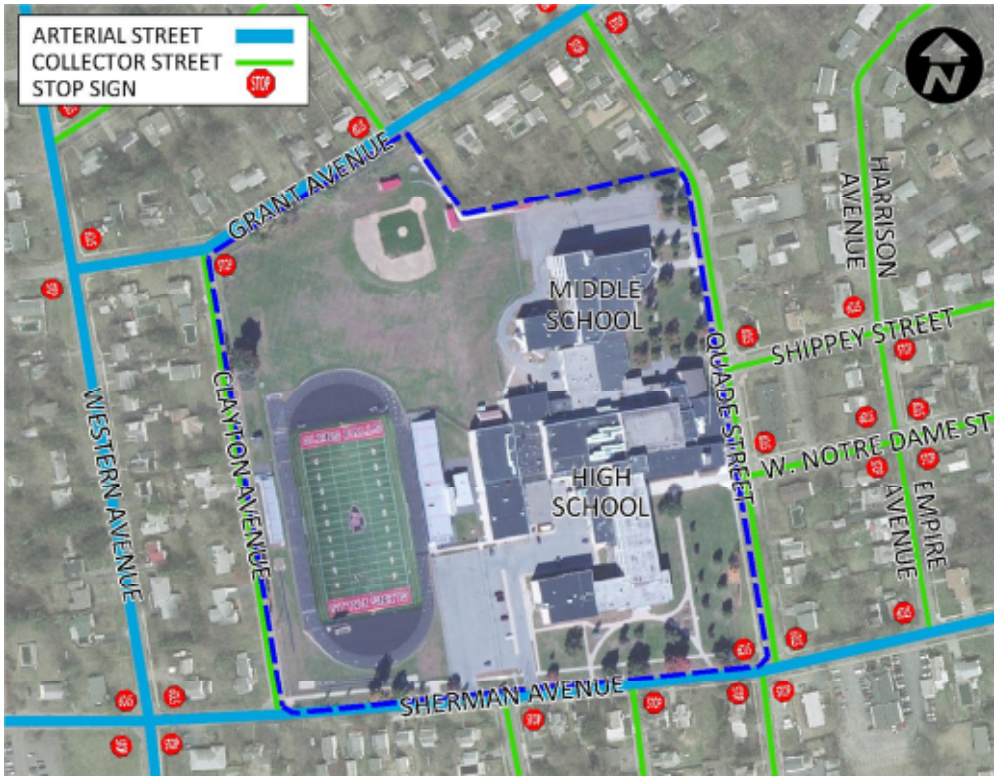


Figure 3: Street operational characteristics and intersection controls near the study area campus.

The Glens Falls School District does not provide bussing to a majority of its students. As a walking school district, bus service is only provided for students with disabilities or for field trips, athletic events, and other extracurricular activities. The bus staging areas for the high school and middle school are located within the faculty-only parking lots, as shown in Figure 4.

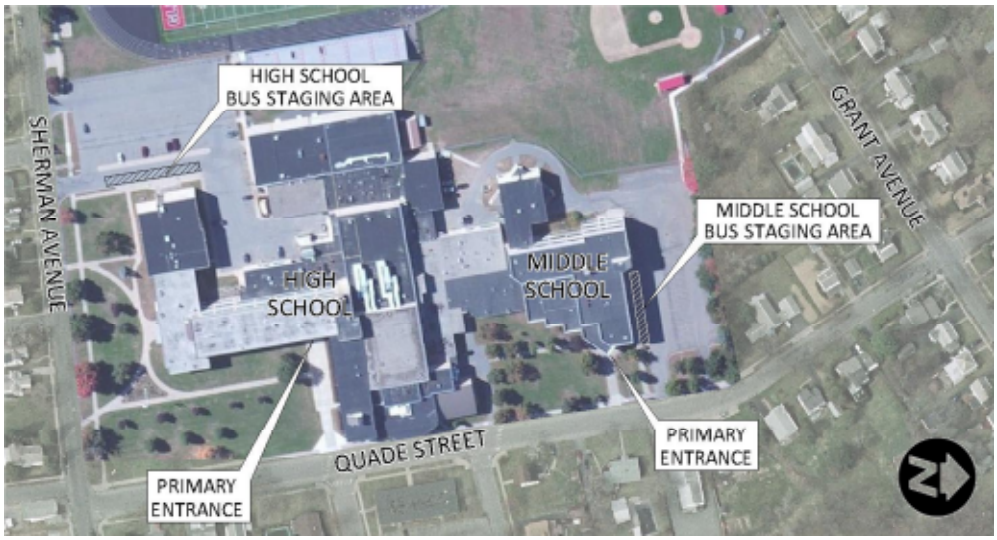


Figure 4: Bus staging areas and primary entrances to the high school and middle school.

1.1.3 Travel Options to School

The available modes of travel to and from the school include walking, bicycling, students driving alone or with other students, public transit through the Greater Glens Falls Transit system, or students being driven to or from the campus by a parent, relative, or other adult.

On-street parking is available on all streets adjacent to the school campus, including the south side of Sherman Avenue and both sides of all other streets. East of Quade Street, parking is allowed only on the north side of Sherman Avenue. There are pick-up and drop-off only parking restrictions along the west side of Quade Street north of Notre Dame Street. The on-campus parking lots are for faculty members only. Assigned parking is available to High School Seniors south east of the campus at the Calvary Assembly of God Church parking lot. A schematic of the parking inventory is illustrated in Figure 6.

Figure 5: Maintained pedestrian paths accessing the school campus.

There are two pedestrian paths accessing the main school buildings from the north and west sides of the campus. One path leads from mid-block along Clayton Avenue, through the football fields north of the bleachers and to the main buildings. The second path leads from Grant Avenue across from Austin Street along a new sidewalk, adjacent to the practice baseball field and batting cage, and into the Middle School parking lot. These paths are shown in Figure 5.

Bicycle racks were located at the two primary entrance points. Due to the cold and windy weather few bikes were expected during observations. Only one bicycle, which appeared to have been damaged and abandoned, was noted in the racks during the day of observations in January. Later campus observations during the spring noticed a higher utilization rate of bicycles in the racks during the school day.

Based upon previous school travel surveys conducted at surrounding elementary schools[1], around 55-60% of the students were picked up or dropped off at the school by their parents. Approximately 30-35% walked to and from school, with the remaining 10% split by carpooling and biking. As these results represent the travel characteristics of two elementary schools, the drive-alone option was not available and the older students found at the Middle and High Schools are likely to exhibit greater independence. However, with only a small percentage of students eligible to drive themselves, and the potential for inclement weather, a similar mode share could be expected.

1.1.4 Pick-up and Drop-off Procedures

Currently, the high school day begins at 7:45 and ends at 2:20. The middle school day begins at 8:30 running to 3:00. Arrivals to the school campus were noted to begin prior to 7:30 AM.

[1] Abe Wing and Big Cross Elementary School Access Plans, 2010

With primary entrances to both the high school and middle school on Quade Street, many students are dropped off along either side of Quade Street. As a measure to combat congestion, reduce through vehicles, and separate high school and middle school traffic, temporary barriers are set up along Quade Street north of West Notre Dame Street and south of Shippey Street during the arrival and departure periods. While this has been effective at managing through traffic, considerable congestion still exists at the peak arrival and dismissal times. When the closest parking spaces to the school entrances were occupied, double parked vehicles were observed allowing passengers to enter and exit the vehicle. In the dismissal peak period, double parked vehicles were waiting for the students to exit the school, while other vehicles were noted parked in unmarked spaces to wait for the students to exit the building.

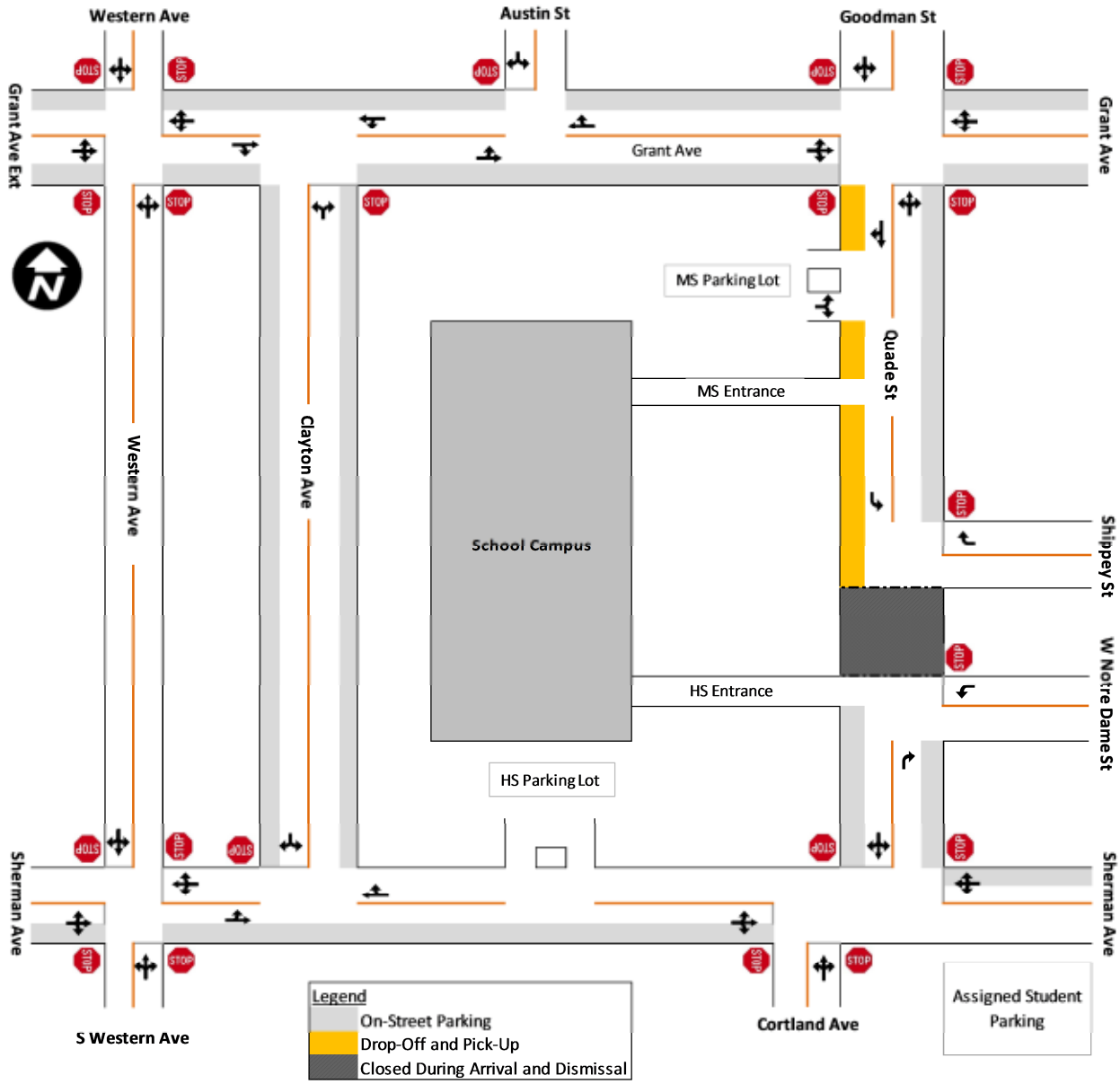


Figure 6: Schematic illustrating on-street parking, assigned student parking, and pick-up and drop-off designated areas. (Not to scale)

In addition to vehicle congestion, many students were dropped off or picked up from the east side of Quade Street. This location requires that students cross Quade Street, and many were noted to forego the marked crosswalk locations in favor of crossing directly in front of the school in the straightest line possible. This increased the potential for students to enter traffic unexpectedly from between parked vehicles, contributing to additional vehicle-pedestrian conflicts and potentially unsafe conditions.

1.2 Purpose and Need

This study was initiated to analyze and address the changing school campus population, operating characteristics, and arrival and departure patterns. Recently, the middle school has taken on all fifth grade students in the district, increasing the number of students attending the campus. As noted earlier, the arrival and departure times of the high school will be aligned with the middle school beginning with the 2012-2013 school year, potentially increasing the peak travel period. Lastly, the overall pick-up and drop-off operational patterns have been evaluated with the recent implementation of temporary traffic barriers.

As described earlier, the purpose of this study includes:

- An evaluation of the current access patterns,
- Projection of access issues under aligned arrival and dismissal times, and
- Proposed short and long term improvements to the circulation patterns.

The following section outlines the recommended short-term and long-term strategies that address the identified queuing, congestion, and safety issues identified during the course of the study. These issues are documented in Sections 3, 4, and 5.

2.0 Recommendations

The proposed recommendations for the project fall under two main categories: modifications to the streetscape environment to improve vehicle flow, reduce congestion, and enhance bicycle and pedestrian safety, or programmatic strategies to change behavior, encourage a greater percentage of walking and biking rates, and reduce the number of vehicle trips to the school.

Additional explanation of the impacts and considerations of these and other improvements is presented in Section 6.0. More detailed cost estimates of several of the more complex recommendations are included in Attachment A.

2.1 Short Term Recommendations

The following four recommendations are immediately implementable at a minimal cost. The primary goal of these recommendations is to provide additional vehicle queuing capacity, improve safety of the students walking to school and to and from the pick-up and drop-off vehicles, and to address the anticipated congestion associated with the aligned school days.

2.1.1 Expand Quade Street Drop-Off Area

Approximate Cost: $1000

To provide more waiting areas near the school, it is recommended that the long-term parking spaces on the west side of Quade Street between Sherman Avenue and West Notre Dame Street are converted to pick-up and drop-off spaces only. This designation will be consistent with the existing

parking restrictions on the west side of Quade Street from West Notre Dame Street to Grant Avenue. The vehicles that currently utilize the west-side Quade Street parking will be dispersed to other on-street parking locations. Students may be encouraged to utilize the assigned parking lot at the Assembly of God Church.

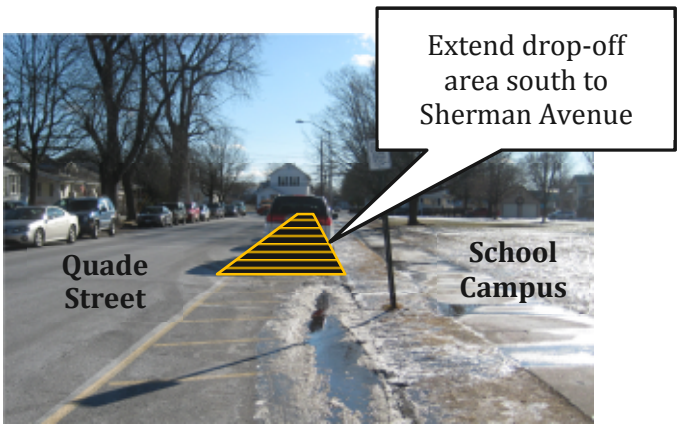


Figure 7: Recommended drop off area expansion, looking south along Quade Street near High School entrance.

2.1.2 Shift Sherman Avenue Parking to North Side of Street

Approximate Cost: $2,250

Similar to the counter-clockwise circulation strategy, parking and waiting areas on the north side of Sherman Avenue adjacent to the school will reduce the number of pedestrian crossings from the south side of the street. Additionally, there are fewer drives on the north side of Sherman Avenue, allowing for a greater number of spaces than the south side. The drop-off area should allow for parking during off-peak evening hours, weekends, and for special events. Parking restrictions should only be placed in this alternate drop-off area during school hours.

Along the entire remaining corridor, parking is currently allowed on the south side of Sherman Avenue. On the studied segment of Sherman Avenue, vehicles will be forced to weave into and out of the realigned traveled way. Due to the stop-controlled intersection entering this segment, traveling speeds are anticipated to be low and the transition should be acceptable.

It is recommended that the drop off area maintains a 20-foot no parking restriction adjacent to all driveways, roadways, and crosswalks. The realigned park on the north side of Sherman Avenue is illustrated in Figure 8.

Figure 8: Realigned parking on north side of Sherman Avenue.

2.1.3 Encourage Counter Clockwise Circulation

Approximate Cost: N/A (Include in existing newsletter mailings)

In the district's communication to parents, it is recommended that the district encourage counterclockwise circulation for both the high school and middle school drop off areas. This circulation pattern provides students access to and from vehicles directly from the sidewalk adjacent to the school, reducing the number of pedestrian crossings. Furthermore, vehicles approaching the campus from West Notre Dame Street and heading south on Quade Street will have access to the newly expanded drop-off and pick-up area; vehicles traveling northbound would not have safe and legal access to these spaces. Lastly, by encouraging this circulation pattern, the school district will be able to promote this additional pick-up and drop-off area expansion.

2.1.4 Increase Temporary Barrier Ballast

Approximate Cost: $100

During our observations, the temporary barriers were noted to blow over in strong gusts. If possible, increasing the ballast in the bottom of the barriers may improve their stability. The increased weight of the barriers will decrease their ease of implementation, but it is important for the temporary barriers to remain visible to be effective.

2.1.5 Install All-Way Stop Controls at Shippey / Empire

Approximate Cost: $800

Given the neighborhood setting, adjacent school campus, localized lack of sidewalk infrastructure, and crash data, all-way stop control is recommended at the Shippey Street / Empire Avenue / Harrison Avenue intersection. Warning flags are also recommended on the new sign for the first six months after installation.

The four short-term recommendations discussed above are illustrated in Figure 9.

Figure 9: Short-term recommendations to enhance safety and reduce congestion at the Glens Falls School District Campus.

2.2 Long Term Streetscape Enhancements

The long term streetscape enhancements are larger projects that attempt to address safety issues and vehicle congestion. The projects typically represent a greater capital expenditure and will likely require significant planning and engineering design, with potential grant funding opportunities.

2.2.1 Improve City Sidewalk Network

Approximate Cost: $100 - $200 per foot of sidewalk

Several critical segments of sidewalk are missing near the school campus. It is recommended that these sidewalks are constructed to emphasize the City's commitment to walking and to improve the pedestrian environment for students en route to school. The three most critical sidewalk segments include:

1. South side of Shippey Street from Quade Street to Liberty Avenue *($60,000 – $120,000)*
2. South side of Grant Avenue from Clayton Avenue to Austin Avenue *($40,000 – $80,000)*
3. Both sides of Harrison Avenue from Garfield Avenue to Shippey Street *($150,000 – $300,000)*

In addition, specific sidewalk treatments such bulb-outs, accessible sidewalk ramps, and detectable warning surfaces should be installed where feasible.

2.2.2 Automatic Quade Street Closure Features

Approximate Cost: $95,000

The intersections of Quade Street at West Notre Dame Street and at Shippey Street should be redeveloped for a more automated and visible street closure. Proposed features may include:

- Bulb-outs to reduce crossing distance and street closure width,
- Automatic gates with flashing lights that close at predetermined times, and
- Permanent warning signs indicating the street closure times.

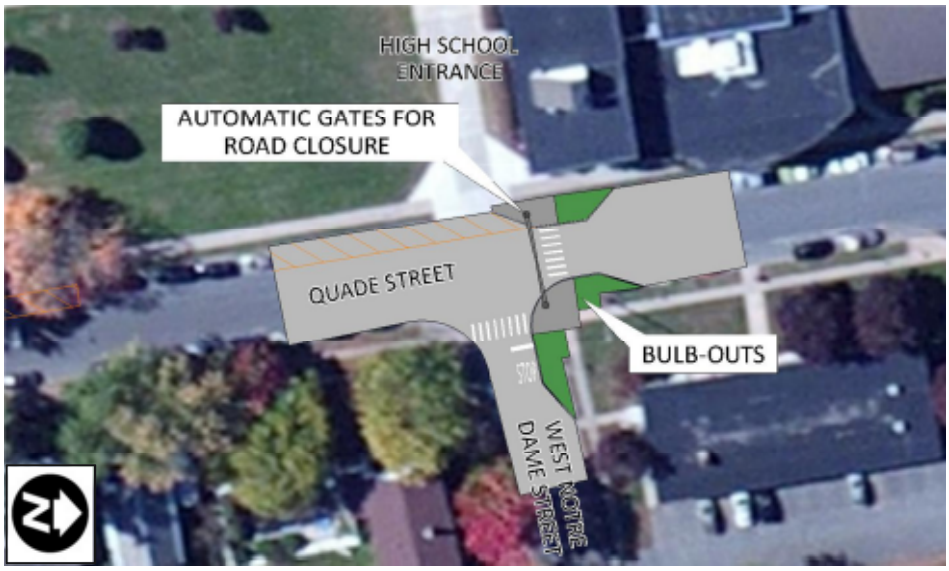


Figure 10: A view of the recommended automatic gates at Quade Street and West Notre Dame Street. Similar treatments are recommended at Quade Street and Shippey Avenue.

2.2.3 Quade Street – Sherman Avenue Loop

Approximate Cost: $550,000

A one way loop, beginning approximately 75 feet north of Sherman Avenue, continuing west with pick-up and drop-off spaces, turning south and intersecting with Stevens Street is proposed as the most feasible off-street parking and waiting area expansion. This alignment provides up to 12 vehicle waiting spaces, plus the greatest coordination within the existing street network, reducing additional vehicle conflicts as much as possible.

Several immediately identifiable issues include:

- Sacrifice of the open green space in front of the school for vehicle waiting areas,
- Potential for additional congestion within the new loop, specifically if vehicles double park to wait, or if left turning vehicles cannot exit the loop,
- Loss of on-street parking / drop-off area queue space if parking is shifted to the north side of Sherman Avenue,
- Two new pedestrian – vehicle conflict areas at loop entrance and exit, and
- Significant reconstruction of existing campus walkways would be required.

This proposed driveway loop is illustrated in Figure 8.

Figure 11: Potential high school drop-off loop. Required sidewalk reconstruction not illustrated.

2.3 Programmatic Strategies

The following strategies are immediately implementable and are intended to change travel behaviors over the long term, ultimately to increase the number of students who walk, bike, and ride the bus to school. These programs may reduce congestion while also promoting healthier lifestyles.

2.3.1 Promote Coordination with Transit

The School District should coordinate with the local transit provider, Greater Glens Falls Transit (GGFT) to increase bus ridership as much as feasible. Potential collaborative programs may include:

- At the beginning of every school year, the district should include a bus route map and time table for the East-West Commuter Route which accesses the school site,
- Provide and promote school subsidized passes for the East-West Commuter Route,
- Modify the afternoon East-West Commuter Route so that the bus picks up on Sherman Avenue directly adjacent to the school, rather than along the existing route along Grant Avenue,
- Construct a waiting shelter for the East-West Route stop at the High School, and
- Provide intuitive internet access, including a route map, for information on the East-West Commuter Route.

2.3.2 Participate in Active Transportation Encouragement Programs

The purpose of these programs is to incentivize active forms of transportation, including walking, bicycling. These programs may include:

- Safe Routes to School events for the Middle School, including Walk to School Day and Bike to School Day,
- Offer students incentives to walk or bike to school, potentially with prizes for highest weekly, monthly, or annual walking or biking trip totals,
- Replace old bike racks with new, functional, well maintained racks in prominent locations close to the school entrances. Consider adding additional bicycle racks, and
- Increase awareness amongst students and parents on the health, lifestyle and educational benefits of biking and walking to school; emphasize the generally lower safety risks on walking or biking to school as compared to driving.

Figure 12: Clean, colorful, and fun new bicycle racks may attract additional bicycle ridership. Pictured: the Loop Rack from Muchi East.

The above recommendations discuss the proposed solutions to address the identified congestion, queuing, and safety issues observed through this study. The following sections describe the site reconnaissance, background investigations, safety research, analysis methodology, and alternative assessments.

3.0 Traffic Observations

The traffic observations were conducted throughout the day on January 18, 2012. The weather was cold, clear, and windy, with temperatures around 25 degrees Fahrenheit. To begin observations, road tube traffic data collectors were placed on Sherman Avenue, Quade Street, Grant Avenue, and Clayton Avenue. The high school and middle school peak arrival and dismissal periods were

observed from the two intersections nearest the primary entrances, with short duration turning movement counts at adjacent intersections throughout the day. The resulting traffic volumes, pedestrian counts, vehicle queues, and general observations were compiled into an overall traffic model.

3.1 Observed Traffic Volumes

The one hour traffic volumes around the school campus is for the AM and PM school arrival and dismissal peaks are shown in Figure 13 and Figure 14, respectively. Note that Quade Street is closed to through traffic between West Notre Dame Street and Shippey Street during these periods, but open throughout the rest of the day.

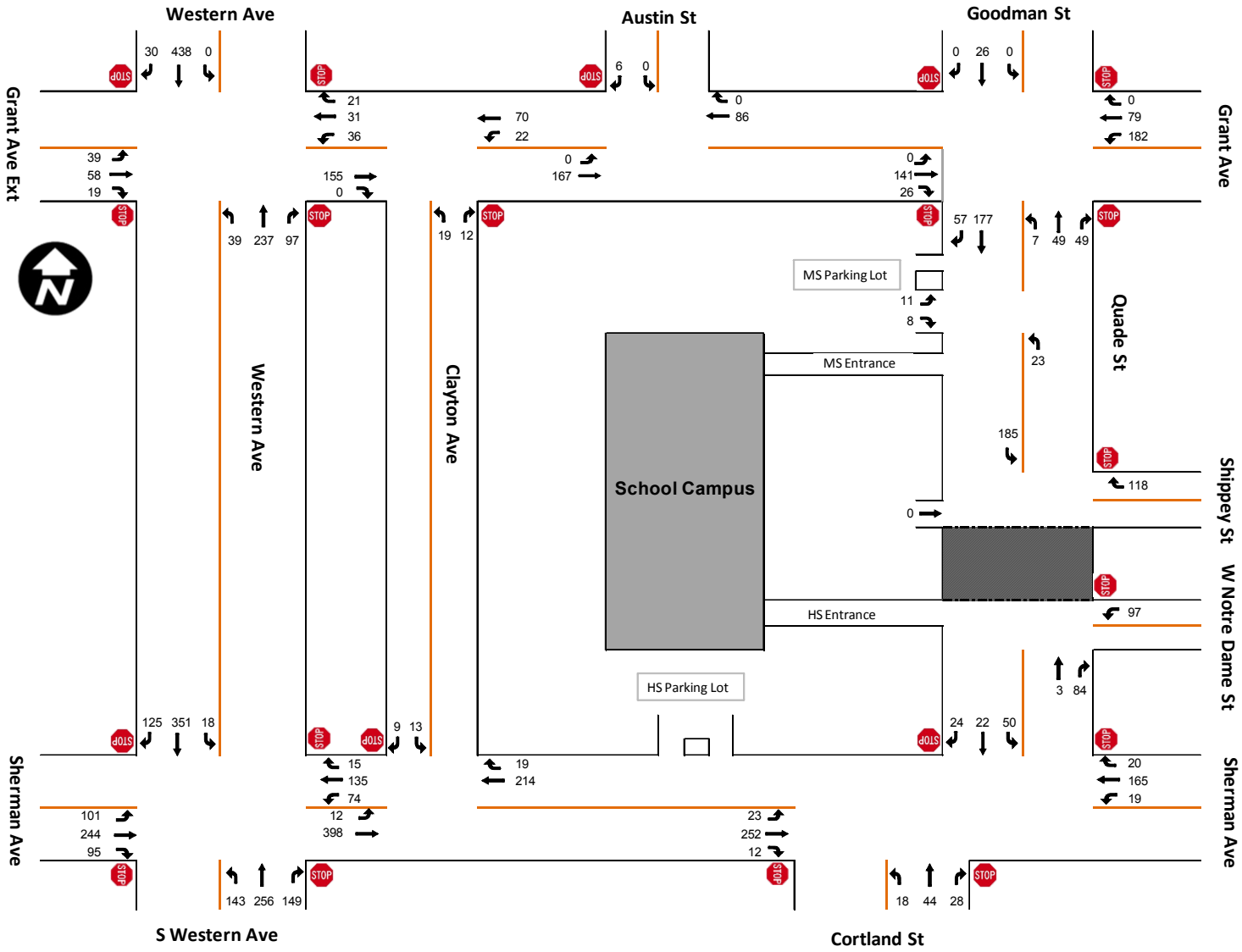


Figure 13: AM peak hour traffic volumes in the study area

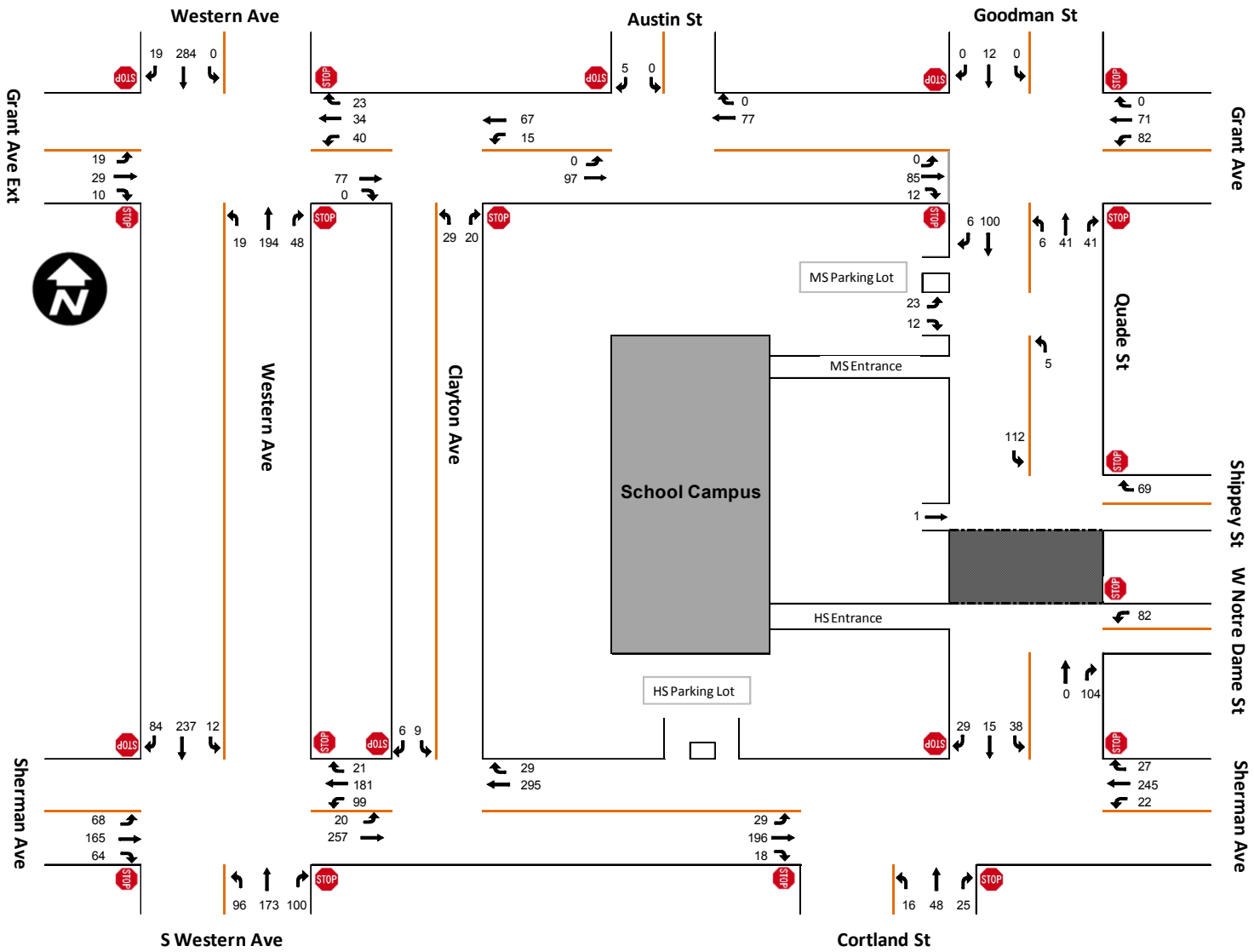


Figure 14: PM peak hour traffic volumes in the study area

The volumes illustrated in Figure 13 and Figure 14 represent the peak hour volumes through the studied intersections. Operating most nearly as arterial streets, Sherman Avenue, Western Avenue and Grant Avenue are expected to have a greater proportion of through vehicles and trips unrelated to the school traffic, and would be less likely to be affected by the sudden peak in traffic due to school arrivals and departures. As local collector roads directly serving the school entries, Quade Street, Shippey Street, and West Notre Dame Street are likely to be more affected by these sudden traffic peaks.

The peaking behavior caused by the arrival and dismissal of students is best illustrated when viewing the data in 15-minute periods. Along Quade Street, the southern intersections at West Notre Dame Street and Sherman Avenue more directly serve the High School, and the northern intersection at Shippey Street more directly serves the middle school. With High School classes beginning at 7:45 and ending at 2:20, the Sherman Avenue and Notre Dame Street intersections are expected to experience peak traffic related to the school from 7:30 – 7:45, and 2:15 – 2:30. Similarly, the peak traffic related to the Middle School would be expected in the period prior to the

beginning and after the commencement of classes, or approximately 8:15-8:30 and 3:00 – 3:15. During the observations conducted January 18, the traffic data collected at these intersections followed that pattern.

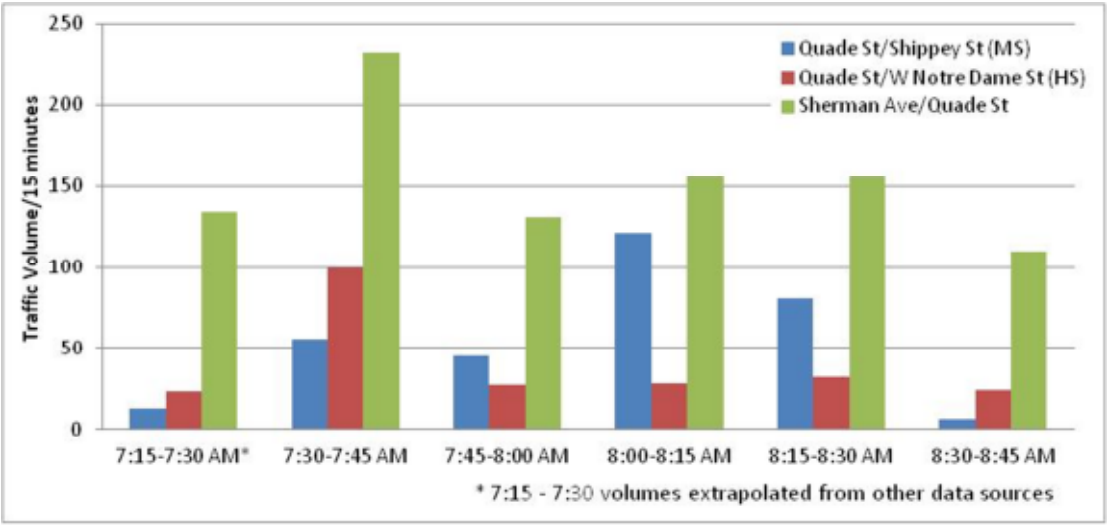


Figure 15: 15 minute volumes through three studied intersections along Quade Street in the AM arrival period.

As expected, the observed volume through these intersections along Quade Street show a clear, short duration increase in the traffic from 7:30 – 7:45 for the Notre Dame Street and Sherman Avenue intersections. The increase in traffic at the Shippey Street intersection includes the two 15-minute periods prior to the first class from 8:00 – 8:30.

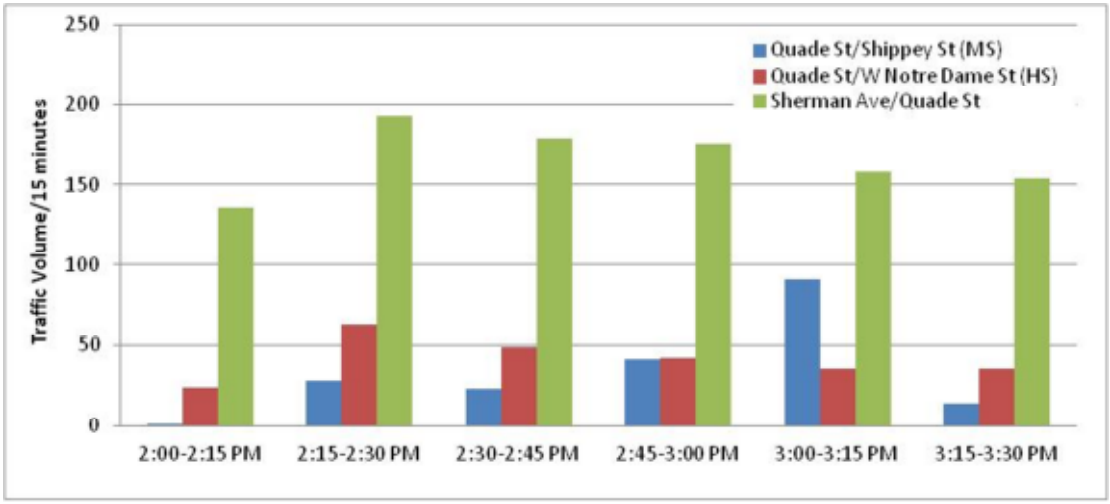


Figure 16: 15 minute volumes through three studied intersections along Quade Street in the PM arrival period.

Also as expected, the observed volume through the Notre Dame Street and Sherman Avenue intersections along Quade Street show a clear, short duration increase in the traffic from 2:15 – 2:30, and the Shippey Street intersection peaks at 3:00 – 3:15.

It should be noted that in past mode share surveys, the walking and biking percentage often increases and the pick-up percentage decreases in the evening as many parents are still working,

and many students participate in extracurricular activities. This indicates that the afternoon peak period is expected to be less pronounced than the morning peak.

3.2 Tube Count Data Collection

Tube counters were placed on the streets adjacent to the school to collect traffic data over the course of the day. The resulting data are shown in Figure 17.

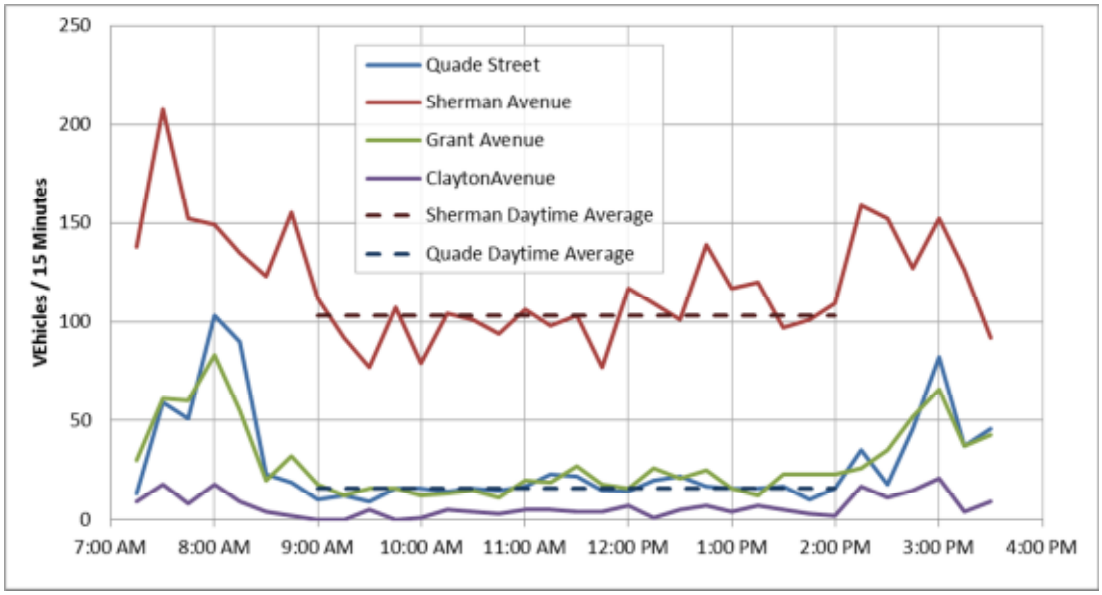


Figure 17: Road volume data from street network adjacent to the school campus from January 18, 2012.

As expected, all neighboring streets display two distinct peak periods in the morning and afternoon hours. This AM and PM peaking behavior is common on many streets as residents commute to and from work. However, the peak is particularly noticeable along Quade Street and Grant Avenue, likely due to traffic related to the schools.

Between 9:00 AM and 2:00 PM, the daytime average vehicle count on Quade Street and Sherman Avenue was approximated to be 16 and 103 vehicles per 15 minutes. These averages are illustrated by the dashed lines in Figure 17.

3.3 Observed Vehicle Queues

As demonstrated by the above figures, the vehicle travel patterns to and from the school are characterized by sharp, short duration increases in traffic for drivers to pick up or drop off students. In both the morning drop-off and afternoon pick-up periods vehicle queues were observed. When no street parking space was available, drivers were noted to momentarily double-park and allow the student to enter or exit the vehicle. Depending on the amount of time used in this process, a queue would often form behind the obstructing vehicle. The maximum observed queue was approximately five vehicles.

In addition to blocking traffic, the double parking created a rushed atmosphere in which students hurried to or from the vehicles. In several instances, students were observed to cross the roadway at unexpected locations, entering traffic from within the vehicle queues.

Fortunately, as Quade Street is a low volume neighborhood street, almost all traffic observed near the school during the arrival and dismissal periods was associated with the school. In this case, most drivers were aware of the potential for pedestrians, were prepared for expected queues, and generally operated appropriately.

3.4 Vehicle and Pedestrian Observation Summary

The following summarizes the general traffic and travel characteristics observed on January 18, 2012:

- The two primary modes to and from the school were walking and being driven / dropped off and picked up. Some students drove themselves and with others.
- Considerable traffic related to the dropping-off and picking-up of students can be expected 30 minutes prior to and following the beginning and ending of the school day, respectively.
- Many students cross Quade Street in the most direct path between their destination and the school entrance.
- Queue lengths were reasonable, and it appeared that most drivers understood that a significant number of students and pedestrians would be present.
- The temporary barriers used to close off Quade Streets were blown over in strong gusts of wind.

4.0 Crash Analysis

All traffic collisions reported to the Glens Falls Police Department were compiled within the study area. From 2008 to 2011, there were 35 collisions resulting in two injuries and zero fatalities. There were no reported collisions involving pedestrians. There was one collision involving a bicyclist resulting in injury. All reported collisions are illustrated in Figure 18.

The collision involving the bicyclist occurred outside the school peak hours and is unlikely to be related to school transportation. In addition, this collision occurred at Morton Street and Sherman Avenue, generally outside the project area. It is illustrated in the far southeast corner of Figure 18.

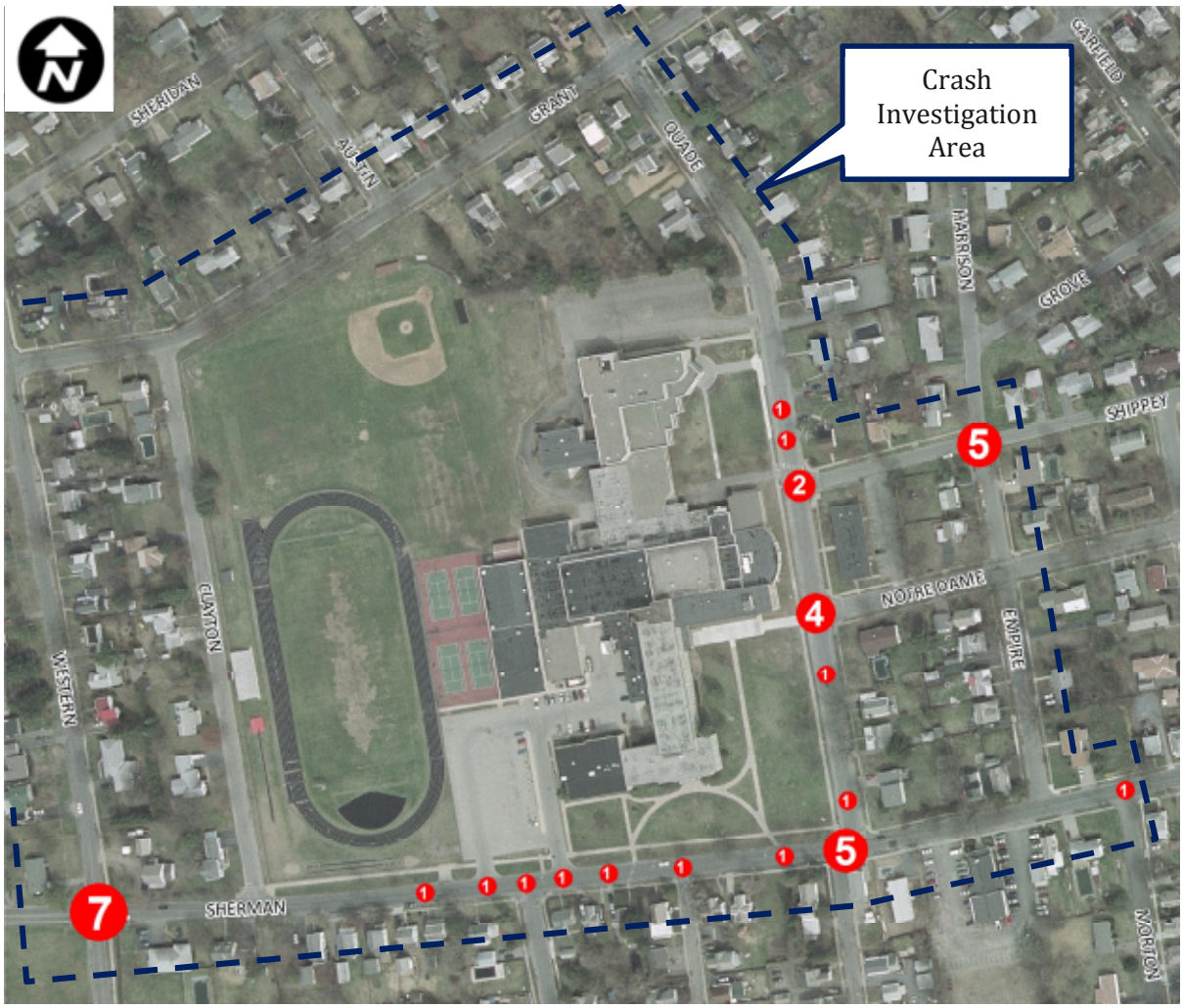


Figure 18: Reported vehicle collisions near the project areas from 2008 to 2011.

From Figure 18, several areas appear to have a high number of collisions, including:

- The Western Avenue / Sherman Avenue intersection,
- The Sherman Avenue / Quade Street intersection,
- The Quade Street / Notre Dame Street intersection,
- The Shippey Street / Empire Avenue / Harrison Avenue intersection
- The Sherman Avenue corridor, and
- The Quade Street corridor.

4.1 Western Avenue / Sherman Avenue Intersection

There were seven collisions at this intersection. Since the intersection is all-way stop controlled, the predominant crash type would be expected to be rear end collisions common at locations where vehicles are often changing speed. However, six of the seven collisions were reported as right angle crashes, indicating that the vehicle did not stop and yield at the intersection. Sight distance is not limited at this location. Advance warning signs or enhanced visibility treatments at the stop sign, such as a retroreflective post, may reduce the number of collisions at this intersection. Two of the seven collisions took place during the school peak hour, and none of these crashes resulted in injury.

4.2 Sherman Avenue / Quade Street Intersection

Five collisions were reported at this intersection, one of which took place during the peak hour of school traffic. No injuries resulted from the collisions. Four of the five collisions were right angle collisions from Cortland Avenue or Quade Street. This may indicate that the offset geometry of the intersection may be adding to confusion.

Although not recommended in this study, the offset entrances to the intersection and the availability of public right of way to the northwest may indicate that this may be an acceptable location for future construction of a roundabout. Due to the operating characteristics of roundabouts, right-angle collisions would likely be reduced significantly. If this collision scenario continues, additional study may be required to determine if a roundabout would improve the safety and operation of this intersection.

4.3 Quade Street / West Notre Dame Street Intersection

Four collisions were reported at this intersection, three of which occurred during the school peak hour with one injury resulting. Two of the four collisions appeared to be between a vehicle performing a parallel parking maneuver and the adjacent parked vehicles. A third collision, resulting in an injury, was reported to have been leaving a parked position with a contributing factor listed as driver inexperience. The fourth collision took place outside of the normal school day.

The collisions were recorded before May of 2010. The current practice of closing Quade Street between West Notre Dame Street and Shippey Street will likely have an impact on collision rates into the future.

4.4 Shippey Street / Empire Avenue / Harrison Avenue Intersection

Five collisions were recorded at this intersection, two of which occurred during the school peak hour, none of which resulted in injury. Four of the five causes of the crashes are reported as failure to yield right of way. At this intersection, the Empire and Harrison Avenue approaches are stop controlled, while the Shippey Street approaches are free. Providing stop control on all approaches will likely correct this collision type.

In addition, an all-way stop controlled intersection is warranted based on MUTCD criteria 2B.07.05B:

> *"The need to control vehicle/pedestrian conflicts near locations that generate high pedestrian volumes;"*

And criteria 2B.07.05D:

> *"An intersection of two residential neighborhood collector (through) streets of similar design and operating characteristics where multi-way stop control would improve traffic operational characteristics of the intersection."*

4.5 Sherman Avenue Corridor

Outside of the Quade Street and Western Avenue intersection collisions, there were seven collisions along this length of street. Two of these seven occurred during the school peak hours and were recorded as vehicles performing parallel parking maneuvers. The remaining five do not appear to be related to school traffic.

4.6 Quade Street Corridor

Outside of the Quade Street intersections with Sherman Avenue and West Notre Dame Street, there were six collisions along the corridor, five of which occurred during the school peak hour. Of these five, all were related to vehicle overtaking maneuvers, indicating that a vehicle was blocking the traveled way. This is potentially due to double parked vehicles waiting for children to enter or exit. These types of collisions may be corrected if additional convenient queue space is available.

5.0 Effect of Aligned School Days

The current staggered high school and middle school arrival and departure times have the effect of distributing the school related traffic impact over two distinct peaks, separated by 45 minutes. By aligning the school days, these peaks will effectively be combined into one, as students from both schools arrive and depart from at the same time.

5.1 Approximating the Existing Demand

During the 2012-2013 school year, the high school arrival and departure times will be aligned with the middle school. In effect, the days for both schools will begin at 8:30 AM and end at 3:00 PM. To determine the anticipated change in traffic due to this alignment, the vehicle trips associated with the high school arrival patterns need to be isolated, and combined with the middle school traffic. Several key assumptions to assist in this analysis follow:

- Families with students in both the high school and middle school are assumed to not currently be making two separate drop-off and pick-up trips. This will result in a conservative traffic estimate, as the aligned times will allow for one of these trips to be removed.
- The mode share of high school students will be approximated at:

  50% - Driven By Parents / Other

  25% - Walk / Bike / Bus

  25% - Drive alone or with student-aged family / friends

This mode share is important. The 25% of high school students (approximately 190 students) that walk, bike, or take the bus to school do not significantly contribute to vehicle congestion. Another 25% of the high school students, again approximately 190 students, park off site or along the side streets, resulting in two vehicle trips over the course of the day: to the school in the morning, and away from the school in the afternoon. The remaining 50% of the high school population, or approximately 385 students, are being driven by a parent or other person. These students are responsible for four trips each, to and from the school in the morning and again in the afternoon.

- All vehicles will be assumed to be carrying two students. This assumption, based on the mode share above, indicates that approximately 195 vehicles will be dropping off and picking up high school students, and 95 vehicles will be driven and parked near the school. This results in approximately 290 vehicles related to the high school student travel patterns expected to access the school campus.

5.2 Typical Glens Falls Street Traffic Characteristics

To approximate the traffic demand related to the school, the observed traffic on the adjacent street network was compared to similar streets in Glens Falls. A previous study[2] produced the tube count data illustrated in Figure 19 on Lincoln Avenue, Horicon Avenue, and Coolidge Avenue in Glens Falls. Operating similarly to a combination of arterial streets (Horicon Avenue) and local collector streets (Coolidge Avenue and Lincoln Avenue), these streets are representative of the mixture of roadway classifications found adjacent to the school campus.

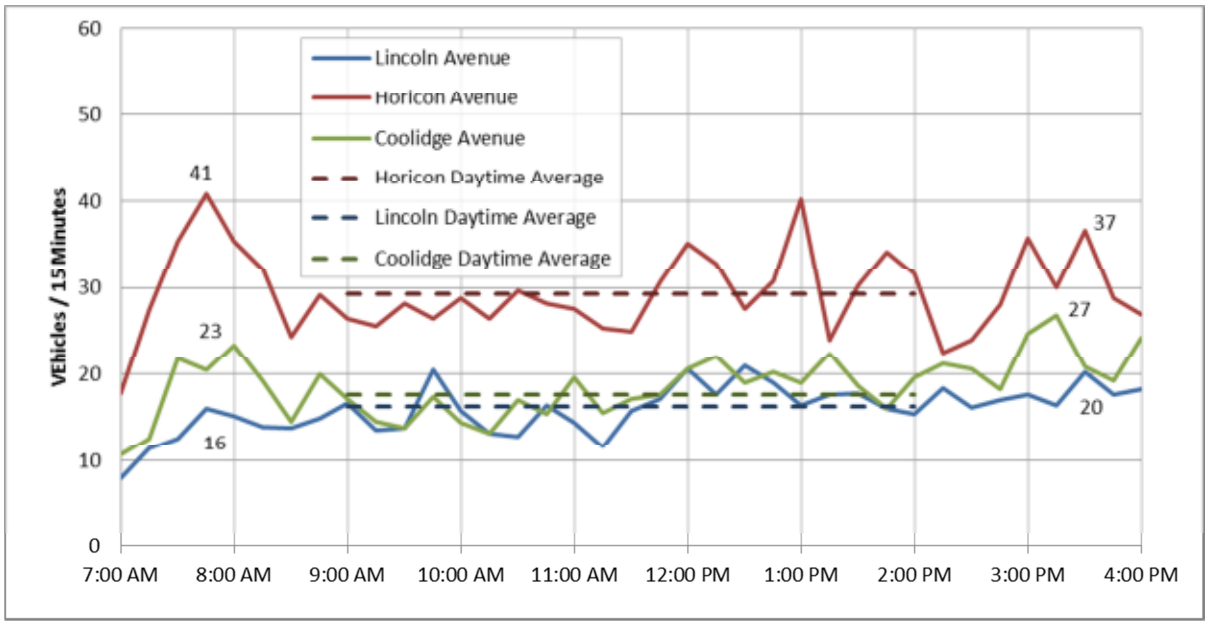


Figure 19: Lincoln Avenue Traffic Calming Study weekday traffic calming data, July 28 - August 3, 2011.

As shown above, the daytime average volume of vehicles for Lincoln, Horicon, and Coolidge Avenues is 16, 29, and 18 vehicles per 15 minutes respectively. Relating these averages to the observed morning and afternoon maximums, the peak 15-minute volume to average 15-minute volume ratio is shown in the table below.

	Daytime Average*	AM Peak*	PM Peak*	AM Peak : Average Ratio	PM Peak : Average Ratio
Lincoln Avenue	16	16	20	1.00	1.25
Horicon Avenue	29	41	37	1.41	1.28
Coolidge Avenue	18	23	27	1.28	1.50

*Vehicles per 15 minutes

Other similar streets within the city were also compared to the traffic volumes measured adjacent to the school. While the general characteristic shape is similar, the data analyzed were only available in one-hour increments. As this study is specifically interested in short-duration peaks caused by the school arrival and dismissal periods, the broad, one-hour increment data is too blunt to be applied to this study.

This one-hour increment data is presented in Figure 20 .

[2] Lincoln Avenue Traffic Calming Study, October 2011. Traffic data taken from 7/28/11 to 8/3/11, excluding the weekend dates of 7/30/11 and 7/31/11.

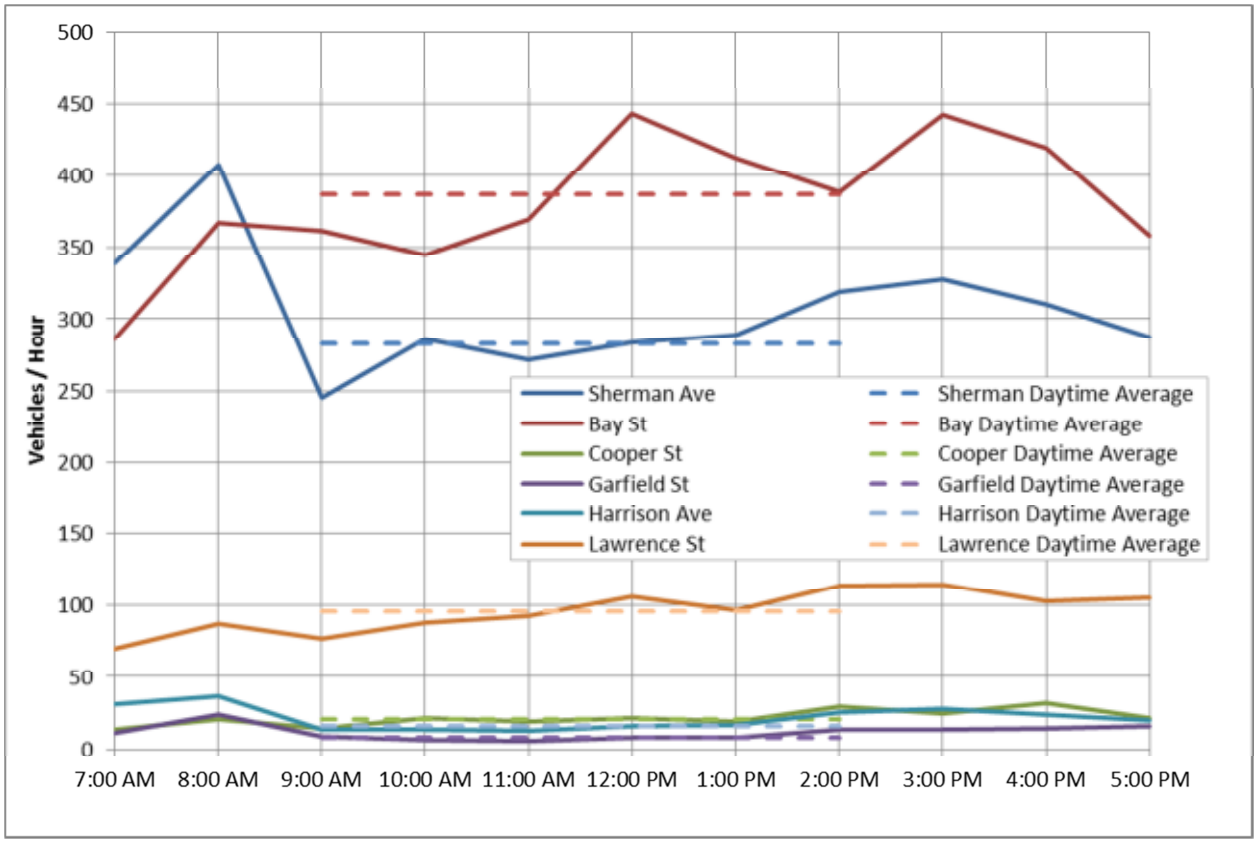


Figure 20: One-hour incremental data from other nearby Glens Falls City streets.

5.3 Isolating High School Related Traffic

Using the peak to average ratio calculated on similar streets, we can approximate the volumes on Sherman Avenue and Quade Street that are assumed to be independent of the school campus. Since Sherman and Horicon Avenues behave as arterial streets, the peak : average ratios obtained from Horicon Avenue are the most appropriate comparison analytic for Sherman Avenue. Similarly, the ratios from Lincoln and Coolidge Avenues, both operating similar to local collector streets, were averaged to be used in approximating the vehicle volumes along Quade Street. These approximated volumes are shown in the table on the following page.

	AM Peak : Average Ratio	PM Peak : Average Ratio	Daytime Average*	Approx. AM Peak*	Approx. PM Peak*
Quade Street	1.14	1.38	16	18	22
Sherman Avenue	1.41	1.28	103	146	131

*Vehicles per 15 minutes

These approximate "normal" peaks shown in the table above are plotted with the observed volumes along Quade Street and Sherman Avenue. The effect of the school campus is approximated by the difference in this "normal" peak and the observed peak, illustrated by the shaded area shown below in Figure 21.

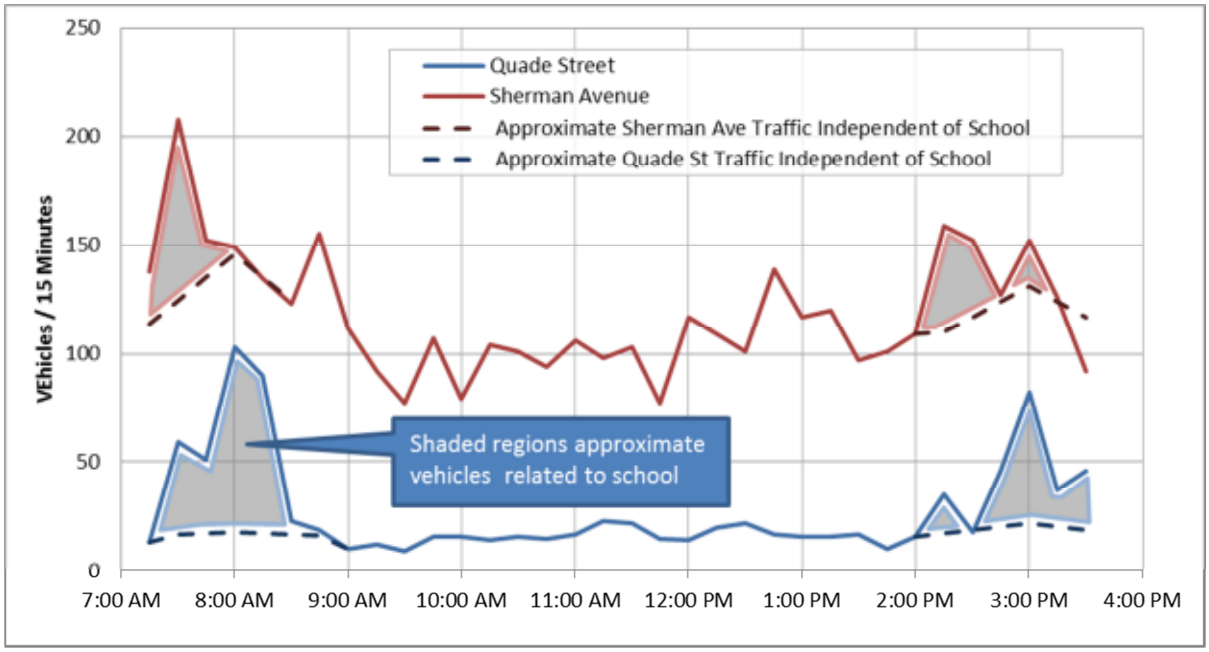


Figure 21: Approximate volume of the traffic related to the school campus along Quade Street and Sherman Avenue.

The shaded regions above illustrate approximately 670 vehicles traveling to the school campus on an average day.

To approximate the traffic shift that will likely occur when the school days are aligned, the difference in the observed vehicles and the independent vehicles arriving from 7:15 – 7:45 and from 2:00 – 2:30 should be shifted and added to the observed vehicles from 8:00 – 8:30 and 2:45 – 3:15. This shift is illustrated below in Figure 22.

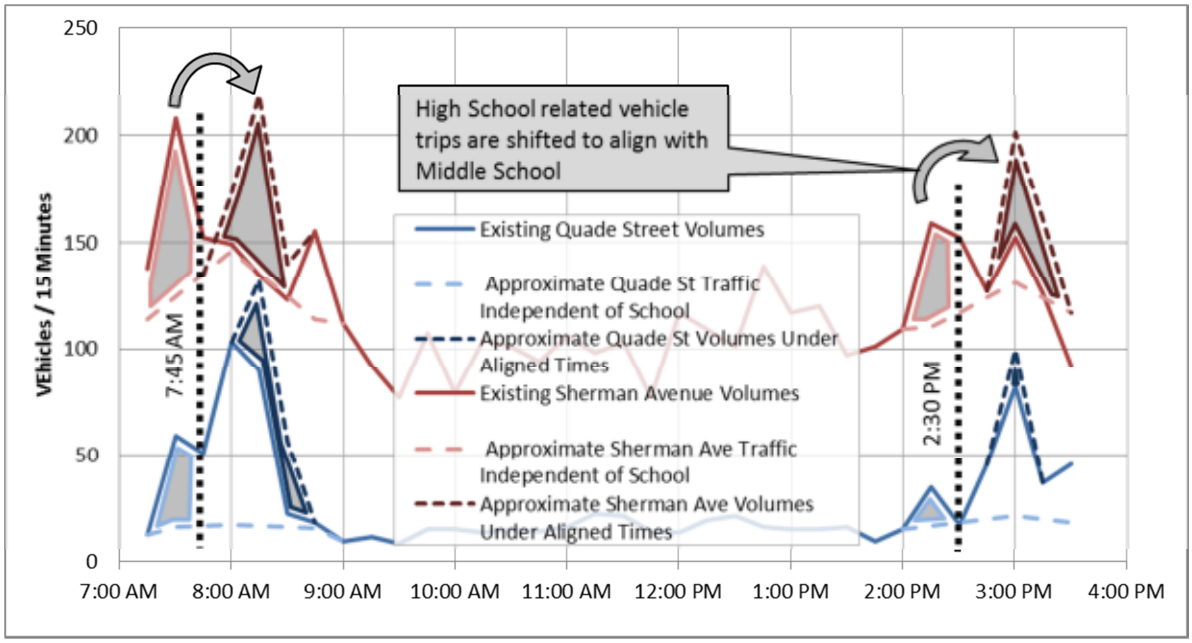


Figure 22: Approximate expected shift in volumes along Quade Street and Sherman Avenue under aligned school days.

The shaded regions illustrated above from 7:15 to 7:45 and 2:00 – 2:30 represent approximately 300 vehicles traveling to and from the school campus along Quade Street and Sherman Avenue every day. This is similar to the approximate demand calculated by the assumptions outlined in Section 5.1.

The approximate traffic resulting from the alignment of the Middle School and High School day along Quade Street and Sherman Avenue is illustrated on Figure 23.

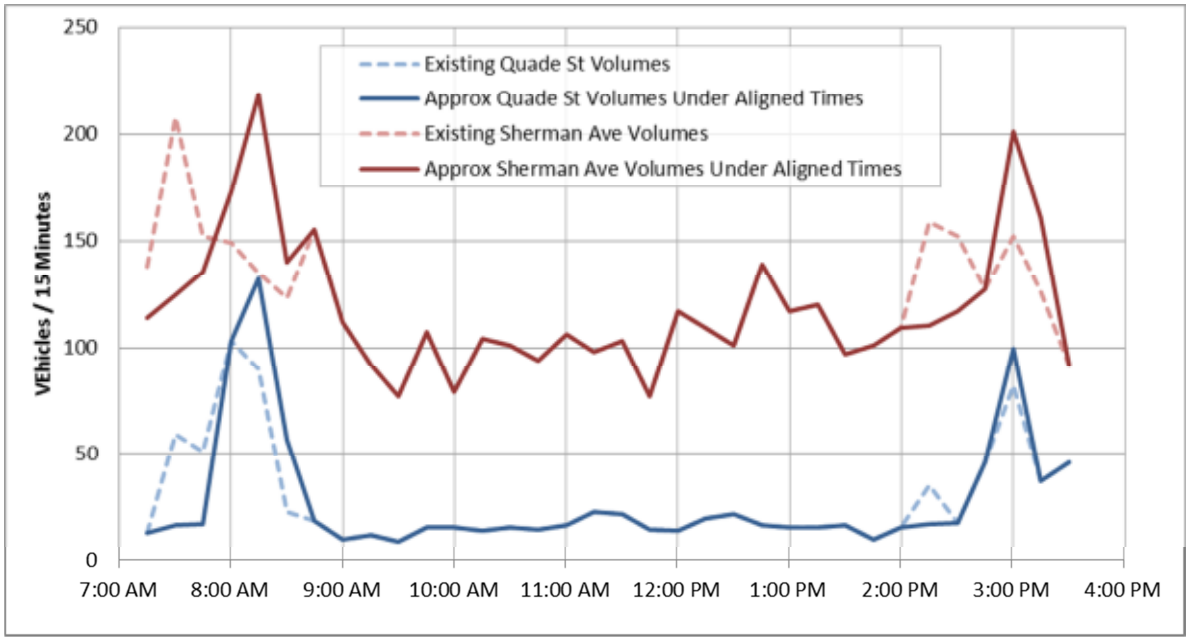


Figure 23: Approximate anticipated volumes along Quade Street and Sherman Avenue under aligned school days.

5.4 Effect of Aligned School Days

The overall effect of aligning the High School and Middle School days is best illustrated in Figure 23. The total number of vehicles accessing the school campus is assumed to remain the same, however the time period in which these vehicles arrive and depart will be shortened. The peak periods shown above have been condensed from 7:15 AM – 8:30 AM and 2:15 – 3:15 PM to 7:45 – 8:15 AM and 2:45 – 3:15 PM. This results in a more pronounced, sharper morning and afternoon peak traffic volume. The changes in these peak 15-minute volumes are illustrated in the table below.

	AM / PM 15- Minute Vehicle Peak: Separate	AM / PM 15- Minute Vehicle Peak: Aligned	AM / PM% Change
Sherman Avenue	209 / 159	218 / 201	+4.8% / +26.4%
Quade Street	103 / 82	132 / 100	+28.2% / +21.6%

The effect of the aligned school days is not expected to significantly change the maximum hourly volume of vehicles through the street network, but it is anticipated to create a spike in the peak 15-minute volume. The relationship between the peak 15-minute period within the peak hour of traffic is represented by the Peak Hour Factor (PHF). The PHF is a measure of the fluctuation of traffic

demand within the peak hour. A PHF equal to 1.0 indicates that there is no fluctuation in the 15 minute intervals within the peak hour. As the PHF decreases, the variation between the peak 15 minute interval and the average 15 minute interval becomes greater.

		Separate School Days			**Aligned School Days**		
		Peak Hour Volume (veh)	Peak 15 Minute Volume (veh)	**Peak Hour Factor (PHF)**	Peak Hour Volume (veh)	Peak 15 Minute Volume (veh)	**Peak Hour Factor (PHF)**
AM	Sherman Avenue	647	208	**0.78**	667	219	**0.76**
	Quade Street	303	103	**0.74**	310	132	**0.59**
PM	Sherman Avenue	590	159	**0.93**	606	201	**0.75**
	Quade Street	211	82	**0.64**	229	100	**0.58**

PHF = Peak Hour Volume / (4 x Peak 15-Minute Volume)

As expected, the peak hour factor dropped along both Quade Street and Sherman Avenue under the aligned school times, most notably along Quade Street in the morning from 0.74 to 0.59, a -20% change, and Sherman Avenue in the afternoon from 0.93 to 0.75, a change of -19%.

In practical terms, the decrease in the PHF indicates that about the same number of vehicles will be accessing the school campus in a shorter window of time, likely leading to increased congestion. From a visual perspective, the peak represented by (1) in Figure 24 is shifted about 45 minutes later in the day to peak (2). There is no change in the size from (1) – (2) because the middle school has little effect on the traffic along Sherman Street in the morning. However, in the evening, the high school peak (3) compounds with the middle school peak to create a significantly larger 15-minute traffic demand at 3:00 PM represented by peak (4). This is also represented by the change in the PHF discussed above.

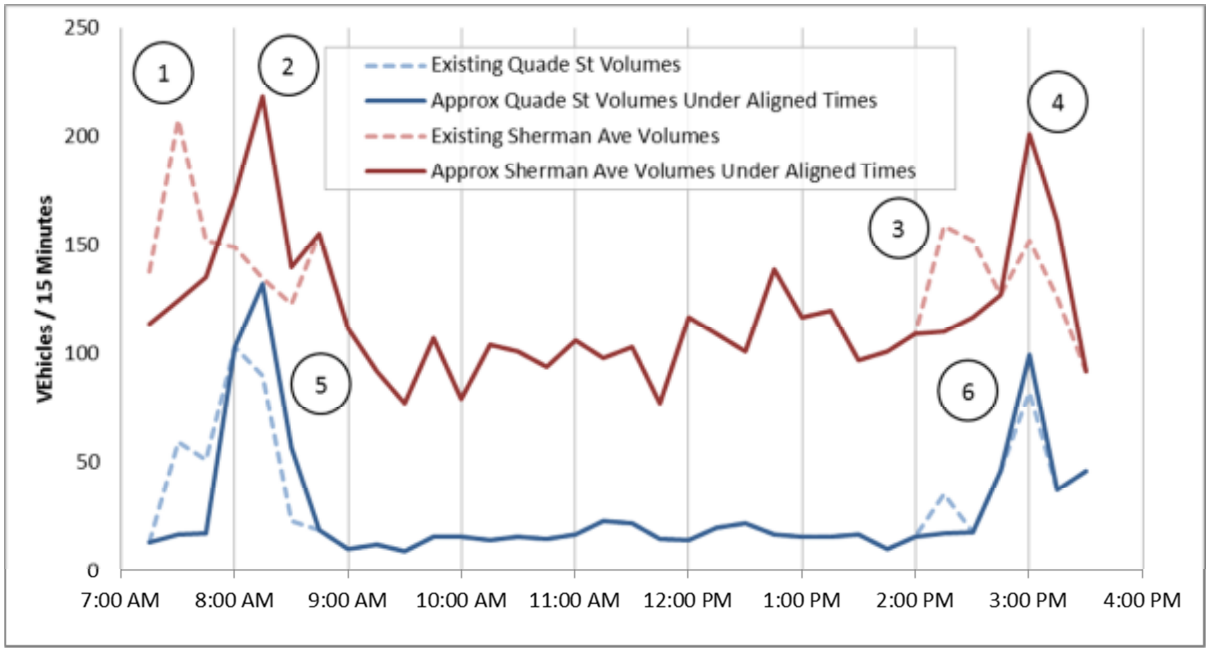


Figure 24: Approximate anticipated volumes along Quade Street and Sherman Avenue under aligned school days, with specific traffic peaks annotated.

Similarly, the high school peak compounds the middle school peak on Quade Street in the morning (5) but appears to have a relatively minor effect in the afternoon (6). This is also demonstrated in the change of the PHF. Overall, the data suggest that congestion will be worsened during the arrival and dismissal periods with the aligned school times, particularly during the peak 15 minutes in the morning drop off period along Quade Street and the afternoon pick up period along Sherman Avenue.

5.5 Sherman Avenue & Quade Street Intersection Analysis

The intersection at Sherman Avenue, Quade Street, and Cortland Street was analyzed using traffic simulation software under the existing separate school days. The existing traffic operation characteristics were then compared to the anticipated conditions under aligned school days. The analytical software used was Synchro Version 7. The primary measure of traffic operation is Level-of-service (LOS), which is a qualitative measure describing the operating conditions as perceived by motorists driving in a traffic stream. LOS is estimated using the procedures outlined in the 2000 Highway Capacity Manual.

The 2000 Highway Capacity Manual defines six qualitative grades to describe the level of service at an intersection. Level-of-Service is based on the average control delay per vehicle. Table 1 shows the various LOS grades and descriptions for signalized and unsignalized intersections.

Table 1: Level-of-Service Criteria for Signalized and Unsignalized Intersections

LOS	Characteristics	Unsignalized Total Delay (sec)	Signalized Total Delay (sec)
A	Little or no delay	≤ 10.0	≤ 10.0
B	Short delays	10.1-15.0	10.1-20.0
C	Average delays	15.1-25.0	20.1-35.0
D	Long delays	25.1-35.0	35.1-55.0
E	Very long delays	35.1-50.0	55.1-80.0
F	Extreme delays	> 50.0	> 80.0

For stop-controlled intersections such as the Sherman Avenue / Quade Street intersection, the LOS provides a tool to compare the existing traffic operations to future, aligned school day traffic operations. Typically, LOS C or above is considered acceptable.

As discussed earlier, the only change in the anticipated traffic characteristics will be the concentration of vehicles into a shorter 15-minute period. This is represented by the peak hour factor. The level-of-service results for the Sherman Avenue / Quade Street intersection is presented in the table below.

AM	**Separate School Days**		**Aligned School Days**	
Sherman Ave/Quade St/Cortland St	**LOS**	**Delay (s)**	**LOS**	**Delay (s)**
Overall	B	12	B	12
EB, Sherman Ave	B	13	B	14
WB, Sherman Ave	B	11	B	11
NB, Cortland St	A	10	B	10
SB, Quade St	B	10	B	10
PM	**Separate School Days**		**Aligned School Days**	
Sherman Ave/Quade St/Cortland St	**LOS**	**Delay (s)**	**LOS**	**Delay (s)**
Overall	B	10	B	13
EB, Sherman Ave	B	10	B	13
WB, Sherman Ave	B	11	B	14
NB, Cortland St	A	9	B	10
SB, Quade St	A	9	B	10

Since the morning peak hour factor at this intersection was relatively stable, the AM peak period level-of-service essentially remained unchanged. In the afternoon, the peak hour factor dropped from 0.93 to 0.75 and the resulting intersection delay is increased as expected. In all aligned cases the delay for each specific entrance into the intersection, as well as the delay for overall intersection, is below 15 seconds, with a resulting acceptable LOS B.

5.6 Effect on Observed Vehicle Queuing

During the observation period, vehicle queuing was cited as a significant issue adding to congestion along Quade Street. With the aligned school days, queuing is expected to increase as more vehicles arrive in the condensed 15-minute peak. This particular queuing is difficult to anticipate as it is based on driver behavior (i.e. double parking, slowly creeping, etc.) and student behavior (time taken to enter and exit vehicle, walking speed, etc.). As queuing has been identified as an issue under the existing drop-off and pick-up patterns, it is evident that the short-term parking supply

near the school has been exhausted. With aligned school days, the additional vehicles will add further demand to this limited supply and queuing will likely increase substantially.

5.7 Summary of Effects of Aligned School Days

The anticipated effects of shifting the start and end times of the High School to align with the Middle School are summarized below:

- No additional increase in total traffic is anticipated with the school alignment; a slight decline is possible as some parents may combine two trips into one.
- Traffic will be condensed primarily into one 30-minute period before school begins and as school ends, resulting in an increase in the peak 15-minute traffic, but no significant change in the peak hour traffic.
- The Sherman Avenue / Quade Street / Cortland Street intersection will likely continue to operate acceptably under the proposed aligned school day.
- Queuing along Quade Street is anticipated to increase substantially as vehicles may double park to drop students off or allow students to enter the vehicle.

6.0 Congestion Mitigation Strategies

The primary issues that have arisen out of this study are summarized below:

- A high percentage of students in the school district are dropped-off and picked-up at both schools.
- Many of these pick-ups and drop-offs occur along Quade Street, and the aligned school days will likely condense the current hour of minor congestion into 30 minutes of greater congestion.
- Several complaints arose about parents waiting in the Middle School Parking Lot, although it is clearly marked for “Authorized Vehicles Only”.
- The existing temporary barriers used to block of Quade Street between West Notre Dame Street and Shippey Street were noticed to be easily blown over.

The following sections discuss the potential strategies that may be employed to address these issues.

6.1 Develop Alternate On-Street Pick-Up and Drop-Off Locations

The most effective congestion mitigation and safety enhancement strategy would involve increasing the number of students that walk and bike to school. However, it is unrealistic to expect considerable change in school commuting behavior before the next school year when school days will be aligned. Until more active modes of transportation are the dominant transportation choice, additional on-street waiting areas may alleviate some queuing and congestion in the short term. The following potential alternatives may be employed to distribute traffic and provide additional queue storage.

6.1.1 Encourage the Use of Clayton Avenue and Grant Avenue Entrance Points

The pedestrian access points at Grant Avenue to the north and Clayton Avenue to the west were underutilized. Both streets had ample on-street parking and maintained paths leading to school entrance points. However, neither street had a covered waiting area or sidewalks along the street, amenities that would likely be needed for the area to be fully utilized. Additionally, the path to Clayton Avenue crosses athletic fields, is not a paved or concrete surface and may be difficult to maintain in the winter, and may not be suitable for pedestrian traffic at all times.

This alternative may be popular with parents as students will be directly dropped off to and picked up from the school campus, yet these parents will not have to navigate the more congested Quade Street and Sherman Avenue.

6.1.2 Restrict Parking along Quade Street South of West Notre Dame Street

The majority of parking along Quade Street is being used throughout the day by students. Restricting parking along one or both sides of Quade Street during the primary start and end times for picking-up and dropping-off only will provide a great deal additional queue storage. The displaced students will likely park on nearby neighborhood streets, and many residents may resist this daily influx of vehicles.

6.1.3 Move the parking aisle along Sherman Avenue

The existing parking aisle on the south side of Sherman Avenue does not directly serve the High School. By moving the parking aisle to the north side of Sherman Avenue, westbound vehicles may be able to drop off and pick up students directly to the campus, eliminating the need for students to have to cross Sherman Avenue. Additionally, the south side of Sherman Avenue has 11 driveways and two roads intersecting the street between Clayton Avenue and Cortland Street. Each roadway and driveway breaks up the parking aisle, reduces the number of parking spaces, and limits sight distance. On the north side of Sherman Avenue, there are only three curbs to the school campus in the same block: two for the high school parking lot and one for access to the athletic fields. Placing the parking aisle on the north side of the street would maximize both pedestrian safety and queue capacity.

The transition along Sherman Avenue from parking on the south side to parking on the north side of would need to be thoroughly reviewed and coordinated with neighboring property owners. Signs would need to be placed and it may be appropriate to coordinate the change in parking with a paving project in order to place centerline and parking aisle pavement markings to clearly delineate the change in traffic pattern. It would be advisable to continue the north side parking west to the next four-way stop intersection at Western Avenue.

Lastly, this adjustment in parking may be combined with hardscape treatments such as bulb-outs to shorten crossing distances and deflect vehicles into the newly realigned driving lane. Bulb-outs may also be helpful at the midblock crosswalks between Larose Street and Cortland Street. At all school driveways parking should be restricted within 20-feet to provide for adequate sight distances.

6.1.4 Encourage counter-clockwise circulation

Parents should be educated to encourage counter clockwise circulation along West Notre Dame Street – Quade Street – Sherman Avenue and Grant Avenue – Quade Street – Shippey Street. This

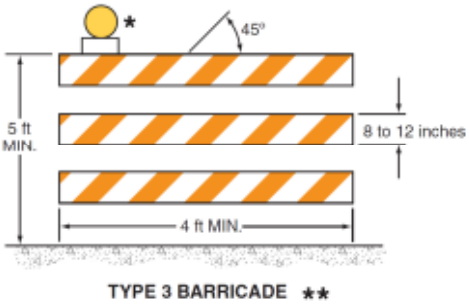
counter clockwise circulation will allow students to directly access the school campus to and from the vehicles without having to cross the street, eliminating many jaywalking instances.

6.2 Restrict Access to School Parking Lots

Congestion within the existing school parking lots was cited as a concern. Currently, the school parking lot entrance is signed to restrict unauthorized vehicles. Beyond educating parents that the lot is not for picking-up or dropping-off students, additional measures may be warranted such as automatic gates further restricting access to the lot, or potential officer enforcement of restrictions.

6.3 Enhanced Temporary Street Closure Barriers

The temporary street closure barriers were effective at keeping most traffic from driving through the closed portion of Quade Street between Shippey Street and West Notre Dame Street. This closure is valuable in the reduction of through traffic and its ability to create a slower vehicle environment, allowing for enhanced pedestrian circulation. Since these effects are only desired during the arrival and dismissal periods, it is imperative that the barriers be temporary and portable. The current temporary barriers, marketed as the Multi-Gate Extendable Barricade and pictured at left set up on Quade Street, suit this application.



According to the Manual of Uniform Traffic Control Devices (MUTCD), the temporary closure of the roadway for approximately one hour would fall into a Category D, or short duration, temporary traffic control situation (Section 6G.02). Under these circumstances, "simplified control procedures may be warranted". A typical duration road closure involves advance warning signs and type 3 barricades. However, given the short duration of the closure, the amount of time to set up and remove these control devices would be too difficult to regularly implement. Additionally, the slow-speed neighborhood environment, coupled with low traffic volumes and general driver familiarity with the devices allows drivers greater time to process the non-traditional traffic control setup. The pedestrian benefits of the road closure outweigh the potential risks associated with this method of street closure.

While the current barriers are acceptable for short term closures on these low volume streets, the barriers were noted to be light and unstable. The barriers were observed to be easily blown onto the ground. The Multi-Gate Extendable Barricade product specification indicates that these barriers may be stabilized with up to 20 pounds of sand or water ballast in the base of the devices, and it is recommended that this feature is utilized.

Based on the observed operation of Quade Street under aligned school days and road closure between West Notre Dame and Shippey Streets, more permanent, automated, and standard road closure devices should be used. These devices may include changeable LED "DO NOT ENTER" signs, railroad-style gates, and flashing red lights that are activated during the arrival and dismissal periods. Additionally, regulatory road signs may need to be installed indicating the closure periods. A more formal evaluation of the effectiveness of the current practices under the aligned school days is advised prior to the installation of these devices.

6.4 Construct New Site Circulation Patterns

Four new site circulation patterns have been preliminarily developed to review the potential impacts to circulation. These alternatives are illustrated as attachments to this memorandum. These hardscape enhancements would generally represent large investments. Illustrations of the alternatives, including cost estimates and an alternatives evaluation chart, are presented in Attachment B.

6.4.1 Alternative 1: Sherman Avenue High School Loop

The Sherman Avenue loop would build a new one-way drop off roadway, intersecting with Stevens Street. The loop may provide queue storage for 10 vehicles. Additional congestion issues may arise as eastbound Sherman Avenue vehicles queue to turn left, not allowing vehicles from the loop to exit, which may create gridlock conditions as the loop fills up. The entrance to the loop is close to the Quade Street / Cortland Street intersection.

6.4.2 Alternative 2: Quade Street to Sherman Avenue Drop-Off

The Quade to Sherman Drop-Off is similar to Alternative 1 but avoids some of the potential gridlock conditions. The drop off drive may provide queue storage for 12 vehicles. The entrance to the drop-off drive is notably close to the Quade Street / Sherman Avenue intersection.

6.4.3 Alternative 3: Grant Avenue Access Road

The Grant Avenue Access Road would create a one-way roadway from the Austin Street / Grant Avenue intersection into the rear of the Middle School parking lot. The roadway would bisect some athletic fields and provide queue storage for 5 vehicles. This access road would provide additional vehicle access to the currently access restricted and congested Middle School Parking Lot.

6.4.4 Alternative 4: Quade Street Middle School Loop

The Quade Street Loop would create a one-way loop south of the Middle School entrance north of Shippey Street. The southern exit from the loop would intersect offset from Shippey Street. The loop may potentially provide queue storage for 6 vehicles.

6.5 Increase the Percentage of Students that Walk / Bike / Bus to School

Increasing the number of students that utilize active transportation as their primary transportation method to school will decrease the number of vehicles accessing the campus, thereby reducing congestion and queuing. As described by the Centers for Disease Control, the National Center for Safe Routes to School, and other advocacy groups cite additional benefits to active commutes to school, including:

- Increased levels of physical activity,
- Improved alertness,
- Heightened self-image and independence,
- Contribution to healthy social and emotional development, and
- Increased likelihood of future active lifestyles.

To increase the mode share of active transportation, the following actions are recommended:

Walk / Bike	Bus
Educate parents on the health, lifestyle and educational benefits of biking and walking to school; encourage students to walk or bike to school on their own.	Increase awareness of bus route and schedule, and encourage greater bus ridership in district newsletter.
Educate parents on reality of safety risks on walking or biking to school, and compare to the generally higher risk of driving.	Subsidize free or reduced student boarding passes to East-West Commuter Route serving the School.
Participate and register for Safe Routes to School events, such as the annual Walk to School Day and Bike to School Day (available only for middle school).	Construct / install a shelter for students to wait protected from the elements.
Offer students incentives to walk or bike to school, potentially with prizes for highest annual weekly or monthly walking or biking trip totals.	Offer students incentives to ride the bus, potentially with prizes for highest annual weekly, monthly, or annual ridership
Replace old bike racks with new, functional, well maintained racks in prominent locations close to the school entrances.	
Work with the City and A/GFTC to prioritize, seek funding for, and construct missing sidewalk segments, particularly the missing curb ramps at new crossing locations and the missing sections to the east of campus.	

7.0 Implementation Matrix

The following implementation task schedule for the recommended enhancements described in Section 2.0 follows below:

Short Term Improvements:

Recommendation	*Description and Responsible Party (RP)*	*Approximate Cost*
Expand Quade Street Drop Off Area	Striping and signs between Sherman Avenue and West Notre Dame Street RP: Coordination between City of Glens Falls DPW, School District	$1,000
Shift Sherman Avenue Parking to North Side of Street	New striping and signs, removing old signs RP: DPW, School District	$2,250
Encourage Counter Clockwise Circulation	Temporary signs and mailers RP: School District	N/A

Recommendation	*Description and Responsible Party (RP)*	*Approximate Cost*
Increase Temporary Barrier Ballast	Sand bags placed in barrier ballast containers RP: School District	$100
Install All-Way Stop Control at Shippey Street and Empire Avenue	Installation of signs and striping, plus temporary warning flags RP: DPW, Glens Falls Police Department (GFPD)	$800

Long Term Improvements:

Recommendation	*Description and Responsible Party (RP)*	*Approximate Cost*
Improve City Sidewalk Network	Sidewalk and curb construction RP: School District, DPW, A/GFTC	$100 - $200 per foot of sidewalk
Automatic Quade Street Closure Features	New gates, signs, curbing, bulb-outs, and crosswalks RP: School District, DPW	$95,000
Quade Street to Sherman Avenue Loop Waiting Area	New curb, asphalt, sidewalk and drive entrances RP: School District, DPW	$550,000

Programmatic Improvements:

Recommendation	*Description and Responsible Party (RP)*	*Approximate Cost*
Promote Coordination with Transit	Publish transit maps and timetables with school flyers; re-route PM East-West Corridor route; waiting shelter at school on Sherman Avenue; potential fare subsidies RP: School District; GGFT; A/GFTC	annual expenses to promote activities
Participate in Active Transportation Encouragement Programs	Participate in national and statewide events when possible; incentivize and promote highest rider- / walker-ship RP: School District; A/GFTC	annual expenses to promote activities

Attachment A: Conceptual Cost Estimates for Recommended Improvements

RSG INC.
RESOURCE SYSTEMS GROUP, INC.

PROJECT: A/GFTC - GFSD
Traffic Circulation Study

CALCULATED BY: CDM DATE: 08/09/12

CONCEPTUAL COST ESTIMATE FOR RECOMMENDED IMPROVEMENTS

Short Term Improvements

Assumptions for all short term improvements: No paving is necessary, only street cleaning, striping, and signs

Expand Quade Street Drop-Off Area

Item	Unit	Quantity	Unit Price		Item Price
4" YELLOW STRIPING	LF	835	0.25	$	208.75
STREET CLEANING	LS	1	250	$	250.00
TRAFFIC SIGNS	EA	3	50	$	150.00
SIGN POSTS	EA	3	100	$	300.00
			Subtotal	$	908.75
			Contingency (10%)	$	90.88
			TOTAL	**$**	**999.63**

Shift Sherman Avenue Parking to North

Item	Unit	Quantity	Unit Price		Item Price
4" WHITE STRIPING	LF	440	0.25	$	110.00
STREET CLEANING	LS	1	250	$	250.00
REMOVING SIGNS & POSTS	EA	5	35	$	175.00
TRAFFIC SIGNS	EA	10	50	$	500.00
SIGN POSTS	EA	10	100	$	1,000.00
			Subtotal	$	2,035.00
			Contingency (10%)	$	203.50
			TOTAL	**$**	**2,238.50**

Stop Signs at Shippey and Empire

Item	Unit	Quantity	Unit Price		Item Price
24" STOP BAR	LF	24	5	$	120.00
"STOP" MARKING	EA	2	100	$	200.00
TRAFFIC SIGNS	EA	2	100	$	200.00
SIGN POSTS	EA	2	100	$	200.00
			Subtotal	$	720.00
			Contingency (10%)	$	72.00
			TOTAL	**$**	**792.00**

Long Term Improvements

Automatic Quade Street Closure Features

Item	Unit	Quantity	Unit Price		Item Price
SIDEWALK	SF	1200	30		$36,000.00
CURB	LF	350	35		$12,250.00
CROSSWALK STRIPING	LF	48	10		$480.00
TURF / ESTABLISHMENT / LANDSCAPING	LS	1	5000		$5,000.00
DRAINAGE MODIFICATIONS	LS	1	15000		$15,000.00
AUTOMATIC VERTICAL SWING GATES	EA	4	10000		$40,000.00
MOBILIZATION / DEMOBILIZATION	LS	1	10900		$10,900.00
			Subtotal	$	70,900.00
			Engineering (20%)	$	14,180.00
			Contingency (10%)	$	7,090.00
			TOTAL	**$**	**92,170.00**

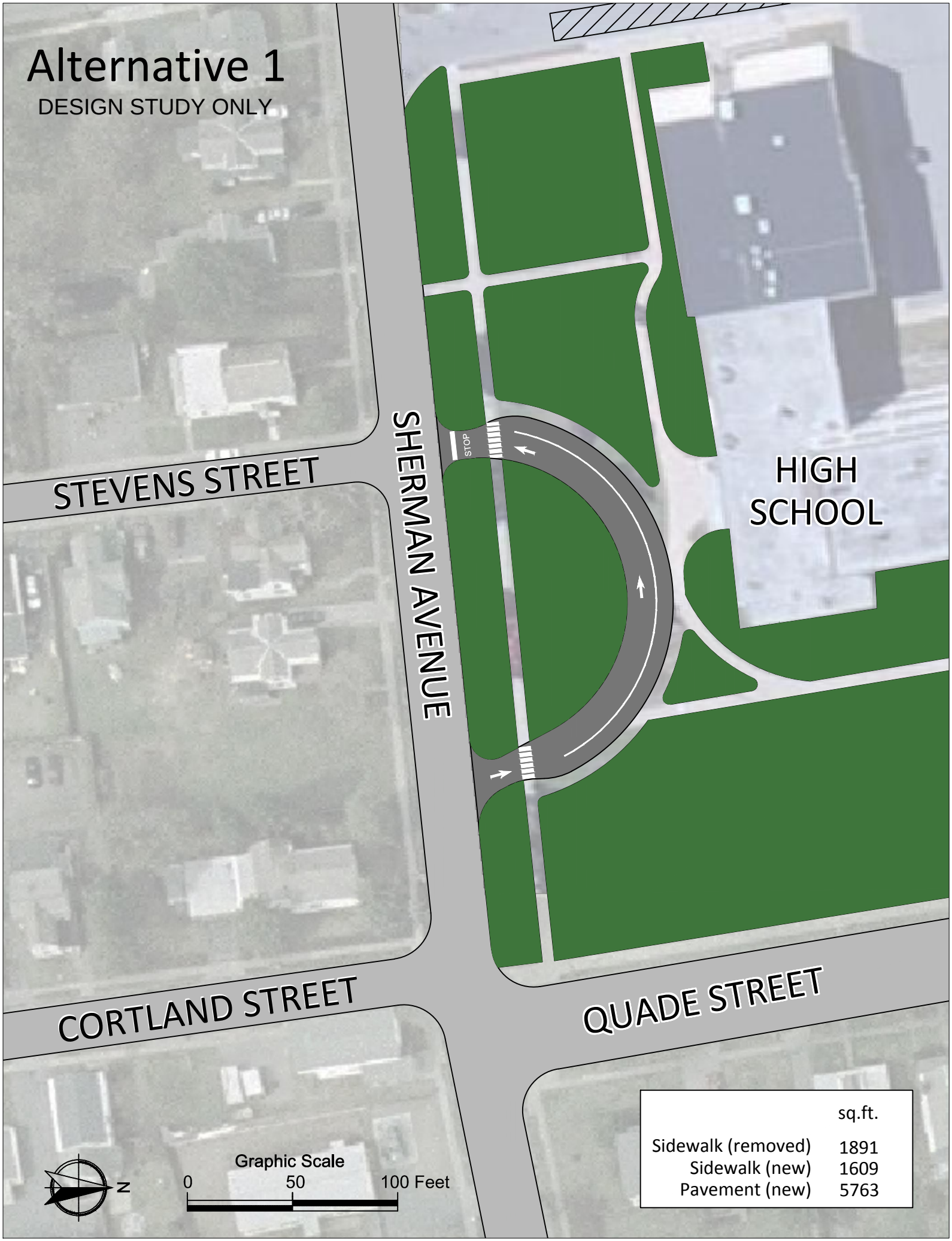
Quade Street to Sherman Avenue Loop

Item	Unit	Quantity	Unit Price		Item Price
SITE PREPARATION	LS	1	20000	$	20,000.00
ASPHALT ROADWAY	SF	6670	35	$	233,450.00
SIDEWALK	SF	2801	30	$	84,030.00
CURB	LF	665	50	$	33,250.00
4" WHITE STRIPING	LF	240	0.25	$	60.00
CROSSWALK STRIPING	LF	32	10	$	320.00
TURF / ESTABLISHMENT / LANDSCAPING	LS	1	15000	$	15,000.00
DRAINAGE MODIFICATIONS	LS	1	15000	$	15,000.00
TRAFFIC SIGNS	EA	3	50	$	150.00
SIGN POSTS	EA	3	100	$	300.00
MOBILIZATION / DEMOBILIZATION	EA	1	40200	$	40,200.00
			Subtotal	$	421,760.00
			Engineering (20%)	$	84,352.00
			Contingency (10%)	$	42,176.00
			TOTAL	**$**	**548,288.00**

Attachment B: Off Street Parking and Drop-Off Expansion Alternatives

Alternative 1

DESIGN STUDY ONLY



	sq.ft.
Sidewalk (removed)	1891
Sidewalk (new)	1609
Pavement (new)	5763

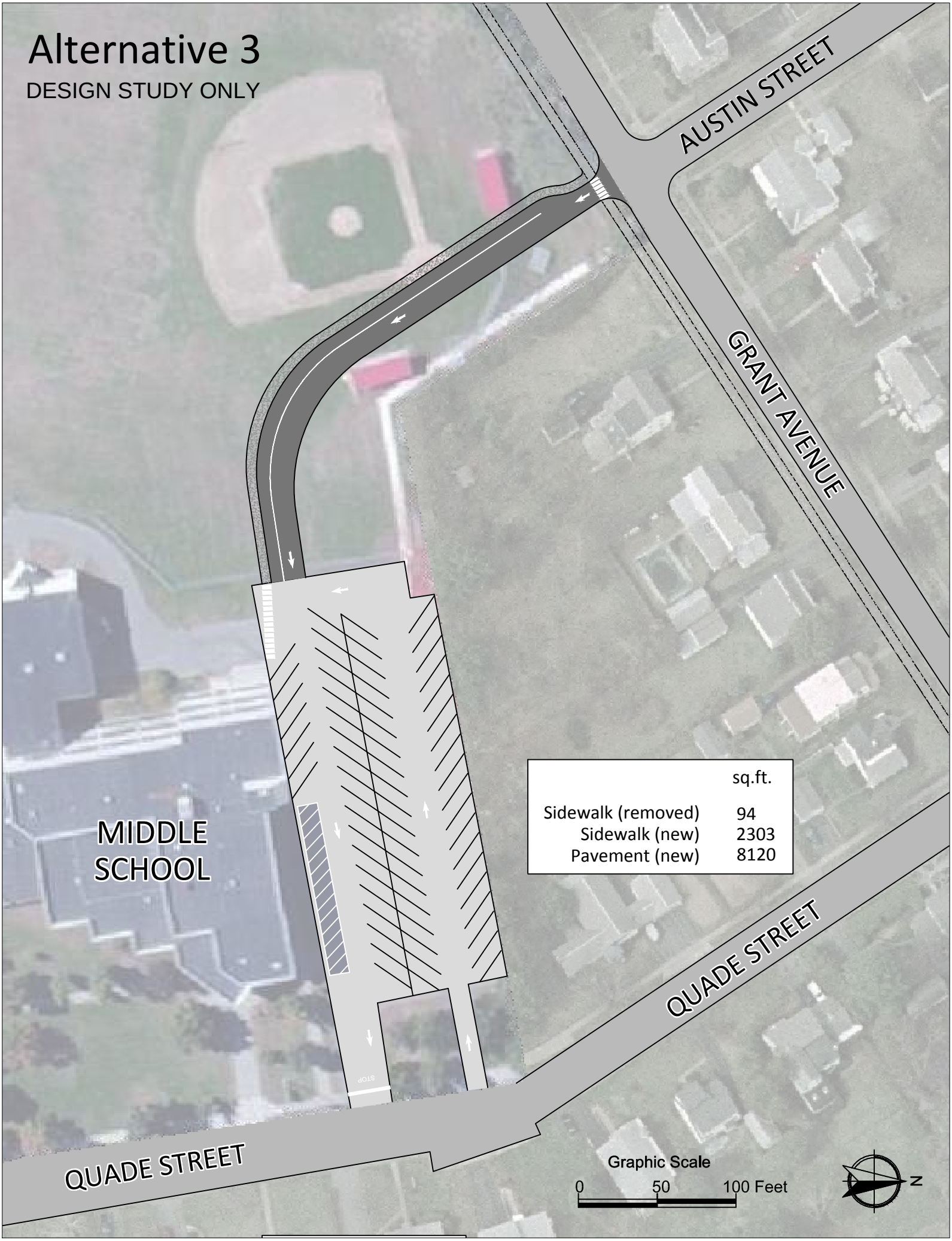
Alternative 2

DESIGN STUDY ONLY

	sq.ft.
Sidewalk (removed)	1926
Sidewalk (new)	2801
Pavement (new)	6669

Alternative 3

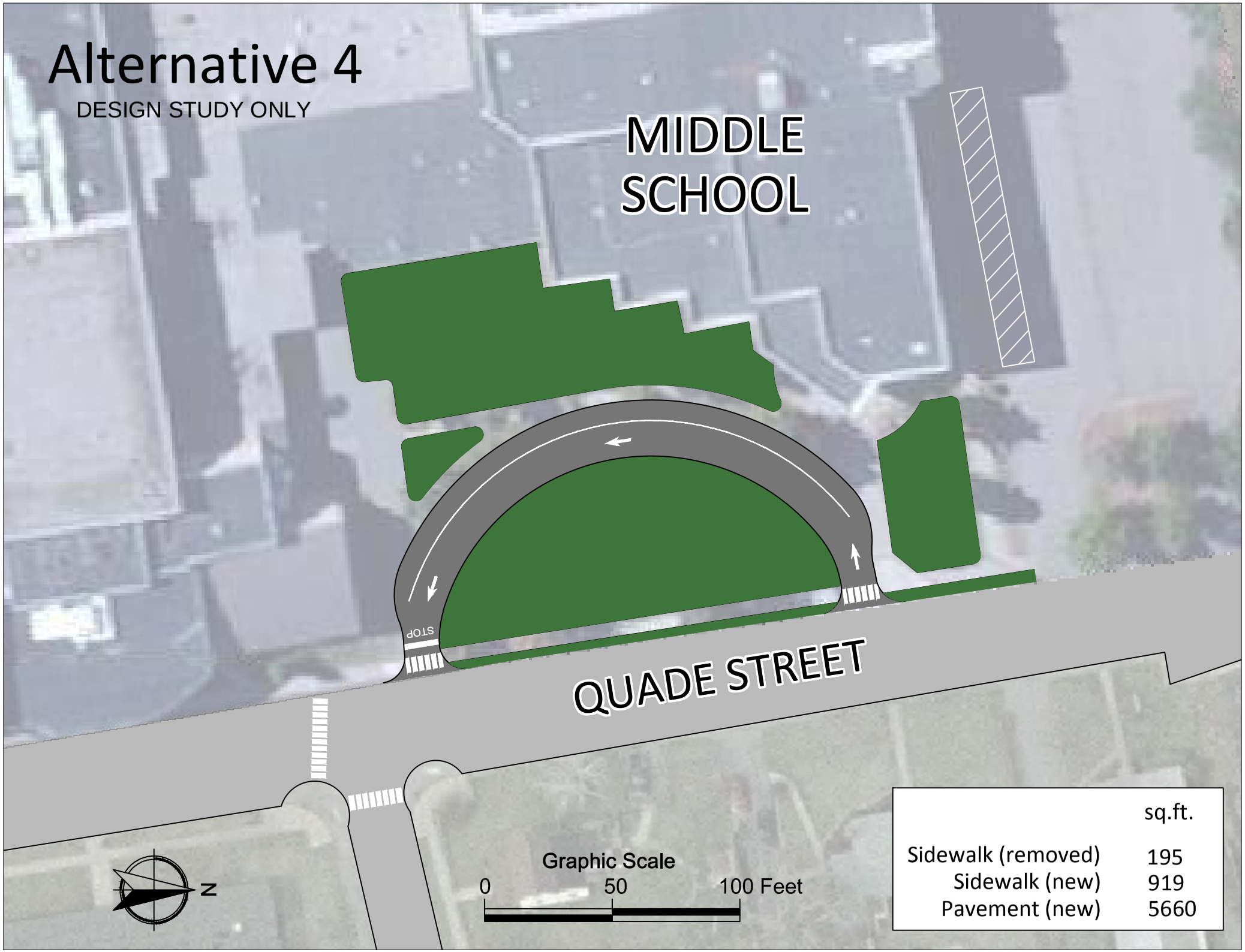
DESIGN STUDY ONLY



	sq.ft.
Sidewalk (removed)	94
Sidewalk (new)	2303
Pavement (new)	8120

Alternative 4

DESIGN STUDY ONLY



	sq.ft.
Sidewalk (removed)	195
Sidewalk (new)	919
Pavement (new)	5660

RSG INC.
RESOURCE SYSTEMS GROUP, INC.

PROJECT: A/GFTC - GFSD Traffic Circulation Study

DATE: 08/09/12

ATTACHMENT B
OFF STREET PARKING AND DROP-OFF EXPANSION ALTERNATIVES AND EVALUATION COMPARISON

Alternative 1: Sherman Ave Loop

Approximate Cost:

Site Preparation:	LS	1	5000	$	5,000.00
New Sidewalk:	SF	1609	35	$	56,315.00
New Roadway:	SF	5763	45	$	259,335.00
Landscaping:	LS	1	5000	$	5,000.00
Drainage:	LS	1	10000	$	10,000.00
Incidentals:	LS	1	2000	$	2,000.00
			Subtotal:	$	337,650.00
			Engineering (10%):	$	33,765.00
			Contingency (20%):	$	67,530.00
			Total:	**$**	**438,945.00**

Evaluation of Features:

Add. Parking	200' (10 vehicles)
Convenience	Good
Circulation	Good
Safety	Fair

Notes:
Drive entrance close to Quade/Cortland and Stevens; Requires substantial landscaping to school green

Overall: Safety concerns with the drive entrance proximity to adjacent intersections discounted this alternative as preferred

Alternative 2: Quade St to Sherman Ave Loop - PREFERRED ALTERNATIVE

Approximate Cost:

Site Preparation:	LS	1	8000	$	8,000.00
New Sidewalk:	SF	2801	35	$	98,035.00
New Roadway:	SF	6609	45	$	297,405.00
Landscaping:	LS	1	7000	$	7,000.00
Drainage:	LS	1	10000	$	10,000.00
Incidentals:	LS	1	3000	$	3,000.00
			Subtotal:	$	423,440.00
			Engineering (10%):	$	42,344.00
			Contingency (20%):	$	84,688.00
			Total:	**$**	**550,472.00**

Evaluation of Features:

Add. Parking	240' (12 vehicles)
Convenience	Good
Circulation	Good
Safety	Good

Notes:
Requires substantial landscaping to school green; Creates break in extended Quade St drop off zone

Overall: Reduced conflict with adjacent drives enhances the viability of this alternative

Alternative 3: Grant Ave to Middle School Parking Lot

Approximate Cost:

Site Preparation:	LS	1	5000	$	5,000.00
New Sidewalk:	SF	2303	35	$	80,605.00
New Roadway:	SF	8120	45	$	365,400.00
Landscaping:	LS	1	5000	$	5,000.00
Drainage:	LS	1	10000	$	10,000.00
Incidentals:	LS	1	15000	$	15,000.00
			Subtotal:	$	481,005.00
			Engineering (10%):	$	48,100.50
			Contingency (20%):	$	96,201.00
			Total:	**$**	**625,306.50**

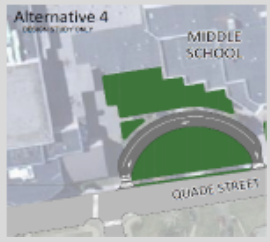
Evaluation of Features:

Add. Parking	320' (16 vehicles)
Convenience	Fair
Circulation	Fair
Safety	Fair

Notes:
Encourages access to Middle School lot, which has been identified as congested; Impacts to athletic fields

Overall: Safety concerns with additional traffic through the congested Middle School lot, plus the impacts to the athletic fields reduce the viability of this alternative

Alternative 4: Quade Street Loop



Approximate Cost:

Site Preparation:	LS	1	3000	$	3,000.00
New Sidewalk:	SF	919	35	$	32,165.00
New Roadway:	SF	5660	45	$	254,700.00
Landscaping:	LS	1	3000	$	3,000.00
Drainage:	LS	1	10000	$	10,000.00
Incidentals:	LS	1	5000	$	5,000.00
			Subtotal:	$	307,865.00
			Engineering (10%):	$	30,786.50
			Contingency (20%):	$	61,573.00
			Total:	**$**	**400,224.50**

Evaluation of Features:

Add. Parking	216' (10 vehicles)
Convenience	Good
Circulation	Fair
Safety	Fair

Notes:
Creates new offset intersection at Quade and Shippey; Potential impacts to bike racks and Middle School entrance

Overall: Safety concerns with offset intersection reduce the viability of this alternative