

MEMORANDUM

To: Catherine Lauria
Chief School Business Officer
West Northfield School District 31

From: Tim Sjogren, P.E., PTOE
Kurt Facknitz, E.I.

Date: February 25, 2019

Subject: Transportation Review and Recommendations
Winkelman Elementary School
Glenview, IL

EXECUTIVE SUMMARY

Kimley-Horn and Associates, Inc. (Kimley-Horn) was retained by West Northfield School District 31 to review access, parking, and circulation conditions at Winkelman Elementary School in Glenview, Illinois. Based on a review of existing conditions, Kimley-Horn identified short- and long-term recommendations to enhance campus access and safety for students, parents, faculty, and staff.

In the short-term, parking lot striping modifications are recommended to increase the parking supply and enhance ADA accessibility. Potential changes to queue operations are also recommended in order to improve the capacity of the student pick-up/drop-off area on the south side of the building. These short-term improvements require limited modifications to existing campus infrastructure and were identified for potential implementation during the second half of the 2018/2019 school year.

In the long-term, modifications to the current dismissal process are recommended to increase efficiency, minimize student loading time, and reduce required faculty/staff levels. In addition to these changes, the existing sidewalk along the south side of the building should be widened in order to extend the designated student pick-up/drop-off area and increase the number of vehicles loading simultaneously. A second queue lane is recommended along the south side of the building in order to increase onsite capacity and minimize spillback to Landwehr Road. Modifications to the north parking lot (Lot B) are recommended to further increase the parking supply. Off-site improvements are also recommended, including a southbound left-turn lane and a northbound right-turn lane on Landwehr Road at South Winkelman Access.

INTRODUCTION

Winkelman Elementary School is located east of Landwehr Road and north of Lake Avenue, immediately north of Glenbrook Hospital. Student enrollment ranges from Pre-K to Grade 5. Access to Winkelman Elementary School is provided along Landwehr Road via two full-access driveways. The north driveway (North Winkelman Access) provides access for buses and passenger vehicles; the south driveway (South Winkelman Access) provides access for passenger vehicles only. The primary faculty/staff and visitor parking lot (Lot A) is located west of the school and is accessed via North Winkelman Access and South

Winkelman Access. Additional parking is provided north of the school (Lot B). A dedicated bus pick-up/drop-off area is also located in Lot B. Bus access to the site is provided by North Winkelman Access. The designated student pick-up/drop-off area is located on the south side of the school and is accessed via South Winkelman Access.

This study was conducted in order to review current transportation operations at the Winkelman Elementary School campus. This memorandum documents the study methodology, summarizes data collected, highlights key findings, and outlines both short-term and long-term recommendations to improve these operations at the site.

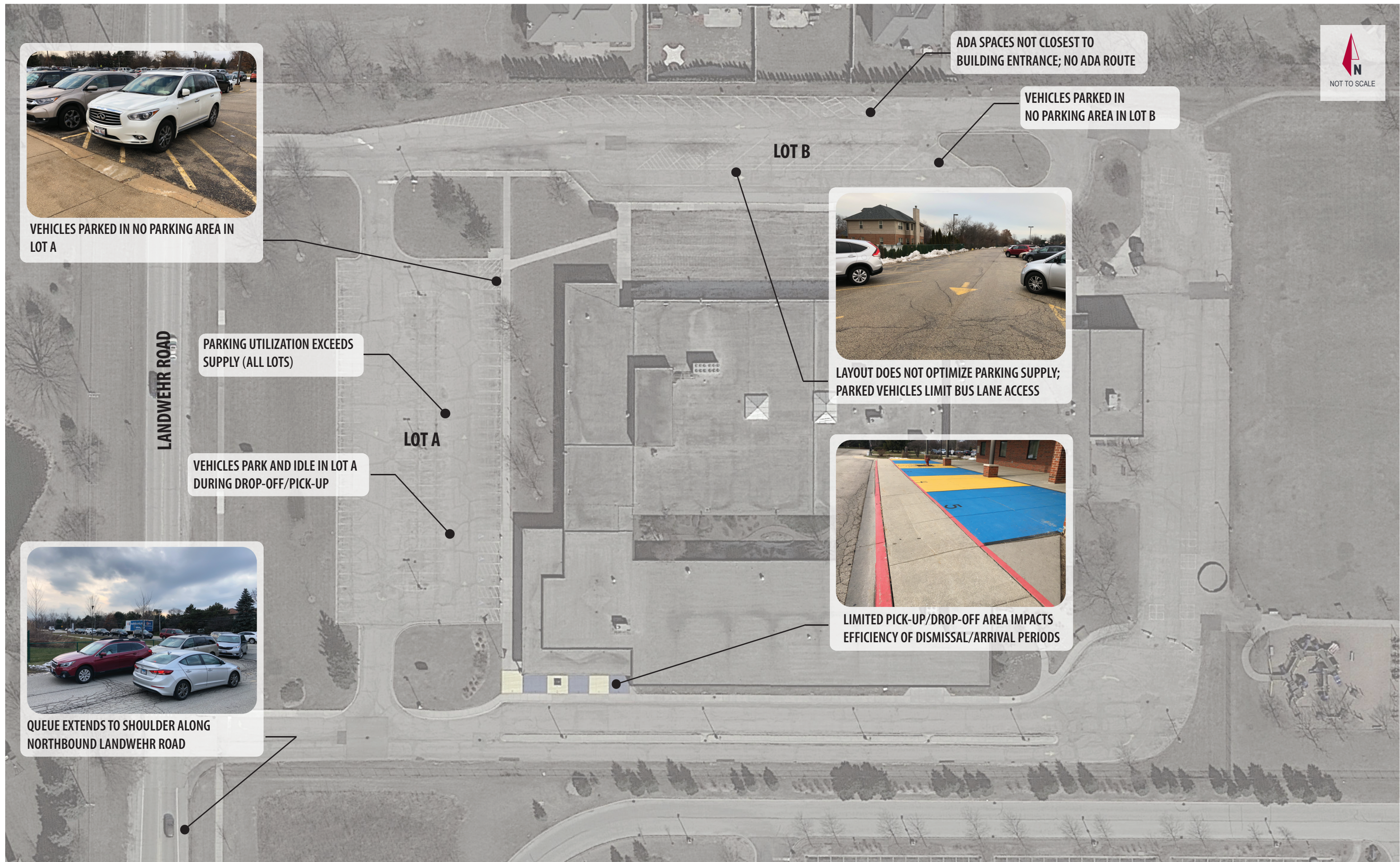
DATA COLLECTION AND ANALYSIS

Kimley-Horn performed observations at Winkelman Elementary School to review existing traffic conditions and operational characteristics. A summary of key observations, data collection, and analyses performed to inform recommendations is outlined below.

Key Observations

Kimley-Horn conducted observations over a 9-hour period (7:00AM – 4:00PM) on a typical school day in December 2018. A summary of key observations is provided below, with further detail and accompanying photographs provided in **Exhibit 1**.

- **Morning Arrival Conditions** – During the morning arrival period, staggered student arrivals were observed from 7:40AM to 8:15AM. Arrival queues were generally accommodated onsite for the initial portion of the drop-off period. A higher concentration of vehicles was observed immediately prior to the first morning bell, with a maximum queue observed after 8:00AM and prior to the second bell at 8:10AM. During this period, the maximum observed queue was 50 vehicles, which exceeded onsite storage and extended onto Landwehr Road. The average time spent in the queue was approximately 3 minutes, and the average drop-off time was 16 seconds.
- **Afternoon Dismissal Conditions** – During afternoon dismissal, vehicles were observed entering the campus for pick-up beginning around 1:00PM. Approximately 15 minutes prior to the dismissal bell at 2:40PM, the onsite queue storage area was fully occupied with approximately 43 vehicles. The maximum observed queue was 53 vehicles, which extended south on Landwehr Road to the Glenbrook Hospital access driveway. Though Landwehr Road is striped to provide a single northbound travel lane, vehicles were observed utilizing the paved shoulder as a de facto right-turn lane to avoid blocking northbound traffic. The overall average time spent in the queue was 29 minutes; following the dismissal bell, the average time spent in the queue was 12 minutes. The initial queue cleared in approximately 21 minutes, followed by more staggered pick-up activity with reduced queue clearance times. The average student loading time was 30 seconds.
- **Parking Utilization** – During the observation period, parking utilization consistently exceeded the supply. Vehicles were observed in non-designated parking areas and ADA accessible drive aisles. In addition, illegal use of ADA spaces was observed. Parking utilization was particularly high during the afternoon dismissal period.
- **Pick-Up/Drop-Off Space** – The pick-up/drop-off area located south of the school currently accommodates approximately four to five vehicles. The length of the pick-up/drop-off area limits the number of students loading/unloading simultaneously.



- **Lot A Pick-Up/Drop-Off Activity** – During morning arrival, vehicles utilized non-designated parking areas in Lot A for student drop-off activity. Vehicles were observed idling in parking lot drive aisles and ADA spaces, with students exiting vehicles and walking through the lot to reach the school entrance, often in conflict with other vehicles and parking maneuvers. During the afternoon dismissal period, several vehicles arrived prior to closure of Lot A and used the parking lot as a student pick-up area.
- **Lot B ADA Accessibility** – Lot B includes two ADA accessible spaces. However, these spaces are not the closest spaces to the nearest building entrance, and no ADA route appears to be provided.
- **Lot B Parking** – Vehicle parking in Lot B is inefficient; the existing layout creates a large amount of unutilized space between vehicles. The parking spaces in the center of Lot B are oversized; the existing spaces are approximately 20'x30', whereas a standard angled parking space is typically 9'x20'. Furthermore, due to the presence of old pavement markings that have not been completely removed, parked vehicles often encroach into the designated bus lane, potentially impacting bus circulation.

Traffic and Pedestrian Counts

To determine current levels of vehicle, bus, pedestrian, and bicycle activity within the study area, weekday traffic counts were performed during a typical weekday in January 2019 when school was in session. The traffic counts were conducted from 7:00AM – 4:00PM at the following intersections:

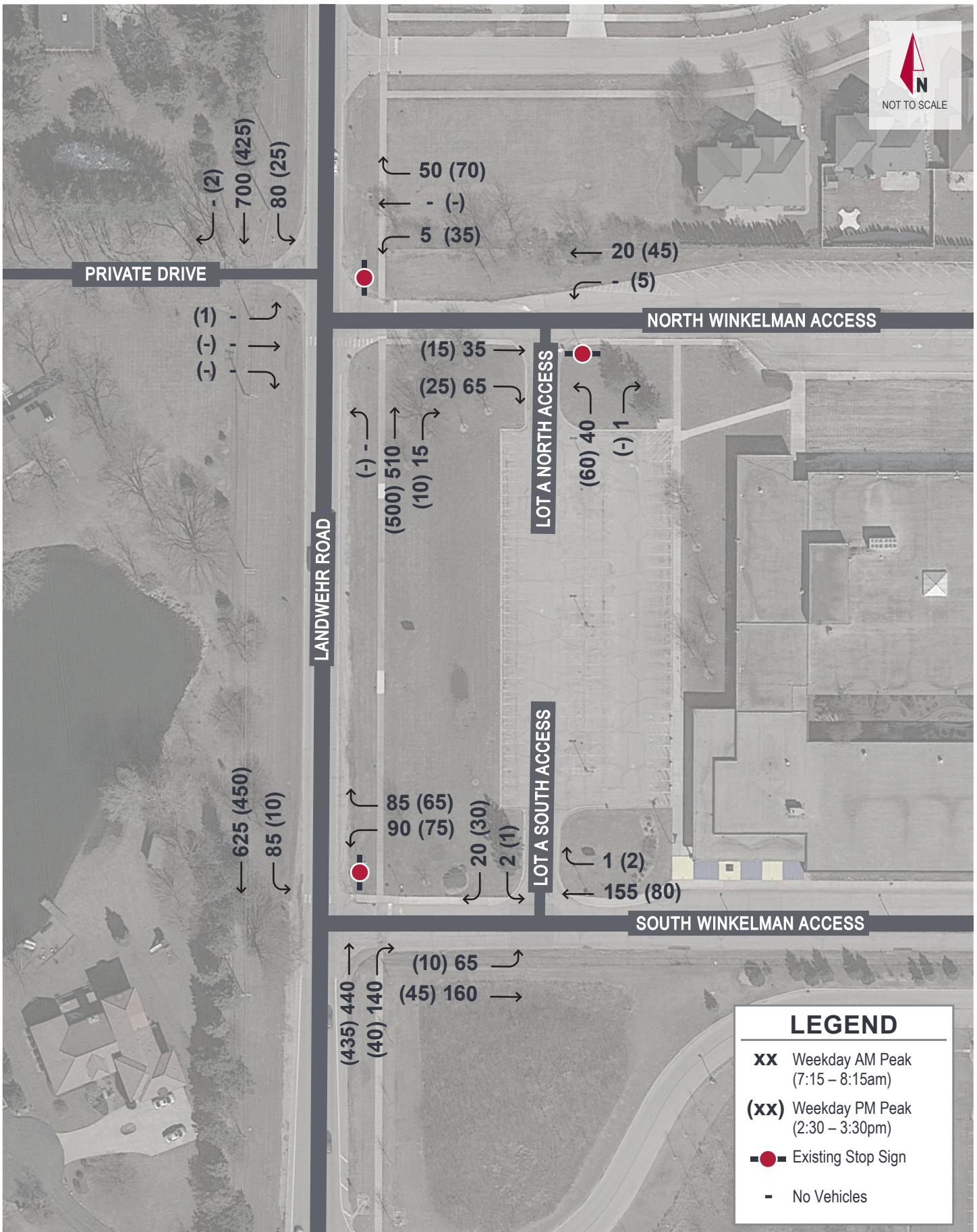
- Landwehr Road/North Winkelman Access
- Landwehr Road/South Winkelman Access
- North Winkelman Access/Lot A South Access
- South Winkelman Access/Lot A North Access

A summary of the existing peak hour traffic volumes is presented in **Exhibit 2**. The morning arrival peak hour was from 7:15AM – 8:15AM, and the afternoon dismissal peak hour was from 2:30PM – 3:30PM.

Traffic Volume Review

Based on field observations and discussions with school administration, the intersection of Landwehr Road and South Winkelman Access is placed under manual control from 7:45AM – 8:15AM during the student arrival period, and from 2:30PM – 3:00PM during the dismissal period. During this time, an off-duty Cook County Police Officer directs traffic at the intersection. This manual control allows exiting (westbound) vehicles to be released in platoons, which prevents these vehicles from queuing on campus and obstructing the designated pick-up/drop-off area. Inbound vehicles traveling southbound on Landwehr Road are generally given priority, preventing vehicles from impeding the southbound through movement for significant periods of time. Despite this, the volume of inbound vehicles, particularly in the morning arrival period, results in significant delays and queuing on southbound Landwehr Road.

Capacity analyses were performed for the intersections of Landwehr Road/North Winkelman Access and Landwehr Road/South Winkelman Access in order to evaluate existing operations. The analysis demonstrates that intersection operation is poor during peak arrival and dismissal periods, with through movements restricted by turning vehicles, particularly at the Landwehr Road/South Winkelman Access intersection. The results are consistent with observations of field operations. Intersection capacity analyses and detailed traffic count data are provided in the appendix.



Based on a review of the count data, traffic volumes entering the campus were significantly higher during the morning arrival period as compared to the afternoon dismissal period. Based on conversations with school administration, it is likely that this is attributable to on-campus after-school programs which reduce the number of students leaving campus with the dismissal bell. However, the difference between arrival and dismissal volumes also suggests potential use of alternate transportation options (e.g., bus, carpool, etc.) during the dismissal period to avoid the afternoon queues or constrained parking conditions. Improvements to the campus transportation infrastructure to increase queue capacity and enhance the efficiency of student pick-up may encourage increased activity during the afternoon peak hour.

Turn Lane Warrant Analysis

Based on the traffic counts and a review of existing queue conditions, turn lane warrants were evaluated for Landwehr Road at North and South Winkelman Access. Turn lane warrants were conducted using guidelines in the Illinois Department of Transportation (IDOT) *Bureau of Design and Environment Manual (BDE)* manual. Based on morning peak hour traffic volumes, a southbound left-turn lane is warranted on Landwehr Road at South Winkelman Access. Installation of a southbound left-turn lane will allow southbound through vehicles to bypass vehicles queueing to turn left onto South Winkelman Access, reducing southbound delays and improving operation of the intersection.

Similarly, based on morning peak hour traffic volumes, a northbound right-turn lane is warranted on Landwehr Road at South Winkelman Access. Installation of a northbound right-turn lane will allow northbound through vehicles to bypass vehicles in the right turn lane when queues extend onto Landwehr Road. Installation of a right-turn lane will formalize the observed use of the intersection during morning arrival and afternoon dismissal, during which the existing northbound shoulder was utilized as a de facto right turn lane when queues extended onto Landwehr Road.

A future capacity analysis of the intersection with the inclusion of southbound left- and northbound right-turn lanes (summarized in the attached appendix) was performed. The analysis demonstrates that the inclusion of turn lanes improves the operation of the intersection, reducing both vehicle delay and queue length. Installation of turn lanes on Landwehr Road will require coordination with the Cook County Department of Transportation and Highways. A copy of the turn lane warrant analysis is provided in the appendix.

Parking Utilization Counts

Lot A currently provides a total of 98 parking spaces, including 85 standard parking spaces, 4 visitor spaces, 4 spaces for traveling faculty, 4 ADA spaces, and 1 space with a 15-minute limit. Lot B currently provides 25 total parking spaces, with 23 standard spaces and 2 ADA spaces.

During the observation period, Kimley-Horn recorded the number of vehicles parked within Lot A and Lot B hourly, from 7:00AM to 4:00PM. During peak arrival and dismissal periods, counts were conducted every 15 minutes to capture the high-turnover parking conditions. Throughout the count period, parking utilization was tabulated for each parking space designation (e.g., standard, ADA, visitor, faculty, 15-minute).

The parking utilization data (summarized in the attached appendix) demonstrates that the number of parked vehicles in both Lot A and Lot B consistently exceeded the number of striped parking spaces provided in each lot. Overall parking utilization was 100 percent or greater for 9 of the 17 count periods. The highest parking utilization occurred during the afternoon dismissal (2:45PM), with 145 vehicles parked on campus. With only 123 striped spaces provided onsite, peak parking utilization exceeded supply. During this period, vehicles were observed parked in No Parking areas and drive aisles.

SUMMARY AND RECOMMENDATIONS

Based on key observations, data collection, and analyses, Kimley-Horn has developed recommended improvements to address access, circulation, and parking challenges. These include recommendations for short-term improvements that can be implemented with limited modifications to existing campus infrastructure, as well as long-term recommendations which may require more significant investment in infrastructure improvements.

Short-Term Recommendations

Provided below are short-term recommendations for campus transportation improvements. These short-term recommendations are also summarized in **Exhibit 3**. These recommendations should be considered for implementation during the second half of the 2018/2019 school year.

Recommendation	Benefit
Convert the existing No Parking area in Lot A into two (2) additional standard parking spaces.	Formalizes existing use and increase Lot A parking supply by two (2) spaces. ¹
Re-stripe the center parking spaces of Lot B and convert the current oversized spaces to 60-degree, 9' x 20' angled parking.	Enhances visibility of pavement markings and increase Lot B parking supply by nine (9) spaces. ¹ Reduces vehicle overhang into the designated bus lane / minimize impacts to bus access.
Relocate the existing ADA spaces on the north side of Lot B to parking spaces closest to the building entrance and convert the existing ADA spaces into standard parking spaces. ADA route should be verified for compatibility with current standards.	Shortens distance between ADA spaces and school entrance in Lot B.
Use cones to block the center of the turnaround area provided for the pick-up/drop-off area.	Increases utilization of turnaround space and reduces queue spillback onto northbound Landwehr Road.
Install a stop sign and stop bar at southbound Lot A South Access.	Encourages exiting drivers to come to a complete stop and look for oncoming traffic before turning, enhancing safety at the intersection.

¹ Based on the recommended additional parking, the current allotment of six (6) ADA spaces is sufficient to serve the campus.

Long Term Recommendations

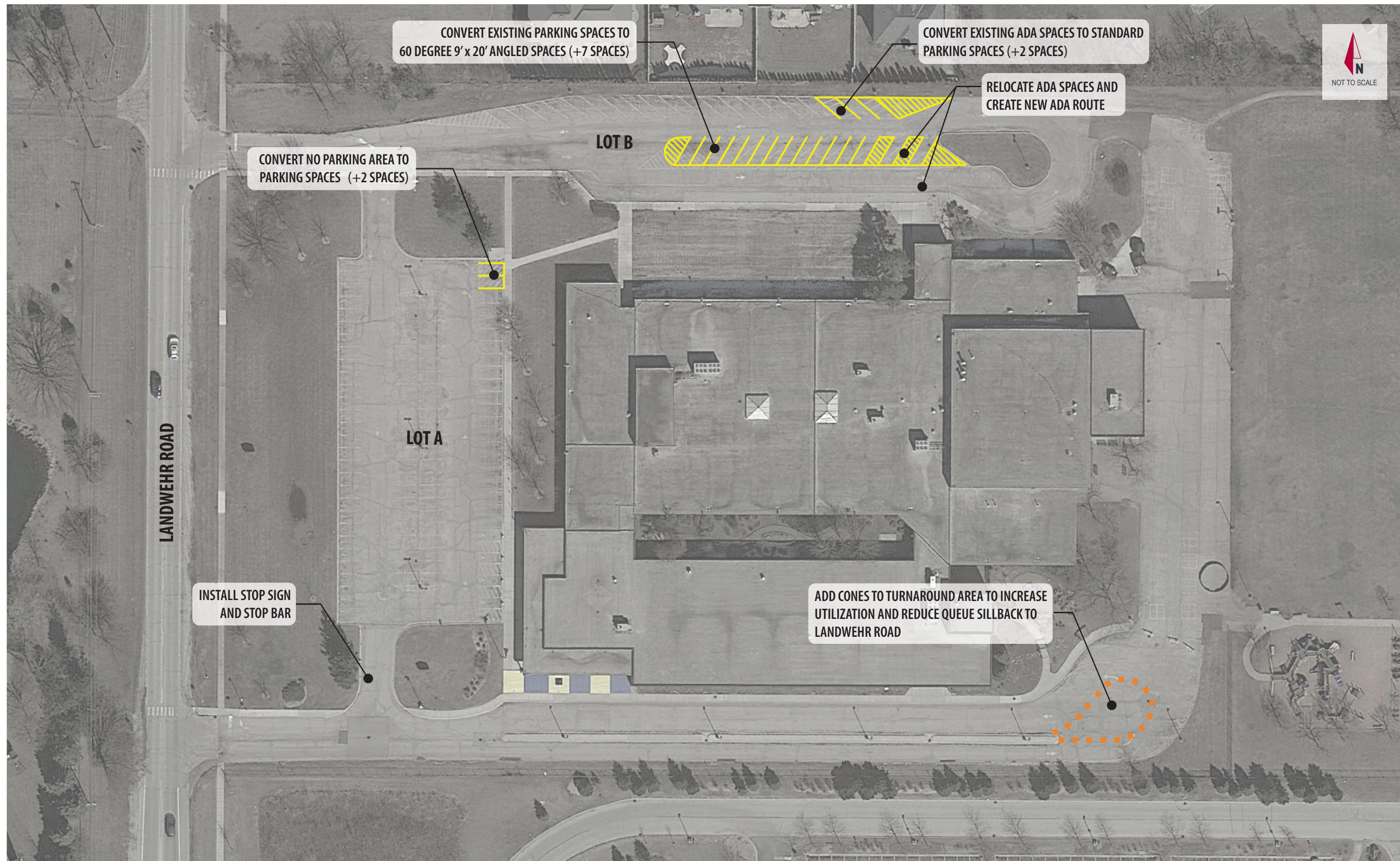
A summary of long-term recommendations for campus transportation improvements is outlined below and depicted in **Exhibit 4**. These recommendations likely require more extensive infrastructure improvements or time and likely would be considered for implementation following the 2018/2019 school year.

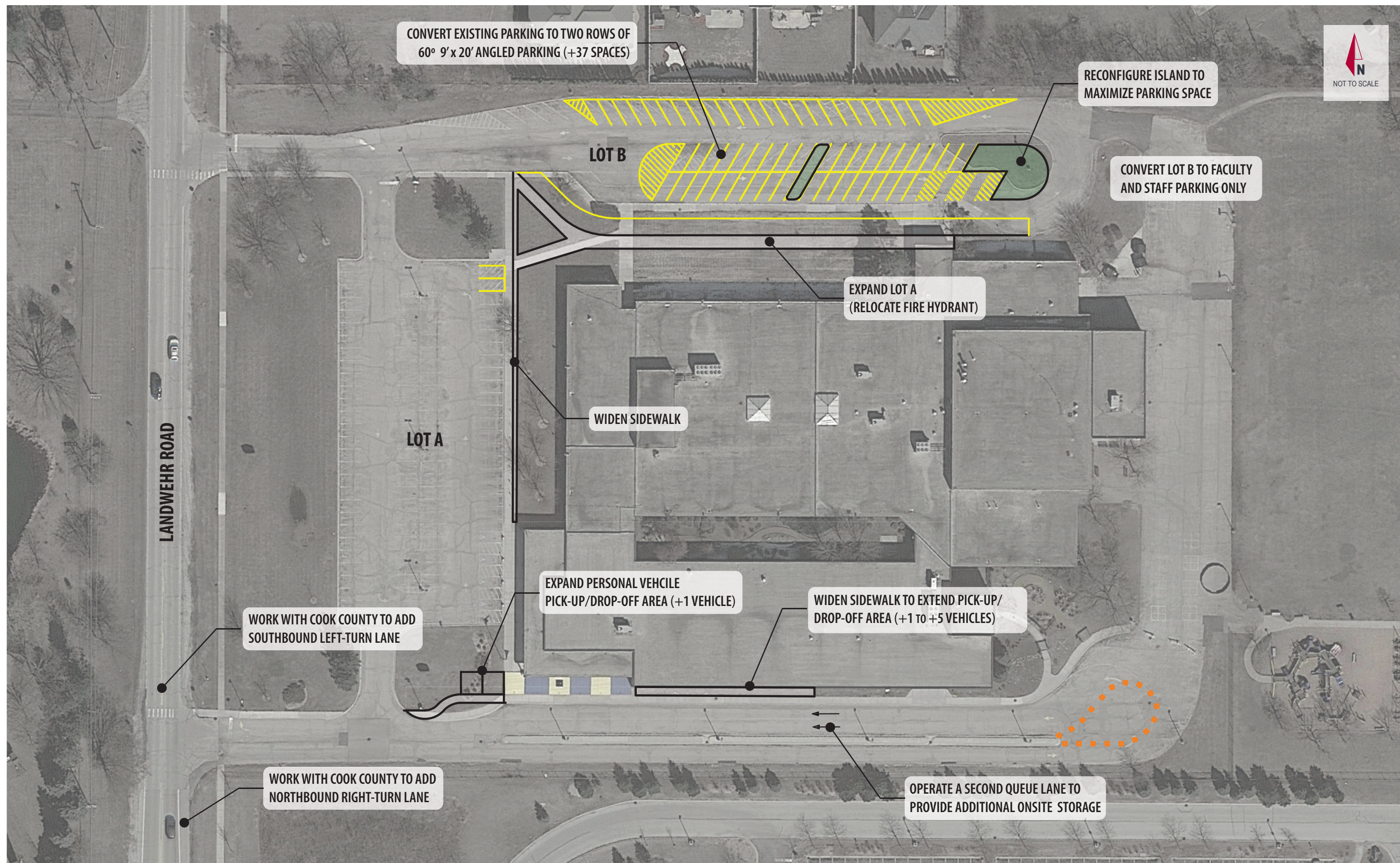
Recommendation	Benefit
Modify the current dismissal process to queue students within the school (gym or cafeteria often used) and dismiss in groups or platoons. Students would be dismissed based on a number system, with numbers distributed to students and parents at the start of the school year. Faculty/staff would monitor the vehicle queue and communicate numbers to additional faculty/staff in the gym. As matching numbers are identified, students would be dismissed from the gym in numbered order corresponding to the vehicle queue.	Increases dismissal loading efficiency by reducing the time it takes for each student to load into the appropriate vehicle. Reduces faculty/staff levels required to manage dismissal period.
Expand Lot B by utilizing the available space to the south of the existing curb line. With the additional space provided in the lot, convert the center parking area into two rows of 60-degree, 9' x 20' angled parking spaces. Reconfigure the existing island to maximize parking space within Lot B.	Increases Lot A parking supply by approximately 37 spaces. ¹
Convert Lot B to faculty and staff parking only; continue to provide additional faculty and staff parking in Lot A.	Allows a portion of Lot A to remain open for visitors and traveling faculty throughout the day. Limits the potential for illegal parking on campus, particularly during the afternoon dismissal period.
Based on existing morning peak hour traffic volumes, both a southbound left-turn lane and northbound right-turn lane are warranted on Landwehr Road at South Winkelman Access. Coordination with Cook County Department of Transportation and Highways would be required to implement off-site roadway improvements.	Provides a dedicated northbound right-turn lane to accommodate queue spillover onto Landwehr Road and minimize impacts to through traffic. Allows southbound through traffic to bypass left turning vehicles, thereby increasing the operational efficiency of the intersection.
Widen the sidewalk east of Lot A.	Minimizes the impact of vehicle overhang from parked vehicles in Lot A and provides additional space for pedestrians entering and exiting the school.
Widen the sidewalk on the north side of the south pick-up/drop-off area. Alternately, or in conjunction with this recommendation, expand the personal vehicle pick-up/drop-off area to the west.	Increases the number of vehicles that can load and unload simultaneously and reduces the average time and total time spent in the afternoon dismissal queues.
Operate a second queue lane when the pick-up queue exceeds storage. The second queue lane would be a staging zone only. As the first queue lane exits, the second queue lane would be directed to the curbside lane for student pick-up.	Increases the number of vehicles that can be stored in the pick-up queue and minimizes queue spillback to Landwehr Road.

¹ Based on the recommended additional parking, the current allotment of six (6) ADA spaces is sufficient to serve the campus

Short-term recommendations include operational modifications and pavement striping changes only; significant infrastructure investment is not required. These improvements were identified to provide short-term impacts to access and parking challenges in the second half of the 2018/2019 school year. Many of the long-term recommendations will require modifications to existing campus infrastructure. In addition, coordination with Cook County Department of Transportation and Highways will be required to implement the recommended off-site improvements. As improvements are planned and designed, continued monitoring of campus access, circulation, and parking conditions is recommended.

Please do not hesitate to contact us with any questions related to the information in this memorandum.





APPENDIX

Parking Utilization Summary

Left Turn Lane Warrant

Right Turn Lane Warrant

Existing Capacity Reports

Future Capacity Reports (With Left and Right Turn Lanes)

Queue Data

Traffic Count Data

PARKING UTILIZATION SUMMARY

Parking Utilization Counts

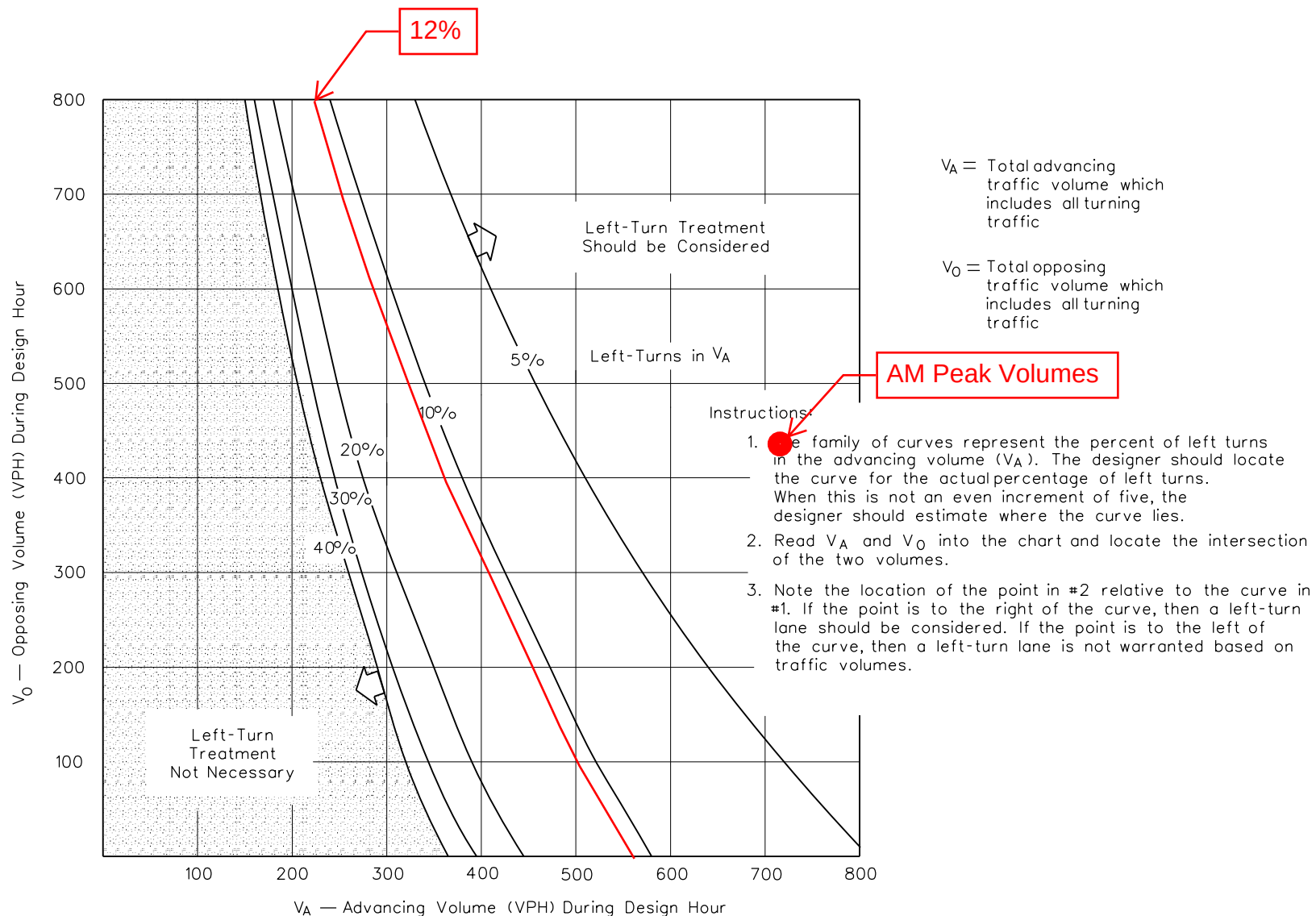
Time	LOT A						LOT B			
	Standard (85 Spaces) ¹	Visitor (4 Spaces)	Travel (4 Spaces)	15-Min (1 Space)	Illegal	ADA (4 Spaces)	Standard (23 Spaces)	Hampton Court	Illegal	ADA (2 Spaces)
7:00 AM	8	0	0	0	0	0	2	0	0	0
7:45 AM	74	2	1	1	0	0	8	0	0	0
8:00 AM	85	4	4	1	0	0	17	0	0	0
8:15 AM	85	4	4	0	1	0	19	0	3	0
8:30 AM	85	3	4	1	1	0	20	0	3	0
9:00 AM	85	3	4	1	1	0	21	0	3	0
10:00 AM	85	3	4	1	1	0	21	0	3	0
11:00 AM	85	1	4	0	1	0	23	0	3	0
12:00 PM	80	1	4	0	1	0	17	0	4	0
1:00 PM	85	3	4	1	1	0	20	0	4	0
2:00 PM	85	4	4	0	1	0	20	0	3	0
2:15 PM	85	4	4	1	2	1	23	0	11	0
2:30 PM	85	4	4	1	2	1	23	0	13	0
2:45 PM	82	4	4	1	2	3	23	4	20	2
3:00 PM	80	3	4	1	0	1	20	0	5	0
3:15 PM	50	2	1	0	0	0	12	0	5	0
4:00 PM	22	2	1	0	0	0	10	0	6	0

¹Number of spaces of each type currently provided on campus.

Parking Utilization Summary

Time	LOT A				LOT B				TOTAL			
	Standard		ADA		Standard		ADA		Standard		ADA	
	Percent Occupied	Spaces Available	Percent Occupied	Spaces Available	Percent Occupied	Spaces Available	Percent Occupied	Spaces Available	Percent Occupied	Spaces Available	Percent Occupied	Spaces Available
7:00 AM	9%	86	0%	4	9%	21	0%	2	9%	107	0%	6
7:45 AM	83%	16	0%	4	35%	15	0%	2	74%	31	0%	6
8:00 AM	100%	0	0%	4	74%	6	0%	2	95%	6	0%	6
8:15 AM	100%	0	0%	4	96%	1	0%	2	99%	1	0%	6
8:30 AM	100%	0	0%	4	100%	0	0%	2	100%	0	0%	6
9:00 AM	100%	0	0%	4	104%	(1)	0%	2	101%	(1)	0%	6
10:00 AM	100%	0	0%	4	104%	(1)	0%	2	101%	(1)	0%	6
11:00 AM	97%	3	0%	4	113%	(3)	0%	2	100%	0	0%	6
12:00 PM	91%	8	0%	4	91%	2	0%	2	91%	10	0%	6
1:00 PM	100%	0	0%	4	104%	(1)	0%	2	101%	(1)	0%	6
2:00 PM	100%	0	0%	4	100%	0	0%	2	100%	0	0%	6
2:15 PM	102%	(2)	25%	3	148%	(11)	0%	2	111%	(13)	17%	5
2:30 PM	102%	(2)	25%	3	157%	(13)	0%	2	113%	(15)	17%	5
2:45 PM	99%	1	50%	1	204%	(24)	100%	0	120%	(23)	83%	1
3:00 PM	94%	6	25%	3	109%	(2)	0%	2	97%	4	17%	5
3:15 PM	56%	41	0%	4	74%	6	0%	2	60%	47	0%	6
4:00 PM	27%	69	0%	4	70%	7	0%	2	35%	76	0%	6

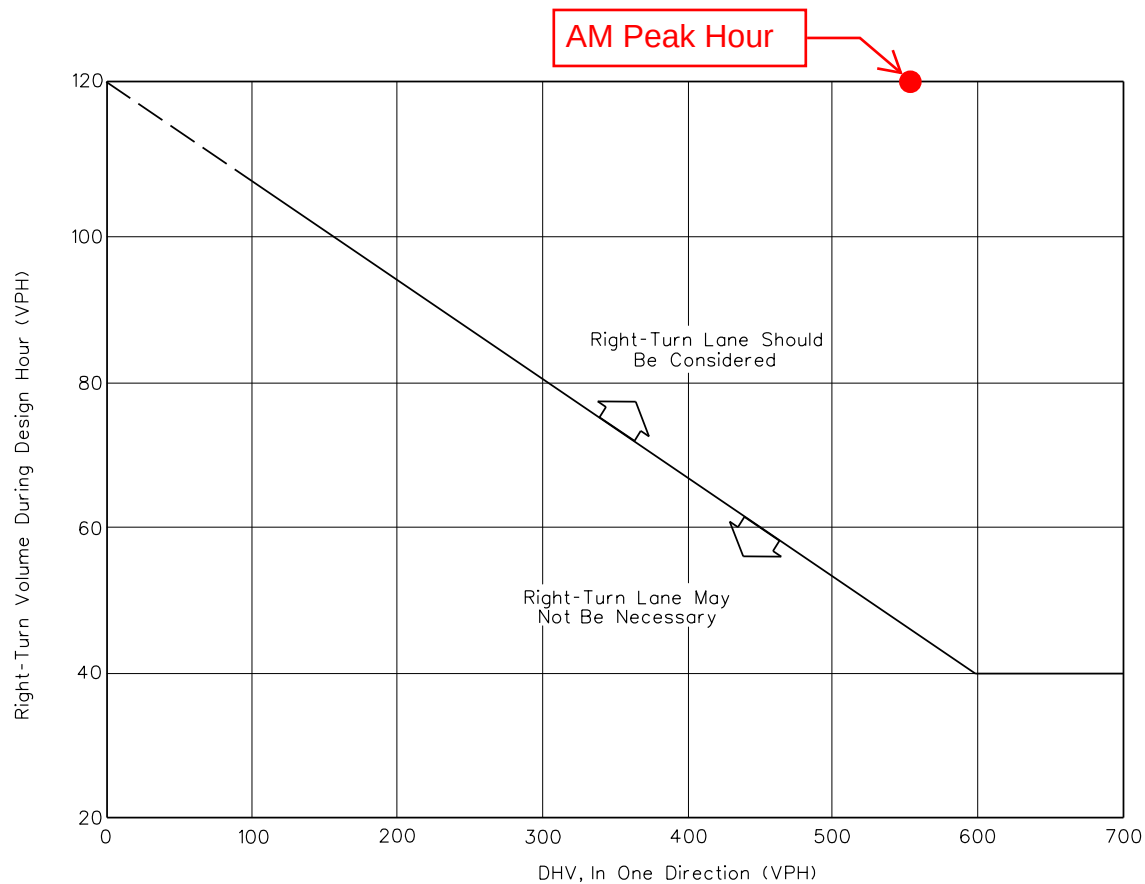
LEFT TURN LANE WARRANT



VOLUME GUIDELINES FOR LEFT-TURN LANES AT UNSIGNALIZED INTERSECTIONS ON TWO-LANE HIGHWAYS (40 mph Design Speed)

Figure 36-3.G

RIGHT TURN LANE WARRANT



Note: For highways with a design speed below 50 mph (80 km/hr), with a DHV in one direction of less than 300, and where right turns are greater than 40, an adjustment should be used. To read the vertical axis of the chart, subtract 20 from the actual number of right turns.

Example

Given: Design Speed = 35 mph (60 km/hr)
 DHV (in one direction) = 250 vph
 Right Turns = 100 vph

Problem: Determine if a right-turn lane is warranted.

Solution: To read the vertical axis, use $100 - 20 = 80$ vph. The figure indicates that right-turn lane is not necessary, unless other factors (e.g., high crash rate) indicate a lane is needed.

GUIDELINES FOR RIGHT-TURN LANES AT UNSIGNALIZED INTERSECTIONS ON TWO-LANE HIGHWAYS

Figure 36-3.A

EXISTING CAPACITY REPORTS

Lanes, Volumes, Timings
3: Landwehr & South Winkelman Access

AM Peak Period - Existing
02/25/2019

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	90	85	440	140	85	625
Future Volume (vph)	90	85	440	140	85	625
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Fr't		0.850	0.967			
Flt Protected	0.950					0.994
Satd. Flow (prot)	1770	1583	1801	0	0	1852
Flt Permitted	0.950					0.685
Satd. Flow (perm)	1770	1583	1801	0	0	1276
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		77	52			
Link Speed (mph)	30		30			30
Link Distance (ft)	151		191			249
Travel Time (s)	3.4		4.3			5.7
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83
Adj. Flow (vph)	108	102	530	169	102	753
Shared Lane Traffic (%)						
Lane Group Flow (vph)	108	102	699	0	0	855
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(ft)	12		0			0
Link Offset(ft)	0		0			0
Crosswalk Width(ft)	16		16			16
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9		9	15	
Number of Detectors	1	1	2		1	2
Detector Template	Left	Right	Thru		Left	Thru
Leading Detector (ft)	20	20	100		20	100
Trailing Detector (ft)	0	0	0		0	0
Detector 1 Position(ft)	0	0	0		0	0
Detector 1 Size(ft)	20	20	6		20	6
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0		0.0	0.0
Detector 2 Position(ft)			94			94
Detector 2 Size(ft)			6			6
Detector 2 Type			Cl+Ex			Cl+Ex
Detector 2 Channel						
Detector 2 Extend (s)			0.0			0.0
Turn Type	Prot	pt+ov	NA		pm+pt	NA
Protected Phases	4	4 5	6		5	2
Permitted Phases					2	
Detector Phase	4	4 5	6		5	2
Switch Phase						
Minimum Initial (s)	5.0		5.0		5.0	5.0

Lanes, Volumes, Timings
3: Landwehr & South Winkelman Access

AM Peak Period - Existing
02/25/2019

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Minimum Split (s)	10.0		10.0		9.0	15.5
Total Split (s)	10.0		11.0		9.0	20.0
Total Split (%)	33.3%		36.7%		30.0%	66.7%
Maximum Green (s)	7.0		8.0		6.0	17.0
Yellow Time (s)	2.0		2.0		2.0	2.0
All-Red Time (s)	1.0		1.0		1.0	1.0
Lost Time Adjust (s)	0.0		0.0			0.0
Total Lost Time (s)	3.0		3.0			3.0
Lead/Lag			Lead		Lag	
Lead-Lag Optimize?			Yes		Yes	
Vehicle Extension (s)	3.0		3.0		3.0	3.0
Recall Mode	None		None		Max	None
Act Effect Green (s)	6.6	15.9	8.2			17.5
Actuated g/C Ratio	0.24	0.57	0.29			0.63
v/c Ratio	0.26	0.11	1.23			0.92
Control Delay	11.2	1.9	139.2			29.0
Queue Delay	0.0	0.0	0.0			0.0
Total Delay	11.2	1.9	139.2			29.0
LOS	B	A	F			C
Approach Delay	6.7		139.2			29.0
Approach LOS	A		F			C

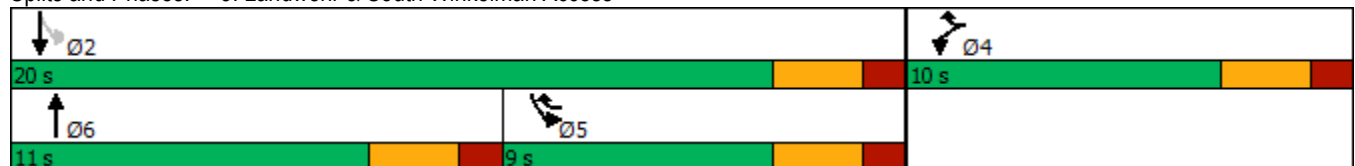
Intersection Summary

Area Type: Other
Cycle Length: 30
Actuated Cycle Length: 27.9
Natural Cycle: 55
Control Type: Semi Act-Uncoord
Maximum v/c Ratio: 1.23
Intersection Signal Delay: 70.0
Intersection Capacity Utilization 84.3%
Analysis Period (min) 15

Intersection LOS: E

ICU Level of Service E

Splits and Phases: 3: Landwehr & South Winkelman Access



Lanes, Volumes, Timings
6: North Winkelman Access

AM Peak Period - Existing
02/25/2019

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	5	50	510	15	80	700
Future Volume (vph)	5	50	510	15	80	700
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt	0.877		0.996			
Flt Protected	0.995					0.995
Satd. Flow (prot)	1625	0	1855	0	0	1853
Flt Permitted	0.995					0.995
Satd. Flow (perm)	1625	0	1855	0	0	1853
Link Speed (mph)	30		30			30
Link Distance (ft)	158		172			185
Travel Time (s)	3.6		3.9			4.2
Confl. Peds. (#/hr)	1	1		1	1	
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84
Adj. Flow (vph)	6	60	607	18	95	833
Shared Lane Traffic (%)						
Lane Group Flow (vph)	66	0	625	0	0	928
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(ft)	12		0			0
Link Offset(ft)	0		0			0
Crosswalk Width(ft)	16		16			16
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9		9	15	
Sign Control	Stop		Free			Free
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization	82.8%			ICU Level of Service E		
Analysis Period (min)	15					

Lanes, Volumes, Timings
3: Landwehr & South Winkelman Access

PM Peak Period - Existing
02/25/2019

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	75	65	435	40	10	450
Future Volume (vph)	75	65	435	40	10	450
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0		50	0	
Storage Lanes	1	1		0	0	
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850	0.989			
Flt Protected	0.950					0.999
Satd. Flow (prot)	1770	1583	1842	0	0	1861
Flt Permitted	0.950					
Satd. Flow (perm)	1770	1583	1842	0	0	1863
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		71	15			
Link Speed (mph)	30		30			30
Link Distance (ft)	151		191			249
Travel Time (s)	3.4		4.3			5.7
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	82	71	478	44	11	495
Shared Lane Traffic (%)						
Lane Group Flow (vph)	82	71	522	0	0	506
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(ft)	12		0			0
Link Offset(ft)	0		0			0
Crosswalk Width(ft)	16		16			16
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9		9	15	
Number of Detectors	1	1	2		1	2
Detector Template	Left	Right	Thru		Left	Thru
Leading Detector (ft)	20	20	100		20	100
Trailing Detector (ft)	0	0	0		0	0
Detector 1 Position(ft)	0	0	0		0	0
Detector 1 Size(ft)	20	20	6		20	6
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex		Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0		0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0		0.0	0.0
Detector 2 Position(ft)			94			94
Detector 2 Size(ft)			6			6
Detector 2 Type			Cl+Ex			Cl+Ex
Detector 2 Channel						
Detector 2 Extend (s)			0.0			0.0
Turn Type	Prot	pt+ov	NA		pm+pt	NA
Protected Phases	4	4 5	6		5	2
Permitted Phases					2	

Lanes, Volumes, Timings
3: Landwehr & South Winkelman Access

PM Peak Period - Existing
02/25/2019

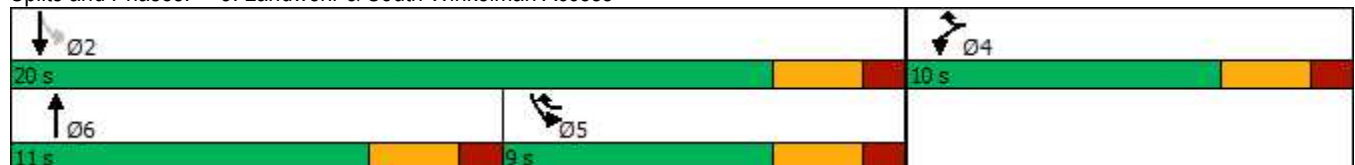
						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Detector Phase	4	4 5	6		5	2
Switch Phase						
Minimum Initial (s)	5.0		5.0		5.0	5.0
Minimum Split (s)	10.0		10.0		9.0	15.5
Total Split (s)	10.0		11.0		9.0	20.0
Total Split (%)	33.3%		36.7%		30.0%	66.7%
Maximum Green (s)	7.0		8.0		6.0	17.0
Yellow Time (s)	2.0		2.0		2.0	2.0
All-Red Time (s)	1.0		1.0		1.0	1.0
Lost Time Adjust (s)	0.0		0.0			0.0
Total Lost Time (s)	3.0		3.0			3.0
Lead/Lag			Lead		Lag	
Lead-Lag Optimize?			Yes		Yes	
Vehicle Extension (s)	3.0		3.0		3.0	3.0
Recall Mode	None		None		Max	None
Act Effct Green (s)	6.5	15.9	8.3			19.2
Actuated g/C Ratio	0.25	0.61	0.32			0.74
v/c Ratio	0.18	0.07	0.87			0.37
Control Delay	10.2	1.4	33.2			4.0
Queue Delay	0.0	0.0	0.0			0.0
Total Delay	10.2	1.4	33.2			4.0
LOS	B	A	C			A
Approach Delay	6.1		33.2			4.0
Approach LOS	A		C			A

Intersection Summary

Area Type: Other
 Cycle Length: 30
 Actuated Cycle Length: 25.9
 Natural Cycle: 40
 Control Type: Semi Act-Uncoord
 Maximum v/c Ratio: 0.87
 Intersection Signal Delay: 17.2
 Intersection Capacity Utilization 42.5%
 Analysis Period (min) 15

Intersection LOS: B
 ICU Level of Service A

Splits and Phases: 3: Landwehr & South Winkelman Access



Lanes, Volumes, Timings
6: North Winkelman Access

PM Peak Period - Existing
02/25/2019

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	35	70	500	10	25	425
Future Volume (vph)	35	70	500	10	25	425
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						
Frt	0.910		0.997			
Flt Protected	0.984					0.997
Satd. Flow (prot)	1668	0	1857	0	0	1857
Flt Permitted	0.984					0.997
Satd. Flow (perm)	1668	0	1857	0	0	1857
Link Speed (mph)	30		30			30
Link Distance (ft)	158		172			185
Travel Time (s)	3.6		3.9			4.2
Confl. Peds. (#/hr)	1	1		1	1	
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96
Adj. Flow (vph)	36	73	521	10	26	443
Shared Lane Traffic (%)						
Lane Group Flow (vph)	109	0	531	0	0	469
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(ft)	12		0			0
Link Offset(ft)	0		0			0
Crosswalk Width(ft)	16		16			16
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9		9	15	
Sign Control	Stop		Free			Free
Intersection Summary						
Area Type:	Other					
Control Type:	Unsignalized					
Intersection Capacity Utilization	56.0%			ICU Level of Service B		
Analysis Period (min)	15					

**FUTURE CAPACITY REPORTS
(WITH LEFT AND RIGHT TURN LANE)**

Lanes, Volumes, Timings
3: Landwehr & South Winkelman Access

AM Peak Period - Future

02/25/2019

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	90	85	440	140	85	625
Future Volume (vph)	90	85	440	140	85	625
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Fr t		0.850		0.850		
Fl t Protected	0.950				0.950	
Satd. Flow (prot)	1770	1583	1863	1583	1770	1863
Fl t Permitted	0.950				0.357	
Satd. Flow (perm)	1770	1583	1863	1583	665	1863
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		77		169		
Link Speed (mph)	30		30			30
Link Distance (ft)	151		191			249
Travel Time (s)	3.4		4.3			5.7
Peak Hour Factor	0.83	0.83	0.83	0.83	0.83	0.83
Adj. Flow (vph)	108	102	530	169	102	753
Shared Lane Traffic (%)						
Lane Group Flow (vph)	108	102	530	169	102	753
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(ft)	12		12			12
Link Offset(ft)	0		0			0
Crosswalk Width(ft)	16		16			16
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9		9	15	
Number of Detectors	1	1	2	1	1	2
Detector Template	Left	Right	Thru	Right	Left	Thru
Leading Detector (ft)	20	20	100	20	20	100
Trailing Detector (ft)	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0
Detector 1 Size(ft)	20	20	6	20	20	6
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)			94			94
Detector 2 Size(ft)			6			6
Detector 2 Type			Cl+Ex			Cl+Ex
Detector 2 Channel						
Detector 2 Extend (s)			0.0			0.0
Turn Type	Prot	pt+ov	NA	Perm	pm+pt	NA
Protected Phases	4	4 5	6		5	2
Permitted Phases				6	2	
Detector Phase	4	4 5	6	6	5	2
Switch Phase						
Minimum Initial (s)	5.0		5.0	5.0	5.0	5.0

Existing (2019) Traffic Volumes

Synchro 10 Report

Lanes, Volumes, Timings
3: Landwehr & South Winkelman Access

AM Peak Period - Future
02/25/2019

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Minimum Split (s)	10.0		10.0	10.0	9.0	15.5
Total Split (s)	10.0		11.0	11.0	9.0	20.0
Total Split (%)	33.3%		36.7%	36.7%	30.0%	66.7%
Maximum Green (s)	7.0		8.0	8.0	6.0	17.0
Yellow Time (s)	2.0		2.0	2.0	2.0	2.0
All-Red Time (s)	1.0		1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	3.0		3.0	3.0	3.0	3.0
Lead/Lag			Lead	Lead	Lag	
Lead-Lag Optimize?			Yes	Yes	Yes	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Recall Mode	None		None	None	Max	None
Act Effect Green (s)	6.6	15.9	8.2	8.2	17.5	18.3
Actuated g/C Ratio	0.24	0.57	0.29	0.29	0.63	0.66
v/c Ratio	0.26	0.11	0.97	0.29	0.15	0.62
Control Delay	11.2	1.9	50.4	3.6	4.2	7.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	11.2	1.9	50.4	3.6	4.2	7.5
LOS	B	A	D	A	A	A
Approach Delay	6.7		39.1			7.1
Approach LOS	A		D			A

Intersection Summary

Area Type: Other

Cycle Length: 30

Actuated Cycle Length: 27.9

Natural Cycle: 40

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.97

Intersection Signal Delay: 19.7

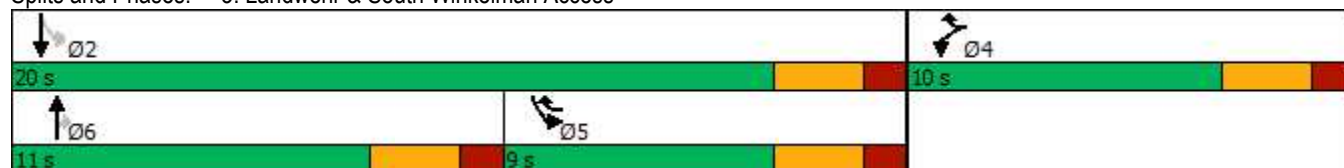
Intersection LOS: B

Intersection Capacity Utilization 44.5%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 3: Landwehr & South Winkelman Access



Lanes, Volumes, Timings
3: Landwehr & South Winkelman Access

PM Peak Period - Future
02/25/2019

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (vph)	75	65	435	40	10	450
Future Volume (vph)	75	65	435	40	10	450
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	0	0		50	0	
Storage Lanes	1	1		1	1	
Taper Length (ft)	25				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850		0.850		
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1770	1583	1863	1583	1770	1863
Flt Permitted	0.950				0.354	
Satd. Flow (perm)	1770	1583	1863	1583	659	1863
Right Turn on Red		Yes		Yes		
Satd. Flow (RTOR)		71		44		
Link Speed (mph)	30		30			30
Link Distance (ft)	151		191			249
Travel Time (s)	3.4		4.3			5.7
Peak Hour Factor	0.91	0.91	0.91	0.91	0.91	0.91
Adj. Flow (vph)	82	71	478	44	11	495
Shared Lane Traffic (%)						
Lane Group Flow (vph)	82	71	478	44	11	495
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Right	Left	Left
Median Width(ft)	12		12			12
Link Offset(ft)	0		0			0
Crosswalk Width(ft)	16		16			16
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15	9		9	15	
Number of Detectors	1	1	2	1	1	2
Detector Template	Left	Right	Thru	Right	Left	Thru
Leading Detector (ft)	20	20	100	20	20	100
Trailing Detector (ft)	0	0	0	0	0	0
Detector 1 Position(ft)	0	0	0	0	0	0
Detector 1 Size(ft)	20	20	6	20	20	6
Detector 1 Type	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex	Cl+Ex
Detector 1 Channel						
Detector 1 Extend (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Queue (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 1 Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0
Detector 2 Position(ft)			94			94
Detector 2 Size(ft)			6			6
Detector 2 Type			Cl+Ex			Cl+Ex
Detector 2 Channel						
Detector 2 Extend (s)			0.0			0.0
Turn Type	Prot	pt+ov	NA	Perm	pm+pt	NA
Protected Phases	4	4 5	6		5	2
Permitted Phases				6	2	

Lanes, Volumes, Timings
3: Landwehr & South Winkelman Access

PM Peak Period - Future
02/25/2019

						
Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Detector Phase	4	4 5	6	6	5	2
Switch Phase						
Minimum Initial (s)	5.0		5.0	5.0	5.0	5.0
Minimum Split (s)	10.0		10.0	10.0	9.0	15.5
Total Split (s)	10.0		11.0	11.0	9.0	20.0
Total Split (%)	33.3%		36.7%	36.7%	30.0%	66.7%
Maximum Green (s)	7.0		8.0	8.0	6.0	17.0
Yellow Time (s)	2.0		2.0	2.0	2.0	2.0
All-Red Time (s)	1.0		1.0	1.0	1.0	1.0
Lost Time Adjust (s)	0.0		0.0	0.0	0.0	0.0
Total Lost Time (s)	3.0		3.0	3.0	3.0	3.0
Lead/Lag			Lead	Lead	Lag	
Lead-Lag Optimize?			Yes	Yes	Yes	
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Recall Mode	None		None	None	Max	None
Act Effct Green (s)	6.5	15.9	8.3	8.3	17.7	19.3
Actuated g/C Ratio	0.25	0.61	0.32	0.32	0.68	0.74
v/c Ratio	0.19	0.07	0.80	0.08	0.02	0.36
Control Delay	10.2	1.4	27.4	4.0	3.0	4.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	10.2	1.4	27.4	4.0	3.0	4.0
LOS	B	A	C	A	A	A
Approach Delay	6.1		25.4			3.9
Approach LOS	A		C			A

Intersection Summary

Area Type: Other

Cycle Length: 30

Actuated Cycle Length: 26

Natural Cycle: 40

Control Type: Semi Act-Uncoord

Maximum v/c Ratio: 0.80

Intersection Signal Delay: 13.7

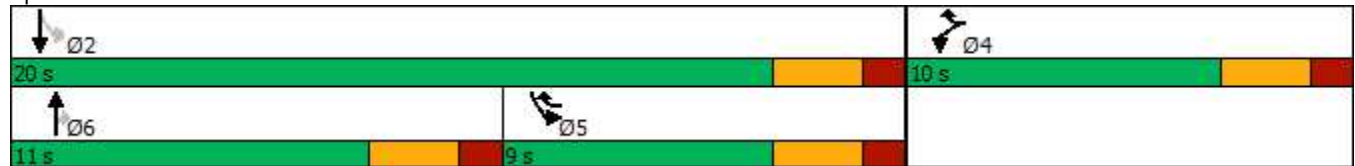
Intersection LOS: B

Intersection Capacity Utilization 34.5%

ICU Level of Service A

Analysis Period (min) 15

Splits and Phases: 3: Landwehr & South Winkelman Access



QUEUE DATA

AM Arrival Queue Analysis

	In	Start Dropoff	End Dropoff	Load Time	Total Time
1	7:37:24 AM	7:48:14	7:49:50	0:01:36	0:12:26
2	7:39:38 AM	7:40:07	7:41:16	0:01:09	0:01:38
3	7:41:32 AM	7:49:19	7:49:28	0:00:09	0:07:56
4	7:41:46 AM	7:49:00	7:49:12	0:00:12	0:07:26
5	7:42:32 AM	7:43:45	7:49:00	0:05:15	0:06:28
6	7:45:01 AM	7:49:49	7:49:56	0:00:07	0:04:55
7	7:45:02 AM	7:49:13	7:49:19	0:00:06	0:04:17
8	7:45:03 AM	7:49:13	7:49:19	0:00:06	0:04:16
9	7:45:04 AM	7:49:29	7:49:35	0:00:06	0:04:31
10	7:45:05 AM	7:49:32	7:49:43	0:00:11	0:04:38
11	7:46:04 AM	7:50:10	7:50:16	0:00:06	0:04:12
12	7:46:09 AM	7:50:24	7:50:32	0:00:08	0:04:23
13	7:46:15 AM	7:50:15	7:50:24	0:00:09	0:04:09
14	7:46:23 AM	7:50:38	7:50:51	0:00:13	0:04:28
15	7:46:25 AM	7:51:18	7:51:32	0:00:14	0:05:07
16	7:46:32 AM	7:50:40	7:50:57	0:00:17	0:04:25
17	7:47:01 AM	7:51:14	7:51:35	0:00:21	0:04:34
18	7:48:23 AM	7:51:16	7:51:39	0:00:23	0:03:16
19	7:48:33 AM	7:51:19	7:51:50	0:00:31	0:03:17
20	7:48:35 AM	7:51:33	7:51:58	0:00:25	0:03:23
21	7:49:11 AM	7:52:03	7:52:12	0:00:09	0:03:01
31	7:53:22 AM	7:53:41	7:53:52	0:00:11	0:00:30
32	7:53:49 AM	7:54:09	7:54:32	0:00:23	0:00:43
33	7:53:54 AM	7:54:26	7:55:23	0:00:57	0:01:29
34	7:54:15 AM	7:54:34	7:54:59	0:00:25	0:00:44
35	7:54:19 AM	7:54:41	7:55:03	0:00:22	0:00:44
36	7:54:26 AM	7:55:07	7:55:30	0:00:23	0:01:04
37	7:54:28 AM	7:54:49	7:55:48	0:00:59	0:01:20
38	7:54:54 AM	7:55:54	7:56:06	0:00:12	0:01:12
39	7:54:57 AM	7:55:59	7:56:13	0:00:14	0:01:16
40	7:55:04 AM	7:55:58	7:56:16	0:00:18	0:01:12
41	7:55:08 AM	7:56:04	7:56:18	0:00:14	0:01:10
42	7:55:30 AM	7:56:06	7:56:24	0:00:18	0:00:54
43	7:55:35 AM	7:56:08	7:56:25	0:00:17	0:00:50
44	7:55:45 AM	7:56:34	7:56:50	0:00:16	0:01:05
45	7:55:46 AM	7:56:40	7:56:59	0:00:19	0:01:13
46	7:55:53 AM	7:56:43	7:57:08	0:00:25	0:01:15
47	7:55:57 AM	7:57:13	7:57:38	0:00:25	0:01:41
48	7:56:15 AM	7:56:59	7:57:15	0:00:16	0:01:00
49	7:56:25 AM	7:57:17	7:57:31	0:00:14	0:01:06
50	7:56:40 AM	7:57:19	7:57:33	0:00:14	0:00:53
51	7:56:46 AM	7:57:38	7:57:53	0:00:15	0:01:07
52	7:56:54 AM	7:57:34	7:57:54	0:00:20	0:01:00
53	7:56:55 AM	7:57:52	7:58:10	0:00:18	0:01:15
54	7:56:59 AM	7:57:59	7:58:15	0:00:16	0:01:16
55	7:57:05 AM	7:58:24	7:58:43	0:00:19	0:01:38
56	7:57:10 AM	7:58:24	7:58:45	0:00:21	0:01:35
57	7:57:17 AM	7:58:24	7:58:48	0:00:24	0:01:31
58	7:57:25 AM	7:58:29	7:58:41	0:00:12	0:01:16
59	7:57:28 AM	7:58:57	7:59:16	0:00:19	0:01:48
60	7:57:33 AM	7:58:40	7:58:52	0:00:12	0:01:19
61	7:57:45 AM	7:58:59	7:59:17	0:00:18	0:01:32
62	7:58:00 AM	7:59:11	7:59:21	0:00:10	0:01:21
63	7:58:07 AM	7:59:08	7:59:16	0:00:08	0:01:09
64	7:58:49 AM	7:59:11	7:59:18	0:00:07	0:00:29
65	7:58:54 AM	7:59:14	7:59:32	0:00:18	0:00:38
66	7:58:59 AM	7:59:20	7:59:30	0:00:10	0:00:31
67	7:59:05 AM	7:59:56	8:00:09	0:00:13	0:01:04
68	7:59:14 AM	8:00:08	8:00:23	0:00:15	0:01:09
69	7:59:18 AM	8:00:00	8:00:09	0:00:09	0:00:51
70	7:59:20 AM	8:00:14	8:00:25	0:00:11	0:01:05
71	7:59:25 AM	8:00:38	8:00:51	0:00:13	0:01:26
72	7:59:34 AM	8:00:40	8:00:55	0:00:15	0:01:21
73	7:59:37 AM	8:00:55	8:01:03	0:00:08	0:01:26
74	7:59:41 AM	8:01:00	8:01:06	0:00:06	0:01:25
75	7:59:45 AM	8:01:01	8:01:21	0:00:20	0:01:36
76	7:59:47 AM	8:01:04	8:01:24	0:00:20	0:01:37
77	7:59:56 AM	8:01:01	8:01:36	0:00:35	0:01:40
78	8:00:00 AM	8:01:41	8:01:54	0:00:13	0:01:54
79	8:00:05 AM	8:01:47	8:02:29	0:00:42	0:02:24
80	8:00:10 AM	8:01:52	8:02:00	0:00:08	0:01:50
81	8:00:13 AM	8:01:56	8:02:08	0:00:12	0:01:55
82	8:00:17 AM	8:02:00	8:02:10	0:00:10	0:01:53
83	8:00:21 AM	8:02:02	8:02:12	0:00:10	0:01:51

AM Arrival Queue Analysis

	In	Start Dropoff	End Dropoff	Load Time	Total Time
84	8:00:24 AM	8:02:02	8:02:14	0:00:12	0:01:50
85	8:00:27 AM	8:02:06	8:02:18	0:00:12	0:01:51
86	8:00:30 AM	8:02:09	8:02:22	0:00:13	0:01:52
87	8:00:34 AM	8:02:23	8:02:45	0:00:22	0:02:11
88	8:00:36 AM	8:02:35	8:02:50	0:00:15	0:02:14
89	8:00:38 AM	8:02:38	8:02:58	0:00:20	0:02:20
90	8:00:41 AM	8:03:09	8:03:25	0:00:16	0:02:44
91	8:00:44 AM	8:03:22	8:03:36	0:00:14	0:02:52
92	8:00:46 AM	8:03:24	8:03:40	0:00:16	0:02:54
93	8:01:01 AM	8:03:30	8:03:41	0:00:11	0:02:40
94	8:01:15 AM	8:03:35	8:03:47	0:00:12	0:02:32
95	8:01:20 AM	8:03:43	8:03:50	0:00:07	0:02:30
96	8:01:22 AM	8:03:55	8:04:04	0:00:09	0:02:42
97	8:01:24 AM	8:04:00	8:04:08	0:00:08	0:02:44
98	8:01:35 AM	8:04:06	8:04:14	0:00:08	0:02:39
99	8:01:40 AM	8:04:11	8:04:27	0:00:16	0:02:47
100	8:01:47 AM	8:04:16	8:04:29	0:00:13	0:02:42
101	8:01:52 AM	8:04:16	8:04:33	0:00:17	0:02:41
102	8:01:55 AM	8:04:40	8:04:53	0:00:13	0:02:58
103	8:01:58 AM	8:04:46	8:05:06	0:00:20	0:03:08
104	8:02:08 AM	8:04:46	8:05:09	0:00:23	0:03:01
105	8:02:30 AM	8:04:53	8:05:12	0:00:19	0:02:42
106	8:02:35 AM	8:05:01	8:05:15	0:00:14	0:02:40
107	8:02:37 AM	8:05:12	8:05:21	0:00:09	0:02:44
108	8:02:39 AM	8:05:21	8:05:45	0:00:24	0:03:06
109	8:02:55 AM	8:05:24	8:05:49	0:00:25	0:02:54
110	8:03:00 AM	8:05:27	8:05:50	0:00:23	0:02:50
111	8:03:04 AM	8:05:30	8:05:55	0:00:25	0:02:51
112	8:03:10 AM	8:05:45	8:05:59	0:00:14	0:02:49
113	8:03:21 AM	8:06:05	8:06:18	0:00:13	0:02:57
114	8:03:23 AM	8:06:04	8:06:20	0:00:16	0:02:57
115	8:03:27 AM	8:06:07	8:06:34	0:00:27	0:03:07
116	8:03:34 AM	8:06:12	8:06:28	0:00:16	0:02:54
117	8:03:35 AM	8:06:45	8:06:59	0:00:14	0:03:24
118	8:03:37 AM	8:06:50	8:07:05	0:00:15	0:03:28
119	8:03:43 AM	8:06:58	8:07:09	0:00:11	0:03:26
120	8:03:46 AM	8:07:17	8:07:36	0:00:19	0:03:50
121	8:03:50 AM	8:07:22	8:07:40	0:00:18	0:03:50
122	8:03:52 AM	8:07:40	8:08:29	0:00:49	0:04:37
123	8:03:56 AM	8:07:49	8:08:32	0:00:43	0:04:36
124	8:03:59 AM	8:08:25	8:08:40	0:00:15	0:04:41
125	8:04:01 AM	8:08:20	8:08:43	0:00:23	0:04:42
126	8:04:03 AM	8:08:49	8:08:57	0:00:08	0:04:54
127	8:04:05 AM	8:08:49	8:09:02	0:00:13	0:04:57
128	8:04:06 AM	8:08:59	8:09:16	0:00:17	0:05:10
129	8:04:08 AM	8:09:10	8:09:20	0:00:10	0:05:12
130	8:04:11 AM	8:09:09	8:09:22	0:00:13	0:05:11
131	8:04:17 AM	8:09:12	8:09:24	0:00:12	0:05:07
132	8:04:22 AM	8:09:24	8:09:56	0:00:32	0:05:34
133	8:04:24 AM	8:09:24	8:10:09	0:00:45	0:05:45
134	8:04:30 AM	8:09:26	8:10:01	0:00:35	0:05:31
135	8:04:45 AM	8:09:59	8:10:10	0:00:11	0:05:25
136	8:04:47 AM	8:10:01	8:10:12	0:00:11	0:05:25
137	8:04:51 AM	8:10:08	8:10:16	0:00:08	0:05:25
138	8:04:57 AM	8:10:19	8:10:30	0:00:11	0:05:33
139	8:05:00 AM	8:10:23	8:10:32	0:00:09	0:05:32
140	8:05:04 AM	8:10:34	8:10:40	0:00:06	0:05:36
141	8:05:15 AM	8:10:27	8:10:36	0:00:09	0:05:21
142	8:05:30 AM	8:10:29	8:10:40	0:00:11	0:05:10
143	8:05:44 AM	8:10:40	8:10:48	0:00:08	0:05:04
144	8:06:11 AM	8:10:48	8:11:01	0:00:13	0:04:50
145	8:06:55 AM	8:11:08	8:11:15	0:00:07	0:04:20
146	8:07:15 AM	8:11:00	8:11:09	0:00:09	0:03:54
147	8:07:30 AM	8:11:10	8:11:15	0:00:05	0:03:45
148	8:07:48 AM	8:11:21	8:11:29	0:00:08	0:03:41
149	8:08:15 AM	8:11:30	8:11:39	0:00:09	0:03:24
150	8:08:29 AM	8:11:42	8:11:51	0:00:09	0:03:22
151	8:08:52 AM	8:11:50	8:11:59	0:00:09	0:03:07
152	8:09:15 AM	8:12:00	8:12:12	0:00:12	0:02:57
153	8:09:44 AM	8:12:02	8:12:16	0:00:14	0:02:32
			Average	0:00:16	0:02:58

PM Queue Analysis

	In	Start Load	End Load	Load Time	Time From Start	Total Time
1	1:01:24	2:41:08	2:41:35	0:00:27	0:02:08	1:40:11
2	1:26:55	2:41:12	2:41:23	0:00:11	0:01:56	1:14:28
3	1:28:33	2:39:27	2:40	0:00:33	0:00:33	1:11:27
4	1:36:04	2:40:10	2:40:28	0:00:18	0:01:01	1:04:24
5	1:38:40	2:41:00	2:41:28	0:00:28	0:02:01	1:02:48
6	1:45:53	2:41:50	2:44:10	0:02:20	0:04:43	0:58:17
7	1:49:48	2:41:43	2:42:14	0:00:31	0:02:47	0:52:26
8	1:51:46	2:43:44	2:44:13	0:00:29	0:04:46	0:52:27
9	1:53:11	2:42:24	2:42:57	0:00:33	0:03:30	0:49:46
10	1:56:45	2:42:35	2:43:05	0:00:30	0:03:38	0:46:20
11	2:00:32	2:43:13	2:43:30	0:00:17	0:04:03	0:42:58
12	2:06:45	2:43:40	2:44:04	0:00:24	0:04:37	0:37:19
13	2:07:03	2:44:23	2:45:06	0:00:43	0:05:39	0:38:03
14	2:10:18	2:44:18	2:44:39	0:00:21	0:05:12	0:34:21
15	2:10:25	2:45:11	2:45:40	0:00:29	0:06:13	0:35:15
16	2:11:00	2:46:28	2:47:16	0:00:48	0:07:49	0:36:16
17	2:11:20	2:44:58	2:45:16	0:00:18	0:05:49	0:33:56
18	2:11:43	2:45:16	2:45:49	0:00:33	0:06:22	0:34:06
19	2:12:45	2:45:32	2:46:03	0:00:31	0:06:36	0:33:18
20	2:13:25	2:46:17	2:46:56	0:00:39	0:07:29	0:33:31
21	2:13:28	2:47:15	2:47:33	0:00:18	0:08:06	0:34:05
22	2:13:50	2:47:08	2:47:47	0:00:39	0:08:20	0:33:57
23	2:14:07	2:47:16	2:47:49	0:00:33	0:08:22	0:33:42
24	2:14:19	2:47:39	2:47:54	0:00:15	0:08:27	0:33:35
25	2:14:29	2:47:44	2:47:59	0:00:15	0:08:32	0:33:30
26	2:14:46	2:48:37	2:49:17	0:00:40	0:09:50	0:34:31
27	2:15:04	2:48:23	2:49:22	0:00:59	0:09:55	0:34:18
28	2:16:15	2:48:35	2:49:26	0:00:51	0:09:59	0:33:11
29	2:16:32	2:48:52	2:49:11	0:00:19	0:09:44	0:32:39
30	2:16:47	2:49:01	2:49:30	0:00:29	0:10:03	0:32:43
31	2:17:53	2:50:23	2:50:50	0:00:27	0:11:23	0:32:57
32	2:18:25	2:49:30	2:50:03	0:00:33	0:10:36	0:31:38
33	2:20:30	2:50:09	2:50:29	0:00:20	0:11:02	0:29:59
34	2:22:07	2:50:12	2:50:32	0:00:20	0:11:05	0:28:25
35	2:22:20	2:50:58	2:51:10	0:00:12	0:11:43	0:28:50
36	2:22:30	2:50:35	2:52:24	0:01:49	0:12:57	0:29:54
37	2:23:40	2:51:17	2:52:00	0:00:43	0:12:33	0:28:20
38	2:24:25	2:51:37	2:52:03	0:00:26	0:12:36	0:27:38
39	2:24:30	2:51:42	2:52:12	0:00:30	0:12:45	0:27:42
40	2:25:10	2:52:11	2:52:50	0:00:39	0:13:23	0:27:40
41	2:26:17	2:52:57	2:53:18	0:00:21	0:13:51	0:27:01
42	2:26:20	2:53:06	2:53:25	0:00:19	0:13:58	0:27:05
*43	2:26:27	2:53:10	2:53:42	0:00:32	0:14:15	0:27:15
44	2:28:00	2:53:15	2:53:44	0:00:29	0:14:17	0:25:44
45	2:29:32	2:53:25	2:53:47	0:00:22	0:14:20	0:24:15
46	2:29:37	2:53:57	2:54:14	0:00:17	0:14:47	0:24:37
47	2:31:50	2:54:04	2:54:23	0:00:19	0:14:56	0:22:33
48	2:33:15	2:54:04	2:54:26	0:00:22	0:14:59	0:21:11
49	2:33:27	2:54:30	2:55:12	0:00:42	0:15:45	0:21:45
50	2:34:10	2:54:20	2:54:40	0:00:20	0:15:13	0:20:30
51	2:34:51	2:54:38	2:55:10	0:00:32	0:15:43	0:20:19
52	2:35:48	2:55:10	2:55:41	0:00:31	0:16:14	0:19:53
53	2:44:04	2:55:20	2:55:44	0:00:24	0:16:17	0:11:40
54	2:44:49	2:55:56	2:56:28	0:00:32	0:17:01	0:11:39
55	2:45:25	2:55:59	2:56:41	0:00:42	0:17:14	0:11:16
56	2:46:05	2:56:08	2:58:12	0:02:04	0:18:45	0:12:07
57	2:46:40	2:56:54	2:58:15	0:01:21	0:18:48	0:11:35
58	2:48:07	2:56:58	2:57:58	0:01:00	0:18:31	0:09:51
59	2:48:29	2:56:54	2:57:24	0:00:30	0:17:57	0:08:55
60	2:49:13	2:57:35	2:58:08	0:00:33	0:18:41	0:08:55
61	2:50:01	2:58:00	2:58:27	0:00:27	0:19:00	0:08:26
62	2:52:00	2:58:02	2:58:39	0:00:37	0:19:12	0:06:39
63	2:52:48	2:58:53	2:59:13	0:00:20	0:19:46	0:06:25
64	2:54:05	2:58:50	2:59:17	0:00:27	0:19:50	0:05:12
65	2:54:44	2:58:56	2:59:20	0:00:24	0:19:53	0:04:36
66	2:55:35	2:59:06	2:59:35	0:00:29	0:20:08	0:04:00
67	2:56:06	2:59:26	2:59:46	0:00:20	0:20:19	0:03:40
68	2:56:46	2:59:53	3:00:20	0:00:27	0:20:53	0:03:34
69	2:57:38	2:59:53	3:00:08	0:00:15	0:20:41	0:02:30
70	2:57:41	3:00:14	3:00:35	0:00:21	0:21:08	0:02:54
71	2:58:02	3:00:14	3:00:40	0:00:26	0:21:13	0:02:38

Average Load Time	Average Time in Queue From Start of PU/DO	Average Time in Queue
0:00:33	0:11:51	0:28:44

TRAFFIC COUNT DATA

Study Name 01 Landwehr & North Winkelman Access
Date Tuesday, January 08, 2019

Report Summary

		Eastbound						Westbound						Northbound						Southbound						Crosswalk				
Time Period	Class.	U	L	T	R	I	O	U	L	T	R	I	O	U	L	T	R	I	O	U	L	T	R	I	O	Total	W	BOC	Pedestrians	Total
AM Peak	Lights	0	0	0	0	0	0	0	5	0	45	50	90	0	0	495	14	509	700	0	76	695	0	771	540	1330		0	0	0
Specified Period	%	0%	0%	0%	0%	0%	0%	0%	71%	0%	90%	88%	93%	0%	0%	97%	93%	97%	99%	0%	93%	99%	0%	98%	96%	97%		0%	0%	0%
7:00 AM - 4:00 PM	Buses	0	0	0	0	0	0	0	2	0	5	7	7	0	0	2	1	3	4	0	6	2	0	8	7	18	E	0	6	6
One Hour Peak	%	0%	0%	0%	0%	0%	0%	0%	29%	0%	10%	12%	7%	0%	0%	0%	7%	1%	1%	0%	7%	0%	0%	1%	1%	1%		0%	100%	0%
7:15 AM - 8:15 AM	Single-Unit Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14	0	14	2	0	0	2	0	2	14	16	S	0	0	0
	%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	3%	0%	3%	0%	0%	0%	0%	0%	0%	2%	1%		0%	0%	0%
	Articulated Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	3	0	3	0	3	N	0	0	0
	%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%		0%	0%	0%
	Total	0	0	0	0	0	0	0	7	0	50	57	97	0	0	511	15	526	709	0	82	702	0	784	561	1367		0	6	6
	PHF																									0.85				
	HV %	0%	0%	0%	0%	0%	0%	0%	29%	0%	10%	12%	7%	0%	0%	3%	7%	3%	1%	0%	7%	1%	0%	2%	4%	3%				
	Bicycles on Road	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
PM Peak	Lights	0	1	0	0	1	2	0	32	0	66	98	32	0	0	488	9	497	447	0	23	415	2	440	555	1036	W	0	2	2
Specified Period	%	0%	100%	0%	0%	100%	100%	0%	89%	0%	92%	91%	97%	0%	0%	97%	100%	97%	97%	0%	96%	97%	100%	97%	97%	97%		0%	100%	0%
7:00 AM - 4:00 PM	Buses	0	0	0	0	0	0	0	4	0	6	10	1	0	0	6	0	6	12	0	1	8	0	9	12	25	E	0	5	5
One Hour Peak	%	0%	0%	0%	0%	0%	0%	0%	11%	0%	8%	9%	3%	0%	0%	1%	0%	1%	3%	0%	4%	2%	0%	2%	2%	2%		0%	100%	0%
2:30 PM - 3:30 PM	Single-Unit Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	6	2	0	0	2	0	2	6	8	S	0	0	0
	%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	0%	1%	0%	0%	0%	0%	0%	1%	1%	1%		0%	0%	0%
	Articulated Trucks	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1	0	0	1	0	1	1	2	N	0	0	0
	%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%		0%	0%	0%
	Bicycles on Road	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	7	7
	%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%		0%	0%	0%
	Total	0	1	0	0	1	2	0	36	0	72	108	33	0	0	501	9	510	462	0	24	426	2	452	574	1071				
	PHF																									0.96				
	HV %	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	1%	0%	1%	1%	0%	0%	1%	0%	1%	1%	1%				

Study Name 02 Landwehr & South Winkelman Access

Date Tuesday, January 08, 2019

Report Summary

		Westbound					Northbound					Southbound					Crosswalk				
Time Period	Class.	U	L	R	I	O	U	T	R	I	O	U	L	T	I	O	Total		BOC	Pedestrians	Total
AM Peak	Lights	0	91	83	174	222	0	424	138	562	707	0	84	616	700	507	1436	E	0	1	1
Specified Period	%	0%	99%	100%	99%	100%	0%	96%	100%	97%	99%	0%	100%	99%	99%	97%	98%		0%	100%	
7:00 AM - 4:00 PM	Buses	0	1	0	1	0	0	3	0	3	5	0	0	4	4	3	8	S	0	0	0
One Hour Peak	%	0%	1%	0%	1%	0%	0%	1%	0%	1%	1%	0%	0%	1%	1%	1%	1%		0%	0%	
7:15 AM - 8:15 AM	Single-Unit Trucks	0	0	0	0	0	0	13	0	13	2	0	0	2	2	13	15	N	0	0	0
	%	0%	0%	0%	0%	0%	0%	3%	0%	2%	0%	0%	0%	0%	0%	2%	1%		0%	0%	
	Articulated Trucks	0	0	0	0	0	0	0	0	0	3	0	0	3	3	0	3		0	1	1
	%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%				
	Total	0	92	83	175	222	0	440	138	578	717	0	84	625	709	523	1462				
	PHF																0.83				
	HV%	0%	1%	0%	1%	0%	0%	4%	0%	3%	1%	0%	0%	1%	1%	3%	2%				
	Bicycles on Road	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				
PM Peak	Lights	0	71	62	133	47	0	425	39	464	505	0	8	434	442	487	1039	E	0	2	2
Specified Period	%	0%	97%	98%	98%	98%	0%	97%	98%	97%	97%	0%	100%	97%	97%	97%	97%		0%	100%	
7:00 AM - 4:00 PM	Buses	0	2	1	3	1	0	5	1	6	13	0	0	11	11	6	20	S	0	0	0
One Hour Peak	%	0%	3%	2%	2%	2%	0%	1%	3%	1%	2%	0%	0%	2%	2%	1%	2%		0%	0%	
2:30 PM - 3:30 PM	Single-Unit Trucks	0	0	0	0	0	0	6	0	6	2	0	0	2	2	6	8	N	0	9	9
	%	0%	0%	0%	0%	0%	0%	1%	0%	1%	0%	0%	0%	0%	0%	1%	1%		0%	100%	
	Articulated Trucks	0	0	0	0	0	0	1	0	1	1	0	0	1	1	1	2		0	11	11
	%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%				
	Total	0	73	63	136	48	0	437	40	477	521	0	8	448	456	500	1069				
	PHF																0.91				
	HV%	0%	3%	2%	2%	2%	0%	3%	3%	3%	3%	0%	0%	3%	3%	3%	3%				
	Bicycles on Road	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0				

Date Tuesday, January 08, 2019

Report Summary

[illegible]

Date Tuesday, January 08, 2019

Report Summary

[illegible]