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Memorandum

SRF No. 01710517

To: Brandon Anderson, PE, City Engineer
City of Apple Valley

From: Matthew Pacyna, PE, Senior Associate
Tom Sachi, PE, Senior Engineer

Date: July 12, 2017

Subject: Portillo's Traffic Study; Apple Valley, MN

Introduction

SRF has completed a traffic study for the proposed Portillo's restaurant development in the southeast quadrant of the Cedar Avenue/147th Street intersection in the City of Apple Valley (see Figure 1: Project Location). The proposed development would replace an existing single-story multi-tenant office complex that is currently on site. The main objectives of this study are to review existing operations within the study area, evaluate transportation impacts of the proposed development, and recommend any necessary improvements to accommodate the proposed development. The following information provides the assumptions, analysis, and recommendations offered for consideration.

Existing Conditions

Existing conditions were reviewed to establish a baseline to identify any future impacts associated with the proposed development. The evaluation of existing conditions includes driveway/intersection turning movement counts, field observations, and an intersection capacity analysis.

Data Collection

Peak period intersection turning movement counts were collected at the following locations the week of March 27, 2017 during the weekday midday and p.m. peak hours:

- 147th Street and Ryan Development/Applebee's Driveways
- 147th Street and 7493 147th Street Driveway
- 147th Street and Glazier Avenue (West)
- Glazier Avenue and Ryan Development Driveway
- Glazier Avenue and Bank/Wings Financial Driveways

Historical traffic volumes previously collected by MnDOT and Kimley-Horn and Associates, Inc. at the Cedar Avenue/147th Street intersection were reviewed and modified to reflect existing (year 2017) conditions. These counts were modified based on the March 2017 counts collected along 147th Street.



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Project Location

Portillo's Traffic Study
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Figure 1

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In addition to the intersection and driveway counts, average daily traffic volumes were collected along 147th Street (east of Glazier Avenue) and Glazier Avenue (south of 147th Street) for a one-week period between Thursday, March 23, 2017 and Wednesday, March 29, 2017. The purpose of these counts was to identify how traffic volumes change by the time-of-day, as well as by day of the week. The collected daily traffic volumes for each day of the week are summarized in Figure 2, while the average weekday and Saturday hourly traffic volume profiles are shown in Figure 3.

Figure 2. Daily Traffic Volumes

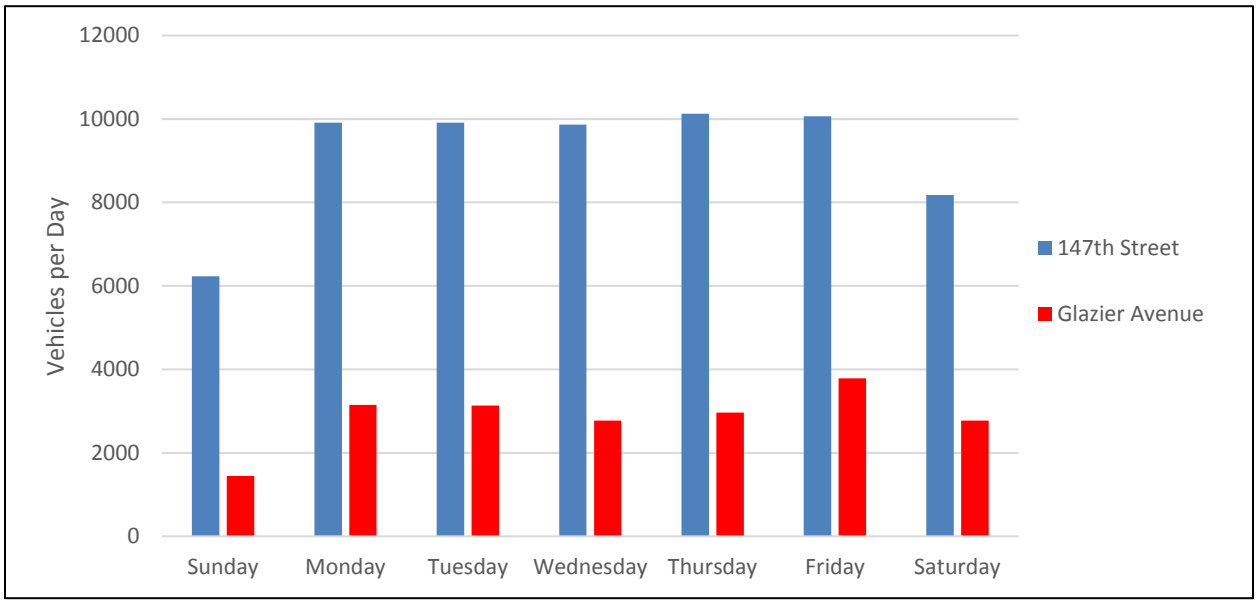
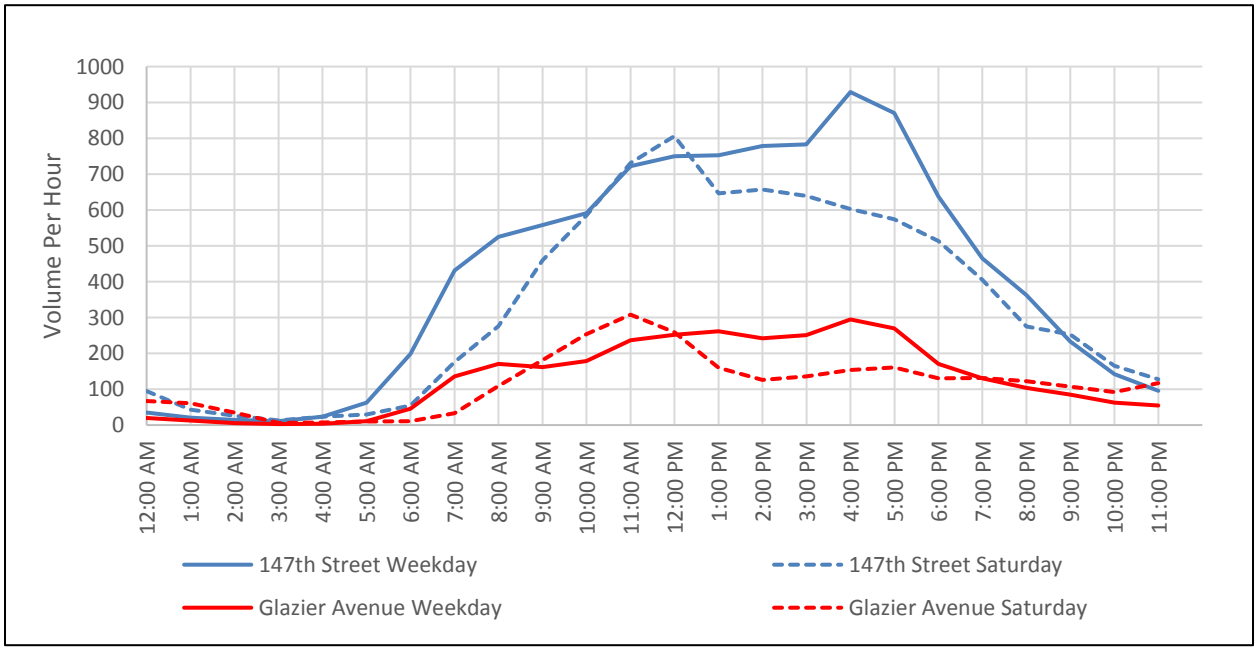


Figure 3. Hourly Traffic Volume Profiles (Weekday and Saturday)



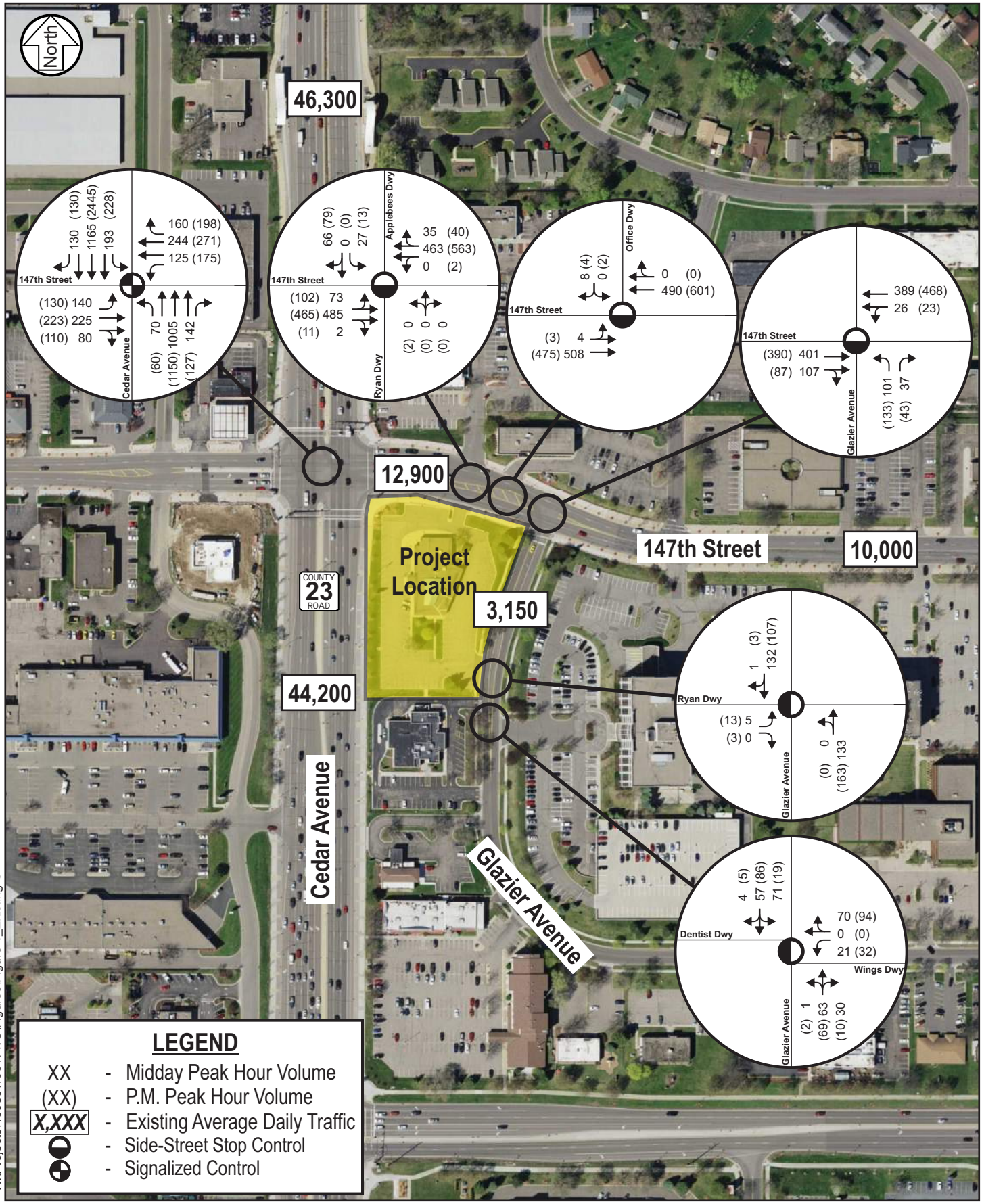
The data collected along 147th Street indicates that average daily traffic volumes are relatively steady between Monday and Friday (approximately 10,000 vehicles per day), with volumes lower on Saturday and Sunday conditions. Volumes along 147th Street peak on weekdays during the late afternoon/evening period (approximately 4:00 p.m. to 5:00 p.m.), but are relatively consistent between 10:00 a.m. and 6:00 p.m. Saturday volumes along 147th Street peak between 11:00 a.m. and 1:00 p.m. However, the magnitude of the peak weekday and Saturday periods is generally similar, particularly during midday conditions. On Glazier Avenue, average weekday daily traffic volumes are near 3,100 vehicles per day. The peak weekday and Saturday periods along Glazier Avenue are consistent with the data collected along 147th Street.

In addition to the traffic data collected, observations were completed to identify roadway characteristics (i.e. roadway geometry, posted speed limits, and traffic controls) and driver behavior within the study area. Cedar Avenue, a principal arterial, is primarily a six-lane divided roadway immediately adjacent to the proposed development, while 147th Street, a minor collector, is a four-lane undivided roadway. The posted speed limits along Cedar Avenue and 147th Street are 45 miles per hour (mph) and 30 mph, respectively. The Cedar Avenue/147th Street intersection is signalized, while the remaining intersections are side-street stop controlled. Existing geometrics, traffic controls, and volumes are shown in Figure 4.

Intersection Capacity Analysis

An existing intersection capacity analysis was completed for the weekday midday and p.m. peak hours to establish a baseline condition to which future traffic operations can be compared. Based on the data collected, the weekday midday peak period is relatively similar for the Saturday midday peak condition. Therefore, only the weekday midday peak period was reviewed. The a.m. peak hour was not evaluated since the proposed development is not expected to be open during that time and area traffic volumes are lower than the midday and p.m. peak periods. Study intersections were analyzed using Synchro/SimTraffic (Version 9). Existing signal timing data was obtained from Dakota County and included in the capacity analysis modeling.

Capacity analysis results identify a Level of Service (LOS), which indicates the quality of traffic flow through an intersection. Intersections are given a ranking from LOS A through LOS F. The LOS results are based on average delay per vehicle, which correspond to the delay threshold values shown in Table 1. LOS A indicates the best traffic operation, with vehicles experiencing minimal delays. LOS F indicates an intersection where demand exceeds capacity, or a breakdown of traffic flow. Overall intersection LOS A through LOS D is generally considered acceptable in the Twin Cities Metro Area.



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Existing Conditions

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Table 1 Level of Service Criteria for Signalized and Unsignalized Intersections

LOS Designation	Signalized Intersection Average Delay/Vehicle (seconds)	Unsignalized Intersection Average Delay/Vehicle (seconds)
A	≤ 10	≤ 10
B	> 10 - 20	> 10 - 15
C	> 20 - 35	> 15 - 25
D	> 35 - 55	> 25 - 35
E	> 55 - 80	> 35 - 50
F	> 80	> 50

For side-street stop controlled intersections, special emphasis is given to providing an estimate for the level of service of the side-street approach. Traffic operations at an unsignalized intersection with side-street stop control can be described in two ways. First, consideration is given to the overall intersection level of service. This accounts for the total number of vehicles entering the intersection and the capability of the intersection to support these volumes. Second, it is important to consider the delay on the minor approach. Since the mainline does not have to stop, the majority of delay is attributed to the side-street approaches. It is typical of intersections with higher mainline traffic volumes to experience high levels of delay (i.e. poor levels of service) on the side-street approaches, but an acceptable overall intersection level of service during peak hour conditions.

Results of the existing intersection capacity analysis shown in Table 2 indicate that the study intersections currently operate at an acceptable overall LOS C or better during the weekday midday and p.m. peak hours with the existing geometric layout and traffic controls. However, during the p.m. peak hour westbound left-turn queues at the Cedar Avenue/147th Street intersection extend beyond the available turn lane storage approximately five to 10 percent of the peak hour. In addition, eastbound queues along 147th Street at the Applebee's driveway extend approximately 90 feet during the p.m. peak hour. Although these queues do not extend to Cedar Avenue, they do create conflicts with through vehicles along 147th Street. No other significant delay or queuing issues were identified.

Table 2 Existing Intersection Capacity Analysis

Intersection	Weekday Midday Peak Hour	Weekday P.M. Peak Hour
	LOS (Delay)	LOS (Delay)
Cedar Avenue and 147th Street	C (24 sec.)	C (32 sec.)
147th Street and Ryan/Applebee's Driveways (1)	A/B (10 sec.)	A/C (15 sec.)
147th Street and 7493 147th Street Driveway (1)	A/A (5 sec.)	A/B (13 sec.)
147th Street and Glazier Avenue (1)	A/B (12 sec.)	A/C (16 sec.)
Glazier Avenue and Ryan Driveway (1)	A/A (6 sec.)	A/A (5 sec.)
Glazier Avenue and Bank/Wings Financial Driveways (1)	A/A (4 sec.)	A/A (4 sec.)

(1) Indicates an unsignalized intersection with side-street stop control, where the overall LOS is shown followed by the worst approach LOS. The delay shown represents the worst side-street approach delay.

Year 2018 No Build Conditions

Since the proposed development would be expected to be completed by year 2018, a no-build condition was reviewed to determine future traffic operations if the proposed development were not constructed. The year 2018 no-build conditions accounts for historical general area background growth within the area. The following sections provide details on the background traffic forecasts and intersection capacity analysis for year 2018 no-build conditions.

Background Traffic Growth

To account for general background growth in the area, an annual growth rate of one percent was applied to the existing peak hour traffic volumes to develop year 2018 background traffic forecasts. This growth rate is generally consistent with historical trends within the study area and future growth projections for Dakota County. Year 2018 no build conditions traffic forecasts are shown in Figure 5.

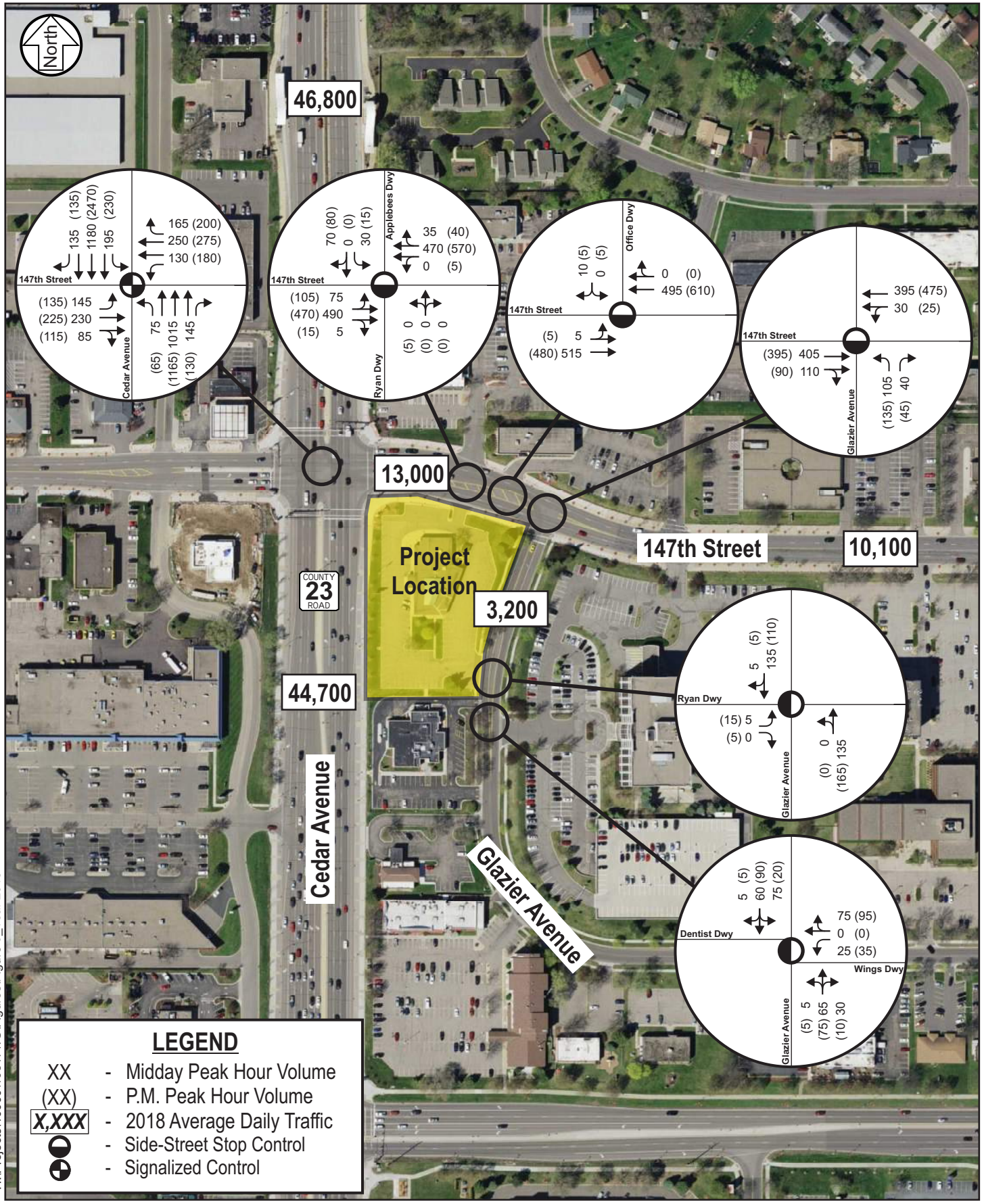
Intersection Capacity Analysis

To determine if the existing roadway network can accommodate the year 2018 no build traffic forecasts, a detailed intersection capacity analysis was completed. Results of the year 2018 no-build intersection capacity analysis shown in Table 3 indicate that all study intersections are expected to operate at an acceptable overall LOS D or better during the weekday midday and p.m. peak hours with the existing roadway geometry and traffic controls. The queuing identified under existing conditions will continue but is not expected to significantly change under year 2018 no-build conditions. However, as traffic volumes along 147th Street increase, side-street access from driveways and cross-streets to 147th Street is expected to become more challenging. This may result in the need to modify access to reduce conflicts and maintain traffic operations.

Table 3 Year 2018 No-Build Intersection Capacity Analysis

Intersection	Weekday Midday Peak Hour	Weekday P.M. Peak Hour
	LOS (Delay)	LOS (Delay)
Cedar Avenue and 147th Street	C (25 sec.)	D (35 sec.)
147th Street and Ryan/Applebee's Driveways (1)	A/B (10 sec.)	A/D (31 sec.)
147th Street and 7493 147th Street Driveway (1)	A/A (5 sec.)	A/B (10 sec.)
147th Street and Glazier Avenue (1)	A/B (13 sec.)	A/C (20 sec.)
Glazier Avenue and Ryan Driveway (1)	A/A (6 sec.)	A/A (6 sec.)
Glazier Avenue and Bank/Wings Financial Driveways (1)	A/A (4 sec.)	A/A (4 sec.)

(1) Indicates an unsignalized intersection with side-street stop control, where the overall LOS is shown followed by the worst approach LOS. The delay shown represents the worst side-street approach delay.



H:\Projects\10000\10517\TS\Figures\Figure 5_Year 2018 No Build Conditions.cdr

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Year 2018 No Build Conditions

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Figure 5

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Year 2030 No Build Conditions

A long-term no-build condition was also reviewed to identify future operations and the need for any future infrastructure improvements regardless of the proposed development. The year 2030 no-build condition accounts for a similar one (1) percent annual background growth rate within the area. The year 2030 no build conditions traffic forecasts are shown in Figure 6.

Intersection Capacity Analysis

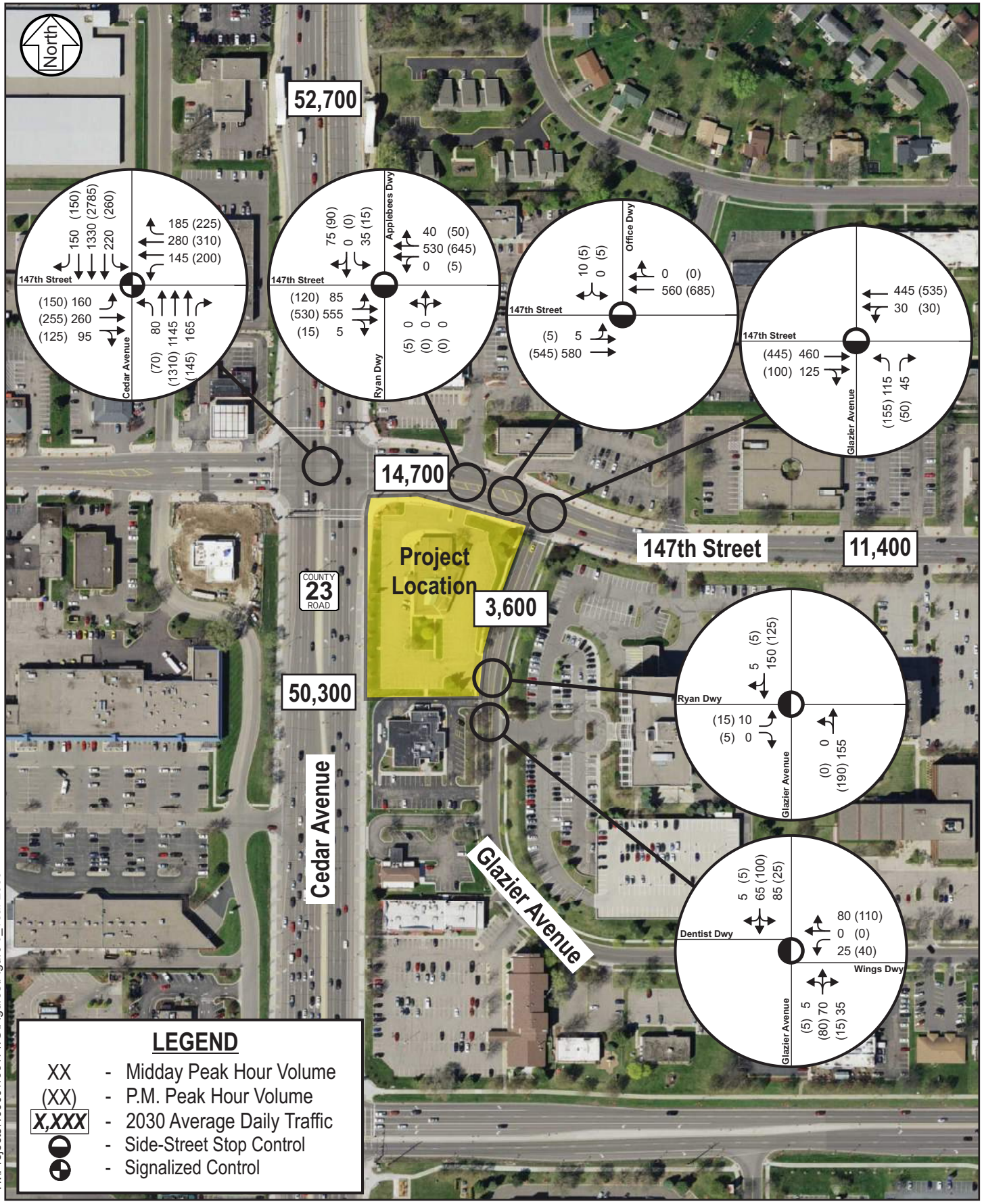
To determine if the existing roadway network can accommodate the year 2030 no build traffic forecasts, a detailed intersection capacity analysis was completed. Results of the year 2030 no-build intersection capacity analysis shown in Table 4 indicate that all study intersections are expected to operate at an acceptable overall LOS D or better during the weekday midday and p.m. peak hours with the existing roadway geometry and traffic controls, except the Cedar Avenue/147th Street intersection during the p.m. peak hour. The Cedar Avenue/147th Street intersection is expected to operate at LOS E during the p.m. peak hour, with significant southbound queuing along Cedar Avenue.

Table 4 Year 2030 No-Build Intersection Capacity Analysis

Intersection	Weekday Midday Peak Hour	Weekday P.M. Peak Hour
	LOS (Delay)	LOS (Delay)
Cedar Avenue and 147th Street	C (27 sec.)	**E (64 sec.)**
147th Street and Ryan/Applebee's Driveways (1)	A/B (14 sec.)	A/F (57 sec.)
147th Street and 7493 147th Street Driveway (1)	A/A (5 sec.)	A/A (8 sec.)
147th Street and Glazier Avenue (1)	A/C (19 sec.)	A/D (29 sec.)
Glazier Avenue and Ryan Driveway (1)	A/A (5 sec.)	A/A (5 sec.)
Glazier Avenue and Bank/Wings Financial Driveways (1)	A/A (4 sec.)	A/A (4 sec.)

(1) Indicates an unsignalized intersection with side-street stop control, where the overall LOS is shown followed by the worst approach LOS. The delay shown represents the worst side-street approach delay.

As traffic volumes along 147th Street increase, side-street access from driveways and cross-streets to 147th Street is also expected to become more challenging, with average westbound queues extending beyond the Applebee's driveway and 95th percentile queues extending to Glazier Avenue during the p.m. peak hour. This may result in the need to modify access to reduce conflicts and maintain traffic operations. It should be noted that the northbound 95th percentile queue along Glazier Drive is expected to extend 150 feet during the p.m. peak hour.



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Year 2030 No Build Conditions

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Figure 6

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Proposed Development

The proposed development, shown in Figure 7, is an approximate 9,000 square Portillo's Restaurant. Portillo's is a fast-casual restaurant and includes drive-thru operations. As proposed, the development would eliminate the existing access to 147th Street in favor of two-access locations along Glazier Avenue. The two driveways proposed along Glazier Avenue are located approximately 175 feet and 275 feet south of 147th Street, with the northern driveway being right-in entrance-only and the southern driveway as full-access. As previously mentioned, the proposed development was assumed to be fully operational by year 2018.

Trip Generation

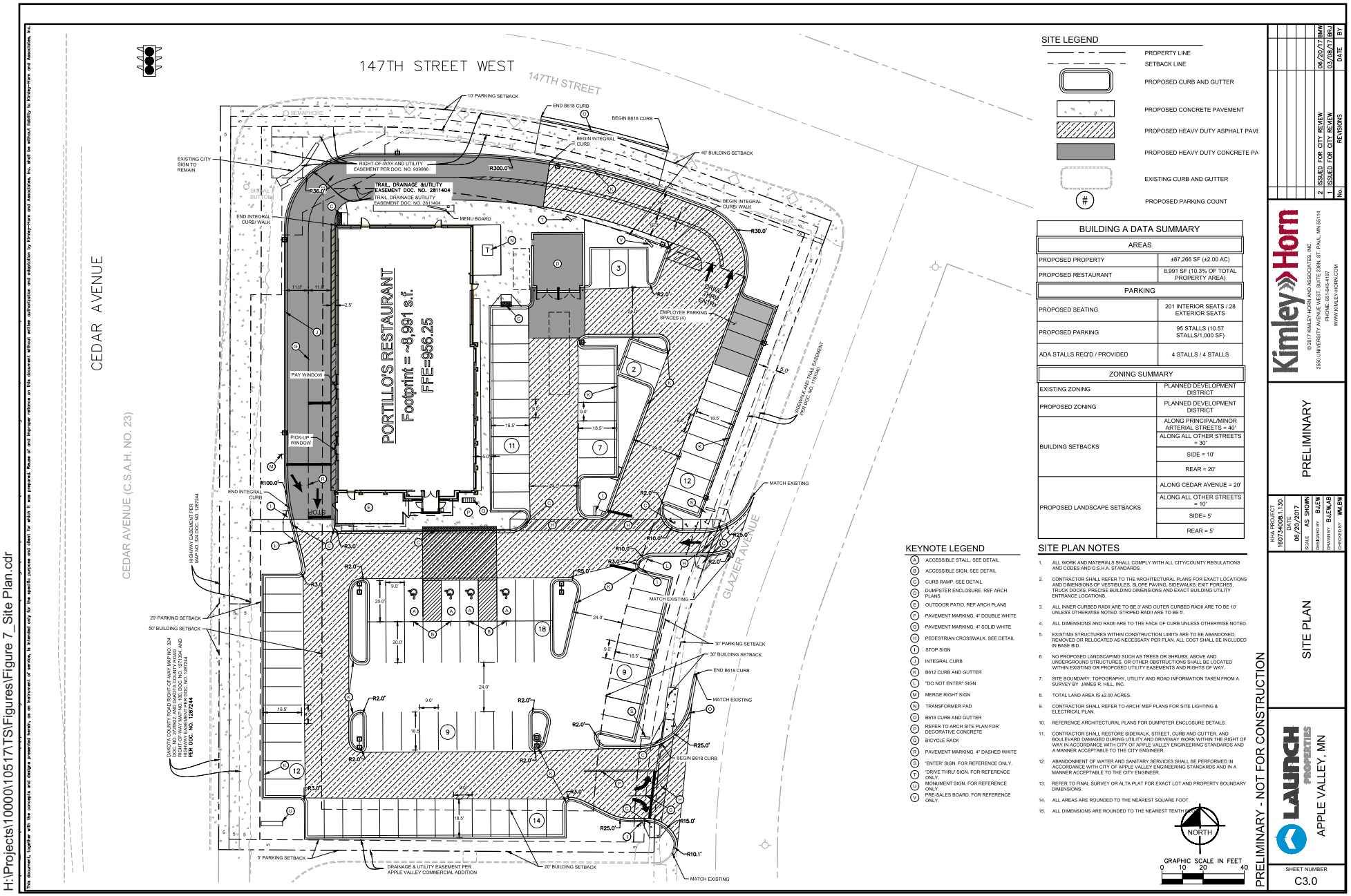
To account for traffic impacts associated with the proposed development, a trip generation estimate for the weekday midday and p.m. peak hours, as well as on a weekday daily basis were developed. This trip generation estimate was developed using a combination of existing traffic counts collected at the site driveways, customer data provided by a previous study completed by Kenig Lindgren, O'Hara, Aboona, Inc (KLOA), and the *Institute of Transportation Engineers (ITE) Trip Generation Manual, Ninth Edition*. Since the proposed development is a unique land use, trips for the proposed development were primarily based on data collected at similar restaurants in Illinois. Trip rates were adjusted to account for the reduced restaurant size as compared to the Illinois restaurants.

Results of the trip generation estimate, shown in Table 5, indicate the proposed development is expected to generate up to approximately 412 weekday midday peak hour, 198 weekday p.m. peak hour, and 3,050 weekday daily trips to/from the site. When subtracting vehicles that were observed currently using the existing Ryan office complex, as well as accounting for motorists already traveling along Cedar Avenue or 147th Street that will now divert their trip to the proposed development before continuing to their destination (i.e. pass-by trips), the net new system impact to the adjacent roadways is expected to be approximately 198 weekday midday peak hour, 66 weekday p.m. peak hour, and 1,175 weekday daily trips. This estimate does not include any multi-use reductions (that account for patrons that live or work within walking distance) to provide a conservative assessment.

Table 5 Trip Generation Estimate

Land Use Type	Size	Weekday Midday Peak Hour Trips		Weekday P.M. Peak Hour Trips		Weekday Daily Trips
		In	Out	In	Out	
Portillo's Restaurant (1)	9,000 SF	206	206	99	99	3,050 (3)
Pass-By Trip Reduction (50%)		- 103	- 103	- 49	-49	-1,525
Existing Ryan Building Reduction (2)		- 3	- 5	- 16	- 18	- 350 (3)
Net New System Trips		**+100**	**+98**	**+34**	**+32**	**+1,175**

(1) Based on data collected at an existing Portillo's Restaurant in Illinois (KLOA study).
(2) Based on actual driveway counts collected March 28, 2017.
(3) Estimated based on the ITE Trip Generation Handbook, leveraging the existing peak hour data available.



This document, together with the concepts and designs presented herein, as an instrument of service, is intended only for the specific purpose and client for which it was prepared. Reuse of and improper reliance on this document without written authorization and adaptation by Kimley-Horn and Associates, Inc. shall be without liability to Kimley-Horn and Associates, Inc.

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Site Plan

Portillo's Traffic Study
City of Apple Valley

Figure 7

Trips generated were distributed to the study area based on the directional distribution shown in Figure 8, which was developed based on existing travel patterns. The site generated trips are shown in Figure 9 and the resultant year 2018 and year 2030 build condition traffic forecasts are shown in Figures 10 and 11, respectively.

Year 2018 Build Conditions

To determine any impacts associated with the proposed development, year 2018 build conditions were reviewed. The year 2018 build conditions account for historical general area background growth within the area, as well as the proposed development.

Intersection Capacity Analysis

To determine if the existing roadway network can accommodate year 2018 build conditions, a detailed intersection capacity analysis was completed. Results of the year 2018 build condition intersection capacity analysis shown in Table 6 indicate that all study intersections and proposed access locations are expected to operate at an acceptable overall LOS D or better during the weekday midday and p.m. peak hours. Northbound queues from the 147th Street/Glazier Avenue intersection will extend beyond the South Portillo's Driveway approximately 10 percent of the midday peak hour. The northbound queues are not expected to impact the South Portillo's Driveway during the p.m. peak hour. Additionally, the westbound left-turn queue at Cedar Avenue/147th Street is expected to extend beyond the available turn lane storage that is currently provided approximately 10 to 15 percent of the p.m. peak hour. Restriping this turn lane with an additional 75 feet of storage would minimize left-turn queues from extending into the westbound through lanes.

Table 6 Year 2018 Build Intersection Capacity Analysis

Intersection	Weekday Midday Peak Hour	Weekday P.M. Peak Hour
	LOS (Delay)	LOS (Delay)
Cedar Avenue and 147th Street	C (27 sec.)	D (37 sec.)
147th Street and Glazier Avenue (1)	A/D (29 sec.) (2)	A/C (18 sec.) (2)
Glazier Avenue and South Portillo's Driveway (1)	A/A (8 sec.)	A/A (6 sec.)
Glazier Avenue and Bank/Wings Financial Driveways (1)	A/A (4 sec.)	A/A (4 sec.)

(1) Indicates an unsignalized intersection with side-street stop control, where the overall LOS is shown followed by the worst approach LOS. The delay shown represents the worst side-street approach delay.

(2) Delay shown does not reflect actual delay since northbound vehicles queue beyond the North Portillo's Driveway.



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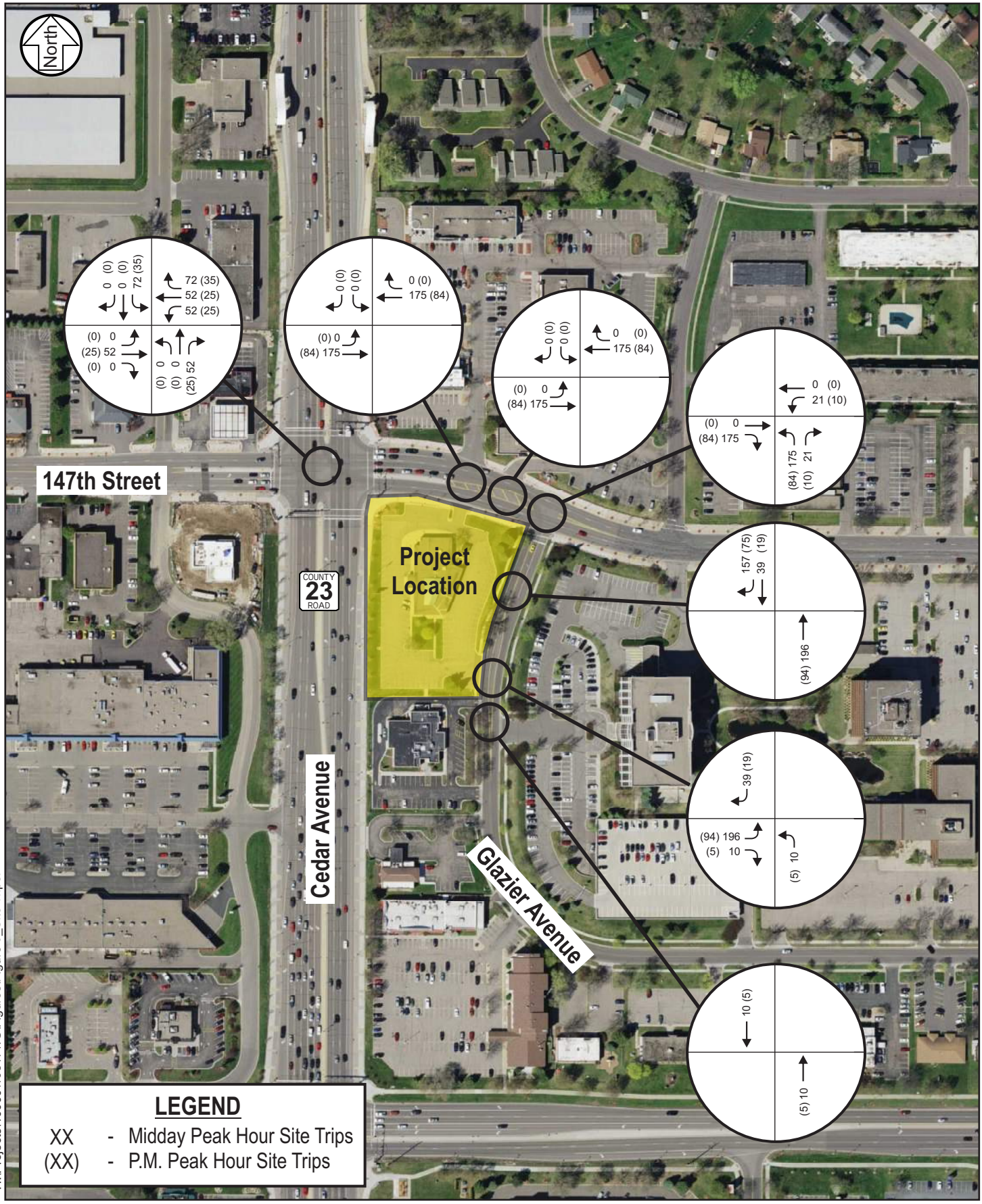
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Directional Distribution

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City of Apple Valley

Figure 8

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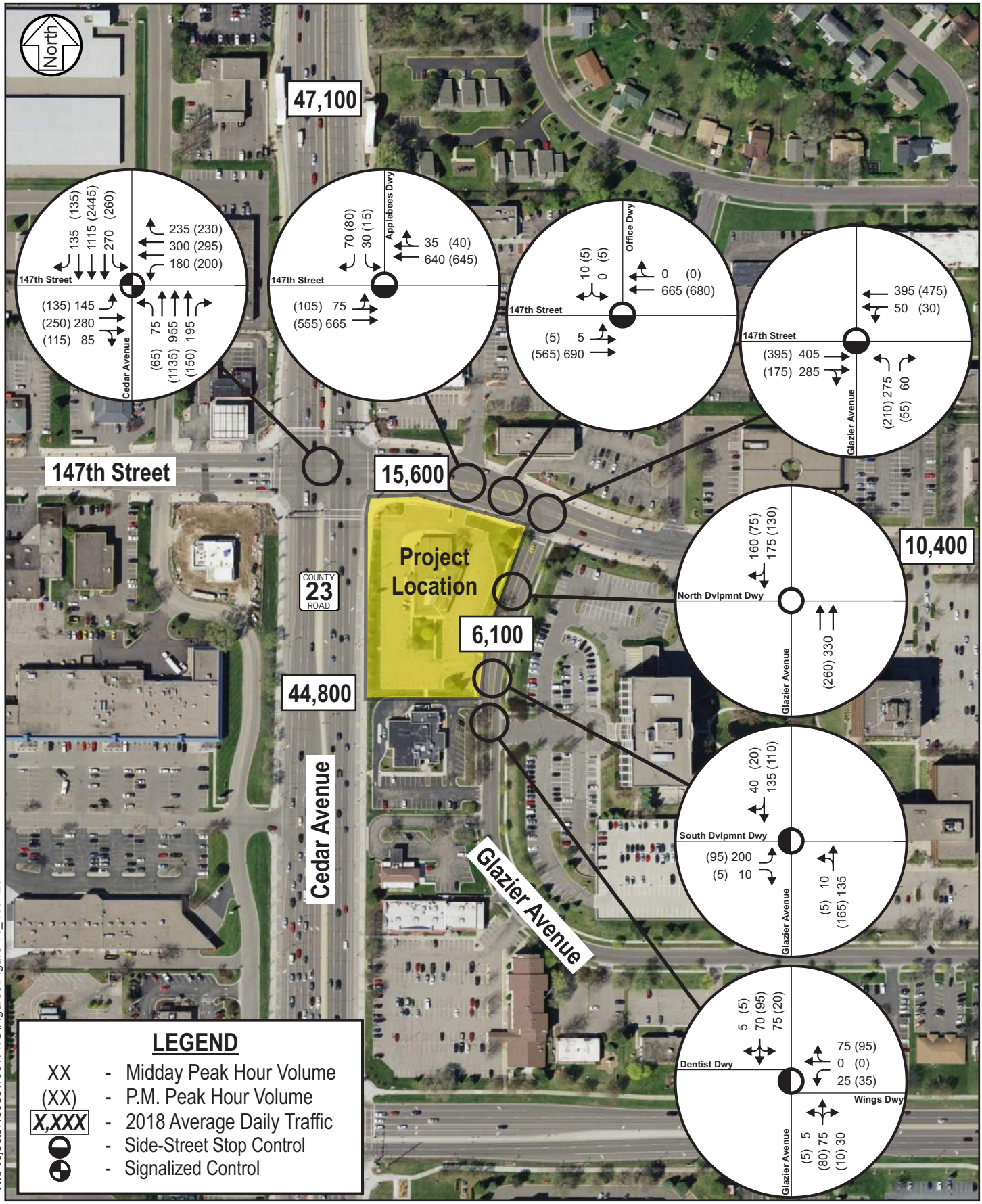
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Site Trips

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Figure 9

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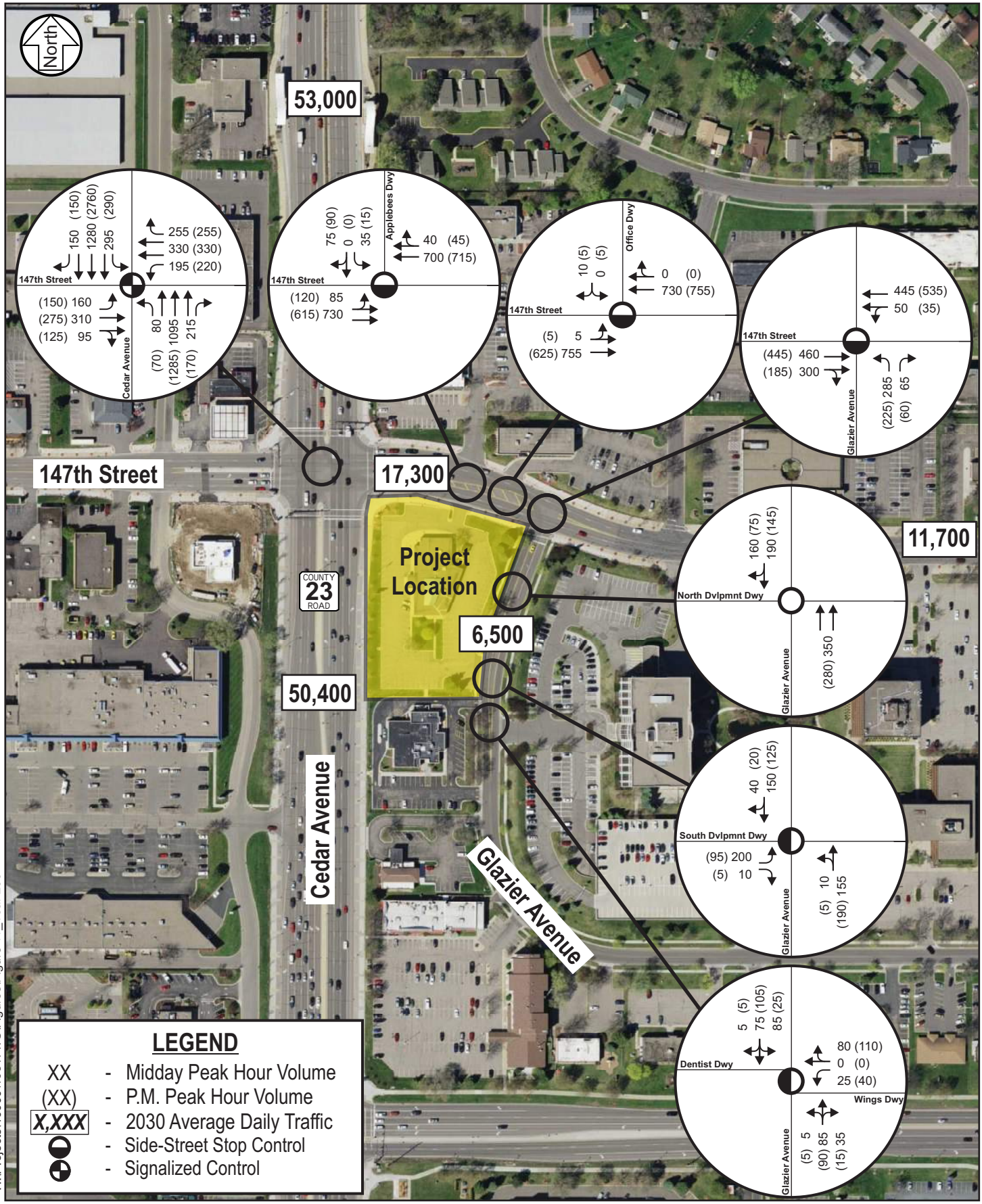
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Year 2018 Build Conditions

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Figure 10

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Year 2030 Build Conditions

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Figure 11

Year 2030 Build Conditions

To determine long-term impacts associated with the proposed development, year 2030 build conditions were reviewed. The year 2030 build conditions account for historical general area background growth within the area, as well as the proposed development.

Intersection Capacity Analysis

To determine if the existing roadway network can accommodate year 2030 build conditions, a detailed intersection capacity analysis was completed. Results of the year 2030 build condition intersection capacity analysis shown in Table 7 indicate that delay and queuing issues are expected during the weekday midday peak hour for vehicles along Glazier Avenue that turn onto 147th Street. This results in northbound queues extending beyond the Wings Financial driveway approximately 35 percent of the midday peak hour, which impacts operations at the Bank/Wings Financial driveway.

During the p.m. peak hour, no significant queuing issues along Glazier Drive are expected. However southbound queuing is expected along Cedar Avenue where the overall intersection is expected to operate at an unacceptable LOS E during the p.m. peak hour. Additionally, westbound left-turn queues at the Cedar Avenue/147th Street intersection are expected to extend to the 147th Street/ Glazier Avenue intersection approximately five (5) to 10 percent of the p.m. peak hour. Any signal timing changes implemented at the Cedar Avenue/147th Street intersection that reduce westbound splits will increase westbound queueing along 147th Street and increases the amount of time the westbound queue would impact northbound Glazier Avenue motorists.

Table 7 Year 2030 Build Intersection Capacity Analysis

Intersection	Weekday Midday Peak Hour	Weekday P.M. Peak Hour
	LOS (Delay)	LOS (Delay)
Cedar Avenue and 147th Street	C (31 sec.)	**E (69 sec.)**
147th Street and Glazier Avenue (1)	B/E (48 sec.) (2)	A/D (30 sec.) (2)
Glazier Avenue and South Portillo's Driveway (1)	D/E (43 sec.)	A/A (6 sec.)
Glazier Avenue and Bank/Wings Financial Driveways (1)	**F/F (105 sec.)**	A/A (4 sec.)

(1) Indicates an unsignalized intersection with side-street stop control, where the overall LOS is shown followed by the worst approach LOS. The delay shown represents the worst side-street approach delay.

(2) Delay shown does not reflect actual delay since northbound vehicles queue beyond the North Portillo's Driveway.

Potential Improvements to Consider

From a traffic operations perspective, the following options are offered for consideration:

1) Extend the median along 147th Street to the east, through Glazier Avenue, effectively converting the 147th Street/Glazier Avenue intersection to a right-in/right-out access. This would result in a change in area travel patterns, with more motorists utilizing Glazier Avenue to access either CSAH 42 or 147th Street (via Garrett Avenue). Further analysis would be required.

2) Restrict northbound access to 147th Street from Glazier Avenue to right-turn only by constructing a roundabout or split roundabout type design, as shown in Figures 12 and 13, respectively. These configurations would require motorists along Glazier Avenue to make a U-turn maneuver to access Cedar Avenue. Preliminary investigation indicates that these options would require right-of-way within the area, particularly to continue to accommodate pedestrian facilities.

   a. These improvements would address the northbound Glazier Avenue issues identified. However, westbound queues from the Cedar Avenue/147th Street intersection are still expected to extend to the 147th Street/Glazier Avenue intersection, which could impact operations of the split roundabout option.

3) Other mitigation measures (such as a traffic signal) were reviewed at the 147th Street/Glazier Avenue intersection, however, they were deemed undesirable by City and/or County staff.

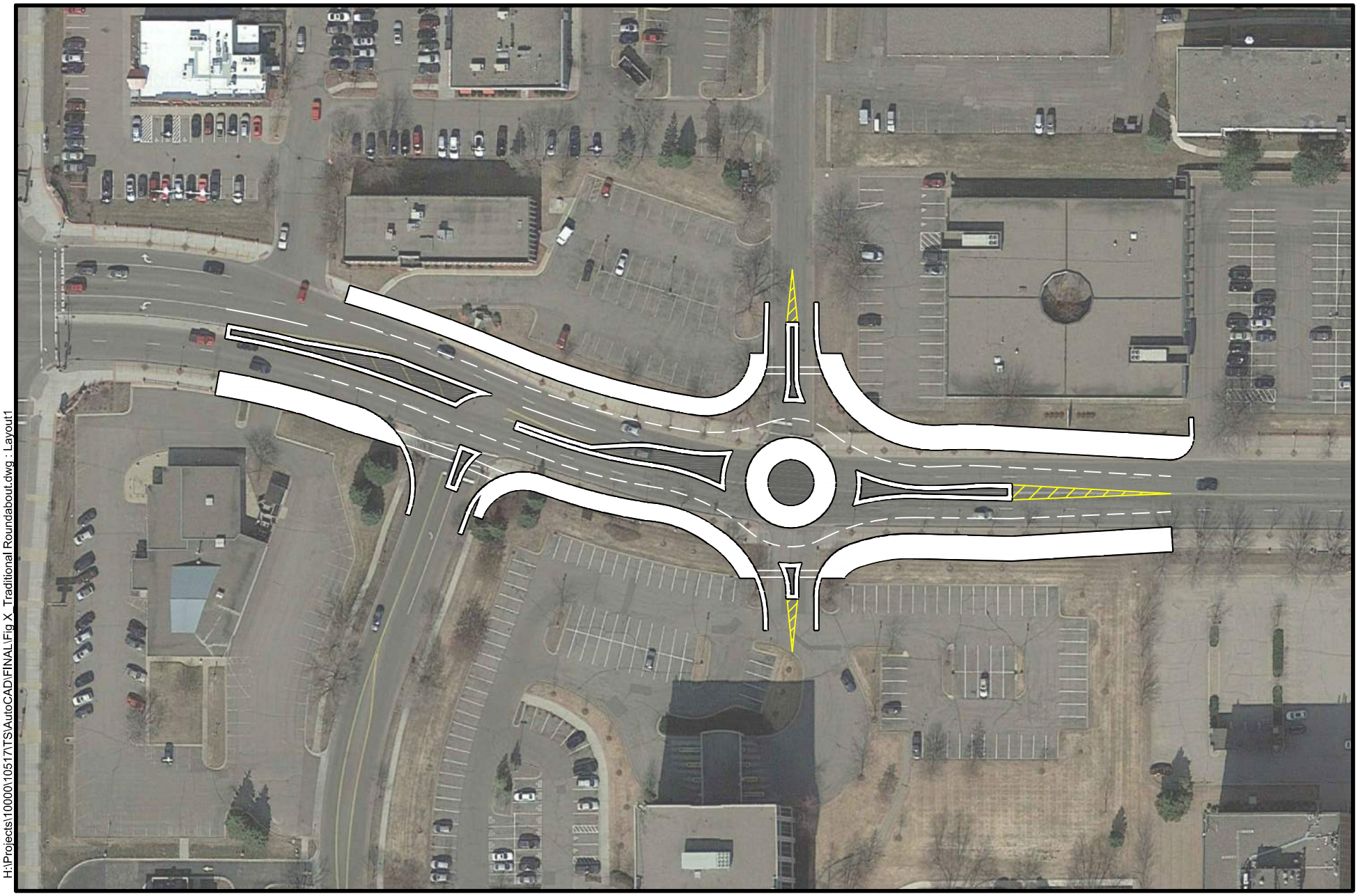
Based on discussion with City staff, the two roundabout improvement alternatives identified are considered the most favorable to area stakeholders. However, further discussion with local stakeholders and additional design refinements are necessary to determine the specific benefits and costs associated with these alternatives.

Volume Changes

The traffic volumes for each scenario were reviewed to determine the change in volume from the Portillo's restaurant at the Cedar Avenue/147th Street and 147th Street/Glazier Avenue intersections. Based on the results shown in Table 8, Portillo's traffic would represent a three (3) to nine (9) percent increase in overall traffic volume at the Cedar Avenue/147th Street intersection. However, Portillo's would increase traffic volumes by up to 37 percent at the 147th Street/Glazier Avenue intersection during the midday peak hour. For the critical move (i.e. the northbound left-turn from Glazier Avenue) Portillo's would increase traffic volumes by more than 150 percent during the midday peak hour.

Table 8 Intersection Volume Comparison

Condition	Cedar Avenue and 147th Street		147th Street and Glazier Avenue		Glazier Avenue Northbound-Left-Turn	
	Midday	P.M.	Midday	P.M.	Midday	P.M.
Year 2018 No Build	3,720	5,300	1,075	1,155	105	135
Year 2030 No Build	4,190	5,975	1,210	1,305	115	155
Year 2018 Build	3,960	5,395	1,460	1,325	275	210
Year 2030 Build	4,430	6,065	1,595	1,470	285	225
Site Trips	350	170	395	190	175	85
Percent Site Trips 2018	9%	3%	27%	14%	63%	40%
Percent Site Trips 2030	8%	3%	25%	13%	61%	38%



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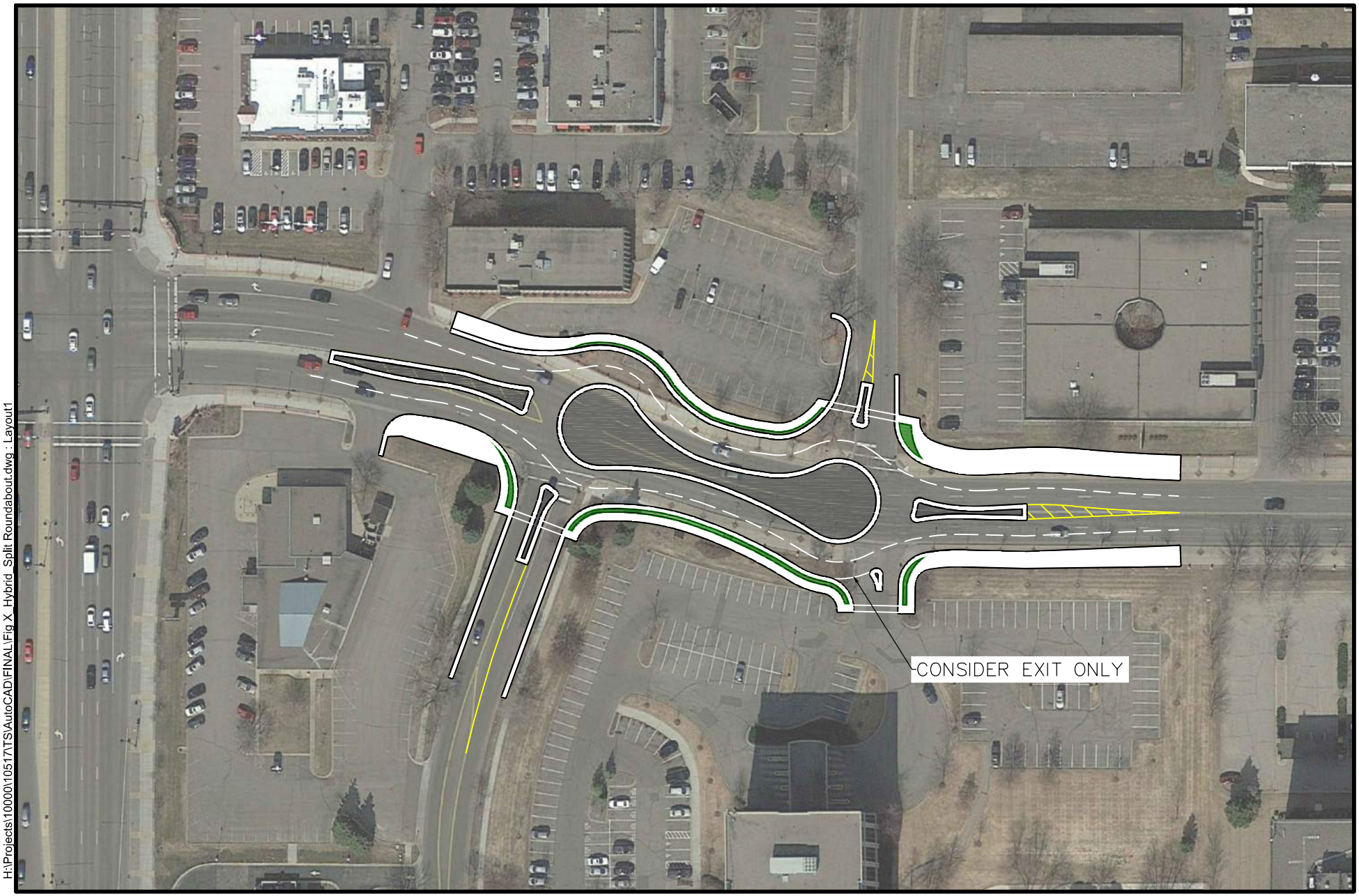
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Traditional Roundabout Concept

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Figure 12



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Hybrid/Split Roundabout Concept

Portillo's Traffic Study
Apple Valley, MN

Figure 13

Conclusions and Recommendations

The following study conclusions and recommendations are offered for consideration:

1) Average daily traffic volumes along 147th Street are relatively steady between Monday and Friday (approximately 10,000 vehicles per day), with volumes lower on Saturday and Sunday conditions.

2) Volumes along 147th Street peak on weekdays during the late afternoon/evening (approximately 4:00 p.m. to 5:00 p.m.), but are relatively consistent between 10:00 a.m. and 6:00 p.m.

3) Saturday volumes along 147th Street peak between 11 a.m. and 1 p.m., although peak weekday and Saturday periods are generally similar in magnitude.

4) Average weekday daily traffic volumes along Glazier Avenue are near 3,100 vehicles per day. The peak weekday and Saturday periods along Glazier Avenue are consistent with the data collected along 147th Street.

5) Study intersections currently operate at an acceptable overall LOS C or better during the weekday midday and p.m. peak hours.

    a. During the p.m. peak hour, westbound left-turn queues at the Cedar Avenue/147th Street intersection extend beyond the available turn lane storage approximately five to 10 percent of the peak hour.

    b. Eastbound queues along 147th Street at the Applebee's driveway extend approximately 90 feet during the p.m. peak hour. Although these queues do not extend to Cedar Avenue, they do create conflicts with through vehicles along 147th Street.

6) All study intersections are expected to continue to operate at an acceptable overall LOS D or better during the weekday midday and p.m. peak hours under year 2018 no-build conditions. The queuing identified under existing conditions will continue.

    a. As traffic volumes along 147th Street increase, side-street access from driveways and cross-streets to 147th Street is expected to become more challenging. This may result in the need to modify access to reduce conflicts and maintain traffic operations.

7) All study intersections are expected to operate at an acceptable overall LOS D or better during the weekday midday and p.m. peak hours with the existing roadway geometry and traffic controls, except the Cedar Avenue/147th Street intersection during the p.m. peak hour under year 2030 no build conditions, which is expected to operate at a LOS E.

8) The proposed development is expected to generate up to approximately 412 weekday midday peak hour, 198 weekday p.m. peak hour, and 3,050 weekday daily trips to/from the site.

    a. The net new system impact to the adjacent roadways is expected to be approximately 198 weekday midday peak hour, 66 weekday p.m. peak hour, and 1,175 weekday daily trips. This estimate does not include any multi-use reductions (that account for patrons that live or work within walking distance) to provide a conservative assessment.

9) All study intersections and proposed access locations are expected to operate at an acceptable overall LOS D or better during the weekday midday and p.m. peak hours under year 2018 build conditions.

   a. Northbound queues from the 147th Street/Glazier Avenue intersection will extend beyond the North Portillo's Driveway approximately 10 percent of the midday peak hour.

10) Under year 2030 build conditions, delay and queuing issues are expected during the weekday midday peak hour along Glazier Avenue as northbound vehicles would have a difficult time turning onto 147th Street.

   a. Northbound queuing from 147th Street is expected to extend beyond the Wings Financial driveway about 35 percent of the midday peak hour.

   b. During the p.m. peak hour, no queuing issues along Glazier Drive are expected. However, southbound queuing along Cedar Avenue and the overall intersection is expected to operate at an unacceptable LOS E. Westbound queues along 147th Street are expected to extend to the 147th Street/Glazier Avenue intersection approximately 10 percent of the time.

   c. Any signal timing changes implemented at the Cedar Avenue/147th Street intersection that reduce westbound splits will increase westbound queues along 147th Street and increases the amount of time queues block northbound Glazier Avenue access to Cedar Avenue.

11) From a traffic operations perspective, the following options are offered for consideration:

   a. Extend the median along 147th Street to the east, through Glazier Avenue, effectively converting the 147th Street/Glazier Avenue intersection to a right-in/right-out access. This would result in a change in area travel patterns, with more motorists utilizing Glazier Avenue to access either CSAH 42 or 147th Street (via Garrett Avenue).

   b. Restrict northbound access to 147th Street to a right-turn only from Glazier Avenue and construct a roundabout or split roundabout type of design, east of Glazier Avenue, to allow vehicles to make a U-turn maneuver to access Cedar Avenue. Preliminary investigation indicates that these options would require right-of-way within the area.

   c. Other mitigation measures (such as a traffic signal) were reviewed at the 147th Street/Glazier Avenue intersection, however, they were deemed undesirable by City and/or County staff.

12) **Based on discussion with City staff, the two roundabout improvement alternatives identified are considered the most favorable to area stakeholders**. Further discussion with local stakeholders and additional design refinements are necessary to determine the specific benefits and costs associated with these alternatives.

13) Portillo's would increase traffic volumes by up to 37 percent at the 147th Street/Glazier Avenue intersection during the midday peak hour. For the critical move (i.e. the northbound left-turn from Glazier Avenue) Portillo's would increase traffic volumes by more than 150 percent.