CITY OF SAINT PAUL

DEPARTMENT OF SAFETY AND INSPECTIONS
375 JACKSON STREET, SUITE 220
ST. PAUL, MINNESOTA 55101-1806
Phone: 651-266-8989 Fax: 651-266-9124
Visit our Web Site at www.stpaul.gov/dsi

Zoning Committee

Staff Report

FILE # 18-026074

1. **APPLICANT:** Starbucks Coffee Company **HEARING DATE:** July 19, 2018
2. **TYPE OF APPLICATION:** Site Plan Review
3. **LOCATION:** 234 Snelling Ave N
4. **PIN & LEGAL DESCRIPTION:** 032823220173 Boulevard Addition Pts Of Lots 1 And Lot 2 And Vac Alley In Cardigans Re And Pts Of Lots 9 Thru Lot 11 In Bushnells Re Of Blk 3 Blv Add Lying Nwly Of A L Desc Ascom At The Sw Cor Of Sd Cardigans Re Th N 0 Deg 3 Min 0 Sec W Along W L Of Sd Cardigans Re 148
5. **PLANNING DISTRICT:** 13 **PRESENT ZONING:** T2
6. **ZONING CODE REFERENCE:** § 61.402(c)
7. **STAFF REPORT DATE:** July 12, 2018 **BY:** Josh Williams
8. **DATE RECEIVED:** January 31, 2018 **DEADLINE FOR ACTION:** August 16, 2018

A. **PURPOSE:** Revised site plan for existing Starbucks store with drive-through sales

B. **PARCEL SIZE:** approx. 0.43 acres

C. **EXISTING LAND USE:** Starbucks store with drive-through sales (T2)

D. **SURROUNDING LAND USE:**
North: Industrial/Utility (B3)
East: Railroad (T2)
South: Commercial (T2)
West: Autobody (T3)

E. **ZONING CODE CITATION:** § 61.402(c)

F. **HISTORY/DISCUSSION:** See Finding 1, below.

G. **DISTRICT COUNCIL RECOMMENDATION:** The Board of the Union Park District Council recommends denial of the application.

H. **FINDINGS:**

1. The subject property was rezoned to T2 in 2013 as part of a larger, property owner-initiated rezoning associated with the redevelopment of several properties to the south and southeast of the subject property. Other adjacent properties were rezoned in 2017 as a result of the Snelling

Avenue South 40-Acre Study. The Planning Commission approved a conditional use permit for drive-through sales and a variance for floor area ratio (FAR) in late 2015. A site plan for the subject property was conditionally approved by the Zoning Administrator in 2016, and a Certificate of Occupancy for the building was issued in March, 2017, with operations beginning shortly thereafter.

2. Since the store began operations in early 2017, City staff have received complaints regarding traffic impacts to Marshall Avenue and the intersection of Snelling and Marshall Avenues, including but not limited to vehicles stopped in the eastbound Marshall vehicular travel lane, vehicles parked or stopped in the eastbound Marshall Avenue bike lane, and vehicles blocking the sidewalk on the southern side (adjacent to the store) of Marshall Avenue. In response to complaints, City staff visited the subject property on numerous occasions throughout the summer and fall of 2017 to observe operations and a traffic monitoring camera was temporarily installed. During this period, staff also began conversations with Starbucks representatives about options for addressing the observed impacts to the public Right-of-Way ("ROW"). In late 2017, the Department of Safety and Inspections sent the Starbucks Corporation a letter describing the observed impacts to the ROW, and ordering Starbucks Corporation to submit a revised site plan for the subject property.
3. In August of 2017, in consultation with City staff and at Starbucks expense, collapsible tube delineators (commonly referred to as "bollards") were installed between the bicycle lane and vehicular travel lane in the Marshall Avenue ROW just east of the entrance to the site, and off-duty police officers were hired to direct traffic on and near the site during peak morning hours. Around this time, Starbucks also increased store staffing to improve drive-through operational efficiency.
4. In September of 2017, Starbucks commissioned Kimley-Horn to conduct a traffic study to analyze existing drive-through operations and to develop and evaluate both interim and long-term options for site plan modifications to improve operations. An interim site plan was submitted to the City for approval in October, and was implemented in November and December of 2017. The changes included converting the 90-degree parking east of the building to angle parking to encourage one-way circulation for non-drive-through traffic and allow for a separate drive-through queueing lane. Traffic control signage was also changed.
5. City, Starbucks, and Kimley-Horn staff met in late September 2017 and again in late November 2017 to review traffic study findings; in each case, City staff requested additional analysis and/or modeling. Starbucks submitted a revised final site plan in early November 2017, and all parties agreed to postpone City action on the site plan following the late November meeting. The revised final site plan was submitted again, along with the requested additional modeling, in early January, and City staff again requested further analysis. Starbucks withdrew the site plan application on January 25th, 2018.
6. Kimley-Horn, on behalf of Starbucks, submitted a new revised final site plan application on January 31, 2018. At that time, Starbucks and City staff agreed to postpone any action on the site plan until additional modeling and evaluation of two site plan alternatives could occur. During March and April of 2018, two site plan alternatives were temporarily implemented. For each alternative, traffic was allowed to adjust to the traffic control changes for approximately two weeks after installation, followed by on-site observations and the collection of a week of video of operations. The first alternative tested ("Scenario 1") was the elimination of egress to Marshall Avenue. The intent of Scenario 1 was to enforce one-way site circulation for all vehicles and force exit to northbound Snelling Avenue, thereby eliminating a conflict point for vehicular traffic in the existing site plan where vehicles exiting the drive-through to Marshall Avenue cross the ingress lane for all vehicles entering the site. The scenario had the additional benefit of preventing illegal left turns from the site to westbound Marshall Avenue, which has been observed to include occur approximately 30% of the time when traffic control officers are not

present; these illegal left turns delay the individual vehicles exiting to Marshall Avenue, thereby exacerbating the adverse impacts of the conflict point on both on- and off-site traffic circulation. The second alternative ("Scenario 2") tested was the placement of a temporary median in Marshall Avenue adjacent to the site. This was accomplished by installing collapsible tube delineators in the Marshall Avenue ROW adjacent to the site, along the double yellow line that separates east- and westbound travel. Like in Scenario 1, the median eliminated the possibility of illegal left turns from the site onto westbound Marshall. It did, however, allow vehicles to continue to exit the site to eastbound Marshall, thereby not eliminating the conflict point just inside the Marshall Avenue ingress/egress. In addition, the simulated median prevented vehicles travelling westbound on Marshall from entering the site.

7. In a memorandum dated May 17, 2018, Kimley-Horn provided to City staff analysis of the alternatives tested and a summary of the traffic data gathered during the testing period. The unsummarized data was also provided, as an appendix to the document. For purposes of comparison, observations from August 2017 were also provided. All traffic volumes cited herein were observed on a Friday (Starbucks highest volume day of the week) unless otherwise stated. Customer volumes exceeded expectations at the time the store opened in early 2017, and drive-through volumes have generally continued to increase since that time. On August 25, 2017, a.m. peak hour traffic (8 a.m. to 9 a.m.) was approximately 80 vehicles, of which 60 used the drive-through. For the two scenarios tested in Spring 2018, observed a.m. peak hour traffic was 100 vehicles for scenario 1 (7 a.m. to 8 a.m.) and 110 hours for scenario 2 (7:30 a.m. to 8:30 a.m.).
8. Observations of "spillback" events, where vehicle have temporarily backed the Marshall Avenue ROW when unable to enter the site due to on-site congestion, suggest that there have been marginal improvements in site operational efficiency. While the observations made August 2017 and March/April 2018 differ in terms of the data points collected and how they are summarized, they are generally comparable. On Friday, August 25, 2018, an estimated 10 "spillback" events where vehicular traffic temporarily blocked portions of the Marshall Avenue ROW were observed between 7 and 9 a.m.. Under Scenario 1 tested in April 2018, a total of 24 spillback events were observed over a 4-day week (excluding Wednesday) and under Scenario 2 a total of 20 events were observed over the same period. Under Scenario 2, the total average time of ROW obstruction was lesser (60 seconds per event) as compared to Scenario 1 (82 seconds per event); no data on length of spillback events in August 2017 was provided. In all cases, an off-duty police officer was employed by Starbucks during the observation period to direct traffic on and near the site.
9. Section 61.202(c) of the Saint Paul Zoning Code allows the Planning Commission to delegate approval and denial of site plan applications to the Zoning Administrator. The existing site plan was conditionally approved by the Zoning Administrator in 2016. In In approving the existing site plan, the Zoning Administrator found the plan to be consistent with the Zoning Code, including Section 61.402(c), which lists findings which a site plan must meet. The proposed modifications to the existing site plan are limited in scope and involve reconfiguration of parking and the drive-through queueing area, with some parking converted to use for drive-through queueing. Consistency with Section 62.108(c) is best evaluated with regard to how the proposed amended site plan differs from the existing, approved site plan. Section 62.108(c) requires the following findings:
   (1) *The city's adopted comprehensive plan and development or project plans for sub-areas of the city.*
   (2) *Applicable ordinances of the City of Saint Paul.*
   (3) *Preservation of unique geologic, geographic or historically significant characteristics of the city and environmentally sensitive areas.*
   (4) *Protection of adjacent and neighboring properties through reasonable provision for such*

matters as surface water drainage, sound and sight buffers, preservation of views, light and air, and those aspects of design which may have substantial effects on neighboring land uses.

(5) *The arrangement of buildings, uses and facilities of the proposed development in order to assure abutting property and/or its occupants will not be unreasonably affected.*

(6) *Creation of energy-conserving design through landscaping and location, orientation and elevation of structures.*

(7) *Safety and convenience of both vehicular and pedestrian traffic both within the site and in relation to access streets, including traffic circulation features, the locations and design of entrances and exits and parking areas within the site.*

(8) *The satisfactory availability and capacity of storm and sanitary sewers, including solutions to any drainage problems in the area of the development.*

(9) *Sufficient landscaping, fences, walls and parking necessary to meet the above objectives.*

(10) *Site accessibility in accordance with the provisions of the Americans with Disabilities Act (ADA), including parking spaces, passenger loading zones and accessible routes.*

(11) *Provision for erosion and sediment control as specified in the ``Ramsey Erosion Sediment and Control Handbook."*

With regard to findings 61.204(c) (1-6) and (8-11), the proposed amendment is substantially similar or identical to the existing, approved site. With regard to finding 61.204(c) (7), the proposed amended site plan is equally or more consistent with the finding as the existing site plan. The proposed amended site plan would provide additional on-site queueing for drive-through traffic (increasing from 9-10 spaces with the current site configuration to 10-11 with the proposed modified site plan, and facilitates overall site circulation by allowing for increased separation of drive-through traffic from vehicles accessing off-street parking. While the increase in queueing and maneuvering room is limited, it is an improvement relative to the current site configuration on a site that is physically constrained by a number of factors. With continued presence of a traffic control officer to assist with on-site operations during the a.m. peak period, the proposed amended site plan should lead to a reduction in impacts to the ROW and the safety concerns associated with those impacts. Continued presence of a traffic control officer to assist with traffic operations on the site should be a condition of approval, with the option for the applicant to return to the Planning Commission to request modification of that condition if it can be demonstrated that any modification of the condition will not adversely impact site operations or public safety.

10. The May 17, 2018 traffic study submitted on behalf of the applicant recommended that Scenario 2, which tested the possibility of a new median in Marshall Avenue adjacent to the site, be implemented, and submitted a concept plan for changes to the Marshall Avenue ROW to accommodate a new median and additional on-street parking. The feasibility of these changes have not been fully evaluated at this time, and action in regard to these proposed changes in the ROW is therefore not prudent at this time. However, reinstallation of collapsible tubes in the Marshall Avenue ROW on an interim basis to simulate a permanent median should be a condition of approval. The installation must be approved by the road authority for Marshall Avenue, understood to be Ramsey County or the State of Minnesota. The collapsible tubes will be removed on a seasonal basis to allow for snow removal, and will be permanently removed at such time as any significant reconfiguration of the Marshall Avenue ROW near the site is undertaken.

I. STAFF RECOMMENDATION:

Based on the findings above, the staff recommends approval of the amended site plan for the existing Starbucks coffee shop with drive-through sales at 234 Snelling Ave N., subject to the

following conditions:

1. The applicant will provide, at their expense, a traffic control officer to direct vehicular traffic on the site during the AM peak period. This condition may be modified in the future by the Planning Commission if the applicant can demonstrate that any modification will not adversely site operations or public safety.
2. Installation of collapsible tubes in the Marshall Avenue ROW, on an interim basis, to simulate the presence of a physical barrier in the median. The installation is not required if not approved by the road authority, which is understood to be either Ramsey County or the State of Minnesota. The collapsible tubes will be removed on a seasonal basis to allow for snow removal, and will be permanently removed at such time as any significant reconfiguration of the Marshall Avenue ROW near the site is undertaken.

CITY OF SAINT PAUL, MINNESOTA
(Conditional Use Permit)

ZONING FILE NO:	15-152-287
APPLICANT:	Ryan Companies US Inc.
PURPOSE:	Conditional use permit for drive-through sales (coffee shop) and variance of minimum floor area ratio
LOCATION:	234 Snelling Ave N
LEGAL DESCRIPTION:	PIN 032823220173, Boulevard Addition Pts Of Lots 1 And Lot 2 And Vac Alley In Cardigans Re And Pts Of Lots 9 Thru Lot 11 In Bushnells Re Of Blk 3 Blv Add Lying Nwly Of A L Desc Ascom At The Sw Cor Of Sd Cardigans Re Th N 0 Deg 3 Min 0 Sec W Along W L Of Sd Cardigans Re 148
ZONING COMMITTEE ACTION:	Recommended approval with conditions on Sept. 10, 2015
PLANNING COMMISSION ACTION:	Approved with conditions on September 18, 2015

CONDITIONS OF THIS PERMIT:
Standard conditions specified in Sec. 61.501; Sec. 65.513; and the following additional conditions:

1. Final plans approved by the Zoning Administrator for this use shall be in substantial compliance with the plan submitted and approved as part of this application.
2. Incorporation into the building and site design of horizontal and vertical elements that visually extend the building to encompass the proposed patio and seating area on the south side of the building and that visually enclose and separate said patio and seating area from the Snelling Avenue ROW.
3. Site plan approval.
4. Saint Paul Public Works review and approval of proposed use and site plan in regard to adequacy of drive-through stacking, ingress and egress, and pedestrian and cyclist safety, as evidenced by site plan approval.
5. The hours of operation of the drive-through service shall be no earlier than 5:30 am to no later than 10:00 pm.

APPROVED BY: Barbara Wencl, Commission Chairperson

I, the undersigned Secretary to the Zoning Committee of the Planning Commission for City of Saint Paul, Minnesota, do hereby certify that I have compared the foregoing copy with the original record in my office; and find the same to be a true and correct copy of said original and of the whole thereof, as based on minutes of the Saint Paul Planning Commission meeting held on September 18, 2015, and on record in the Saint Paul Planning Office, 25 West Fourth Street, Saint Paul, Minnesota.

This permit will expire two years from the date of approval if the use herein permitted is not established, subject to administrative extension not to exceed one year (§ 61.105). If one of the following occurs, the use herein permitted shall automatically expire: the use is established but subsequently is discontinued for 365 days or is replaced by another use, the lot area is reduced, or as otherwise provided in § 61.505.

The decision to grant this permit by the Planning Commission is an administrative action subject to appeal to the City Council. Anyone affected by this action may appeal this decision by filing the appropriate application and fee at the Zoning Office, 1400 City Hall Annex, 25 West Fourth Street. **Any such appeal must be filed within 10 calendar days of the date of the Planning Commission's decision.**

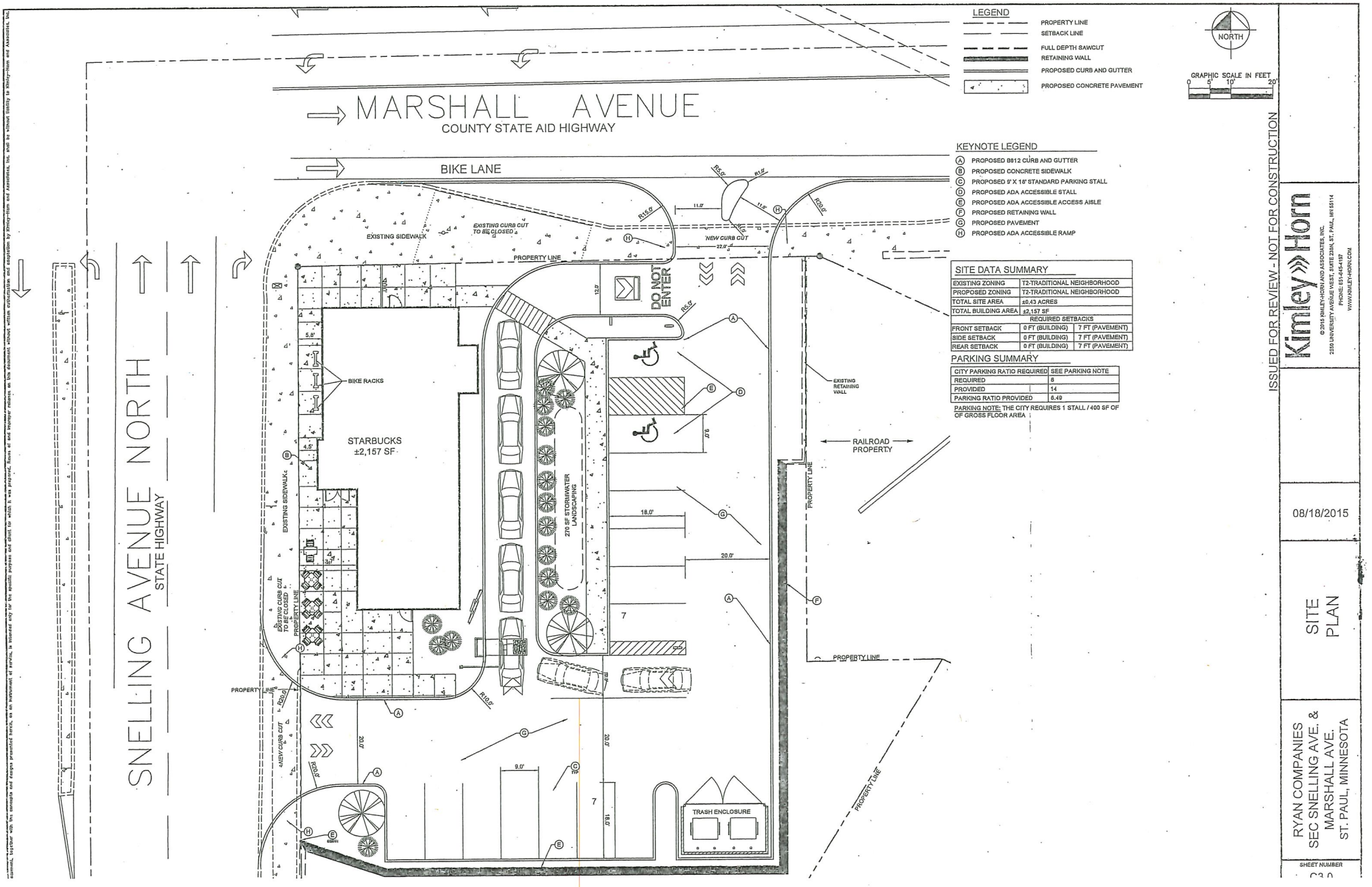
Violation of the conditions of this permit may result in its revocation.

Samantha Langer
Samantha Langer
Secretary to the Saint Paul
Zoning Committee

Copies to:
Ryan Companies US Inc., Kimley Horn and Associates, Inc., District Council 13

Mailed: September 18, 2015

ORIGINAL SITE PLAN



SITE DATA SUMMARY

EXISTING ZONING	T2-TRADITIONAL NEIGHBORHOOD
PROPOSED ZONING	T2-TRADITIONAL NEIGHBORHOOD
TOTAL SITE AREA	±0.43 ACRES
TOTAL BUILDING AREA	±2,157 SF

REQUIRED SETBACKS		
FRONT SETBACK	0 FT (BUILDING)	7 FT (PAVEMENT)
SIDE SETBACK	0 FT (BUILDING)	7 FT (PAVEMENT)
REAR SETBACK	0 FT (BUILDING)	7 FT (PAVEMENT)

PARKING SUMMARY

CITY PARKING RATIO REQUIRED	SEE PARKING NOTE
REQUIRED	8
PROVIDED	14
PARKING RATIO PROVIDED	6.49

PARKING NOTE: THE CITY REQUIRES 1 STALL / 400 SF OF OF GROSS FLOOR AREA

ISSUED FOR REVIEW - NOT FOR CONSTRUCTION

Kimley»Horn

2550 UNIVERSITY AVENUE WEST, SUITE 238N, ST. PAUL, MN 55114
PHONE: 651-645-4197
WWW.KIMLEY-HORN.COM

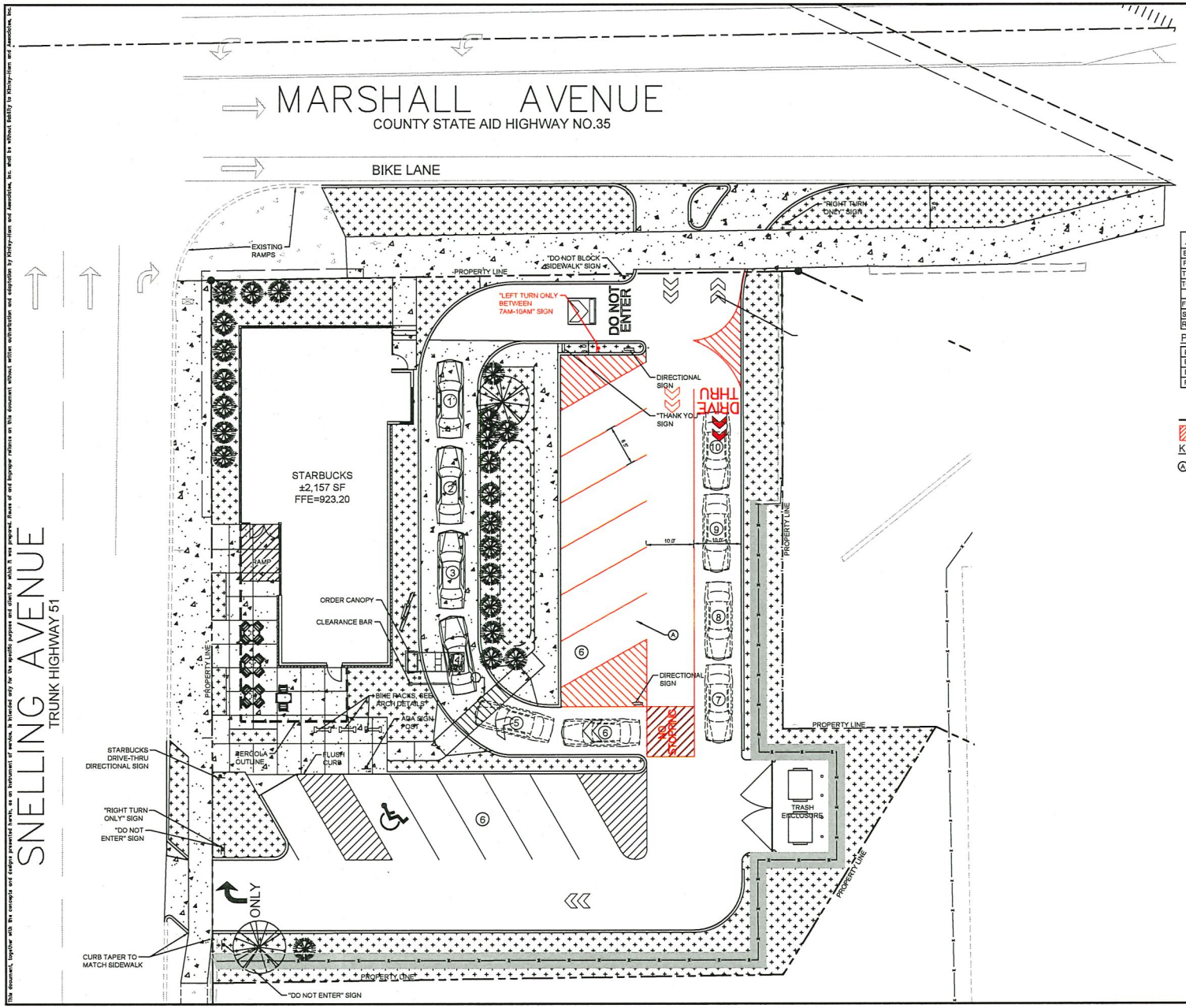
08/18/2015

SITE PLAN

RYAN COMPANIES
SEC SNELLING AVE. & MARSHALL AVE.
ST. PAUL, MINNESOTA

SHEET NUMBER
C3.0

INTERIM SITE PLAN



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PARKING SUMMARY	
REQUIRED	6
EXISTING	14
PROPOSED	12
PARKING RATIO PROPOSED	5.56

LEGEND

PROPERTY LINE

PROPOSED IMPROVEMENTS

KEYNOTE LEGEND

(A) PROPOSED 8.5' X 18' ANGLED PARKING STALL

Kimley»Horn

2550 UNIVERSITY AVENUE WEST, SUITE 238N, ST. PAUL, MN 55114
PHONE: 651-645-4197
WWW.KIMLEY-HORN.COM

DATE 10/17/17

PROPOSED INTERIM SITE PLAN PHASE 1

234 SNELLING AVE.
ST. PAUL, MINNESOTA

SHEET NUMBER C3.0A

K:\TWC_LDEV\NORR Architects\Starbucks – St. Paul, MN\3 Design\CAD\PlanSheets\NORR PLANS\C3.0A–Site Plan.dwg October 17, 2017 – 12:28pm

PD=
#=032823220173

City of Saint Paul Department of Safety & Inspections, 375 Jackson Street, Suite 220, Saint Paul MN 55101

SITE PLAN REVIEW APPLICATION

Date Application Received:

RECEIVED
JAN 31 2018
By: City of St Paul DSI

CK# 001851

Staff Use Only	
SPR File #	18-026074
Application Fee $	525
Staff Meeting Date:	3/20/18
City Agent:	TIA ANDERSON

Project Name:	Starbucks Traffic Improvements - Snelling and Marshall
Site Address: 234 Snelling Ave., St. Paul, MN, 55104	Property Identification Number: 032823220173
Project Description:	Modification of drive thru and parking lot and addition of street parking to improve traffic flow.

Provide (5) five Paper Copies 11x17 and an electronic PDF version (11x17 print format) of the complete Site Plan package including **certificate of survey, civil site plan, exterior architectural plan, and landscape plan.**

Project Summary

Est. Project Cost: $ 100,000 *(exclusive of land value)*	Est. Construction Start April 1, 2018	Proposed Land Use:
Parcel Area *[sq. ft.]* 18,638 SF	Disturbed Area *[sq. ft.]* 9,636 SF	☐ Residential ☐ Institutional ☐ Parking Only ☑ Commercial ☐ Industrial ☐ Mixed-Use ☐ Other
Floor Area Ratio .12	Building Gross Floor Area 2,157 SF	# Off-Street Parking Spaces 10
☐ Historic District/Property	☐ Flood Plain Property	☐ Steep Slope (>12%)

Residential Project Details

# Residential Units	# Affordable	% AMI for Affordable

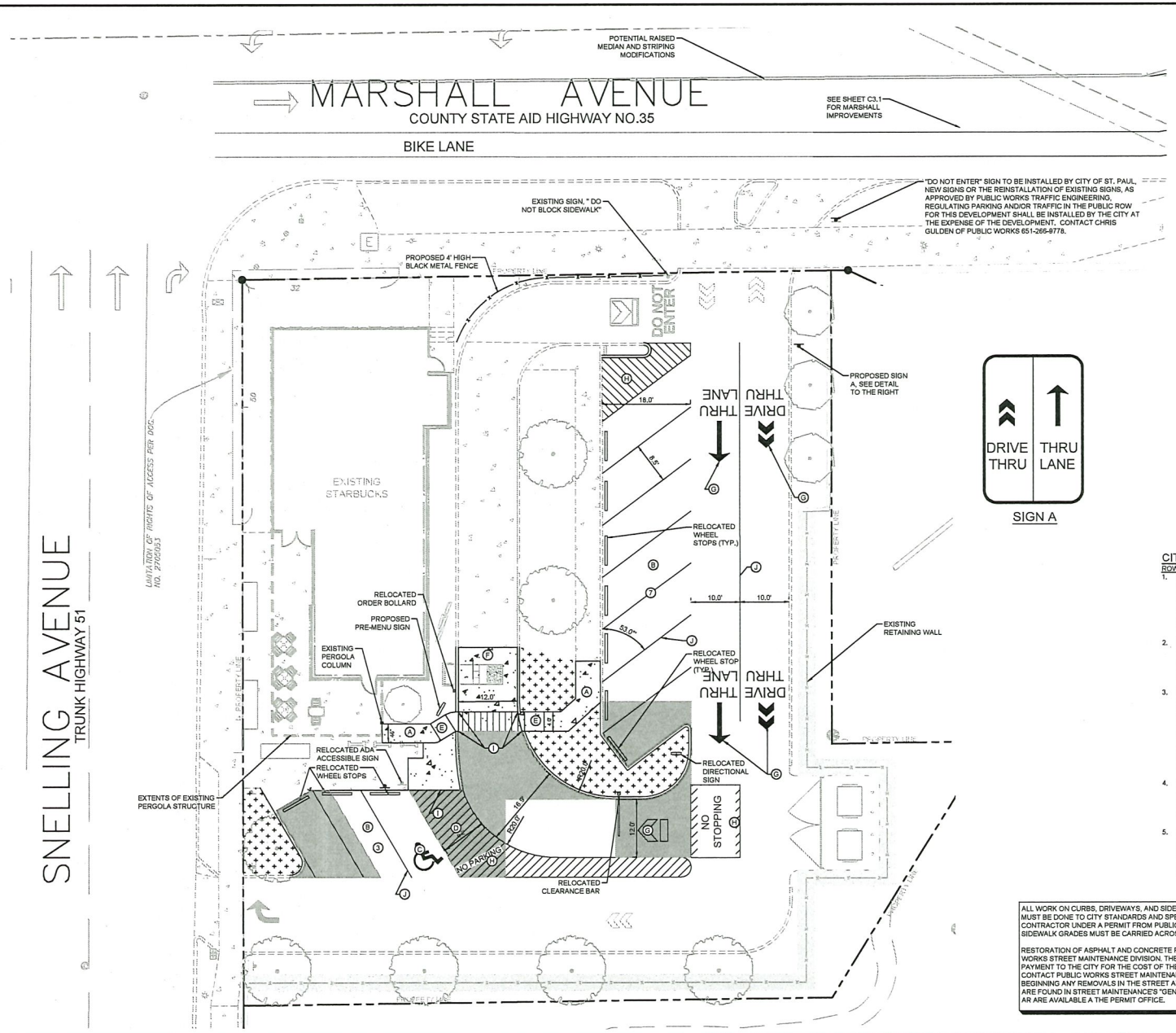
Applicant Information [Name, company, address, phone, e-mail]

Developer or Property Owner	Project Contact [PM, architect]	Construction Contact
Starbucks Coffee Company 564 W Randolph Street Chicago, IL 60661	Trisha Sieh Kimley-Horn and Associates 2550 University Ave W Suite 238N St Paul, MN, 55114 Direct: 651-643-0470 Cell: 540-449-9698	

Trisha Sieh
Signature

01/30/2018
Date

Staff Use Only			
Zoning District T2	Overlay Zoning District —		District Council 13
Ward 1	Watershed District		MnDOT or County COUNTY - MARSHALL STATE - SNELLING
☐ Parkland Dedication	☐ TDMP	☐ CUP Required	Previous SPR



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SIDE SETBACK	0 FT (BUILDING)	7 FT (PAVEMENT)
REAR SETBACK	0 FT (BUILDING)	7 FT (PAVEMENT)

PARKING SUMMARY	
CITY PARKING RATIO REQUIRED	SEE PARKING NOTE
REQUIRED	6
PROVIDED*	10
PARKING RATIO PROVIDED	4.64

PARKING NOTE: THE CITY REQUIRES 1 STALL / 400 SF OF OF GROSS FLOOR AREA
*NOTE: SIX ADDITIONAL "OFF-SITE" PARALLEL STALLS PROPOSED ALONG MARSHALL AVE

LEGEND

- PROPERTY LINE
- PROPOSED FENCING
- PROPOSED LANDSCAPING
- PROPOSED CONCRETE PAVEMENT
- PROPOSED PAVEMENT MARKING
- PROPOSED ASPHALT PAVEMENT
- PROPOSED CURB AND GUTTER

KEYNOTE LEGEND

- (A) PROPOSED CONCRETE SIDEWALK
- (B) PROPOSED 8.5' X 18' ANGLED PARKING STALL
- (C) PROPOSED ADA ACCESSIBLE STALL
- (D) PROPOSED ADA ACCESSIBLE ACCESS AISLE
- (E) PROPOSED ADA ACCESSIBLE RAMP
- (F) PROPOSED DRIVE THRU CONCRETE PAVEMENT
- (G) PROPOSED PAVEMENT MARKING
- (H) PROPOSED PAVEMENT STRIPING 45°, 4" YELLOW PAINT, 2' O.C.
- (I) FLUSH CURB
- (J) 4" SWSL

CITY OF ST. PAUL STANDARD NOTES

ROW NOTES

1. INSPECTION CONTACT: THE DEVELOPER SHALL CONTACT THE RIGHT OF WAY INSPECTOR DICK ROHLAND, 651-485-1688, (ONE WEEK PRIOR TO BEGINNING OF WORK) TO DISCUSS TRAFFIC CONTROL, PEDESTRIAN SAFETY AND COORDINATION OF ALL WORK IN THE PUBLIC RIGHT OF WAY, NOTE: IF A ONE WEEK NOTICE IS NOT PROVIDED TO THE CITY, ANY RESULTING DELAYS SHALL BE THE SOLE RESPONSIBILITY OF THE CONTRACTOR.
2. SAFE WORK SITE REQUIREMENTS: THE CONTRACTOR SHALL PROVIDE A CONTINUOUS, ACCESSIBLE AND SAFE PEDESTRIAN WALKWAY THAT MEETS ADA AND MN MUTCD STANDARDS IF WORKING IN A SIDEWALK AREA, AND TRAFFIC CONTROL PER MN MUTCD REQUIREMENTS FOR WORK IN THE PUBLIC RIGHT OF WAY.
3. NO PRIVATE FACILITIES IN THE RIGHT OF WAY: THE DEVELOPER IS STRICTLY PROHIBITED FROM INSTALLING PRIVATE ELECTRICAL WIRING, CONDUIT, RECEPTACLES AND/OR LIGHTING IN THE CITY'S RIGHT OF WAY. THIS INCLUDES STUBBING CONDUIT OR CABLE INTO THE PUBLIC RIGHT OF WAY TO ACCOMMODATE UTILITY FEEDS TO THE SITE. COORDINATE WITH EACH UTILITY PRIOR TO CONSTRUCTION TO DETERMINE FEED POINTS INTO THE PROPERTY. UTILITIES ARE RESPONSIBLE FOR SECURING EXCAVATION PERMITS TO RUN THEIR SERVICE INTO A SITE, AND (WHERE REQUIRED) SUBMITTING PLANS FOR REVIEW BY THE PUBLIC WORKS UTILITY REVIEW COMMITTEE.
4. WORK CONDUCTED ON STATE ROADWAYS, TRUNK HIGHWAYS OR RIGHT OF WAY MAY ALSO REQUIRE PERMITTING THROUGH MNDOT. MNDOT CONTACT IS BUCK CRAIG (651-234-7911), STATE AND CITY APPROVAL IS REQUIRED ON MNDOT ROADWAYS MAINTAINED BY THE CITY
5. ACCESS TO SIGNAL CONTROLLER AND LIGHTING CABINETS MUST BE MAINTAINED AT ALL TIMES - IF FENCING IS REQUIRED FOR A JOB SITE, A KEY OR OTHER MEANS OF ACCESS MUST BE PROVIDED TO THE CITY OF ST. PAULS TRAFFIC MAINTENANCE DEPARTMENT, CONTACT JOHN MCNAMARA, GENERAL FORMAN SIGNALS AND LIGHTING AT 651/266-9780.

ALL WORK ON CURBS, DRIVEWAYS, AND SIDEWALKS WITHIN THE PUBLIC RIGHT OF WAY MUST BE DONE TO CITY STANDARDS AND SPECIFICATIONS BY A LICENSED AND BONDED CONTRACTOR UNDER A PERMIT FROM PUBLIC WORKS SIDEWALK SECTION (651-266-6120). SIDEWALK GRADES MUST BE CARRIED ACROSS DRIVEWAYS.

RESTORATION OF ASPHALT AND CONCRETE PAVEMENTS ARE PERFORMED BY THE PUBLIC WORKS STREET MAINTENANCE DIVISION. THE CONTRACTOR IS RESPONSIBLE FOR PAYMENT TO THE CITY FOR THE COST OF THESE RESTORATIONS. THE CONTRACTOR SHALL CONTACT PUBLIC WORKS STREET MAINTENANCE TO SET UP A WORK ORDER PRIOR TO BEGINNING ANY REMOVALS IN THE STREET AT 651-266-9700. PROCEDURES AND UNIT COSTS ARE FOUND IN STREET MAINTENANCE'S "GENERAL REQUIREMENTS - ALL RESTORATIONS" AR ARE AVAILABLE A THE PERMIT OFFICE.

No.	REVISIONS	DATE	BY
2	ISSUE TO CITY	01/31/18	BRJ
1	ISSUE TO CITY	11/2/17	BRJ

Kimley»Horn
© 2017 KIMLEY-HORN AND ASSOCIATES, INC.
2550 UNIVERSITY AVENUE WEST, SUITE 238N, ST. PAUL, MN 55114
PHONE 651-645-4197
WWW.KIMLEY-HORN.COM

I HEREBY CERTIFY THAT THIS PLAN, SPECIFICATION, OR REPORT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MINNESOTA.

TRISHA SIEH
DATE 11/06/17 LIC. NO. 49548

KHA PROJECT
DATE 11/06/17
SCALE AS SHOWN
DESIGNED BY PJG
DRAWN BY PJG
CHECKED BY TDS

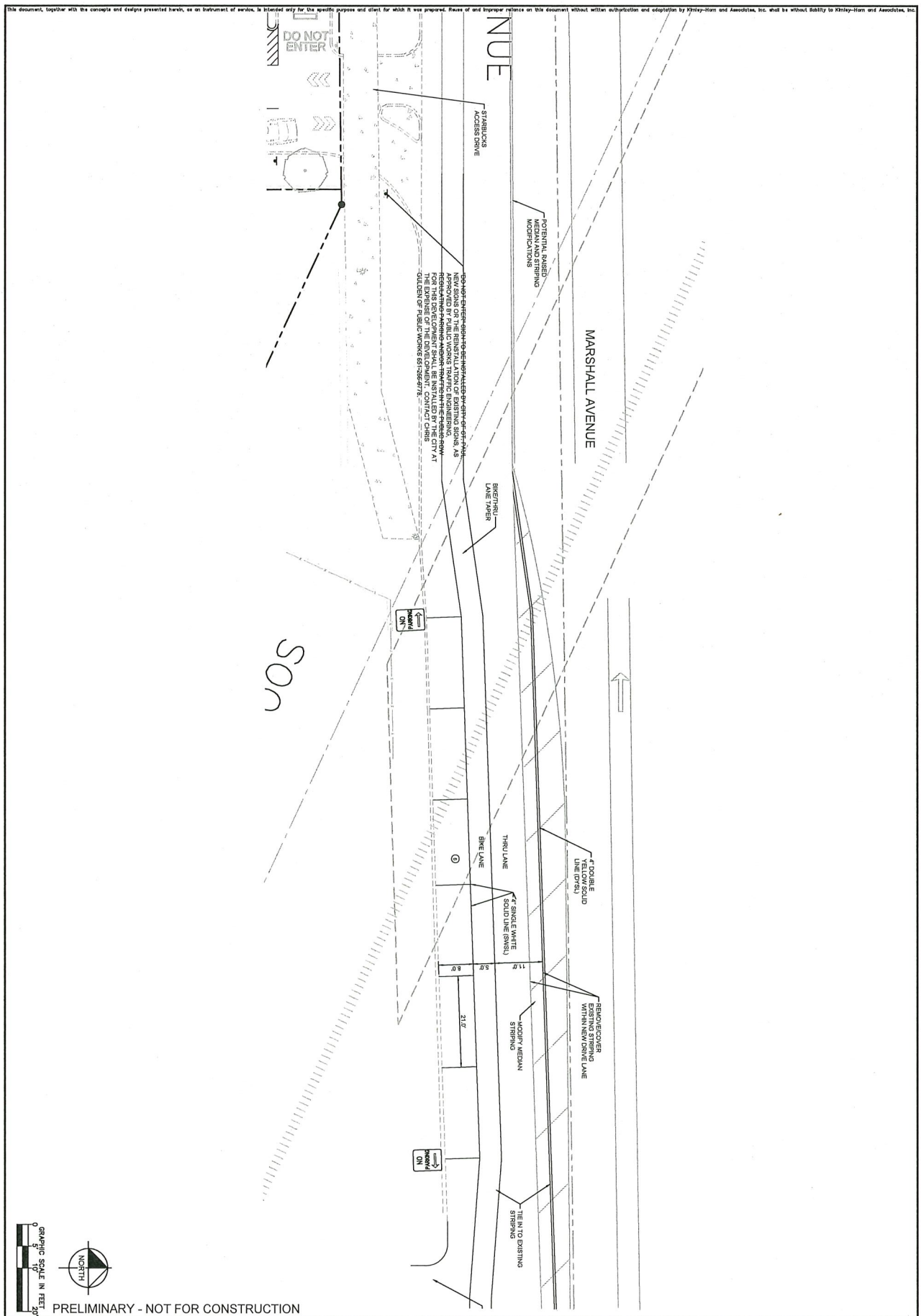
PRELIMINARY - NOT FOR CONSTRUCTION

SITE PLAN

STARBUCKS SITE IMPROVEMENTS
234 SNELLING AVE.
ST. PAUL, MINNESOTA

SHEET NUMBER
C3.0

K:\TWC_LDEV\NORR Architects\Starbucks – St. Paul, MN\3 Design\CAD\PlanSheets\2017 Plans\C3.0–Site Plan.dwg May 17, 2018 – 7:08am



PRELIMINARY - NOT FOR CONSTRUCTION

SHEET NUMBER C3.1	STARBUCKS SITE IMPROVEMENTS 234 SNELLING AVE. ST. PAUL, MINNESOTA	SITE PLAN - MARSHALL AVE	KHA PROJECT DATE 11/06/17 SCALE AS SHOWN DESIGNED BY PJG DRAWN BY PJG CHECKED BY TDS	I HEREBY CERTIFY THAT THIS PLAN, SPECIFICATION OR REPORT WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MINNESOTA. TRISHA SEH DATE: 11/06/17 MN LIC. NO. 49848	Kimley»Horn © 2017 KIMLEY-HORN AND ASSOCIATES, INC. 2550 UNIVERSITY AVENUE WEST, SUITE 238N, ST. PAUL, MN 55114 PHONE: 651-645-4197 WWW.KIMLEY-HORN.COM

No.	REVISIONS	DATE	BY
2	ISSUE TO CITY	01/31/18	BRJ
1	ISSUE TO CITY	11/2/17	BRJ

UNION PARK DISTRICT COUNCIL
161 Snelling Avenue North, Saint Paul, MN 55104
651.645.6887 | info@unionparkdc.org | www.unionparkdc.org
An Affirmative Action, Equal Opportunity Employer

November 21, 2017

Donna Drummond, Director of Planning, PED
Larry Zangs, Site Plan Review Coordinator, DSI
City of Saint Paul
25 West 4th Street
St. Paul, MN 55102

Dear Donna and Larry:

On November 20, the Union Park District Council Committee on Land Use and Economic Development discussed the Revised Site Plan, Amended Traffic Narrative, and Traffic Operations Summary submitted by Starbucks for its drive-through location at 234 North Snelling Avenue, along with input from City staff.

At that meeting, the Committee voted to endorsed the same resolution passed last week by the Union Park Transportation Committee. The language of that recommendation is provided below in full.

The Committee recommends denial of the Revised Site Plan. The proposed measures in the interim and long-term plans do not address the concerns of the community.

The Committee believes that the proposed additional queueing spaces on the site will **not be adequate** to meet the observed demand and therefore will not eliminate obstructions of the right-of-way caused by queuing vehicles.

Through their collective observations and numerous experiences with the site, Committee members and attendees agreed that there are frequently over three or four vehicles queueing within the public right-of-way—blocking the sidewalk, bicycle lane, and traffic lanes on Marshall and Snelling Avenues. Moreover, Starbucks' limited observations do not account for drivers who choose to avoid waiting in the queue completely, because there is simply no space left in the right-of-way to wait.

The Committee further believes that the anticipated vehicle movements in the interim plan are not manageable, and it urges the City to collect observational data on the functioning of the interim plan before approving the long-term plan.

In short, the Committee concluded that neither the interim nor the long-term plan provides adequate queuing space to meet the demand without obstruction the right-of-way, in a location where a drive-through poses serious safety concerns.

Through this resolution, the Committee is urging the City of Saint Paul to deny this Revised Site Plan and withdraw its Conditional Use Permit for operation of the drive-through.

Sincerely,

Julie Reiter

Julie Reiter, Executive Director
Union Park District Council

cc: Council President Russ Stark
Councilmember Dai Thao
Josh Williams, Senior Planner, PED
Tia Anderson, Senior Planner, DSI

UNION PARK DISTRICT COUNCIL
161 Snelling Avenue North, Saint Paul, MN 55104
651.645.6887 | info@unionparkdc.org | www.unionparkdc.org
An Affirmative Action, Equal Opportunity Employer

December 15, 2017

Donna Drummond, Director of Planning, PED
Larry Zangs, Site Plan Review Coordinator, DSI
City of Saint Paul
25 West 4th Street
St. Paul, MN 55102

Dear Donna and Larry:

At its regular meeting on December 6, 2017, the Union Park District Council Board voted to endorsed the resolutions related to the revised site plan for the Starbucks drive-through passed by its Transportation Committee on November 14 and its Committee on Land Use and Economic Development on November 21:

The Board recommends denial of the Revised Site Plan. The proposed measures in the interim and long-term plans do not address the concerns of the community.

It is our understanding that Starbucks will be submitting a second revised site plan to the City soon. The Board nonetheless passed this resolution to affirm that 1) the interim plan as it has been implemented **has not avoided** obstructions of the right-of-way, and 2) providing only a few additional queueing spaces on the site will **not be adequate** to meet the observed demand, and therefore will not eliminate obstructions of the right-of-way caused by queuing vehicles.

I urge the City to hold Starbucks to its obligation to avoid right-of-way obstruction as outlined in its Conditional Use Permit. If the conditions cannot be met, the permit for operation of the drive-through should be withdrawn.

Sincerely,

Julie Reiter

Julie Reiter, Executive Director
Union Park District Council

cc: Council President Russ Stark
Councilmember Dai Thao
Josh Williams, Senior Planner, PED
Tia Anderson, Senior Planner, DSI

Kimley»Horn

MEMORANDUM

To: David Kuebler, P.E. – City of Saint Paul Public Works
Josh Williams – City of Saint Paul PED

From: Douglas Arnold, P.E.
Trisha Sieh, P.E.

Date: May 17, 2018

Re: Traffic Analysis Summary
Starbucks (Snelling Avenue and Marshall Avenue)
Saint Paul, Minnesota

Introduction

A Conditional Use Permit for drive-through sales was issued in 2015 for the Starbucks building at 234 Snelling Avenue, with Site Plan approval following in May of 2016. Since store opening in February 2017, this Starbucks has outperformed the anticipates sales volumes and hence the store is experiencing more drive-through trips than expected. At certain times of the day, the drive-through queue has caused occasional back-ups onto Marshall Avenue. Additionally, some vehicles choose to exit left onto Marshall Avenue, which is not a permitted movement.

Starbucks and their project team have been actively and cooperatively working with the City since June 14, 2017, which has culminated in the submittal of the enclosed Site Plan Amendment. Starbucks has taken several actions to reduce the off-site backups and limit traffic congestion. The following memorandum provides a summary of actions taken to date, including interim site plan changes and access testing.

Coordination with City Staff

Starbucks have been very engaged with the City since the store has opened to help address the traffic concerns. Starbucks understands and acknowledges that the City and neighbors want, and deserve, to see improvements that will address the City and neighborhood's concerns and ensure a safe and inviting store for Starbuck's customers, the neighborhood, and public to enjoy.

The existing approved site plan for the property was driven by the site plan review standards under the City Code. During the initial development phase of the property, Starbucks proposed several drive-through and site designs that would have increased on-site queueing beyond the current site plan and minimized (or eliminated) spillback onto Marshall Avenue and any weaving conditions at the Marshall Avenue driveway. These design alternatives were ultimately rejected and the current site layout moved forward.

Starbucks is currently in compliance with the existing Conditional Use Permit (CUP) and Site Plan Review approvals. However, Starbucks is amendable to site plan modifications that will improve traffic on-site and on local streets, and has applied for the enclosed Site Plan Amendment in an effort to work collaboratively with the City.

Below is a timeline of actions taken by Starbucks and the City to improve site operations since store opening in February 2017:

August 2017

- City installed tube delineators to protect the on-street bike lane, at Starbucks expense.
- Starbucks hired an off-duty police officer to control traffic during peak morning hours, entirely at Starbucks expense.
- Starbucks increased staffing to ensure drive-through window times were lower than system average, thereby increasing efficiency of the drive-through and reducing potential back-ups.

September 2017

- Starbucks commissioned a traffic study to evaluate the current site queueing operations and assess how potential site configurations would affect traffic patterns.
- Starbucks developed several site plan options for both interim and longer term solutions.
- On September 29th, Starbucks and Kimley-Horn met with City staff from PED, PW, and DSI to discuss the results of the traffic study, and evaluate interim and longer term solutions to resolve traffic issues. Additional analysis was requested by the City.

October 2017

- On October 19th, Starbucks submitted an Interim Site Plan to the City for approval.

November 2017

- On November 2nd, Starbucks submitted a revised final Site Plan Amendment package, including additional site plan traffic modeling requested by City staff.
- On November 6th, Starbucks began implementing some of the Interim Site Plan improvements by restriping the eastern parking row from 90 degrees to angled parking to create one way circulation and dedicated drive-through queue lane.
- On November 30th, Starbucks and Kimley-Horn met with PED, PW, and DSI staff to discuss additional modeling and revised site plan. Starbucks agreed to provide further additional modeling.

December 2017

- On December 18th, Starbucks installed the traffic control signage as part of the Interim Site Plan improvements.

January 2018

- On January 8th, Starbucks submitted a revised Site Plan Amendment along with additional modeling requested by City staff.
- On January 17th, Starbucks and Kimley-Horn met with PED, PW, and DSI staff to discuss additional modeling and alternative site plan modifications. Starbucks agrees to provide further analysis of vehicle movements.
- On January 25th, Starbucks withdrew the Site Plan Amendment application with intent to resubmit.
- On January 31st, Starbucks submitted a revised final Site Plan Amendment package, with the intent to supplement with additional modeling.

As a result of the January 31st Site Plan Amendment package submittal, Starbucks and Kimley-Horn worked with City staff to develop a plan to test different access configurations on site, including testing the closure of the Marshall Avenue access and testing a temporary median along Marshall Avenue. In coordination with the City, two access scenarios were tested; Scenario 1 consisted of closing the Marshall Avenue exit, resulting in all traffic forced to exit onto Snelling Avenue, and Scenario 2 consisted of installing bollards along Marshall Avenue to prohibit left-turn into and out of the site along Marshall Avenue (simulating a raised center median on Marshall Avenue), while maintaining the right-turn exit onto Marshall Avenue. Following provides a timeline of the access alternative testing, where each test had a two-week period to allow traffic to normalize to the new circulation pattern, and one week of observations:

Scenario 1

- Temporary traffic control set-up from March 19, 2018 through April 8, 2018.
- Video recording and observations from April 4, 2018 through April 8, 2018.

Scenario 2

- Temporary traffic control set-up from April 9, 2018 through April 28, 2018.
- Video recording and observations from April 3, 2018 through April 28, 2018.

More detailed information on the previous traffic studies, as well as an in-depth analysis of the scenario testing is provided later in this memo.

Summary of Previous Traffic Analysis (2017)

As previously mentioned, a traffic analysis was performed in the fall of 2017 to quantify site operating conditions, including the amount of traffic generated by the site, the drive-through operations, and drive-through vehicle queueing and how that was impacting operations along Marshall Avenue. Following is a summary of the November 2017 analysis:

- The site generated approximately 160 AM peak hour trips (80 entering and 80 exiting). All traffic entered the site from Marshall Avenue, while approximately 65% of the traffic exited the site to Marshall Avenue and 35% of the traffic exited the site to Snelling Avenue.

- The site accommodated approximately nine (9) vehicles on site.
- The maximum drive-through queue was observed to be twelve (12) vehicles with an average queue of seven (7) vehicles.
- There were approximately ten (10) events from 7:00 AM to 9:00 AM where the drive-through queue spilled back onto Marshall Avenue.

An addendum to the November 2017 traffic memo was submitted to the City on January 8, 2018 to assess the site circulation as a result of the Interim Site Plan changes. The supplemental analysis reviewed vehicle circulation, number of trips generated by the site, and queueing. Following is a summary of the January 2018 analysis:

- The site generated approximately 180 AM peak hour trips (90 entering and 90 exiting). All traffic entered the site from Marshall Avenue, while approximately 70% of the traffic exited the site to Marshall Avenue and 30% of the traffic exited the site to Snelling Avenue.
- The maximum drive-through queue was observed to be eleven (11) vehicles.

Both memos are provided as an **Attachment**.

Access Alternatives Testing (2018)

As previously mentioned, in coordination with the City, Starbucks tested two access scenarios. Video data was recorded, in conjunction with multiple field observations, in order to analyze the two scenarios. The City of Saint Paul independently recorded video and analyzed drive-through operations for both access scenario tests.

The following section provides an in-depth summary of the two access scenarios that were tested in the Spring of 2018.

Field Observations

- *Scenario 1 (Closure of Marshall Avenue Exit)*
  - There was a lot of confusion when the test was first implemented since all traffic was forced to exit onto Snelling Avenue.
  - After the first day of implementing the access test, a second officer was added to help control traffic on site.
  - A number of vehicles were observed to exit onto Marshall Avenue from the entry lane.
  - There were times where the exit queue at Snelling Avenue approach the drive-through entry.
  - During the observation period (04/02 through 04/06), there was a snow storm event on the Tuesday that impacted afternoon business and morning business on Wednesday.
  - The site was able to accommodate a maximum of ten (10) vehicles, with some instances where eleven (11) vehicles were queued on site.
  - Based on discussion with Starbucks store staff, a slight decrease in sales was observed during this testing period.

- *Scenario 2 (Median along Marshall Avenue)*
  - Observations showed that on site circulation was generally better because exiting vehicles had a choice to exit onto Snelling Avenue or Marshall Avenue, similar to existing conditions.
  - One police officer was on-site to control traffic.
  - A few vehicles were observed to enter the site from westbound Marshall Avenue through the exit lane.
  - The exit queue onto Snelling Avenue never approached the drive-through entry.
  - The site could accommodate a maximum of ten (10) vehicles, with some instances where eleven (11) vehicles were queued on site.
  - Based on conversations with St. Paul police that were assigned to traffic control, Scenario 2 operated better and more efficiently as compared to Scenario 1.
  - Based on discussion with Starbucks store staff, customers were more receptive to Scenario 2 than Scenario 1.

AM Peak Hour Traffic Volumes

Turning movement counts were performed during the Friday AM peak period to determine the number of vehicle entering and exiting the Starbucks development. Counts were performed for both scenarios.

Based on the counts, there were a total of 100 vehicles entering the site from eastbound Marshall Avenue and 95 vehicles exiting onto Snelling Avenue for Scenario 1. For Scenario 2, there were 110 vehicles entering the site from eastbound Marshall Avenue, 45 vehicles exiting onto Snelling Avenue, and 70 vehicles exiting onto Marshall Avenue. Based on the traffic counts, the site accommodated more traffic during the Friday AM peak hour during Scenario 2 testing (110 vehicles) as compared to Scenario 1 testing (100 vehicles).

In order to provide some level of comparison, traffic counts were collected in December 2017 after the interim site plan changes were implemented. Based on those traffic counts, there were a total of 90 vehicles entering the site from eastbound Marshall Avenue, 30 vehicles exiting onto Snelling Avenue, and 60 vehicles exiting onto Marshall Avenue.

Drive-Through Vehicle Queues

Drive-through queues were quantified during the Friday AM peak period (7:00 AM to 10:00 AM), which is traditionally the busiest day of the week for Starbucks. Queue information was recorded for one minute intervals during the three-hour period, April 6th for Scenario 1 and April 27th for Scenario 2. These queues were quantified to determine the maximum amount of vehicle storage on site that is needed to accommodate the drive-through queues. Based on field observations, the maximum number of vehicles able to queue on site without impacting Marshall Avenue was ten (10) vehicles, with eleven (11) vehicles stored on site a portion of the time. This is an improvement from the nine (9) vehicles that were previously observed to stack on site before the Interim Site Plan changes were in place.

Table 1 provides a summary of the maximum, average, and 95th percentile queues, reported as the number of vehicles. Based on the analysis of the Friday AM peak period, Scenario 1 resulted in a longer queue as compared to Scenario 2. For Scenario 1, the 95th percentile queue was twelve (12) vehicles, whereas the 95th percentile queue for Scenario 2 was nine (9) vehicles.

Table 1: Drive-Through Queue Summary (# of Vehicles)

Time Period	Scenario 1 (Closure of Marshall Avenue Exit)			Scenario 2 (Restricted Marshall Avenue Exit)		
	Avg.	Max	95th	Avg.	Max	95th
7:00 AM to 8:00 AM	7	14	13	6	11	9
8:00 AM to 9:00 AM	6	10	10	6	10	9
9:00 AM to 10:00 AM	9	15	13	7	9	9
7:00 AM to 10:00 AM	8	15	12	6	11	9

As a comparison to the traffic data collected in December 2017, Scenario 1 resulted in a longer maximum queue (fifteen (15) vehicles vs. eleven (11) vehicles), while Scenario 2 resulting in a shorter maximum queue (nine (9) vehicles vs. eleven (11) vehicles). It should be noted that the average and maximum queue was lower as part of Scenario 2 even though it generated more trips during the AM peak hour than Scenario 1.

Marshall Avenue Queue Spillback

A more thorough analysis was performed to quantify the number of times that the drive-through queue exceeded the existing on-site storage and impeded operations of eastbound vehicle and bicycle traffic along Marshall Avenue. For Scenario 1, the queue spillback was reviewed from 7:00 AM to 10:00 from Monday, April 2, 2018 through Friday, April 6, 2018. For Scenario 2, the queue spillback was reviewed from 7:00 AM to 10:00 from Monday, April 23, 2018 through Friday, April 27, 2018.

There was a major snow storm event in Saint Paul during the afternoon/evening of Tuesday, April 3rd that impacted the morning commute on Wednesday, April 4th during the Scenario 1 testing. Wednesdays are generally a slower day of the week for Starbucks sales. Therefore, Wednesday was excluded in order to provide an accurate comparison of the two scenarios.

Table 2 provides a summary of the number of spillback events, and total blockage time, for each of the two scenarios. As shown, the number of spillback events and the total duration of the spillback events were more for Scenario 1 as compared to Scenario 2. The 95th percentile queue on Marshall Avenue was longer for Scenario 1 as compared to Scenario 2 (four (4) vehicles vs. three (3) vehicles).

Table 2: Summary of Marshall Avenue Queue Spillback Events

Time Period (7:00 AM to 10:00 AM)	Scenario 1 (Closure of Marshall Avenue Exit)				Scenario 2 (Restricted Marshall Avenue Exit)			
	# of Events	Total Duration (seconds)	Avg. Time per Event (seconds)	95th Queue (# of vehicles)	# of Events	Total Duration (seconds)	Avg. Time per Event (seconds)	95th Queue (# of vehicles)
Mon (04/02, 04/23)	3	406	135	5	8	494	62	3
Tues 04/03, 04/24)	6	161	27	2	9	551	61	3
Thurs (04/05, 04/26)	2	120	60	3	1	22	22	1
Fri (04/06, 04/27)	13	1,279	98	3	2	130	65	3
Total	24	1,966	82	4	20	1,197	60	3

Note: Wednesday was excluded from the summary due to the snow storm on 04/04.

As part of the spillback analysis, the impacts to the bike lane were summarized. Due to the fact that Scenario 1 was performed during winter conditions, there was minimal bicycle activity along Marshall Avenue. For Scenario 2, there were eight (8) events over the course of the week where a bike was travelling along Marshal Avenue and the bike lane was blocked by a queued vehicle.

Snelling Avenue Exit Queues

Vehicle queues exiting onto Snelling Avenue were quantified during the Friday AM peak period (7:00 AM to 10:00 AM) for both access scenarios. Queues were recorded on a Friday since that is traditionally the busiest day for Starbucks. Queues were reported for each one minute interval from 7:00 AM to 10:00 AM for April 6, 2018 for Scenario 1 and April 27, 2018 for Scenario 2.

These queues were quantified to determine if the additional vehicle demand on the Snelling Avenue would result in vehicle queues that would impact the drive-through operations. **Table 3** provides a summary of the Snelling Avenue exit queues and includes the average queue, maximum queue, and 95th percentile queue (all recorded as the number of vehicles). Although the average queue was less than one (1) vehicle for both scenarios, the maximum queue observed was longer for Scenario 1 as compared to Scenario 2 (five (5) vehicles vs. four (4) vehicle) and the 95th percentile queue was slightly higher for Scenario 1 as compared to Scenario 2 (three (3) vehicles vs. two (2) vehicles).

Table 3: Summary of Snelling Avenue Exit Queues (# of Vehicles)

Time Period	Scenario 1 (Closure of Marshall Avenue Exit)			Scenario 2 (Restricted Marshall Avenue Exit)		
	Avg.	Max	95th	Avg.	Max	95th
7:00 AM to 8:00 AM	< 1	5	2	< 1	2	1
8:00 AM to 9:00 AM	1	4	3	< 1	3	1
9:00 AM to 10:00 AM	< 1	4	2	< 1	4	2
Total (Morning Peak Period)	< 1	5	3	< 1	4	2

There is currently 125 feet of storage space on-site from Snelling Avenue to the start of the drive-through. There were occasions during Scenario 1 where the queue exiting onto Snelling Avenue approach the drive-through, which had the potential to create gridlock on site.

Summary of Access Alternatives Testing

Following provides a summary of the access testing:

- The AM peak hour trip generation was approximately 10% higher for Scenario 2 as compared to Scenario 1.
- The drive-through queues were longer for Scenario 1 as compared to Scenario 2. The 95th percentile queue was twelve (12) vehicles for Scenario 1 and nine (9) vehicles for Scenario 2.
- There were more queue spillback events onto Marshall Avenue during Scenario 1 as compared to Scenario 2, and the total duration and maximum number of vehicles queued was also greater in Scenario 1.
- With Scenario 1, there was potential that the queue for exiting vehicles onto Snelling Avenue to impact entry into the drive-through.
- Although the number of vehicles entering the site during the AM peak hour for Scenario 2 was higher than Scenario 1 (110 vehicles vs. 100 vehicles), the drive-through queue was shorter for Scenario 2 as compared to Scenario 1.

Based on the information provided above, Scenario 2 performed better than Scenario 1. Starbucks will work with the City and County to implement median modifications along Marshall Avenue to improve site operations.

On-Site Mitigation Considerations

Working with the City, Starbucks has developed a revised site plan that addresses operational deficiencies that are occurring on-site. These improvements build upon the Interim Site Plan improvements that have already been implemented, and are in addition to the proposed median modifications described above. The major change will be to extend the drive-through to the south to provide more on-site storage of queueing vehicles. With the changes, it is anticipated that an additional two vehicles will be able to queue on site, which brings the total vehicle storage on site to twelve (12) vehicles, with an additional space between the sidewalk and the roadway.

The access testing showed that the during the Friday AM peak hour, the maximum queue for Scenario 2 (preferred scenario) was eleven (11) vehicles while the 95th percentile queue was nine (9) vehicles. Based on this information, the proposed site plan changes that will provide storage of twelve (12) will accommodate the Scenario 2 observed queues.

With the extension of the drive-through, there is approximately 100 feet of storage for vehicles exiting onto Snelling Avenue before the queue would begin to impact operations of the drive-through. Based on the analysis for Scenario 2, the maximum exit queue onto Snelling Avenue is not anticipated to impact entry into the drive-through.

Conclusions

Starbucks has worked extensively with the City of Saint Paul over the last nine months to develop solutions that minimize the impacts of the on-site operations on the public roadway network. As a result of the access testing, it is recommended that Scenario 2 be implemented. Furthermore, with the proposed site plan changes that will increase on-site storage, the drive-through queue is not expected to impact bicycle and vehicle operations along Marshall Avenue.

ATTACHMENTS

A. Previous Traffic Studies
B. Drive-Through Queue Summary
C. Snelling Avenue Exit Queue Summary
D. Marshall Avenue Spillback Summary

Kimley»Horn

ATTACHMENT A:
Previous Traffic Studies

Kimley»Horn

MEMORANDUM

To: David Kuebler – City of Saint Paul Public Works
Josh Williams – City of Saint Paul PED

From: Douglas Arnold, P.E. and Trisha Sieh, P.E.
Kimley-Horn and Associates, Inc.

Date: November 2, 2017

Re: Traffic Operations Summary - Starbucks (Snelling Avenue and Marshall Avenue)
Saint Paul, Minnesota

Executive Summary

A 2,150 square foot Starbucks coffee shop with drive-through was constructed on the southeast corner of Snelling Avenue & Marshall Avenue in 2016. Since opening, the store has been outperforming market projections. As a result, there are instances throughout the day where the available drive-through vehicle queue storage on site is unable to accommodate the vehicle demand. Field observations were performed on Friday, August 25, 2017 to review existing drive-through operations. Based on the review, there average vehicle queue was seven (7) vehicles during the morning peak hour, with a maximum vehicle queue of twelve (12) vehicles. The current site can accommodate up to eight (8) to nine (9) vehicles on site.

As a result of the drive-through operations, Starbucks and Kimley-Horn have been working with City staff to make modifications to the site layout to provide more on-site storage and eliminate queueing on the adjacent public roadway network. Following provides a summary of the proposed site plan changes:

- **Proposed Interim Site Plan** – Restripe the parking spaces and drive-aisle on the east side of the site to angled parking to create one way site circulation, improve parking maneuvering times, and allow for a dedicated drive-through queue lane on the far east side of the site. With these changes, the site will be able to accommodate ten (10) vehicles with single lane stacking and fourteen (14) vehicles with double stacking.

- **Proposed (long-term) Site Plan** – In addition to restriping the parking spaces and drive-aisle on the east side of the site, the drive-through queue lane will be extended further south to provide more stacking. With the proposed long term site plan changes, the site will be able to accommodate eleven (12) vehicles on site with single lane stacking, removing impacts to the public roadway system. Six (6) parking stalls on the south side of Marshall, east of the Starbucks driveway entrance would be stripped.

Introduction

A 2,150 square foot Starbucks coffee shop with drive-through was constructed on the southeast corner of Snelling Avenue & Marshall Avenue in 2016. Since opening, the store has been outperforming market projections. As a result, there are instances throughout the day where the available drive-through vehicle queue storage on site is unable to accommodate the vehicle demand.

Starbucks representatives have been working closely with City of Saint Paul staff to design and implement changes to the site layout to minimize the impact of site generated traffic on the public roadway network.

Based on scoping discussions with City staff, Kimley-Horn has prepared a traffic technical memorandum. The purpose of the memo is to summarize existing operating conditions of the Starbucks restaurant and the signalized intersection of Snelling Avenue & Marshall Avenue, as well as provide justification for the proposed changes to the site layout.

Existing Conditions

Existing operating conditions of the Starbucks coffee shop and surrounding roadway network was reviewed on Friday, August 25, 2017. This included site observations during the AM peak period, turning movement counts and capacity analysis at the intersection of Snelling Avenue & Marshall Avenue, and a summary of drive-through vehicle queueing and processing time.

Based on information provided by Starbucks, Fridays are historically the busiest day. **Table 1** provides a summary of drive-through customer occasions through September 2017. As shown in the table, the site generates +/- 70% more traffic on a Friday than the average day during the morning peak period. The historical Friday peak drive-through customer occasions are consistent with what was observed on Friday, August 25, 2017.

TABLE 1: DRIVE-THROUGH OCCASIONS

Time Period	*Average Morning Peak Period Drive-Through Customer Occasions (Year 2017)*	*Friday Morning Peak Period Drive-Through Customer Occasions (Year 2017)*
6:00 AM to 7:00 AM	21	37
7:00 AM to 8:00 AM	33	64
8:00 AM to 9:00 AM	36	60
9:00 AM to 10:00 AM	35	58
10:00 AM to 11:00 AM	30	48
Total (Morning Peak Period)	155	267

Existing Observations

Site observations were performed during the AM peak period (7:00 AM to 9:00 AM) on Friday, August 25, 2017. Following provides a summary of the observations.

- For the most part, vehicles did not block the sidewalk when the queues reached the south end of the parking lot.
- There were instances where the drive-through queue spilled back into Marshall Avenue. When that occurred, vehicles would queue in the existing bike lane allowing for eastbound traffic to continue along Marshall Avenue. The maximum number of vehicles queued on the roadway as three during the AM peak period.
- The layout of the parking lot, in particular the 90 degree parking spaces, caused interruptions to the drive-through operations when motorists pulled into and/or out of those parking spaces along the east side of the building.
- A number of vehicles leaving the drive-through proceeding to leave the site via Marshall Avenue by making a northbound left-turn movement, which is prohibited based on current signing.

On Site Drive-Through Operations

Kimley-Horn collected drive through data on Friday, August 25, 2017 during the AM peak period (7:00 AM to 9:00 AM) which is anticipated to be the busiest time for the drive-through. Information collected includes processing time and vehicle queue lengths.

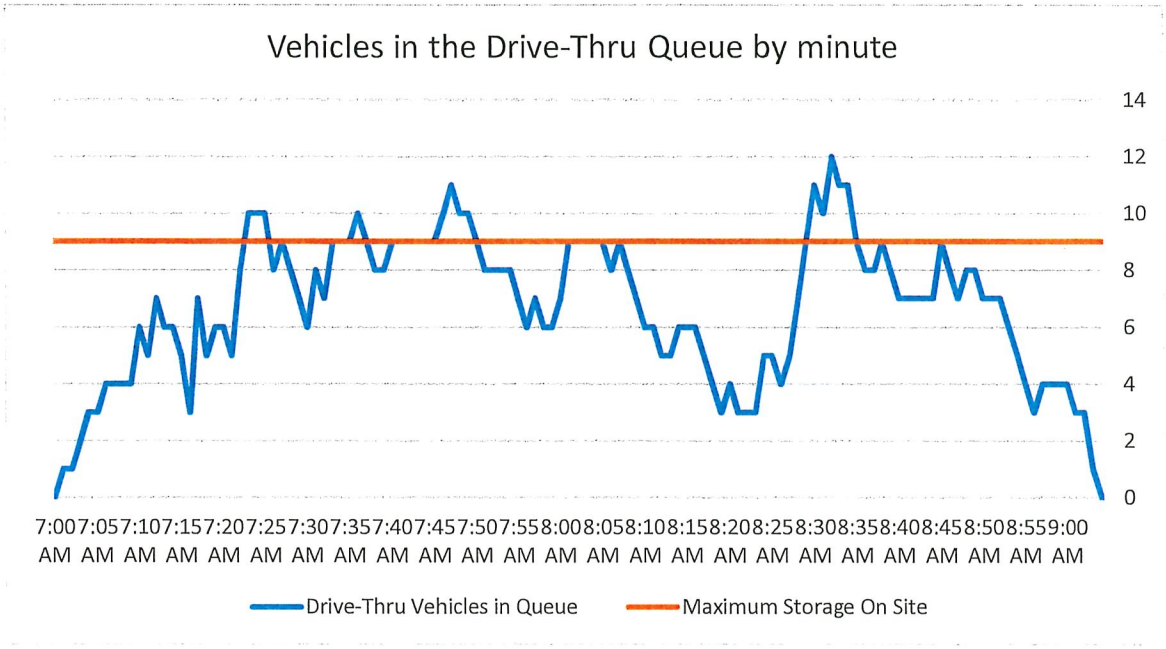
Processing Time

Data was collected that quantified the time it took to process an order, which was assumed to be from when a vehicle arrived at the order board to when the same vehicle left the pickup window. Based on the data collected, **the average processing time was approximately 2 minutes and 45 seconds**. The minimum processing time was 1 minute and 21 seconds and the maximum processing time was 4 minutes and 47 seconds. A table is provided as an attachment that provides the processing time for each vehicle that used the drive-through during the AM peak period.

Based on discussion with Starbucks staff, one way to improve processing time is to provide more storage between the order board and the pick-up window. Currently there is enough space to allow for approximately four vehicles. Based on previous experience at existing stores, optimal storage is for five vehicles.

Drive-Through Vehicle Queue

The vehicle queue for the drive-through was measured every minute during the two-hour AM peak period. The following graph shows a visual representation of how the vehicle queue varied during the AM peak period.



Based on the data collected, the maximum queue observed was twelve (12) vehicles, with the average queue being seven (7) vehicles. Currently, the site provides enough storage for eight (8) vehicles on site without impacting the operations of the Marshall Avenue (including the bike lane sidewalk on the southside of the roadway), which is typically sufficient for Starbuck's projected operations. This Starbucks café is out-performing projections and, based on the data collected, is generating approximately 10% more drive-through traffic than typical.

Intersection Operations at Snelling Avenue & Marshall Avenue

Intersection turning movements were collected at the intersection of Snelling Avenue & Marshall Avenue on Thursday, September 7, 2017 during the AM and PM peak periods. These counts include traffic generated by the Starbucks development. **Table 1** provides a summary of the AM and PM peak hour turning movement volumes. The turning movement volumes are provided as an attachment.

TABLE 1: EXISTING TURNING MOVEMENT VOLUMES (SEPT 2017)

Peak Hour	Northbound			Southbound			Eastbound			Westbound		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
AM	50	1,485	65	50	1,025	150	290	210	50	50	265	125
PM	60	1,105	110	45	1,415	175	180	395	95	135	325	70

Using Synchro/SimTraffic, the intersection was analyzed to determine overall intersection delay and level of service with the Starbucks traffic during normal weekday conditions. Additionally, the westbound approach was analyzed further to determine the 95th percentile queue lengths for the through and left-turn movements. **Table 2** provides a summary of the capacity analysis. Based on the SimTraffic results, the intersection is operating at LOS D during the AM and PM peak hours and all individual movements are operating at LOS E or better during the AM and PM peak hours.

TABLE 2: EXISTING CONDITIONS CAPACITY ANALYSIS SUMMARY

PK HR	Northbound (Delay/LOS)			Southbound (Delay/LOS)			Eastbound (Delay/LOS)			Westbound (Delay/LOS)		
	LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
AM	62.0/E	58.6/E	44.9/D	36.6/D	25.2/C	11.1/B	59.4/E	30.2/C	11.6/B	26.8/C	41.7/D	20.9/C
	58.2/E			23.9/C			44.3/D			34.2/C		
	44.9/D											
PM	43.8/D	24.9/C	16.6/B	45.2/D	33.4/C	20.3/C	51.6/D	56.2/E	34.8/C	62.0/E	57.7/E	22.7/C
	25.1/C			32.3/C			52.0/D			54.3/D		
	41.6/D											

Mitigation Plan

Kimley-Horn, working with Starbucks staff, have developed two revised site plans that help in addressing the current operational concerns of the development; an interim plan and a long-term plan. The first plan can be implemented with only some striping modifications and is proposed to be completed within two (2) to three (3) weeks from City approval. The second plan, the long-term solution, will require reconstruction of the parking lot and is anticipated to be completed within six (6) to nine (9) months, pending weather conditions and City approvals. Both plans are attached to this memorandum.

Proposed Interim Site Plan

The interim plan proposes to restripe the parking spaces along the east side of the building from 90 degree to angled. This will allow for quicker entering and exiting of the parking space, which in return will reduce the impact of the drive-through operations. This will result in a loss of two (2) parking spaces onsite. Onsite parking is still in excess of minimum City code requirement.

Striping will be provided to guide entering vehicles to queue for the drive-through along the far east drive aisle. This will provide a drive aisle between the parking spaces and the drive-through queue, which at peak times could serve as additional queue storage, essentially creating a dual lane drive-through. Upon exiting the drive-through, all vehicles will be guided (through signage) to exit the site via Marshall Avenue eastbound.

With these changes, it is anticipated that the site can store up to ten (10) vehicles when utilizing the single drive-through lane, and up to fourteen (14) vehicles when utilizing the dual lane drive-through.

Proposed (long-term) Site Plan

In addition to the restriping of the interim modifications above, the long-term plan proposes to shift the drive-through queue further south to provide more on-site storage. With the new drive-through layout, the site can be expected to provide twelve (12) vehicle storage on site.

Overall, the site will provide ten (10) spaces with the proposed changes, which is a reduction of four (4) spaces total. In order to make up the loss of on-site parking spaces, Starbucks is proposing to provide up to six (6) on street public parking spaces along the south side of Marshall Avenue, east of the site driveway. The public on street parking on Marshall Avenue can be added without modifying or affecting the westbound lane striping.

Summary

Starbucks has been working closely with the City of Saint Paul to come up with solutions to the current over-performing operating conditions. Plans have been developed as part of this process to provide additional on-site storage of queueing drive-through vehicles.

Based on the site observations and data collection, the maximum drive-through queue was twelve (12) vehicles. With the proposed changes to the site layout, it can be expected that all twelve (12) vehicles will have the ability to queue on site without impacting the operations of Marshall Avenue.

Attachments

- Turning Movement Data
- Time on Site Data
- Processing Time Data
- Proposed Interim Site Plan
- Proposed Site Plan

Kimley-Horn : Lisle (IL)
1001 Warrenville Road, Suite 350

Lisle, Illinois, United States 60532
331.481.7332 Morgan.hoxsie@kimley-horn.com

Count Name: 1_Snelling Avenue & Marshall Avenue
Site Code: 1
Start Date: 09/07/2017

Turning Movement Data

Start Time	Marshall Avenue Westbound					Marshall Avenue Eastbound					Snelling Avenue Southbound					Snelling Avenue Northbound					
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
7:00 AM	12	30	19	2	61	61	56	6	2	123	11	219	23	3	253	9	360	18	1	387	824
7:15 AM	11	48	31	2	90	52	47	7	5	106	12	248	25	2	285	12	361	24	2	397	878
7:30 AM	7	70	42	1	119	65	44	5	3	114	11	261	38	3	310	10	383	21	2	414	957
7:45 AM	11	70	31	2	112	77	63	12	3	152	10	272	48	2	330	19	366	16	0	401	995
Hourly Total	41	218	123	7	382	255	210	30	13	495	44	1000	134	10	1178	50	1470	79	5	1599	3654
8:00 AM	15	61	24	2	100	74	47	18	1	139	12	237	26	0	275	11	368	16	1	395	909
8:15 AM	15	64	27	1	106	74	52	15	3	141	13	251	36	2	300	8	368	10	0	386	933
8:30 AM	3	62	19	4	84	60	48	13	2	121	14	244	37	2	295	10	323	20	4	353	853
8:45 AM	16	60	23	2	99	60	57	19	0	136	12	236	39	0	287	11	314	24	2	349	871
Hourly Total	49	247	93	9	389	268	204	65	6	537	51	968	138	4	1157	40	1373	70	7	1483	3566
*** BREAK ***	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4:00 PM	28	59	31	3	118	49	101	23	4	173	17	354	30	1	401	19	260	29	6	308	1000
4:15 PM	24	82	13	7	119	52	89	24	8	165	12	349	39	3	400	18	248	35	0	301	985
4:30 PM	30	81	16	7	127	43	96	26	9	165	11	369	44	2	424	17	284	29	1	330	1046
4:45 PM	39	82	17	6	138	46	97	18	5	161	8	338	43	1	389	16	288	27	3	331	1019
Hourly Total	121	304	77	23	502	190	383	91	26	664	48	1410	156	7	1614	70	1080	120	10	1270	4050
5:00 PM	27	81	20	6	128	45	99	22	9	166	10	345	31	3	386	10	259	23	7	292	972
5:15 PM	38	79	17	6	134	45	99	27	4	171	15	361	53	2	429	15	272	27	5	314	1048
5:30 PM	28	87	16	6	131	45	85	25	3	155	15	309	31	1	355	16	327	24	2	367	1008
5:45 PM	24	80	19	3	123	47	84	25	8	156	8	354	40	6	402	18	271	27	1	316	997
Hourly Total	117	327	72	21	516	182	367	99	24	648	48	1369	155	12	1572	59	1129	101	15	1289	4025
Grand Total	328	1096	365	60	1789	895	1164	285	69	2344	191	4747	583	33	5521	219	5052	370	37	5641	15295
Approach %	18.3	61.3	20.4	-	-	38.2	49.7	12.2	-	-	3.5	86.0	10.6	-	-	3.9	89.6	6.6	-	-	-
Total %	2.1	7.2	2.4	-	11.7	5.9	7.6	1.9	-	15.3	1.2	31.0	3.8	-	36.1	1.4	33.0	2.4	-	36.9	-
Lights	318	1038	344	-	1700	852	1104	273	-	2229	185	4549	538	-	5272	213	4866	367	-	5446	14647
% Lights	97.0	94.7	94.2	-	95.0	95.2	94.8	95.8	-	95.1	96.9	95.8	92.3	-	95.5	97.3	96.3	99.2	-	96.5	95.8
Mediums	9	19	20	-	48	38	9	9	-	56	4	152	41	-	197	5	145	2	-	152	453
% Mediums	2.7	1.7	5.5	-	2.7	4.2	0.8	3.2	-	2.4	2.1	3.2	7.0	-	3.6	2.3	2.9	0.5	-	2.7	3.0
Articulated Trucks	1	1	0	-	2	3	1	3	-	7	2	44	2	-	48	0	40	1	-	41	98
% Articulated Trucks	0.3	0.1	0.0	-	0.1	0.3	0.1	1.1	-	0.3	1.0	0.9	0.3	-	0.9	0.0	0.8	0.3	-	0.7	0.6
Bicycles on Road	0	38	1	-	39	2	50	0	-	52	0	2	2	-	4	1	1	0	-	2	97
% Bicycles on Road	0.0	3.5	0.3	-	2.2	0.2	4.3	0.0	-	2.2	0.0	0.0	0.3	-	0.1	0.5	0.0	0.0	-	0.0	0.6
Bicycles on Crosswalk	-	-	-	10	-	-	-	-	10	-	-	-	-	6	-	-	-	-	3	-	-
% Bicycles on Crosswalk	-	-	-	16.7	-	-	-	-	14.5	-	-	-	-	18.2	-	-	-	-	8.1	-	-
Pedestrians	-	-	-	50	-	-	-	-	59	-	-	-	-	27	-	-	-	-	34	-	-
% Pedestrians	-	-	-	83.3	-	-	-	-	85.5	-	-	-	-	81.8	-	-	-	-	91.9	-	-

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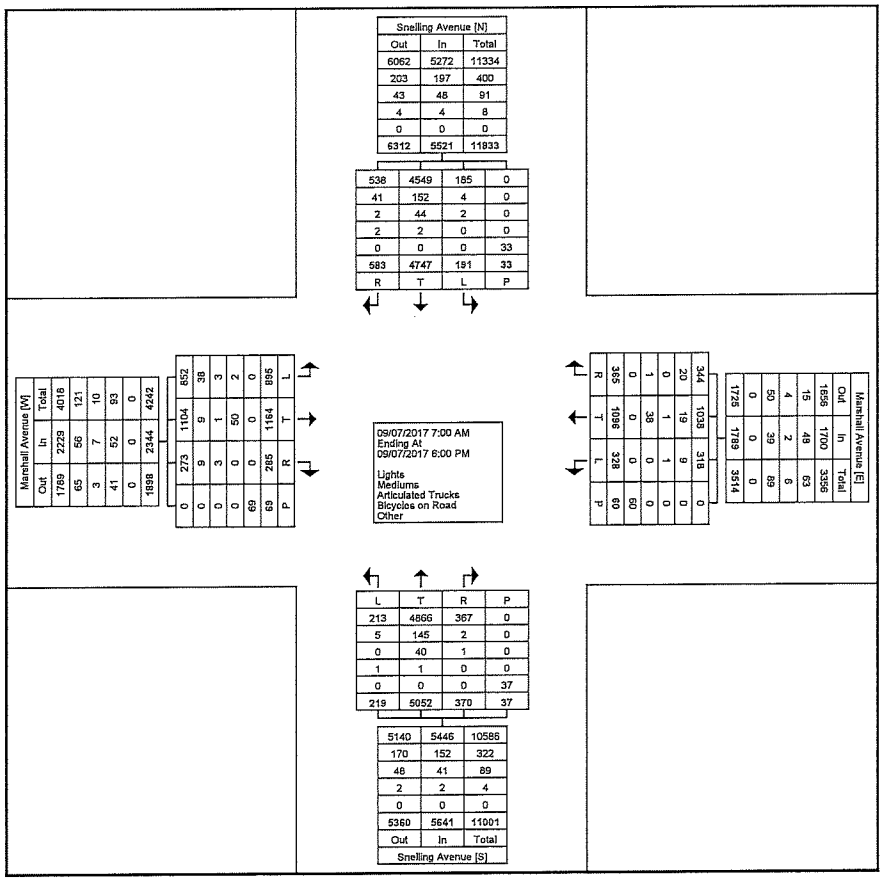
Count Name: 1_Snelling Avenue & Marshall Avenue
Site Code: 1
Start Date: 09/07/2017



Turning Movement Data Plot

Kimley-Horn : Lisle (IL)
1001 Warrenville Road, Suite 350

Lisle, Illinois, United States 60532
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Count Name: 1_Snelling Avenue & Marshall Avenue
Site Code: 1
Start Date: 09/07/2017

Turning Movement Peak Hour Data (7:30 AM)

Start Time	Marshall Avenue Westbound					Marshall Avenue Eastbound					Snelling Avenue Southbound					Snelling Avenue Northbound					
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
7:30 AM	7	70	42	1	119	65	44	5	3	114	11	261	38	3	310	10	383	21	2	414	957
7:45 AM	11	70	31	2	112	77	63	12	3	152	10	272	48	2	330	19	366	16	0	401	995
8:00 AM	15	61	24	2	100	74	47	18	1	139	12	237	26	0	275	11	368	16	1	395	909
8:15 AM	15	64	27	1	106	74	52	15	3	141	13	251	36	2	300	8	368	10	0	386	933
Total	48	265	124	6	437	290	206	50	10	546	46	1021	148	7	1215	48	1485	63	3	1596	3794
Approach %	11.0	60.6	28.4	-	-	53.1	37.7	9.2	-	-	3.8	84.0	12.2	-	-	3.0	93.0	3.9	-	-	-
Total %	1.3	7.0	3.3	-	11.5	7.6	5.4	1.3	-	14.4	1.2	26.9	3.9	-	32.0	1.3	39.1	1.7	-	42.1	-
PHF	0.800	0.946	0.738	-	0.918	0.942	0.817	0.694	-	0.898	0.885	0.938	0.771	-	0.920	0.632	0.969	0.750	-	0.964	0.953
Lights	46	247	116	-	409	272	186	44	-	502	45	965	132	-	1142	46	1432	62	-	1540	3593
% Lights	95.8	93.2	93.5	-	93.6	93.8	90.3	88.0	-	91.9	97.8	94.5	89.2	-	94.0	95.8	96.4	98.4	-	96.5	94.7
Mediums	2	9	8	-	19	15	3	6	-	24	0	41	14	-	55	2	44	1	-	47	145
% Mediums	4.2	3.4	6.5	-	4.3	5.2	1.5	12.0	-	4.4	0.0	4.0	9.5	-	4.5	4.2	3.0	1.6	-	2.9	3.8
Articulated Trucks	0	0	0	-	0	2	0	0	-	2	1	14	1	-	16	0	9	0	-	9	27
% Articulated Trucks	0.0	0.0	0.0	-	0.0	0.7	0.0	0.0	-	0.4	2.2	1.4	0.7	-	1.3	0.0	0.6	0.0	-	0.6	0.7
Bicycles on Road	0	9	0	-	9	1	17	0	-	18	0	1	1	-	2	0	0	0	-	0	29
% Bicycles on Road	0.0	3.4	0.0	-	2.1	0.3	8.3	0.0	-	3.3	0.0	0.1	0.7	-	0.2	0.0	0.0	0.0	-	0.0	0.8
Bicycles on Crosswalk	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	0.0	-	-	-	-	0.0	-	-	-	-	0.0	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	6	-	-	-	-	10	-	-	-	-	7	-	-	-	-	3	-	-
% Pedestrians	-	-	-	100.0	-	-	-	-	100.0	-	-	-	-	100.0	-	-	-	-	100.0	-	-

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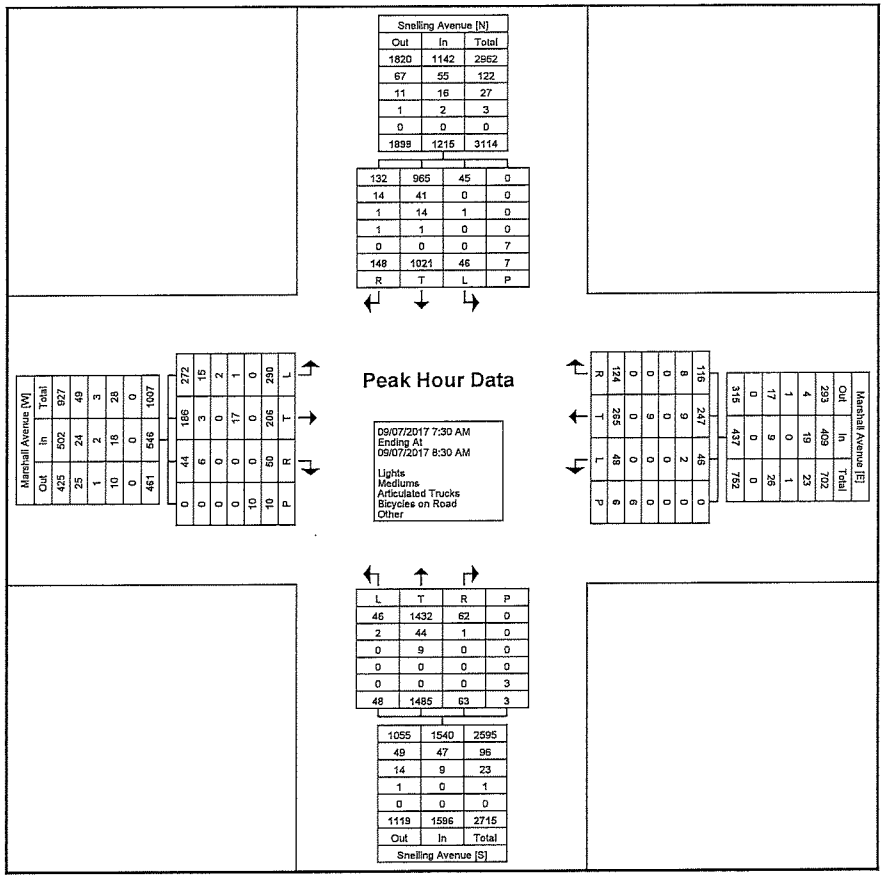

Turning Movement Peak Hour Data Plot (7:30 AM)

Kimley-Horn : Lisle (IL)
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Lisle, Illinois, United States 60532
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Count Name: 1_Snelling Avenue & Marshall Avenue
Site Code: 1
Start Date: 09/07/2017

Turning Movement Peak Hour Data (4:30 PM)

Start Time	Marshall Avenue Westbound					Marshall Avenue Eastbound					Snelling Avenue Southbound					Snelling Avenue Northbound					Int. Total
	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	
4:30 PM	30	81	16	7	127	43	96	26	9	165	11	369	44	2	424	17	284	29	1	330	1046
4:45 PM	39	82	17	6	138	46	97	18	5	161	8	338	43	1	389	16	288	27	3	331	1019
5:00 PM	27	81	20	6	128	45	99	22	9	166	10	345	31	3	386	10	259	23	7	292	972
5:15 PM	38	79	17	6	134	45	99	27	4	171	15	361	53	2	429	15	272	27	5	314	1048
Total	134	323	70	25	527	179	391	93	27	663	44	1413	171	8	1628	58	1103	106	16	1267	4085
Approach %	25.4	61.3	13.3	-	-	27.0	59.0	14.0	-	-	2.7	86.8	10.5	-	-	4.6	87.1	8.4	-	-	-
Total %	3.3	7.9	1.7	-	12.9	4.4	9.6	2.3	-	16.2	1.1	34.6	4.2	-	39.9	1.4	27.0	2.6	-	31.0	-
PHF	0.859	0.985	0.875	-	0.955	0.973	0.987	0.861	-	0.969	0.733	0.957	0.807	-	0.949	0.853	0.957	0.914	-	0.957	0.974
Lights	133	306	69	-	508	171	380	93	-	644	44	1379	162	-	1585	57	1068	106	-	1231	3968
% Lights	99.3	94.7	98.6	-	96.4	95.5	97.2	100.0	-	97.1	100.0	97.6	94.7	-	97.4	98.3	96.8	100.0	-	97.2	97.1
Mediums	1	2	1	-	4	7	1	0	-	8	0	27	9	-	36	1	30	0	-	31	79
% Mediums	0.7	0.6	1.4	-	0.8	3.9	0.3	0.0	-	1.2	0.0	1.9	5.3	-	2.2	1.7	2.7	0.0	-	2.4	1.9
Articulated Trucks	0	0	0	-	0	0	0	0	-	0	0	7	0	-	7	0	5	0	-	5	12
% Articulated Trucks	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.0	0.5	0.0	-	0.4	0.0	0.5	0.0	-	0.4	0.3
Bicycles on Road	0	15	0	-	15	1	10	0	-	11	0	0	0	-	0	0	0	0	-	0	26
% Bicycles on Road	0.0	4.6	0.0	-	2.8	0.6	2.6	0.0	-	1.7	0.0	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	0.6
Bicycles on Crosswalk	-	-	-	6	-	-	-	-	6	-	-	-	-	0	-	-	-	-	3	-	-
% Bicycles on Crosswalk	-	-	-	24.0	-	-	-	-	22.2	-	-	-	-	0.0	-	-	-	-	18.8	-	-
Pedestrians	-	-	-	19	-	-	-	-	21	-	-	-	-	8	-	-	-	-	13	-	-
% Pedestrians	-	-	-	76.0	-	-	-	-	77.8	-	-	-	-	100.0	-	-	-	-	81.3	-	-

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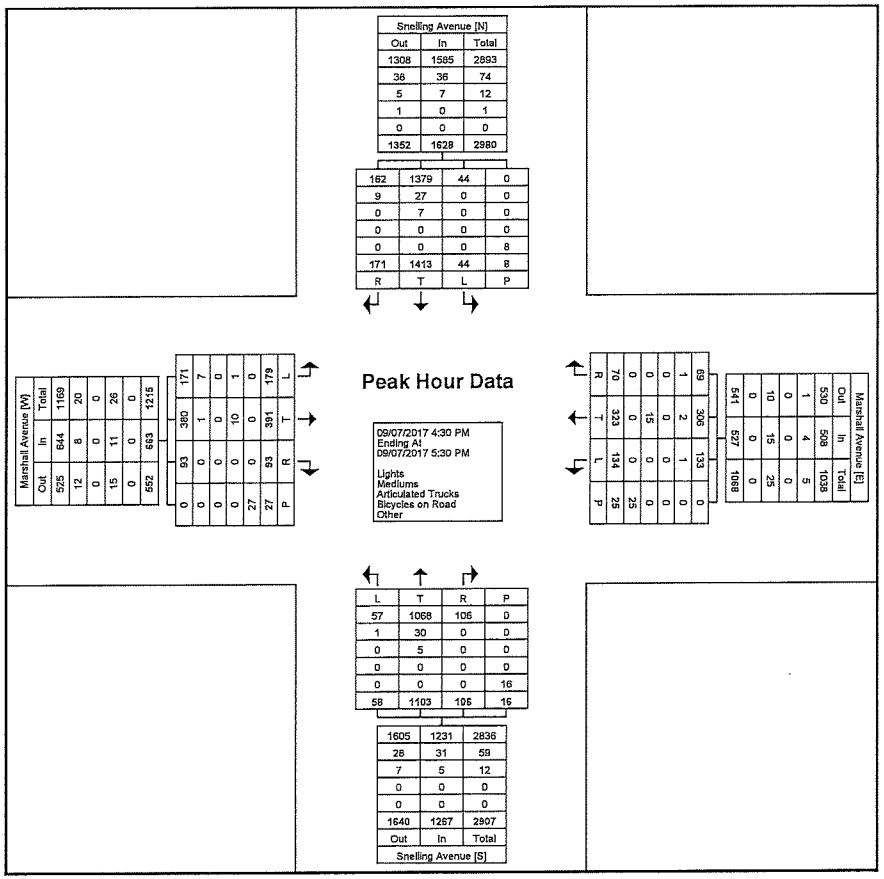

Turning Movement Peak Hour Data Plot (4:30 PM)

TIME ON SITE (USED TO CALCULATE VEHICLE QUEUE)										
Vehicle Number	Enter Time		Exit Time		Time On Site (Minutes)	Vehicle Number	Enter Time		Exit Time		Time On Site (Minutes)
	Minute	Seconds	Minute	Seconds			Minute	Seconds	Minute	Seconds	
1	0	40	6	40	6.00	84	56	50	64	37	7.78
4	3	30	7	34	4.07	86	57	55	65	55	8.00
5	4	10	9	27	5.28	87	59	0	66	22	7.37
7	6	30	11	17	4.78	88	60	30	66	58	6.47
8	6	44	12	26	5.70	90	61	40	68	35	6.92
9	7	35	13	44	6.15	91	61	45	69	36	7.85
10	9	35	14	21	4.77	92	61	55	70	22	8.45
11	10	15	14	50	4.58	93	62	55	72	28	9.55
13	10	50	16	20	5.50	95	63	34	73	10	9.60
14	12	3	16	58	4.92	96	64	36	73	35	8.98
15	12	43	18	50	6.12	99	65	29	74	48	9.32
16	12	57	15	28	2.52	100	66	40	76	39	9.98
17	14	42	18	53	4.18	101	67	0	77	34	10.57
18	14	48	19	28	4.67	106	73	17	78	3	4.77
20	17	18	20	25	3.12	107	73	57	78	35	4.63
21	17	33	20	52	3.32	108	74	36	79	5	4.48
22	17	43	21	48	4.08	109	74	43	81	3	6.33
23	17	56	23	28	5.53	110	76	25	85	10	8.75
26	19	35	25	0	5.42	111	78	55	82	46	3.85
27	19	40	25	38	5.97	114	80	49	86	5	5.27
28	20	29	26	27	5.97	116	82	48	86	36	3.80
29	20	42	26	59	6.28	118	84	33	88	43	4.17
31	22	18	28	31	6.22	119	84	45	90	47	6.03
32	22	22	28	53	6.52	120	85	6	91	12	6.10
33	22	35	29	24	6.82	122	86	45	93	6	6.35
34	23	0	30	5	7.08	123	87	50	94	53	7.05
35	23	5	30	40	7.58	124	88	10	95	17	7.12
36	23	17	31	2	7.75	125	88	15	95	46	7.52
37	25	12	31	56	6.73	126	88	55	96	50	7.92
39	25	58	32	46	6.80	127	89	0	97	48	8.80
40	27	29	34	46	7.28	128	89	30	98	51	9.35
41	28	28	35	41	7.22	129	90	0	99	37	9.62
42	30	37	37	31	6.90	130	90	40	100	35	9.92
43	31	3	37	57	6.90	131	90	48	101	56	11.13
44	31	25	38	37	7.20	132	92	40	103	14	10.57
45	31	50	42	4	10.23	133	92	48	104	6	11.30
46	31	55	44	33	12.63	134	94	40	105	50	11.17
47	33	5	45	29	12.40	136	97	8	106	18	9.17
48	33	10	45	59	12.82	137	98	40	107	15	8.58
49	34	17	46	19	12.03	139	98	52	108	34	9.70
50	35	16	48	6	12.83	141	101	38	110	6	8.47
52	36	50	48	59	12.15	144	103	0	109	17	6.28
53	37	10	50	16	13.10	147	104	20	110	36	6.27
56	40	15	51	30	11.25	148	105	5	113	10	8.08
57	42	29	52	6	9.62	149	105	25	113	41	8.27
61	44	47	53	39	8.87	150	105	45	114	29	8.73
63	45	28	54	19	8.85	152	108	0	115	35	7.58
65	45	40	55	19	9.65	153	108	40	116	7	7.45
66	46	2	56	6	10.07	154	109	1	116	32	7.52
67	46	48	58	9	11.35	155	110	8	117	39	7.52
68	47	8	56	55	9.78	157	113	15	121	29	8.23
73	48	35	59	16	10.68	159	116	32	123	16	6.73
77	52	30	61	59	9.48	161	117	28	123	55	6.45
79	53	41	63	16	9.58	162	117	31	124	43	7.20
80	54	35	62	38	8.05						

DRIVE-THROUGH PROCESSING TIME

Arrival	Departure	Process Time	Arrival	Departure	Process Time	Arrival	Departure	Process Time	Arrival	Departure	Process Time	Arrival	Departure	Process Time	Arrival	Departure	Process Time
6:59:40	7:03:58	0:04:18	7:19:40	7:21:46	0:02:06	7:35:07	7:38:35	0:03:28	7:59:31	8:02:36	0:03:05	8:19:13	8:22:39	0:03:26	8:44:16	8:47:12	0:02:57
7:00:25	7:04:37	0:04:12	7:20:39	7:23:28	0:02:49	7:37:42	7:42:01	0:04:19	8:01:19	8:03:13	0:01:55	8:20:40	8:25:02	0:04:22	8:45:49	8:48:21	0:02:32
7:01:48	7:05:40	0:03:52	7:21:18	7:23:59	0:02:41	7:39:42	7:44:29	0:04:47	8:02:04	8:03:58	0:01:54	8:23:14	8:25:55	0:02:41	8:46:38	8:49:12	0:02:34
7:03:08	7:06:40	0:03:32	7:21:55	7:24:59	0:03:04	7:40:46	7:45:28	0:04:42	8:02:29	8:04:35	0:02:06	8:25:08	8:26:30	0:01:22	8:47:17	8:50:28	0:03:12
7:04:30	7:07:34	0:03:04	7:23:34	7:25:40	0:02:06	7:42:13	7:45:58	0:03:45	8:03:19	8:05:55	0:02:35	8:26:13	8:28:36	0:02:23	8:48:24	8:51:28	0:03:03
7:05:58	7:09:24	0:03:26	7:24:21	7:26:27	0:02:06	7:44:37	7:46:25	0:01:48	8:04:03	8:06:12	0:02:08	8:27:47	8:30:44	0:02:58	8:49:21	8:53:11	0:03:50
7:06:51	7:10:24	0:03:33	7:25:10	7:27:01	0:01:51	7:45:39	7:47:55	0:02:16	8:04:44	8:06:57	0:02:13	8:28:57	8:33:07	0:04:10	8:50:43	8:53:38	0:02:55
7:07:57	7:10:48	0:02:52	7:26:03	7:28:31	0:02:28	7:46:05	7:48:56	0:02:51	8:06:02	8:08:30	0:02:28	8:31:26	8:34:53	0:03:27	8:51:38	8:54:26	0:02:48
7:09:36	7:11:17	0:01:41	7:26:49	7:28:51	0:02:02	7:46:39	7:50:13	0:03:35	8:06:44	8:09:33	0:02:49	8:32:36	8:35:16	0:02:40	8:53:15	8:55:34	0:02:19
7:10:31	7:12:24	0:01:53	7:27:04	7:28:52	0:01:48	7:48:07	7:51:34	0:03:27	8:07:34	8:10:23	0:02:49	8:33:19	8:35:47	0:02:28	8:53:44	8:56:06	0:02:22
7:11:04	7:13:45	0:02:41	7:27:25	7:29:23	0:01:58	7:49:06	7:52:07	0:03:01	8:08:35	8:12:22	0:03:47	8:35:04	8:36:45	0:01:41	8:54:33	8:56:32	0:01:59
7:11:47	7:14:23	0:02:36	7:28:28	7:30:06	0:01:38	7:50:26	7:53:41	0:03:15	8:09:44	8:13:08	0:03:24	8:35:39	8:37:43	0:02:04	8:55:41	8:57:40	0:01:58
7:12:34	7:14:50	0:02:17	7:28:57	7:30:38	0:01:40	7:51:41	7:54:18	0:02:37	8:10:31	8:13:49	0:03:18	8:36:19	8:38:43	0:02:23	8:56:17	8:58:11	0:01:54
7:13:56	7:16:19	0:02:24	7:29:33	7:31:02	0:01:29	7:52:20	7:55:16	0:02:55	8:12:26	8:14:41	0:02:16	8:37:17	8:39:36	0:02:19	8:56:41	8:59:07	0:02:26
7:14:30	7:17:02	0:02:32	7:30:12	7:31:55	0:01:42	7:53:48	7:56:06	0:02:18	8:13:13	8:16:39	0:03:26	8:38:09	8:40:34	0:02:26	8:57:43	9:01:27	0:03:45
7:15:06	7:18:30	0:03:24	7:30:44	7:32:46	0:02:02	7:54:29	7:56:54	0:02:26	8:14:12	8:17:38	0:03:27	8:38:54	8:41:51	0:02:57	8:58:16	9:02:45	0:04:28
7:17:04	7:18:55	0:01:51	7:31:23	7:34:43	0:03:20	7:55:46	7:58:05	0:02:19	8:15:07	8:18:02	0:02:55	8:39:41	8:43:13	0:03:32	8:59:30	9:03:17	0:03:47
7:17:36	7:19:30	0:01:53	7:32:03	7:35:36	0:03:34	7:56:37	7:59:11	0:02:34	8:16:45	8:18:35	0:01:50	8:40:44	8:44:00	0:03:16	9:01:42	9:03:56	0:02:15
7:18:34	7:20:24	0:01:50	7:32:53	7:37:30	0:04:37	7:57:07	8:01:10	0:04:03	8:17:40	8:19:01	0:01:21	8:42:02	8:45:43	0:03:41	9:02:55	9:04:39	0:01:44
7:19:04	7:20:54	0:01:50	7:34:01	7:38:01	0:03:59	7:58:07	8:01:48	0:03:41	8:18:17	8:20:58	0:02:41	8:43:24	8:46:17	0:02:53	9:03:36	9:06:05	0:02:29
Maximum				0:04:47		Minimum				0:01:21		Average				0:02:47	

Kimley»Horn

MEMORANDUM

To: David Kuebler – City of Saint Paul Public Works
Josh Williams – City of Saint Paul PED

From: Douglas Arnold, P.E. and Trisha Sieh, P.E.
Kimley-Horn and Associates, Inc.

Date: January 8, 2018

Re: Addendum to November 2, 2017 Traffic Operations Summary
Starbucks (Snelling Avenue and Marshall Avenue)
Saint Paul, Minnesota

Starbucks has recently implemented interim site plan changes to help better circulate traffic into and out of the store located on the southeast corner of Snelling Avenue & Marshall Avenue in the City of Saint Paul, MN. As discussed with City staff, the following changes were implemented: restripe the parking spaces and drive-aisle on the east side of the site to angled parking to create one way site circulation, improve parking maneuvering times, and allow for a dedicated drive-through queue lane on the far east side of the site.

In order to assess the site circulation as a result of the interim site plan changes, a traffic count was performed on Monday, December 18, 2017 in order to quantify the number of vehicles entering/exiting the site, the amount of queueing that is occurring, and the circulation of exiting traffic during the AM peak period. Mondays and Fridays are typically the busiest days for Starbucks. It should be noted that a traffic officer was on site during the time the traffic counts were collected.

- Based on the traffic counts performed in September 2017, the site generated approximately 160 AM peak hour trips (80 entering, 80 exiting). Based on the December 2017 count, the site is generating 170-180 AM peak hour trips (+/- 10% fluctuation in traffic can be expected based on customer travel patterns and desires). Therefore, the interim site plan changes appear to not have generated a significant increase in site traffic.
- Based on the September 2017 counts, the maximum queue observed was twelve vehicles. With the interim site plan changes in place, the maximum queue was observed to be eleven vehicles.
- Based on the December 2017 counts, approximately 70% of the site traffic exited via Marshall Avenue. Of the traffic exiting onto Marshall Avenue, only 5% made the prohibited left-turn.

With the above information, it appears that the interim site plan changes have not lead to a substantial increase in traffic generated by the development or vehicle queueing. Also, the Marshall Avenue exit is most predominately used and non-compliance of the restricted left-turn onto Marshall Avenue was limited.

Kimley»Horn

ATTACHMENT B:

Drive-Through Queue Summary

DRIVE-THROUGH QUEUE		
	Scenario 1	Scenario 2
Date	4/6/2018	4/27/2018
Day	Friday	Friday
7:00:00 AM	0	7
7:01:00 AM	1	6
7:02:00 AM	2	4
7:03:00 AM	3	6
7:04:00 AM	4	11
7:05:00 AM	4	9
7:06:00 AM	4	9
7:07:00 AM	5	10
7:08:00 AM	7	5
7:09:00 AM	7	6
7:10:00 AM	8	4
7:11:00 AM	4	5
7:12:00 AM	4	5
7:13:00 AM	3	4
7:14:00 AM	2	4
7:15:00 AM	4	6
7:16:00 AM	4	7
7:17:00 AM	4	8
7:18:00 AM	5	7
7:19:00 AM	6	7
7:20:00 AM	9	6
7:21:00 AM	12	5
7:22:00 AM	13	5
7:23:00 AM	12	6
7:24:00 AM	10	4
7:25:00 AM	7	4
7:26:00 AM	9	4
7:27:00 AM	6	3
7:28:00 AM	7	6
7:29:00 AM	6	4
7:30:00 AM	7	4
7:31:00 AM	10	2
7:32:00 AM	10	1
7:33:00 AM	9	1
7:34:00 AM	11	1
7:35:00 AM	11	4
7:36:00 AM	9	4
7:37:00 AM	8	2
7:38:00 AM	5	2
7:39:00 AM	6	5
7:40:00 AM	5	4
7:41:00 AM	6	4
7:42:00 AM	5	4
7:43:00 AM	5	6
7:44:00 AM	5	8
7:45:00 AM	6	9
7:46:00 AM	5	9
7:47:00 AM	8	6
7:48:00 AM	7	6
7:49:00 AM	6	5
7:50:00 AM	6	8
7:51:00 AM	8	7
7:52:00 AM	9	6
7:53:00 AM	8	4
7:54:00 AM	10	5
7:55:00 AM	11	5
7:56:00 AM	12	4
7:57:00 AM	14	6
7:58:00 AM	14	5
7:59:00 AM	14	7
Avg	7.033333333	5.35
Max	14	11
95th	13.05	9

8:00:00 AM	10	10
8:01:00 AM	7	8
8:02:00 AM	8	10
8:03:00 AM	5	9
8:04:00 AM	6	7
8:05:00 AM	7	7
8:06:00 AM	8	5
8:07:00 AM	8	5
8:08:00 AM	7	4
8:09:00 AM	5	5
8:10:00 AM	9	5
8:11:00 AM	7	4
8:12:00 AM	9	5
8:13:00 AM	10	6
8:14:00 AM	8	5
8:15:00 AM	7	6
8:16:00 AM	6	6
8:17:00 AM	8	5
8:18:00 AM	8	4
8:19:00 AM	6	4
8:20:00 AM	4	4
8:21:00 AM	3	5
8:22:00 AM	4	9
8:23:00 AM	4	7
8:24:00 AM	3	5
8:25:00 AM	4	6
8:26:00 AM	5	7
8:27:00 AM	3	10
8:28:00 AM	3	7
8:29:00 AM	4	5
8:30:00 AM	3	6
8:31:00 AM	4	7
8:32:00 AM	4	6
8:33:00 AM	4	4
8:34:00 AM	4	4
8:35:00 AM	4	6
8:36:00 AM	6	7
8:37:00 AM	4	7
8:38:00 AM	3	6
8:39:00 AM	2	6
8:40:00 AM	4	7
8:41:00 AM	2	8
8:42:00 AM	5	8
8:43:00 AM	4	8
8:44:00 AM	3	6
8:45:00 AM	6	5
8:46:00 AM	7	5
8:47:00 AM	4	5
8:48:00 AM	10	4
8:49:00 AM	9	2
8:50:00 AM	9	2
8:51:00 AM	8	2
8:52:00 AM	9	2
8:53:00 AM	10	2
8:54:00 AM	10	1
8:55:00 AM	7	4
8:56:00 AM	8	6
8:57:00 AM	6	5
8:58:00 AM	8	5
8:59:00 AM	9	6
Avg	6.033333333	5.616666667
Max	10	10
95th	10	9.05

9:00:00 AM	11	7
9:01:00 AM	10	7
9:02:00 AM	9	6
9:03:00 AM	10	5
9:04:00 AM	9	4
9:05:00 AM	11	5
9:06:00 AM	13	5
9:07:00 AM	14	5
9:08:00 AM	8	6
9:09:00 AM	8	8
9:10:00 AM	8	7
9:11:00 AM	10	7
9:12:00 AM	11	5
9:13:00 AM	10	6
9:14:00 AM	11	8
9:15:00 AM	9	6
9:16:00 AM	9	4
9:17:00 AM	7	3
9:18:00 AM	8	5
9:19:00 AM	9	3
9:20:00 AM	10	4
9:21:00 AM	10	6
9:22:00 AM	9	9
9:23:00 AM	10	7
9:24:00 AM	11	6
9:25:00 AM	9	6
9:26:00 AM	7	5
9:27:00 AM	8	6
9:28:00 AM	7	8
9:29:00 AM	6	9
9:30:00 AM	5	9
9:31:00 AM	5	8
9:32:00 AM	6	8
9:33:00 AM	4	8
9:34:00 AM	6	6
9:35:00 AM	8	6
9:36:00 AM	9	5
9:37:00 AM	9	6
9:38:00 AM	13	5
9:39:00 AM	11	8
9:40:00 AM	10	5
9:41:00 AM	11	7
9:42:00 AM	11	9
9:43:00 AM	15	8
9:44:00 AM	10	6
9:45:00 AM	10	5
9:46:00 AM	10	4
9:47:00 AM	6	5
9:48:00 AM	6	4
9:49:00 AM	6	6
9:50:00 AM	7	5
9:51:00 AM	5	5
9:52:00 AM	6	5
9:53:00 AM	7	6
9:54:00 AM	9	4
9:55:00 AM	6	5
9:56:00 AM	8	7
9:57:00 AM	10	9
9:58:00 AM	10	8
9:59:00 AM	10	8
Avg	8.85	6.133333333
Max	15	9
95th	13	9
Total		
Avg	7.305555556	5.7
Max	15	11
95th	12	9

Kimley»Horn

ATTACHMENT C:

Snelling Avenue Exit Queue Summary

SNELLING AVENUE EXIT QUEUE		
	Scenario 1	Scenario 2
Date	4/6/2018	4/27/2018
Day	Friday	Friday
7:00:00 AM	0	0
7:01:00 AM	0	1
7:02:00 AM	0	0
7:03:00 AM	0	0
7:04:00 AM	1	0
7:05:00 AM	2	0
7:06:00 AM	0	0
7:07:00 AM	0	0
7:08:00 AM	0	0
7:09:00 AM	0	1
7:10:00 AM	0	0
7:11:00 AM	1	0
7:12:00 AM	0	0
7:13:00 AM	1	0
7:14:00 AM	0	0
7:15:00 AM	3	0
7:16:00 AM	0	0
7:17:00 AM	1	1
7:18:00 AM	0	0
7:19:00 AM	0	0
7:20:00 AM	0	0
7:21:00 AM	0	1
7:22:00 AM	0	0
7:23:00 AM	1	1
7:24:00 AM	0	0
7:25:00 AM	2	1
7:26:00 AM	0	1
7:27:00 AM	1	1
7:28:00 AM	0	0
7:29:00 AM	0	1
7:30:00 AM	0	0
7:31:00 AM	0	0
7:32:00 AM	0	0
7:33:00 AM	1	0
7:34:00 AM	0	1
7:35:00 AM	2	0
7:36:00 AM	1	2
7:37:00 AM	5	2
7:38:00 AM	1	1
7:39:00 AM	1	0
7:40:00 AM	1	0
7:41:00 AM	0	0
7:42:00 AM	1	0
7:43:00 AM	1	0
7:44:00 AM	1	0
7:45:00 AM	1	0
7:46:00 AM	0	1
7:47:00 AM	1	0
7:48:00 AM	0	0
7:49:00 AM	1	1
7:50:00 AM	1	0
7:51:00 AM	0	1
7:52:00 AM	1	0
7:53:00 AM	1	0
7:54:00 AM	3	0
7:55:00 AM	2	0
7:56:00 AM	1	0
7:57:00 AM	0	1
7:58:00 AM	0	0
7:59:00 AM	2	0
Avg	0.7	0.316666667
Max	5	2
95th	2.05	1

8:00:00 AM	3	0
8:01:00 AM	2	0
8:02:00 AM	0	1
8:03:00 AM	1	0
8:04:00 AM	2	0
8:05:00 AM	0	0
8:06:00 AM	0	0
8:07:00 AM	1	1
8:08:00 AM	1	0
8:09:00 AM	1	1
8:10:00 AM	0	1
8:11:00 AM	1	0
8:12:00 AM	0	0
8:13:00 AM	2	0
8:14:00 AM	3	0
8:15:00 AM	4	1
8:16:00 AM	4	3
8:17:00 AM	3	0
8:18:00 AM	2	0
8:19:00 AM	2	1
8:20:00 AM	1	0
8:21:00 AM	1	0
8:22:00 AM	0	0
8:23:00 AM	0	0
8:24:00 AM	2	0
8:25:00 AM	3	1
8:26:00 AM	0	1
8:27:00 AM	1	0
8:28:00 AM	0	0
8:29:00 AM	0	1
8:30:00 AM	1	1
8:31:00 AM	0	0
8:32:00 AM	1	1
8:33:00 AM	3	0
8:34:00 AM	0	0
8:35:00 AM	1	1
8:36:00 AM	0	0
8:37:00 AM	1	0
8:38:00 AM	2	0
8:39:00 AM	3	0
8:40:00 AM	0	1
8:41:00 AM	0	1
8:42:00 AM	0	0
8:43:00 AM	0	1
8:44:00 AM	1	1
8:45:00 AM	0	0
8:46:00 AM	0	1
8:47:00 AM	3	1
8:48:00 AM	2	0
8:49:00 AM	0	0
8:50:00 AM	0	1
8:51:00 AM	0	0
8:52:00 AM	1	0
8:53:00 AM	1	1
8:54:00 AM	0	0
8:55:00 AM	2	0
8:56:00 AM	1	1
8:57:00 AM	1	0
8:58:00 AM	1	0
8:59:00 AM	2	1
Avg	1.116666667	0.416666667
Max	4	3
95th	3	1

9:00:00 AM	0	0
9:01:00 AM	0	0
9:02:00 AM	1	1
9:03:00 AM	0	0
9:04:00 AM	1	1
9:05:00 AM	1	2
9:06:00 AM	0	3
9:07:00 AM	1	0
9:08:00 AM	0	0
9:09:00 AM	0	0
9:10:00 AM	0	0
9:11:00 AM	0	1
9:12:00 AM	0	0
9:13:00 AM	0	0
9:14:00 AM	0	1
9:15:00 AM	1	0
9:16:00 AM	1	0
9:17:00 AM	0	1
9:18:00 AM	0	0
9:19:00 AM	4	0
9:20:00 AM	0	0
9:21:00 AM	1	0
9:22:00 AM	0	0
9:23:00 AM	2	0
9:24:00 AM	0	1
9:25:00 AM	0	0
9:26:00 AM	1	1
9:27:00 AM	1	3
9:28:00 AM	2	1
9:29:00 AM	4	0
9:30:00 AM	0	0
9:31:00 AM	0	0
9:32:00 AM	1	1
9:33:00 AM	1	0
9:34:00 AM	0	1
9:35:00 AM	0	0
9:36:00 AM	0	0
9:37:00 AM	0	0
9:38:00 AM	0	1
9:39:00 AM	1	1
9:40:00 AM	0	2
9:41:00 AM	2	2
9:42:00 AM	1	2
9:43:00 AM	0	0
9:44:00 AM	0	0
9:45:00 AM	0	1
9:46:00 AM	1	0
9:47:00 AM	0	1
9:48:00 AM	1	0
9:49:00 AM	0	0
9:50:00 AM	0	2
9:51:00 AM	1	2
9:52:00 AM	0	1
9:53:00 AM	2	0
9:54:00 AM	1	4
9:55:00 AM	0	0
9:56:00 AM	0	0
9:57:00 AM	0	0
9:58:00 AM	0	1
9:59:00 AM	0	1
Avg	0.55	0.65
Max	4	4
95th	2	2.05
Total		
Avg	0.788888889	0.461111111
Max	5	4
95th	3	2

Kimley»Horn

ATTACHMENT D:

Marshall Avenue Spillback Summary

Scenario	Date	Day	Start Time	End Time	Duration	Max Queue	Bike Traffic	Block Intersection
1	4/2/2018	Monday	7:27:28	7:27:49	0:00:21	1	0	0
1	4/2/2018	Monday	7:27:49	7:28:06	0:00:17	3	0	0
1	4/2/2018	Monday	7:28:06	7:28:35	0:00:29	0.5	0	0
1	4/2/2018	Monday	7:43:29	7:43:40	0:00:11	1	0	0
1	4/2/2018	Monday	7:43:40	7:44:32	0:00:52	2	0	0
1	4/2/2018	Monday	7:44:32	7:44:53	0:00:21	6	0	1
1	4/2/2018	Monday	7:44:53	7:45:34	0:00:41	5	0	0
1	4/2/2018	Monday	7:45:34	7:46:02	0:00:28	4	0	0
1	4/2/2018	Monday	7:46:02	7:46:46	0:00:44	1	0	0
1	4/2/2018	Monday	7:46:46	7:48:06	0:01:20	2	0	0
1	4/2/2018	Monday	7:48:06	7:48:27	0:00:21	0.5	0	0
1	4/2/2018	Monday	7:50:14	7:50:55	0:00:41	2	0	0
1	4/3/2018	Tuesday	7:40:55	7:41:20	0:00:25	2	0	0
1	4/3/2018	Tuesday	9:14:30	9:15:32	0:01:02	0.5	0	0
1	4/3/2018	Tuesday	9:18:29	9:18:45	0:00:16	1	0	0
1	4/3/2018	Tuesday	9:35:44	9:36:10	0:00:26	1	0	0
1	4/3/2018	Tuesday	9:37:55	9:38:11	0:00:16	0.5	0	0
1	4/3/2018	Tuesday	9:39:31	9:39:47	0:00:16	1	0	0
1	4/5/2018	Thursday	7:26:42	7:26:57	0:00:15	0.5	0	0
1	4/5/2018	Thursday	8:19:45	8:19:55	0:00:10	3	0	0
1	4/5/2018	Thursday	8:19:55	8:21:06	0:01:11	2	0	0
1	4/5/2018	Thursday	8:21:06	8:21:30	0:00:24	0.5	0	0
1	4/6/2018	Friday	7:19:52	7:20:09	0:00:17	0	0	0
1	4/6/2018	Friday	7:20:58	7:21:18	0:00:20	1	0	0
1	4/6/2018	Friday	7:21:18	7:21:38	0:00:20	3	0	1
1	4/6/2018	Friday	7:21:38	7:23:26	0:01:48	1	0	0
1	4/6/2018	Friday	7:54:34	7:54:41	0:00:07	1	0	0
1	4/6/2018	Friday	7:54:41	7:55:06	0:00:25	2	0	0
1	4/6/2018	Friday	7:55:06	7:55:16	0:00:10	1	0	0
1	4/6/2018	Friday	7:55:16	7:58:04	0:02:48	4	0	0
1	4/6/2018	Friday	7:58:04	7:58:38	0:00:34	2	0	0
1	4/6/2018	Friday	7:58:38	7:59:33	0:00:55	3	0	0
1	4/6/2018	Friday	9:00:18	9:01:00	0:00:42	1	0	0
1	4/6/2018	Friday	9:01:05	9:01:12	0:00:07	1	0	0
1	4/6/2018	Friday	9:01:12	9:01:38	0:00:26	2	0	0
1	4/6/2018	Friday	9:01:38	9:02:00	0:00:22	1	0	0
1	4/6/2018	Friday	9:02:20	9:02:31	0:00:11	2	0	0
1	4/6/2018	Friday	9:02:31	9:03:31	0:01:00	1	0	0
1	4/6/2018	Friday	9:04:37	9:05:13	0:00:36	2	0	0
1	4/6/2018	Friday	9:05:13	9:06:04	0:00:51	3	0	0
1	4/6/2018	Friday	9:06:04	9:06:38	0:00:34	1	0	0
1	4/6/2018	Friday	9:06:38	9:07:43	0:01:05	3	0	0
1	4/6/2018	Friday	9:12:01	9:12:27	0:00:26	2	0	0
1	4/6/2018	Friday	9:12:27	9:12:54	0:00:27	1	0	0
1	4/6/2018	Friday	9:14:13	9:14:37	0:00:24	0.5	0	0
1	4/6/2018	Friday	9:14:13	9:14:37	0:00:24	1	0	0
1	4/6/2018	Friday	9:22:43	9:23:10	0:00:27	2	0	0
1	4/6/2018	Friday	9:38:04	9:38:18	0:00:14	2	0	0
1	4/6/2018	Friday	9:38:18	9:38:36	0:00:18	3	0	0
1	4/6/2018	Friday	9:38:36	9:39:20	0:00:44	2	0	0
1	4/6/2018	Friday	9:39:20	9:40:20	0:01:00	1	0	0
1	4/6/2018	Friday	9:40:20	9:40:40	0:00:20	2	0	0
1	4/6/2018	Friday	9:40:40	9:41:15	0:00:35	1	0	0
1	4/6/2018	Friday	9:41:32	9:42:59	0:01:27	2	0	0
1	4/6/2018	Friday	9:42:59	9:43:54	0:00:55	4	0	1

Scenario	Date	Day	Start Time	End Time	Duration	Max Queue	Bike Traffic	Block Intersection
2	4/23/2018	Monday	7:47:37	7:47:43	0:00:06	1	0	0
2	4/23/2018	Monday	7:47:43	7:48:22	0:00:39	3	2	0
2	4/23/2018	Monday	7:48:22	7:49:08	0:00:46	2	0	0
2	4/23/2018	Monday	7:49:08	7:49:42	0:00:34	1	0	0
2	4/23/2018	Monday	7:50:14	7:51:01	0:00:47	1	0	0
2	4/23/2018	Monday	7:55:04	7:55:59	0:00:55	0.5	1	0
2	4/23/2018	Monday	7:56:04	7:57:03	0:00:59	0.5	0	0
2	4/23/2018	Monday	7:57:03	7:57:18	0:00:15	1	0	0
2	4/23/2018	Monday	7:59:46	8:00:54	0:01:08	2	1	0
2	4/23/2018	Monday	8:00:54	8:01:49	0:00:55	1	1	0
2	4/23/2018	Monday	8:02:24	8:02:50	0:00:26	1	0	0
2	4/23/2018	Monday	8:03:30	8:03:45	0:00:15	2	0	0
2	4/23/2018	Monday	8:46:26	8:46:39	0:00:13	4	0	1
2	4/23/2018	Monday	8:46:39	8:46:55	0:00:16	1	0	0
2	4/24/2018	Tuesday	7:35:49	7:37:17	0:01:28	0.5	1	0
2	4/24/2018	Tuesday	7:39:24	7:39:54	0:00:30	0.5	0	0
2	4/24/2018	Tuesday	7:39:54	7:40:26	0:00:32	2.5	0	0
2	4/24/2018	Tuesday	7:40:26	7:41:09	0:00:43	1.5	0	0
2	4/24/2018	Tuesday	7:49:17	7:49:27	0:00:10	1	0	0
2	4/24/2018	Tuesday	8:36:54	8:37:26	0:00:32	1	0	0
2	4/24/2018	Tuesday	9:32:11	9:32:28	0:00:17	1	0	0
2	4/24/2018	Tuesday	9:32:28	9:32:48	0:00:20	2	0	0
2	4/24/2018	Tuesday	9:37:40	9:37:44	0:00:04	1	0	0
2	4/24/2018	Tuesday	9:37:44	9:38:40	0:00:56	2	0	0
2	4/24/2018	Tuesday	9:38:40	9:39:14	0:00:34	3	0	0
2	4/24/2018	Tuesday	9:48:09	9:48:35	0:00:26	1	0	0
2	4/24/2018	Tuesday	9:55:58	9:56:19	0:00:21	1	1	0
2	4/24/2018	Tuesday	9:56:38	9:57:32	0:00:54	3	0	0
2	4/24/2018	Tuesday	9:57:32	9:57:42	0:00:10	2	0	0
2	4/24/2018	Tuesday	9:57:42	9:58:36	0:00:54	5	0	1
2	4/24/2018	Tuesday	9:58:36	9:58:56	0:00:20	1	0	0
2	4/25/2018	Wednesday	7:31:19	7:32:07	0:00:48	1	0	0
2	4/25/2018	Wednesday	7:32:07	7:32:42	0:00:35	2	0	0
2	4/25/2018	Wednesday	7:32:42	7:33:43	0:01:01	3	0	0
2	4/25/2018	Wednesday	7:33:43	7:34:13	0:00:30	1	1	0
2	4/25/2018	Wednesday	7:35:54	7:36:00	0:00:06	1	0	0
2	4/25/2018	Wednesday	7:36:00	7:36:49	0:00:49	2	0	0
2	4/25/2018	Wednesday	7:40:01	7:40:46	0:00:45	1	0	0
2	4/25/2018	Wednesday	7:40:46	7:41:14	0:00:28	2	0	0
2	4/25/2018	Wednesday	7:41:14	7:43:05	0:01:51	1	0	0
2	4/25/2018	Wednesday	7:47:19	7:47:49	0:00:30	2	0	0
2	4/25/2018	Wednesday	7:47:49	7:48:04	0:00:15	1	0	0
2	4/25/2018	Wednesday	7:48:49	7:49:24	0:00:35	1	0	0
2	4/25/2018	Wednesday	9:26:48	9:28:24	0:01:36	1	0	0
2	4/25/2018	Wednesday	9:29:37	9:30:06	0:00:29	1	0	0
2	4/26/2018	Thursday	7:05:50	7:06:12	0:00:22	1	0	0
2	4/27/2018	Friday	7:03:57	7:04:32	0:00:35	1	0	0
2	4/27/2018	Friday	7:58:20	7:58:38	0:00:18	0.5	0	0
2	4/27/2018	Friday	7:58:38	7:59:05	0:00:27	1.5	0	0
2	4/27/2018	Friday	9:30:10	9:30:45	0:00:35	2	0	0
2	4/27/2018	Friday	9:30:45	9:31:00	0:00:15	3	0	0

SPILLBACK ONTO MARSHALL AVENUE QUALITATIVE SUMMARY

- Option 1
  - Monday 04/02/2018
    - 7AM to 8AM
      - Event # 1 Total Time = 1 minute 7 seconds
        - 7:27:28 to 7:27:49 (21 seconds)
          - One vehicle queued on Marshall but there was still plenty of space for it to fit on site
        - 7:27:49 to 7:28:06 (17 seconds)
          - Vehicle queued on Marshall causes two more vehicles traveling straight to be blocked on Marshall
        - 7:28:06 to 7:28:35 (29 seconds)
          - One vehicle halfway in the driveway and still blocking the bike lane (there is room for the vehicle, the vehicle in front is not pulling up close enough to the next vehicle)
      - Event # 2 Total Time = 4 minutes 58 seconds
        - 7:43:29 to 7:43:40 (11 seconds)
          - One vehicle queued on Marshall, site is packed efficiently
        - 7:43:40 to 7:44:32 (52 seconds)
          - Queue on Marshall increased to two vehicles, site is still packed efficiently and the driveway queue hasn't moved
        - 7:44:32 to 7:44:53 (21 seconds)
          - Queue increased to six vehicles that are queuedback into the intersection (mix of vehicles visiting the site and through traffic)
        - 7:44:52 to 7:45:34 (42 seconds)
          - Queue reduced to five vehicles on Marshall and intersection is not blocked anymore
        - 7:45:34 to 7:46:02 (28 seconds)
          - Queue reduced to four vehicles on Marshall
        - 7:46:02 to 7:46:46 (44 seconds)
          - Queue reduced to one vehicle on Marshall
        - 7:46:46 to 7:48:06 (80 seconds)
          - Queue increased to two vehicles on Marshall
        - 7:48:06 to 7:48:27 (21 seconds)
          - Queue reduced to one vehicle halfway in the driveway still blocking the bike lane
      - Event # 3 Total Time = 41 seconds
        - 7:50:14 to 7:50:55 (41 seconds)
          - Two vehicles queued on Marshall, site is packed efficiently
    - 8AM to 9AM – No Events
    - 9AM to 10AM – No Events

- Tuesday 04/03/2018 (Afternoon Snow Storm)
  - 7AM to 8AM
    - Event # 1 Total Time = 25 seconds
      - 7:40:55 to 7:41:20 (25 seconds)
        - Two vehicles queued onto Marshall, site packed efficiently
  - 8AM to 9AM – No Events
  - 9AM to 10AM
    - Event # 2 Total Time = 1 minute 2 seconds
      - 9:14:30 to 9:15:32 (62 seconds)
        - One vehicle sticking halfway out of the driveway bike lane still blocked
    - Event # 3 Total Time = 16 seconds
      - 9:18:29 to 9:18:45 (16 seconds)
        - One vehicle queued onto Marshall, there is room for the vehicle to fit but they are not pulling all the way into the site
    - Event # 4 Total Time = 25 seconds
      - 9:35:44 to 9:36:10 (25 seconds)
        - One vehicle queued onto Marshall, site packed efficiently
    - Event # 5 Total Time = 16 seconds
      - 9:37:55 to 9:38:11 (16 seconds)
        - One vehicle sticking halfway out of the driveway bike lane still blocked
    - Event # 6 Total Time = 16 seconds
      - 9:39:31 to 9:39:47 (16 seconds)
        - One vehicle queued onto Marshall, there is space to fit in the driveway
- Wednesday 04/04/2018 (still a lot of snow on the roads and site)
  - 7AM to 8AM – No Events
  - 8AM to 9AM - No Events
  - 9AM to 10AM – No Events
- Thursday 04/05/2018
  - 7AM to 8AM
    - Event # 1 Total Time = 15 seconds
      - 7:26:42 to 7:26:57 (15 seconds)
        - One vehicle sticking halfway out of the driveway, site packed mediumly efficient
  - 8AM to 9AM
    - Event # 2 Total Time = 1 minute 45 seconds
      - 8:19:45 to 8:19:55 (10 seconds)
        - Three vehicles queued on Marshall, site packed efficiently
      - 8:19:55 to 8:21:06 (71 seconds)
        - Queue on Marshall reduced to two vehicles
      - 8:21:06 to 8:21:30 (24 seconds)
        - Queue reduced to one vehicle just sticking half way out of the driveway but it looks like the cop approached the 2nd vehicle and asked them to keep moving and stop blocking Marshall
  - 9AM to 10AM – No Events

- Friday 04/06/2018
  - 7AM to 8AM
    - Event # 1 Total Time = 17 seconds
      - 7:19:52 to 7:20:09 (17 seconds)
        - One vehicle queued onto Marshall, site packed efficiently
    - Event # 2 Total Time = 1minute 28 seconds
      - 7:20:58 to 7:21:18 (20 seconds)
        - One vehicle queued on Marshall, site packed efficiently
      - 7:21:18 to 7:21:38 (20 seconds)
        - Queue on Marshall increased to three vehicles, intersection is blocked, site is still packed efficiently
      - 7:22:38 to 7:23:26 (48 seconds)
        - Queue reduced to one vehicle on Marshall
    - Event # 3 Total Time = 4 minutes 59 seconds
      - 7:54:34 to 7:54:41 (7 seconds)
        - One vehicle queued on Marshall, site packed efficiently
      - 7:54:41 to 7:55:06 (25 seconds)
        - Vehicle queue on Marshall increased to two vehicles
      - 7:55:06 to 7:55:16 (10 seconds)
        - Vehicle queue reduced to one vehicle on Marshall
      - 7:55:16 to 7:58:04 (172 seconds)
        - Vehicle queue increased to four vehicles on Marshall (during the time frame the queue moved but then another vehicle increased the queue back to four vehicles within a few seconds of the change). Intersection very close to being blocked
      - 7:58:04 to 7:58:38 (34 seconds)
        - Queue on Marshall reduced to two vehicles (one vehicle entered the site and another decided to not visit the site after briefly queueing)
      - 7:58:38 to 7:59:33 (55 seconds)
        - Queue increased to 3 vehicles queuedon Marshall (3 new arrivals – one vehicle in the queue entered the site and the other decided not to visit the site)
        - When this queue dissipated to zero it looked like one vehicle entered the site and the officer re-directed the other two vehicles to stop waiting on Marshall
  - 8AM to 9AM – No Events
  - 9AM to 10AM
    - Event # 4 Total Time = 42 seconds
      - 9:00:18 to 9:1:00 (42 seconds)
        - One vehicle queued on Marshall, site packed efficiently
    - Event # 5 Total Time = 55 seconds
      - 9:01:05 to 9:01:12 (7 seconds)
        - One vehicle queued on Marshall, site paced efficiently
      - 9:01:12 to 9:01:38 (26 seconds)
        - Queue on Marshall increased to two vehicles
      - 9:01:38 to 9:02:00 (22 seconds)
        - Queue on Marshall reduced to one vehicle
    - Event # 6 Total Time = 1 minute 11 seconds
      - 9:02:20 to 9:02:31 (11 seconds)
        - Queue on Marshall is two vehicles, site packed efficiently
      - 9:02:31 to 9:03:31 (60 seconds)
        - Queue on Marshall reduced to one vehicle, vehicle behind first one decided not to visit the site

- Event # 7 Total Time = 3 minutes 6 seconds
  - 9:04:37 to 9:05:13 (36 seconds)
    - Two vehicles queued on Marshall, site packed efficiently
  - 9:06:13 to 9:06:04 (51 seconds)
    - Queue increased to 3 vehicles
  - 9:06:04 to 9:06:38 (34 seconds)
    - Queue reduced to one vehicle
  - 9:06:38 to 9:07:43 (65 seconds)
    - Queue increased to 3 vehicles
    - One vehicle entered the site and two other vehicles left the queue after being approached by the officer
- Event # 8 Total Time = 53 seconds
  - 9:12:01 to 9:12:27 (26 seconds)
    - Two vehicles queued on Marshall, site packed efficiently
  - 9:12:27 to 9:12:54 (27 seconds)
    - Queue reduced to one vehicle on Marshall
- Event # 9 Total Time = 24 seconds
  - 914:13 to 9:14:37 (24 seconds)
    - One vehicle in the driveway halfway, bicycle lane still blocked
- Event # 10 Total Time = 14 seconds
  - 9:19:43 to 9:19:57 (14 seconds)
    - One vehicle on Marshall, site packed, efficiently
- Event # 11 Total Time = 27 seconds
  - 9:22:43 to 9:23:10 (27 seconds)
    - Two vehicles queued on Marshall
- Event # 12 Total Time = 3 minutes 11 seconds
  - 9:38:04 to 9:38:18 (14 seconds)
    - Two vehicles queued on Marshall, site packed efficiently
  - 9:38:18 to 9:38:36 (18 seconds)
    - Queue increased to 3 vehicles
  - 9:38:36 to 9:39:20 (44 seconds)
    - Queue reduced to two vehicles
  - 9:39:20 to 9:40:20 (60 seconds)
    - Queue reduced to one vehicle
  - 9:40:20 to 9:40:40 (20 seconds)
    - Queue increased to two vehicles
  - 9:40:40 to 9:41:15 (35 seconds)
    - Queue decreased to one vehicle
- Event # 13 Total Time = 2 minutes 22 seconds
  - 9:41:32 to 9:42:59 (87 seconds)
    - Two vehicles queued on Marshall
  - 9:42:59 to 9:43:54 (55 seconds)
    - Queue increased to 4 vehicles, intersection blocked
    - 1 vehicle made it onsite, officer sent 3 vehicles away
- Another Event begins one minute before the end of the video file

- Option 2
  - Monday 04/23/2018
    - 7AM to 8AM
      - Event # 1 Total Time = 2 minutes 5 seconds
        - 7:47:37 to 7:47:43 (6 seconds)
          - One vehicle queued onto Marshall, site packed efficiently
        - 7:47:43 to 7:48:22 (39 seconds)
          - Queue increased to three vehicles intersection almost blocked
          - Bike Lane blocked & 2 bicyclists needed to use the regular vehicle travel lane
        - 7:48:11 to 7:49:08 (46 seconds)
          - Queue reduced to two vehicles
        - 7:49:08 to 7:49:42 (34 seconds)
        - Queue reduced to one vehicle
      - Event # 2 Total Time = 47 seconds
        - 7:50:14 to 7:51:01 (47 seconds)
          - One vehicle queued on Marshall
      - Event # 3 Total Time = 55 seconds
        - 7:55:04 to 7:55:59 (55 seconds)
          - One vehicle halfway in the driveway, bike lane still blocked
          - Bike came right at the end of the vehicle blocking the lane
      - Event # 4 Total Time = 59 seconds
        - 7:56:04 to 7:57:03 (59 seconds)
          - One vehicle halfway in the driveway still blocking the bike lane
        - 7:57:03 to 7:57:18 (75 seconds)
          - Queue on Marshall is now one full vehicle

    - 8AM to 9AM
      - Event # 5 Total Time = 2 minutes 3 seconds
        - 7:59:46 to 8:00:54 (68 seconds)
          - Two vehicles queued on Marshall
          - Bike lane blocked, one bicycle had to go around the queue
        - 8:00:54 to 8:01:49 (55 seconds)
          - Queue reduced to one vehicle
          - Bike came right at the end of the lane being blocked
      - Event # 6 Total Time = 26 seconds
        - 8:02:24 to 8:02:50 (26 seconds)
          - 1 vehicle queue - another vehicle queued for less than 5 seconds then decided not to wait in the queue
      - Event # 7 Total Time = 15 seconds
        - 8:03:30 to 8:03:45 (15 seconds)
          - Two vehicle queue that dissipated very quickly once vehicles were queued more efficiently on site by the officer
      - Event # 8 Total Time = 29 seconds
        - 8:46:26 to 8:46:39 (13 seconds)
          - Four vehicles queued (1 vehicle waiting to go onsite the others were unable to continue traveling straight, intersection blocked
        - 8:46:39 to 8:46:55 (16 seconds)
          - Vehicle moved over to block bike lane and three vehicles continued along Marshall
    - 9AM to 10AM
      - Event # N/A Total Time = 26 seconds
        - 9:10:15 to 9:10:41 (26 seconds)

        - One vehicle queued on Marshal – caused by officer speaking to another vehicle onsite
        - *Did not include in data summary
- Tuesday 04/24/2018
    - 7AM to 8AM
        - Event # 1 Total Time = 1 minute 28 seconds
            - 7:35:49 to 7:37:17 (88 seconds)
                - One vehicle halfway onsite, easily could have pulled in to the driveway to not block the bike lane
                - One bike had to use vehicle travel lane to avoid blockage
        - Event # 2 Total Time = 1 minute 43 seconds
            - 7:39:24 to 7:39:54 (30 seconds)
                - One vehicle halfway in the driveway + 1 vehicle fully queued on Marshall
            - 7:39:54 to 7:40:26 (30 seconds)
                - One vehicle halfway in the driveway + 2 vehicles fully queued on Marshall.
            - 7:40:26 to 7:41:09 (43 seconds)
                - One vehicle halfway in the driveway + 1 vehicle fully queued on Marshall
        - Event # 3 Total Time = 10 seconds
            - 7:49:17 to 7:49:27 (10 seconds)
                - One vehicle queue on Marshall
    - 8AM to 9AM
        - Event # 4 Total Time = 30 seconds
            - 8:36:54 to 8:37:26 (30 seconds)
                - One vehicle queued on Marshall
    - 9AM to 10AM
        - Event # 5 Total Time = 37 seconds
            - 9:32:11 to 9:32:28 (17 seconds)
                - One vehicle queued on Marshall
            - 9:32:28 to 9:32:48 (20 seconds)
                - Queue increased to 2 vehicles
        - Event # 6 Total Time = 1 minute 34 seconds
            - 9:37:40 to 9:37:44 (4 seconds)
                - One vehicle queued on Marshall
            - 9:37:44 to 9:38:40 (56 seconds)
                - Queue increased to two vehicles
            - 9:38:40 to 9:39:14 (34 seconds)
                - Queue increased to 3 vehicles
        - Event # 7 Total Time = 26 seconds
            - 9:48:09 to 9:48:35 (26 seconds)
                - One vehicle queued on Marshall but they could fit in the driveway
        - Event # 8 Total Time = 21 seconds
            - 9:55:58 to 9:56:19 (21 seconds)
                - One vehicle queued on Marshall
                - One Bicyclist impacted by queue
        - Event # 9 Total Time = 2 minutes 20 seconds
            - 9:56:38 to 9:57:32 (54 seconds)
                - Three vehicles queued on Marshall
            - 9:57:32 to 9:57:42 (10 seconds)
                - Queue reduced to two vehicles
            - 9:57:42 to 9:58:36 (56 seconds)

- Queue increased to approximately three vehicles – intersection now blocked
- 9:58:36 to 9:58:56 (20 seconds)
- One vehicle queued on Marshall
- Another Event begins one minute before the end of the video file

- Wednesday 04/25/2018
  - 7AM to 8AM
    - Event # 1 Total Time = 2 minutes 54 seconds
      - 7:31:19 to 7:32:07 (48 seconds)
        - One vehicle on queued Marshall
      - 7:32:07 to 7:32:42 (35 seconds)
        - Two vehicles queued on Marshall
      - 7:32:42 to 7:33:43 (61 seconds)
        - Three vehicles queued on Marshall
      - 7:33:43 to 7:34:13 (30 seconds)
        - One vehicle queued on Marshall
        - One bike impacted by blockage
    - Event # 2 Total Time = 55 seconds
      - 7:35:54 to 7:35:00 (06 seconds)
        - One vehicle queued on Marshall
      - 7:35:00 to 7:36:49 (49 seconds)
        - Two vehicles queued on Marshall
    - Event #3 Total time = 3 minutes 4 seconds
      - 7:40:01 to 7:40:46 (45 seconds)
        - One vehicle queued on Marshall
      - 7:40:46 to 7:41: 14 (28 seconds)
        - Queue increased to two vehicles
      - 7:41:14 to 7:43:05 (111 seconds)
        - Queue decreased to one vehicle
    - Event # 4 Total Time = 45 seconds
      - 7:47:19 to 7:47:49 (30 seconds)
        - Two vehicles queued on Marshall
      - 7:49:49 to 7:48:04 (15 seconds)
        - One vehicle queued on Marshall
    - Event # 5 Total Time = 35 seconds
      - 7:48: 49 to 7:49:24 (35 seconds)
        - One vehicle queued on Marshall
  - 8AM to 9AM - No Events
  - 9AM to 10AM –
    - Event # 6 Total Time = 1 minute 36 seconds
      - 9:26:48 to 9:28:24 (96 seconds)
        - One vehicle queued on Marshall
    - Event # 7 Total Time = 29 seconds
      - 9:29:37 to 9:30:06 (29 seconds)
        - One vehicle queued on Marshall
- Thursday 04/26/2018
  - 7AM to 8AM
    - Instance # 1 Total Time = 24 seconds
      - 7:05:50 to 7:06:12
        - One vehicle queued on Marshall
  - 8AM to 9AM – No Events
  - 9AM to 10AM – No Events

- Friday 04/27/2018
  - 7AM to 8AM
    - Instance # 1 Total Time = 1 minutes 20 seconds
      - 7:03:57 to 7:04:32 (35 seconds)
        - One vehicle queued on Marshall
      - 7:58:20 to 7:58:38 (18 seconds)
        - One vehicle halfway in the driveway, bike lane still blocked
      - 7:58:38 to 7:59:05 (27 seconds)
        - One vehicle halfway in the driveway + One full vehicle queued on Marshall
  - 8AM to 9AM – No Events
  - 9AM to 10AM
    - Event # 2 Total Time = 45 seconds
      - 9:30:10 to 9:30:45 (35 seconds)
        - Two vehicles queued on Marshall
      - 9:30:45 to 9:31:00 (15 seconds)
        - Three vehicles queued on Marshall (Two vehicles attempting to travel straight on Marshall were blocked by the one waiting to get into the site)