KAW VALLEY ENGINEERING, INC.

TRAFFIC IMPACT STUDY
WALGREENS
SW 29th STREET AND SW GAGE BOULEVARD
TOPEKA, KANSAS

Prepared For:

BATIS DEVELOPMENT COMPANY
2933 SW Woodside Drive, Suite 200
Topeka, Kansas 66614

Prepared By:

KAW VALLEY ENGINEERING, INC.
14700 West 114th Terrace
Lenexa, Kansas 66215

April 17, 2014

Project No. A14D6828

Consulting Engineers

Walgreens
SW 29th Street and SW Gage Boulevard
Topeka, Kansas
Project No. A14D6828

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TRAFFIC ANALYSIS

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KAW VALLEY ENGINEERING, INC.

April 17, 2014 **A14D6828**

Batis Development Company
2933 SW Woodside Drive, Suite 200
Topeka, Kansas 66614

RE: WALGREENS
SW 29th STREET AND SW GAGE BOULEVARD
TOPEKA, KANSAS

On the behalf of Batis Development Company, Kaw Valley Engineering, Inc. (KVE) has completed a Traffic Impact Study for a proposed Walgreens on the northwest corner of SW 29th Street and SW Gage Boulevard in Topeka, Kansas. The purpose of this study is to assess current traffic conditions and to determine the impact of additional traffic on the surrounding street system generated by the proposed development.

This report has been completed in accordance with City requirements and will be submitted to the City of Topeka, Kansas. This report summarizes our findings and focuses on the impacts the proposed project will have on traffic during the typical weekday AM and PM peak hour periods. The report includes an analysis of existing conditions and traffic volumes, proposed traffic projections, capacity analysis and recommendations for improvements that would be warranted by the development of this property.

DEVELOPMENT DESCRIPTION

The Batis Development Company is proposing the construction of a 14,820 SF free standing Walgreens with Drive Thru. The proposed development will be located on the northwest corner of SW 29th Street and SW Gage Boulevard in Topeka, Kansas. The general location of the site relative to major streets is shown on Figure 1. The site plan for the proposed development is shown on Figure 2. The proposed development will be constructed in a single phase and additional development on the property in the future is not anticipated. The developer is proposing one site access point on SW 29th Street and one access point on SW Gage Boulevard. Although not specifically addressed in this study, the site configuration should be designed to accommodate easy access to parking areas as well as truck loading areas along the building while limiting conflict points internal to the site. The site designer should evaluate internal turning radii and driveway widths to accommodate both passenger and truck traffic. The recommended location and configuration of the drives in relation with street offsets is discussed later in the report.

EXISTING ROADWAY CONDITIONS AND TRAFFIC VOLUMES

SW 29th Street is a four lane undivided roadway with a center two way left turn. In the southeast corner of the proposed development, SW 29th Street intersects with SW Gage Boulevard. SW Gage Boulevard is also a four lane undivided roadway with a center two way left turn lane. The intersection of SW 29th Street and SW Gage Boulevard is signalized. The two way left turn lanes transition to a single dedicated left turn lane at the intersection with a raised median. The posted speed limit is 40 mph on both SW 29th Street and SW Gage Boulevard. Both roadways would be classified as arterials and are the primary corridors used to access Interstate 470, a mix of residential areas as well as small commercial developments. Refer to Figure 3 for an illustration of the existing street layout adjacent to the development.

To assess the impacts of the proposed development, KVE collected Peak Hour Traffic counts for the A.M. and P.M. peak hour on Wednesday April 2, 2014. Manual turning movement counts were collected at the following intersections:

- SW 29th Street and SW Gage Boulevard

Refer to Figure 4 for the Existing A.M. and P.M. Peak Hour Traffic Volume and Distribution Diagrams.

DRIVEWAY SPACING AND ACCESS MANAGEMENT

The fundamental concern that needs to be addressed by the site designer is proper planning for future traffic volumes and access management. As stated earlier, the Batis Development Company is proposing to construct two driveways to serve the Walgreens. One entrance is planned to be located on SW 29th Street. This entrance is noted to be 36' wide to allow one ingress and two egress lanes and is shown to be approximately 320' west of the center of the 29th and Gage intersection. The proposed driveway is offset approximately 50' east of an existing driveway to the commercial development on the southwest corner of 29th Street and Gage Boulevard. The second driveway proposed to be constructed as part of the Walgreen's development is to be located on SW Gage Boulevard approximately 340' north of the center of the 29th and Gage intersection. This access is also illustrated as 36' wide with one ingress and two egress lanes. Similar to the proposed driveway on 29th Street, the Gage Boulevard access is offset from the driveways serving the commercial development in the northeast quadrant of the intersection of SW 29th Street and SW Gage Boulevard. To maximize accessibility to the proposed Walgreen's the number of access points to the property is appropriate, but the site designer needs to consider the impact and spacing the proposed driveways have on the traffic operations of the adjacent street network and driveways.

The anticipated traffic volumes expected to be generated by this project will not significantly increase the traffic on the adjacent street network, but the proposed Walgreens will replace a small number of single family homes and consolidate driveways into higher volume commercial entrances. Proper driveway spacing and controls on traffic movements should be considered. To enhance safety, it is recommended that the site designer considers the functional area of the adjacent intersections and the impacts constructing driveways in close proximity to adjacent intersections has on traffic operations. AASHTO states the driveways should not be situated within the functional boundary of at grade intersections. This boundary is traditionally

recognized as the physical limits of the intersection including the limits of auxiliary turn lanes, but should also be expanded to include the functional area comprising of queues, reaction and maneuvering distance as practical. Research has indicated that to enhance safety, the average driver should expect to clear an intersection or complete one maneuver prior to being expected to encounter another decision due to downstream traffic operations. Based upon the design speed of both SW 29th Street and SW Gage Boulevard the recommended spacing between site driveways and adjacent intersections can be determined from the information presented in Table 1 below.

Table 1

		Limiting Conditions			Desirable Conditions		
Upstream Functional Area	**Speed**	**PIEV Plus Deceleration (ft)**	**Queue 95% (ft)**	**Total (ft)**	**PIEV Plus Deceleration (ft)**	**Queue 95% (ft)**	**Total (ft)**
Eastbound on SW 29th Street	40 mph	335	TBD	335 + Queue	490	TBD	490 + Queue
Southbound on SW Gage Boulevard	40 mph	335	TBD	335 + Queue	490	TBD	490 + Queue

Downstream Functional Area	**Speed**	**AASHTO SSD (ft)**	**Downstream Functional Area 2013 KDOT AMP**	**Left Turn Driving Task (ft)**
Westbound on SW 29th Street	40 mph	335	245	90
Northbound on SW Gage Boulevard	40 mph	335	245	90

Source: 2013 KDOT Access Management Policy Table 4.4

Furthermore, consideration needs to be given to issues that arise from closely spaced driveways on opposite sides of a roadway. Ideally, access points should be aligned or provided with sufficient separation to limit the conflicts from opposing left turns or conflicting left turn in and left turn out.

SIGHT DISTANCE

The guidelines for sight distance analysis are based upon the design guidelines for intersection sight distance for at-grade intersections published in the American Association of State Highway and Transportation Officials (AASHTO), A Policy on Geometric Design of Highway and Streets, *2004 Edition.* Refer to Table 2 for the recommended sight distances for driveways.

Table 2

Intersection Sight				
Access Location and Turning Movement		Design Speed*	AASHTO Recommended Distance Passenger Car	AASHTO Recommended Distance Single Unit Truck
Driveway on SW 29th Street	Left	40	500**	620**
	Right		385	500
Driveway on SW Gage Boulevard	Left	40	500**	620**
	Right		385	500

* Design Speed was assumed to be statutory speed of 40 mph.
** Intersection Sight Distances based on five lane road for left turns.

The recommended intersection sight appears to be available along the frontage of the Walgreen's property. The topography within the vicinity of the proposed development is generally level with limited horizontal curvature. The developer is advised that care should be taken by the site designer to not locate landscaping or development signage within the sight triangles at each driveway.

SITE TRAFFIC PROJECTIONS

The analysis of the proposed development's impact included estimates of vehicle trip generation and distribution of trips onto the street network. This study focuses on the typical weekday AM and PM peak hours as well as additional ADT since the development is commercial in nature. Vehicle trip generation estimates were determined using the Institute of Transportation Engineers (ITE) Trip Generation Manual, 9th *Edition*. Based on the anticipated use of this development, ITE Code 881 for a drug store with drive through window seemed most appropriate for this development. The estimated daily AM and PM peak hour volumes are shown in Table 3.

Table 3 - DEVELOPMENT TRAFFIC

Walgreens

ITE Trip Generation: 9th edition					
Land Use	**1000 GFA**	**ITE Code**	**Daily Traffic**	**AM Peak Hour**	**PM Peak Hour**
Drug Store with Drive Through Window	**14.82**	**881**	**1436**	**51**	**147**
	Enter		718	27	73
	Exit		718	25	73

Page: 1801-1804

Average Rate used

TRIP DISTRIBUTION

Using the trip generations above, the projected traffic was distributed onto the existing street system. It was assumed the site-generated traffic would follow a similar distribution pattern to existing traffic. Using these assumptions, site-generated traffic was distributed onto the adjacent roadway network. The general trip distributions are summarized in Table 4.

Table 4

Trip Distribution (Table 4)	
Direction	Site Distribution Proposed
To/From East on SW 29th Street	30%
To/From West on SW 29th Street	20%
To/From North on SW Gage Boulevard	25%
To/From South on SW Gage Boulevard	25%
Total	100%

The projected traffic volumes were superimposed onto the street system with the existing traffic. The area in the general vicinity of the proposed Walgreens is developed and it is anticipated that future growth in background traffic adjacent to the development will be limited and therefore was not analyzed. Refer to Figure 5 for the Proposed AM and PM Peak Hour Traffic Volume Diagrams.

CAPACITY AND QUEUING ANALYSIS

The peak hour traffic volumes at the study intersections were analyzed to determine the operational characteristics during the peak hours of a typical weekday for the following scenarios:

- Existing Conditions
- Existing Plus Proposed Conditions

The study intersections were analyzed using procedures and methodology outlined in the Highway Capacity Manual 2000 (HCM) produced by the Transportation Research Board. The intersections were evaluated using Level-of-Service (LOS). An intersection operational analysis is typically quantified by the LOS experienced by drivers. LOS ranges from 'A' to 'F'. LOS 'A' represents free flow movement of traffic and minimal delay. LOS 'F' is usually an indication of congested conditions and excessive delay. Intermediate grades indicate incremental increases in congestion and delay. The LOS deemed acceptable varies by community and facility type. LOS of 'E' of 'F' are often acceptable for low or moderate traffic volumes such as private driveways or intersections were signalization warrants are not met or a traffic signal may be undesirable. The criteria for LOS as defined by delay for an unsignalized and signalized intersection is listed in Table 5.

Table 5

Level-of-Service: Delay Threshold		
Level-of-Service (LOS)	Unsignalized Intersection Approach Delay (Sec/Veh)	Signalized Intersection Approach Delay (Sec/Veh)
A	0-<10	0-<10
B	10-<15	10-<20
C	15-<25	21-<35
D	25-<35	35-<55
E	35-<50	55-<80
F	>50	>80

A queuing analysis was also performed for the study intersections. This type of analysis will be used to determine if the proposed driveways are adequately spaced, there are potential conflicts with the access points and determine if dedicated turning lanes or additional length to turning lanes may be required. Results are presented as the 95th Percentile Queue. Moreover, the 95th Percentile Queue is a measurement of the expected length (queue) of traffic that would develop because of traffic control at an intersection. The 95th percentile was used to account for traffic fluctuations.

The results of the analyses as well as recommendations for improvements to the study intersections are listed below for each of the scenarios evaluated.

EXISTING CONDITIONS

The results of the capacity analysis for the existing AM and PM peak hours are summarized in Table 6. The intersection of SW 29th Street and SW Gage Boulevard was evaluated using the existing traffic volumes, roadway geometry, and traffic control as indicated on Figure 3 to determine the extent of the existing queues and level of service at the signalized intersection.

Table 6

Summary of Results: Capacity & Queuing Analysis							
Existing Conditions							
		AM Peak Hour			PM Peak Hour		
Intersection	Movement	LOS	Delay (sec/veh)	95% Queuing	LOS	Delay (sec/veh)	95% Queuing
SW 29th Street and SW Gage Boulevard	All Movements	D	42.3	-	D	49.5	-
	Eastbound Left			240			243
	Eastbound			197			295
	Westbound Left			161			313
	Westbound			287			388
	Northbound Left			72			146
	Northbound			396			310
	Southbound Left			176			307
	Southbound			166			289

The results of the analysis for the existing conditions indicate that the intersection is currently operating at a LOS D. This is typically an acceptable operating threshold for urban areas during peak hour. More importantly the queuing analysis indicate that during a typical AM and PM peak hour, the vehicle queue that develops due to the traffic signal will have a high probability of impacting traffic flow into and out of both the existing and proposed commercial driveways in all directions due to the proximity of the driveways to the existing signal. Regarding the proposed Walgreens, the anticipated spillback will have the greatest impact on the northbound and eastbound left turn movement downstream of the traffic signal. Ideally, site entrances would be located (at minimum) outside the intersection vehicular storage area in addition to the areas needed for preparation/reaction time and deceleration, but the available frontage depicted on Figure 2 is limited. It is recommended that the site designer consider limited access to the proposed Walgreens entrance on SW Gage Boulevard to improve traffic flow on the public roadway.

EXISTING PLUS DEVELOPMENT CONDITIONS

As stated earlier, Batis Development Company is proposing two full access driveways. This configuration has been analyzed to determine the impact the proposed development will have on the adjacent street network. The results of the capacity analysis for the proposed AM and PM peak hours are summarized in Table 7. Refer to Figure 5 for the Proposed AM and PM Peak Hour traffic volume diagram.

Table 7

Summary of Results: Capacity & Queuing Analysis							
Proposed Conditions							
		AM Peak Hour			PM Peak Hour		
Intersection	Movement	LOS	Delay (sec/veh)	95% Queuing	LOS	Delay (sec/veh)	95% Queuing
SW 29th Street and SW Gage Boulevard	All Movements	D	42.9	-	D	51.7	-
	Eastbound Left			240			243
	Eastbound			197			307
	Westbound Left			161			313
	Westbound			293			406
	Northbound Left			74			156
	Northbound			400			316
	Southbound Left			187			326
	Southbound			169			177
North Driveway and SW Gage Boulevard	Eastbound Left	D	31	4	F	55.1	20
	Eastbound Right	B	10.6	2	B	12.4	4
	Northbound Left	A	9	1	B	10.5	3
West Driveway and SW 29th Street	Eastbound Left	A	8.6	0	A	10	2
	Southbound Left	C	18.7	1	E	37	15
	Southbound Right	B	10.1	1	A	9.5	2

The results of the analysis for proposed conditions indicate that the development of the Walgreen's will have little impact on the adjacent signalized intersection at 29th and Gage Boulevard. From a Level of Service Analysis, the left turn movements from the proposed driveways will function, but operate at an undesirable level of service due to the baseline traffic demand on the adjacent public streets, especially during the PM Peak Hour. It is anticipated the driveway at SW Gage Boulevard will experience more congestion than the SW 29th Street driveway. The heavy traffic volumes coupled with the poor access spacing and general access management along the public roadways is cause for concern due to the increased probability of accidents along the corridor due to the number of vehicle conflict points.

RECOMMENDED IMPROVEMENTS

Based upon the analysis results described above, the following improvements would be recommended to improve drivers' safety by limiting vehicular conflict points.

1. It is recommended that the developer and site designer consider limited access to the proposed Walgreens along SW Gage Boulevard by installing a properly designed 'pork chop' within the driveway to limit access to right in/right out.

2. Although within the functional area of the SW Gage Boulevard and SW 29th Street intersection, a full access driveway on SW 29th Street is more desirable than SW Gage Boulevard due to existing traffic volumes. The geometrics of the driveway as currently depicted on the site plan will create left turn conflicts due to opposing left turns associated

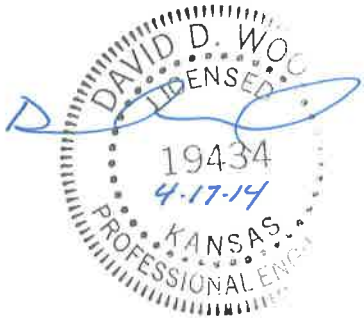
with offset driveways, but the volume of traffic at the driveway on the south side of the street is anticipated to be minimal and full access to the Walgreens in this location is less likely to impede traffic flow on the adjacent public street.

As redevelopment in the vicinity of SW 29th Street and SW Gage Boulevard occurs, it would be advantageous for the City of Topeka to adopt a more comprehensive access management policy to reduce the number of vehicle conflict points along both roadways.

If you have any questions regarding the findings in this study, don't hesitate to contact me at (913) 894-5150 or at wood@kveng.com.

Respectfully Submitted,
Kaw Valley Engineering, Inc.

David D. Wood, P.E.
Project Engineer



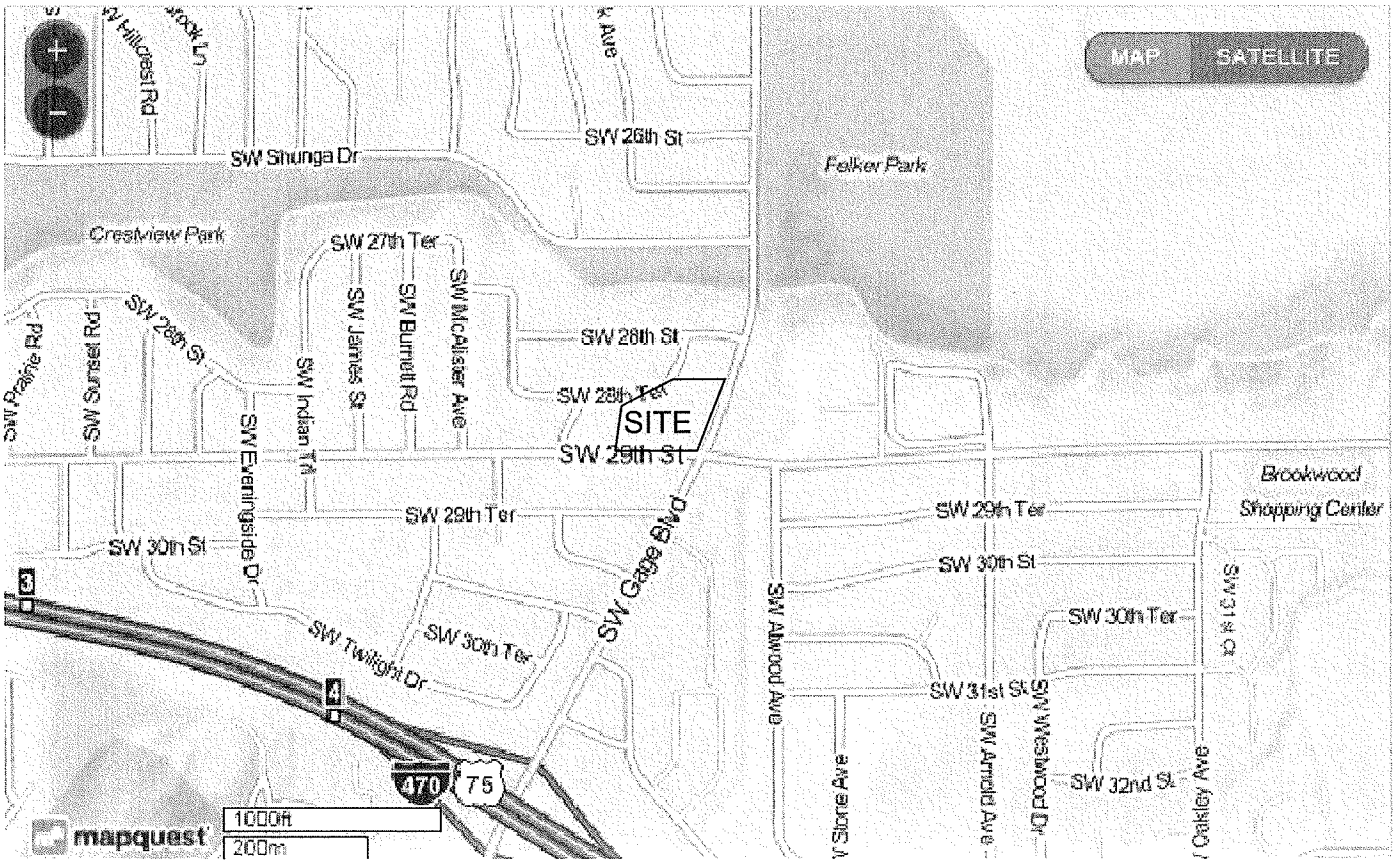


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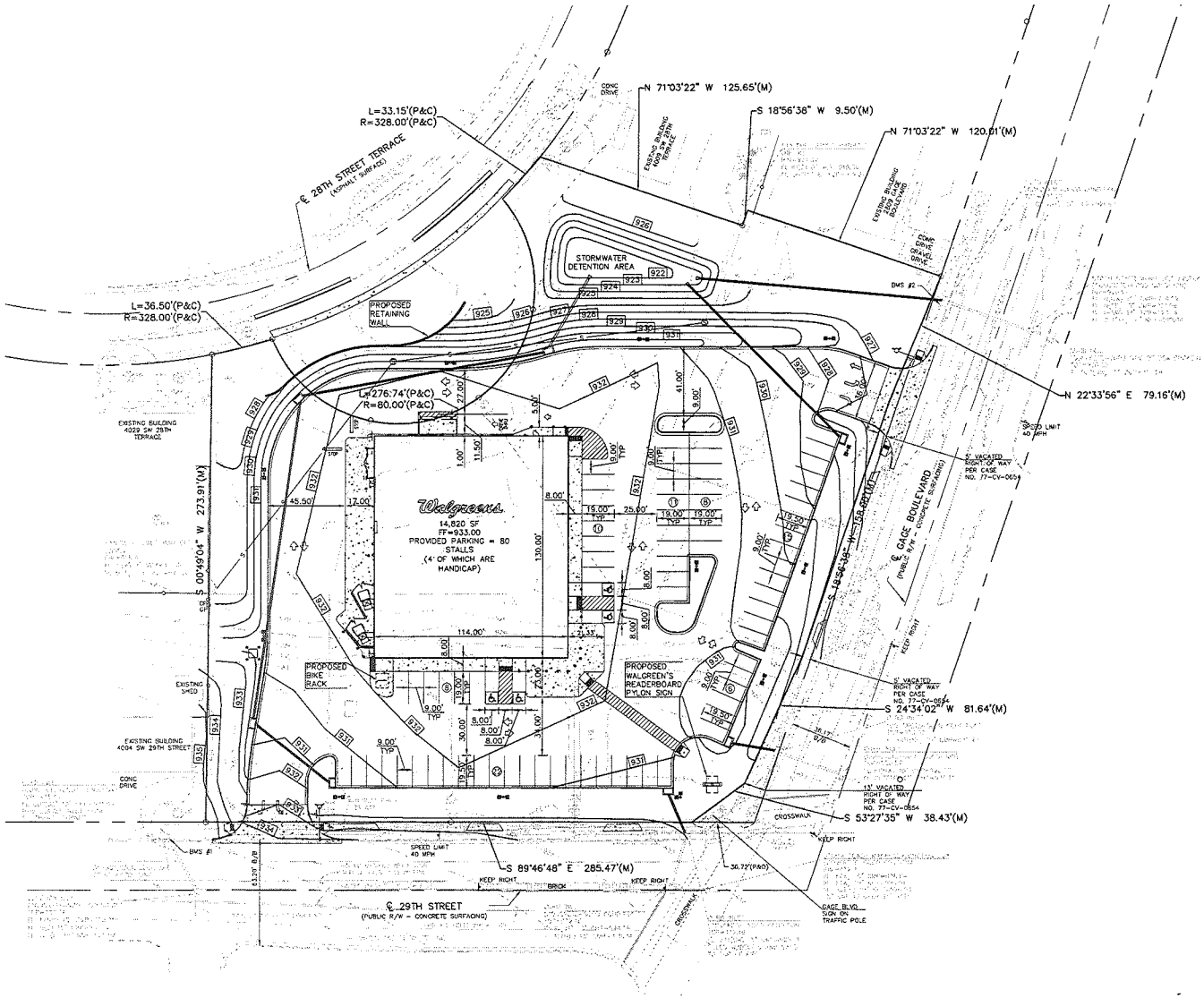
FIGURE "1"
PROJECT #: A14D6828
WALGREENS
TOPEKA, KANSAS
VICINITY MAP

SCALE: N.T.S.
FIGURE-01.dwg



GRAPHIC SCALE

(IN FEET)
1 inch = 30 ft.

DESCRIPTION PER TITLE COMMITMENT–3904 SW 29TH STREET:
LOT 19, BLOCK C, IN WESTVIEW HEIGHTS ESTATE, AN ADDITION TO THE CITY OF TOPEKA, SHAWNEE COUNTY, KANSAS.

DESCRIPTION PER TITLE COMMITMENT–3908 SW 29TH STREET:
LOT 20, BLOCK C, IN WESTVIEW HEIGHTS ESTATE, AN ADDITION TO THE CITY OF TOPEKA, SHAWNEE COUNTY, KANSAS.

DESCRIPTION PER TITLE COMMITMENT–4000 SW 29TH STREET:
LOT 21, BLOCK C, WESTVIEW HEIGHTS ESTATE, AN ADDITION TO THE CITY OF TOPEKA, SHAWNEE COUNTY, KANSAS.

DESCRIPTION PER TITLE COMMITMENT–4000 SW 29TH STREET:
LOT 8, BLOCK C, IN WESTVIEW HEIGHTS ESTATE, AN ADDITION TO THE CITY OF TOPEKA, SHAWNEE COUNTY, KANSAS.

DESCRIPTION PER TITLE COMMITMENT–4000 SW 29TH STREET:
LOT 7, BLOCK C, IN WESTVIEW HEIGHTS ESTATE, AN ADDITION TO THE CITY OF TOPEKA, SHAWNEE COUNTY, KANSAS.

DESCRIPTION PER TITLE COMMITMENT–4000 SW 29TH STREET:
LOT 6, BLOCK C, WESTVIEW HEIGHTS ESTATE, AN ADDITION TO THE CITY OF TOPEKA, SHAWNEE COUNTY, KANSAS.

DESCRIPTION PER TITLE COMMITMENT–4000 SW 29TH STREET:
LOT 5, EXCEPT THE WEST 2.73 FEET, BLOCK C, WESTVIEW HEIGHTS ESTATE, IN THE CITY OF TOPEKA, SHAWNEE COUNTY, KANSAS.

SURVEYOR'S RECOMMENDED DESCRIPTION:

BASIS OF BEARINGS:

2319 NORTH JACKSON
P.O. BOX 1304
JUNCTION CITY, KANSAS 66441
(785)762-5040
FAX (785)762-7744
E-MAIL jc@kveng.com
KAW VALLEY ENGINEERING, INC.
CONSULTING ENGINEERS
KAW VALLEY ENGINEERING, INC., IS AUTHORIZED TO OFFER ENGINEERING SERVICES BY KANSAS STATE CERTIFICATE OF AUTHORIZATION #-113, EXPIRES 12/31/14

PROJ. NO. A14_6828 DSN: LDG
CFN: 6196EXBA_LEASE DWN: EAR/JP

Walgreens
FACILITIES PLANNING
DESIGN AND ENGINEERING
1411 LAKE COOK ROAD
DEERFIELD, IL 60015-5195

I HEREBY CERTIFY THAT THIS PLAT AND SPECIFICATION WAS PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED LAND SURVEYOR UNDER THE LAWS OF THE STATE OF KANSAS AS INSPIRED BY MY HAND AND SEAL.

BATIS
SURVEYING

NO.	DATE	BY	DESCRIPTION
0	4-7-14	DPR	INITIAL ISSUE

REVISIONS

LEASE EXHIBIT
ASBUILT SURVEY

WALGREENS
29TH STREET & GAGE BOULEVARD
TOPEKA, KANSAS

CADD PLOT: EXHIBIT A-LEASE
DRAWN BY: BJS
DATE: 4/2/2014
REVIEWED: LDG

1 OF 1

FIGURE 2

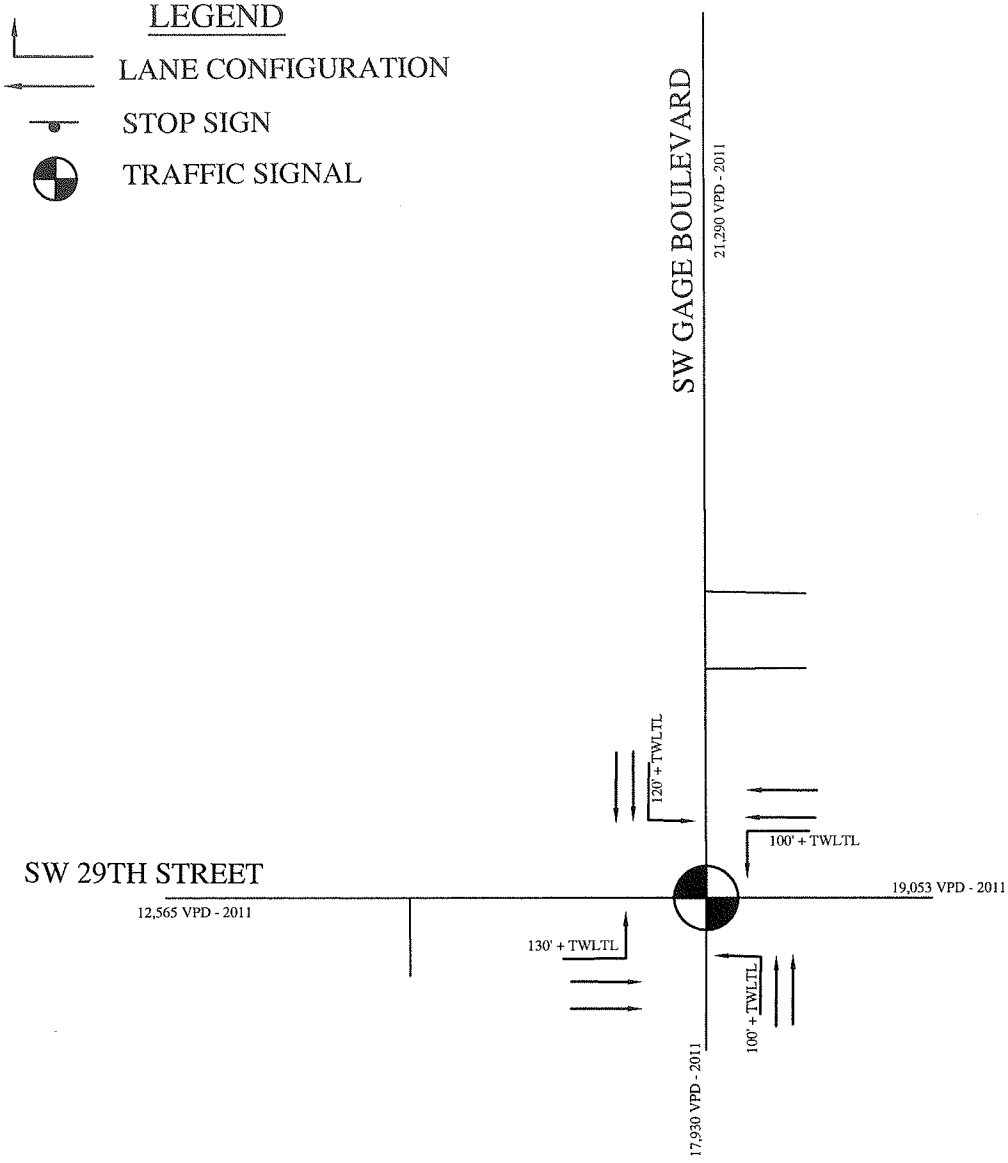


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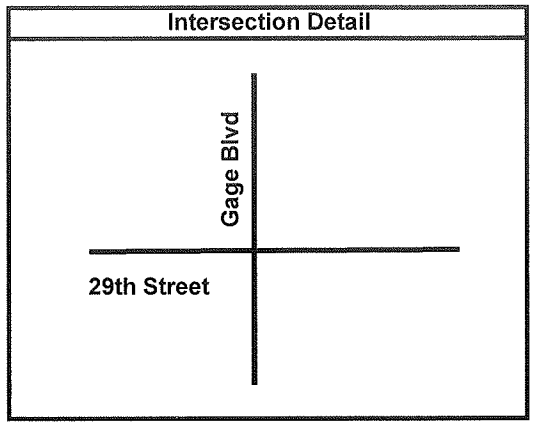
FIGURE "3"
PROJECT #: A14D6828
WALGREENS
TOPEKA, KANSAS
EXISTING CONDITIONS
ROADWAY CONFIGURATION
SCALE: N.T.S.
FIGURE-03.dwg

Traffic Impact Study: Topeka Walgreens
Kaw Valley Engineering, Inc.

Project #: A14D6428
Volume and Distribution Diagram
Intersection: SW 29th Street and SW Gage Blvd
Date: 4-2-14

North



PM	Traffic Movement											
Time	EBL	EB	EBR	WBL	WB	WBR	NBL	NB	NBR	SBL	SB	SBR
7:00	35	62	7	15	26	29	7	94	15	22	50	8
7:15	35	83	8	10	56	43	10	157	39	31	65	9
7:30	47	79	9	27	106	82	7	180	41	35	87	18
7:45	63	108	11	34	86	67	14	213	47	27	102	26
8:00	34	94	12	29	89	64	7	124	32	34	66	17
8:15	51	72	7	29	74	50	12	134	41	36	89	27
8:30	46	113	3	32	95	56	6	113	37	26	68	26
8:45	48	71	5	25	59	59	9	137	41	48	48	18
Peak Hour Counts	**195**	**353**	**39**	**119**	**355**	**263**	**40**	**651**	**161**	**132**	**344**	**88**
Peak Hour Factor	**0.77**	**0.82**	**0.81**	**0.88**	**0.84**	**0.80**	**0.71**	**0.76**	**0.86**	**0.92**	**0.84**	**0.81**
Distribution	**33%**	**60%**	**7%**	**16%**	**48%**	**36%**	**5%**	**76%**	**19%**	**23%**	**61%**	**16%**

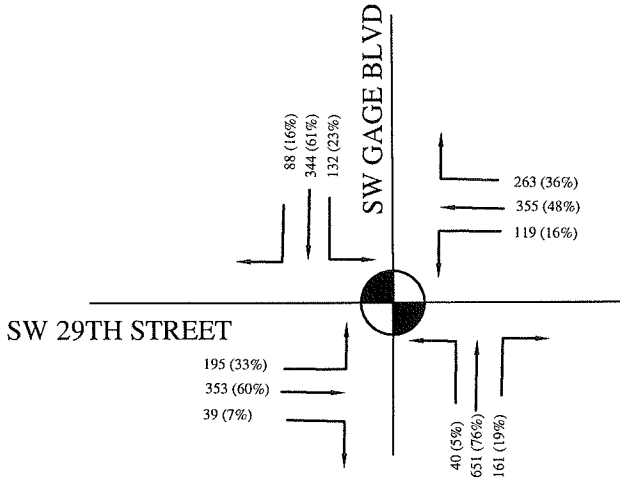
PM	Traffic Movement											
Time	EBL	EB	EBR	WBL	WB	WBR	NBL	NB	NBR	SBL	SB	SBR
4:00	29	121	16	50	119	61	11	87	37	76	167	26
4:15	20	89	16	56	134	56	15	82	39	61	125	26
4:30	30	88	12	48	108	53	31	102	54	82	158	58
4:45	33	120	22	56	122	63	27	94	42	48	110	35
5:00	48	150	26	62	132	68	26	148	61	58	117	31
5:15	49	101	20	55	137	55	23	100	42	60	135	33
5:30	32	104	13	63	137	67	28	92	33	67	118	40
5:45	42	109	20	50	136	71	16	112	37	47	90	24
Peak Hour Counts	**162**	**475**	**81**	**236**	**528**	**253**	**104**	**434**	**178**	**233**	**480**	**139**
Peak Hour Factor	**0.83**	**0.79**	**0.78**	**0.94**	**0.96**	**0.93**	**0.93**	**0.73**	**0.73**	**0.87**	**0.89**	**0.87**
Distribution	**23%**	**66%**	**11%**	**23%**	**52%**	**25%**	**15%**	**61%**	**25%**	**27%**	**56%**	**16%**

LEGEND

EXISTING PEAK HOUR VOLUME

245 (40%) ← DISTRIBUTION

AM PEAK HOUR



PM PEAK HOUR

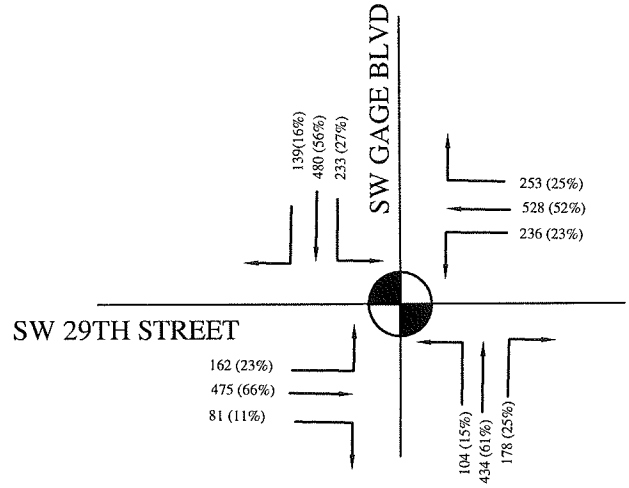


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FIGURE "4"

WALGREENS
TOPEKA, KANSAS
EXISTING CONDITIONS
EXISTING AM AND PM TRAFFIC
VOLUME/DISTRIBUTION DIAGRAM
SCALE: N.T.S.
FIGURE-04.dwg

Traffic Impact Study: SW 29th Street and SW Gage Boulevard
Kaw Valley Engineering, Inc.
Project #: A14D6428

Walgreens

ITE Trip Generation: 9th edition					
Land Use	**1000 GFA**	**ITE Code**	**Daily Traffic**	**AM Peak Hour**	**PM Peak Hour**
Drug Store with Drive Through Window	**14.82**	**881**	**1436**	**51**	**147**
	Enter		718	27	73
	Exit		718	25	73

Page: 1801-1804

Average Rate used

Land Use: 881
Pharmacy/Drugstore with Drive-Through Window

Description

Pharmacies/drugstores are retail facilities that primarily sell prescription and non-prescription drugs. These facilities may also sell cosmetics, toiletries, medications, stationery, personal care products, limited food products and general merchandise. The drug stores in this category contain drive-through windows. Pharmacy/drugstore without a drive-through window (Land Use 880) is a related use.

Additional Data

Several studies indicated that they had two drive-through windows.

Peak hours of the generator—

The weekday A.M. peak hour varied between 8:00 a.m. and 12:00 p.m. The weekday P.M. peak hour varied between 12:00 p.m. and 6:00 p.m. The weekend peak hour varied between 12:00 p.m. and 7:00 p.m.

The sites were surveyed between the 1990s and the 2000s in California, Colorado, Florida, Minnesota, New Hampshire, New Jersey, New York, Pennsylvania, Vermont and Wisconsin.

To assist in the future analysis of this land use, it is important that the number of drive-through lanes at the study site be reported.

Source Numbers

369, 418, 436, 547, 550, 552, 563, 568, 573, 599, 621, 716, 727, 728, 734

Pharmacy/Drugstore with Drive-Through Window
(881)

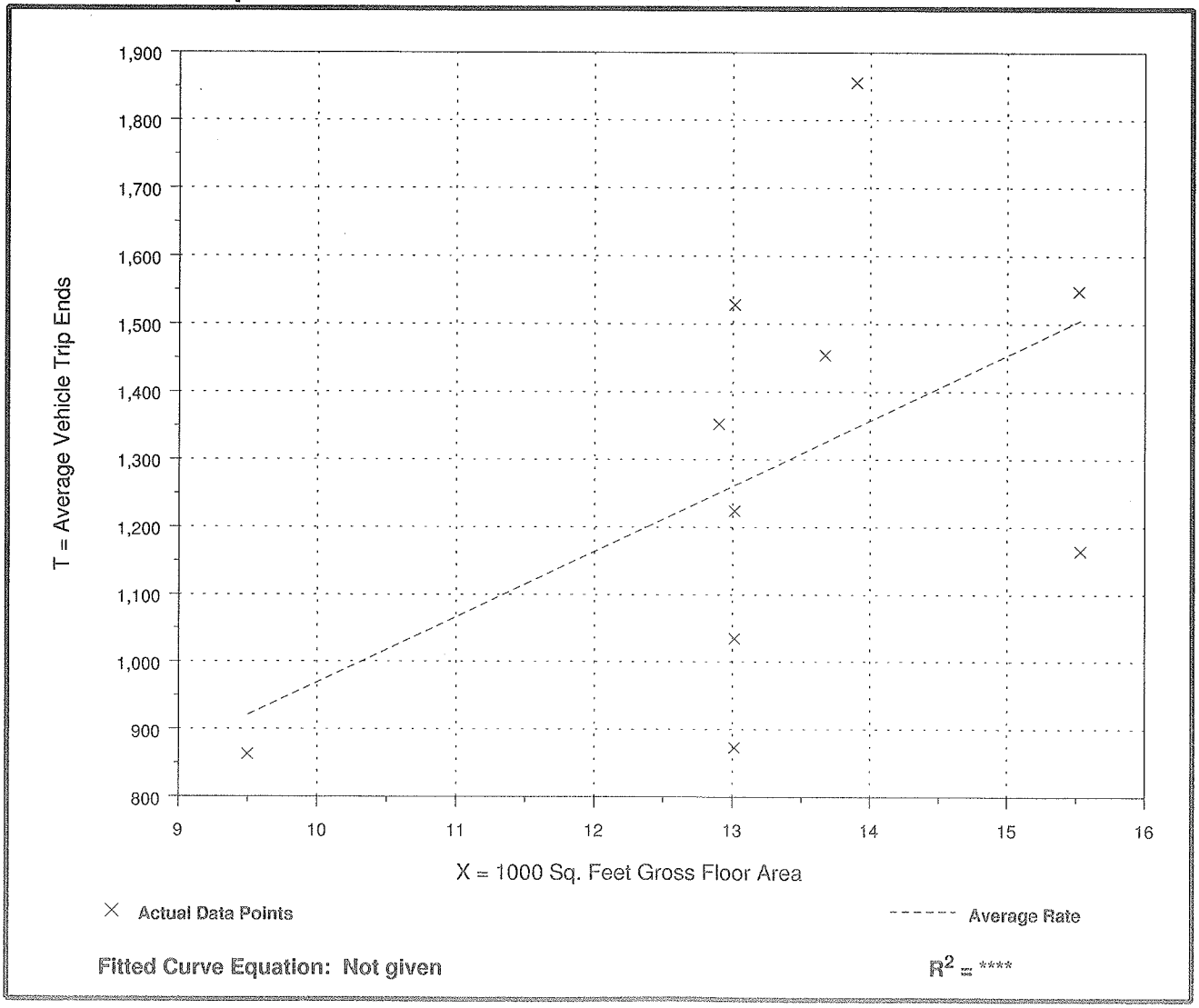
Average Vehicle Trip Ends vs: 1000 Sq. Feet Gross Floor Area
On a: Weekday

Number of Studies: 10
Average 1000 Sq. Feet GFA: 13
Directional Distribution: 50% entering, 50% exiting

Trip Generation per 1000 Sq. Feet Gross Floor Area

Average Rate	Range of Rates	Standard Deviation
96.91	67.09 - 133.45	21.59

Data Plot and Equation



Fitted Curve Equation: Not given

R^2 = ****

Pharmacy/Drugstore with Drive-Through Window
(881)

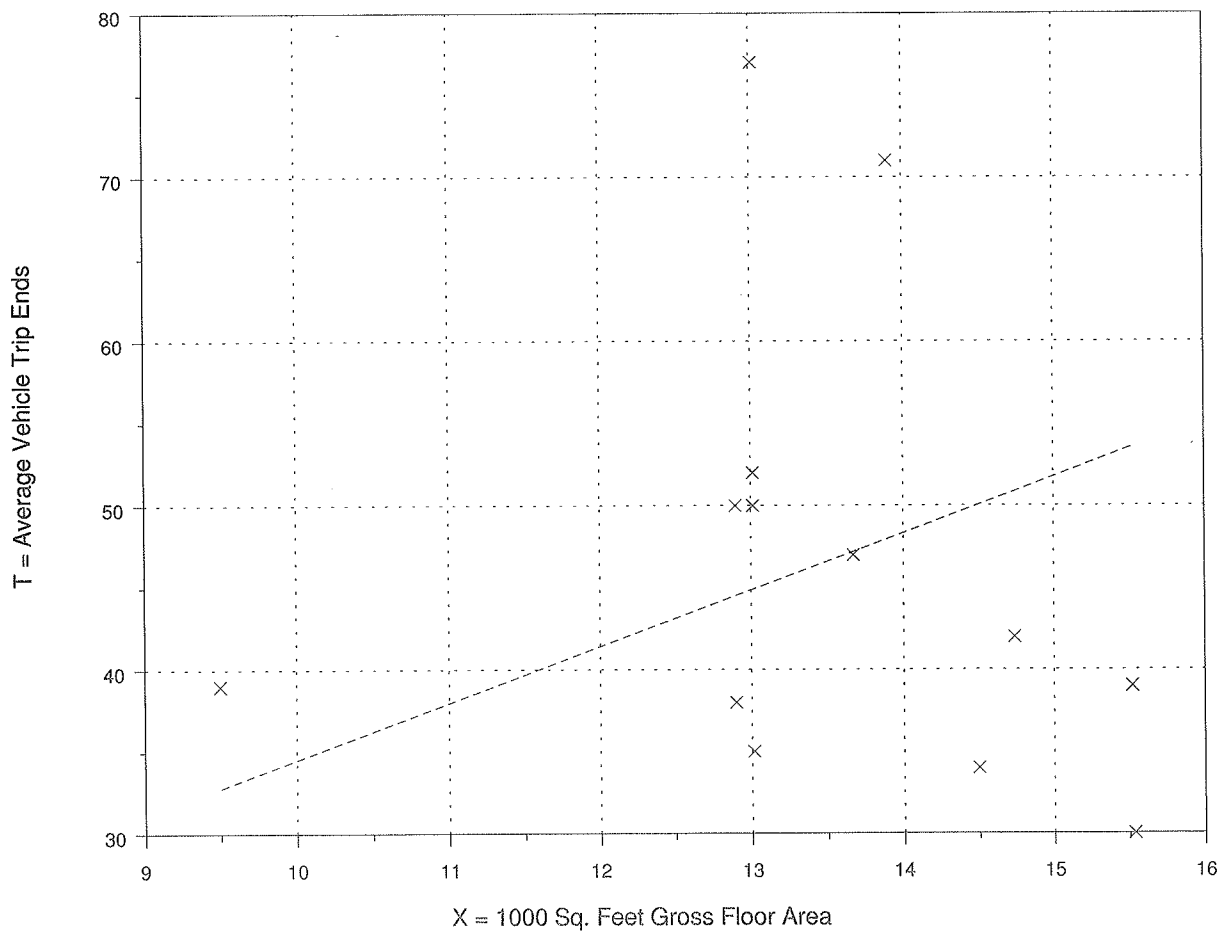
Average Vehicle Trip Ends vs: 1000 Sq. Feet Gross Floor Area
On a: Weekday,
Peak Hour of Adjacent Street Traffic,
One Hour Between 7 and 9 a.m.

Number of Studies: 13
Average 1000 Sq. Feet GFA: 13
Directional Distribution: 52% entering, 48% exiting

Trip Generation per 1000 Sq. Feet Gross Floor Area

Average Rate	Range of Rates	Standard Deviation
3.45	1.93 - 5.92	2.10

Data Plot and Equation



Fitted Curve Equation: Not given

R^2 = ****

Pharmacy/Drugstore with Drive-Through Window
(881)

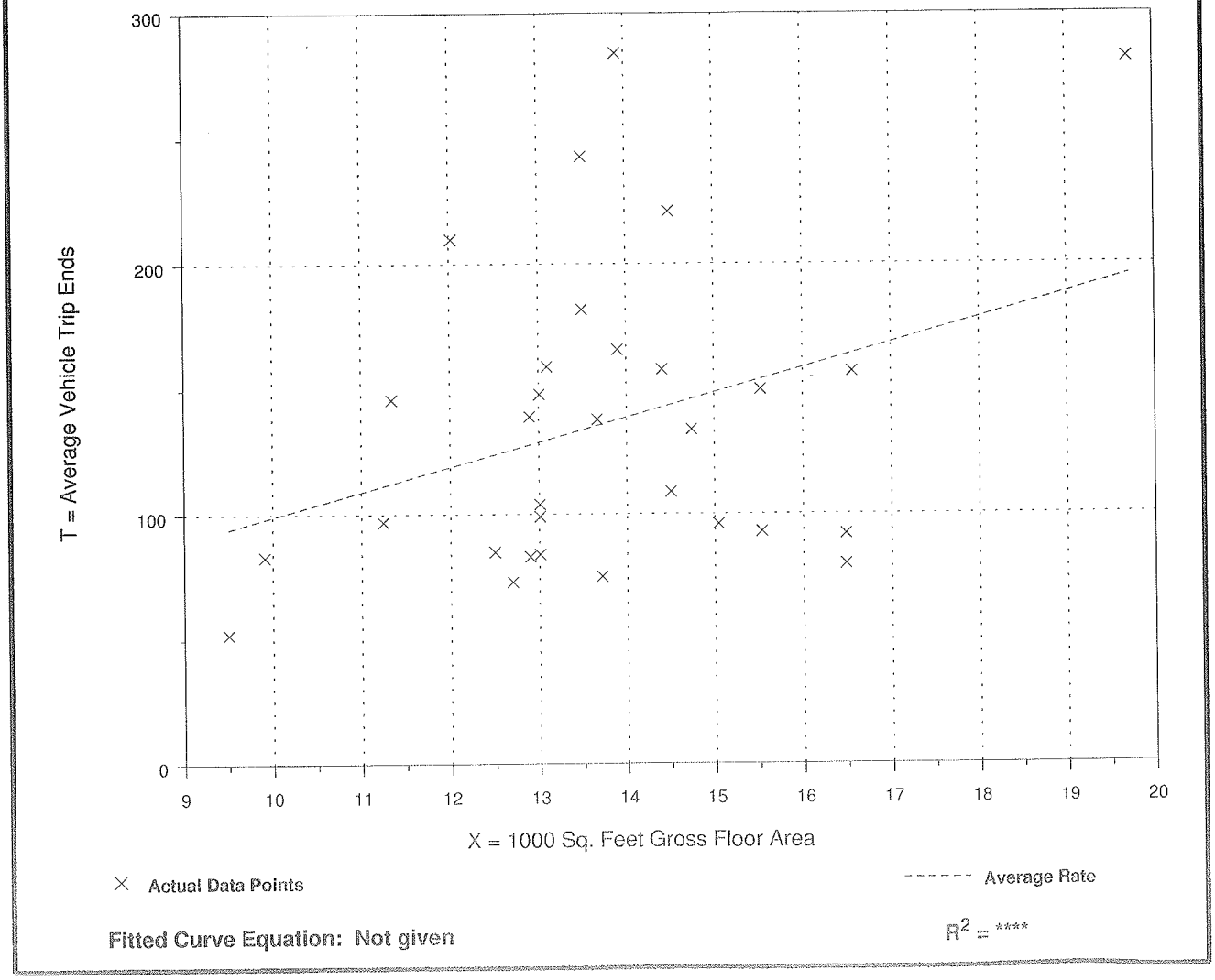
Average Vehicle Trip Ends vs: 1000 Sq. Feet Gross Floor Area
On a: Weekday,
Peak Hour of Adjacent Street Traffic,
One Hour Between 4 and 6 p.m.

Number of Studies: 31
Average 1000 Sq. Feet GFA: 14
Directional Distribution: 50% entering, 50% exiting

Trip Generation per 1000 Sq. Feet Gross Floor Area

Average Rate	Range of Rates	Standard Deviation
9.91	4.85 - 20.43	5.04

Data Plot and Equation



Fitted Curve Equation: Not given

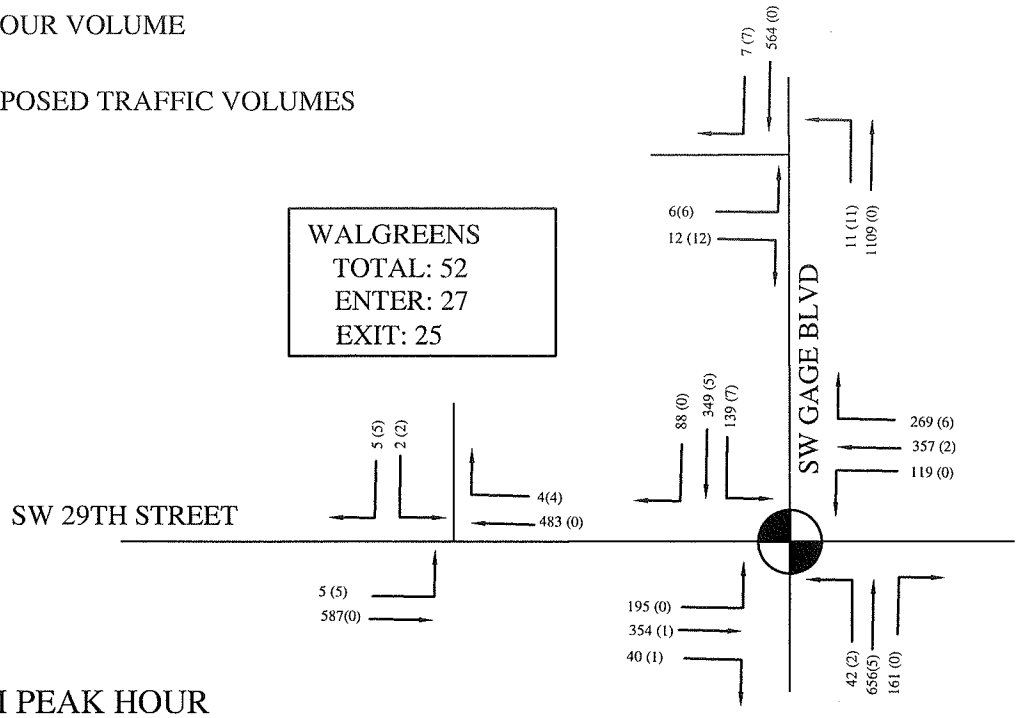
R^2 = ****

LEGEND

EXISTING PEAK HOUR VOLUME

245 (40%) ← PROPOSED TRAFFIC VOLUMES

AM PEAK HOUR



PM PEAK HOUR

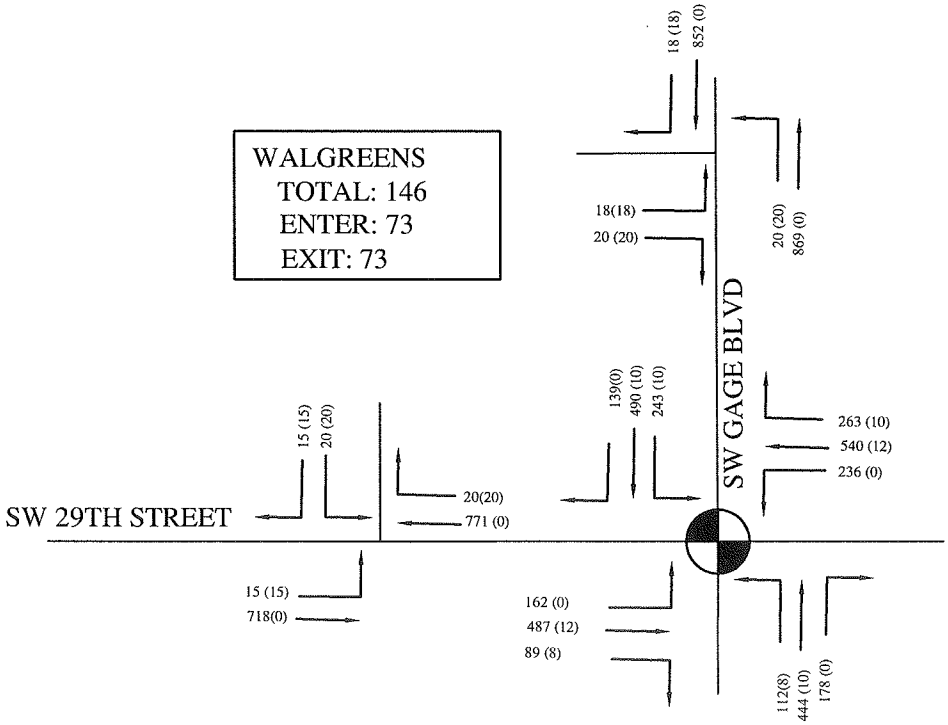


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FIGURE "5"

WALGREENS
TOPEKA, KANSAS
EXISTING PLUS PROPOSED CONDITIONS
EXISTING AM AND PM TRAFFIC
VOLUME/DISTRIBUTION DIAGRAM
SCALE: N.T.S.
FIGURE-05.dwg

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	229	461	140	727	47	955	154	509
v/c Ratio	0.80	0.52	0.66	0.90	0.42	0.75	0.72	0.33
Control Delay	57.1	37.8	56.5	45.1	62.7	36.8	60.6	22.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	57.1	37.8	56.5	45.1	62.7	36.8	60.6	22.0
Queue Length 50th (ft)	168	153	104	232	35	338	114	131
Queue Length 95th (ft)	240	197	161	287	72	396	176	166
Internal Link Dist (ft)		689		639		456		329
Turn Bay Length (ft)								
Base Capacity (vph)	337	954	261	864	123	1265	248	1526
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.68	0.48	0.54	0.84	0.38	0.75	0.62	0.33

Intersection Summary

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Frt	1.00	0.99		1.00	0.94		1.00	0.97		1.00	0.97	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	3486		1770	3314		1770	3434		1770	3431	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1770	3486		1770	3314		1770	3434		1770	3431	
Volume (vph)	195	353	39	119	355	263	40	651	161	131	344	88
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	229	415	46	140	418	309	47	766	189	154	405	104
RTOR Reduction (vph)	0	7	0	0	113	0	0	17	0	0	18	0
Lane Group Flow (vph)	229	454	0	140	614	0	47	938	0	154	491	0
Turn Type	Prot			Prot			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Actuated Green, G (s)	18.3	28.6		13.4	23.7		5.9	41.9		13.6	49.6	
Effective Green, g (s)	18.3	28.6		13.4	23.7		5.9	41.9		13.6	49.6	
Actuated g/C Ratio	0.16	0.25		0.12	0.21		0.05	0.37		0.12	0.44	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	285	878		209	692		92	1268		212	1499	
v/s Ratio Prot	c0.13	0.13		0.08	c0.19		0.03	c0.27		c0.09	0.14	
v/s Ratio Perm												
v/c Ratio	0.80	0.52		0.67	0.89		0.51	0.74		0.73	0.33	
Uniform Delay, d1	45.9	36.5		47.9	43.6		52.4	31.1		48.2	21.0	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	15.0	0.5		7.9	13.1		4.7	3.9		11.7	0.6	
Delay (s)	60.9	37.0		55.8	56.7		57.1	35.0		59.9	21.6	
Level of Service	E	D		E	E		E	C		E	C	
Approach Delay (s)		44.9			56.6			36.0			30.5	
Approach LOS		D			E			D			C	

Intersection Summary			
HCM Average Control Delay	42.3	HCM Level of Service	D
HCM Volume to Capacity ratio	0.79		
Actuated Cycle Length (s)	113.5	Sum of lost time (s)	16.0
Intersection Capacity Utilization	72.8%	ICU Level of Service	C
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	191	654	278	919	122	720	274	729
v/c Ratio	0.83	0.80	0.87	0.92	0.65	0.77	0.86	0.62
Control Delay	71.4	48.0	63.7	47.1	59.2	43.7	62.8	34.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	71.4	48.0	63.7	47.1	59.2	43.7	62.8	34.0
Queue Length 50th (ft)	146	247	208	336	92	260	205	240
Queue Length 95th (ft)	#243	295	#313	388	146	310	#307	289
Internal Link Dist (ft)		689		639		456		329
Turn Bay Length (ft)								
Base Capacity (vph)	246	851	349	1056	227	937	349	1181
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.78	0.77	0.80	0.87	0.54	0.77	0.79	0.62

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Frt	1.00	0.98		1.00	0.95		1.00	0.96		1.00	0.97	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	3462		1770	3367		1770	3385		1770	3420	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1770	3462		1770	3367		1770	3385		1770	3420	
Volume (vph)	162	475	81	236	528	253	104	434	178	233	480	139
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	191	559	95	278	621	298	122	511	209	274	565	164
RTOR Reduction (vph)	0	12	0	0	49	0	0	36	0	0	22	0
Lane Group Flow (vph)	191	642	0	278	870	0	122	684	0	274	707	0
Turn Type	Prot			Prot			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Actuated Green, G (s)	14.9	26.7		20.7	32.5		12.3	30.6		20.6	38.9	
Effective Green, g (s)	14.9	26.7		20.7	32.5		12.3	30.6		20.6	38.9	
Actuated g/C Ratio	0.13	0.23		0.18	0.28		0.11	0.27		0.18	0.34	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	230	807		320	955		190	904		318	1161	
v/s Ratio Prot	0.11	0.19		c0.16	c0.26		0.07	c0.20		c0.15	0.21	
v/s Ratio Perm												
v/c Ratio	0.83	0.80		0.87	0.91		0.64	0.76		0.86	0.61	
Uniform Delay, d1	48.6	41.4		45.6	39.7		49.0	38.6		45.6	31.5	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	21.7	5.5		21.2	12.6		7.2	5.9		20.6	2.4	
Delay (s)	70.3	46.9		66.9	52.3		56.3	44.5		66.2	33.9	
Level of Service	E	D		E	D		E	D		E	C	
Approach Delay (s)		52.2			55.7			46.2			42.7	
Approach LOS		D			E			D			D	

Intersection Summary			
HCM Average Control Delay	49.5	HCM Level of Service	D
HCM Volume to Capacity ratio	0.83		
Actuated Cycle Length (s)	114.6	Sum of lost time (s)	12.0
Intersection Capacity Utilization	75.6%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	229	463	140	736	49	961	164	515
v/c Ratio	0.80	0.52	0.66	0.90	0.44	0.77	0.75	0.34
Control Delay	57.3	37.8	56.7	45.9	63.5	37.5	62.7	22.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.2
Total Delay	57.3	37.8	56.7	45.9	63.5	37.5	62.7	23.4
Queue Length 50th (ft)	168	153	104	236	37	343	121	133
Queue Length 95th (ft)	240	197	161	#293	74	400	#187	169
Internal Link Dist (ft)		238		639		456		209
Turn Bay Length (ft)								
Base Capacity (vph)	336	953	260	863	123	1252	247	1524
Starvation Cap Reductn	0	0	0	0	0	0	0	751
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.68	0.49	0.54	0.85	0.40	0.77	0.66	0.67

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Frt	1.00	0.98		1.00	0.94		1.00	0.97		1.00	0.97	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	3485		1770	3311		1770	3435		1770	3432	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1770	3485		1770	3311		1770	3435		1770	3432	
Volume (vph)	195	354	40	119	357	269	42	656	161	139	349	88
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	229	416	47	140	420	316	49	772	189	164	411	104
RTOR Reduction (vph)	0	7	0	0	114	0	0	17	0	0	18	0
Lane Group Flow (vph)	229	456	0	140	622	0	49	944	0	164	497	0
Turn Type	Prot			Prot			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Actuated Green, G (s)	18.3	28.8		13.5	24.0		6.0	41.7		13.9	49.6	
Effective Green, g (s)	18.3	28.8		13.5	24.0		6.0	41.7		13.9	49.6	
Actuated g/C Ratio	0.16	0.25		0.12	0.21		0.05	0.37		0.12	0.44	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	284	881		210	698		93	1258		216	1495	
v/s Ratio Prot	c0.13	0.13		0.08	c0.19		0.03	c0.27		c0.09	0.14	
v/s Ratio Perm												
v/c Ratio	0.81	0.52		0.67	0.89		0.53	0.75		0.76	0.33	
Uniform Delay, d1	46.1	36.6		48.0	43.7		52.6	31.6		48.4	21.2	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	15.3	0.5		7.8	13.7		5.3	4.1		14.2	0.6	
Delay (s)	61.4	37.1		55.8	57.3		57.9	35.7		62.6	21.8	
Level of Service	E	D		E	E		E	D		E	C	
Approach Delay (s)		45.1			57.1			36.8			31.7	
Approach LOS		D			E			D			C	

Intersection Summary			
HCM Average Control Delay	42.9	HCM Level of Service	D
HCM Volume to Capacity ratio	0.80		
Actuated Cycle Length (s)	113.9	Sum of lost time (s)	16.0
Intersection Capacity Utilization	73.6%	ICU Level of Service	D
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	5	587	483	4	2	5
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	6	691	568	5	2	6
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)			318			
pX, platoon unblocked						
vC, conflicting volume	573				928	286
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	573				928	286
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				99	99
cM capacity (veh/h)	996				265	710

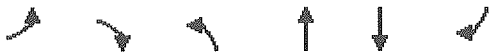
Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	SB 1	SB 2
Volume Total	6	345	345	379	194	2	6
Volume Left	6	0	0	0	0	2	0
Volume Right	0	0	0	0	5	0	6
cSH	996	1700	1700	1700	1700	265	710
Volume to Capacity	0.01	0.20	0.20	0.22	0.11	0.01	0.01
Queue Length 95th (ft)	0	0	0	0	0	1	1
Control Delay (s)	8.6	0.0	0.0	0.0	0.0	18.7	10.1
Lane LOS	A					C	B
Approach Delay (s)	0.1			0.0		12.6	
Approach LOS						B	

Intersection Summary			
Average Delay	0.1		
Intersection Capacity Utilization	26.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	6	12	11	1109	564	7
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	7	14	13	1305	664	8
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)				289		
pX, platoon unblocked	0.77					
vC, conflicting volume	1346	336	672			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1150	336	672			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	95	98	99			
cM capacity (veh/h)	145	660	915			

Direction, Lane #	EB 1	EB 2	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	7	14	13	652	652	442	229
Volume Left	7	0	13	0	0	0	0
Volume Right	0	14	0	0	0	0	8
cSH	145	660	915	1700	1700	1700	1700
Volume to Capacity	0.05	0.02	0.01	0.38	0.38	0.26	0.13
Queue Length 95th (ft)	4	2	1	0	0	0	0
Control Delay (s)	31.0	10.6	9.0	0.0	0.0	0.0	0.0
Lane LOS	D	B	A				
Approach Delay (s)	17.4		0.1			0.0	
Approach LOS	C						

Intersection Summary			
Average Delay	0.2		
Intersection Capacity Utilization	40.7%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	18	20	20	869	852	18
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	21	24	24	1022	1002	21
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)				268		
pX, platoon unblocked	0.83					
vC, conflicting volume	1571	512	1024			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1480	512	1024			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	77	95	97			
cM capacity (veh/h)	93	507	674			

Direction, Lane #	EB 1	EB 2	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	21	24	24	511	511	668	355
Volume Left	21	0	24	0	0	0	0
Volume Right	0	24	0	0	0	0	21
cSH	93	507	674	1700	1700	1700	1700
Volume to Capacity	0.23	0.05	0.03	0.30	0.30	0.39	0.21
Queue Length 95th (ft)	20	4	3	0	0	0	0
Control Delay (s)	55.1	12.4	10.5	0.0	0.0	0.0	0.0
Lane LOS	F	B	B				
Approach Delay (s)	32.6		0.2			0.0	
Approach LOS	D						

Intersection Summary			
Average Delay	0.8		
Intersection Capacity Utilization	34.1%	ICU Level of Service	A
Analysis Period (min)	15		

Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	191	678	278	944	132	731	286	505
v/c Ratio	0.83	0.82	0.87	0.93	0.68	0.79	0.88	0.43
Control Delay	72.7	49.4	64.8	49.5	61.4	45.5	66.5	27.7
Queue Delay	8.2	0.0	0.0	0.2	0.0	1.6	89.7	3.1
Total Delay	80.9	49.4	64.8	49.7	61.4	47.1	156.2	30.8
Queue Length 50th (ft)	146	258	208	348	99	266	216	138
Queue Length 95th (ft)	#243	307	#313	#406	156	316	#326	177
Internal Link Dist (ft)		257		639		456		188
Turn Bay Length (ft)								
Base Capacity (vph)	243	853	346	1053	225	921	347	1178
Starvation Cap Reductn	0	0	0	0	0	0	106	552
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.79	0.79	0.80	0.90	0.59	0.79	1.19	0.81

Intersection Summary

95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Lane Util. Factor	1.00	0.95		1.00	0.95		1.00	0.95		1.00	0.95	
Frt	1.00	0.98		1.00	0.95		1.00	0.96		1.00	0.95	
Flt Protected	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (prot)	1770	3457		1770	3365		1770	3387		1770	3367	
Flt Permitted	0.95	1.00		0.95	1.00		0.95	1.00		0.95	1.00	
Satd. Flow (perm)	1770	3457		1770	3365		1770	3387		1770	3367	
Volume (vph)	162	487	89	236	540	263	112	444	178	243	290	139
Peak-hour factor, PHF	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Adj. Flow (vph)	191	573	105	278	635	309	132	522	209	286	341	164
RTOR Reduction (vph)	0	12	0	0	50	0	0	35	0	0	47	0
Lane Group Flow (vph)	191	666	0	278	894	0	132	696	0	286	458	0
Turn Type	Prot			Prot			Prot			Prot		
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases												
Actuated Green, G (s)	15.0	27.3		20.9	33.2		12.6	30.3		21.3	39.0	
Effective Green, g (s)	15.0	27.3		20.9	33.2		12.6	30.3		21.3	39.0	
Actuated g/C Ratio	0.13	0.24		0.18	0.29		0.11	0.26		0.18	0.34	
Clearance Time (s)	4.0	4.0		4.0	4.0		4.0	4.0		4.0	4.0	
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Lane Grp Cap (vph)	229	815		319	965		193	886		326	1134	
v/s Ratio Prot	0.11	0.19		c0.16	c0.27		0.07	c0.21		c0.16	0.14	
v/s Ratio Perm												
v/c Ratio	0.83	0.82		0.87	0.93		0.68	0.79		0.88	0.40	
Uniform Delay, d1	49.2	41.9		46.1	40.1		49.7	39.7		46.0	29.5	
Progression Factor	1.00	1.00		1.00	1.00		1.00	1.00		1.00	1.00	
Incremental Delay, d2	22.2	6.4		22.0	14.3		9.6	6.9		22.3	1.1	
Delay (s)	71.4	48.3		68.1	54.4		59.3	46.6		68.3	30.5	
Level of Service	E	D		E	D		E	D		E	C	
Approach Delay (s)		53.3			57.5			48.6			44.2	
Approach LOS		D			E			D			D	

Intersection Summary			
HCM Average Control Delay	51.7	HCM Level of Service	D
HCM Volume to Capacity ratio	0.85		
Actuated Cycle Length (s)	115.8	Sum of lost time (s)	12.0
Intersection Capacity Utilization	77.1%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	15	718	771	20	20	15
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	18	845	907	24	24	18
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)			337			
pX, platoon unblocked	0.76				0.76	0.76
vC, conflicting volume	931				1376	465
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	597				1182	0
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	98				83	98
cM capacity (veh/h)	744				136	827

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	SB 1	SB 2
Volume Total	18	422	422	605	326	24	18
Volume Left	18	0	0	0	0	24	0
Volume Right	0	0	0	0	24	0	18
cSH	744	1700	1700	1700	1700	136	827
Volume to Capacity	0.02	0.25	0.25	0.36	0.19	0.17	0.02
Queue Length 95th (ft)	2	0	0	0	0	15	2
Control Delay (s)	10.0	0.0	0.0	0.0	0.0	37.0	9.5
Lane LOS	A					E	A
Approach Delay (s)	0.2			0.0		25.2	
Approach LOS						D	

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	31.9%	ICU Level of Service	A
Analysis Period (min)	15		