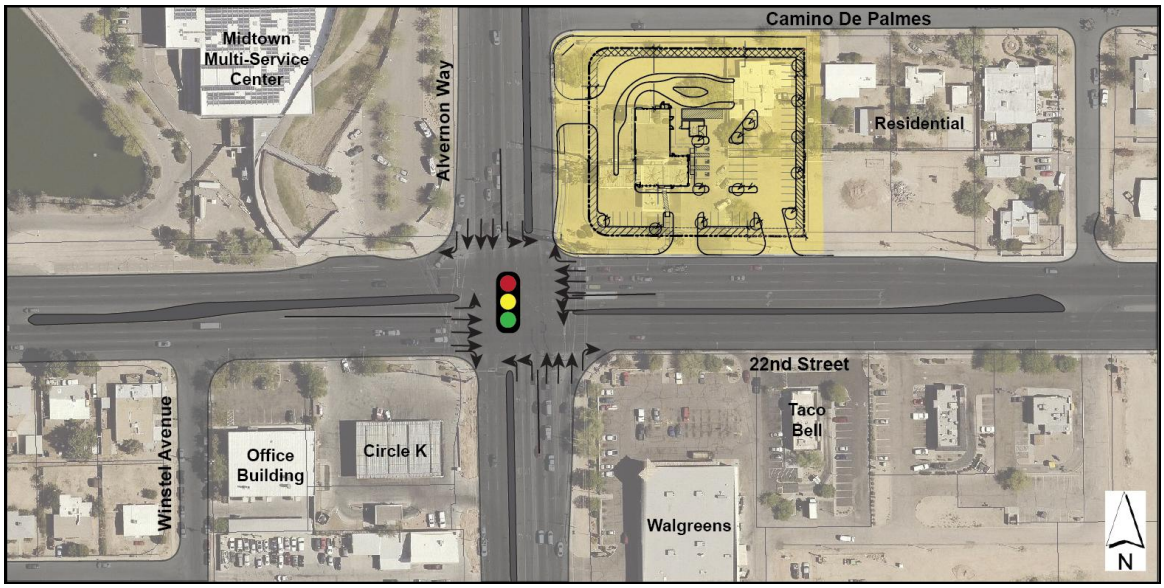
McDonalds – Northeast Corner Alvernon Way and Twenty-Second Street

Traffic Statement



Prepared for Submittal To:

City of Tucson, Arizona

September 11, 2014

McDonalds – Northeast Corner of Alvernon Road and Twenty-Second Street

Traffic Statement

Prepared for Submittal to:

City of Tucson, Arizona

Prepared by:
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September 11, 2014

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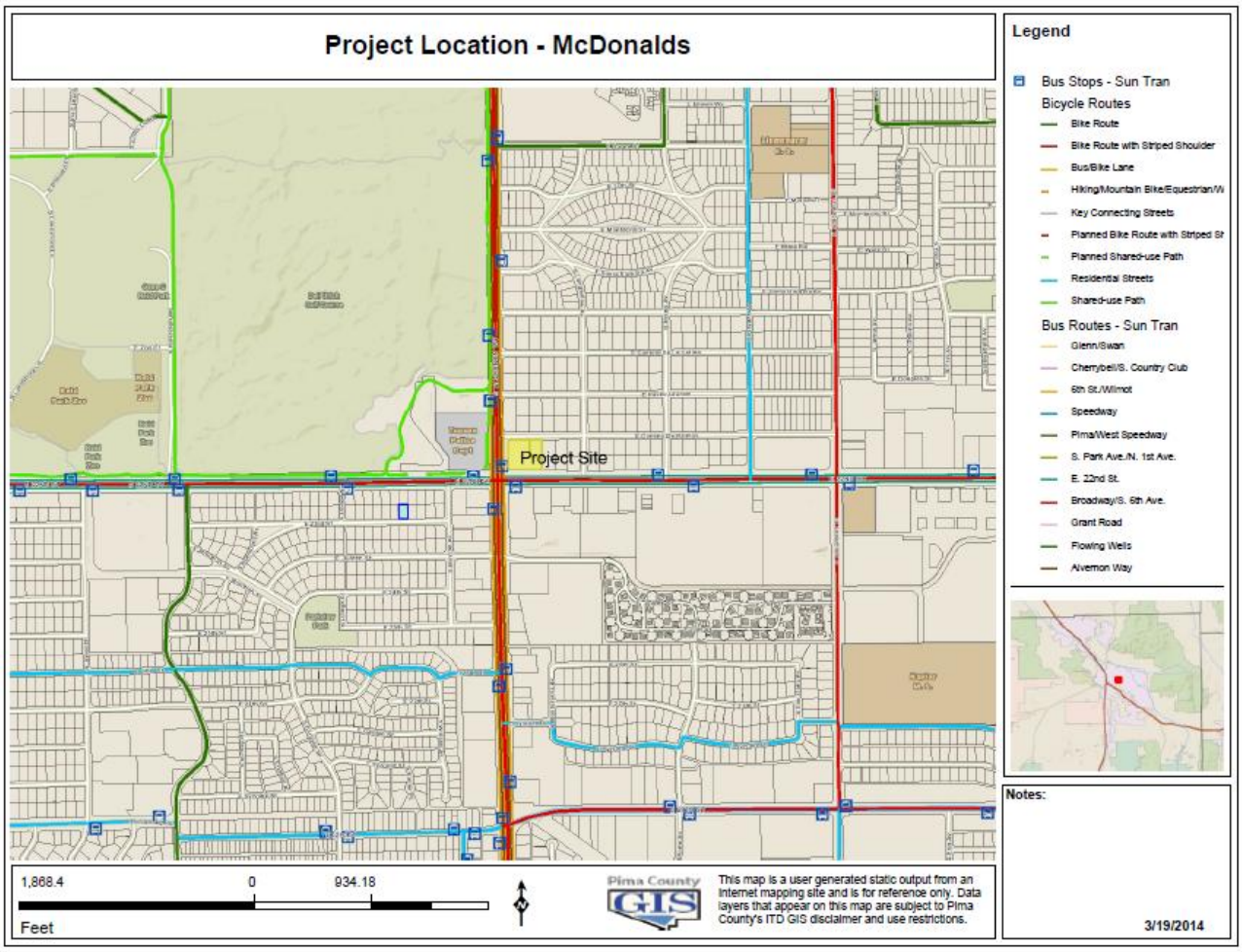
1. Introduction and Summary of Key Findings

Project Overview

This report analyzes traffic impacts from a proposed commercial development in the northeast quadrant of the intersection of Alvernon Way and 22nd Street in the City of Tucson, Arizona. The project location is shown in Exhibit 1. The project is a 5,318 square foot McDonald's fast food restaurant with drive-thru lanes. The proposed development will replace an existing Shell gas station with convenience store and twelve gas pumps on the site. Access to the new store is proposed on both Alvernon Way and 22nd Street.

Exhibit 1 Project Location



Source: Pima County GIS

Purpose of Traffic Statement

This analysis addresses impacts from the proposed McDonald's on the surrounding roadways and the signalized intersection of Alvernon Way/22nd Street and the driveway intersections. The City has required a traffic statement to address access and trip generation associated with the project. This study focuses on the impacts in the opening year (2014) of the project and addresses the AM and PM peak hour impacts at the proposed driveway intersections with Alvernon Way and 22nd Street and

the signalized intersection of Alvernon Way/22nd Street where the significant impacts are expected to occur.

Methodology

This analysis uses recorded weekday AM and PM peak hour volumes from 2012. The volumes were provided by the Pima Association of Governments website, on their traffic volumes link. A 2%/year increase was applied to these volumes to estimate year 2014 volumes.

The estimated site trips from the project were added to these future background volumes to provide an estimate of total traffic at buildout of the project. The analyses are provided for 2014 with and without site trips to clearly demonstrate the impacts from the project.

Summary

The proposed store will generate about 2,640 total trips during the average weekday, with about 242 during the morning peak hour and 174 during the evening peak hour. However, considering the number of trips associated with the land use intensity of the previous use (gas station with convenience market) on the site, and the estimated passer-by trips (non-primary trips) for the project, the estimated net new trips generated by the store will be about 21 during the morning peak hour and 14 during the evening peak hour.

The level of service at the intersection of 22nd Street/Alvernon Way operates at LOS D during the am and pm peak hours.

Due to the existing raised medians on 22nd Street and Alvernon Way along the project frontage, all project driveways should remain for right-in, right-out access only.

The driveways on 22nd Street are within the right turn lane for the westbound turn lane at the 22nd Street/Alvernon Way intersection.

The west driveway on 22nd Street should be located 150 feet from the near pavement edge of Alvernon Way, per City of Tucson access management guidelines. The east driveway should be located 80 feet east of the west driveway.

The driveway on Alvernon Way should be located so as not to conflict with the bus stop. Based on criteria in the *Transportation Access Management Guidelines for the City of Tucson, Arizona*, the Alvernon Driveway can be located approximately 180 feet north of 22nd Street, curb line to curb line to meet both corner clearance requirements, and bus stop/driveway location criteria (Figure 5-14, Bus Bay Detail 1, Bottom Detail). The location of the bus stop prior to the driveway will also act as a turn lane for the driveway.

2. Proposed Development

Site Location

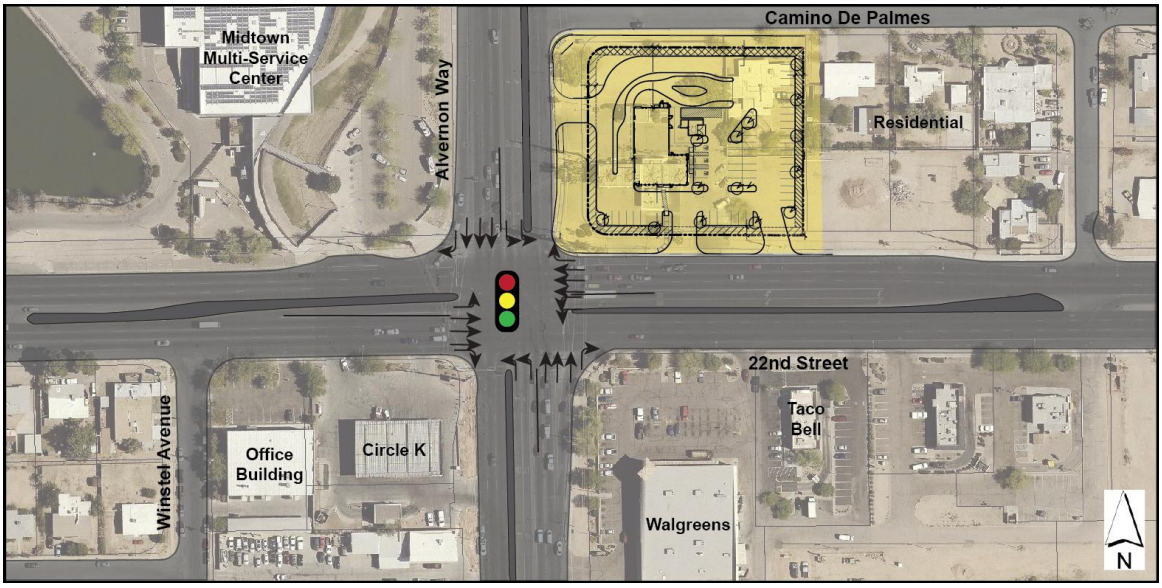
The project is located in the northeast quadrant of the intersection of 22nd Street and Alvernon Way in the City of Tucson.

Proposed Development and Access

The proposed development is shown in Exhibit 2. Drive-thru orders are taken on the north side of the building and are picked up on the west side of the building at the drive-thru window.

There are two proposed driveways on 22nd Street and one on Alvernon Way. All will be for right-in, right-out movements.

Exhibit 2 Proposed Development



Development Phasing and Timing

Construction of the project is expected to commence at some time during this year (2014).

3. Analysis of Existing Conditions

Physical Characteristics

This section provides a description of the roadways that provide access to the project. The regional context of these roadways is shown in the Exhibit 1, Project Location. Exhibit 3 provides a physical inventory of these roadways and Exhibit 4 contains ground photographs showing the roadways as they exist today.

Existing Roads

Alvernon Way is an arterial road with a 4 to 6-lane cross section near the project. There are three travel lanes in each direction south of 22nd Street, although one through lane continues as one of two northbound left turn lanes on the approach to 22nd Street.

Curbs and sidewalks exist along both sides of the roadway, north and south of 22nd Street. A multi-use path is located on the west side of Alvernon Way, north of 22nd Street, and is used extensively by recreational walkers, joggers and cyclists. Striped paved shoulders along both sides of the roadway are used for bicycle access.

In the area of the project, land uses accessed directly from Alvernon Way south of the project are predominately retail/commercial uses. North of 22nd Street, there are offices and residential uses on the east side of Alvernon Way. The Patrick H. Hardesty Mid-town Multi Service Center is located near the northwest corner of the intersection and Reid Park is along the west side of Alvernon Way, north of 22nd Street.

The posted speed limit is 40 mph.

22nd Street has similar roadway characteristics as Alvernon Way as indicated in Exhibit 3, although it is a six-lane roadway east and west of Alvernon Way. Land uses along 22nd Street in the vicinity of the project are mostly retail and commercial.

Exhibit 3 Roadway Inventory

Roadway Segment	No. Lanes	Median	Bike Facility	Ped Facility	Speed Limit
Alvernon Way: North of 22nd Street	5	Raised	Striped Lane	Sidewalks/ Multi-Use Path	40
Alvernon Way: South of 22nd Street	6	Raised	Striped Lane	Sidewalks	40
22nd Street: East of Alvernon Way	6	Raised	Striped Lane	Sidewalks	40
22nd Street: West of Alvernon Way	6	Raised	Striped Lane	Sidewalks	40

Exhibit 4 Ground Photographs

Looking west along 22nd Street east of Alvernon Way (project site on right)

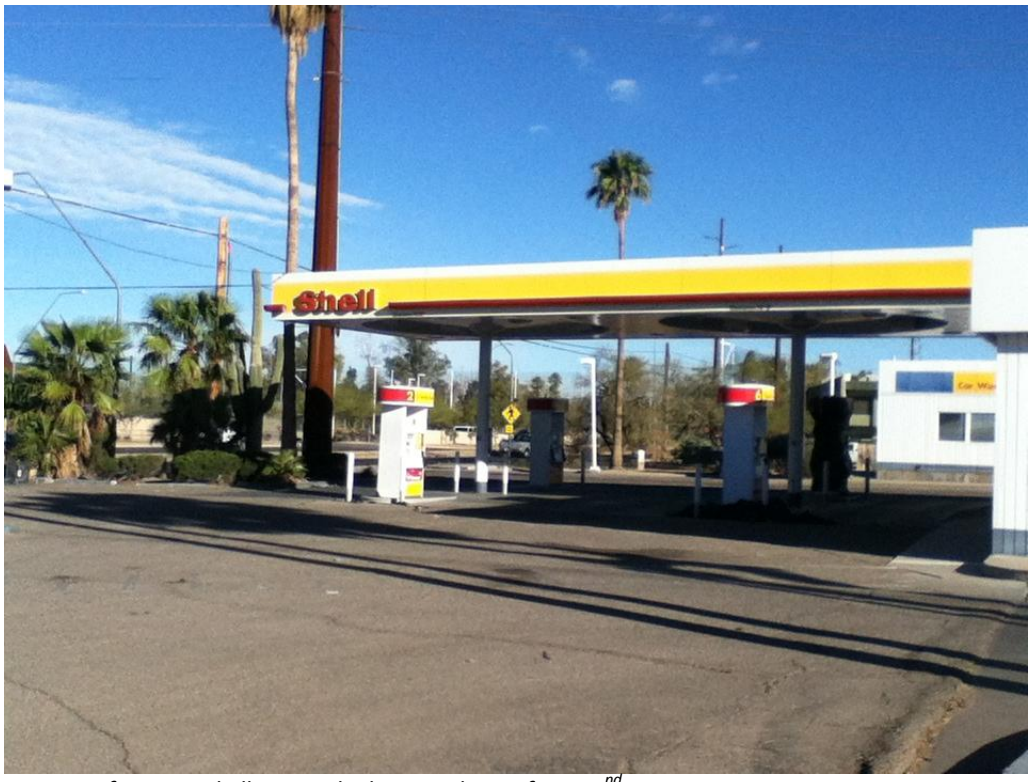
Looking north on Alvernon Way along project frontage. Existing driveway to Shell on the right.

Exhibit 4 (cont.) Ground Photographs

Looking south on Alvernon Way – project is on the left. Drivers would U-turn at signal to access project.

Looking north along Alvernon Way from south of 22nd Street.

Exhibit 4 (cont.) Ground Photographs



View of existing Shell Station-looking northwest from 22nd Street.

Traffic Volumes and Level of Service

Level of service (LOS) is a qualitative description of how well a roadway operates under prevailing traffic conditions. A grading system of A through F, similar to academic grades, is utilized. LOS A is free-flowing traffic, whereas LOS F is forced flow and extreme congestion. Level of service D is the assumed performance standard in the project area during the peak periods. Traffic volumes and planning level LOS D capacities of the surrounding roadways are provided in Exhibit 5. Capacities are taken from the FDOT generalized LOS Tables[1]. Average daily volumes were recorded in 2010 as shown in the table. Analysis of historical available data indicates that volumes on these roadways decreased from previous years, and we assume that current (Year 2014) volumes, at best, are similar to the 2010 volumes.

The tables show that the roadway volumes are below their LOS D capacities, based on daily traffic volumes.

Exhibit 5 Current Segment Performance – Planning Level Analysis

Roadway Segment	Source	Year	LOS D Capacity	Recorded ADT
Alvernon Way: North of 22nd Street	PAG	2010	35,800	32,800
Alvernon Way: South of 22nd Street	PAG	2010	53,900	36,600
22nd Street: East of Alvernon Way	PAG	2010	53,900	45,000
22nd Street: West of Alvernon Way	PAG	2010	53,900	38,300

Current volumes (Year 2014) are assumed to be the same as recorded.

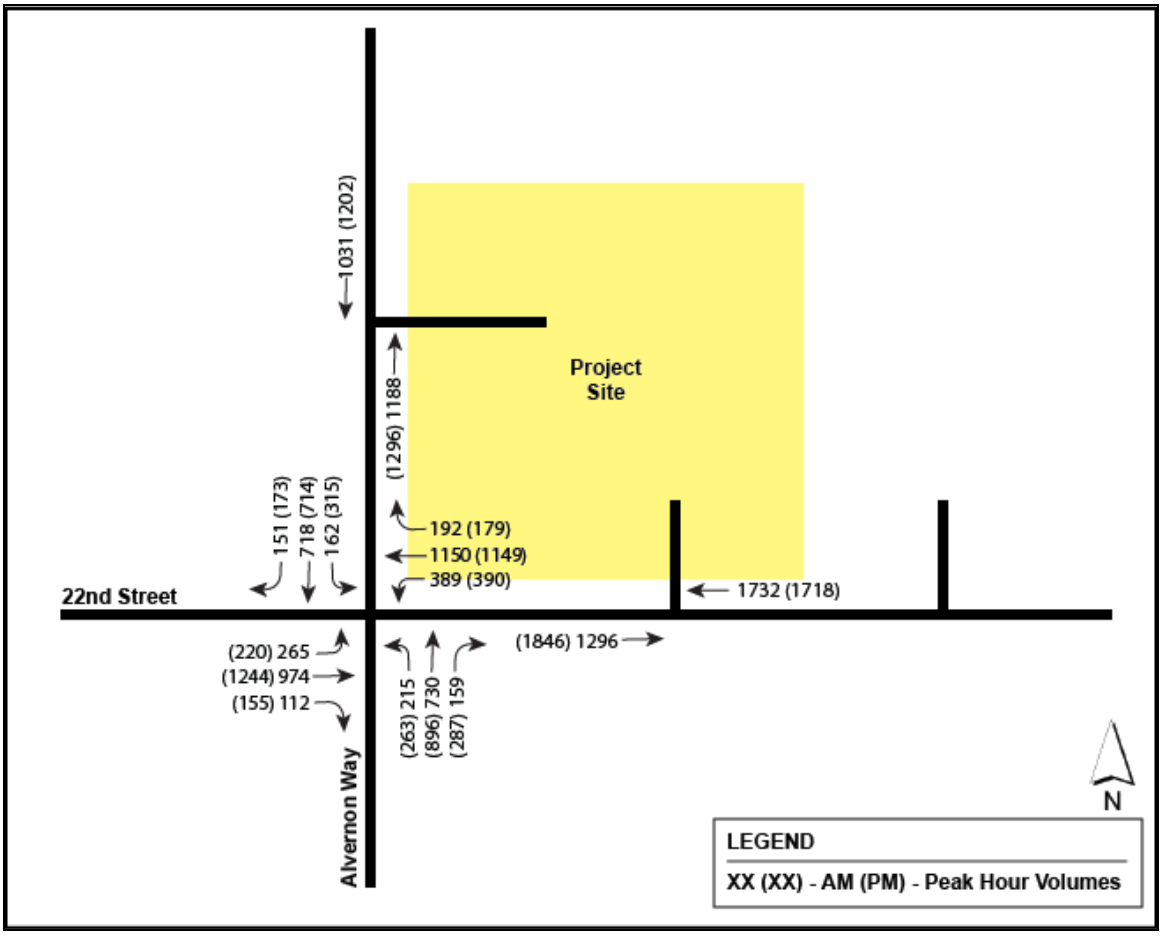
[1] Florida Department of Transportation *2012 Generalized Service Volume Tables*

Existing Intersection

The existing signalized intersection of Alvernon Way/22nd Street is a four-legged intersection with two thru lanes northbound and three on the other approaches. The northbound, southbound and westbound approaches have dual left turn lanes. Each approach has an exclusive right turn lane, with the northbound and southbound right turns channelized with yield control. Signal control includes permitted lefts during the through phasing and protected lag left turn phasing on each approach.

The current peak hour volumes used in this analysis are shown in the diagram in Exhibit 6. To be conservative, we applied a 2% per year growth to the 2012 intersection counts from PAG to estimate existing (2014) counts.

Exhibit 6 Current Peak Hour Volumes



4. Projected Traffic

Site Traffic Forecasting

The future traffic from the project is estimated using the trip rates contained in the Institute of Traffic Engineers' *Trip Generation, 9th Edition* for land use category 934 – Fast Food Restaurant with Drive Thru and is based on square footage. Trip generation is the mathematical product of land use intensity (building square footage, number of units, etc.) and the trip generation rate. The result is the total number of one-way trips expected to be generated by the project. These trips represent the number of vehicles estimated to enter and leave the project. All of the estimates are based on average trip rates for 1,000 square feet of building space.

Trip Generation

Exhibit 7 provides the ITE trip rates and resulting trip generation for the proposed store during the average weekday. These volumes represent the total number of vehicle trips generated by the project at the driveways.

Exhibit 7 Trip Generation (Proposed Project)

Trip Generation Rates			*ITE*	*Weekday AM*		*Weekday PM*		*Avg Weekday*	
Proposed Use	***Unit***	***No.Units***	***Categ.***	***In***	***Out***	***In***	***Out***	***In***	***Out***
Restaurant (Fast-Food)	1000 SF	5.318	934	45.42		32.65		496.12	
w/Drive Thru				51%	49%	52%	48%	50%	50%
Estimated Trip Generation			*No.*	*Weekday AM*		*Weekday PM*		*Avg Weekday*	
Proposed Use		***Unit***	***Units***	***In***	***Out***	***In***	***Out***	***In***	***Out***
Restaurant (Fast-Food)		1000 SF	5.318	242		174		2638	
w/Drive Thru				123	118	90	83	1319	1319

Trip Deductions

Some of the site traffic comes from the existing traffic stream on adjoining streets, and is called passer-by or diverted-linked trips. For instance, commuters along these roadways may stop to pick up breakfast while on their way to or from work. The *ITE Trip Generation Handbook* provides pass-by rates for this land use category. The AM and PM pass by rate for this land use are about 50% (AM =49%, PM= 50%) We applied a pass-by rate of 50 percent to both peak period and daily trips.

The pass-by trips and resulting net new trips (trips generated less pass-by trips) on the roadways are provided in Exhibit 8.

Exhibit 8 Pass-by Trips (Proposed Project)

Pass-by Trips	*ITE*	*Pass-by*	*Weekday AM*		*Weekday PM*		*Avg Weekday*	
Proposed Used	***Categ.***	***Rate***	***In***	***Out***	***In***	***Out***	***In***	***Out***
Restaurant (Fast-Food)	934	*50%*	121		87		1,319	
w/Drive Thru			62	59	45	42	660	660
			Weekday AM		***Weekday PM***		***Avg Weekday***	
SUMMARY OF TRIPS (Proposed Use)			***In***	***Out***	***In***	***Out***	***In***	***Out***
Net New Trips on External Network			121		87		1,319	
(=Total-Pass-by Trips)			62	59	45	42	660	660

Because there was a previous use on this property, we have also taken a deduction for the existing trips on the roadways. These trips were estimated using ITE trip generation rates for land use category 946 – Gasoline/Service Station with Convenience Market & Car Wash. We also applied the pass-by rates and estimated the net new trips associated with this land use. The trip generation rates and calculations are provided in Exhibit 9.

Exhibit 9 Trip Generation, including Pass-By Reduction (Previous Project)

Trip Generation Rates			*ITE*	*Weekday AM*		*Weekday PM*		*Avg Weekday*	
Previous Use	***Unit***	***No.Units***	***Categ.***	***In***	***Out***	***In***	***Out***	***In***	***Out***
Gasoline/Service station with	Vehicle Fueling	12	946	18.84		13.86		152.84	
Convenience Market & Car Wash	Positions			51%	49%	51%	49%	50%	50%

Estimated Trip Generation			*ITE*	*Weekday AM*		*Weekday PM*		*Avg Weekday*	
Previous Use	***Unit***	***No.Units***	***Categ.***	***In***	***Out***	***In***	***Out***	***In***	***Out***
Gasoline/Service station with	Vehicle Fueling	12	946	226		166		1834	
Convenience Market & Car Wash	Positions			115	111	85	81	917	917

Pass-by Trips	*ITE*	*Pass-by*	*Weekday AM*		*Weekday PM*		*Avg Weekday*	
Previous Use	***Categ.***	***Rate***	***In***	***Out***	***In***	***Out***	***In***	***Out***
Gasoline/Service station with	945	*56%*	127		93		1,027	
Convenience Market			65	62	48	46	514	514
			Weekday AM		*Weekday PM*		*Avg Weekday*	
SUMMARY OF TRIPS (Previous Use)			***In***	***Out***	***In***	***Out***	***In***	***Out***
Net New Trips on External Network			99		73		807	
(=Total-Pass-by Trips)			51	49	37	36	403	403

Subtracting the new trips from the previous land use from the new trips from the proposed land use results in the following net new trips in Exhibit 10. Exhibit 10 shows that the estimated new trips, after deducting the passer-by trips and accounting for the trips associated with the previous gas station use, are 21 during the AM peak, 14 during the PM peak and 512 during the average weekday. Therefore, the impact during the peak hours to the surrounding roadway system, relative to the previous use, is minimal on the roadway and at the intersection.

Exhibit 10 Net New Trips

Proposed Use (McDonald's)		*Weekday AM*		*Weekday PM*		*Avg Weekday*	
SUMMARY OF NET TRIPS		***In***	***Out***	***In***	***Out***	***In***	***Out***
Net New Trips on External Network		121		87		1,319	
(=Total-Pass-by Trips)		62	59	45	42	660	660

Previous Use (Gas Station)		*Weekday AM*		*Weekday PM*		*Avg Weekday*	
SUMMARY OF NET TRIPS		***In***	***Out***	***In***	***Out***	***In***	***Out***
Net New Trips on External Network		99		73		807	
(=Total-Pass-by Trips)		51	49	37	36	403	403

Comparison		*Weekday AM*		*Weekday PM*		*Avg Weekday*	
SUMMARY OF TRIPS		***In***	***Out***	***In***	***Out***	***In***	***Out***
Net New Trips on External Network		21		14		512	
(=Total-Pass-by Trips)		11	10	8	6	256	256

Trip Distribution

Although the net new trips will be minimal at the intersection of Alvernon Way/22nd Street, the actual trips generated by this project have been distributed to the surrounding roadway network and the access driveways as shown in Exhibit 11, below. This table was used to estimate the driveway turning movements.

Exhibit 11 Site Traffic Distribution (NEW TRIPS)

		AM PEAK		PM PEAK		DAILY		
DISTRIBUTION - NEW TRIPS	DIST	IN	OUT	IN	OUT	IN	OUT	TOTAL
Alvernon Way: North of 22nd Street	*25%*	15	14	11	10	165	165	330
Alvernon Way: South of 22nd Street	*25%*	15	15	11	10	165	165	330
22nd Street: East of Alvernon Way	*25%*	16	15	11	11	165	165	330
22nd Street: West of Alvernon Way	*25%*	16	15	12	11	165	165	330
	100%	62	59	46	42	660	660	1320

Site Traffic Assignment

Using the distribution of total trips shown in Exhibit 10, the site trips are assigned to the roadways and the intersections and driveways. The resulting peak hour assignment at buildout of the project is illustrated in Exhibit 12, Site Traffic Assignment.

It should be noted that the reduction of pass-by trips and the new net trips account for a minimum number of trips added at the Alvernon/22nd Street intersection. For instance, there are 21 net peak hour trips added to the roadways, some of which will not travel through the intersection (for instance, the eastbound inbound trips entering Driveway 3). For this reason, the distribution of trips through the intersection will be very minor (three or fewer additional trips per turning movement), and for this reason, have not analyzed conditions "with project" at the intersection. However, we have analyzed the project driveways.

Total Traffic

All site trips (total trip generation) are assigned to the driveways. However, the additional trips added at the intersection of Alvernon/22nd Street are minimal. This is because the traffic data for this intersection were collected while the Shell station was still in operation. Considering this and the percentage of pass by trips discussed previously results in a very minimal addition of trips to the intersection (see Exhibit 13). The analysis of the Alvernon Way/22nd Street intersection was done for the year 2014 conditions. Adding the incremental net trips from the project to the intersection would not result in noticeable impacts. We did analyze the impacts at the driveways. The delays and peak hour levels of service are provided in Exhibit 14.

Access Requirements

The near-side edge of the driveway closest to Alvernon Way should be located 150 feet from the curb side of Alvernon Way, and the driveway to the east should be 80 feet, curb to curb, from the 1st Driveway. These spacings are required based on criteria in the *Transportation Access Management Guidelines for the City of Tucson, Arizona.* The guideline is provided in Exhibit 15.

Exhibit 12 Site Traffic Assignment

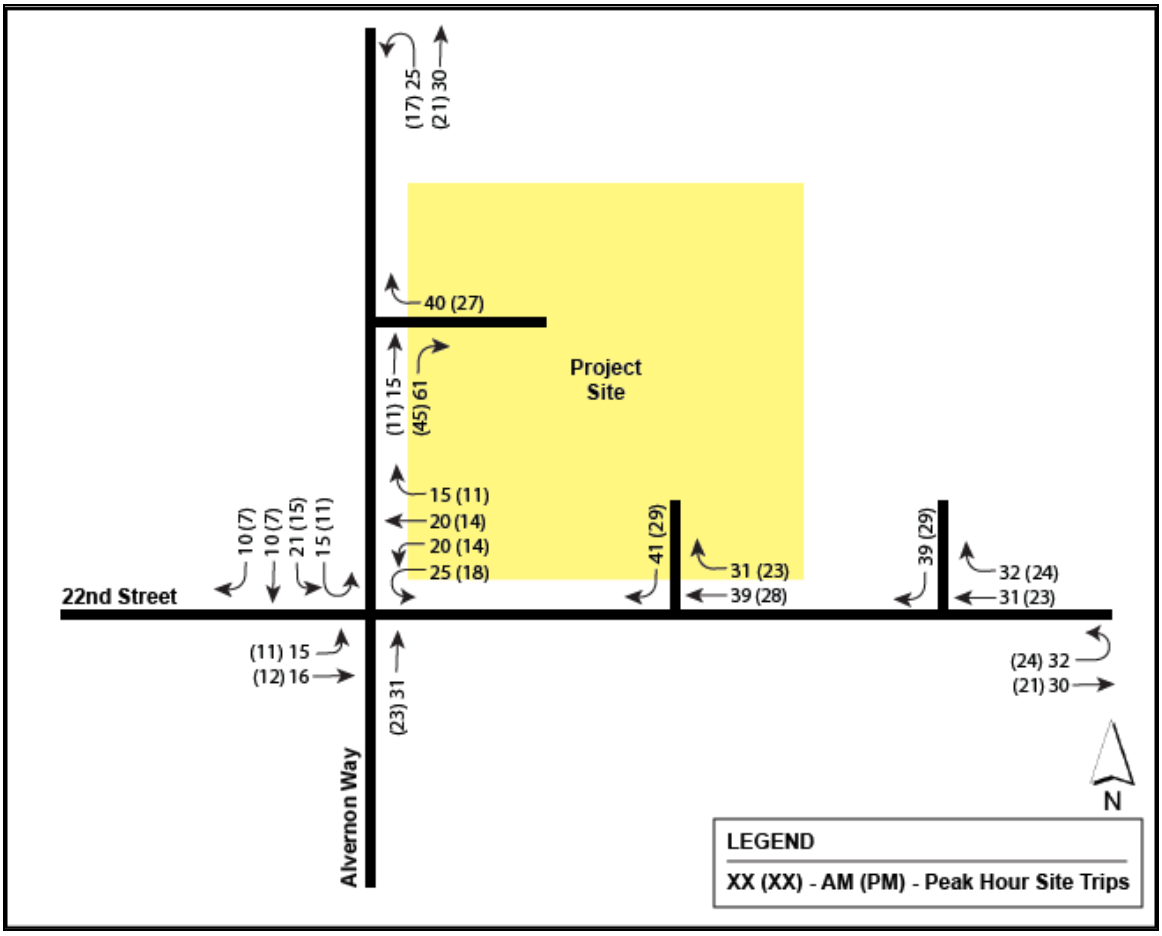


Exhibit 13 Net Site Trips added to the Alvernon/22nd Street Intersection

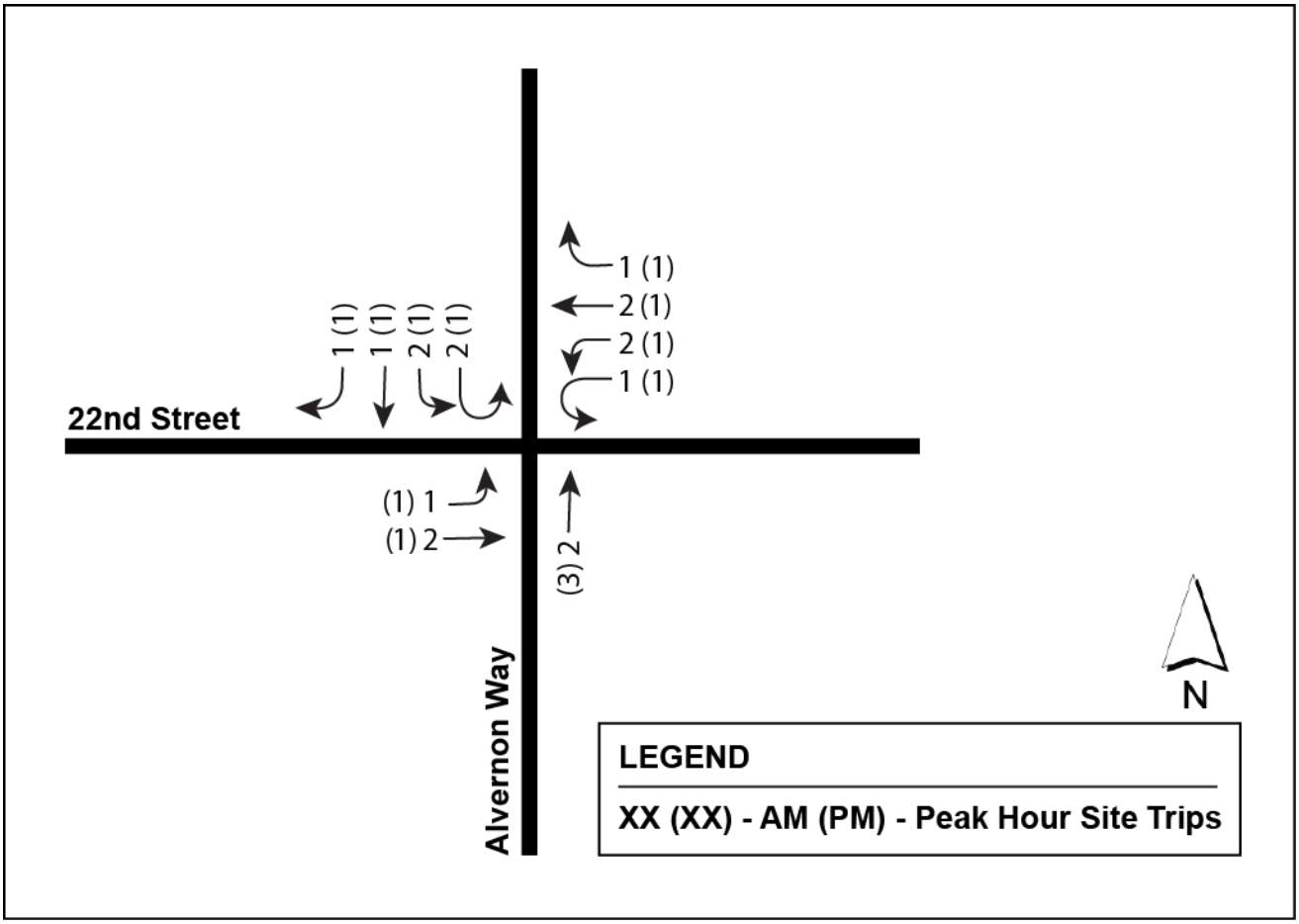


Exhibit 14 Summary of Intersection Performance with the Project – Current Configuration

CURRENT CONFIGURATION	AM Peak Hour		PM Peak Hour		Max Queue Length (ft)
	LOS	Delay	LOS	Delay	
Alvernon Way / 22nd Street					
Eastbound left	D	36.1	C	33.8	181
Eastbound thru	C	31.5	D	49.0	
Eastbound right	C	23.5	C	23.4	47
EASTBOUND APPROACH	C	31.7	D	44.5	
Westbound left	C	25.7	C	31.4	93
Westbound thru	C	33.7	D	36.5	
Westbound right	C	23.1	C	23.5	50
WESTBOUND APPROACH	C	30.7	C	34.0	
Northbound left	C	28.2	D	27.8	79
Northbound thru	C	31.6	C	39.8	
Northbound right	C	22.1	D	23.3	76
NORTHBOUND APPROACH	C	29.6	C	34.4	
Southbound left	C	34.2	C	41.8	117
Southbound thru	C	27.1	C	25.4	
Southbound right	C	22.8	C	21.8	48
SOUTHBOUND APPROACH	C	27.6	C	29.2	
INTERSECTION	C	30.1	C	35.9	
DRIVEWAY 1 / Alvernon Way					
Westbound Right	B	11.6	B	11.5	6
DRIVEWAY 2 / 22nd Street					
Southbound Right	B	14.4	B	14.0	9
DRIVEWAY 3 / 22nd Street					
Southbound right	B	14.5	B	14.1	8

Exhibit 15 Driveway Spacing Criteria – City of Tucson

Transportation Access Management Guidelines for the City of Tucson

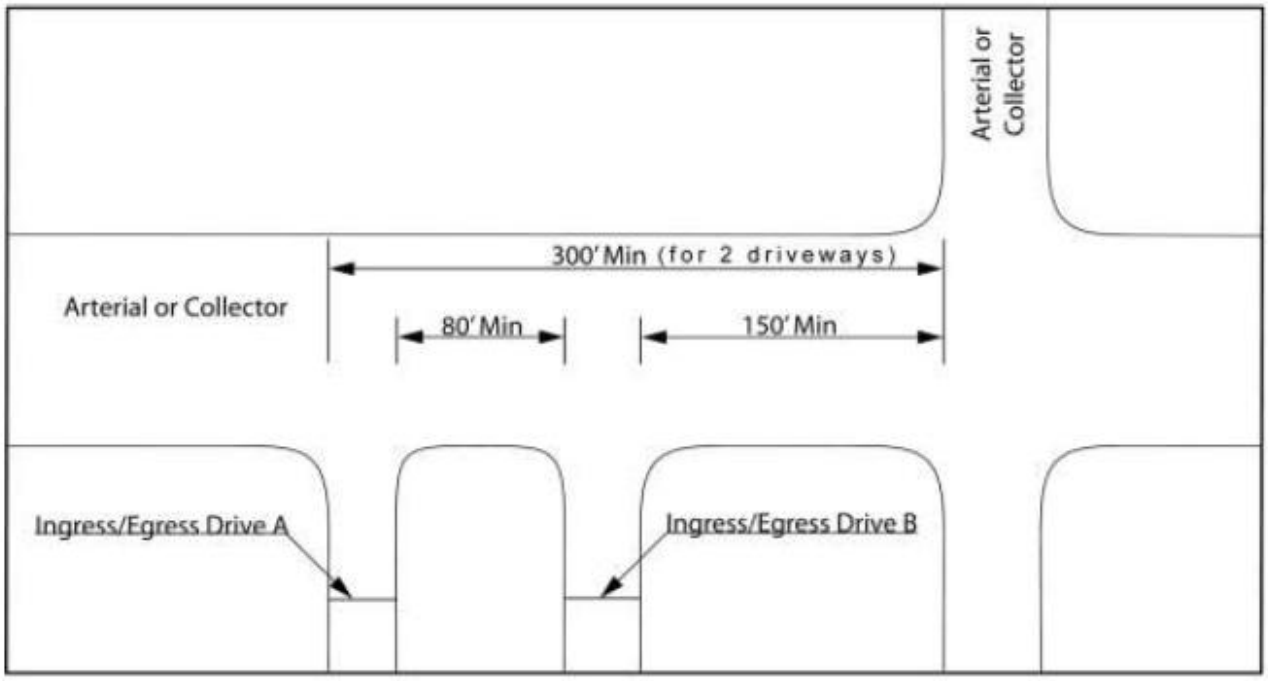


Figure 5-4 – Driveway Location Distances

Because of the bus stop for northbound buses on Alvernon Way adjacent to the project, the driveway should be located after the bus loading zone as shown in Exhibit 16. The Bottom Bus Bay Detail 1- Major Intersections from the Transportation Access Management Guidelines for the City of Tucson[2] Is the one that applies to this location.

[2] The top detail would not be tenable due to the distances required and the distance available between the end of the stop and Camino de Palmas, to the north.

Exhibit 16 Bus Stop Design and Spacing Criteria – City of Tucson

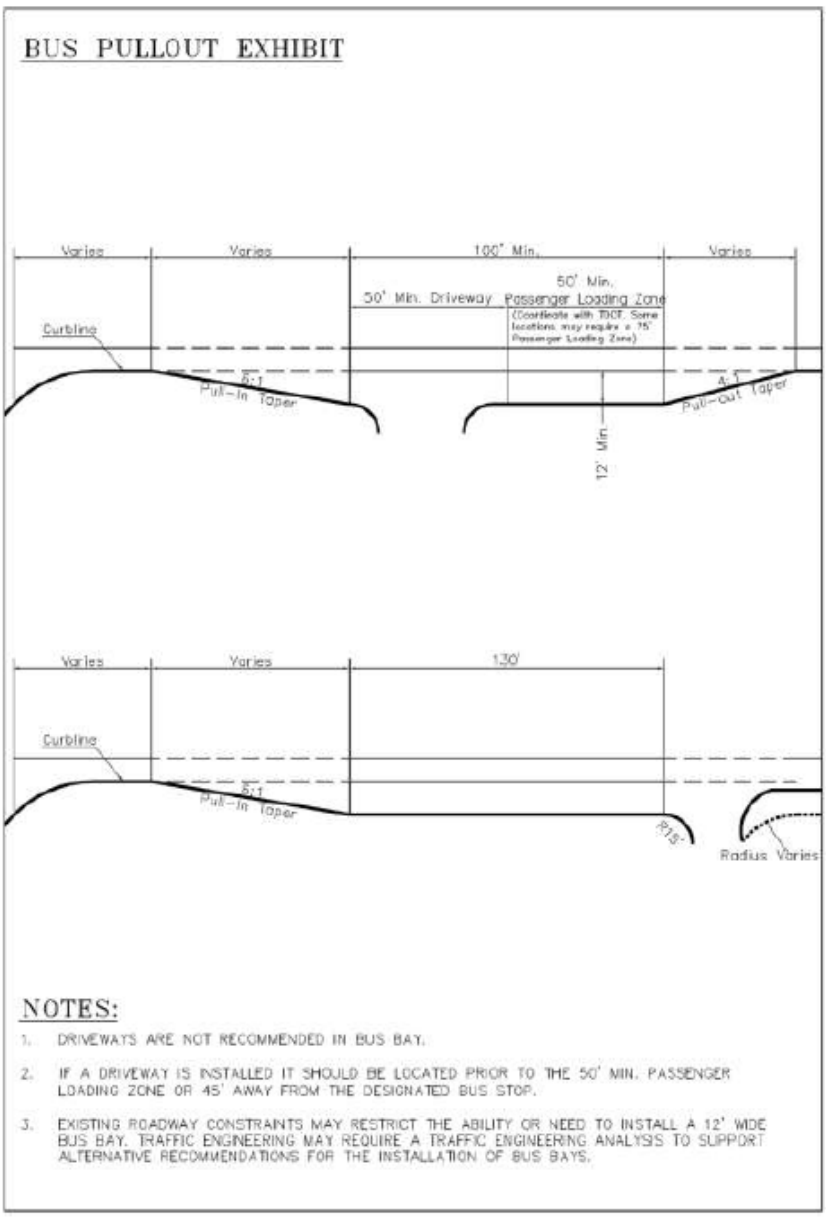


Figure 5-14 – Bus Bay Detail 1 – Major Intersections

Turn Lane Requirements

The driveways on 22nd Street are within the westbound right turn lane on 22nd Street. The bus bay on Alvernon Way should be reconstructed per Detail 5-14, Detail 1 (bottom detail) from the *Transportation Access Management Guidelines for the City of Tucson Arizona,* as shown in Exhibit 16. This design incorporates a 150 foot turn lane.

Traffic Control Needs

Traffic control devices, including signs and markings, should be installed in accordance with the MUTCD.

Pedestrian, Bicycle, and Transit Consideration

Pedestrian and bicycle access to the project will be provided by the existing sidewalks and bike lanes in the vicinity of the project. The bus stop should be constructed per Detail 5-14, Detail 1 (bottom detail) of the *Transportation Access Management Guidelines for the City of Tucson, Arizona.*

Speed Considerations

Speeding is not known to be problematic in the project vicinity and so no traffic calming devices or strategies are being addressed in this report.

Sight Distances

Sight visibility triangles will be included in the project development plan, as required by the City of Tucson's development code.

5. Conclusions and Recommendations

- The proposed store will generate about 2,640 trips during the average weekday, with about 242 during the morning peak hour and 174 during the evening peak hour. However, in considering the number of trips associated with the land use intensity of the previous use (gas station with convenience market) on the site, and the estimated passer-by trips (non-primary trips) for the project, the estimated net new trips generated by the store will be about 21 during the morning peak hour and 14 during the evening peak hour.
- The level of service at the intersection of 22nd Street/Alvernon Way operates at LOS D during the am and pm peak hours.
- Due to the existing raised medians on 22nd Street and Alvernon Way along the project frontage, all project driveways should remain for right-in, right-out access only.
- The driveways on 22nd Street are within the right turn lane for the westbound turn lane at the 22nd Street/Alvernon Way intersection.
- The west driveway on 22nd Street should be located 150 feet from the near pavement edge of Alvernon Way, per City of Tucson access management guidelines. The east driveway should be located 80 feet east of the west driveway.
- The driveway on Alvernon Way should be located so as not to conflict with the bus stop. Based on City of Tucson Access Management Guidelines, the Alvernon Driveway can be located approximately 180 feet north of 22nd Street, curb line to curb line to meet both corner clearance requirements, and bus stop/driveway location criteria (Figure 5-14, Bus Bay Detail 1, Bottom Detail). The location of the bus stop prior to the driveway will also act as a turn lane for the driveway.

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APPENDIX

- Site Plan
- *Traffic Data*
- Synchro Analysis Sheets

CONCEPTUAL SITE PLAN
4597ww side PP

NORTH

0' 20' 40' 80'
SCALE: 1" = 20'-0"

DEVELOPMENT PROGRAM

EXISTING ZONING:	C-1, R-1, O-3
PROPOSED ZONING:	C-1, P
LOT AREA:	63,453 S.F.
BUILDING HEIGHT:	23'-4"
BUILDING AREA:	5,273 S.F.
PARKING PROVIDED:	57 SPACES

VICINITY MAP

NOT TO SCALE

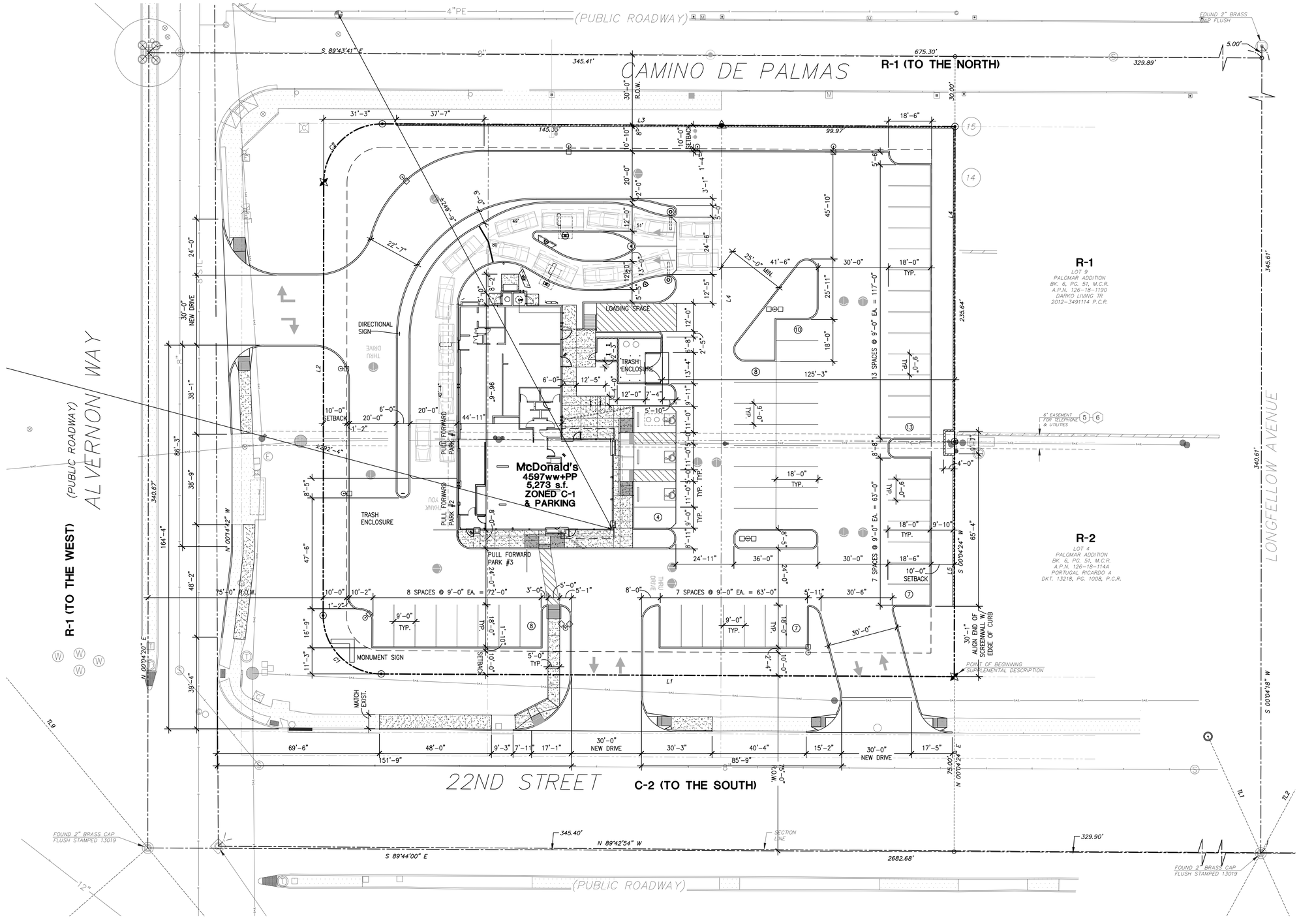
DATE: 07/29/14
SITE LOCATION: 002-1015
RBA PROJECT NO.: 13025

McDONALDS RESTAURANT

NEC of ALVERNON WAY & 22ND STREET
3901 East 22nd Street
Tucson, Arizona 85712

robert brown architects
549 south 48th street • suite 108
tempe • arizona • 85281
p.480.377.2222 f.480.377.2230

CONCEPTUAL SITE PLAN
4597ww side PP



DATE: 07.28.14
SITE LOCATION: 002-1015
RBA PROJECT NO.: 13025

McDONALDS RESTAURANT

NEC of ALVERNON WAY & 22ND STREET
3901 East 22nd Street
Tucson, Arizona 85712

SP-1

robert brown architects
549 south 48th street • suite 108
tempe • arizona • 85281
p.480.377.2222 f.480.377.2230

Project: Alvernon Way/22nd Street

Date: Wednesday, October 17, 2012

0:15

Count Starts at

	7:00 AM	NB Alvernon			SB Alvernon			EB 22nd Street			WB 22nd Street				TOTALS					END	
	END Time	Left Turn	THRU	Right Turn	Left Turn	THRU	Right Turn	Left Turn	THRU	Right Turn	Left Turn	THRU	Right Turn		NB	SB	EB	WB	Total	Time	
	7:15 AM	22	161	19	24	145	22	40	184	15	69	222	41		202	191	239	332	964	7:15 AM	
	7:30 AM	46	191	19	36	173	35	51	218	22	83	270	38		256	244	291	391	1182	7:30 AM	
	7:45 AM	58	182	17	38	199	37	59	214	26	99	265	48		257	274	299	412	1242	7:45 AM	
	8:00 AM	55	163	38	31	172	24	76	235	32	96	285	58		256	227	343	439	1265	8:00 AM	
	8:15 AM	47	189	52	45	156	48	59	263	29	101	290	43		288	249	351	434	1322	8:15 AM	
	8:30 AM	47	168	46	42	163	36	61	225	21	78	266	36		261	241	307	380	1189	8:30 AM	
	8:45 AM	53	184	59	35	157	38	53	227	22	84	258	43		296	230	302	385	1213	8:45 AM	
	9:00 AM	30	141	50	35	136	39	64	241	28	74	225	42		221	210	333	341	1105	9:00 AM	
7:00 AM	8:00 AM	181	697	93	129	689	118	226	851	95	347	1042	185		971	936	1172	1574	4653	7:00 AM	8:00 AM
7:15 AM	8:15 AM	206	725	126	150	700	144	245	930	109	379	1110	187		1057	994	1284	1676	5011	7:15 AM	8:15 AM
7:30 AM	8:30 AM	207	702	153	156	690	145	255	937	108	374	1106	185		1062	991	1300	1665	5018	7:30 AM	8:30 AM
7:45 AM	8:45 AM	202	704	195	153	648	146	249	950	104	359	1099	180		1101	947	1303	1638	4989	7:45 AM	8:45 AM
8:00 AM	9:00 AM	177	682	207	157	612	161	237	956	100	337	1039	164		1066	930	1293	1540	4829	8:00 AM	9:00 AM
7:00 AM	9:00 AM	358	1379	300	286	1301	279	463	1807	195	684	2081	349		2037	1866	2465	3114	9482	7:00 AM	9:00 AM
														PHF	0.92	0.90	0.93	0.95			
2014 NP	2% Lin	215	730	159	162	718	151	265	974	112	389	1150	192								

Count Starts at

	4:00 PM	NB Alvernon			SB Alvernon			EB 22nd Street			WB 22nd Street				TOTALS					END	
	END Time	Left Turn	THRU	Right Turn	Left Turn	THRU	Right Turn	Left Turn	THRU	Right Turn	Left Turn	THRU	Right Turn		NB	SB	EB	WB	Total	Time	
	4:15 PM	48	170	90	80	163	36	52	314	25	79	255	42		308	279	391	376	1354	4:15 PM	
	4:30 PM	64	210	67	75	177	51	33	291	29	60	222	47		341	303	353	329	1326	4:30 PM	
	4:45 PM	48	189	84	66	164	42	64	325	38	90	303	41		321	272	427	434	1454	4:45 PM	
	5:00 PM	69	242	81	74	172	44	39	262	34	89	227	54		392	290	335	370	1387	5:00 PM	
	5:15 PM	59	198	60	77	169	47	56	324	32	102	303	36		317	293	412	441	1463	5:15 PM	
	5:30 PM	77	233	51	86	182	33	53	285	45	94	272	41		361	301	383	407	1452	5:30 PM	
	5:45 PM	45	202	83	61	195	43	58	334	16	86	232	36		330	299	408	354	1391	5:45 PM	
	6:00 PM	56	178	68	55	143	34	42	268	22	90	231	40		302	232	332	361	1227	6:00 PM	
4:00 PM	5:00 PM	229	811	322	295	676	173	188	1192	126	318	1007	184		1362	1144	1506	1509	5521	4:00 PM	5:00 PM
4:15 PM	5:15 PM	240	839	292	292	682	184	192	1202	133	341	1055	178		1371	1158	1527	1574	5630	4:15 PM	5:15 PM
4:30 PM	5:30 PM	253	862	276	303	687	166	212	1196	149	375	1105	172		1391	1156	1557	1652	5756	4:30 PM	5:30 PM
4:45 PM	5:45 PM	250	875	275	298	718	167	206	1205	127	371	1034	167		1400	1183	1538	1572	5693	4:45 PM	5:45 PM
5:00 PM	6:00 PM	237	811	262	279	689	157	209	1211	115	372	1038	153		1310	1125	1535	1563	5533	5:00 PM	6:00 PM
4:00 PM	6:00 PM	466	1622	584	574	1365	330	397	2403	241	690	2045	337		2672	2269	3041	3072	11054	4:00 PM	6:00 PM
														PHF	0.89	0.96	0.91	0.94			
2014 NP	2% Lin	263	896	287	315	714	173	220	1244	155	390	1149	179								

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	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.91	1.00	0.97	0.91	1.00	0.97	0.95	1.00	0.97	0.91	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	5085	1583	3433	5085	1583	3433	3539	1583	3433	5085	1583
Flt Permitted	0.17	1.00	1.00	0.16	1.00	1.00	0.24	1.00	1.00	0.16	1.00	1.00
Satd. Flow (perm)	320	5085	1583	592	5085	1583	855	3539	1583	576	5085	1583
Volume (vph)	265	974	112	389	1150	192	215	730	159	162	718	151
Peak-hour factor, PHF	0.93	0.93	0.93	0.95	0.95	0.95	0.92	0.92	0.92	0.90	0.90	0.90
Adj. Flow (vph)	285	1047	120	409	1211	202	234	793	173	180	798	168
RTOR Reduction (vph)	0	0	88	0	0	145	0	0	121	0	0	119
Lane Group Flow (vph)	285	1047	32	409	1211	57	234	793	52	180	798	49
Turn Type	pm+pt		Perm	pm+pt		Perm	pm+pt		Perm	pm+pt		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		6
Actuated Green, G (s)	36.0	22.3	22.3	38.2	23.4	23.4	30.1	25.1	25.1	28.1	24.1	24.1
Effective Green, g (s)	38.0	23.3	23.3	40.2	24.4	24.4	32.1	26.1	26.1	30.1	25.1	25.1
Actuated g/C Ratio	0.44	0.27	0.27	0.47	0.28	0.28	0.37	0.30	0.30	0.35	0.29	0.29
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	388	1374	428	797	1439	448	498	1072	479	367	1481	461
v/s Ratio Prot	c0.13	0.21		0.09	c0.24		c0.03	c0.22		0.03	0.16	
v/s Ratio Perm	0.20		0.08	0.15		0.13	0.14		0.11	0.14		0.11
v/c Ratio	0.73	0.76	0.08	0.51	0.84	0.13	0.47	0.74	0.11	0.49	0.54	0.11
Uniform Delay, d1	29.0	28.9	23.4	25.1	29.1	23.0	27.5	27.0	21.7	33.1	25.7	22.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	7.1	2.6	0.1	0.6	4.6	0.1	0.7	4.6	0.5	1.0	1.4	0.5
Delay (s)	36.1	31.5	23.5	25.7	33.7	23.1	28.2	31.6	22.1	34.2	27.1	22.8
Level of Service	D	C	C	C	C	C	C	C	C	C	C	C
Approach Delay (s)		31.7			30.7			29.6			27.6	
Approach LOS		C			C			C			C	

Intersection Summary			
HCM Average Control Delay	30.1	HCM Level of Service	C
HCM Volume to Capacity ratio	0.72		
Actuated Cycle Length (s)	86.2	Sum of lost time (s)	12.0
Intersection Capacity Utilization	75.0%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	0	40	1126	61	0	1031
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	43	1224	66	0	1121
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	Raised					
Median storage veh)	1					
Upstream signal (ft)			141			
pX, platoon unblocked	0.80	0.80			0.80	
vC, conflicting volume	1597	612			1290	
vC1, stage 1 conf vol	1224					
vC2, stage 2 conf vol	374					
vCu, unblocked vol	1497	267			1114	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)	5.8					
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	93			100	
cM capacity (veh/h)	193	586			499	

Direction, Lane #	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	43	612	612	66	374	374	374
Volume Left	0	0	0	0	0	0	0
Volume Right	43	0	0	66	0	0	0
cSH	586	1700	1700	1700	1700	1700	1700
Volume to Capacity	0.07	0.36	0.36	0.04	0.22	0.22	0.22
Queue Length (ft)	6	0	0	0	0	0	0
Control Delay (s)	11.6	0.0	0.0	0.0	0.0	0.0	0.0
Lane LOS	B						
Approach Delay (s)	11.6	0.0			0.0		
Approach LOS	B						

Intersection Summary			
Average Delay	0.2		
Intersection Capacity Utilization	41.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	0	1296	1666	41	0	41
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	1409	1811	45	0	45
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					Raised	
Median storage veh)					1	
Upstream signal (ft)		180				
pX, platoon unblocked					0.81	
vC, conflicting volume	1855				2303	626
vC1, stage 1 conf vol					1833	
vC2, stage 2 conf vol					470	
vCu, unblocked vol	1855				2134	626
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)					5.8	
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	90
cM capacity (veh/h)	322				96	427

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	SB 1
Volume Total	470	470	470	724	724	407	45
Volume Left	0	0	0	0	0	0	0
Volume Right	0	0	0	0	0	45	45
cSH	1700	1700	1700	1700	1700	1700	427
Volume to Capacity	0.28	0.28	0.28	0.43	0.43	0.24	0.10
Queue Length (ft)	0	0	0	0	0	0	9
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	14.4
Lane LOS							B
Approach Delay (s)	0.0			0.0			14.4
Approach LOS							B

Intersection Summary			
Average Delay	0.2		
Intersection Capacity Utilization	43.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	0	1296	1700	32	0	39
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	1409	1848	35	0	42
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					Raised	
Median storage veh)					1	
Upstream signal (ft)		260				
pX, platoon unblocked					0.81	
vC, conflicting volume	1883				2335	633
vC1, stage 1 conf vol					1865	
vC2, stage 2 conf vol					470	
vCu, unblocked vol	1883				2183	633
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)					5.8	
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	90
cM capacity (veh/h)	315				92	422

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	SB 1
Volume Total	470	470	470	739	739	404	42
Volume Left	0	0	0	0	0	0	0
Volume Right	0	0	0	0	0	35	42
cSH	1700	1700	1700	1700	1700	1700	422
Volume to Capacity	0.28	0.28	0.28	0.43	0.43	0.24	0.10
Queue Length (ft)	0	0	0	0	0	0	8
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	14.5
Lane LOS							B
Approach Delay (s)	0.0			0.0			14.5
Approach LOS							B

Intersection Summary			
Average Delay	0.2		
Intersection Capacity Utilization	43.6%	ICU Level of Service	A
Analysis Period (min)	15		

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	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	0.91	1.00	0.97	0.91	1.00	0.97	0.95	1.00	0.97	0.91	1.00
Frt	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1770	5085	1583	3433	5085	1583	3433	3539	1583	3433	5085	1583
Flt Permitted	0.17	1.00	1.00	0.17	1.00	1.00	0.24	1.00	1.00	0.15	1.00	1.00
Satd. Flow (perm)	324	5085	1583	628	5085	1583	882	3539	1583	554	5085	1583
Volume (vph)	220	1244	155	390	1149	179	263	896	287	315	714	173
Peak-hour factor, PHF	0.93	0.93	0.93	0.95	0.95	0.95	0.92	0.92	0.92	0.90	0.90	0.90
Adj. Flow (vph)	237	1338	167	411	1209	188	286	974	312	350	793	192
RTOR Reduction (vph)	0	0	122	0	0	137	0	0	195	0	0	133
Lane Group Flow (vph)	237	1338	45	411	1209	51	286	974	117	350	793	59
Turn Type	pm+pt		Perm	pm+pt		Perm	pm+pt		Perm	pm+pt		Perm
Protected Phases	7	4		3	8		5	2		1	6	
Permitted Phases	4		4	8		8	2		2	6		6
Actuated Green, G (s)	34.0	22.0	22.0	34.0	22.0	22.0	31.1	25.1	25.1	31.1	25.1	25.1
Effective Green, g (s)	36.0	23.0	23.0	36.0	23.0	23.0	33.1	26.1	26.1	33.1	26.1	26.1
Actuated g/C Ratio	0.42	0.27	0.27	0.42	0.27	0.27	0.39	0.31	0.31	0.39	0.31	0.31
Clearance Time (s)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	358	1374	428	694	1374	428	553	1085	486	452	1560	486
v/s Ratio Prot	c0.10	c0.26		0.09	0.24		0.04	c0.28		c0.06	0.16	
v/s Ratio Perm	0.18		0.11	0.16		0.12	0.16		0.20	0.24		0.12
v/c Ratio	0.66	0.97	0.11	0.59	0.88	0.12	0.52	0.90	0.24	0.77	0.51	0.12
Uniform Delay, d1	29.2	30.8	23.3	30.1	29.7	23.4	27.0	28.2	22.1	33.7	24.2	21.2
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	4.6	18.2	0.1	1.4	6.8	0.1	0.8	11.6	1.2	8.1	1.2	0.5
Delay (s)	33.8	49.0	23.4	31.4	36.5	23.5	27.8	39.8	23.3	41.8	25.4	21.8
Level of Service	C	D	C	C	D	C	C	D	C	D	C	C
Approach Delay (s)		44.5			34.0			34.4			29.2	
Approach LOS		D			C			C			C	

Intersection Summary			
HCM Average Control Delay	35.9	HCM Level of Service	D
HCM Volume to Capacity ratio	0.87		
Actuated Cycle Length (s)	85.1	Sum of lost time (s)	16.0
Intersection Capacity Utilization	82.2%	ICU Level of Service	E
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	0	27	1251	45	0	1202
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	29	1360	49	0	1307
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	Raised					
Median storage veh)	1					
Upstream signal (ft)			141			
pX, platoon unblocked	0.74	0.74			0.74	
vC, conflicting volume	1795	680			1409	
vC1, stage 1 conf vol	1360					
vC2, stage 2 conf vol	436					
vCu, unblocked vol	1722	209			1198	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)	5.8					
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	95			100	
cM capacity (veh/h)	156	587			426	

Direction, Lane #	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2	SB 3
Volume Total	29	680	680	49	436	436	436
Volume Left	0	0	0	0	0	0	0
Volume Right	29	0	0	49	0	0	0
cSH	587	1700	1700	1700	1700	1700	1700
Volume to Capacity	0.05	0.40	0.40	0.03	0.26	0.26	0.26
Queue Length (ft)	4	0	0	0	0	0	0
Control Delay (s)	11.5	0.0	0.0	0.0	0.0	0.0	0.0
Lane LOS	B						
Approach Delay (s)	11.5	0.0			0.0		
Approach LOS	B						

Intersection Summary			
Average Delay	0.1		
Intersection Capacity Utilization	44.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	0	1846	1675	23	0	29
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	2007	1821	25	0	32
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					Raised	
Median storage veh)					1	
Upstream signal (ft)		180				
pX, platoon unblocked					0.69	
vC, conflicting volume	1846				2502	619
vC1, stage 1 conf vol					1833	
vC2, stage 2 conf vol					669	
vCu, unblocked vol	1846				2282	619
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)					5.8	
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	93
cM capacity (veh/h)	325				93	431

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	SB 1
Volume Total	669	669	669	728	728	389	32
Volume Left	0	0	0	0	0	0	0
Volume Right	0	0	0	0	0	25	32
cSH	1700	1700	1700	1700	1700	1700	431
Volume to Capacity	0.39	0.39	0.39	0.43	0.43	0.23	0.07
Queue Length (ft)	0	0	0	0	0	0	6
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	14.0
Lane LOS							B
Approach Delay (s)	0.0			0.0			14.0
Approach LOS							B

Intersection Summary			
Average Delay	0.1		
Intersection Capacity Utilization	42.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Volume (veh/h)	0	1846	1694	24	0	28
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	2007	1841	26	0	30
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					Raised	
Median storage veh)					1	
Upstream signal (ft)		260				
pX, platoon unblocked					0.70	
vC, conflicting volume	1867				2523	627
vC1, stage 1 conf vol					1854	
vC2, stage 2 conf vol					669	
vCu, unblocked vol	1867				2323	627
tC, single (s)	4.1				6.8	6.9
tC, 2 stage (s)					5.8	
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	93
cM capacity (veh/h)	319				91	426

Direction, Lane #	EB 1	EB 2	EB 3	WB 1	WB 2	WB 3	SB 1
Volume Total	669	669	669	737	737	394	30
Volume Left	0	0	0	0	0	0	0
Volume Right	0	0	0	0	0	26	30
cSH	1700	1700	1700	1700	1700	1700	426
Volume to Capacity	0.39	0.39	0.39	0.43	0.43	0.23	0.07
Queue Length (ft)	0	0	0	0	0	0	6
Control Delay (s)	0.0	0.0	0.0	0.0	0.0	0.0	14.1
Lane LOS							B
Approach Delay (s)	0.0			0.0			14.1
Approach LOS							B

Intersection Summary			
Average Delay	0.1		
Intersection Capacity Utilization	43.3%	ICU Level of Service	A
Analysis Period (min)	15		