Wal-Mart

US 16 / Sammis Trail / Moon Meadows

Draft Traffic Impact Study

(Supplemental Report to the December 23rd 2005 Study to include connection of Rearage Road to Catron Boulevard)

Rapid City, South Dakota

Prepared for

Wal-Mart Stores, Inc.

At the request of BFA, Inc.

Prepared by
HDR Engineering, Inc.

DECEMBER 28TH 2005

HDR | ONE COMPANY *Many Solutions*℠

Memo

To: City of Rapid City Planning Staff (Vicki Fischer, Marcia Elkins, and John Less) & SDDOT (Monica Heller)	
From: Jason Kjenstad-HDR	Project: Wal*Mart Study – Rapid City, SD
CC: Joe Feldmann, BFA	
Date: 12-28-2005	Job No: 20494

Traffic Impact Analysis 12-28-05 (Updated 12-23-05 Study to review Rearage Road Connection to Catron Boulevard)

Study Objective

The objective of this traffic impact study is to determine if the US 16 / Moon Meadows / Sammis Trail intersection, Catron Boulevard / Rearage Road intersection, and internal proposed intersections can support the proposed traffic generated by a proposed Wal*Mart Superstore.

Executive Summary

A traffic impact analysis was performed for a new mixed-use development near US Highway 16 and Sammis Trail in Rapid City, SD. This mixed-use development features a Wal*Mart, a Hotel, 4 retail lots, and 300 single-family detached housing lots. A level of service (LOS) analysis was preformed for the intersection of US 16 and Sammis Trail, Catron Boulevard and Rearage Road, as well as five additional intersections. The analysis revealed that a signal is warranted at the intersection of US 16 / Sammis Road / Moon Meadows Drive with a single left-turn lane on the southbound approach and a dual left-turn for the westbound approach. An additional signal is required at the intersection of Sammis Trail at the Main Access Road, along with exclusive left and right-turn lanes on the eastbound approach (assuming full site development). The recommendation for a signal at the Main Access Road is to allow clearing of the east approach to prevent queuing that would negatively impact the US 16 / Sammis Trail intersection. The analysis further revealed that a signal will be required at Catron Boulevard and Rearage Road intersection assuming a fully developed site to improve the intersection to LOS C or better. The recommendation for a signal assumes the existing geometrics on Catron Boulevard with an additional westbound left-turn lane only. A westbound exclusive left-turn lane will be required opening day at the Catron Boulevard / Rearage Road intersection. A signal at Sammis Trail/Main Access Road and Catron Boulevard/Rearage Road does not meet signal warrant criteria opening day therefore should not be installed until it is warranted. All other intersections operate at LOS C or better.

Driveway locations as indicated on the figures are the recommended locations determined from this traffic analysis. It is recommended that Sammis Trail have limited access since it is classified as an arterial for the City of Rapid City.

The intersection of Sammis Trail / Rearage Road operates at an acceptable LOS and does not warrant a traffic signal.

It is recommended that that the rearage road be constructed as a three-lane section from Sammis Trail to Catron Boulevard. The continuous left-turn lane should be channelized at major intersections along the rearage road.

Several types of signal control options were evaluated with the recommended lane geometry to determine if queuing along Sammis Trail would have a negative impact at the US 16 / Sammis Trail intersection and Sammis Trail / Main Access Road. Simulation results revealed that protected left-turns operate with no adverse impacts causing unacceptable queue lengths. SimTRAFFIC also verified the length of the recommended storage lanes were sufficient. It is recommended the detector loops be placed according to the SDDOT recommended procedure or video detection be used to allow the signals to operate fully-actuated. Signal conduit should be placed beneath the proposed intersection of Sammis Trail / Main Access to prepare for the future installation of a signal.

Background

The proposed development will be located at the southwest corner of the Commerford Ranch Development Park near US 16, Moon Meadows Drive and Sammis Trail. The land uses included in the proposal are shown in **Table 1**.

Table 1: Land Use Information

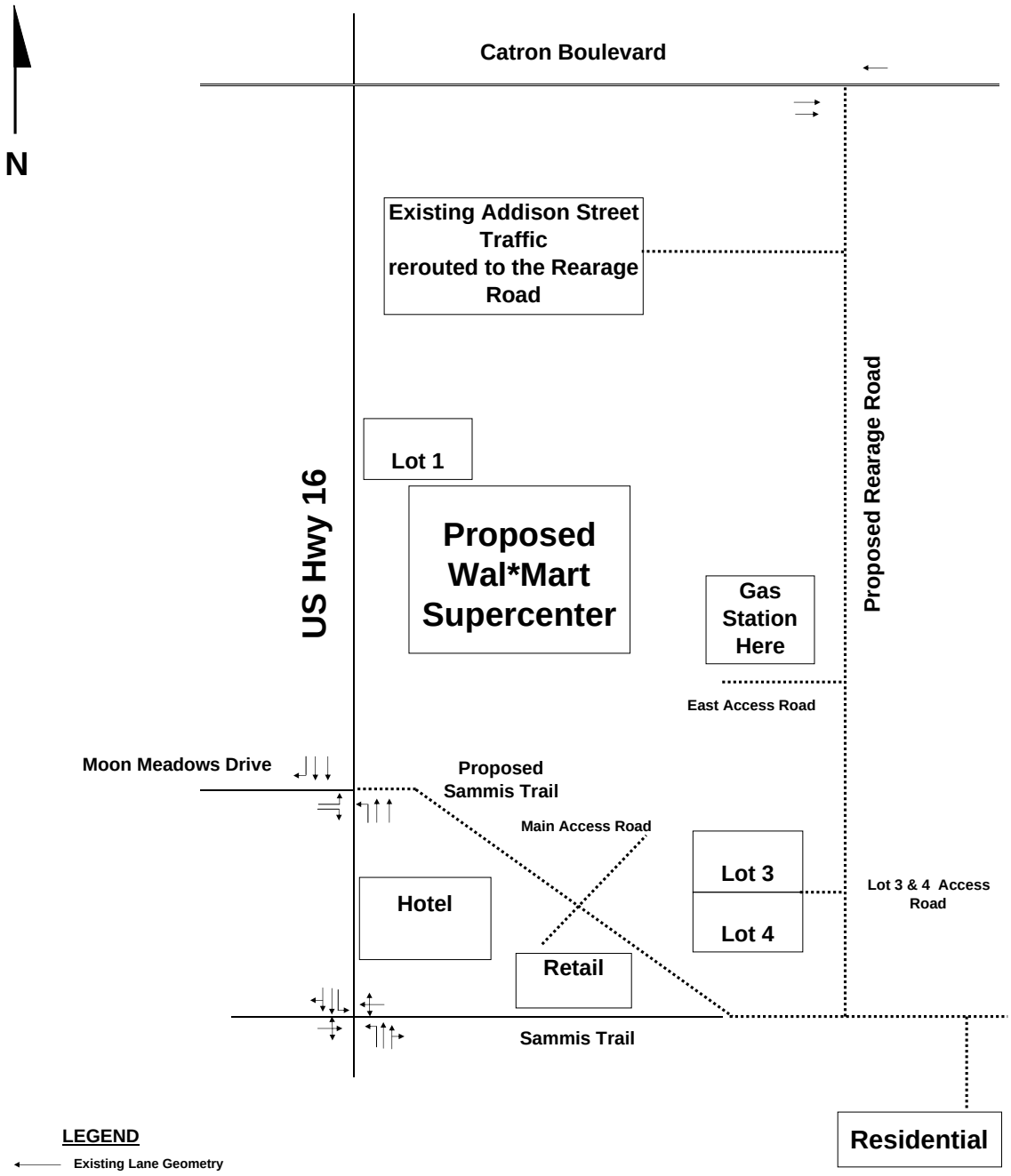
Land Use Type	Size
Wal*Mart (Discount Superstore)	203,000 sq.ft.
Lot 1 (Specialty Retail)	30,000 sq.ft.
Lot 3 (High Turnover Restaurant)	6,000 sq.ft.
Lot 4 (Specialty Retail)	50,000 sq. ft.
Hotel	150 rooms
Specialty Retail near Hotel	20,000 sq. ft.
Single Family Detached Housing	300 lots

The site plan includes the realignment of a portion of Sammis Trail west of US 16 to connect with Moon Meadows Drive at US 16. The Wal*Mart and Lots 1,3, & 4 will be located north of Sammis Trail, while the hotel, specialty retail, and single family houses will be located south of Sammis Trail. The Wal*Mart and Lot 1 will have an access road (Main Access Road) located approximately 850-900 feet east of US 16. The access road will continue across Sammis Trail to provide access to the hotel and retail, creating a four-way intersection. Until the Hotel and retail area are developed, an interim connection from existing Sammis Trail will be required. The existing Sammis Trail shall connect to the proposed Sammis Trail at approximately a 90 degree angle. The location of the interim connection shall be a minimum of 200 feet north of the access road to Wal*Mart. This interim connection shall be removed as development begins on the south side of Sammis Trail.

The proposed Rearage Road would run parallel to US 16 from Sammis Trail to Catron Boulevard. This road would provide access to Wal*Mart, lots along the eastern edge of the development, and would allow the existing Addison Street access to US 16 to be rerouted to the Rearage Road. A driveway will be located approximately 400 feet north of the Rearage Road/Sammis Trail intersection to provide access to Lots 3 & 4. The exact driveway location shall meet City of Rapid City driveway spacing standards. One additional access road will also be constructed to provide direct access to the rearage road. The study area encompasses the US 16 / Moon Meadows Drive intersection, Catron Boulevard / Rearage Road intersection, plus five additional intersections created by the development:

- US 16 / Moon Meadows Drive / Sammis Trail
- Catron Boulevard / Rearage Road
- Addison Street / Rearage Road
- Sammis Trail / Main Access Road (proposed)
- Sammis Trail / Rearage Road (proposed)
- Rearage Trail / East Access Road (proposed)
- Rearage Road / Lot 3 & 4 access (proposed)

An illustration of the proposed development and study area is shown in **Figure 1**.



HDR	**Existing Lane Geometry**	**Figure 1**
		December 2005

Methodology

The main objective of the study was to determine the traffic impacts of the proposed mixed-use development located near the intersection of US 16 and Moon Meadows Drive/Sammis Trail in Rapid City, South Dakota. A traffic operations analysis of the surrounding roadway system and proposed roadways was performed to predict the quality of traffic operations in the area.

- Existing AM and PM peak hour turning movement counts were collected at the intersection of US 16/Moon Meadows Drive and on Catron Boulevard (**Figure 2**). The existing counts were adjusted to represent summer "seasonal" volumes factors supplied by the SDDOT.

- The proposed development trips were estimated using the methodology of ITE Trip Generation, 7th Edition. The PM Peak Hour of Generator rate for the Wal*Mart store was adjusted based on recommendations in a SDDOT completed study "Verify Certain ITE Trip Generation Rate Applications in South Dakota".

- Some portion of the trips to the proposed development may be shared-use trips. An internal capture rate of 16% was agreed upon by City of Rapid City, the State of South Dakota, and HDR to be used in this study.

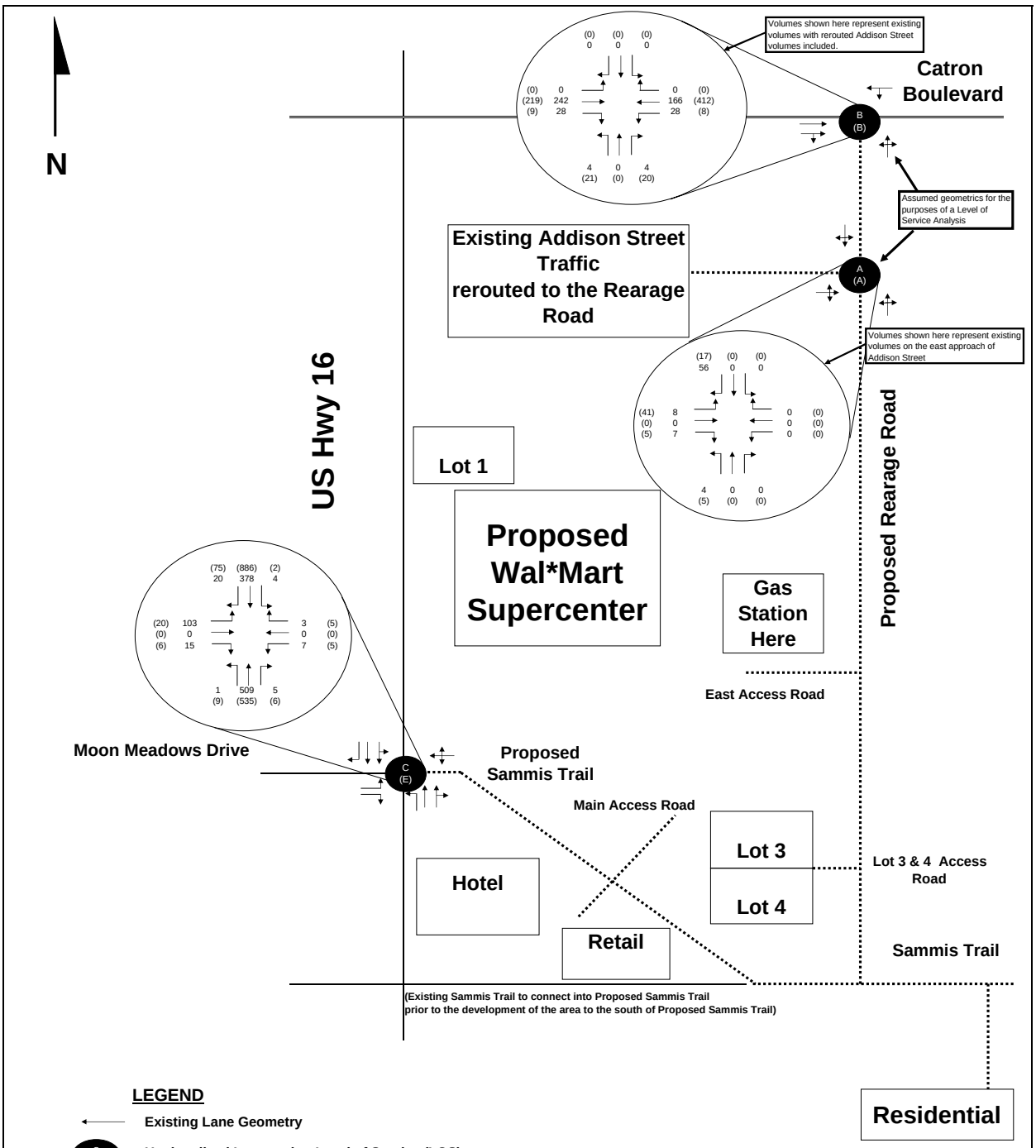
- The pre-development daily traffic volumes were used to determine the directional orientation of traffic. It was assumed the development would alter the directional orientation as shown in **Figure 3**.

- Capacity analyses (Level of Service) were performed for the AM and PM peak hours. The following scenarios will be evaluated:

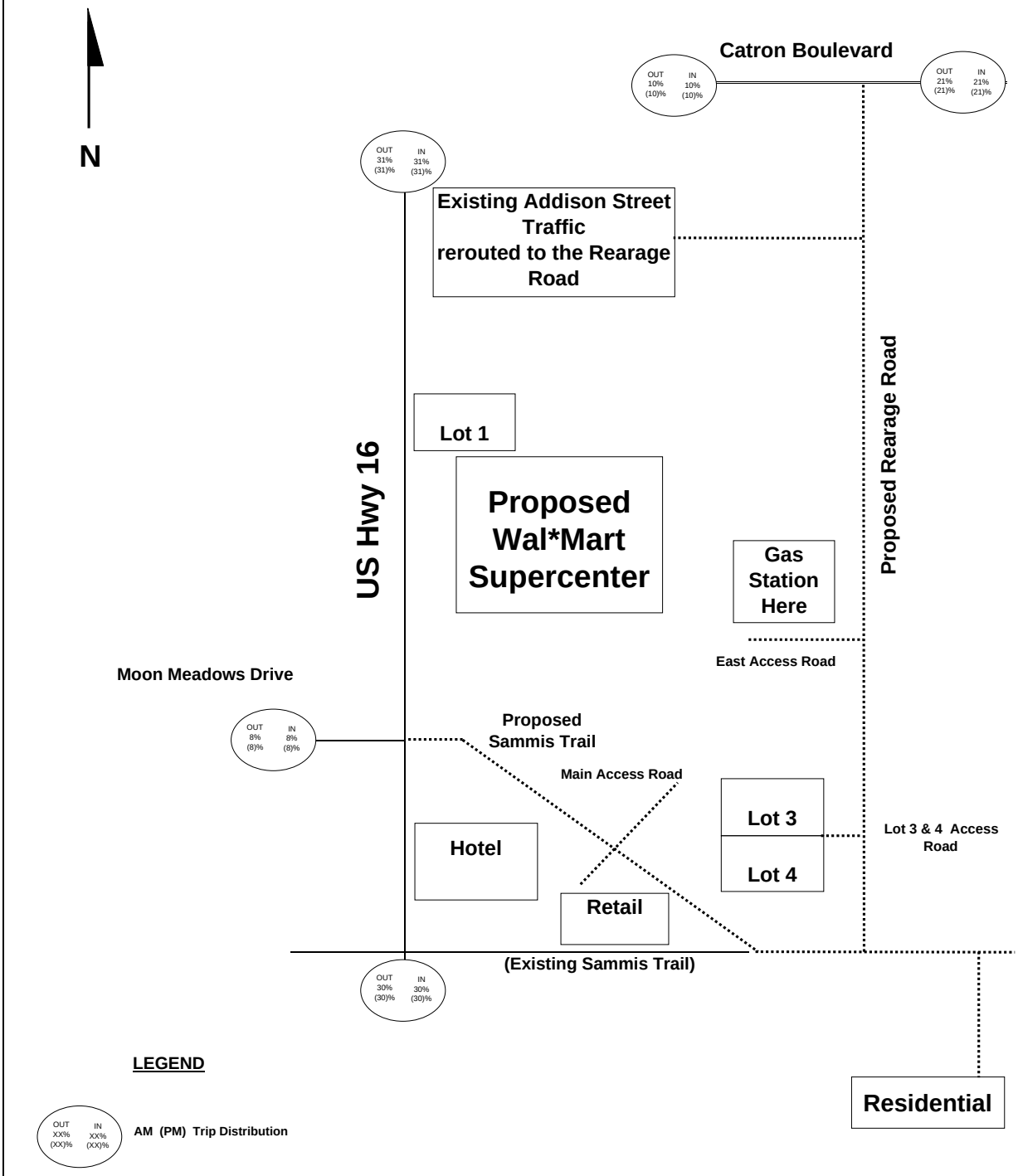
  - **Existing Conditions**
  - **2005 Build Condition** – Existing volumes added to the build volumes (proposed development trips).
  - **2020 Build Condition –** Existing volumes increased at a rate of 2% per year for 15 years added to the build volumes (proposed development trips).

- The impacts of the site-generated trips on the surrounding street network were determined using Synchro 6.1 and the methodologies summarized in the *Highway Capacity Manual*.

- Mitigation measures were identified to provide acceptable operations at the study area intersections.



HDR	**Existing "Seasonal" Volumes and Levels of Service** (Combined Sammis Trail and Moon Meadows) and (Addison Street trips rerouted to Rearage Road.)	**Figure 2** December 2005



HDR	**Trip Assignment and Distribution Percentages**	**Figure 3**
		December 2005

Trip Generation

ITE Trip Generation, 7th Edition was used to determine the number of expected trips generated by the development during the AM and PM peak hour. Due to the numerous buildings on the proposed site, separate land uses were used in the trip generation calculation. The trip generation rate for the Wal*Mart Superstore was adjusted to 5.00 for the PM Peak Hour of Generator based on a study completed by the South Dakota Department of Transportation.

Based on the high density of retail land uses located in a relatively small area, an internal capture rate of 16% was determined to be a conservative approach for estimating trips for this development. The trips internally captured were routed on the proposed roadways with exception of trips that were allowed to travel between land uses using internal roadways or parking lots.

The site-generated trip summary using this methodology is shown in **Table 2.**

Table 2

				AM Peak Hour of Generator						PM Peak Hour of Generator					
Development	Number	Unit	ITE Land Use	% Enter	% Exit	ITE Trip Rate	Total Trip Ends	Entering Trips	Exiting Trips	% Enter	% Exit	ITE Trip Rate	Total Trip Ends	Entering Trips	Exiting Trips
Wal*Mart	203000	sq ft	813	53%	47%	3.17	644	341	302	52%	48%	5.00	1015	528	487
Lot 1 (Specialty Retail)	30000	sq ft	814	48%	52%	6.84	205	98	107	56%	44%	5.02	151	84	66
Lot 3 (High Turnover Restaurant)	6000	sq ft	932	52%	48%	13.53	81	42	39	55%	45%	18.8	113	62	51
Lot 4 (Specialty Retail)	50000	sq ft	814	48%	52%	6.84	342	164	178	56%	44%	5.02	251	141	110
Hotel	150	Rooms	310	55%	45%	0.52	78	43	35	58%	42%	0.61	92	53	38
Specialty Retail	20000	sq ft	814	48%	52%	6.84	137	66	71	56%	44%	5.02	100	56	44
Houses (SF Detached)	300	lots	210	26%	74%	0.77	231	60	171	64%	36%	1.02	306	196	110
						Subtotal	1718	815	903				2027	1120	907
						Internal Trip Reduction - 16%	275	130	145				324	179	145
						Total	1443	684	759				1703	941	762

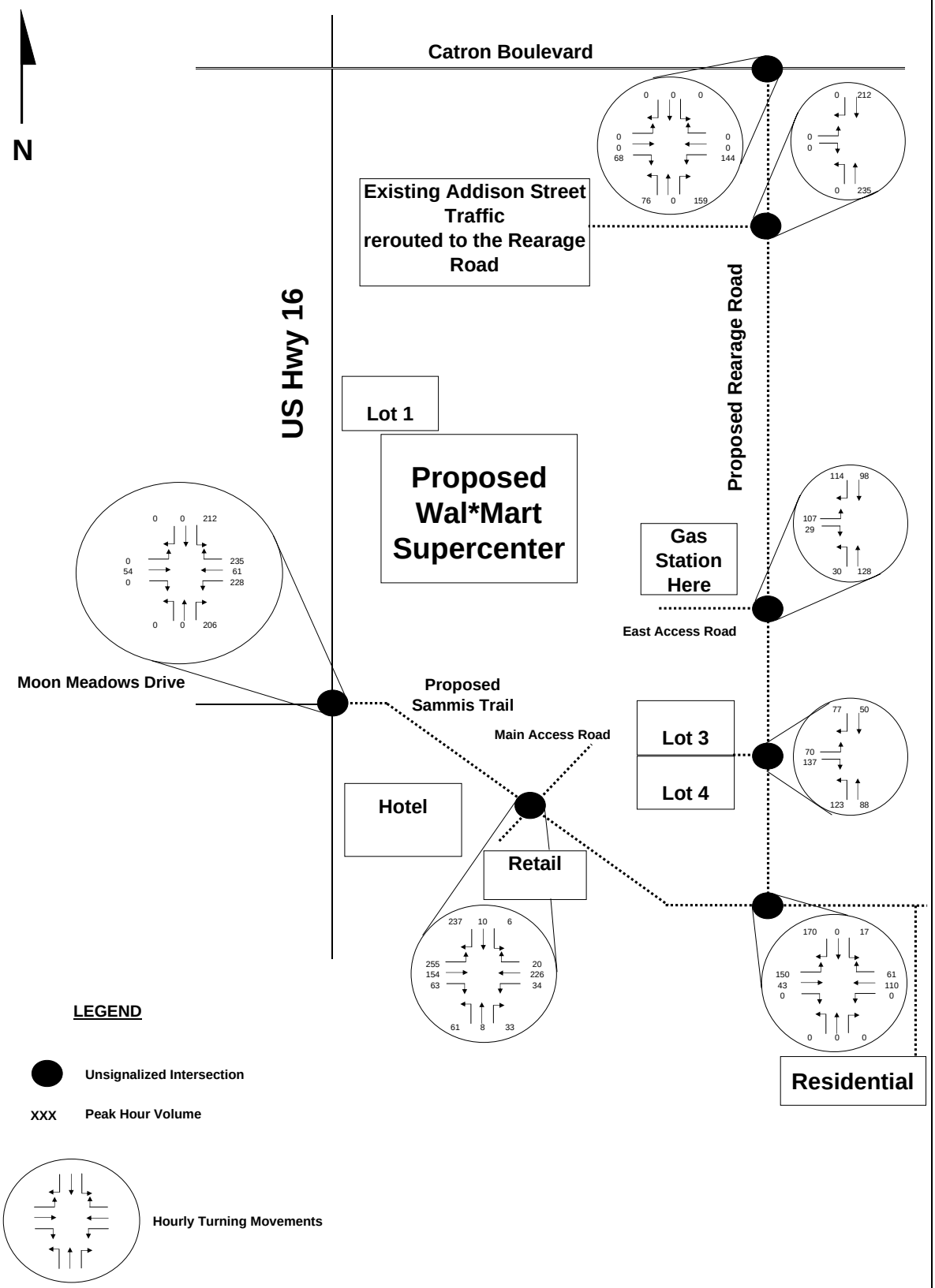
Note: The PM trip generation rate for Wal*Mart was determined by information provided in a Trip Generation Study conducted by the SDDOT called "Verify Certain ITE Trip Generation Rate Applications" in South Dakota.

Trip Distribution

The orientation of site-generated traffic is the most complex and subjective step in the process of any traffic impact analysis. There are a variety of methods available to estimate the likely orientation of traffic; however, no method can guarantee 100 percent accuracy (people are free to visit this site from any location using whichever route they choose). Therefore, it is important to provide the most reasonable possible analysis in combination with a procedure that is reasonably conservative such that an appropriate "factor of safety" is inherent to the results. Trips were distributed along each of the roadway segments and intersections using the directional orientation from Figure 3 and the layout of the proposed site. It is important to note that several assumptions were made including:

- Wal*Mart and Lot 1 proposed trips were assigned via the Main access road and the East Access Road using the external percentages. All trips entering from Catron Boulevard used the East Access Road and the trips entering from US 16 used the Main Access Road.
- All of the trips entering and exiting lot 3 & 4 occurred via the Rearage Road as no internal access to Wal*Mart exists.
- All of the trips entering and exiting the hotel and retail area south of Sammis Trail used the Main Access Road.
- All of the proposed trips entering and exiting the residential area used Sammis Trail to the east of the Rearage Road.

The site generated trip distribution for the AM and PM peak hours are shown in **Figures 4** and **5**, respectively.



HDR

Site Generated Traffic & Assignment (AM)

Figure 4

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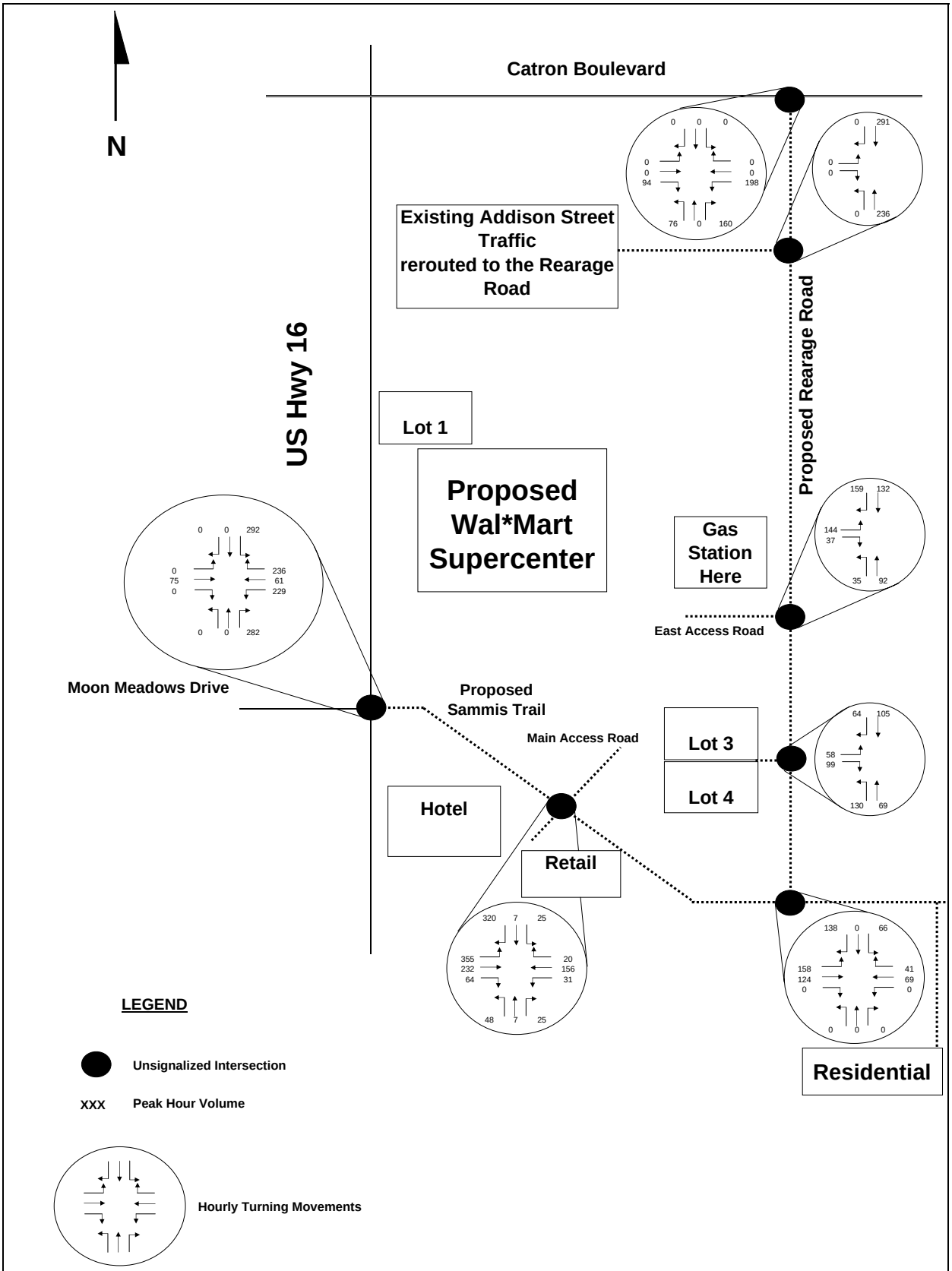


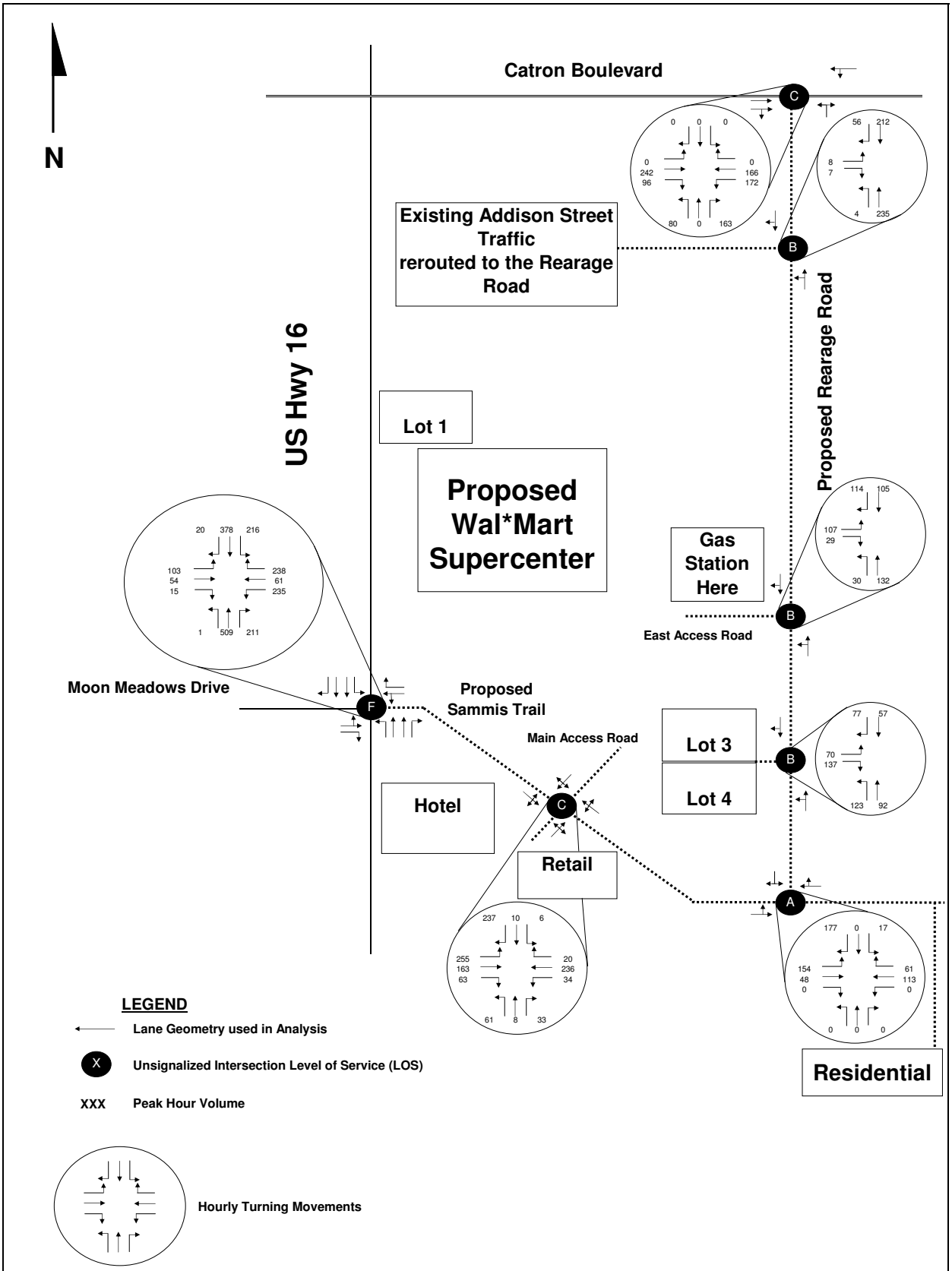
Site Generated Traffic & Assignment (PM)

Figure 5

December 2005

Post-Development Volume

The existing AM and PM peak hour traffic volumes from Figure 2 were combined with those from Figures 4 and 5, respectively, to determine the total volumes used in the level of service analysis. It is assumed due to the number of land uses estimated in this study that this area will take 5 to10 years to be fully developed as only the Wal*Mart store is being proposed at this time. The LOS for each intersection is also documented and represents the unmitigated or baseline scenario. An assessment of the quality of traffic operations and mitigation measures are discussed in the next section. **Figures 6** and **7** documents the anticipated post-development turning movements and LOS for the AM and PM peak hours, respectively.



HDR

Post-Development Volume and Levels of Service (AM)

Figure 6

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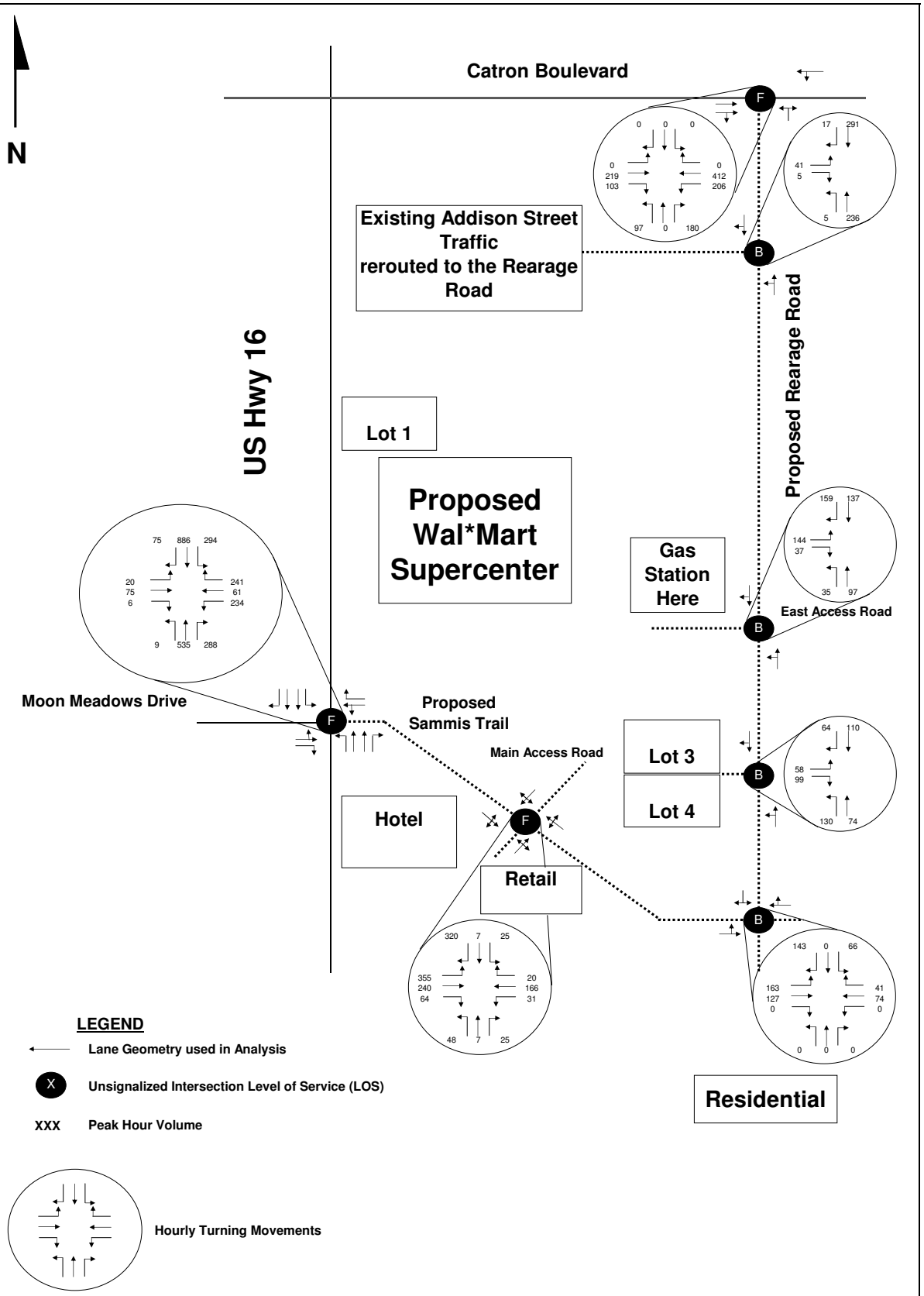

HDR

Post-Development Volume and Levels of Service (PM)

Figure 7

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Analysis Description

Observations of traffic volumes provide an understanding of the general nature of traffic, but are insufficient to indicate either the ability of the street network to carry additional traffic or the quality of service provided by the street system. For this reason the concept of Level of Service (LOS) was developed to correlate numerical traffic operational data to subjective descriptions of traffic performance at intersections. Each lane of traffic has delay associated with it and therefore a correlating LOS. The weighted average delay for each of these lanes of traffic for a signalized intersection is the intersection LOS. LOS categories range from LOS A (best) to F (worst) as shown in **Table 3.**

TABLE 3: Level of Service Description

Level of Service	SIGNALIZED Intersection Control Delay (sec)	UNSIGNALIZED Intersection Control Delay (sec)	Intersection LOS Description
A	≤ 10.0	≤ 10.0	Free flow, insignificant delays.
B	10.1-20.0	10.1-15.0	Stable operation, minimal delays.
C	20.1-35.0	15.1-25.0	Stable operation, acceptable delays.
D	35.1-55.0	25.1-35.0	Restricted flow, regular delays.
E	55.1-80.0	35.1-50.0	Maximum capacity, extended delays. Volumes at or near capacity. Long queues form upstream from intersection.
F	> 80.0	> 50.0	Forced flow, excessive delays. Represents jammed conditions. Intersection operates below capacity with low volumes. Queues may block upstream intersections.

Source: *Highway Capacity Manual*, Transportation Research Board, 2000

The intersection capacity analyses were completed using Synchro 6.1 software. Synchro replicates the analysis procedures defined in the *2000 Highway Capacity Manual*. This manual provides procedures for the analysis of both signalized and unsignalized intersections. It should be noted that stop-controlled intersections are analyzed by identifying the amount of delay at each approach that conflict with other intersection movements (i.e. all movements except the free flow through lanes), thus approach level of service is reported for unsignalized intersections.

LOS "C" has generally been established as the standard for planning of transportation facilities for peak hour traffic conditions. For this study, LOS "C" for the overall intersection was used as the minimum standard.

A review of the analyses for each volume scenario is provided in the following sections, with summaries of the LOS analyses. Summary LOS output reports of the analysis are included in the appendix and may be referenced to review signal timings and phasing as presented in this study.

Unmitigated Conditions Analysis

Capacity analysis was performed using the existing AM and PM peak hour traffic volumes adjusted when necessary to represent peak summer volumes on the existing and proposed roadway network. In general, the surrounding roadways on the eastern edge of the site are characterized by low levels of traffic with acceptable levels of service based on the lane geometry shown in **Figures 6 and 7**. The US 16 / Sammis Trail / Moon Meadows and Catron Boulevard / Rearage Road intersections are characterized by near or over capacity conditions. In this study, it was assumed that the intersection of Sammis Trail / Main Access Road and Sammis Trail / Rearage Road operated as all-way stop controlled, while the remaining intersections were two-way stop controlled (with US 16, Rearage Road, and Catron Boulevard as the mainlines). A summary of the intersection LOS for the existing conditions is documented in **Table 4.**

TABLE 4: Unmitigated Condition Intersection Level-of-Service

Intersection	Traffic Control	AM Peak Hour LOS	Avg Delay per Vehicle (sec)	PM Peak Hour LOS	Avg Delay per Vehicle (sec)
U.S. 16 / Sammis Trail	Two-Way	F	N/A[2]	F	N/A[2]
Sammis Trail / Main access road	Four-Way Stop	C	23.1[1]	F	N/A[2]
Catron Boulevard / Rearage Road	Two-Way	C	22.5	F	N/A[2]
Addison Street / Rearage Road	Two-Way	B	11.1	B	13.3
Sammis Trail / Rearage Road	ALL-Way Stop	A	9.2	B	10.1
Rearage Road / Lot 3 & 4	Two-Way	B	12.1	B	12.3
Rearage Road / East Access	Two-Way	B	12.2	B	13.7

Source: HDR Engineering, Inc. using Synchro 6.1 (HCM Methodology)
Note: 1. Worst Approach at LOS D (34.0 sec/veh), overall intersection at LOS C or 23.1 sec/veh
Note: 2. Overcapacity conditions

The LOS reported for four-way stop controlled intersections represents overall intersection delay, whereas the delay for two-way stop controlled intersections are reported as the "worst approach." This is to account for the potential of vehicles waiting on the minor approaches for unreasonable amounts of time where mainline through vehicles have no delay. Two-way stop controlled intersections having minor approaches operating at LOS D, E, or F do not necessarily require mitigation; however additional minor street approach lanes and investigation of signal warrants may be appropriate.

Mitigation
There are three main areas that will likely require mitigation as a result of the development:

- US Highway 16 / Moon Meadows / Sammis Trail
- Sammis Trail / Wal*Mart Main Access Road
- Catron Boulevard / Rearage Road

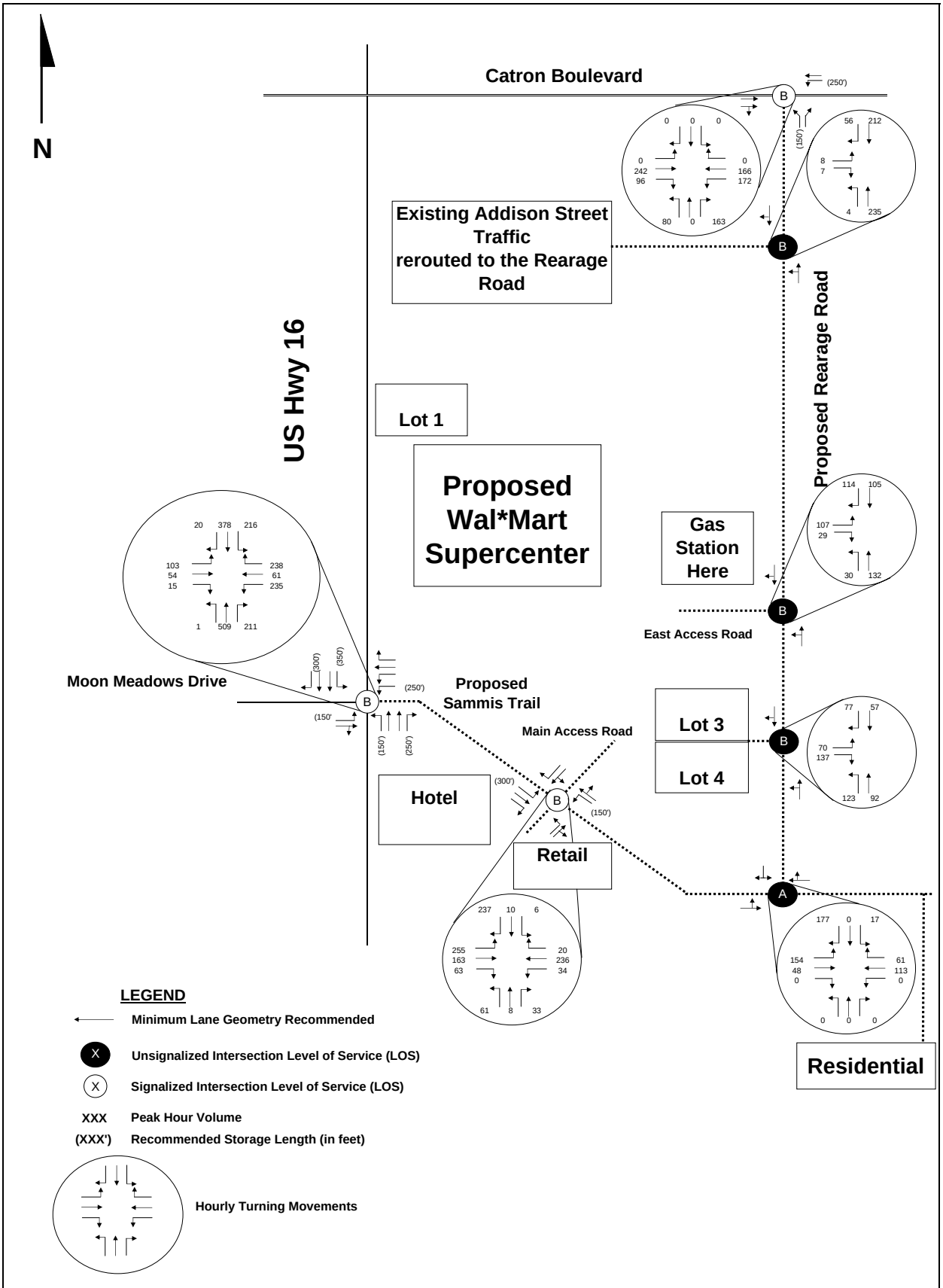
U.S. Highway 16 / Sammis Trail
As documented in Figure 6 and 7, the intersection of US 16 / Sammis Trail is expected to operate at deficient levels after the site is developed. To mitigate this condition, installation of an 8-phase traffic signal with protected left-turn phasing for the northbound and southbound directions and protected left-turn phasing for the eastbound and westbound approaches is the most appropriate measure. A Synchro analysis revealed that this measure improved the level of service to LOS C in the PM peak hour. The large volume of left-turning traffic from Sammis Trail onto southbound US 16 also warrants an additional left-turn lane.

Sammis Trail / Main Access Road
As documented in Figure 6 and 7, the intersection of Sammis Trail / Main Access Road is expected to operate at an unacceptable level of service with queuing on the eastbound approach a concern due to the distance from US 16. To mitigate this condition, the intersection shall be signalized and the proposed lane geometry shall consist of an exclusive left-turn lane along the eastbound approach from Sammis Trail and a right-turn lane to improve intersection operations, especially in reducing queue lengths. Installation of a traffic signal (with permitted-protected left turns for eastbound left-turning traffic) improved PM peak hour operations from LOS F to LOS B and reduced queuing.

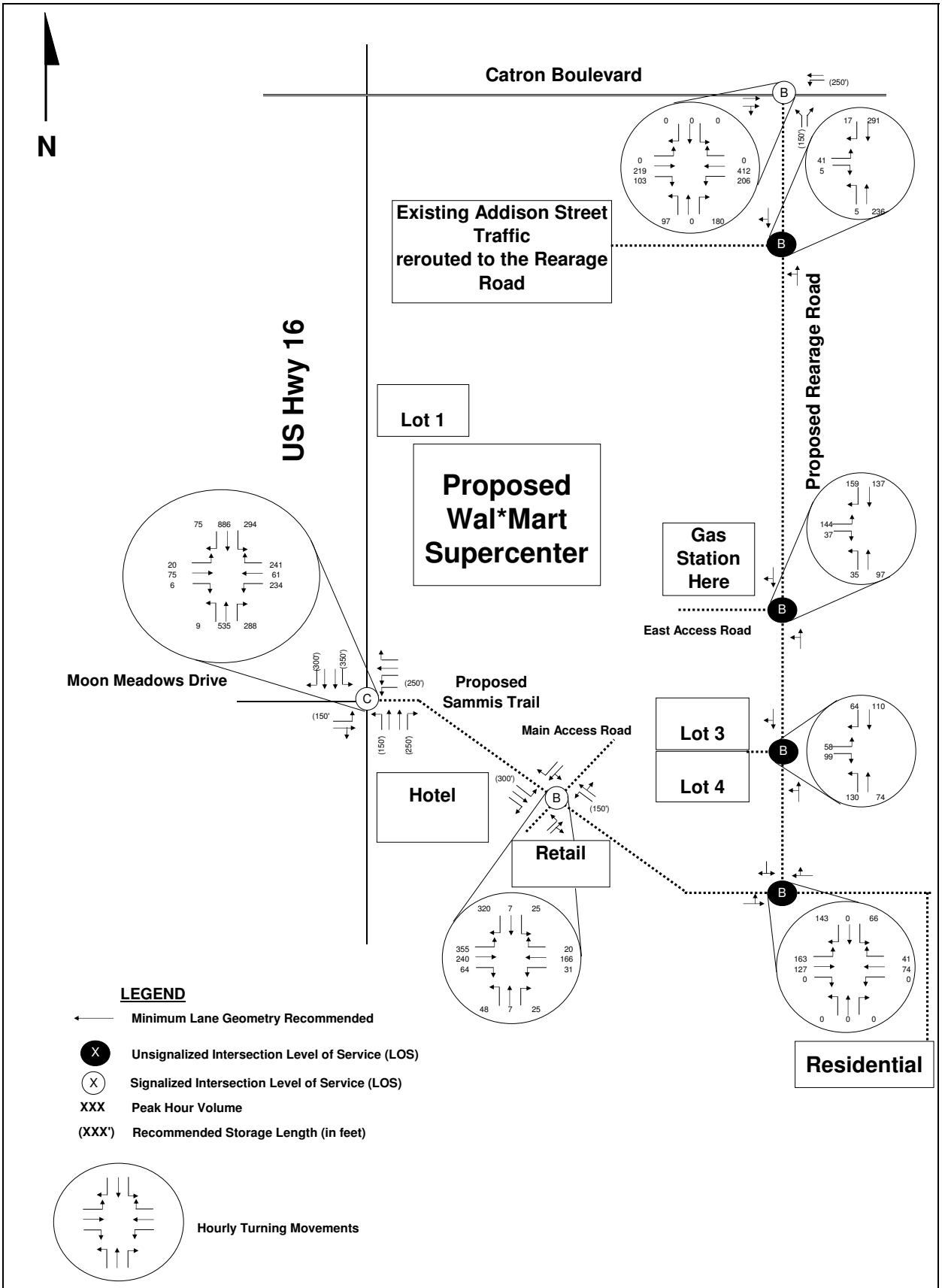
Catron Boulevard / Rearage Road
As documented in Figure 6 and 7, the intersection of Catron Boulevard / Rearage Road is expected to operate at deficient levels after the site is developed. To mitigate this condition, the intersection shall be signalized and the proposed lane geometry shall consist of an exclusive left-turn lane along the westbound approach. Installation of a traffic signal with protected left turns improved operations from LOS F to LOS B in the PM peak hour.

Summary of Capacity Improvements
Summaries of the mitigated LOS and turning movements are documented in **Figures 8 and 9**, and **Table 5** for the AM and PM peak hours. The following improvements were made:

- Installation of an 8-phase traffic signal at US Highway 16 / Sammis Trail.
- Installation of an additional left-turn lane along westbound Sammis Trail at US Highway 16.
- Installation of a traffic signal at Sammis Trail / Main Access Road.
- Installation of a left-turn lane along eastbound Sammis Trail at the Main Access Road.
- Installation of a right-turn lane along eastbound Sammis Trail at the Main Access Road.
- Installation of a traffic signal at Catron Boulevard / Rearage Road
- Installation of a left-turn lane along westbound Catron Boulevard at the Rearage Road



HDR	**Mitigated Post-Development Volume and Levels of Service (AM)**	**Figure 8**
		December 2005



HDR	**Mitigated Post-Development Volume and Levels of Service (PM)**	**Figure 9**
		December 2005

TABLE 5: Mitigated Intersection Level-of-Service

Intersection	Traffic Control	AM Peak Hour LOS	Avg Delay per Vehicle (sec)	PM Peak Hour LOS	Avg Delay per Vehicle (sec)
U.S. 16 / Sammis Trail	Signal	B	19.2	C	21.5
Sammis Trail / Main access road	Signal	B	10.5	B	10.4
Catron Boulevard / Rearage Road	Signal	B	11.9	B	10.5
Addison Street / Rearage Road	Two-Way	B	11.1	B	13.3
Sammis Trail / Rearage Road	ALL-Way Stop	A	9.2	B	10.1
Rearage Road / Lot 3 & 4	Two-Way	B	12.1	B	12.3
Rearage Road / East Access	Two-Way	B	12.2	B	13.7

Source: HDR Engineering, Inc. using Synchro 6.1 (HCM Methodology)

Future Build (2020) Conditions Analysis

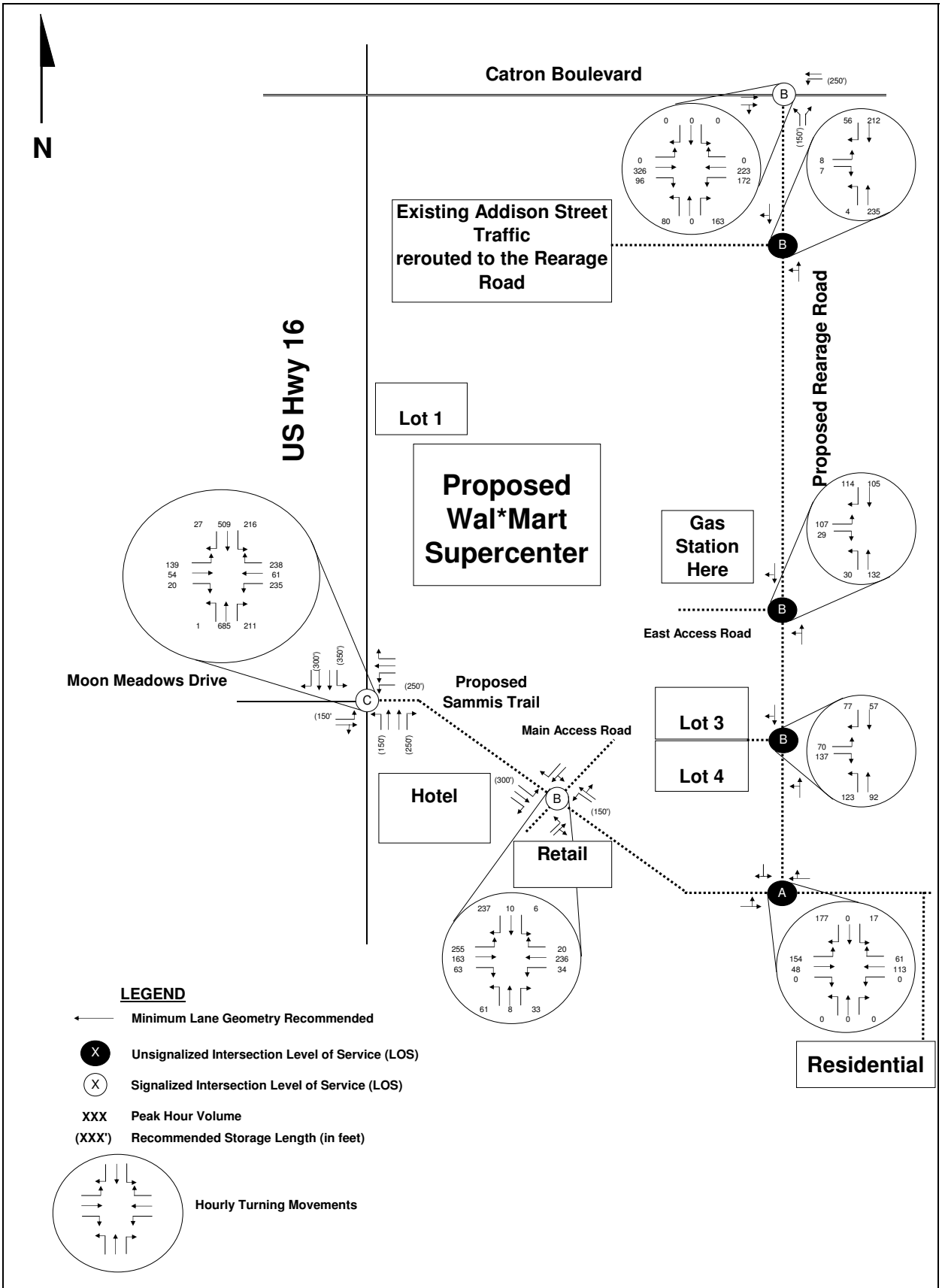
Based on growth trends in the study area, future build (2020) volumes were developed by growing the existing traffic volumes by 2.0 percent per year for 15 years and adding them to the trips generated by the proposed mixed-use development including a Wal*Mart store. The growth rate was based on historical count information gathered by the SDDOT. The 2020 build traffic volumes and LOS (AM) are shown in **Figure 10**. The 2020 build traffic volumes and LOS (PM) are shown in **Figure 11**.

The capacity analysis was performed using future build (2020) AM and PM peak hour traffic volumes to determine if the geometric improvements recommended would serve this area in the future. It was determined through an operational analysis that the study intersections would operate at an acceptable LOS in 2020 with no further geometric improvements. A summary of the intersection LOS for the existing conditions is documented in **Table 6.**

TABLE 6: Future Build (2020) Intersection Level-of-Service

Intersection	Traffic Control	AM Peak Hour LOS	Avg Delay per Vehicle (sec)	PM Peak Hour LOS	Avg Delay per Vehicle (sec)
U.S. 16 / Sammis Trail	Signal	C	22.3	C	23.8
Sammis Trail / Main access road	Signal	B	10.5	B	10.4
Catron Boulevard / Rearage Road	Signal	B	10.9	B	10.8
Addison Street / Rearage Road	Two-Way	B	11.1	B	13.3
Sammis Trail / Rearage Road	ALL-Way Stop	A	9.2	B	10.1
Rearage Road / Lot 3 & 4	Two-Way	B	12.1	B	12.3
Rearage Road / East Access	Two-Way	B	12.2	B	13.7

Source: HDR Engineering, Inc. using Synchro 6.1 (HCM Methodology)

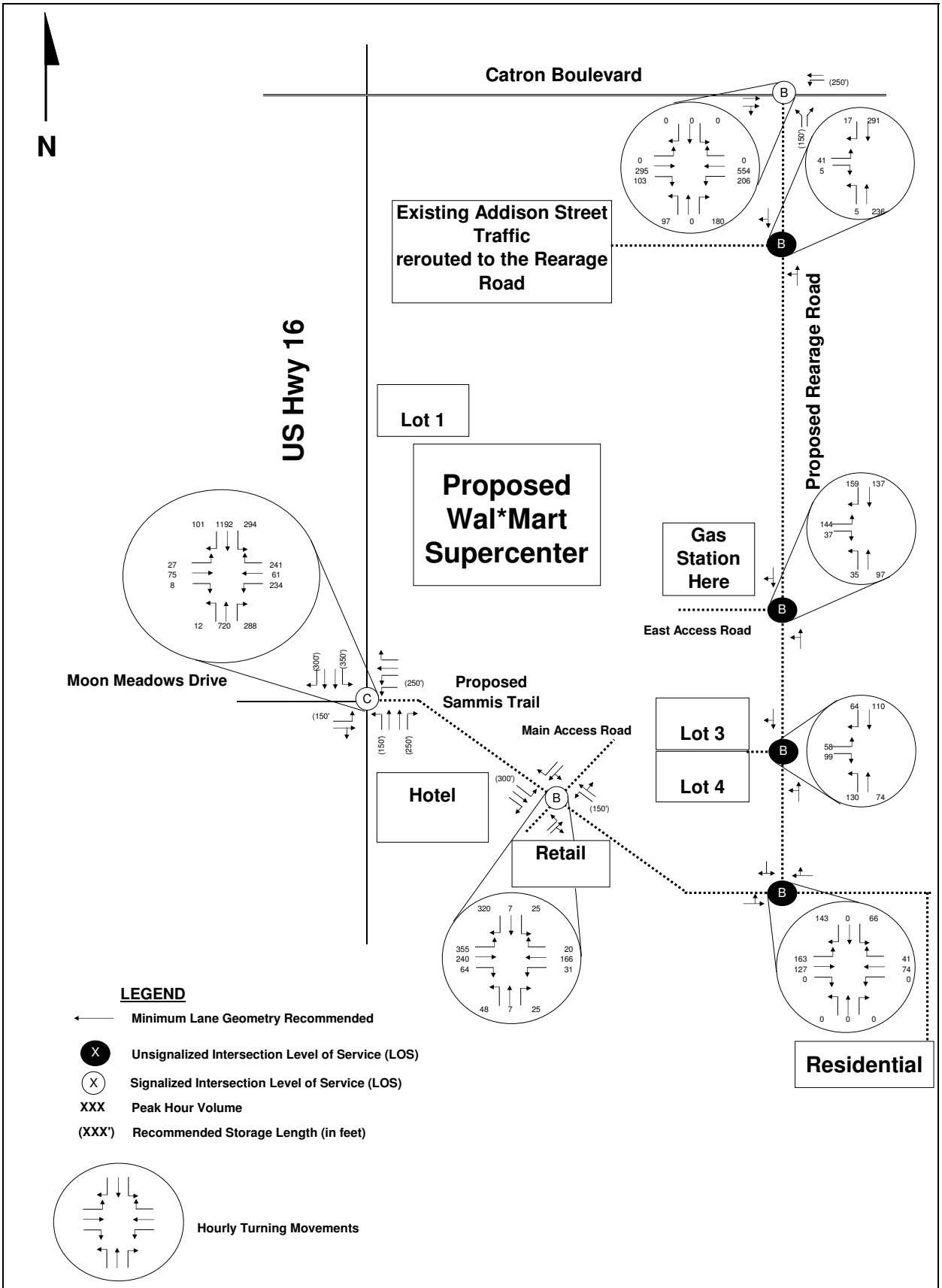


HDR

Future Build (2020)Volumes and Levels of Service (AM)

Figure 10

December 2005



Future Build (2020) Volumes and Levels of Service (PM)

Figure 11

December 2005

APPENDIX

1.) Current Site Plan
2.) Synchro Print-outs

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SITE PLAN

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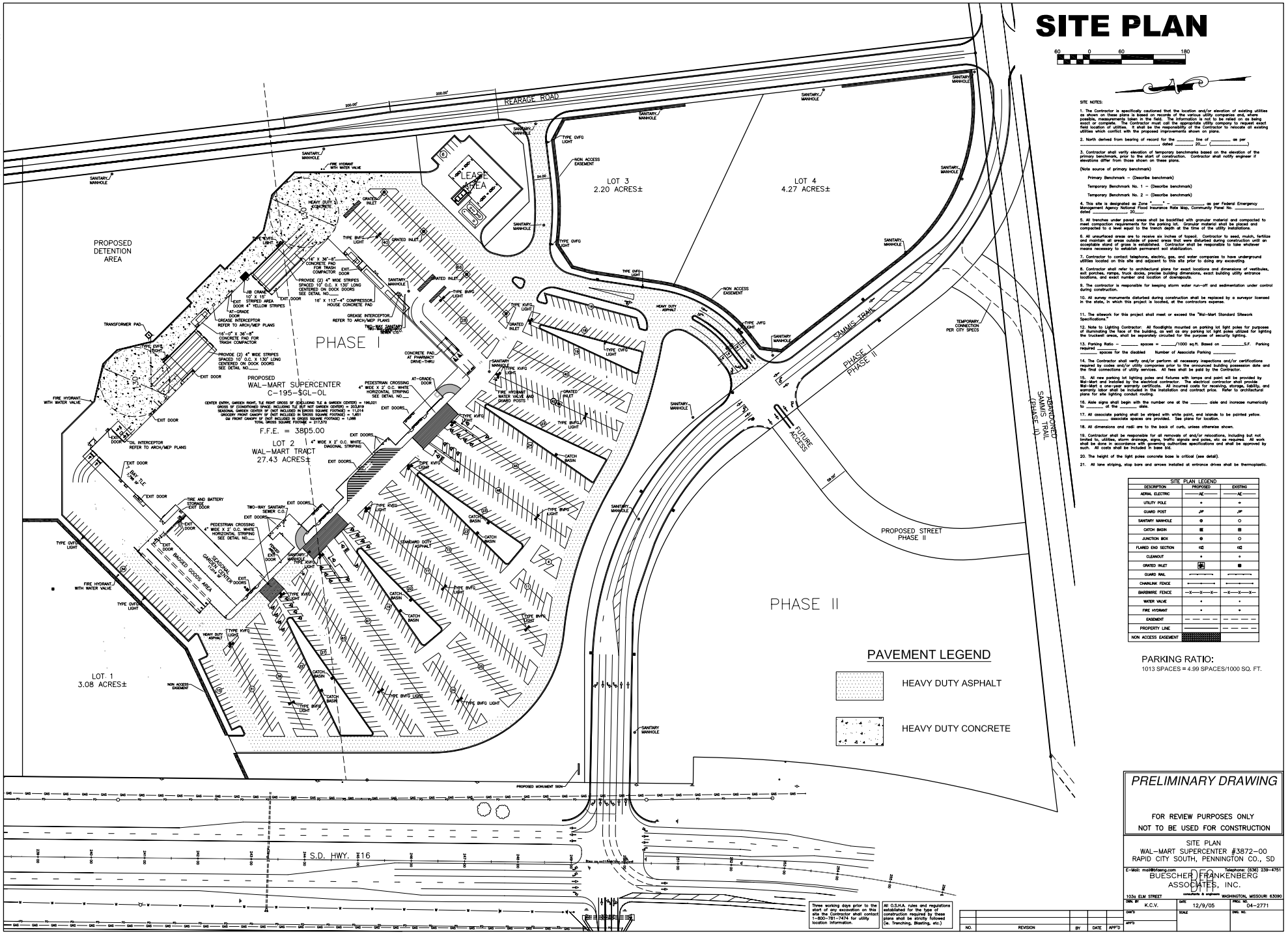


PAVEMENT LEGEND

HEAVY DUTY ASPHALT

HEAVY DUTY CONCRETE

SITE NOTES:

1. The Contractor is specifically cautioned that the location and/or elevation of existing utilities as shown on these plans is based on records of the various utility companies and, where possible, measurements taken in the field. The information is not to be relied on as being exact or complete. The Contractor must call the appropriate utility company to request exact field location of utilities. It shall be the responsibility of the Contractor to relocate all existing utilities which conflict with the proposed improvements shown on plans.

2. North derived from bearing of record for the _____ line of _____ as per _____ dated _____ 20____. (_____)

3. Contractor shall verify elevation of temporary benchmarks based on the elevation of the primary benchmark, prior to the start of construction. Contractor shall notify engineer if elevations differ from those shown on these plans.

(Note source of primary benchmark)

Primary Benchmark – (Describe benchmark)

Temporary Benchmark No. 1 – (Describe benchmark)

Temporary Benchmark No. 2 – (Describe benchmark)

4. This site is designated as Zone "_____" _____ as per Federal Emergency Management Agency National Flood Insurance Rate Map, Community Panel No. _____ dated _____ 20____

5. All trenches under paved areas shall be backfilled with granular material and compacted to meet compaction requirements for the parking lot. Granular material shall be placed and compacted to a level equal to the trench depth at the time of the utility installations.

6. All unsurfaced areas are to receive six inches of topsoil. Contractor to seed, mulch, fertilize and maintain all areas outside of paved areas that were disturbed during construction until an acceptable stand of grass is established. Contractor shall be responsible to take whatever means necessary to establish permanent soil stabilization.

7. Contractor to contact telephone, electric, gas, and water companies to have underground utilities located on this site and adjacent to this site prior to doing any excavating.

8. Contractor shall refer to architectural plans for exact locations and dimensions of vestibules, exit porches, ramps, truck docks, precise building dimensions, exact building utility entrance locations, and exact number and location of downspouts.

9. The contractor is responsible for keeping storm water run-off and sedimentation under control during construction.

10. All survey monuments disturbed during construction shall be replaced by a surveyor licensed in the state, in which this project is located, at the contractors expense.

11. The sitework for this project shall meet or exceed the "Wal-Mart Standard Sitework Specifications."

12. Note to Lighting Contractor: All floodlights mounted on parking lot light poles for purposes of illuminating the face of the building, as well as any parking lot light poles utilized for lighting the truckwell areas, shall be separately circuited for the purpose of security lighting.

13. Parking Ratio – _____ spaces = _____/1000 sq.ft. Based on _____ S.F. Parking required _____ spaces for the disabled Number of Associate Parking _____

14. The Contractor shall verify and/or perform all necessary inspections and/or certifications required by codes and/or utility companies prior to the announced building possession date and the final connections of utility services. All fees shall be paid by the Contractor.

15. All new parking lot lighting poles and fixtures with lamps and paint will be provided by Wal-Mart and installed by the electrical contractor. The electrical contractor shall provide Wal-Mart a one-year warranty certificate. All incurred costs for receiving, storage, liability, and warranty labor shall be included in the installation and contract price. Refer to architectural plans for site lighting conduit routing.

16. Aisle signs shall begin with the number one at the _____ aisle and increase numerically to _____ at the _____ aisle.

17. All associate parking shall be striped with white paint, and islands to be painted yellow. _____ associate spaces are provided. See plans for location.

18. All dimensions and radii are to the back of curb, unless otherwise shown.

19. Contractor shall be responsible for all removals of and/or relocations, including but not limited to, utilities, storm drainage, signs, traffic signals and poles, etc as required. All work shall be done in accordance with governing authorities specifications and shall be approved by such. All costs shall be included in base bid.

20. The height of the light poles concrete base is critical (see detail).

21. All lane striping, stop bars and arrows installed at entrance drives shall be thermoplastic.

SITE PLAN LEGEND		
DESCRIPTION	PROPOSED	EXISTING
AERIAL ELECTRIC	—AE—	—AE—
UTILITY POLE	•	•
GUARD POST	⊙P	⊙P
SANITARY MANHOLE	⊕	○
CATCH BASIN	▦	▦
JUNCTION BOX	⊕	○
FLARED END SECTION	⊏□	⊏□
CLEANOUT	•	•
GRATED INLET	▦	▦
GUARD RAIL		
CHAINLINK FENCE		
BARBWIRE FENCE	—X—X—X—	—X—X—X—
WATER VALVE	•	•
FIRE HYDRANT	•	•
EASEMENT	— — — —	— — — —
PROPERTY LINE	— — — —	— — — —
NON ACCESS EASEMENT		

PARKING RATIO:
1013 SPACES = 4.99 SPACES/1000 SQ. FT.

PRELIMINARY DRAWING

FOR REVIEW PURPOSES ONLY
NOT TO BE USED FOR CONSTRUCTION

Three working days prior to the start of any excavation on this site the Contractor shall contact 1-800-781-7474 for utility location information.

All O.S.H.A. rules and regulations established for the type of construction required by these plans shall be strictly followed (ie. Trenching, Blasting, etc.)

NO.	REVISION	BY	DATE	APP'D

SITE PLAN
WAL-MART SUPERCENTER #3872-00
RAPID CITY SOUTH, PENNINGTON CO., SD

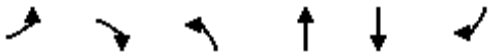
E-Mail: mail@bfaeng.com Telephone: (636) 239-4751
BUESCHER FRANKENBERG ASSOCIATES, INC.
consultants & engineers
103a ELM STREET WASHINGTON, MISSOURI 63090

DSN. BY	DATE	PROJ. NO.
K.C.V.	12/9/05	04-2771
CHK'D	SCALE	DWG. NO.
APP'D		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	242	96	172	166	80	163
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	263	104	187	180	87	177
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			367		870	184
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			367		870	184
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			84		65	79
cM capacity (veh/h)			1188		245	827

Direction, Lane #	EB 1	EB 2	WB 1	NB 1
Volume Total	175	192	367	264
Volume Left	0	0	187	87
Volume Right	0	104	0	177
cSH	1700	1700	1188	464
Volume to Capacity	0.10	0.11	0.16	0.57
Queue Length 95th (ft)	0	0	14	87
Control Delay (s)	0.0	0.0	5.1	22.5
Lane LOS			A	C
Approach Delay (s)	0.0		5.1	22.5
Approach LOS				C

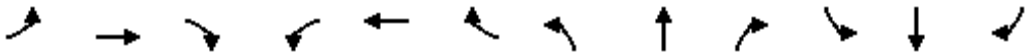
Intersection Summary			
Average Delay	7.8		
Intersection Capacity Utilization	54.8%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	8	7	4	235	212	56
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	9	8	4	255	230	61
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	525	261	291			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	525	261	291			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	98	99	100			
cM capacity (veh/h)	511	778	1270			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	16	260	291
Volume Left	9	4	0
Volume Right	8	0	61
cSH	609	1270	1700
Volume to Capacity	0.03	0.00	0.17
Queue Length 95th (ft)	2	0	0
Control Delay (s)	11.1	0.2	0.0
Lane LOS	B	A	
Approach Delay (s)	11.1	0.2	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	26.4%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	255	163	63	34	236	20	61	8	33	6	10	237
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	277	177	68	37	257	22	66	9	36	7	11	258

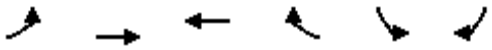
Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	523	315	111	275
Volume Left (vph)	277	37	66	7
Volume Right (vph)	68	22	36	258
Hadj (s)	0.06	0.02	-0.04	-0.52
Departure Headway (s)	5.9	6.2	7.1	6.2
Degree Utilization, x	0.86	0.54	0.22	0.47
Capacity (veh/h)	599	535	440	537
Control Delay (s)	34.0	16.4	12.1	14.5
Approach Delay (s)	34.0	16.4	12.1	14.5
Approach LOS	D	C	B	B

Intersection Summary			
Delay	23.1		
HCM Level of Service	C		
Intersection Capacity Utilization	80.2%	ICU Level of Service	D
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	103	54	15	235	61	238	1	509	211	216	378	20
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	112	59	16	255	66	259	1	553	229	235	411	22
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1451	1665	205	1276	1458	277	433			783		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1451	1665	205	1276	1458	277	433			783		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	14	98	0	28	64	100			72		
cM capacity (veh/h)	20	69	801	28	92	721	1123			831		

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	NB 3	NB 4	SB 1	SB 2	SB 3	SB 4
Volume Total	171	16	322	259	1	277	277	229	235	205	205	22
Volume Left	112	0	255	0	1	0	0	0	235	0	0	0
Volume Right	0	16	0	259	0	0	0	229	0	0	0	22
cSH	26	801	32	721	1123	1700	1700	1700	831	1700	1700	1700
Volume to Capacity	6.52	0.02	9.99	0.36	0.00	0.16	0.16	0.13	0.28	0.12	0.12	0.01
Queue Length 95th (ft)	Err	2	Err	41	0	0	0	0	29	0	0	0
Control Delay (s)	Err	9.6	Err	12.8	8.2	0.0	0.0	0.0	11.0	0.0	0.0	0.0
Lane LOS	F	A	F	B	A				B			
Approach Delay (s)	9127.8		5548.2		0.0				3.9			
Approach LOS	F		F									

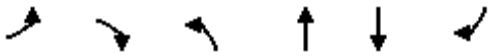
Intersection Summary				
Average Delay	2222.0			
Intersection Capacity Utilization	61.3%	ICU Level of Service	B	
Analysis Period (min)	15			



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Stop	Stop		Stop	
Volume (vph)	154	48	113	61	17	177
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	167	52	123	66	18	192

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total (vph)	220	189	211
Volume Left (vph)	167	0	18
Volume Right (vph)	0	66	192
Hadj (s)	0.19	-0.18	-0.50
Departure Headway (s)	4.8	4.5	4.4
Degree Utilization, x	0.29	0.24	0.26
Capacity (veh/h)	709	755	765
Control Delay (s)	9.8	8.9	8.9
Approach Delay (s)	9.8	8.9	8.9
Approach LOS	A	A	A

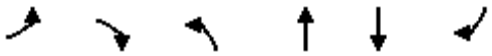
Intersection Summary			
Delay	9.2		
HCM Level of Service	A		
Intersection Capacity Utilization	44.4%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	70	137	123	92	57	77
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	76	149	134	100	62	84
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	471	104	146			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	471	104	146			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	85	84	91			
cM capacity (veh/h)	500	951	1436			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	225	234	146
Volume Left	76	134	0
Volume Right	149	0	84
cSH	729	1436	1700
Volume to Capacity	0.31	0.09	0.09
Queue Length 95th (ft)	33	8	0
Control Delay (s)	12.1	4.8	0.0
Lane LOS	B	A	
Approach Delay (s)	12.1	4.8	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	6.4		
Intersection Capacity Utilization	43.4%	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)	107	29	30	132	105	114
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	116	32	33	143	114	124
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	385	176	238			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	385	176	238			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	81	96	98			
cM capacity (veh/h)	603	867	1329			

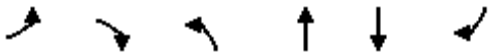
Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	148	176	238
Volume Left	116	33	0
Volume Right	32	0	124
cSH	645	1329	1700
Volume to Capacity	0.23	0.02	0.14
Queue Length 95th (ft)	22	2	0
Control Delay (s)	12.2	1.6	0.0
Lane LOS	B	A	
Approach Delay (s)	12.2	1.6	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	3.7		
Intersection Capacity Utilization	40.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Volume (veh/h)	219	103	206	412	97	180
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	238	112	224	448	105	196
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			350		1190	175
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			350		1190	175
tC, single (s)			4.1		6.8	6.9
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			81		28	77
cM capacity (veh/h)			1206		147	838

Direction, Lane #	EB 1	EB 2	WB 1	NB 1
Volume Total	159	191	672	301
Volume Left	0	0	224	105
Volume Right	0	112	0	196
cSH	1700	1700	1206	317
Volume to Capacity	0.09	0.11	0.19	0.95
Queue Length 95th (ft)	0	0	17	242
Control Delay (s)	0.0	0.0	4.3	75.9
Lane LOS			A	F
Approach Delay (s)	0.0		4.3	75.9
Approach LOS				F

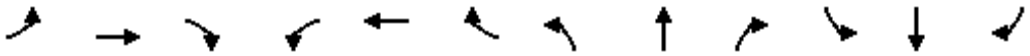
Intersection Summary			
Average Delay	19.5		
Intersection Capacity Utilization	72.1%	ICU Level of Service	C
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	41	5	5	236	291	17
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	45	5	5	257	316	18
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	593	326	335			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	593	326	335			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	90	99	100			
cM capacity (veh/h)	466	716	1225			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	50	262	335
Volume Left	45	5	0
Volume Right	5	0	18
cSH	485	1225	1700
Volume to Capacity	0.10	0.00	0.20
Queue Length 95th (ft)	9	0	0
Control Delay (s)	13.3	0.2	0.0
Lane LOS	B	A	
Approach Delay (s)	13.3	0.2	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	1.1		
Intersection Capacity Utilization	27.3%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Volume (vph)	355	240	64	31	166	20	48	7	25	25	7	320
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	386	261	70	34	180	22	52	8	27	27	8	348

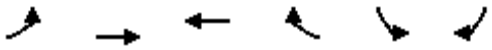
Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total (vph)	716	236	87	383
Volume Left (vph)	386	34	52	27
Volume Right (vph)	70	22	27	348
Hadj (s)	0.08	0.01	-0.03	-0.50
Departure Headway (s)	6.1	6.6	7.4	6.1
Degree Utilization, x	1.21	0.43	0.18	0.65
Capacity (veh/h)	587	507	431	571
Control Delay (s)	130.5	14.7	12.1	19.8
Approach Delay (s)	130.5	14.7	12.1	19.8
Approach LOS	F	B	B	C

Intersection Summary			
Delay	74.2		
HCM Level of Service	F		
Intersection Capacity Utilization	83.0%	ICU Level of Service	E
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Volume (veh/h)	20	75	6	234	61	241	9	535	288	294	886	75
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	22	82	7	254	66	262	10	582	313	320	963	82
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	2208	2516	482	1769	2285	291	1045			895		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2208	2516	482	1769	2285	291	1045			895		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	0	0	99	0	0	63	99			58		
cM capacity (veh/h)	0	16	531	0	22	706	662			754		

Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	NB 3	NB 4	SB 1	SB 2	SB 3	SB 4
Volume Total	103	7	321	262	10	291	291	313	320	482	482	82
Volume Left	22	0	254	0	10	0	0	0	320	0	0	0
Volume Right	0	7	0	262	0	0	0	313	0	0	0	82
cSH	0	531	0	706	662	1700	1700	1700	754	1700	1700	1700
Volume to Capacity	Err	0.01	Err	0.37	0.01	0.17	0.17	0.18	0.42	0.28	0.28	0.05
Queue Length 95th (ft)	Err	1	Err	43	1	0	0	0	53	0	0	0
Control Delay (s)	Err	11.9	Err	13.1	10.5	0.0	0.0	0.0	13.2	0.0	0.0	0.0
Lane LOS	F	B	F	B	B				B			
Approach Delay (s)	Err		Err		0.1				3.1			
Approach LOS	F		F									

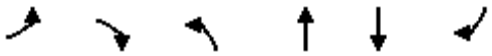
Intersection Summary				
Average Delay		Err		
Intersection Capacity Utilization	66.5%	ICU Level of Service	C	
Analysis Period (min)	15			



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Stop	Stop		Stop	
Volume (vph)	163	127	74	41	66	143
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	177	138	80	45	72	155

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total (vph)	315	125	227
Volume Left (vph)	177	0	72
Volume Right (vph)	0	45	155
Hadj (s)	0.15	-0.18	-0.31
Departure Headway (s)	4.8	4.7	4.6
Degree Utilization, x	0.42	0.16	0.29
Capacity (veh/h)	720	717	721
Control Delay (s)	11.2	8.6	9.6
Approach Delay (s)	11.2	8.6	9.6
Approach LOS	B	A	A

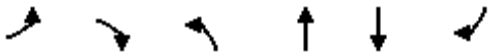
Intersection Summary			
Delay	10.1		
HCM Level of Service	B		
Intersection Capacity Utilization	43.1%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	58	99	130	74	110	64
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	63	108	141	80	120	70
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	517	154	189			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	517	154	189			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	86	88	90			
cM capacity (veh/h)	465	892	1385			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	171	222	189
Volume Left	63	141	0
Volume Right	108	0	70
cSH	666	1385	1700
Volume to Capacity	0.26	0.10	0.11
Queue Length 95th (ft)	25	9	0
Control Delay (s)	12.3	5.3	0.0
Lane LOS	B	A	
Approach Delay (s)	12.3	5.3	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	5.6		
Intersection Capacity Utilization	41.8%	ICU Level of Service	A
Analysis Period (min)	15		



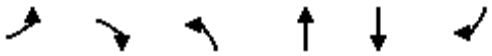
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	144	37	35	97	137	159
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	157	40	38	105	149	173
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	417	235	322			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	417	235	322			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	73	95	97			
cM capacity (veh/h)	574	804	1238			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	197	143	322
Volume Left	157	38	0
Volume Right	40	0	173
cSH	610	1238	1700
Volume to Capacity	0.32	0.03	0.19
Queue Length 95th (ft)	35	2	0
Control Delay (s)	13.7	2.3	0.0
Lane LOS	B	A	
Approach Delay (s)	13.7	2.3	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	4.6		
Intersection Capacity Utilization	46.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Total Lost time (s)	4.0		4.0	4.0	4.0	4.0
Lane Util. Factor	0.95		1.00	1.00	1.00	1.00
Frt	0.96		1.00	1.00	1.00	0.85
Flt Protected	1.00		0.95	1.00	0.95	1.00
Satd. Flow (prot)	3210		1676	1765	1676	1500
Flt Permitted	1.00		0.95	1.00	0.95	1.00
Satd. Flow (perm)	3210		1676	1765	1676	1500
Volume (vph)	242	96	172	166	80	163
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	263	104	187	180	87	177
RTOR Reduction (vph)	85	0	0	0	0	123
Lane Group Flow (vph)	282	0	187	180	87	54
Turn Type			Prot			Perm
Protected Phases	4		3	8	2	
Permitted Phases						2
Actuated Green, G (s)	6.7		7.0	17.7	11.3	11.3
Effective Green, g (s)	6.7		7.0	17.7	11.3	11.3
Actuated g/C Ratio	0.18		0.19	0.48	0.31	0.31
Clearance Time (s)	4.0		4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	581		317	844	512	458
v/s Ratio Prot	c0.09		c0.11	0.10	c0.05	
v/s Ratio Perm						0.04
v/c Ratio	0.49		0.59	0.21	0.17	0.12
Uniform Delay, d1	13.6		13.7	5.6	9.4	9.3
Progression Factor	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2	0.6		2.8	0.1	0.2	0.1
Delay (s)	14.2		16.5	5.7	9.6	9.4
Level of Service	B		B	A	A	A
Approach Delay (s)	14.2			11.2	9.4	
Approach LOS	B			B	A	

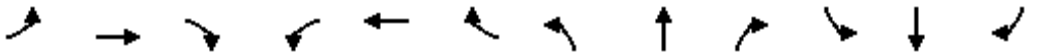
Intersection Summary			
HCM Average Control Delay	11.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.37		
Actuated Cycle Length (s)	37.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	35.0%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	8	7	4	235	212	56
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	9	8	4	255	230	61
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	525	261	291			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	525	261	291			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	98	99	100			
cM capacity (veh/h)	511	778	1270			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	16	260	291
Volume Left	9	4	0
Volume Right	8	0	61
cSH	609	1270	1700
Volume to Capacity	0.03	0.00	0.17
Queue Length 95th (ft)	2	0	0
Control Delay (s)	11.1	0.2	0.0
Lane LOS	B	A	
Approach Delay (s)	11.1	0.2	0.0
Approach LOS	B		

Intersection Summary			
Average Delay		0.4	
Intersection Capacity Utilization		26.4%	ICU Level of Service A
Analysis Period (min)		15	

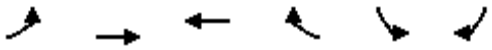


Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0			4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00			1.00	1.00
Frt	1.00	1.00	0.85	1.00	0.99		1.00	0.88			1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00			0.98	1.00
Satd. Flow (prot)	1676	1765	1500	1676	1744		1676	1553			1731	1500
Flt Permitted	0.35	1.00	1.00	0.65	1.00		0.75	1.00			0.93	1.00
Satd. Flow (perm)	618	1765	1500	1139	1744		1316	1553			1635	1500
Volume (vph)	255	163	63	34	236	20	61	8	33	6	10	237
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	277	177	68	37	257	22	66	9	36	7	11	258
RTOR Reduction (vph)	0	0	36	0	7	0	0	25	0	0	0	177
Lane Group Flow (vph)	277	177	32	37	272	0	66	20	0	0	18	81
Turn Type	pm+pt		Perm	Perm			Perm			Perm		Perm
Protected Phases	7	4			8			2			6	
Permitted Phases	4		4	8			2			6		6
Actuated Green, G (s)	17.0	17.0	17.0	8.6	8.6		11.4	11.4			11.4	11.4
Effective Green, g (s)	17.0	17.0	17.0	8.6	8.6		11.4	11.4			11.4	11.4
Actuated g/C Ratio	0.47	0.47	0.47	0.24	0.24		0.31	0.31			0.31	0.31
Clearance Time (s)	4.0	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	3.0
Lane Grp Cap (vph)	417	824	701	269	412		412	486			512	470
v/s Ratio Prot	c0.08	0.10			0.16			0.01				
v/s Ratio Perm	c0.23		0.02	0.03			0.05				0.01	c0.05
v/c Ratio	0.66	0.21	0.05	0.14	0.66		0.16	0.04			0.04	0.17
Uniform Delay, d1	6.7	5.7	5.3	11.0	12.6		9.0	8.7			8.7	9.1
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00			1.00	1.00
Incremental Delay, d2	4.0	0.1	0.0	0.2	3.9		0.2	0.0			0.0	0.2
Delay (s)	10.6	5.9	5.3	11.2	16.5		9.2	8.7			8.7	9.2
Level of Service	B	A	A	B	B		A	A			A	A
Approach Delay (s)		8.3			15.9			9.0			9.2	
Approach LOS		A			B			A			A	

Intersection Summary			
HCM Average Control Delay	10.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.44		
Actuated Cycle Length (s)	36.4	Sum of lost time (s)	8.0
Intersection Capacity Utilization	49.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
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
Lane Util. Factor	1.00	1.00		0.97	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	0.97		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1676	1708		3252	1765	1500	1676	3353	1500	1676	3353	1500
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1676	1708		3252	1765	1500	1676	3353	1500	1676	3353	1500
Volume (vph)	103	54	15	235	61	238	1	509	211	216	378	20
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	112	59	16	255	66	259	1	553	229	235	411	22
RTOR Reduction (vph)	0	15	0	0	0	209	0	0	202	0	0	20
Lane Group Flow (vph)	112	60	0	255	66	50	1	553	27	235	411	2
Turn Type	Prot			Prot		Over	Prot		Over	Prot		Over
Protected Phases	7	4		3	8	1	5	2	3	1	6	7
Permitted Phases												
Actuated Green, G (s)	5.8	4.5		6.3	5.0	10.2	0.7	16.3	6.3	10.2	25.8	5.8
Effective Green, g (s)	5.8	4.5		6.3	5.0	10.2	0.7	16.3	6.3	10.2	25.8	5.8
Actuated g/C Ratio	0.11	0.08		0.12	0.09	0.19	0.01	0.31	0.12	0.19	0.48	0.11
Clearance Time (s)	4.0	4.0		4.0	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	3.0	3.0	3.0
Lane Grp Cap (vph)	182	144		384	166	287	22	1025	177	321	1623	163
v/s Ratio Prot	0.07	0.04		c0.08	c0.04	0.03	0.00	c0.16	0.02	c0.14	0.12	0.00
v/s Ratio Perm												
v/c Ratio	0.62	0.42		0.66	0.40	0.17	0.05	0.54	0.15	0.73	0.25	0.01
Uniform Delay, d1	22.7	23.2		22.5	22.7	18.0	26.0	15.4	21.1	20.3	8.1	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
Incremental Delay, d2	6.1	2.0		4.3	1.6	0.3	0.9	0.5	0.4	8.3	0.1	0.0
Delay (s)	28.7	25.1		26.8	24.3	18.3	26.8	15.9	21.5	28.6	8.2	21.2
Level of Service	C	C		C	C	B	C	B	C	C	A	C
Approach Delay (s)		27.3			22.7			17.6			15.8	
Approach LOS		C			C			B			B	

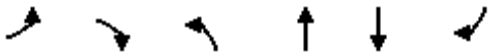
Intersection Summary			
HCM Average Control Delay	19.2	HCM Level of Service	B
HCM Volume to Capacity ratio	0.54		
Actuated Cycle Length (s)	53.3	Sum of lost time (s)	12.0
Intersection Capacity Utilization	51.2%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Stop	Stop		Stop	
Volume (vph)	154	48	113	61	17	177
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	167	52	123	66	18	192

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total (vph)	220	189	211
Volume Left (vph)	167	0	18
Volume Right (vph)	0	66	192
Hadj (s)	0.19	-0.18	-0.50
Departure Headway (s)	4.8	4.5	4.4
Degree Utilization, x	0.29	0.24	0.26
Capacity (veh/h)	709	755	765
Control Delay (s)	9.8	8.9	8.9
Approach Delay (s)	9.8	8.9	8.9
Approach LOS	A	A	A

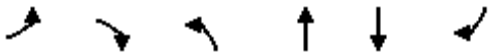
Intersection Summary			
Delay	9.2		
HCM Level of Service	A		
Intersection Capacity Utilization	44.4%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	70	137	123	92	57	77
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	76	149	134	100	62	84
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	471	104	146			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	471	104	146			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	85	84	91			
cM capacity (veh/h)	500	951	1436			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	225	234	146
Volume Left	76	134	0
Volume Right	149	0	84
cSH	729	1436	1700
Volume to Capacity	0.31	0.09	0.09
Queue Length 95th (ft)	33	8	0
Control Delay (s)	12.1	4.8	0.0
Lane LOS	B	A	
Approach Delay (s)	12.1	4.8	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	6.4		
Intersection Capacity Utilization	43.4%	ICU Level of Service	A
Analysis Period (min)	15		



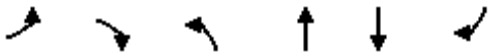
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	107	29	30	132	105	114
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	116	32	33	143	114	124
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	385	176	238			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	385	176	238			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	81	96	98			
cM capacity (veh/h)	603	867	1329			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	148	176	238
Volume Left	116	33	0
Volume Right	32	0	124
cSH	645	1329	1700
Volume to Capacity	0.23	0.02	0.14
Queue Length 95th (ft)	22	2	0
Control Delay (s)	12.2	1.6	0.0
Lane LOS	B	A	
Approach Delay (s)	12.2	1.6	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	3.7		
Intersection Capacity Utilization	40.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Total Lost time (s)	4.0		4.0	4.0	4.0	4.0
Lane Util. Factor	0.95		1.00	1.00	1.00	1.00
Frt	0.95		1.00	1.00	1.00	0.85
Flt Protected	1.00		0.95	1.00	0.95	1.00
Satd. Flow (prot)	3192		1676	1765	1676	1500
Flt Permitted	1.00		0.95	1.00	0.95	1.00
Satd. Flow (perm)	3192		1676	1765	1676	1500
Volume (vph)	219	103	206	412	97	180
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	238	112	224	448	105	196
RTOR Reduction (vph)	84	0	0	0	0	153
Lane Group Flow (vph)	266	0	224	448	105	43
Turn Type			Prot			Perm
Protected Phases	4		3	8	2	
Permitted Phases						2
Actuated Green, G (s)	9.1		7.5	20.6	8.1	8.1
Effective Green, g (s)	9.1		7.5	20.6	8.1	8.1
Actuated g/C Ratio	0.25		0.20	0.56	0.22	0.22
Clearance Time (s)	4.0		4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	791		343	991	370	331
v/s Ratio Prot	0.08		c0.13	c0.25	c0.06	
v/s Ratio Perm						0.03
v/c Ratio	0.34		0.65	0.45	0.28	0.13
Uniform Delay, d1	11.3		13.4	4.7	11.9	11.5
Progression Factor	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2	0.3		4.4	0.3	0.4	0.2
Delay (s)	11.6		17.8	5.1	12.3	11.7
Level of Service	B		B	A	B	B
Approach Delay (s)	11.6			9.3	11.9	
Approach LOS	B			A	B	

Intersection Summary			
HCM Average Control Delay	10.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	36.7	Sum of lost time (s)	8.0
Intersection Capacity Utilization	37.6%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	41	5	5	236	291	17
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	45	5	5	257	316	18
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	593	326	335			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	593	326	335			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	90	99	100			
cM capacity (veh/h)	466	716	1225			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	50	262	335
Volume Left	45	5	0
Volume Right	5	0	18
cSH	485	1225	1700
Volume to Capacity	0.10	0.00	0.20
Queue Length 95th (ft)	9	0	0
Control Delay (s)	13.3	0.2	0.0
Lane LOS	B	A	
Approach Delay (s)	13.3	0.2	0.0
Approach LOS	B		

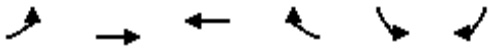
Intersection Summary			
Average Delay	1.1		
Intersection Capacity Utilization	27.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0			4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00			1.00	1.00
Frt	1.00	1.00	0.85	1.00	0.98		1.00	0.88			1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00			0.96	1.00
Satd. Flow (prot)	1676	1765	1500	1676	1736		1676	1561			1699	1500
Flt Permitted	0.41	1.00	1.00	0.60	1.00		0.73	1.00			0.83	1.00
Satd. Flow (perm)	726	1765	1500	1055	1736		1296	1561			1470	1500
Volume (vph)	355	240	64	31	166	20	48	7	25	25	7	320
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	386	261	70	34	180	22	52	8	27	27	8	348
RTOR Reduction (vph)	0	0	35	0	9	0	0	19	0	0	0	244
Lane Group Flow (vph)	386	261	35	34	193	0	52	16	0	0	35	104
Turn Type	pm+pt		Perm	Perm			Perm			Perm		Perm
Protected Phases	7	4			8			2			6	
Permitted Phases	4		4	8			2			6		6
Actuated Green, G (s)	19.3	19.3	19.3	7.5	7.5		11.6	11.6			11.6	11.6
Effective Green, g (s)	19.3	19.3	19.3	7.5	7.5		11.6	11.6			11.6	11.6
Actuated g/C Ratio	0.50	0.50	0.50	0.19	0.19		0.30	0.30			0.30	0.30
Clearance Time (s)	4.0	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	3.0
Lane Grp Cap (vph)	551	876	744	203	335		386	465			438	447
v/s Ratio Prot	c0.14	0.15			0.11			0.01				
v/s Ratio Perm	c0.21		0.02	0.03			0.04				0.02	c0.07
v/c Ratio	0.70	0.30	0.05	0.17	0.58		0.13	0.03			0.08	0.23
Uniform Delay, d1	6.7	5.8	5.1	13.1	14.3		10.0	9.7			9.8	10.3
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00			1.00	1.00
Incremental Delay, d2	4.0	0.2	0.0	0.4	2.4		0.2	0.0			0.1	0.3
Delay (s)	10.7	6.0	5.1	13.5	16.7		10.1	9.7			9.9	10.6
Level of Service	B	A	A	B	B		B	A			A	B
Approach Delay (s)		8.5			16.2			10.0			10.5	
Approach LOS		A			B			A			B	

Intersection Summary			
HCM Average Control Delay	10.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	38.9	Sum of lost time (s)	8.0
Intersection Capacity Utilization	50.7%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
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
Lane Util. Factor	1.00	1.00		0.97	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1676	1744		3252	1765	1500	1676	3353	1500	1676	3353	1500
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1676	1744		3252	1765	1500	1676	3353	1500	1676	3353	1500
Volume (vph)	20	75	6	234	61	241	9	535	288	294	886	75
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	22	82	7	254	66	262	10	582	313	320	963	82
RTOR Reduction (vph)	0	5	0	0	0	203	0	0	281	0	0	41
Lane Group Flow (vph)	22	84	0	254	66	59	10	582	32	320	963	41
Turn Type	Prot			Prot		Over	Prot		Over	Prot		Perm
Protected Phases	7	4		3	8	1	5	2	3	1	6	
Permitted Phases												6
Actuated Green, G (s)	1.4	8.1		6.3	13.0	14.1	0.7	17.6	6.3	14.1	31.0	31.0
Effective Green, g (s)	1.4	8.1		6.3	13.0	14.1	0.7	17.6	6.3	14.1	31.0	31.0
Actuated g/C Ratio	0.02	0.13		0.10	0.21	0.23	0.01	0.28	0.10	0.23	0.50	0.50
Clearance Time (s)	4.0	4.0		4.0	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	3.0	3.0	3.0
Lane Grp Cap (vph)	38	227		330	369	341	19	950	152	381	1674	749
v/s Ratio Prot	0.01	c0.05		c0.08	0.04	0.04	0.01	0.17	0.02	c0.19	c0.29	
v/s Ratio Perm												0.03
v/c Ratio	0.58	0.37		0.77	0.18	0.17	0.53	0.61	0.21	0.84	0.58	0.05
Uniform Delay, d1	30.1	24.7		27.2	20.2	19.3	30.5	19.3	25.6	22.9	10.9	8.0
Progression Factor	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	19.6	1.0		10.3	0.2	0.2	23.9	1.2	0.7	14.9	0.5	0.0
Delay (s)	49.7	25.7		37.5	20.4	19.6	54.4	20.5	26.3	37.9	11.4	8.0
Level of Service	D	C		D	C	B	D	C	C	D	B	A
Approach Delay (s)		30.4			27.5			22.9			17.4	
Approach LOS		C			C			C			B	

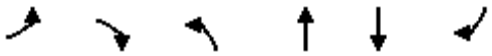
Intersection Summary			
HCM Average Control Delay	21.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	62.1	Sum of lost time (s)	12.0
Intersection Capacity Utilization	56.5%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Stop	Stop		Stop	
Volume (vph)	163	127	74	41	66	143
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	177	138	80	45	72	155

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total (vph)	315	125	227
Volume Left (vph)	177	0	72
Volume Right (vph)	0	45	155
Hadj (s)	0.15	-0.18	-0.31
Departure Headway (s)	4.8	4.7	4.6
Degree Utilization, x	0.42	0.16	0.29
Capacity (veh/h)	720	717	721
Control Delay (s)	11.2	8.6	9.6
Approach Delay (s)	11.2	8.6	9.6
Approach LOS	B	A	A

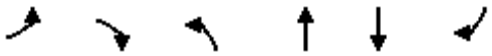
Intersection Summary			
Delay	10.1		
HCM Level of Service	B		
Intersection Capacity Utilization	43.1%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	58	99	130	74	110	64
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	63	108	141	80	120	70
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	517	154	189			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	517	154	189			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	86	88	90			
cM capacity (veh/h)	465	892	1385			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	171	222	189
Volume Left	63	141	0
Volume Right	108	0	70
cSH	666	1385	1700
Volume to Capacity	0.26	0.10	0.11
Queue Length 95th (ft)	25	9	0
Control Delay (s)	12.3	5.3	0.0
Lane LOS	B	A	
Approach Delay (s)	12.3	5.3	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	5.6		
Intersection Capacity Utilization	41.8%	ICU Level of Service	A
Analysis Period (min)	15		



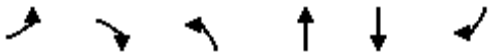
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	144	37	35	97	137	159
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	157	40	38	105	149	173
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	417	235	322			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	417	235	322			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	73	95	97			
cM capacity (veh/h)	574	804	1238			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	197	143	322
Volume Left	157	38	0
Volume Right	40	0	173
cSH	610	1238	1700
Volume to Capacity	0.32	0.03	0.19
Queue Length 95th (ft)	35	2	0
Control Delay (s)	13.7	2.3	0.0
Lane LOS	B	A	
Approach Delay (s)	13.7	2.3	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	4.6		
Intersection Capacity Utilization	46.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Total Lost time (s)	4.0		4.0	4.0	4.0	4.0
Lane Util. Factor	0.95		1.00	1.00	1.00	1.00
Frt	0.97		1.00	1.00	1.00	0.85
Flt Protected	1.00		0.95	1.00	0.95	1.00
Satd. Flow (prot)	3239		1676	1765	1676	1500
Flt Permitted	1.00		0.95	1.00	0.95	1.00
Satd. Flow (perm)	3239		1676	1765	1676	1500
Volume (vph)	326	96	172	223	80	163
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	354	104	187	242	87	177
RTOR Reduction (vph)	51	0	0	0	0	139
Lane Group Flow (vph)	407	0	187	242	87	38
Turn Type			Prot			Perm
Protected Phases	4		3	8	2	
Permitted Phases						2
Actuated Green, G (s)	10.3		7.0	21.3	7.9	7.9
Effective Green, g (s)	10.3		7.0	21.3	7.9	7.9
Actuated g/C Ratio	0.28		0.19	0.57	0.21	0.21
Clearance Time (s)	4.0		4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	897		315	1011	356	319
v/s Ratio Prot	c0.13		c0.11	0.14	c0.05	
v/s Ratio Perm						0.03
v/c Ratio	0.45		0.59	0.24	0.24	0.12
Uniform Delay, d1	11.1		13.8	3.9	12.2	11.8
Progression Factor	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2	0.4		3.0	0.1	0.4	0.2
Delay (s)	11.5		16.8	4.1	12.5	12.0
Level of Service	B		B	A	B	B
Approach Delay (s)	11.5			9.6	12.2	
Approach LOS	B			A	B	

Intersection Summary			
HCM Average Control Delay	10.9	HCM Level of Service	B
HCM Volume to Capacity ratio	0.43		
Actuated Cycle Length (s)	37.2	Sum of lost time (s)	12.0
Intersection Capacity Utilization	37.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	8	7	4	235	212	56
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	9	8	4	255	230	61
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	525	261	291			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	525	261	291			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	98	99	100			
cM capacity (veh/h)	511	778	1270			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	16	260	291
Volume Left	9	4	0
Volume Right	8	0	61
cSH	609	1270	1700
Volume to Capacity	0.03	0.00	0.17
Queue Length 95th (ft)	2	0	0
Control Delay (s)	11.1	0.2	0.0
Lane LOS	B	A	
Approach Delay (s)	11.1	0.2	0.0
Approach LOS	B		

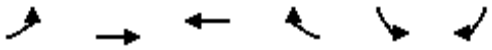
Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	26.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0			4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00			1.00	1.00
Frt	1.00	1.00	0.85	1.00	0.99		1.00	0.88			1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00			0.98	1.00
Satd. Flow (prot)	1676	1765	1500	1676	1744		1676	1553			1731	1500
Flt Permitted	0.35	1.00	1.00	0.65	1.00		0.75	1.00			0.93	1.00
Satd. Flow (perm)	618	1765	1500	1139	1744		1316	1553			1635	1500
Volume (vph)	255	163	63	34	236	20	61	8	33	6	10	237
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	277	177	68	37	257	22	66	9	36	7	11	258
RTOR Reduction (vph)	0	0	36	0	7	0	0	25	0	0	0	177
Lane Group Flow (vph)	277	177	32	37	272	0	66	20	0	0	18	81
Turn Type	pm+pt		Perm	Perm			Perm			Perm		Perm
Protected Phases	7	4			8			2			6	
Permitted Phases	4		4	8			2			6		6
Actuated Green, G (s)	17.0	17.0	17.0	8.6	8.6		11.4	11.4			11.4	11.4
Effective Green, g (s)	17.0	17.0	17.0	8.6	8.6		11.4	11.4			11.4	11.4
Actuated g/C Ratio	0.47	0.47	0.47	0.24	0.24		0.31	0.31			0.31	0.31
Clearance Time (s)	4.0	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	3.0
Lane Grp Cap (vph)	417	824	701	269	412		412	486			512	470
v/s Ratio Prot	c0.08	0.10			0.16			0.01				
v/s Ratio Perm	c0.23		0.02	0.03			0.05				0.01	c0.05
v/c Ratio	0.66	0.21	0.05	0.14	0.66		0.16	0.04			0.04	0.17
Uniform Delay, d1	6.7	5.7	5.3	11.0	12.6		9.0	8.7			8.7	9.1
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00			1.00	1.00
Incremental Delay, d2	4.0	0.1	0.0	0.2	3.9		0.2	0.0			0.0	0.2
Delay (s)	10.6	5.9	5.3	11.2	16.5		9.2	8.7			8.7	9.2
Level of Service	B	A	A	B	B		A	A			A	A
Approach Delay (s)		8.3			15.9			9.0			9.2	
Approach LOS		A			B			A			A	

Intersection Summary			
HCM Average Control Delay	10.5	HCM Level of Service	B
HCM Volume to Capacity ratio	0.44		
Actuated Cycle Length (s)	36.4	Sum of lost time (s)	8.0
Intersection Capacity Utilization	49.5%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
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
Lane Util. Factor	1.00	1.00		0.97	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	0.96		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1676	1693		3252	1765	1500	1676	3353	1500	1676	3353	1500
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1676	1693		3252	1765	1500	1676	3353	1500	1676	3353	1500
Volume (vph)	139	54	20	235	61	238	1	685	211	216	509	27
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	151	59	22	255	66	259	1	745	229	235	553	29
RTOR Reduction (vph)	0	20	0	0	0	210	0	0	198	0	0	26
Lane Group Flow (vph)	151	61	0	255	66	49	1	745	31	235	553	3
Turn Type	Prot			Prot		Over	Prot		Over	Prot		Over
Protected Phases	7	4		3	8	1	5	2	3	1	6	7
Permitted Phases												
Actuated Green, G (s)	6.0	4.7		7.9	6.6	11.1	0.7	19.4	7.9	11.1	29.8	6.0
Effective Green, g (s)	6.0	4.7		7.9	6.6	11.1	0.7	19.4	7.9	11.1	29.8	6.0
Actuated g/C Ratio	0.10	0.08		0.13	0.11	0.19	0.01	0.33	0.13	0.19	0.50	0.10
Clearance Time (s)	4.0	4.0		4.0	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	3.0	3.0	3.0
Lane Grp Cap (vph)	170	135		435	197	282	20	1101	201	315	1691	152
v/s Ratio Prot	c0.09	0.04		0.08	c0.04	0.03	0.00	c0.22	0.02	c0.14	0.16	0.00
v/s Ratio Perm												
v/c Ratio	0.89	0.45		0.59	0.34	0.17	0.05	0.68	0.15	0.75	0.33	0.02
Uniform Delay, d1	26.2	26.0		24.1	24.2	20.1	28.9	17.1	22.6	22.7	8.7	23.9
Progression Factor	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	38.5	2.4		2.0	1.0	0.3	1.0	1.7	0.4	9.3	0.1	0.1
Delay (s)	64.7	28.3		26.1	25.2	20.4	29.9	18.8	23.0	31.9	8.8	24.0
Level of Service	E	C		C	C	C	C	B	C	C	A	C
Approach Delay (s)		52.0			23.5			19.8			16.0	
Approach LOS		D			C			B			B	

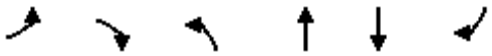
Intersection Summary			
HCM Average Control Delay	22.3	HCM Level of Service	C
HCM Volume to Capacity ratio	0.61		
Actuated Cycle Length (s)	59.1	Sum of lost time (s)	12.0
Intersection Capacity Utilization	57.4%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Stop	Stop		Stop	
Volume (vph)	154	48	113	61	17	177
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	167	52	123	66	18	192

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total (vph)	220	189	211
Volume Left (vph)	167	0	18
Volume Right (vph)	0	66	192
Hadj (s)	0.19	-0.18	-0.50
Departure Headway (s)	4.8	4.5	4.4
Degree Utilization, x	0.29	0.24	0.26
Capacity (veh/h)	709	755	765
Control Delay (s)	9.8	8.9	8.9
Approach Delay (s)	9.8	8.9	8.9
Approach LOS	A	A	A

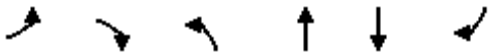
Intersection Summary			
Delay	9.2		
HCM Level of Service	A		
Intersection Capacity Utilization	44.4%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	70	137	123	92	57	77
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	76	149	134	100	62	84
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	471	104	146			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	471	104	146			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	85	84	91			
cM capacity (veh/h)	500	951	1436			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	225	234	146
Volume Left	76	134	0
Volume Right	149	0	84
cSH	729	1436	1700
Volume to Capacity	0.31	0.09	0.09
Queue Length 95th (ft)	33	8	0
Control Delay (s)	12.1	4.8	0.0
Lane LOS	B	A	
Approach Delay (s)	12.1	4.8	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	6.4		
Intersection Capacity Utilization	43.4%	ICU Level of Service	A
Analysis Period (min)	15		



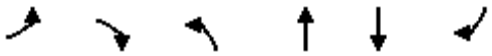
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	107	29	30	132	105	114
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	116	32	33	143	114	124
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	385	176	238			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	385	176	238			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	81	96	98			
cM capacity (veh/h)	603	867	1329			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	148	176	238
Volume Left	116	33	0
Volume Right	32	0	124
cSH	645	1329	1700
Volume to Capacity	0.23	0.02	0.14
Queue Length 95th (ft)	22	2	0
Control Delay (s)	12.2	1.6	0.0
Lane LOS	B	A	
Approach Delay (s)	12.2	1.6	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	3.7		
Intersection Capacity Utilization	40.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800
Total Lost time (s)	4.0		4.0	4.0	4.0	4.0
Lane Util. Factor	0.95		1.00	1.00	1.00	1.00
Frt	0.96		1.00	1.00	1.00	0.85
Flt Protected	1.00		0.95	1.00	0.95	1.00
Satd. Flow (prot)	3223		1676	1765	1676	1500
Flt Permitted	1.00		0.95	1.00	0.95	1.00
Satd. Flow (perm)	3223		1676	1765	1676	1500
Volume (vph)	295	103	206	554	97	180
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	321	112	224	602	105	196
RTOR Reduction (vph)	64	0	0	0	0	155
Lane Group Flow (vph)	369	0	224	602	105	41
Turn Type			Prot			Perm
Protected Phases	4		3	8	2	
Permitted Phases						2
Actuated Green, G (s)	10.8		7.6	22.4	8.1	8.1
Effective Green, g (s)	10.8		7.6	22.4	8.1	8.1
Actuated g/C Ratio	0.28		0.20	0.58	0.21	0.21
Clearance Time (s)	4.0		4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0		3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	904		331	1027	353	316
v/s Ratio Prot	0.11		0.13	c0.34	c0.06	
v/s Ratio Perm						0.03
v/c Ratio	0.41		0.68	0.59	0.30	0.13
Uniform Delay, d1	11.3		14.3	5.1	12.8	12.3
Progression Factor	1.00		1.00	1.00	1.00	1.00
Incremental Delay, d2	0.3		5.4	0.9	0.5	0.2
Delay (s)	11.6		19.7	6.0	13.3	12.5
Level of Service	B		B	A	B	B
Approach Delay (s)	11.6			9.7	12.8	
Approach LOS	B			A	B	

Intersection Summary			
HCM Average Control Delay	10.8	HCM Level of Service	B
HCM Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	38.5	Sum of lost time (s)	8.0
Intersection Capacity Utilization	43.1%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	41	5	5	236	291	17
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	45	5	5	257	316	18
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	593	326	335			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	593	326	335			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	90	99	100			
cM capacity (veh/h)	466	716	1225			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	50	262	335
Volume Left	45	5	0
Volume Right	5	0	18
cSH	485	1225	1700
Volume to Capacity	0.10	0.00	0.20
Queue Length 95th (ft)	9	0	0
Control Delay (s)	13.3	0.2	0.0
Lane LOS	B	A	
Approach Delay (s)	13.3	0.2	0.0
Approach LOS	B		

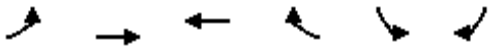
Intersection Summary			
Average Delay	1.1		
Intersection Capacity Utilization	27.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0		4.0	4.0			4.0	4.0
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00			1.00	1.00
Frt	1.00	1.00	0.85	1.00	0.98		1.00	0.88			1.00	0.85
Flt Protected	0.95	1.00	1.00	0.95	1.00		0.95	1.00			0.96	1.00
Satd. Flow (prot)	1676	1765	1500	1676	1736		1676	1561			1699	1500
Flt Permitted	0.41	1.00	1.00	0.60	1.00		0.73	1.00			0.83	1.00
Satd. Flow (perm)	726	1765	1500	1055	1736		1296	1561			1470	1500
Volume (vph)	355	240	64	31	166	20	48	7	25	25	7	320
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	386	261	70	34	180	22	52	8	27	27	8	348
RTOR Reduction (vph)	0	0	35	0	9	0	0	19	0	0	0	244
Lane Group Flow (vph)	386	261	35	34	193	0	52	16	0	0	35	104
Turn Type	pm+pt		Perm	Perm			Perm			Perm		Perm
Protected Phases	7	4			8			2			6	
Permitted Phases	4		4	8			2			6		6
Actuated Green, G (s)	19.3	19.3	19.3	7.5	7.5		11.6	11.6			11.6	11.6
Effective Green, g (s)	19.3	19.3	19.3	7.5	7.5		11.6	11.6			11.6	11.6
Actuated g/C Ratio	0.50	0.50	0.50	0.19	0.19		0.30	0.30			0.30	0.30
Clearance Time (s)	4.0	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	3.0
Lane Grp Cap (vph)	551	876	744	203	335		386	465			438	447
v/s Ratio Prot	c0.14	0.15			0.11			0.01				
v/s Ratio Perm	c0.21		0.02	0.03			0.04				0.02	c0.07
v/c Ratio	0.70	0.30	0.05	0.17	0.58		0.13	0.03			0.08	0.23
Uniform Delay, d1	6.7	5.8	5.1	13.1	14.3		10.0	9.7			9.8	10.3
Progression Factor	1.00	1.00	1.00	1.00	1.00		1.00	1.00			1.00	1.00
Incremental Delay, d2	4.0	0.2	0.0	0.4	2.4		0.2	0.0			0.1	0.3
Delay (s)	10.7	6.0	5.1	13.5	16.7		10.1	9.7			9.9	10.6
Level of Service	B	A	A	B	B		B	A			A	B
Approach Delay (s)		8.5			16.2			10.0			10.5	
Approach LOS		A			B			A			B	

Intersection Summary			
HCM Average Control Delay	10.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.51		
Actuated Cycle Length (s)	38.9	Sum of lost time (s)	8.0
Intersection Capacity Utilization	50.7%	ICU Level of Service	A
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
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
Lane Util. Factor	1.00	1.00		0.97	1.00	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt	1.00	0.99		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1676	1739		3252	1765	1500	1676	3353	1500	1676	3353	1500
Flt Permitted	0.95	1.00		0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1676	1739		3252	1765	1500	1676	3353	1500	1676	3353	1500
Volume (vph)	27	75	8	234	61	241	12	720	288	294	1192	101
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	29	82	9	254	66	262	13	783	313	320	1296	110
RTOR Reduction (vph)	0	5	0	0	0	203	0	0	280	0	0	51
Lane Group Flow (vph)	29	86	0	254	66	59	13	783	33	320	1296	59
Turn Type	Prot			Prot		Over	Prot		Over	Prot		Perm
Protected Phases	7	4		3	8	1	5	2	3	1	6	
Permitted Phases												6
Actuated Green, G (s)	1.7	8.5		7.5	14.3	16.0	0.7	23.0	7.5	16.0	38.3	38.3
Effective Green, g (s)	1.7	8.5		7.5	14.3	16.0	0.7	23.0	7.5	16.0	38.3	38.3
Actuated g/C Ratio	0.02	0.12		0.11	0.20	0.23	0.01	0.32	0.11	0.23	0.54	0.54
Clearance Time (s)	4.0	4.0		4.0	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	3.0	3.0	3.0
Lane Grp Cap (vph)	40	208		344	355	338	17	1086	158	378	1809	809
v/s Ratio Prot	0.02	c0.05		c0.08	0.04	0.04	0.01	0.23	0.02	c0.19	c0.39	
v/s Ratio Perm												0.04
v/c Ratio	0.72	0.41		0.74	0.19	0.17	0.76	0.72	0.21	0.85	0.72	0.07
Uniform Delay, d1	34.4	28.9		30.8	23.5	22.2	35.1	21.2	29.0	26.3	12.3	7.8
Progression Factor	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	48.4	1.3		8.0	0.3	0.2	106.9	2.4	0.7	15.9	1.4	0.0
Delay (s)	82.8	30.3		38.8	23.8	22.4	141.9	23.6	29.7	42.2	13.7	7.9
Level of Service	F	C		D	C	C	F	C	C	D	B	A
Approach Delay (s)		43.0			29.7			26.7			18.6	
Approach LOS		D			C			C			B	

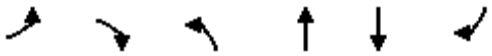
Intersection Summary			
HCM Average Control Delay	23.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	71.0	Sum of lost time (s)	12.0
Intersection Capacity Utilization	61.9%	ICU Level of Service	B
Analysis Period (min)	15		
c Critical Lane Group			



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Sign Control		Stop	Stop		Stop	
Volume (vph)	163	127	74	41	66	143
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	177	138	80	45	72	155

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total (vph)	315	125	227
Volume Left (vph)	177	0	72
Volume Right (vph)	0	45	155
Hadj (s)	0.15	-0.18	-0.31
Departure Headway (s)	4.8	4.7	4.6
Degree Utilization, x	0.42	0.16	0.29
Capacity (veh/h)	720	717	721
Control Delay (s)	11.2	8.6	9.6
Approach Delay (s)	11.2	8.6	9.6
Approach LOS	B	A	A

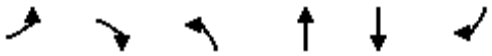
Intersection Summary			
Delay	10.1		
HCM Level of Service	B		
Intersection Capacity Utilization	43.1%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Volume (veh/h)	58	99	130	74	110	64
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	63	108	141	80	120	70
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	517	154	189			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	517	154	189			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	86	88	90			
cM capacity (veh/h)	465	892	1385			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	171	222	189
Volume Left	63	141	0
Volume Right	108	0	70
cSH	666	1385	1700
Volume to Capacity	0.26	0.10	0.11
Queue Length 95th (ft)	25	9	0
Control Delay (s)	12.3	5.3	0.0
Lane LOS	B	A	
Approach Delay (s)	12.3	5.3	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	5.6		
Intersection Capacity Utilization	41.8%	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)	144	37	35	97	137	159
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	157	40	38	105	149	173
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	417	235	322			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	417	235	322			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	73	95	97			
cM capacity (veh/h)	574	804	1238			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	197	143	322
Volume Left	157	38	0
Volume Right	40	0	173
cSH	610	1238	1700
Volume to Capacity	0.32	0.03	0.19
Queue Length 95th (ft)	35	2	0
Control Delay (s)	13.7	2.3	0.0
Lane LOS	B	A	
Approach Delay (s)	13.7	2.3	0.0
Approach LOS	B		

Intersection Summary			
Average Delay	4.6		
Intersection Capacity Utilization	46.1%	ICU Level of Service	A
Analysis Period (min)	15		

Wal-Mart

US 16 / Sammis Trail / Moon Meadows

Draft Traffic Impact Study

(Supplemental Report to the December 23rd 2005 Study to review impacts of the proposed Wal*Mart Supercenter on a connection to Highway 79 via Sammis Trail and Spring Creek Road.)

Rapid City, South Dakota

Prepared for

Wal-Mart Stores, Inc.

At the request of BFA, Inc.

Prepared by
HDR Engineering, Inc.

JANUARY 9, 2006

HDR | ONE COMPANY *Many Solutions*℠

Memo

To: City of Rapid City Planning Staff (Vicki Fischer, Marcia Elkins, and John Less) & SDDOT (Monica Heller)	
From: Jason Kjenstad-HDR	Project: Wal*Mart Study – Rapid City, SD
CC: Joe Feldmann, BFA	
Date: 1-09-2006	Job No: 20494

Traffic Impact Analysis 1-09-06 (Additional information regarding future connection to Highway 79 via Sammis Trail and Spring Creek Road)

Study Objective

The key objective of this supplemental report to the 12-23-05 traffic impact study is to provide landowners east of the proposed Wal*Mart site an idea of the traffic levels that are to be expected in the future based on the roadway classifications with respect to the City of Rapid City future streets plan and due to the proposed Wal*Mart Supercenter.

Background

To prepare for future growth between US 16 and Highway 79, the City has adopted a future streets plan that indicates the location of many proposed roadways that will be required in the future to serve the developments south of Catron Boulevard. Although a complete land use plan has not been created, the roadway classifications were assigned based on spacing criteria that would allow for local, collector, and arterial roadways to properly serve this developing area.

Street Classifications and Anticipated Traffic Volumes

Below are standard characteristics associated with the future roadways located to the south and east of the proposed study area:

Arterials: The posted speed limit is typically 35 mph or higher with anticipated traffic volumes in excess of 15,000 vehicles per day. Arterial streets require a minimum of 100' of Right to Way to allow for a minimum of a 4-lane cross-section to be constructed.

Based on Level of Service "C" criteria supported by most city and state agencies, the following types of roadways will support the traffic volumes as indicated below on a **planning** level:

- 4-lane undivided roadway without turn lanes – 15,400 vehicles per day
- 4-lane undivided roadway with right or left turn lanes – 20,700 vehicles per day
- 4-lane divided roadway with right and left turn lanes – 27,200 vehicles per day

It should be anticipated that arterials located in and around this study area will carry at a minimum 15,000 vehicles per day up to 30,000 vehicles per day.

Collectors: The posted speed limit is typically 30 mph or higher with anticipated traffic volumes in excess of 7,000 vehicles per day. Collector streets require a minimum of 80' of Right of Way to allow for a minimum of a two-lane cross-section to be constructed.

Based on Level of Service "C" criteria, the following types of roadways will support the traffic volumes as indicated below on a **planning** level:

- 2-lane undivided roadway without turn lanes – 6,500 vehicles per day
- 2-lane undivided roadway with right of left turn lanes – 10,300 vehicles per day
- 3-lane undivided roadway with left turn lanes – 11,400 vehicles per day
- 3-lane undivided roadway with right and left turn lanes – 16,300 vehicles per day

It should be anticipated that collector streets located in and around this study area will carry at a minimum 7,000 vehicles per day up to 15,000 vehicles per day.

The above information is valid for ***planning purposes*** only as an operational analysis would be required for final design of any roadway constructed. This is a v/c (volume/capacity) relationship analysis and allows city and state planners to prepare for growth in areas such as this when future land uses and exact roadway locations have not been determined.

The comparisons given above that relate volume to capacity were determined from information collected in Sioux Falls, South Dakota and were analyzed/verified using Synchro and SimTRAFFIC. The original capacity assumptions were given in a previous saturation flow rate study conducted in Sioux Falls. It should be noted that the volume/capacity information determined based on the Sioux Falls study is consistent with what the Highway Capacity Software (HCS) has now adopted based on the Florida Department of Transportations program (LOSPLAN) used to create generalized tables for transportation planning.

Effects of Wal*Mart on Future Roadways east of the Proposed Development (Connection to Highway 79 via Sammis Trail and Spring Creek Road)

The Wal*Mart Superstore including Outlots as shown in Table 2 of the 12-23-05 report will generate roughly 1,500 trips in the P.M. peak hour. Assuming that the P.M. peak hour represents roughly 10% of the Average Daily Traffic (ADT), it was concluded that the Wal*Mart Superstore including Outlots will generate roughly 15,000 trips per day (*ITE Trip Generation Manual* would equate to roughly 14,000 to 15,000 trips per day for a normal weekday so the assumption of 10% is valid).

In discussion with the City of Rapid City and SDDOT staff, it was estimated based on the length of the connection to Highway 79, location of the proposed Wal*Mart Store in regards to future residential growth along and around the study area, proposed surrounding roadway network, and existing land uses that between **10%** to **20%** of the trips generated by Wal*Mart would use a connection to Highway 79. In terms of ADT, this would equate to 1,500 to 3,000 vehicles per day. Understanding that the connection is classified as an arterial roadway, the Wal*Mart Superstore including Outlots would represent approximately 11% ((3,000 trips generated by Wal*Mart/27,200 trips representing daily capacity)*100) of the overall daily capacity of the roadway. If the roadway classification was a collector, the Wal*Mart Superstore including Outlots would represent approximately 18% of the overall daily capacity. This also assumes that Wal*Mart is the destination of every trip using the connection between Wal*Mart and Highway 79 and is not a shared-use trip or a pass-by trip.

It should be noted that the capacity percentages given above were based on Level of Service "C" criteria. LOS "C" has generally been established as the standard for planning of transportation facilities for peak hour traffic conditions. However, LOS "D" is often accepted in urbanized areas as the operational minimum. LOS "D" criteria would indicate that the Wal*Mart Supercenter including Outlots would represent a lower percentage of the overall daily capacity.

Conclusion

This analysis based on street classifications and capacity would indicate that the proposed Wal*Mart Supercenter including Outlots would not represent an unreasonable percentage of the future capacity available to serve this area on the connection to Highway 79.

Appendix

Supporting information from Sioux Falls Study
Supporting information from FDOT Generalized Tables

Table
Level of Service (LOS) by Average Daily Traffic (ADT) Volumes

		NUMBER OF LANES/CAPACITY CALCULATIONS																
		ARTERIAL ROADWAY									EXPRESSWAY					FREEWAY		
ARTERIALS	VEHICLES PER HOUR PER LANE	2-Lane Undivided w/o Turn Lanes	2-Lane Undivided with R or L Turn Lanes	3-Lane Undivided with L Turn Lane	3-Lane Undivided with R & L Turn Lanes	4-Lane Undivided w/o Turn Lanes	4-Lane Undivided with R or L Turn Lanes	4-Lane Divided with R & L Turn Lanes	6-Lane with R & L Turn Lanes	8-Lane with R & L Turn Lanes	2-Lane w/o Turn Lanes	2-Lane with R or L Turn Lanes	2-Lane with R & L Turn Lanes	4-Lane with R & L Turn Lanes	6-Lane with R & L Turn Lanes	4-Lane	6-Lane	8-Lane
Left/Thru/Right Lane	600	600	0	0	0	0	0	0	0	0	NA	NA	NA	NA	NA	NA	NA	NA
Left/Thru Lane	600	0	600	0	0	600	600	0	0	0	NA	NA	NA	NA	NA	NA	NA	NA
Thru/Right Lane	700	0	0	700	0	700	0	0	0	0	NA	NA	NA	NA	NA	NA	NA	NA
Thru Lane	800	0	0	0	800	0	800	1600	2400	3200	NA	NA	NA	NA	NA	NA	NA	NA
Turn Lane	350	0	350	350	700	0	350	700	700	700	NA	NA	NA	NA	NA	NA	NA	NA
EXPRESSWAYS																		
One Thru Lane	900	NA	NA	NA	NA	NA	NA	NA	NA	NA	900	900	900	0	0	NA	NA	NA
Two + Lanes	1100	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	0	0	2200	3300	NA	NA	NA
Turn Lane	350	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	350	700	700	700	NA	NA	NA
FREEWAYS																		
Outside Lane	1900	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	1900	1900	1900
Center Lane	2100	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	2100	4200
Inside Lane	2300	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2300	2300	2300
Peak Hour Direction Capacity		600	950	1050	1500	1300	1750	2300	3100	3900	900	1250	1600	2900	4000	4200	6300	8400
LOS A		180	285	315	450	390	525	690	930	1170	270	375	480	870	1200	1260	1890	2520
LOS B		90	142.5	157.5	225	195	262.5	345	465	585	135	187.5	240	435	600	630	945	1260
LOS C		120	190	210	300	260	350	460	620	780	180	250	320	580	800	840	1260	1680
LOS D		120	190	210	300	260	350	460	620	780	180	250	320	580	800	840	1260	1680
LOS E		90	142.5	157.5	225	195	262.5	345	465	585	135	187.5	240	435	600	630	945	1260
LOS F		0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
(Check Capacity)		600	950	1050	1500	1300	1751	2300	3100	3900	900	1250	1600	2900	4000	4200	6300	8400
Peak Hour Percentage		10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	9%	9%	9%
Directional Split		60%	60%	60%	60%	55%	55%	55%	55%	55%	60%	60%	60%	55%	55%	55%	55%	55%
DAILY TWO-WAY CAPACITY																		
LOS A		3,000	4,750	5,250	7,500	7,090	9,550	12,550	16,910	21,270	4,500	6,250	8,000	15,820	21,820	25,450	38,180	50,910
LOS B		1,500	2,380	2,630	3,750	3,550	4,770	6,270	8,450	10,640	2,250	3,130	4,000	7,910	10,910	12,730	19,090	25,450
LOS C		2,000	3,170	3,500	5,000	4,730	6,360	8,360	11,270	14,180	3,000	4,170	5,330	10,550	14,550	16,970	25,450	33,940
LOS D		2,000	3,170	3,500	5,000	4,730	6,360	8,360	11,270	14,180	3,000	4,170	5,330	10,550	14,550	16,970	25,450	33,940
LOS E		1,500	2,380	2,630	3,750	3,550	4,770	6,270	8,450	10,640	2,250	3,130	4,000	7,910	10,910	12,730	19,090	25,450
LOS F		0	0	0	0	0	20	0	0	0	0	0	0	0	0	0	0	0
(Check Capacity)		**10,000**	**15,850**	**17,510**	**25,000**	**23,650**	**31,830**	**41,810**	**56,350**	**70,910**	**15,000**	**20,850**	**26,660**	**52,740**	**72,740**	**84,850**	**127,260**	**169,690**
Capacity Rounded		10,000	15,900	17,500	25,000	23,700	31,800	41,800	56,400	70,900	15,000	20,900	26,700	52,700	72,700	84,900	127,300	169,700

Notes:
(1) The capacity assumptions were originally calculated based on a study conducted in Sioux Falls, SD. These assumptions were then verified using SYNCHRO and SimTraffic.
(2) The SimTraffic analysis determined that the capacity assumptions correspond to 1/4 mile signal spacing. For less than 1/4 mile spacing, the roadway is too volatile to produce arterial LOS results. For 1/2 mile spacing, the through lane capacities can be increased slightly (approximately 50 to 100 vplph).
(3) The peak hour percentage of 10% for arterial roadways was calculated from the volume data provided in the 1998 ATR Report (Mn/DOT). The peak hour percentage for freeways is approximately 9.0%.
(4) The original LOS thresholds were calculated based on similar volume-to-capacity ratios.

Level of Service	v/c Ratio	
A	< 0.6	60% of capacity
B	0.6 to 0.7	70% of capacity
C	0.7 to 0.8	80% of capacity
D	0.8 to 0.9	90% of capacity
E	0.9 to 1.0	100% capacity
F	> 1.0	

However, based on examples in the 2000 Highway Capacity Manual (HCM), these percentages were adjusted to the following

Level of Service	**Percentage**
A	30%
B	15%
C	20%
D	20%
E	15%
F	0%

Capacity Assumptions: (1)

Through Only Lane	800 vph
LT/TH Lane	600 vph
TH/RT Lane	700 vph
TH/RT/LT Lanes	600 vph
Turn Lanes	350 vph

Peak Hour Percentages (2)

Arterial Roadway	10%
Directional Orientation	60/40

(1) Assumes 1/4 mile signal spacing. For less than 1/4 mile signal spacing, roadway becomes too volatile to determine LOS by ADT. For greater than 1/4 mile signal spacing, the capacity for a through lane can be increased by approximately 50-100 vplph. *
(2) Based on data provided in the Mn/DOT 1998 Automatic Traffic Recorder (ATR) Report.

* vplph - vehicles per lane per hour

Note: This figure contains approximate values. The values are highly dependant on the assumptions used. It should not be used for operational analyses or final design.

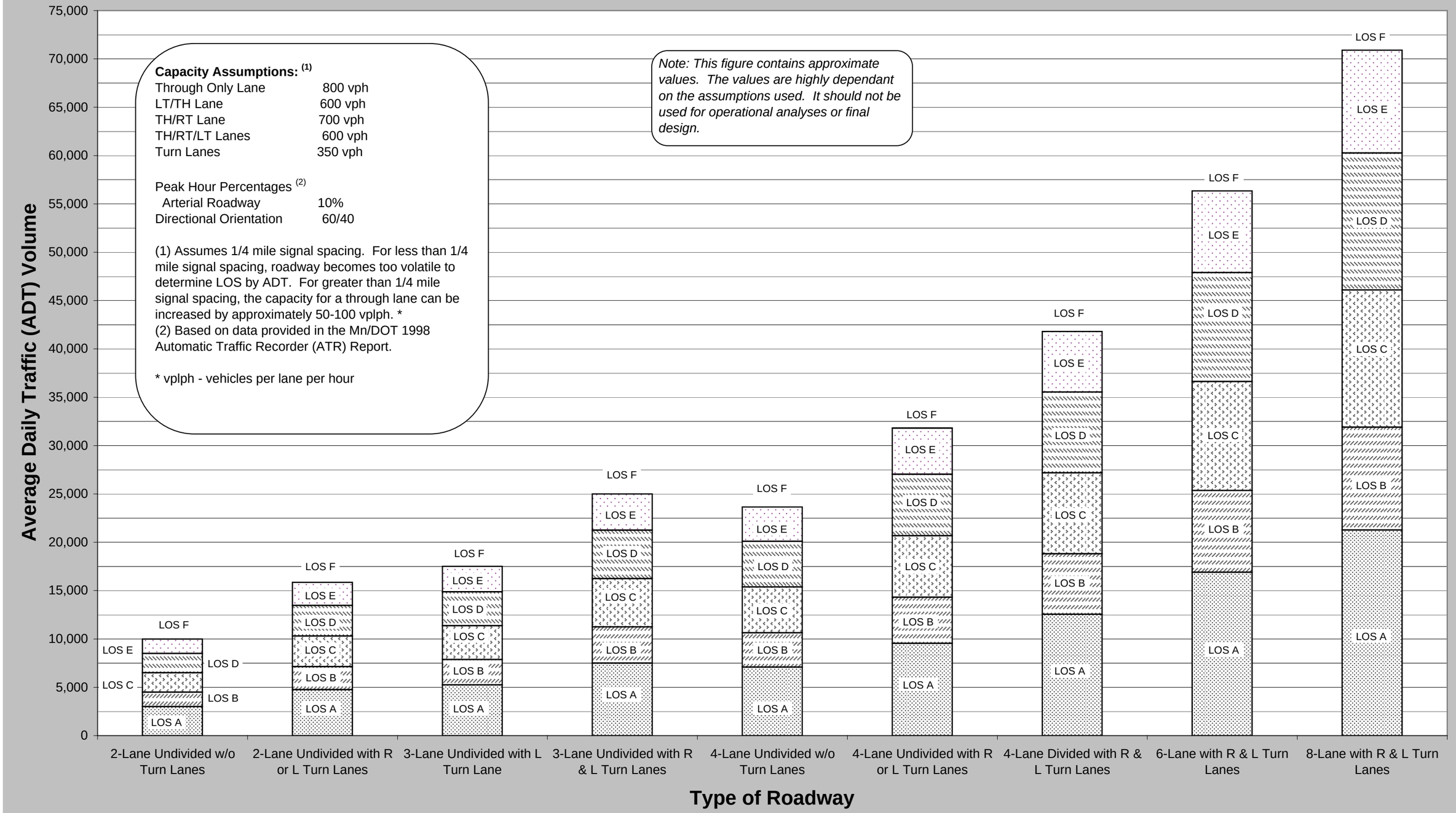


Figure
Estimated Daily Level of Service - Arterial Roadways

1/10/2006

TABLE 4 - 1
GENERALIZED **ANNUAL AVERAGE DAILY** VOLUMES FOR FLORIDA'S **URBANIZED AREAS***

UNINTERRUPTED FLOW HIGHWAYS

Lanes	Divided	Level of Service A	B	C	D	E
2	Undivided	2,000	7,000	13,800	19,600	27,000
4	Divided	20,400	33,000	47,800	61,800	70,200
6	Divided	30,500	49,500	71,600	92,700	105,400

STATE TWO-WAY ARTERIALS

Class I (>0.00 to 1.99 signalized intersections per mile)

Lanes	Divided	Level of Service A	B	C	D	E
2	Undivided	**	4,200	13,800	16,400	16,900
4	Divided	4,800	29,300	34,700	35,700	***
6	Divided	7,300	44,700	52,100	53,500	***
8	Divided	9,400	58,000	66,100	67,800	***

Class II (2.00 to 4.50 signalized intersections per mile)

Lanes	Divided	Level of Service A	B	C	D	E
2	Undivided	**	1,900	11,200	15,400	16,300
4	Divided	**	4,100	26,000	32,700	34,500
6	Divided	**	6,500	40,300	49,200	51,800
8	Divided	**	8,500	53,300	63,800	67,000

Class III (more than 4.5 signalized intersections per mile and not within primary city central business district of an urbanized area over 750,000)

Lanes	Divided	Level of Service A	B	C	D	E
2	Undivided	**	**	5,300	12,600	15,500
4	Divided	**	**	12,400	28,900	32,800
6	Divided	**	**	19,500	44,700	49,300
8	Divided	**	**	25,800	58,700	63,800

Class IV (more than 4.5 signalized intersections per mile and within primary city central business district of an urbanized area over 750,000)

Lanes	Divided	Level of Service A	B	C	D	E
2	Undivided	**	**	5,200	13,700	15,000
4	Divided	**	**	12,300	30,300	31,700
6	Divided	**	**	19,100	45,800	47,600
8	Divided	**	**	25,900	59,900	62,200

NON-STATE ROADWAYS

Major City/County Roadways

Lanes	Divided	Level of Service A	B	C	D	E
2	Undivided	**	**	9,100	14,600	15,600
4	Divided	**	**	21,400	31,100	32,900
6	Divided	**	**	33,400	46,800	49,300

Other Signalized Roadways
(signalized intersection analysis)

Lanes	Divided	Level of Service A	B	C	D	E
2	Undivided	**	**	4,800	10,000	12,600
4	Divided	**	**	11,100	21,700	25,200

Source: Florida Department of Transportation 02/22/02
Systems Planning Office
605 Suwannee Street, MS 19
Tallahassee, FL 32399-0450
http://www11.myflorida.com/planning/systems/sm/los/default.htm

FREEWAYS

Interchange spacing ≥ 2 mi. apart

Lanes	Level of Service A	B	C	D	E
4	23,800	39,600	55,200	67,100	74,600
6	36,900	61,100	85,300	103,600	115,300
8	49,900	82,700	115,300	140,200	156,000
10	63,000	104,200	145,500	176,900	196,400
12	75,900	125,800	175,500	213,500	237,100

Interchange spacing < 2 mi. apart

Lanes	Level of Service A	B	C	D	E
4	22,000	36,000	52,000	67,200	76,500
6	34,800	56,500	81,700	105,800	120,200
8	47,500	77,000	111,400	144,300	163,900
10	60,200	97,500	141,200	182,600	207,600
12	72,900	118,100	170,900	221,100	251,200

BICYCLE MODE

(**Note**: Level of service for the bicycle mode in this table is based on roadway geometrics at 40 mph posted speed and traffic conditions, not number of bicyclists using the facility.) (Multiply motorized vehicle volumes shown below by number of directional roadway lanes to determine two-way maximum service volumes.)

Paved Shoulder/ Bicycle Lane Coverage	Level of Service A	B	C	D	E
0-49%	**	**	3,200	13,800	>13,800
50-84%	**	2,500	4,100	>4,100	***
85-100%	3,100	7,200	>7,200	***	***

PEDESTRIAN MODE

(**Note:** Level of service for the pedestrian mode in this table is based on roadway geometrics at 40 mph posted speed and traffic conditions, not number of pedestrians using the facility.) (Multiply motorized vehicle volumes shown below by number of directional roadway lanes to determine two-way maximum service volumes.)

Sidewalk Coverage	Level of Service A	B	C	D	E
0-49%	**	**	**	6,400	15,500
50-84%	**	**	**	9,900	19,000
85-100%	**	2,200	11,300	>11,300	***

BUS MODE (Scheduled Fixed Route)

(Buses per hour)

(**Note:** Buses per hour shown are only for the **peak hour** in the **single direction** of the higher traffic flow.)

Sidewalk Coverage	Level of Service A	B	C	D	E
0-84%	**	>5	≥4	≥3	≥2
85-100%	>6	>4	≥3	≥2	≥1

ARTERIAL/NON-STATE ROADWAY ADJUSTMENTS

DIVIDED/UNDIVIDED

(alter corresponding volume by the indicated percent)

Lanes	Median	Left Turns Lanes	Adjustment Factors
2	Divided	Yes	+5%
2	Undivided	No	-20%
Multi	Undivided	Yes	-5%
Multi	Undivided	No	-25%

ONE-WAY FACILITIES

Decrease corresponding two-directional volumes in this table by 40% to obtain the equivalent one directional volume for one-way facilities.

*This table does not constitute a standard and should be used only for general planning applications. The computer models from which this table is derived should be used for more specific planning applications. The table and deriving computer models should not be used for corridor or intersection design, where more refined techniques exist. Values shown are two-way annual average daily volumes (based on K_{100} factors) for levels of service and are for the automobile/truck modes unless specifically stated. Level of service letter grade thresholds are probably not comparable across modes and, therefore, cross modal comparisons should be made with caution. Furthermore, combining levels of service of different modes into one overall roadway level of service is not recommended. The table's input value defaults and level of service criteria appear on the following page. Calculations are based on planning applications of the Highway Capacity Manual, Bicycle LOS Model, Pedestrian LOS Model and Transit Capacity and Quality of Service Manual, respectively for the automobile/truck, bicycle, pedestrian and bus modes.

**Cannot be achieved using table input value defaults.

***Not applicable for that level of service letter grade. For automobile/truck modes, volumes greater than level of service D become F because intersection capacities have been reached. For bicycle and pedestrian modes, the level of service letter grade (including F) is not achievable, because there is no maximum vehicle volume threshold using table input value defaults.

TABLE 4 – 2
GENERALIZED **ANNUAL AVERAGE DAILY** VOLUMES FOR FLORIDA'S **AREAS TRANSITIONING INTO URBANIZED AREAS** OR **AREAS OVER 5,000 NOT IN URBANIZED AREAS***

UNINTERRUPTED FLOW HIGHWAYS

Lanes	Divided	Level of Service A	B	C	D	E
2	Undivided	2,100	6,900	12,900	18,200	24,900
4	Divided	18,600	30,200	43,600	56,500	64,200
6	Divided	27,900	45,200	65,500	84,700	96,200

STATE TWO-WAY ARTERIALS

Class I (>0.00 to 1.99 signalized intersections per mile)

Lanes	Divided	Level of Service A	B	C	D	E
2	Undivided	**	4,000	13,100	15,500	16,300
4	Divided	4,600	27,900	32,800	34,200	***
6	Divided	6,900	42,800	49,300	51,400	***

Class II (2.00 to 4.50 signalized intersections per mile)

Lanes	Divided	Level of Service A	B	C	D	E
2	Undivided	**	**	10,500	14,500	15,300
4	Divided	**	3,700	24,400	30,600	32,200
6	Divided	**	6,000	38,000	46,100	48,400

Class III (more than 4.5 signalized intersections per mile)

Lanes	Divided	Level of Service A	B	C	D	E
2	Undivided	**	**	5,000	11,800	14,600
4	Divided	**	**	11,700	27,200	30,800
6	Divided	**	**	18,400	42,100	46,300

NON-STATE ROADWAYS

Major City/County Roadways

Lanes	Divided	Level of Service A	B	C	D	E
2	Undivided	**	**	7,000	13,600	14,600
4	Divided	**	**	16,400	29,300	30,900
6	Divided	**	**	25,700	44,100	46,400

Other Signalized Roadways
(signalized intersection analysis)

Lanes	Divided	Level of Service A	B	C	D	E
2	Undivided	**	**	4,400	9,400	12,000
4	Divided	**	**	10,300	20,200	24,000

Source: Florida Department of Transportation 02/22/02
Systems Planning Office
605 Suwannee Street, MS 19
Tallahassee, FL 32399-0450
http://www11.myflorida.com/planning/systems/sm/los/default.htm

FREEWAYS

Lanes	Level of Service A	B	C	D	E
4	23,500	38,700	52,500	62,200	69,100
6	36,400	59,800	81,100	96,000	106,700
8	49,100	80,900	109,600	129,800	144,400
10	61,800	101,800	138,400	163,800	182,000

BICYCLE MODE

(**Note:** Level of service for the bicycle mode in this table is based on roadway geometrics at 40 mph posted speed and traffic conditions, not number of bicyclists using the facility.) (Multiply motorized vehicle volumes shown below by number of directional roadway lanes to determine two-way maximum service volumes.)

Paved Shoulder/ Bicycle Lane Coverage	Level of Service A	B	C	D	E
0-49%	**	1,900	3,300	13,600	>13,600
50-84%	**	2,500	4,000	>4,000	***
85-100%	3,200	7,100	>7,100	***	***

PEDESTRIAN MODE

(**Note:** Level of service for the pedestrian mode in this table is based on roadway geometric at 40 mph posted speed and traffic conditions, not number of pedestrians using the facility.) (Multiply motorized vehicle volumes shown by number of directional roadway lanes to determine two-way maximum service volumes.)

% Sidewalk Coverage	Level of Service A	B	C	D	E
0-49%	**	**	**	6,300	15,400
50-84%	**	**	**	9,800	18,800
85-100%	**	2,200	11,200	>11,200	***

ARTERIAL/NON-STATE ROADWAY ADJUSTMENTS

DIVIDED/UNDIVIDED

Lanes	Median	Left Turn Lanes	Adjustment Factors
2	Divided	Yes	+5%
2	Undivided	No	-20%
Multi	Undivided	Yes	-5%
Multi	Undivided	No	-25%

ONE-WAY FACILITIES

Decrease corresponding two-directional volumes in this table by 40% to obtain the equivalent one directional volume for one-way facilities.

*This table does not constitute a standard and should be used only for general planning applications. The computer models from which this table is derived should be used for more specific planning applications. The table and deriving computer models should not be used for corridor or intersection design, where more refined techniques exist. Values shown are two-way annual average daily volumes (based on K_{100} factors) for levels of service and are for the automobile/truck modes unless specifically stated. Level of service letter grade thresholds are probably not comparable across modes and, therefore, cross modal comparisons should be made with caution. Furthermore, combining levels of service of different modes into one overall roadway level of service is not recommended. The table's input value defaults and level of service criteria appear on the following page. Calculations are based on planning applications of the Highway Capacity Manual, Bicycle LOS Model, and Pedestrian LOS Model, respectively for the automobile/truck, bicycle and pedestrian modes.

**Cannot be achieved using table input value defaults.

***Not applicable for the level of service letter grade. For automobile/truck modes, volumes greater than level of service D become F because intersection capacities have been reached. For bicycle and pedestrian modes, the level of service letter grade (including F) is not achievable, because there is no maximum vehicle volume threshold using table input value defaults.