

Windhaven Apartments Traffic Impact Analysis



WINDHAVEN APARTMENTS TRAFFIC IMPACT ANALYSIS

SUBMITTED TO:

CITY OF SPOKANE

July 2016

PREPARED BY:

William (Bill) White

PROJECT ENGINEER:

Kennet Bertelsen, P.E.



316 Boone Avenue, Suite 360
Spokane, WA 99223
509.315.8366

MMI PROJECT #: 5594.002

EXECUTIVE SUMMARY

Windhaven First Addition is an approved City residential development that occupies 49.48 acres aligned north of Barnes Road and west of Indian Trail Road within the Indian Trail neighborhood of Spokane. The project was initially approved in year 2006 for the construction of 286 single family homes. No homes have been constructed yet; although the street infrastructure for the development is complete. This includes primary vehicle access to Barnes Road via Forest Lane and Pamela Lane, with secondary access provided to the adjacent apartment development (to the east) via Jamestown Lane. The project is within an RSF zone of the City with a site Comprehensive Plan designation of Residential 4-10.

Due to evolving market conditions, the project proponent has recently proposed to develop up to 750 apartment units on the site as opposed to single family homes. The proposal results in a density of 15.2 homes per acres, which exceeds the approved residential density. Thus, a Comprehensive Plan amendment and zone change would be needed to accommodate the proposal; specifically to a RMF zone and Comprehensive Plan designation of Residential 15-30.

Note the proposed apartment density marginally exceeds minimum zoning and Comprehensive Plan allowances, and is just under half of maximum allowable densities (of up to 30 apartments per acre). The reduced density was accommodated to minimize the traffic impacts of the proposed development on the Indian Trail neighborhood; as this was expressed as a concern of citizens living within the area. The developers have reduced site densities considerably from initial development proposals.

Site access is promoted as described previously, with primary access provided via Forest Lane and Pamela Street and secondary access via Jamestown Lane. Currently, pedestrian access only is proposed via Moore Street intersecting with Shawnee Avenue to the north, as this is a pedestrian/school route. However, this can be revisited during the design process if City officials determine vehicle access would benefit the neighborhood in the future.

Per City concurrency evaluations, Windhaven First Addition with 286 homes is vested to generate 210 trips during the AM peak hour and 271 trips during the PM peak hour. This would represent the trip generation equivalent of 460 apartment units. This distinction is important because it demonstrates that 46 percent of the current apartment proposal could be developed before surpassing vested/programmed traffic generation levels. A comparison of trip generation equivalencies is provided below.

Vested Residential Land Use & Trip Comparisons							
Residential Land Use	Dwelling Units	AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
Single Family Homes (ITE Code 210)	286	65	145	210	179	92	271
General Apartment Units (ITE Code 220)	460	46	183	229	176	95	271

As shown on the next page, the 750 unit apartment proposal represents a net gain of 161 trips during the AM peak hour and 159 trips during the PM peak hour over those vested/associated with single family home development. This TIA is being required by the City to support the Comprehensive Plan amendment and zone change processes because the current land use proposal (of apartments) presents a net gain in trip generation over those vested/identified above for the site (as single family homes).

Project Trip Generation Gains – Proposed Apartments Vrs. Vested Single Family							
Land Use	Dwelling Units	AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
Apartments - ITE Code 220	750	74	297	371	280	150	430
Single Family Homes - ITE Code 210	286	65	145	210	179	92	271
Net Gain Site Trips	--	9	152	161	101	58	159

TRAFFIC FORECASTS AND CAPACITY

City officials require this study address traffic operations principally for site access intersections and seven off-site intersections most impacted by development within the Indian Trail neighborhood. The analysis was required for the AM and PM peak hours of the typical weekday, as based on the forecast year 2021 completion year of the project. A summary of study intersections include:

- ◆ Shawnee Avenue/Indian Trail Road
- ◆ Barnes Road/Indian Trail Road
- ◆ Strong Road/Indian Trail Road
- ◆ Indian Trail Road/Francis Avenue
- ◆ Alberta Street/Francis Avenue
- ◆ Ash Street/Francis Avenue
- ◆ Maple Street/Francis Avenue
- ◆ Barnes Road/Forest Lane (Project Access)
- ◆ Barnes Road/Pamela Lane (Project Access)

Existing Conditions. Traffic counts were performed during typical weekdays in March, with a follow-up count in April (for Shawnee Road/Indian Trail Road intersection) to capture the peak demands of the morning and afternoon commutes. These counts were performed specifically while local schools were in session, as to capture the travel demands of these special traffic generators.

City of *Spokane Administrative Policy and Procedure for Transportation Concurrency Level of Service Standards* defines a LOS E standard for signalized and unsignalized intersections aligned along a principal arterial. An analysis of existing traffic operations indicates there were no levels-of-service (LOS) issues identified within the field, as all intersections were shown to function at LOS E or better between the AM and PM peak hours. Existing intersection LOS conclusions are shown on the next page.

Existing LOS and Delay - AM and PM Peak Hours				
Signalized Intersections	AM Peak		PM Peak	
	LOS ¹	Delay ²	LOS ¹	Delay ²
Shawnee Ave/Indian Trail Rd	B	17.3	A	7.7
Barnes Rd/Indian Trail Rd	B	18.1	B	14.4
Strong Rd/Indian Trail Rd	A	9.7	B	18.9
Indian Trail Rd/Francis Ave	B	12.3	A	7.9
Alberta St/Francis Ave	D	36.4	C	32.2
Ash St/Francis Ave	C	22.3	C	20.4
Maple St/Francis Ave	B	17.7	D	41.9
1. LOS = Levels-of-Service 2. Del = Delay in seconds				

Secondary lane capacity analyses and speed counts were performed discretionarily to support conclusions for Indian Trail Road. The lane analysis was used to help identify whether adequate capacity exists for through traffic (northbound and southbound movements) outside of study intersections along Indian Trail Road. Lane capacities were reviewed for three count locations within the vicinity of the “bottleneck” on Indian Trail Road: 1) north of Weile Avenue (south of bottleneck); 2) north of Kathleen Avenue (within bottleneck); and 3) north of Lowell Avenue (north of Bottleneck). A summary of the lane capacity analysis is shown below.

Existing Indian Trail Lane Capacity - AM and PM Peak Hours									
Indian Trail Road	Capacity			AM Peak Hour			PM Peak Hour		
	NB	SB	Tot	NB	SB	Tot	NB	SB	Tot
N/of Weile Ave	1,800	1,800	3,600	287	1,114	1,401	1,099	450	1,549
N/of Kathleen Ave	900	900	1,800	283	1,151	1,434	1,085	449	1,534
N/of Lowell Ave	900	900	1,800	246	954	1,200	807	384	1,191

As shown, lane capacity is sufficient within the four lane section of Indian Trail north Road north of Weile Avenue. However, existing counts are shown to exceed directional lane capacities within specifically within the bottleneck area north of Kathleen Avenue. There is minor lane capacity exceptions noted north of Lowell Avenue, but overall capacity appears to be sufficient north of the bottleneck. A comparison/review of this data does suggest need for lane widening as based on existing count data.

Despite the lane capacity results above, travel speeds within the corridor do not seem to be overly compromised. Speed counts were performed at the locations identified/reviewed above, south of, within, and north of the bottleneck area along Indian Trail Road. Average travel speeds were found to be 3 to 6 mph above the posted 30 mph speed limit along the roadway during AM and PM peak hours in both travel directions. The conclusion from this is that, while

additional capacity is needed, the travel time of typical commuters is not yet impacted. A summary of speed data is shown on the next page.

Indian Trail ADT and Speed Counts - AM and PM Peak Hours					
Indian Trail Road	ADT	Average Speed - Northbound		Average Speed - Southbound	
		AM Peak	PM Peak	AM Peak	PM Peak
N/of Weile Ave	17,299	36.5	36.8	36.0	35.7
N/of Kathleen Ave	16,821	37.9	36.8	34.8	37.9
N/of Lowell Ave	13,555	34.3	31.9	33.4	33.2

Future Conditions. Future 2021 traffic volumes were developed for operational analyses assuming: 1) baseline (non-development associated) traffic growth, 2) the development of eleven study area pipeline projects (including vested Windhaven First Addition), and 3) the assignment of project trips. A 0.5 percent annual growth rate was applied to counts to reflect baseline (non-development) traffic growth. This growth was combined with the trips generated by pipeline projects to generate future without project traffic forecasts. The trip generation of these developments is shown below.

Vested Residential Land Use & Trip Comparisons by TAZ								
TAZ and Development	Dwelling Units/Homes		AM Peak Hour			PM Peak Hour		
	Single	Multi	In	Out	Total	In	Out	Total
TAZ 29								
- Hunts Point	183	48	48	119	167	142	72	214
- Windhaven First	286	0	65	145	210	179	92	271
- Ponderosa Ridge 3 rd	12	0	6	13	19	10	5	15
- Ponderosa Ridge 4 th	25	0	8	19	27	20	10	30
Subtotal TAZ 29	506	48	127	296	423	351	179	530
TAZ 30								
- Diamond Rock	0	96	10	41	51	46	25	71
- Replat McCarroll	13	0	6	13	19	11	6	17
- McCarroll's 3 rd	10	0	5	12	17	9	5	14
- McCarroll's 4 th	15	0	6	14	20	13	7	20
- McCarroll's East	7	28	8	26	34	21	10	31
- Woodridge View	7	0	5	10	15	6	3	9
Subtotal TAZ 30	52	124	40	116	156	106	56	162
TAZ 31								
- Estates at Rocky	15	0	6	14	20	13	7	20
- Westwinds PUD	19	0	7	16	23	16	8	24
Subtotal TAZ 31	34	0	13	30	43	29	15	44
Total Pipeline Trips	592	172	180	442	622	486	250	736

Note from the previous table that trip generation for the existing, approved development is reflected via the row “Windhaven First” located in TAZ 29; indicating trip generation of 210 AM peak hour and 271 PM peak hour trips. These trips are highlighted because they are already vested by the City for the Windhaven site and have entitlement to roadway capacity. They are therefore reflected in the future without project condition presented by this TIA.

As highlighted previously, the current land use proposal represents a net gain of 161 trips during the AM peak hour and 159 trips during the PM peak hour over those vested/associated with single family home development (described preceding paragraph). Future with project traffic forecasts reflects this gain in trips, over future without project traffic (including pipeline), as it represents a change in forecast travel demands (as currently anticipated by City officials). Thus, to be clear, this TIA addresses the full traffic impacts associated with the construction of a 750 unit apartment complex upon City roadways. The impacts were essentially reviewed/defined in stages given the approved status of a single family development versus that of a proposed apartment community.

The resulting traffic forecasts result in growth rates of between 6 and 7 percent annually on Indian Trail Road, which far exceeds historical growth rates ranging between 1 and 1.5 percent annually. Thus, traffic forecasts are very conservative for year 2021 and may be more representative of long term traffic growth (beyond year 2021).

Note that about 19 percent of project trips are anticipated to/from the east on Barnes Road (via the new extension and connection to Strong Road). About 2 percent are anticipated from adjacent businesses, services, and retail. About 9 percent of project trips are anticipated to/from the north and 70 percent to/from the south on Indian Trail Road. The majority of project trips along Indian Trail Road south will travel to/from the east on Francis Avenue; distributing throughout a study area that addresses the Alberta Street and Maple/Ash Couplet intersections with Francis Avenue.

Future intersection analyses indicated that no overall LOS issues were noted based upon a review of future year 2021 traffic forecasts. This determination is made because no study intersection is forecast to function below LOS E on the principal arterials of Indian Trail Road or Francis Avenue during the peak hours. LOS at site access intersections are also shown to operate acceptably at LOS C or better during the peak hours. The resulting, forecast LOS, both without and with project development, are shown on the following Table.

Forecast Year 2021 LOS and Delay - AM and PM Peak Hours								
Year 2021 Condition	Future Without Project Traffic				Future With Project Traffic			
	AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
Signalized Intersections	LOS ¹	Delay ²	LOS ¹	Delay ²	LOS ¹	Delay ²	LOS ¹	Delay ²
Shawnee Ave/Indian Trail Rd	B	17.9	A	8.2	B	17.9	A	8.3
Barnes Rd/Indian Trail Rd	C	26.9	B	19.9	D	43.7	C	22.9
Strong Rd/Indian Trail Rd	C	20.2	D	52.4	D	37.3	E	68.8
Indian Trail Rd/Francis Ave	C	20.3	B	10.1	C	29.6	B	10.7
Alberta St/Francis Ave	E	65.6	D	53.7	E	78.3	E	59.4
Ash St/Francis Ave	C	26.1	C	21.3	C	28.9	C	21.5
Maple St/Francis Ave	B	17.8	E	55.9	B	17.1	E	58.7
	AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
Unsignalized Intersections	LOS ¹	Delay	LOS ¹	Delay	LOS ¹	Delay	LOS ¹	Delay
Forest Ln/Barnes Rd	B	10.6	B	10.2	B	11.4	B	10.6
Pamela Ln/Barnes Rd	B	13.1	B	12.0	C	19.0	C	14.0
1. LOS = Levels-of-Service 2. Del = Delay in seconds								

Note although overall intersection LOS were forecast to be acceptable during the peak hours, meeting City concurrency requirements, the westbound approach to Maple Street/Francis Avenue intersection is forecast to have 89 seconds of average control delay during the PM peak hour; representing a LOS F condition. The maximum phase split for the approach is currently 43 seconds (the available green time during one signal cycle). A comparison of control delay with this phase split confirms individual vehicles would wait about three full signal cycles before clearing the intersection. Queue conditions are forecast to be extensive within this approach.

Forecast lane capacity was still shown to be sufficient within the four lane section of Indian Trail north Road north of Weile Avenue. Forecast traffic volumes further demonstrate the need for lane widening north of Kathleen Avenue (within bottleneck) and north of Lowell Avenue (north of Bottleneck). This determination is confirmed because forecast traffic volumes well exceed single lane capacity in the southbound direction during the AM peak hour and the northbound direction during the PM peak hour. Forecast lane volume comparisons are shown below.

Future With-Project Indian Trail Lane Capacity - AM and PM Peak Hours									
Indian Trail Road	Capacity			AM Peak Hour			PM Peak Hour		
	NB	SB	Tot	NB	SB	Tot	NB	SB	Tot
N/of Weile Ave	1,800	1,800	3,600	376	1,396	1,772	1,351	732	2,083
N/of Kathleen Ave	900	900	1,800	385	1,483	1,868	1,410	781	2,191
N/of Lowell Ave	900	900	1,800	371	1,360	1,731	1,211	790	2,001

Pedestrian, Bike, and Transit. Pedestrian, bicycle, and transit access conditions are favorable within the project vicinity. Sidewalk is contiguous between the developments and nearby transit stops, shopping centers, and public facilities (a library and a park). There are commute bicycle routes on Indian Trail Road and Barnes Road; although some form of designated bike lanes for recreational facilities would be ideal in the future (such remediation is beyond the scope of development projects). Finally STA transit access to Indian Trail Road is sufficient on weekdays, with transit stops located within walking distance about ¼- mile east of Windhaven.

Supplemental Studies. Two supplemental studies were performed to support this TIA: 1) a Microsimulation analysis submitted to the City on 5/24/16 (provided in Technical Appendix E) and 2) an analysis of collision data submitted to the City on 6/8/16 (provided in Technical Appendix F).

The microsimulation analysis was performed to review the cumulative impact of traffic within the context of closely spaced intersections such as those aligned along Francis Avenue. The analysis addresses conditions such as spillback between intersections, spillback beyond turning bays, forced lane changes, and unbalanced lane use for downstream turns.

The intersections of Francis Avenue with Indian Trail Road, Alberta Street, Ash Street, and Maple Street were reviewed with this supplemental study, as based on existing counts, future without, and future with-project traffic forecasts during the PM peak hour. The analysis generally concludes the cumulative impact of traffic congestion between the Francis Avenue intersections with Ash Street and Maple Street may cause average delays and queues that moderately surpass those stated by this TIA. Thus, the microsimulation analysis indicates the westbound approach issues specified for the Maple Street/Francis Avenue may be greater than identified based on traditional LOS and delay analyses.

The collision analysis was performed for Indian Trail Road and indicates 52 recorded collisions occurred along the roadway between January 1, 2013 and May 31, 2016. Overall, 42 percent of collisions involved vehicle property damage only with 58 percent involving injuries. There were no fatalities within the study timeframe.

An average of 15.2 collisions occur the study arterial segment each year that, when compared with an average of 15,892 ADT, results in rate of 0.98 collisions per million miles of vehicle travel. Comparatively, the Washington State Department of Transportation 2014 Annual Collision Summary Report indicates Spokane County experiences a system/network-wide rate of 168.7 collisions per 100 million miles of travel, or 1.687 collisions per million miles of travel. Thus, by comparison, the calculated corridor rate is well below the average for Spokane County suggesting no unusual collision issue exists along Indian Trail Road. This conclusion was confirmed based on a review of intersections and driveways on an individual basis.

IMPROVEMENT RECOMMENDATION AND MITIGATION

The project is responsible for mitigating traffic impacts via transportation impact fee (TIF) contribution. The fee scheduled for the Northwest Service Area, within which the project is located, is \$483.49 per unit for two-story apartments and \$296.33 for three-story apartments. Thus, the Windhaven development would be conditioned with up to **\$362,620** of traffic impact fees (\$483.49 * 750 two-story apartments), as collected prior to the issuance of any building permit on a per-unit/home or development phase basis.

The study concludes that adequate overall LOS is maintained at study intersections in accordance with City of Spokane Standards. However, secondary and supplemental analyses identify transportation improvements or demand strategies are needed to help improve traffic mobility for two study area locations, as based on a review of forecast traffic conditions.

- 1. Improvement – Indian Trail Road.** The lane capacity analysis indicates additional through lanes are needed in the northbound and southbound travel directions of Indian Trail Road, respectively. Upon coordination with City officials, it has been determined that the arterial can be restriped with some widening in locations to provide a minimum four-lane cross section throughout the current “bottleneck” extending between Kathleen Avenue and Lowell Avenue. This would provide needed lane capacity and address one of the top neighborhood concerns expressed via comment letters and emails, and also via the 5/25/15 public meeting.

Mitigation. The project proponent has offered to front the costs of improving Indian Trail Road, to be constructed with a City pavement rehabilitation project scheduled summer of year 2018. The City pavement rehabilitation project is funded. The Windhaven TIF of \$362,620 would be dedicated specifically to Indian Trail improvements as SEPA (and future concurrency) mitigation. Additional costs not be covered by the City would be fronted by the Windhaven developer and would be reimbursed either by TIF credits (for future developments within the Northwest Service Area) or via latecomers reimbursement provided via other Indian Trail Neighborhood developments. City officials indicate they will provide design services. The specifics of mitigation will be coordinated with City officials and enforced via developer agreements.

- 2. Improvement – Maple Street/Francis Avenue Congestion.** Traditional analyses indicate the westbound approach to the intersection will experience less tolerable LOS, delays, and vehicle queues. This was confirmed with microsimulation analysis. Two alternatives are being considered for managing/minimizing project impacts on Francis Avenue: 1) Adaptive signal controls retrofitted to the Francis Avenue intersections with Ash Street and Maple Street or 2) development travel demand management strategies. Adaptive signal controls would increase the operational efficiency of study intersections. Travel demand strategy would reduce development travel demands on Francis Avenue.

Mitigation. Adaptive signal control would be a direct mitigation of development; with design and installation coordinated with City and WSDOT officials. The prevailing travel demand strategy is to offer STA bus passes to residence of Windhaven. The Spokane Regional Commute Trip Reduction Plan has a 10 percent travel reduction goal. Thus, a minimum of 80 monthly bus passes would be offered to residences of Windhaven, as provided on a first-come basis. This would affect a 10 percent decrease in project trip generation meeting regional CTR goals. The preferred alternative would be advanced in coordination with City officials, as enforced with a developer agreement.

PUBLIC PARTICIPATION

Primary questions/points from the public involvement process performed to support this project are addressed as follows:

- ◆ The scope for this study was set in coordination with officials from the City of Spokane and WSDOT. Any locations/areas not included (in this study) were likely because project impacts were anticipated to be minimal outside of the specified and highlighted study area (reviewed by this TIA).

- ◆ The study did not review impacts to Woodside Avenue because trips from Windhaven are not likely to turn to/from this unsignalized intersection; especially because traffic circles programmed along Woodside Avenue should deter the occurrence of neighborhood cut through traffic. Note it is understood overall that turning traffic at this intersection is a public concern, but the collision rate determined for this intersection currently does not denote the potential for a high accident location.
- ◆ A collision analysis was performed in response to neighborhood concerns. The analysis does not highlight a high accident location (HAL) along Indian Trail Road, nor does it conclude that Indian Trail Road is a high accident corridor (HAC).
- ◆ The Barnes Road, Phoebe to Strong “Safety” project programmed for construction in year 2017 will provide a paved, secondary route of travel in the event some emergency forced the closure of Indian Trail Road.
- ◆ The project reviews a number of concurrent development projects (i.e. pipeline projects), specifically in the development of traffic forecasts. Any subsequent developments must review Windhaven and these pipeline projects in order to assure cumulative traffic growth and capacity commitments are considered as the region continues to mature.
- ◆ City officials identified the pipeline projects to be included with this development.
- ◆ The TIA addresses the full traffic impacts associated with trip generation for 750 apartment units. The TIA phases the analysis into future without and then future with project conditions because a number of trips are already vested for the site and are treated as a pipeline project. But trip gains/increases are then combined to reflect total-apartment build trip totals.
- ◆ Conservative traffic forecasts were developed for the Barnes Road connection to Strong Road; reflecting specified and non-specified development/pipeline project traffic. The traffic forecasts presented in the TIA are more conservative (higher) than traffic studies generated by the City Street Department for the roadway.
- ◆ The City has directed that the final TIA moderately the Barnes Road assignments from 21% to 19% with the remaining trips directed to other destinations along Indian Trail Road (such as the shopping center).
- ◆ This TIA reflects a resultant 6 to 7 percent annual growth by year 2021 which can be extrapolated to a 1.4 percent annual growth rate through year 2040. By comparison, the Indian Trail Widening Roadway Capacity Justification Report provided by City Engineers predicts 1.3 percent annual growth on Indian Trail Road by year 2040. Thus, the TIA uses conservative traffic forecasts that exceeds the projections of even City officials.
- ◆ LOS were demonstrated to be adequate along Indian Trail Road with this TIA, as defined by City LOS Standards. As such, any recommendations of this report do not have to be programmed within the City 6-Transportation Improvement Program/Plan. With that said, this Final TIA does recommend a minimum four lane roadway with two northbound and two southbound lanes will be constructed along Indian Trail Road, within the Kathleen Avenue and Lowell Avenue “bottleneck” area, as a condition of development. The improvement would be developed with the City roadway rehabilitation project programmed for Indian Trail Road in year 2018.
- ◆ A summary field study was performed for the Lusitano Apartment complex located adjacent to the proposed Windhaven development along Barnes Road. The field study indicates the resultant trip generation rates used in the TIA are nearly 60 percent higher

in the AM and over 45 percent higher in the PM versus rates established on local field counts. This means this TIA well overestimates traffic versus what is likely to occur in the future with Windhaven development.

SUMMARY

The improvements and mitigation described will address project-related deficiencies noted throughout the TIA (specifically for Indian Trail Road). The project will contribute \$362,620 towards mitigation of area deficiencies, via the TIF; specifically working to Indian Trail Road improvements. The project will also either provide adaptive traffic controls for the Maple Street/Francis Avenue intersection or promote travel demand management strategies to minimize project impacts to Francis Avenue. Thus, this TIA should successfully support the zone change and comprehensive plan modifications being sought with the 750 unit apartment project proposal being sought for Windhaven, as project impacts will be addressed.

No further recommendations are provided by this TIA.

TABLE OF CONTENTS

Traffic Forecasts and Capacity	ii
Improvement Recommendation and Mitigation	vii
Public Participation	viii
Summary	x
1 Introduction	1
1.1 Project Description	1
1.2 Analysis Scope and Methodology	6
2 Existing Conditions	9
2.1 Roadway Network	9
2.2 Traffic Counts	11
2.3 Traffic Operations & Capacity	15
2.4 Transit	18
2.5 Pedestrian and Bicycle Facilities	18
2.6 Collision Histories	18
3 Future 2021 Traffic Conditions	21
3.1 Roadway Network	21
3.2 Traffic Forecasts	22
3.3 Traffic Operations	36
3.4 Transit	40
3.5 Pedestrian and Bicycle Facilities	40
3.6 Microsimulation	40
4 Improvement Recommendation & Mitigation	42
4.1 Indian Trail Road Restriping and Widening	42
4.2 Maple Street/Francis Avenue Congestion Relief	43
4.3 Project Mitigation	43
5 Public Involvement	45
6 Summary and Conclusions	50
6.1 Traffic Forecasts and Capacity	51
6.2 Improvement Recommendations and Mitigation	53
6.3 Public Participation	54
6.4 Summary	55

TABLES AND FIGURES

TABLES

Table 1.	Vested Residential Land Uses & Trip Comparisons	3
Table 2.	Intersection Level of Service Criteria	7
Table 3.	Existing Intersection Geometrics and Traffic Controls	10
Table 4.	Arrival, Departure, and Queue Volume Comparisons.....	12
Table 5.	Indian Trail ADT and Speed Counts - AM and PM Peak Hours	12
Table 6.	Existing LOS and Delay – AM and PM Peak Hours	15
Table 7.	Existing Queue Potentials – AM and PM Peak Hours	16
Table 8.	Existing Indian Trail Lane Capacity – AM and PM Peak Hours	17
Table 9.	Vested Residential Land Use & Trip Generation Comparisons by TAZ	24
Table 10.	Project Trip Generation Gains	26
Table 11.	Forecast Year 2021 LOS and Delay – AM and PM Peak Hours	36
Table 12.	Future With-Project Queue Potentials – AM and PM Peak Hours.....	38
Table 13.	Future With-Project Indian Trail Lane Capacity – AM and PM Peak Hours.....	39

FIGURES

Figure 1.	Site Location	4
Figure 2.	Site Plan	5
Figure 3.	Existing Traffic Volumes - AM Peak Hour.....	13
Figure 4.	Existing Traffic Volumes - PM Peak Hour.....	14
Figure 5.	Pipeline Project Trip Assignments – AM Peak Hour.....	27
Figure 6.	Pipeline Project Trip Assignments – PM Peak Hour.....	28
Figure 7.	Future 2021 Without Project Traffic Volumes – AM Peak Hour.....	29
Figure 8.	Future 2021 Without Project Traffic Volumes – PM Peak Hour.....	30
Figure 9.	Project Trip Assignments – AM Peak Hour.....	32
Figure 10.	Project Trip Assignments – PM Peak Hour.....	33
Figure 11.	Future 2021 With Project Traffic Volumes – AM Peak Hour.....	34
Figure 12.	Future 2021 With Project Traffic Volumes – PM Peak Hour.....	35

Technical Appendix A: Glossary of Terms
Technical Appendix B: Summary Traffic Counts
Technical Appendix C: LOS Summary Worksheets
Technical Appendix D: Pipeline Project Trip Assignments
Technical Appendix E: Microsimulation Analysis
Technical Appendix F: Collision History Analysis

1 INTRODUCTION

Windhaven First Addition is an approved residential planned unit development (PUD) located within the Indian Trail neighborhood of Spokane, Washington. The project is located within a Residential Single Family (RSF) zone of the City with a Comprehensive Plan designation of Residential 4-10. Approved by City officials in the year 2006, the roadway infrastructure for the development has been constructed but no homes have been built.

As a result of evolving market conditions, the project proponent would like to develop apartment units on the site in-lieu of single family homes. A Comprehensive Plan amendment and zone change would be needed to accommodate this development modification. Specifically, Residential Multifamily (RMF) zone and Residential 15-30 Comprehensive Plan designations would be needed (and are being sought) to allow for apartment development.

Through the growth management act (GMA), City officials have planned for and certified transportation concurrency for roads within the Indian Trail neighborhood, as based on historical land use development proposals (Windhaven and other development projects). Zone and Comprehensive Plan changes could impact concurrency determinations. As such, City officials have requested due-diligence, in terms of a development traffic study, to assess the impact of a revised development proposal.

This report summarizes the Traffic Impact Analysis (TIA) performed for the Windhaven Apartments development proposed in the City of Spokane, Washington. The analysis identifies the transportation impacts of the current development proposal on primary arterials and roadways located within and providing access to the Indian Trail neighborhood. The scope and work program for this study was developed in coordination with technical staff from City of Spokane, and was performed in accordance with City of Spokane Road TIA Guidelines.

The City of Spokane is lead agency for this project and will provide principal TIA review. Any additional agencies would provide secondary review per the request of City officials.

1.1 PROJECT DESCRIPTION

Approved Project. The Windhaven First Addition project site occupies 49.48 acres aligned north of Barnes Road just under 1,000 feet west of Indian Trail Road within the Indian Trail neighborhood of Spokane. The approved project includes the construction of up to 286 single family homes programmed for construction over approximately five years. The project was historically approved for development by City officials in year 2006 within an RSF zone of the City and with a site Comprehensive Plan designation of Residential 4-10. The approved proposal represents a density of 5.8 single family homes per acre.

According to Spokane Municipal Code, the Residential Single-Family zone *“is a low density single-family residential zone. It allows a minimum of four and a maximum of ten dwelling units per acre. One- and two-story builds characterize the allowed housing. The major type of new development will be attached and detached single-family residences.”*

According to the City Comprehensive Plan, the Residential 4-10 *“designation allows single-family residences, and attached (zero-lot line) single-family residences. The allowed density is*

a minimum of four units and a maximum of ten units per acre. Allowed structure types are single-family residences, attached (zero-lot line) single family residences, or two-family residences in appropriate areas."

Primary access to the project has already been constructed via Forest Lane and Pamela Lane; two local streets extending into the development from Barnes Road (along southern boundary of site). Secondary access would be promoted through an extension of Jamestown Lane into the adjacent apartment development east of Windhaven. A final access was historically developed for vehicle traffic via an extension of Moore Street to Shawnee Avenue (along northern boundary of site). However, this approach would be used only for pedestrian access in the future.

As shown (right), Windhaven has already been developed with a network of local streets. North-south circulation streets include Concord Lane, Windhaven Lane, and Camden Lane. East-west circulation includes Jamestown Lane, Georgetown Lane, Morgantown Lane, Yorktown Lane, and Youngstown Lane.



Aerial: Existing Windhaven Site (Source: Google Maps)

Project Proposal. The project proponent has recently proposed to develop up to 750 apartment units on the 49.48 acre site, as a result of changing market demands. The proposal results in a density of 15.2 homes per acre, which exceeds the approved residential density. Thus, this proposal dictates that a Comprehensive Plan amendment and zone change would be needed to accommodate the apartment proposal; specifically to a RMF zone and Comprehensive Plan designation of Residential 15-30. The current apartment proposal results in a density that just marginally exceeds minimum zoning and Comprehensive Plan allowances, and just under half of maximum allowable density (nearly 1,500 apartments could be developed under these City designations). The reduced apartment densities

According to Spokane Municipal Code, the Residential Multifamily (RMF) zone *"is a medium-density residential zone. Allowed housing is characterized by one to four story structures and a higher percentage of building coverage than in the RTF zone. The major types of development will include attached and detached single-family residential, condominiums, apartments, duplexes, townhouses and row houses. The minimum and maximum densities are fifteen and thirty units per acre."*

The Residential 15-30 land use is simply described within the City Comprehensive Plan as a *"designation that allows higher density residential use at a density of 15 to 30 units per acre."*

Site access and internal circulation would be promoted as described previously. Primary access would be provided via the Barnes Road intersections with Forest Lane and Pamela Street. Secondary access would be provided by an extension of Jamestown Lane into the adjacent apartment complex. Pedestrian access only would be provided via Moose Street. Internal circulation would be promoted by three north-south and five east-west local streets.

Figure 1 provides a vicinity map locating Windhaven. Figure 2 provides the current site plan for the proposed apartment development. Note this plan will evolve with time. As such, this study was intentionally developed to review a high unit count for the site in order to present a worse-case analysis of project transportation impacts.

1.1.1 Project Scope

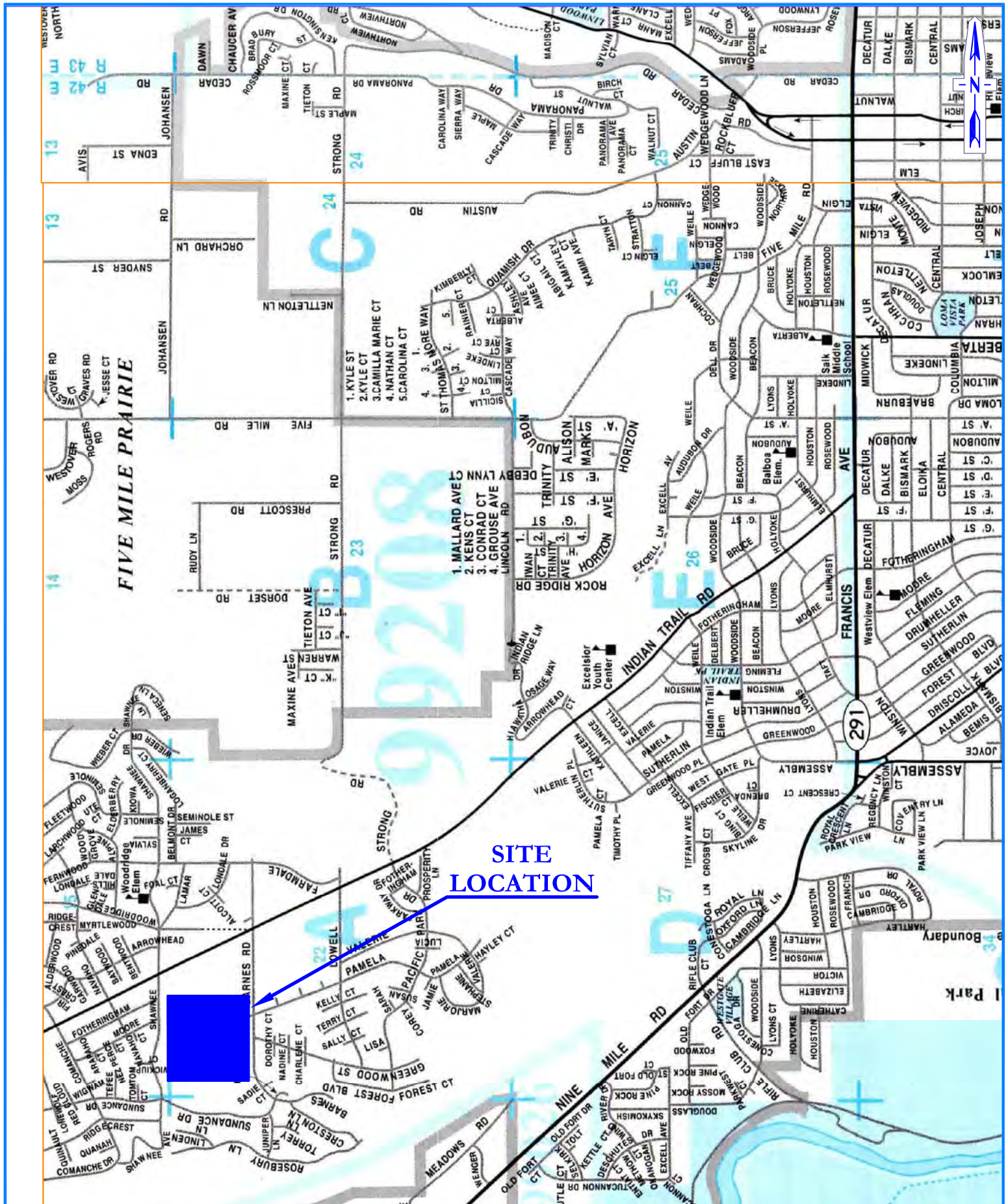
City transportation engineering staff has reviewed capacity conditions for primary roadways aligned within the Indian Trail neighborhood. To be clear, there are long term improvement needs confirmed within the area; in particular, the widening of Indian Trail Road to a four lane section between Lowell Avenue and Excell Avenue. However, city staff has been able to confirm transportation concurrency for Indian Trail roadways within the immediate future. This means they have been able to demonstrate that adequate capacity would generally be available to accommodate some traffic growth. Currently there are 12 development projects vested and approved via the Comprehensive Plan process.

Windhaven First Addition is one of the development projects vested and addressed within the current Comprehensive Plan. As indicated, 286 single family homes were approved historically and, according to City resources, this development would be allowed to generate 210 trips during the AM peak hour and 271 during the PM peak hour of the work commute under the previous Comprehensive Plan and zoning approval.

According to comparisons developed using the *Trip Generation Manual* (ITE 9th Edition, 2012), the trips generated by 286 homes is equivalent to the trips generated by 460 apartment units. Thus, from a transportation perspective, 286 single family homes and 460 apartments are generally equivalent. A summary of this comparison is provided in Table 1.

Table 1. Vested Residential Land Use & Trip Comparisons							
Residential Land Use	Dwelling Units	AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
Single Family Homes (ITE Code 210)	286	65	145	210	179	92	271
General Apartment Units (ITE Code 220)	460	46	183	229	176	95	271

Transportation concurrency is reviewed within the City of Spokane based upon PM peak hour traffic conditions. As shown above, the trips generated by 286 homes and 460 apartments are equal during the PM peak hour. There is a minor differential during the AM peak hour. Trip generation was based upon equations that relate trips to dwelling units for single and multi-family homes. Further discussion on trip generation is provided within Section 3.2.



**MORRISON
MAIERLE, INC.**
An Employee-Owned Company

Engineers
Surveyors
Scientists
Planners

316 W. BOONE
SUITE 360
Spokane WA 99201

Phone: (509) 991-8884
bwhite@m-m.net

DRAWN BY: WDW
CHKD. BY: KB
APPR. BY: KB
DATE: 05-2016

COPYRIGHT © MORRISON-MAIERLE, INC., 2016

WINDHAVEN APARTMENTS
TRAFFIC IMPACT ANALYSIS

SPOKANE

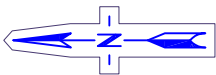
WA

PROJECT NO.
5594.002

SITE LOCATION

FIGURE NUMBER

1



**MORRISON
MAIERLE, INC.**
An Employee-Owned Company

Engineers
Surveyors
Scientists
Planners

316 W. BOONE
SUITE 360
Spokane WA 99201

Phone: (509) 991-8684
bwhite@m-m.net

COPYRIGHT © MORRISON-MAIERLE, INC., 2016

DRAWN BY: WDW
CHKD. BY: KB
APPR. BY: KB
DATE: 05-2016

SPOKANE

WINDHAVEN APARTMENTS
TRAFFIC IMPACT ANALYSIS

WA

PROJECT NO.
5594.002

FIGURE NUMBER

2

PRELIMINARY SITE PLAN
(Source: JR Bonnet Engineering)

1.2 ANALYSIS SCOPE AND METHODOLOGY

The purpose of this TIA is to review the traffic and transportation impacts of the proposed development on vicinity arterials and recommend improvements and strategies, as needed, to mitigate impacts in order to assure adequate transportation capacities. This section describes the primary scope and methods used to evaluate traffic conditions and determine potential improvements for the project study area.

1.2.1 Project Scope

A TIA evaluates roadway capacity primarily through an examination of intersection operations. Congestion and increased vehicle delays are experienced more rapidly at intersections versus road segments (between intersections) due to the number and frequency of conflicts (i.e. turning vehicles and stopping or slowing movements).

The scope for this study was established in coordination with City of Spokane and Washington State Department of Transportation (WSDOT) engineering officials. Per direction, this study quantifies traffic operations and capacity based principally on intersection level-of-service (LOS), as performed by direction for the intersections of:

- | | |
|------------------------------------|--|
| ◆ Shawnee Avenue/Indian Trail Road | ◆ Ash Street/Francis Avenue |
| ◆ Barnes Road/Indian Trail Road | ◆ Maple Street/Francis Avenue |
| ◆ Strong Road/Indian Trail Road | ◆ Barnes Road/Forest Lane (Project Access) |
| ◆ Indian Trail Road/Francis Avenue | ◆ Barnes Road/Pamela Lane (Project Access) |
| ◆ Alberta Street/Francis Avenue | |

Per the direction of local agency staff, the analysis was performed for the AM and PM peak/commute hours of the weekday, which are the highest hours of capacity demand within this area of Spokane. The forecast analysis horizon year for this study is 2021, which is the completion and final occupancy year of the proposed development.

1.2.1 Methodology - Intersection Operations

Intersection capacity was evaluated using the level-of-service (LOS) methodologies of the *Highway Capacity Manual* (TRB, 2010). The *Highway Capacity Manual* (HCM) is a nationally recognized and locally accepted method of measuring traffic flow and congestion for intersections. Criteria range from LOS A, indicating free-flow conditions with minimal vehicle delays, to LOS F, indicating congestion with significant vehicle delays (and operational failures).

LOS for a signalized intersection is defined in terms of the average control delay experienced by all vehicles at the intersection, as measured over a specific time period such as a peak hour. LOS for a one or two-way stop controlled intersection or driveway is the function of average control delays experienced by vehicles in a particular approach or approach movement over a timeframe such as a peak hour. Typically, the stopped approach or movement experiencing the worst LOS is reported. Finally, LOS at an all-way stop-controlled intersection is defined by the average control delays experienced by all vehicles at the intersection, as with signals, but the LOS thresholds are associated with delays for unsignalized intersections.

Table 2 outlines the LOS criteria for signalized and unsignalized intersections from the *Highway Capacity Manual*. As shown, LOS thresholds, as a function of delay, vary between signalized

and unsignalized intersections. This is because driver tolerances for delay have been documented to be much higher at signalized versus unsignalized intersections.

Table 2. Intersection Level of Service Criteria		
Level of Service	Signalized: Control Delay (sec/veh)	Unsignalized: Control Delay (sec/veh)
A	≤10	≤10
B	>10 – 20	>10 - 15
C	>20 – 35	>15 - 25
D	>35 – 55	>25 - 35
E	>55 – 80	>35 - 50
F	> 80	>50
Source: <i>Highway Capacity Manual</i> (TRB, 2010)		

LOS was determined for this study using Synchro Version 9.1, (Trafficware, 2015). This software tool can apply the analysis methodologies of HCM 2010 and is a standard industry software application.

LOS thresholds for the City of Spokane are highlighted by “Transportation Concurrency Level of Service Standards”, which is an administrative policy and procedure document available from the City clerk’s office. Section 5.2.1.3 indicates LOS E is the threshold for “signalized arterial intersections along Principal or Minor arterials identified on Comprehensive Plan Map TR3.” This standard applies to all signalized study intersections, as they are located along the principal arterials of Francis Avenue and Indian Trail Road. Section 5.2.2 indicates LOS E is the operational threshold for movements at unsignalized intersections. Road improvements and/or transportation demand strategies may be required to help mitigate capacity issues, as determined via results that fall below City LOS thresholds.

1.2.2 Methodology – Vehicle Queues

Average and 95th percentile queue analyses were performed to provide guidance regarding turn pocket impacts for signalized intersections. Average queues are those most typically predicted to occur at an intersection with some frequency. 95th percentile queues represent near-maximum queue conditions predicted to occur only a few times during the peak hour. While it is not ideal to have 95th percentile queue potentials exceed turn lane/pocket storage length, it is acceptable so long as average queues can be accommodated. A turn lane/pocket issue is prevalent when average queues exceed storage length. Thus some form of improvement may need to be considered; typically in the form of signal phase adjustment, turn lane/pocket adjustment, and sometimes even the provision of a second turn lane.

Queues are presented in terms of total “stacking” vehicles with the equivalent queue length provided in feet. For this study, an average length of 25-feet was used per vehicle, as recommended by the HCM, and via standard industry practices. This space includes the length of the vehicle plus spacing between vehicles. Queue determinations were provided using Synchro, which also bases evaluations on HCM methodologies.

1.2.3 Methodology – Lane Capacity

A lane capacity analysis was developed as a secondary measure and method for evaluating traffic conditions specifically for Indian Trail Road. This analysis was performed due to the “bottleneck” that exists along the roadway; caused by a narrowing of the arterial from four lanes south of Excell Avenue to three lanes north.

The lane capacity analysis was performed based upon peak hourly volume data provided by the Year 2011-2035 Spokane Metropolitan Transportation Plan (SRTC, 2011). Generally, the Plan provides vehicle per hour per lane (vphpl) capacity thresholds distinguished by functional classification and operating speed. According to this table, the best approximation of Indian Trail Road is that of a 30 mph urban arterial collector arterial; both with a practical capacity of 900 vphpl. Therefore, this was used as the basis for reviewing lane capacities for the roadway.

Table 2.2 SRTC Regional Demand Model Street Typology

Street Type	Type Number	Capacity (vphpl)	Operating Speed
Rural Freeway	1	2000	70
Rural Local Street	9	500	25
I-90, SR 195 to Freya-NSC	10	1800	60
Urban Interstate	11	2000	60
Urban Expressway	12	2000	60
Urban Arterial	14	1100	40
Urban Arterial – CBD	15	900	30
Collector Arterial	17	900	35
Urban Arterial-CBD–One-way	18	800	30
Local Street	23	500	25
Neighborhood Collector	20	600	30
Ramps	50	1600	40
Rural Highways	52	1800	60
Urban Arterial Ramp	53	1000	50
I-90 Viaduct Ramp, SR 195-Freya	54	1200	40
Local Road	60	1000	25
Exclusive Light-rail Transit Link	66	1000	35
Fairchild AFB	99	500	25

Hourly Lane Capacity Thresholds (Source: SRTC)

Note these are capacity thresholds typically associated and used with the development of a forecast travel demand model and are not typically used as a primary means for evaluating capacities on city roadways. However, this secondary means was sought specifically as a method for reviewing “through” traffic capacity on Indian Trail Road, as primary analysis measures focus on intersection operations.

Thus, the conclusions of this TIA were primarily derived from intersection analyses and the methodologies of the HCM. Secondary conclusions were derived from lane capacity analyses, and other considerations such as travel speed and queuing.

2 EXISTING CONDITIONS

This section describes existing traffic conditions within the project study area. Described are study roadways, current traffic volumes, and existing operations and capacity conditions.

2.1 ROADWAY NETWORK

The study focuses on traffic operations for a number of intersections located along the roadways of Indian Trail Road, Barnes Road, Strong Road, Francis Avenue, Alberta Street, Ash Street, and Maple Street. A description of study roadways is provided as follows, in order of descending functional classification:

- ◆ **Francis Avenue.** Also designated State Route 291, Francis Avenue is an *urban principal arterial*. The roadway has a five lane cross section, which includes a two-way left-turn lane (TWLTL), with contiguous sidewalk, curb, and gutter along both sides of the roadway. The posted speed limit is 35 mph within the study area. The current City traffic flow map indicates the arterial supports between 26,000 and 29,000 average daily traffic (ADT) within the study area east of Indian Trail Road, dropping to 11,900 ADT west.
- ◆ **Indian Trail Road.** This *urban principal arterial* has a speed limit of 35 mph within the City of Spokane. City traffic flow map indicates the roadway supports about 17,100 ADT north of Francis Avenue, dropping to 11,000 ADT north of Strong Road. Curb, sidewalk, and gutter are contiguous on both sides of the roadway throughout the project study area. Precluding intersection configurations, general lane geometrics are as follows:
 - Four travel lanes immediately north of Francis Avenue to about Elmhurst Avenue (approximate 500 foot section).
 - Five lanes (including a TWLTL) adjacent to Indian Trail Center between Elmhurst Avenue and Holyoke Avenue (nearly a 900 foot section).
 - Four lanes from Holyoke Avenue north to about Excell Avenue (about a 3,600 foot section).
 - Three lanes (including a TWLTL) north of Excell Avenue to Lowell Avenue (about a 5,100 foot section). A traffic “bottleneck” has been noted to occur in the four to three lane transition area within the vicinity of Excell Avenue.
 - Four lanes with two southbound, one northbound, and one TWLTL between Lowell Avenue and Barnes Road (nearly a 1,500 foot section) adjacent to Sundance Plaza.
 - Three lanes (including a TWLTL) north of Excell Avenue to nearly City limits (section length is greater than a mile).
- ◆ **Maple Street & Ash Street Couplet.** These are urban principal arterials throughout the majority of the City. Maple Street is a two-lane northbound arterial and Ash Street a two lane southbound arterial; both with posted speeds of 30 mph within the vicinity of Francis Avenue. Sidewalk, curb, and gutter are contiguous along both sides of both roadways within the project study area. City traffic flow maps indicate about 25,000 ADT south and nearly 28,000 ADT north of Francis Avenue on the couplet.
- ◆ **Alberta Street.** This is an *urban minor arterial* with a three-lane cross-section, including a TWLTL, and a posted speed limit of 30 mph south of Francis Avenue. North of Francis Avenue, this *local street* with a two-lane cross-section and posted speed limit of 25 mph. Curb, gutter, and sidewalk are contiguous along the arterial. Traffic flow maps indicate the roadway supports 10,600 ADT south of Francis Avenue with no counts to the north.

- ◆ **Barnes Road.** This is an *urban major collector* for approximately ½ mile on either side of Indian Trail Road. The collector primarily has a two-lane cross-section east of Indian Trail Road. The roadway has a five-lane cross section for about 1,300 feet west of Francis Avenue, adjacent to Sundance Plaza; continuing an approximate 2,000 additional feet as a three lane roadway (including a TWLTL). The speed limit is 25 mph within the study area. Curb, gutter, and sidewalk are contiguous along the majority of the roadway. City traffic flow maps indicate the roadway supports about 2,000 ADT on either side of Indian Trail Road.
- ◆ **Shawnee Avenue.** This is currently classified as an *urban major collector* within the City. The roadway has a two-lane cross section, improved with sidewalks, curb, and gutter. The posted speed limit is 25 mph with a 20 mph school zone west of Indian Trail Road. The roadway supports about 2,300 ADT.
- ◆ **Strong Road.** This is currently classified as an *urban major collector* within the City. The roadway has a two-lane cross section, improved with sidewalks, curb, and gutter west of Indian Trail Road. A 40-foot wide, unimproved section (a gravel roadway) is aligned east of Indian Trail Road. The posted speed limit is 25 mph. The roadway is estimated to support less than 2,000 vehicles per day within the study area.

A summary of existing intersection turn lane locations and traffic control conditions (signal, one-way, two-way, or all way stops) is provided in Table 3. Shown are different traffic movements at intersections and whether a turn-lane is provided. If no specific lane is shown, then turns are performed from adjacent, shared through-lane. Also indicated are traffic control conditions for the intersection. Controls and lanes are denoted with an “X”. Turn lanes are denoted with a “1” for a single-lane, “2” for a double-lane, etc.

Table 3. Existing Intersection Geometrics and Traffic Controls												
Intersection	Traffic Control				Intersection Geometrics							
	Traffic Signal	One-Way Stop	Two-Way Stop	All-Way Stop	NB Left Turn Lane	NB Right Turn Lane	SB Left Turn Lane	SB Right Turn Lane	WB Left Turn Lane	WB Right Turn Lane	EB Left Turn Lane	EB Right Turn Lane
Shawnee Ave/Indian Trail Rd	X	-	-	-	1	1	1	1	1	-	1	-
Barnes Rd/Indian Trail Rd	X	-	-	-	1	1	1	1 ³	1	-	1	-
Strong Rd/Indian Trail Rd	X	-	-	-	1	1	1	1	-	-	1	-
Indian Trail Rd/Francis Ave	X	-	-	-	-	-	2 ¹	-	-	1	1	-
Alberta St/Francis Ave	X	-	-	-	-2 ¹	-	1	-	1	-	1	-
Ash St/Francis Ave	X	-	-	-	-	-	1	1	1	-	-	-
Maple St/Francis Ave	X	-	-	-	2 ²	-	-	-	-	-	1	-
Barnes Rd/Forest Ln	-	X	-	-	-	-	-	-	-	-	1	-
Barnes Rd/Pamela Ln	-	-	X	-	-	-	-	-	1	-	1	-
<ol style="list-style-type: none"> 1. Double left-turn lane with right-turns shared from outer left-turn lane. 2. Double left-turn lane with through movements shared from inner left-turn lane. 3. Widened pocket that continues as a through lane south of intersection. 												

2.2 TRAFFIC COUNTS

Traffic counts were collected specifically for this study on typical weekdays in March and April of 2016 (Tuesday through Thursday). Traffic counts were performed in the morning between 7:00 and 9:00 AM and in the afternoon/evening between 4:00 PM to 6:00 PM in order to identify the AM and PM peak hours of commute traffic activity for each intersection.

The peak volume for each intersection was used in traffic analyses, respectively, in order to assure a worst-case review of capacity demands. As such, the peak hour did vary between intersections during the morning and afternoon timeframes. With that said, a prevalent 7:00 to 8:00 AM peak hour was noted on Indian Trail Road in the morning. A 5:00 to 6:00 PM peak was noted at nearly all study intersections during the evening. Original count worksheets are provided in Section B of the technical Appendix.

Typically, raw counts are used directly in LOS analysis. However, in some situations, a reconciliation of arrival versus departure volumes must be performed to fully consider travel demands at intersection. A departure volume is noted as vehicle traffic crosses the stop-bar and enters an intersection; typically recorded and used in analyses as specific through and turn movements are identified. However, in some instances arrival volumes must also be recorded as vehicle traffic does not always make it through the stop-bar during a typical signal cycle. Residual traffic must therefore wait in queues until the next green phase (or more) allows them to clear the intersection. The difference in arrival less departure traffic represents additional travel demands upon through and turning movements at an intersection. Thus, this differential is recorded and then combined with base/raw traffic counts in order to fully review travel demands upon an intersection.

Upon scope coordination with City and State agencies, it was determined there were particular approaches of concern where vehicle traffic did not clear the stop-bar and had to wait through an additional signal cycle on Francis Avenue and Indian Trail Road. The movements and timeframes of concern are as follows:

- ◆ Eastbound Alberta Street/Francis Avenue - AM Peak Hour
- ◆ Eastbound Ash Street/Francis Avenue - AM Peak Hour
- ◆ Southbound Indian Trail Road/Francis Avenue - AM Peak Hour
- ◆ Northbound Maple Street/Francis Avenue - PM Peak Hour
- ◆ Westbound Maple Street/Francis Avenue - PM Peak Hour
- ◆ Westbound Indian Trail Road/Francis Avenue - PM Peak Hour

Follow-up counts were performed in March 2016 for the traffic movements specified, for the respective AM and PM peak hours noted through weekday counts. Data collected included arrival volumes, departing traffic (crossing the stop-line), and then the remaining vehicles that queue following the end of the green signal phase. Counts were performed for every signal cycle, with residual queues/vehicle identified following many signal cycles. These residual vehicles were summarized for each approach noted above and combined, as needed, with raw counts to assure maximum travel demands would be assessed with this TIA.

A summary of this comparison is provided in Table 4 for the AM and PM peak hours. The original count worksheets are provided in Technical Appendix B. The original count worksheets show arrival, departure, and queue volumes on a per cycle basis.

Table 4. Arrival, Departure, and Queue Volume Comparisons

Location & Approach	Timeframe	Original Count	Additional Arrival Count	Additional Departure Count	Queue Volume
Eastbound Alberta St/Francis Ave	AM Peak	1,175	1,228	193	1,413 ✓
Eastbound Ash St/Francis Ave ¹	AM Peak	1,053	1,029	61	1,090 ✓
Southbound Indian Trail Rd/Francis Ave	AM Peak	1,113	1,129	20	1,149 ✓
Northbound Maple St/Francis Ave	PM Peak	1,374	1,406	31	1,437 ✓
Westbound Maple St/Francis Ave	PM Peak	1,362	1,362	28	1,390 ✓
Westbound Indian Trail Rd/Francis Ave	PM Peak	1,636 ✓	997	7	1,004
1. Through volume only impacted.					

As shown, the majority of follow up counts exceed original counts when factoring in the residential queues (i.e. the balance remaining between arrival and departure counts). The only exception occurs within the westbound approach to the Indian Trail Road/Francis Avenue intersections. As such, the higher of count volumes were used in the analysis, as denoted with a check (✓). The resulting traffic gains for these approaches were proportioned to each movement based on turning volume count data. [Figure 3](#) and [Figure 4](#) provide a summary of the resulting AM and PM peak hour counts for study intersections.

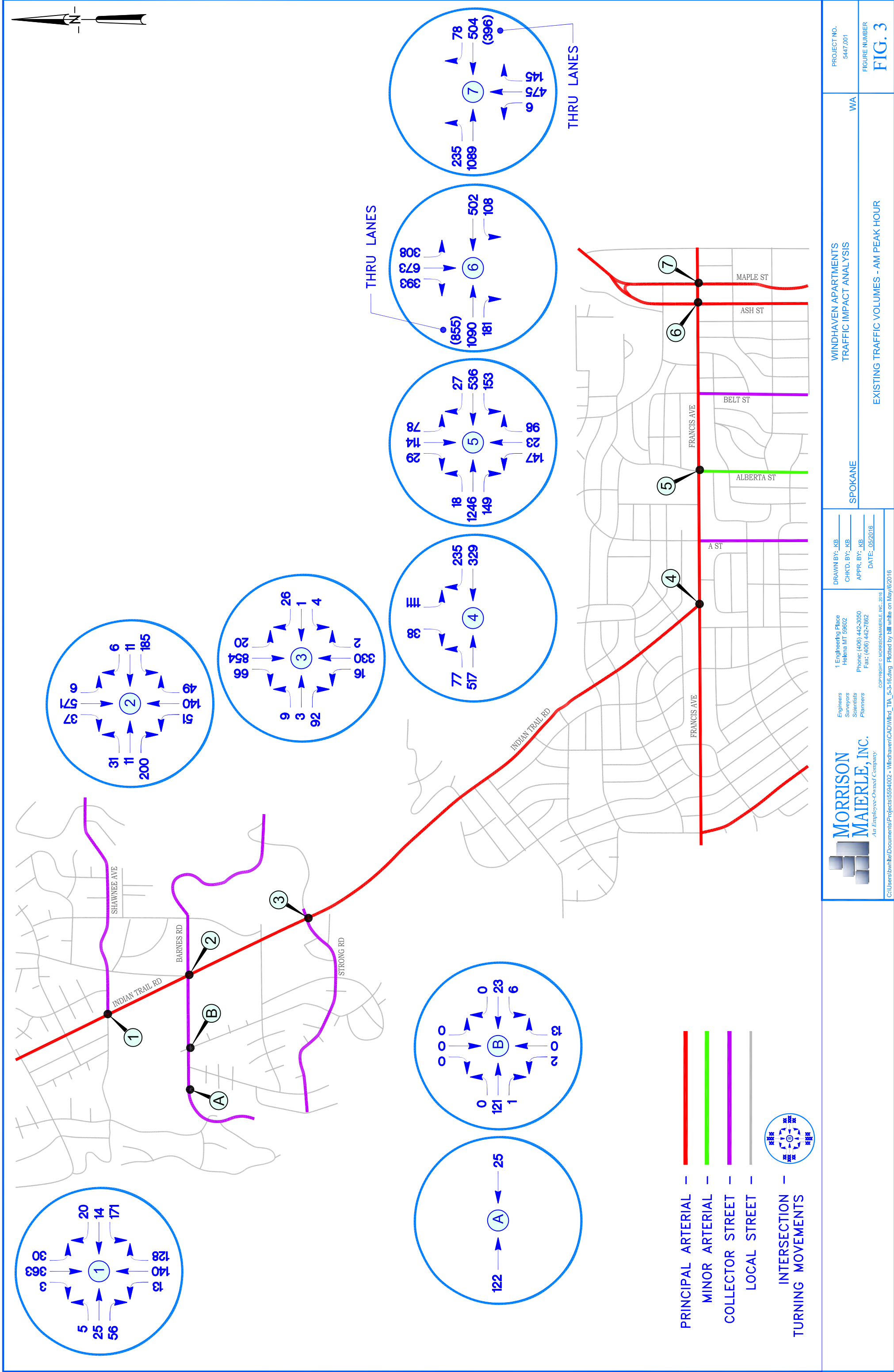
Speed Counts. Speed counts were performed at three locations to further review the impact of the “bottleneck”. Counters were placed on Indian Trail Road: 1) north of Weile Avenue (south of bottleneck); 2) north of Kathleen Avenue (within bottleneck); and 3) north of Lowell Avenue (north of Bottleneck). Average speeds and corresponding ADT are summarized in [Table 5](#).

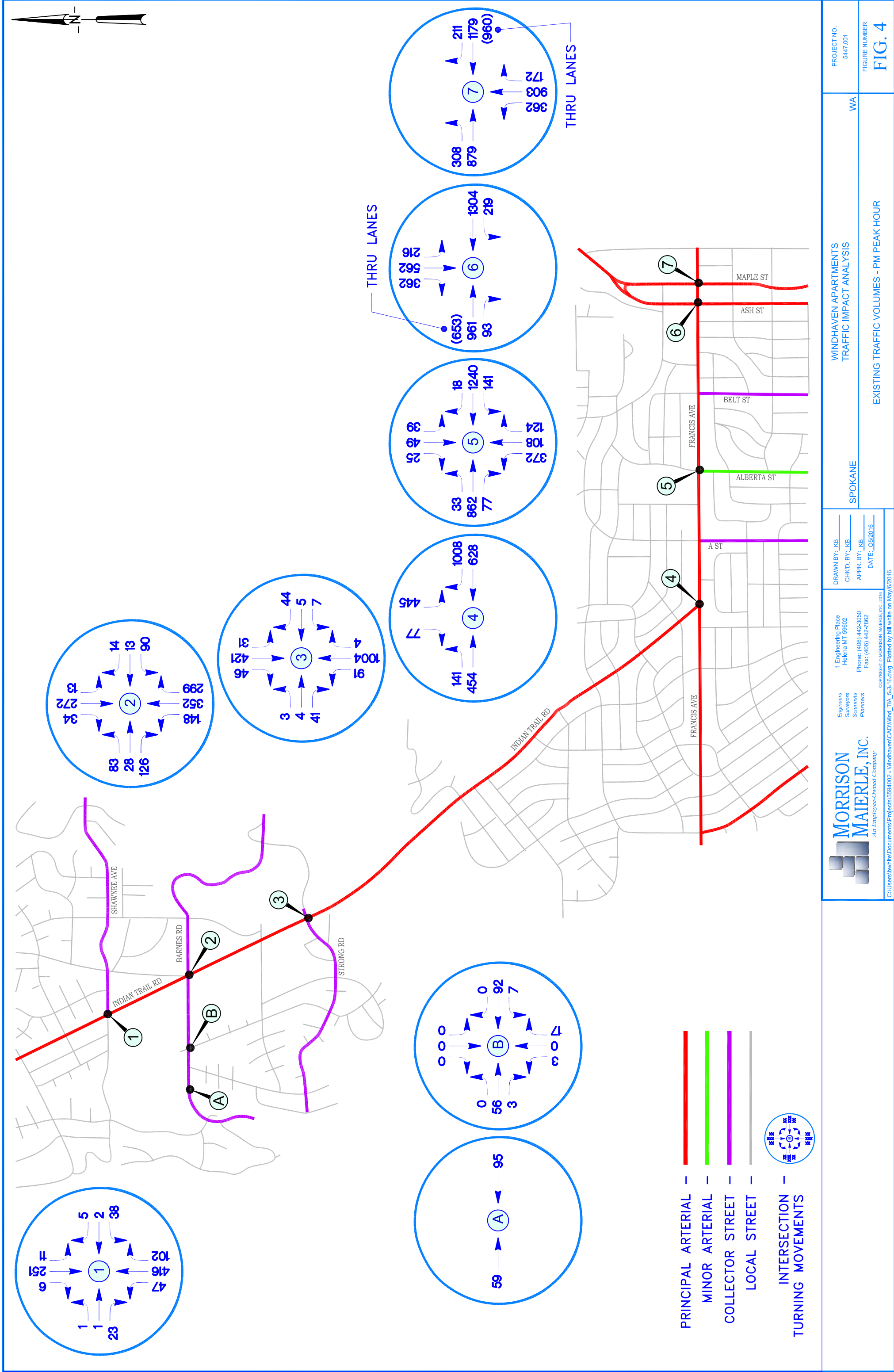
Table 5. Indian Trail ADT and Speed Counts - AM and PM Peak Hours

Indian Trail Road	ADT	Average Speed - Northbound		Average Speed - Southbound	
		AM Peak	PM Peak	AM Peak	PM Peak
N/of Weile Ave	17,299	36.5	36.8	36.0	35.7
N/of Kathleen Ave	16,821	37.9	36.8	34.8	37.9
N/of Lowell Ave	13,555	34.3	31.9	33.4	33.2

As shown, ADT counts range between 17,300 ADT south to 13,555 north of the bottleneck. The posted speed limit is 30 mph. Counts indicate average speeds exceed the posted limit by 3 to nearly 8 mph throughout analysis limits in both directions. There is a minimal difference in average speeds between the four lane section south of the bottleneck and the three lane section within the bottleneck.

School Traffic. This statement has been provided to simply acknowledge that all traffic counts were performed while local schools were in operation within the study area. Area schools can generate traffic that results in higher demand on City roadways. Thus, counts were performed to assure the activities of schools such as Indian Trail Elementary, Woodridge Elementary, Westview Elementary, Balboa Elementary, and Salk Middle School are addressed.





2.3 TRAFFIC OPERATIONS & CAPACITY

The LOS and capacity analyses were performed based on a review of the adjusted traffic volumes summarized in Section 2.2 and the geometric conditions described in Section 2.1. Signal timing data was provided by City of Spokane staff via Synchro files and timing cards.

This data includes information such as phase minimum and maximum splits, all-red and yellow times, pedestrian timing data, additional vehicle passage and gaps, etc.; generally the working parameters of an actuated traffic signal. No optimization or adjustment was made to these files as to maintain precise City timings noted in the field, including coordination details for the Ash and Maple Street intersections with Francis Avenue. Note that northbound lane utilizations for the Maple Street/Francis Avenue intersection were adjusted per field observations performed in July 2016, per the direction of City officials. These utilizations were used in forecast analyses as well.

Table 6 provides a summary of LOS for the AM and PM peak hours. Also shown are average control vehicle delays for each intersection. Note there are no project turning movements that currently occur at the Forest Lane and Pamela Lane intersections with Barnes Road. As such, these intersections were not included in the analysis.

Table 6. Existing LOS and Delay - AM and PM Peak Hours				
Signalized Intersections	AM Peak		PM Peak	
	LOS ¹	Delay ²	LOS ¹	Delay ²
Shawnee Ave/Indian Trail Rd	B	17.3	A	7.7
Barnes Rd/Indian Trail Rd	B	18.1	B	14.4
Strong Rd/Indian Trail Rd	A	9.7	B	18.9
Indian Trail Rd/Francis Ave	B	12.3	A	7.9
Alberta St/Francis Ave	D	36.4	C	32.2
Ash St/Francis Ave	C	22.3	C	20.4
Maple St/Francis Ave	B	17.7	D	41.9
1. LOS = Levels-of-Service 2. Del = Delay in seconds				

As shown, all study intersections currently function within acceptable LOS ranges, as no signalized intersection functions below LOS E. This indicates that no capacity improvements would be warranted on the basis of existing traffic operations, as there is sufficient roadway capacity. LOS summary worksheets are provided in Section C of the Technical Appendix.

Queue Potentials. Existing queue potentials were reviewed for study intersections. As indicated, both average and 95th percentile queues are considered. Most acceptable conditions are those where average and 95th percentile queues do not exceed lane/pocket storage. Tolerable conditions are those where average queues do not exceed lane storage/pocket length, even when 95th percentile queues do exceed storage. Unacceptable conditions are noted where both average and 95th percentile queues exceed available lane/pocket storage.

Summary queue conditions are provided in Table 7 for the AM and PM peak hours. Again, queues are represented in terms of vehicle demands versus vehicle storage. A sense of length impacts is determined roughly by multiplying vehicles times a transportation industry spacing standard of 25 feet.

Table 7. Existing Queue Potentials - AM and PM Peak Hours					
Signalized Intersections	Lane Capacity	AM Peak		PM Peak	
		Avg.	95%	Avg.	95%
Shawnee Ave/Indian Trail Rd – Northbound Left-Turn Lane – Northbound Right-Turn Lane – Southbound Left-Turn Lane – Southbound Right-Turn Lane – Westbound Left-Turn Lane – Eastbound Left-Turn Lane	7 vehicles ¹ 3 vehicles 3 vehicles ¹ 3 vehicles 3 vehicles 3 vehicles	1 vehicle 0 vehicle 1 vehicle 0 vehicle 5 vehicle 1 vehicle	1 vehicles 1 vehicle 1 vehicle 0 vehicle 6 vehicles 1 vehicles	1 vehicle 1 vehicle 1 vehicle 1 vehicle 1 vehicle 0 vehicle	1 vehicle 1 vehicle 1 vehicle 1 vehicle 2 vehicles 1 vehicles
Barnes Rd/Indian Trail Rd – Northbound Left-Turn Lane – Northbound Right-Turn Lane – Southbound Left-Turn Lane – Westbound Left-Turn Lane – Eastbound Left-Turn Lane	8 vehicles ¹ 5 vehicles 7 vehicles ¹ 6 vehicles 4 vehicles	1 vehicle 0 vehicle 1 vehicle 3 vehicles 1 vehicle	2 vehicles 1 vehicle 1 vehicle 6 vehicles 2 vehicles	2 vehicles 1 vehicle 1 vehicle 1 vehicle 1 vehicle	5 vehicles 5 vehicles 1 vehicle 3 vehicles 3 vehicles
Strong Rd/Indian Trail Rd – Northbound Left-Turn Lane – Northbound Right-Turn Lane – Southbound Left-Turn Lane – Southbound Right-Turn Lane – Eastbound Right-Turn Lane	7 vehicles ¹ 4 vehicles 7 vehicles ¹ 4 vehicles 8 vehicles	1 vehicle 0 vehicle 1 vehicle 1 vehicle 1 vehicle	1 vehicle 0 vehicle 1 vehicle 1 vehicle 2 vehicles	1 vehicle 0 vehicle 1 vehicle 0 vehicle 0 vehicle	2 vehicles 0 vehicle 1 vehicle 1 vehicle 1 vehicle
Indian Trail Rd/Francis Ave – Westbound Right-Turn Lane – Eastbound Left-Turn Lane	16 vehicles ² 2 vehicles	0 vehicle 1 vehicle	2 vehicles 2 vehicles	1 vehicle 1 vehicle	7 vehicles 3 vehicles
Alberta St/Francis Ave – Northbound Left-Turn Lane – Southbound Left-Turn Lane – Westbound Left-Turn Lane – Eastbound Left-Turn Lane	9 vehicles ¹ 4 vehicles 8 vehicles ¹ 8 vehicles ¹	4 vehicles 2 vehicles 3 vehicles 1 vehicle	7 vehicles 4 vehicles 8 vehicles 1 vehicle	8 vehicles 1 vehicle 2 vehicles 1 vehicle	17 vehicles 3 vehicles 5 vehicles 2 vehicles
Ash St/Francis Ave – Southbound Left-Turn Lane – Southbound Right-Turn Lane – Westbound Left-Turn Lane	21 vehicles 21 vehicles 20 vehicles ^{1,3}	6 vehicles 4 vehicle 2 vehicles	9 vehicles 7 vehicles 6 vehicles	5 vehicles 7 vehicles 6 vehicles	8 vehicles 12 vehicles 7 vehicles
Maple St/Francis Ave – Northbound Left-Turn Lane – Eastbound Left-Turn Lane	13 vehicles 20 vehicles ^{1,3}	1 vehicle 6 vehicles	1 vehicle 8 vehicles	9 vehicle 9 vehicles	16 vehicle 16 vehicles
<ol style="list-style-type: none"> 1. Transitions into a TWLTL, so additional storage can be available. 2. Free movement which turns into a designated receiving lane, so queues not as critical. 3. The designated left-turn lane is broken by an intersection so queue pocket is a two-length measurement. 					

As shown, the majority of average queues are accommodated within available turn lane/pocket lengths, which represent acceptable or tolerable conditions. The only exception occurs within the westbound left-turn lane for the Shawnee Road/Indian Trail intersection. Both analytically

and through visual inspection in the field, queues extend beyond the available turn pocket for about 10 to 15 minutes of the peak hour(s) as a result of activities associated with Woodridge Elementary school. Outside these short timeframes, queue activity is minimal; thus, there would be minimal cost-benefit to extending the lane for a 20 to 30 minute queue impact per day.

95th percentile exceptions are noted at the following locations:

- ◆ Shawnee Avenue/Indian Trail Road – Westbound left turn 95th percentile queues exceed storage by 3 vehicles during the AM peak hour.
- ◆ Indian Trail Road/Francis Avenue – Eastbound left-turn 95th percentile demands exceed storage by one vehicle during the PM peak hour.
- ◆ Alberta Street/Francis Avenue – Northbound left-turn 95th percentile queues exceed storage by 8 vehicles; although there is a shared left-turn lane at this intersection also. As such, this impact may be somewhat overstated during the PM peak hour.

Indian Trail Lane Capacity. Lane capacities were reviewed for three count locations on Indian Trail Road: 1) north of Weile Avenue (south of bottleneck); 2) north of Kathleen Avenue (within bottleneck); and 3) north of Lowell Avenue (north of Bottleneck). As indicated, a practical lane capacity is 900 vphpl as based on information provided by the SRTC. A summary of existing approach counts versus capacity is provided in Table 8 for the AM and PM peak hours.

Note the lane capacity analysis is based on a review of through-lane capacity only (northbound and southbound travel lanes). A TWLTL helps traffic operationally as it accommodates neighborhood turning traffic, but it has minimal influence on the movement of through traffic.

Table 8. Existing Indian Trail Lane Capacity - AM and PM Peak Hours									
Indian Trail Road	Capacity			AM Peak Hour			PM Peak Hour		
	NB	SB	Tot	NB	SB	Tot	NB	SB	Tot
N/of Weile Ave	1,800	1,800	3,600	287	1,114	1,401	1,099	450	1,549
N/of Kathleen Ave	900	900	1,800	283	1,151	1,434	1,085	449	1,534
N/of Lowell Ave	900	900	1,800	246	954	1,200	807	384	1,191

As shown, lane capacity is sufficient within the four lane section of Indian Trail north Road north of Weile Avenue. However, existing counts are shown to exceed directional lane capacities within the bottleneck area north of Kathleen Avenue. Specifically, counts exceed southbound lane capacities during the AM peak hour and northbound capacities during the PM peak hour, by approximately 200 to 250 vehicles. There is minor lane capacity exceptions noted north of Lowell Avenue, but overall capacity appears to be sufficient north of the bottleneck.

This review was based on data collected from machine counters. There is some difference between approach volumes from these counts versus turn movement counts because: 1) machine and tube counts were performed on different days and 2) differences in count location.

2.4 TRANSIT

Spokane Transit Authority (STA) operates one accessible route within reasonable vicinity of Windhaven. STA Route 23 “Maple/Ash” accesses the Indian Trail neighborhood on weekdays only, with no service provided on weekends. The weekday route operates on a 30 minute rotation, operating along Indian Trail Road between 7:00 AM and 6:30 PM. The route circulates between the downtown Plaza and Meadow Park Glen (a bus turnaround north of Blackfoot Avenue) principally via Monroe Street, Broadway Avenue, the Maple/Ash Couplet, Rowan Street, Alberta Street, Francis Avenue, and Indian Trail Road.

The nearest transit stops to Windhaven are located at the Barnes Road/Indian Trail Road intersection. Located approximately ¼ mile to the east, these stops are within reasonable walking distance for typical transit users.

2.5 PEDESTRIAN AND BICYCLE FACILITIES

Pedestrian access/mobility and circulation is generally well-served within the project study area. This supposition is based on the consideration of sidewalk being available on most arterial roadways leading to/from the development. Specifically, sidewalk is available between the development and destinations such as STA transit access, the nearby Sundance Plaza shopping center (Albertsons, Rite Aid, Starbucks, Subway, and other shops and restaurants), Pacific Park (on Lowell Avenue), and the Indian Trail Spokane public library.

According to the Spokane Regional Transportation Council website, Indian Trail Road and Barnes Road are two designated bike routes within the project vicinity. Both roadways are designated as “Shared Roadway” routes, defined as a select roadway allowing both vehicular traffic and bicycle traffic to share the street. There is no signage, striping, or designated bike lanes along these types of bicycle routes.

2.6 COLLISION HISTORIES

Per public comment and the subsequent direction of City officials, an analysis of collision histories was performed to support this TIA. The analysis was summarized as submitted to the City on June 8, 2016 as a supplemental analysis called “Windhaven Apartments, Indian Trail Safety/Collision Analysis”. This technical memorandum is summarized in Section F of the Technical Appendix. A summary of the analysis is provided in this section.

Collision histories were reviewed for 2.67 miles of Indian Trail Road between Navaho Avenue and Francis Avenue, as directed by City officials. Intersections, driveways, and mid-block locations were considered, as well as for the corridor section overall. Histories were reviewed for nearly a three and a half-year period extending between January 1, 2013 and May 31, 2016, the most current three-plus year timeframe available. Collision data was provided by City of Spokane officials. The histories/data reviewed reflects recorded collisions, as identified through evidentiary reports provided by City of Spokane, Spokane County, and/or State law enforcement officials. Unreported collisions do occur on roadways such as Indian Trail Road. However, Safety studies can be performed only based on recorded data. Most typically, unreported collisions would involve minor property damage only (typically non-injury).

The purposes of collision analyses is to determine whether safety issues occur as a result of operational or design issues, such as signal phase issues, sight distance limitations,

channelization alignment issues, etc. A location where numerous incidents occur could indicate a high accident location (HAL). A high number of collisions occurring along a street or street section may indicate a high accident corridor (HAC).

Any collision is important to consider and is relevant in safety analyses. However, collisions are reviewed on the basis of severity rates to help determine whether some form of remediation may be needed to address persistent, reoccurring collision issues within the context of traffic densities. An intersection or corridor section may have a high number of collisions/incidents, but this is not as statistically significant if the high traffic volumes are also experienced. Collision rates are calculated to provide a statistical means for quantifying collision density.

Typically jurisdictions such as Spokane have no set thresholds for identifying an HAL or HAC. However, a typical industry recommendation is that further evaluation/analysis should be considered if accident rates exceed 1.0 collisions per million entering vehicles for an intersection or driveway.

The Washington State Department of Transportation provides collision statistics within annual summary reports. The “2014 Annual Collision Summary”, the most current report available, indicates Spokane County experiences a system/network-wide rate of 168.7 collisions per 100 million miles of travel, or 1.687 collisions per million miles of travel.

Data and Results. 52 recorded collisions were recorded to occur along Indian Trail Road during the three year and five month study period. Overall, 42 percent of collisions involved vehicle property damage only with 58 percent involving injuries. There were no fatalities within the study timeframe. An average of 15.2 collisions occurs along Indian Trail Road each year that, when compared with an average of 15,892 ADT, results in a CCR of 0.98 collisions per million miles of vehicle travel. Three prevailing collision types along the corridor include:

1. **35% Rear-End Collisions** - A following vehicle collides with a preceding stopped or slowing vehicle);
2. **25% Left Angle** - A left turn “tee” collisions where a permissive left-turning vehicle crosses in front of a through vehicle at an intersection or driveway.
3. **19% Right Angle** - A right-turning vehicle at an intersection or driveway enters the roadway in front of a through vehicle.

The remaining 21 percent of collision types varied between same direction side-swipe, opposite direction side-swipe, opposite direction head-on, a collision with a fixed object (tree, pole, sign, or parked car), and a collision with a pedestrian or bicyclist.

A summary of intersection collision data for the highest three intersection locations, as determined on the basis of ICR comparisons, is summarized as follow:

1. **Francis Avenue/Indian Trail Road.** Sixteen collisions occurred over three years and five months with an average of 4.7 collisions occurring per year; calculating to an ICR of 0.74 collisions per million entering vehicles. Severities were equal between injury and property damage only collisions. The prevailing intersection types include left-angle (56-percent) and rear end (31 percent).
2. **Navaho Avenue/Indian Trail Road.** Three collisions occurred over three years and five months with an average of 0.9 collisions occurring per year; calculating to an ICR of 0.59

collisions per million entering vehicles. Two collisions involved property damage only with one injury accident. All collisions were right angle.

3. **Barnes Road/Indian Trail Road.** Eight collisions occurred over three years and five months with an average of 2.3 collisions occurring per year; calculating to an ICR of 0.47 collisions per million entering vehicles. 75 percent of collisions involved injuries with 25 percent property damage only. The prevailing intersection types include left and right-angle collisions (63 percent). A pedestrian was hit crossing at the intersection.

The supplemental report indicates intersection and driveway ICR do not exceed 1.0 collisions per million entering vehicles. Thus, it does not appear an HAL is prevalent on the basis of collision densities. Similarly, the CCR is just below 1.0 collisions per million entering vehicles, suggesting a HAC does not exist along Indian Trail Road as the rate is well below the average for roadways throughout Spokane County.

Other highlights and pertinent information from the safety analysis includes:

- ◆ No fatalities were noted within the three year and five month study timeframe.
- ◆ A pedestrian incident was noted at the Barnes Road intersections.
- ◆ A pedestrian incident was noted mid-block between Shawnee Avenue and Barnes Road.
- ◆ Nine collisions were attributed to “wet” roadway conditions, with four during rain, outside of snow/ice.
- ◆ Two additional collisions were attributed to snow/ice.
- ◆ Twelve collisions occurred at night (dark)

3 FUTURE 2021 TRAFFIC CONDITIONS

This section summarizes year 2021 future traffic conditions. Described are future roadway network changes, future traffic volumes, and forecast traffic operations and capacity.

3.1 ROADWAY NETWORK

Project One. An improvement project is programmed and fully funded for the study area. *The City of Spokane Six Year Capital Improvement Program* (City of Spokane, 2016) highlights the Barnes Road, Phoebe to Strong “Safety” project programmed for construction in year 2017. The project includes the construction of a two lane roadway with offset sidewalks constructed about 2,200 feet between Phoebe Drive (west) and Strong Road (east).

The project will improve access to the Five Mile neighborhood (east of the Indian Trail neighborhood) and north of Spokane, as opposed to continued and lengthier travel via Francis Avenue, the Maple/Ash couplet, and/or other arterials. The project is anticipated to divert 80 percent of existing traffic turning to/from the east at the Strong Road/Indian Trail Intersection to the new connection via Barnes Road. In addition, future development trips are anticipated to use the new roadway, as described in the next section.

Given this is programmed and fully funded prior to the year 2021 analysis/horizon year of this study, the capacity benefit from this improvement project was included in forecast analyses.

Project Two. The North Indian Trail Road Widening project has been incorporated into the City of Spokane Transportation Impact Fee program. The project includes the widening of Indian Trail Road with two through lanes constructed between Barnes Road (north) and Excell Avenue (south), maintaining the TWLTL; including any signal upgrades.



Barnes Rd Improvement Alignment (Source: City)

The timeline for this project cannot yet be determined. City officials are aware of the need and citizens of the Indian Trail neighborhood support the project. However, the City currently lacks the funding needed to construct this \$3,000,000 project. As such, this project is not yet programmed in the *Six Year Capital Improvement Program*. Given these conditions, the improvement was NOT reflected in future year 2021 analyses.

Project Three. There are a number of pavement preservation projects programmed by the City throughout the Indian Trail neighborhood. These will improve street conditions but do not impact circulation or capacity. Specifically a pavement rehabilitation project is programed for

Indian Trail Road in year 2018. While this is not relevant to capacity on the onset, it is highlighted because of mitigation discussions provided later within this document for the arterial.

There are no other agency or development improvements planned or programmed within the five-year analysis timeframe of this project. Other than the trips diverted as a result of the Barnes Road extension, no other improvements or changes to forecast conditions were considered.

3.2 TRAFFIC FORECASTS

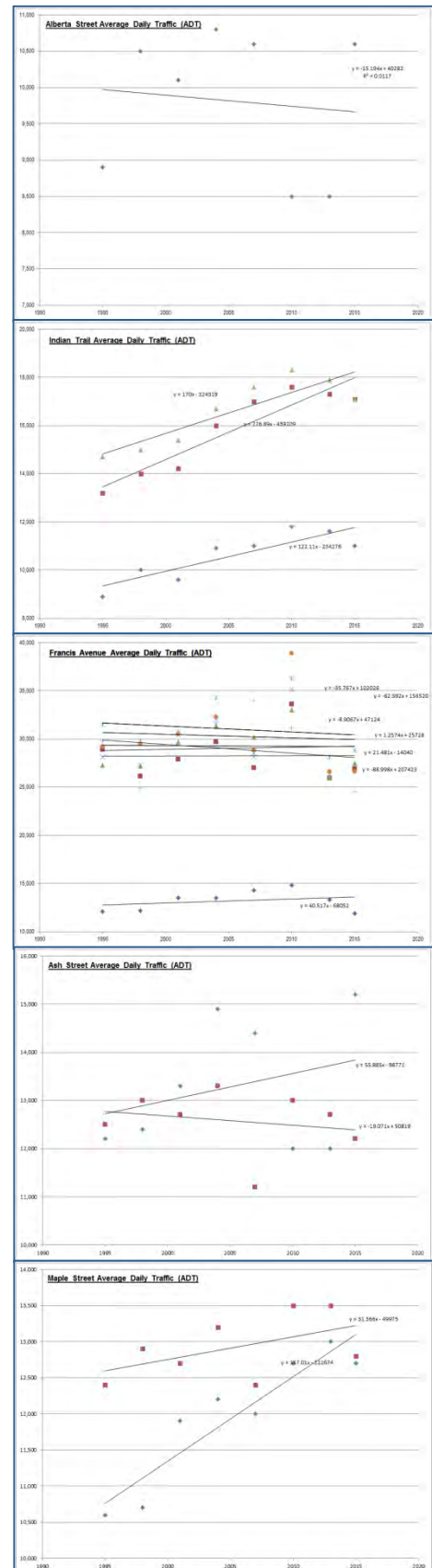
Year 2021 traffic forecasts were comprised of baseline growth, the trips generated by other vested, but yet to be constructed developments projects, and the trips generated by the proposed development. Baseline traffic growth refers to the increase of through traffic not typically associated with development of projects within the project study area. Baseline growth is projected with the use of traffic growth rates. To establish the growth rate for this study, historical traffic counts were reviewed for study arterials.

Traffic growth was compared based on historical year 1995 to 2015 ADT counts, as available for Indian Trail Road, Francis Avenue, Alberta Street, Ash Street, and Maple Street (multiple locations). Counts indicate minimal and even negative growth on the majority of City roadways; however, positive growth was noted specifically for Indian Trail Road, ranging between 1.0 and 1.5 percent annually. The statistical average growth rate of all count points reviewed was 0.3 percent annually.

Based on this analysis, a 0.5% annual growth rate was applied to counts to forecast baseline 2021 traffic forecasts. This rate is conservative (high) for the majority of the study area. The baseline growth rate was seemingly moderate for Indian Trail Road. However, it must be understood the 1.0 to 1.5 percent annual growth rate almost directly reflects development growth within the Indian Trail neighborhood throughout the last 20 years. The impact of development growth is discussed in the following sections. Once the trips generated by these developments and Windhaven are reflected in forecasts, the annual growth rate for the roadway well exceeds historical growth for Indian Trail Road. Thus, all traffic forecasts are ultimately conservative (high-end) for this TIA.

3.2.1 Pipeline Projects

Per coordination with agencies, the trips generated by eleven vested land use projects, known as pipeline projects, were addressed within this study. These projects have been approved by the City of Spokane, but are in the process of



being developed. As such, the trips generated by these projects are not yet recorded in counts and need to be addressed in forecasts as they have rights to future capacity. A summary of pipeline projects are as follows:

1. **Hunts Point.** 183 single family and 48 multifamily homes aligned on 52.56 acres south of Pacific Park Drive and west of Indian Trail Road. No homes have been developed (as of yet) on the site.
2. **Windhaven First Addition.** 289 single family homes aligned on 49.48 acres north of Barnes Road and west of Indian Trail Road. No homes have been developed (as of yet) on the site.
3. **Ponderosa Ridge 3rd Addition.** 12 single family homes yet to be developed out of 43 approved on 9.94 acres aligned north of Barnes Road and west of Sundance Drive.
4. **Ponderosa Ridge 4th Addition.** 25 single family homes aligned on 18.95 acres west and east of Rosebury Lane. No homes have been developed (as of yet) on the site.
5. **Diamond Rock.** 96 apartment units developed on 4.32 acres aligned within the southeast quadrant of the Barnes Road/Indian Trail Road intersection.
6. **Replat McCarroll's Addition Phase 2.** 13 single family homes aligned on 2.69 acres north of Barnes Road and east of Woodridge Drive. No homes have been developed.
7. **McCarroll's East 3rd Addition.** 10 single family homes yet to be developed out of 44 approved on 19.18 acres aligned north of Barnes Road and east of Seminole Street.
8. **McCarroll's East 4th Addition.** 15 single family homes aligned on 8.85 acres south of Barnes Road and east of James Street. No homes have been developed (as of yet).
9. **McCarroll's East.** 133 single family and 28 multifamily homes aligned on 118.2 acres south of Barnes Road.
10. **Woodridge View 1st Addition.** 7 single family homes yet to be developed out of 40 approved on 24.72 acres aligned north of Seminole Drive and east of Fleetwood Court.
11. **Estates at Rocky Ridge.** 15 single family homes yet to be developed out of 42 approved on 13.17 acres aligned south of Lincoln Road and east of Hiawatha Drive.
12. **Westwinds PUD.** 19 single family homes yet to be developed out of 36 approved on 19.96 acres aligned south of Strong Road and west of Upper Mayes Lane.

The assignment of pipeline project trips was developed based upon trip generation and trip distribution information provided by City traffic engineers. In summary, City staff performed trip generation calculations based upon information provided within the ITE *Trip Generation Manual*, as based upon a comparison of rate and equation data that correlate site trips to dwelling units for single and multi-family land uses. And then, using the regional travel demand model, the City identified the likely distribution patterns of trips throughout the project study area.

The City congregated trip generation and distribution information into three transportation analysis zones (TAZ's). A TAZ a transportation analysis and modeling term which refers to a geographical area that experiences similarities in travel characteristics (i.e. approaching and departing access/traffic trends); as bordered by arterials, agency limits, or topographical features (cliffs, rivers/streams, etc.). They simply allow for the organization of transportation data, both for analytical reasons and for the presentation of information. With this understanding, a summary of trip generation for TAZ 29, 30, and 31 are shown in Table 9 for the AM and PM peak hours. Trip generation is shown per development within each TAZ.

Table 9. Vested Residential Land Use & Trip Comparisons by TAZ								
TAZ and Development	Dwelling Units/Homes		AM Peak Hour			PM Peak Hour		
	Single	Multi	In	Out	Total	In	Out	Total
TAZ 29								
- Hunts Point	183	48	48	119	167	142	72	214
- Windhaven First	286	0	65	145	210	179	92	271
- Ponderosa Ridge 3 rd	12	0	6	13	19	10	5	15
- Ponderosa Ridge 4 th	25	0	8	19	27	20	10	30
Subtotal TAZ 29	506	48	127	296	423	351	179	530
TAZ 30								
- Diamond Rock	0	96	10	41	51	46	25	71
- Replat McCarroll	13	0	6	13	19	11	6	17
- McCarroll's 3 rd	10	0	5	12	17	9	5	14
- McCarroll's 4 th	15	0	6	14	20	13	7	20
- McCarroll's East	7	28	8	26	34	21	10	31
- Woodridge View	7	0	5	10	15	6	3	9
Subtotal TAZ 30	52	124	40	116	156	106	56	162
TAZ 31								
- Estates at Rocky	15	0	6	14	20	13	7	20
- Westwinds PUD	19	0	7	16	23	16	8	24
Subtotal TAZ 31	34	0	13	30	43	29	15	44
Total Pipeline Trips	592	172	180	442	622	486	250	736

As shown, the 592 single family and 172 multi-family homes approved within the Indian Trail neighborhood generate 622 trips during the AM peak hour and 736 trips during the PM peak hour. Overall, about 71 percent of these trips are generated by TAZ 29, 23 percent by TAZ 30, and 6 percent by TAZ 31, as averaged between the AM and PM peak hours.

As indicated, City staff also provided TAZ distribution information as based upon information gained from the regional travel demand model. Project trips were assigned to the study area based upon these distributions. Trip distributions for each TAZ are summarized below.

TAZ 29 - Located west of Indian Trail Road, all trips from this TAZ are anticipated to access or travel through Indian Trail Road. Overall 4 percent of trips from TAZ 29 are anticipated to access Indian Trail Road via Shawnee Avenue, 49 percent via Barnes Avenue, 25 percent via Strong Road, and 22 percent via Pacific Park Drive. The distribution of trips outside of the study area is as follows (100 percent distributions to/from):

- ◆ **Barnes Road.** 19 percent of trips are anticipated to/from the east of Indian Trail Road; via the new connection with Strong Road.
- ◆ **Indian Trail Road.** 9 percent of project trips are anticipated to/from the north of Barnes Road.
- ◆ **Francis Avenue.** 6 percent of project trips are anticipated to/from the west of Indian Trail Road and 25 percent to/from the east of the Maple/Ash Couplet.
- ◆ **A Street.** 8 percent of project trips are anticipated to/from the south of Francis Avenue.
- ◆ **Alberta Street.** 12 percent of project trips are anticipated to/from the south and 3 percent to/from the north of Francis Avenue.

- ◆ **Belt Street.** 1 percent of project trips are anticipated to/from the south of Francis Avenue.
- ◆ **Maple/Ash Couplet.** 9 percent of project trips are anticipated to/from the south and 6 percent to/from the north of Francis Avenue.
- ◆ **Local Generators.** 2 percent of project trips are anticipated via local trip generators such as the Sundance Plaza shopping center.

TAZ 30 - Located east of Indian Trail Road, the majority of trips from this TAZ will access or cross Indian Trail Road. Overall 57 percent of trips from TAZ 30 are anticipated to access Indian Trail Road via Barnes Avenue, 1 percent via Lowell Avenue, and 10 percent via Strong Road. Of these trips, the distribution outside of the study area is as follows (68 percent distributions to/from):

- ◆ **Barnes Road.** 6 percent of trips are anticipated to/from the west of Indian Trail Road.
- ◆ **Strong Road.** 2 percent of trips are anticipated to/from the west of Indian Trail Road.
- ◆ **Indian Trail Road.** 7 percent of project trips are anticipated to/from the north of Barnes Road.
- ◆ **Francis Avenue.** 5 percent of project trips are anticipated to/from the west of Indian Trail Road and 13 percent to/from the east of the Maple/Ash Couplet.
- ◆ **A Street.** 4 percent of project trips are anticipated to/from the south of Francis Avenue.
- ◆ **Alberta Street.** 6 percent of project trips are anticipated to/from the south of Francis Avenue.
- ◆ **Maple/Ash Couplet.** 7 percent of project trips are anticipated to/from the south and 18 percent to/from the north of Francis Avenue.

TAZ 31 - Located on the western edge of the Indian Trail neighborhood, a minority of these trips from this TAZ will access or cross Indian Trail Road. Overall 14 percent of trips from TAZ 31 are anticipated to access Indian Trail Road via Barnes Avenue, 2 percent via Lowell Avenue, and 2 percent via Strong Road. Of these trips, the distribution outside of the study area is as follows (18 percent distributions to/from):

- ◆ **Barnes Road.** 2 percent of trips are anticipated to/from the west of Indian Trail Road.
- ◆ **Strong Road.** 2 percent of trips are anticipated to/from the west of Indian Trail Road.
- ◆ **Indian Trail Road.** 4 percent of project trips are anticipated to/from the north of Barnes Road.
- ◆ **Francis Avenue.** 5 percent of project trips are anticipated to/from the west of Indian Trail Road and 1 percent to/from the east of the Maple/Ash Couplet.
- ◆ **A Street.** 1 percent of project trips are anticipated to/from the south of Francis Avenue.
- ◆ **Alberta Street.** 1 percent of project trips are anticipated to/from the south of Francis Avenue.
- ◆ **Maple/Ash Couplet.** 1 percent of project trips are anticipated to/from the south and 1 percent to/from the north of Francis Avenue.

Note that a number of trips will travel through the study area as a result of travel via the Five Mile Road and Cedar Road intersections with the Maple/Ash Couplet (or Country Homes Boulevard). About 47 percent of TAZ 31 trips will impact the study area, via Maple/Ash north. Of these trips, about 20 percent anticipated to/from the east and 2 percent to/from the west (of Maple/Ash) on Francis Avenue, and 25 percent are anticipated to/from the south (of Francis Avenue) via the Maple/Ash Couplet.

Figure 5 and Figure 6 provide a summary of pipeline project trip assignments for the AM and PM peak hours at study intersections. Also highlighted are pipeline project locations and rough TAZ boundaries. Pipeline trips were combined with baseline forecasts to develop the future without project traffic volumes, as shown on Figure 7 and Figure 8 for the peak hours. TAZ trips assignments are provided in Section D of the Technical Appendices.

Windhaven First Addition. The trips generated by Windhaven First Addition were purposefully included in future without-project traffic forecasts. This is because the trips associated with these 286 homes are already programmed/approved for the Indian Trail neighborhood. Thus, these would be considered pipeline project trips, just like any other approved, but yet to be constructed, development project. Proposed development trips are combined with vested trips to reflect site traffic for the 750 unit apartment complex, as described in the following sections.

3.2.2 Trip Generation

Trip generation was predicted using the methods outlined in the Institute of Transportation Engineers (ITE) *Trip Generation Manual* (9th Edition, 2012). The Trip Generation Manual is a nationally recognized and locally accepted method for forecasting trip generation for a range of commercial, retail, and residential land uses. The forecasting methods were developed based on the survey of other existing land use developments located throughout the United States.

Trip generation was determined using ITE Code 220 for Apartment land uses. The ITE describes this land use as “rental dwelling units located within the same building with at least three other dwelling units.” Trip generation was determined based on equations that estimate trips according to the number of dwelling units. Equations were used over rates because more than 10 surveys/studies were used to develop ITE equations with a resulting data regression fit of near or in excess of 0.75.

As indicated, the site has already been approved for development of 286 single family homes. According to Table 1, this represents the trips of approximately 460 apartment units. However, because trip generation is based upon linear regression equations, trip generation projections were developed for 750 apartment units. The trip generation associated with Windhaven First addition and 286 homes, as specified by City data, was then subtracted from these totals to determine the net gain in site-generated trips. A summary of trip forecasts are shown in Table 10 for the AM and PM peak hours.

Table 10. Project Trip Generation Gains							
Land Use	Dwelling Units	AM Peak Hour			PM Peak Hour		
		In	Out	Total	In	Out	Total
Apartments - ITE Code 220	750	74	297	371	280	150	430
Single Family Homes - ITE Code 210	286	65	145	210	179	92	271
Net Gain Site Trips	--	9	152	161	101	58	159

As the project proposal results in a net gain in trip generation of 161 trips during the AM peak hour and 159 trips during the PM peak hour. These trips represent the net gain in traffic over those vested and approved by the City of Spokane.

3.2.3 Trip Distribution

As Windhaven is located with City TAZ 29, the assignment of site trip gains was based on the distribution patterns established for this zone. The only difference is all project trips would use the Barnes Road intersection to access Indian Trail Road. Approximately 40 percent of project trips would access Windhaven via Barnes Road and 60 percent via Pamela Lane. A summary of overall site distributions is again as follows:

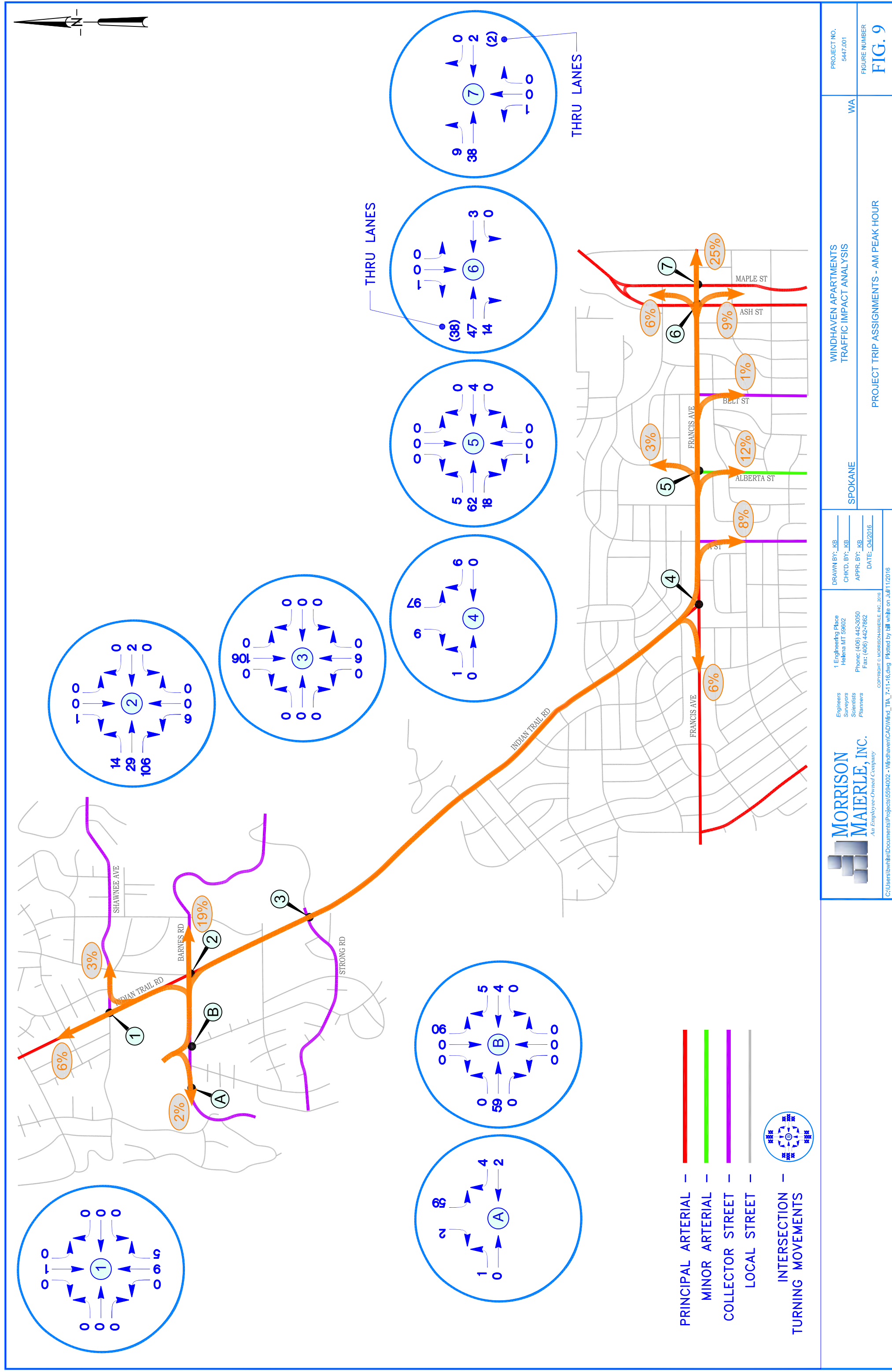
- ◆ **Barnes Road.** 19 percent of trips are anticipated to/from the east of Indian Trail Road, via the new connection with Strong Road.
- ◆ **Indian Trail Road.** 9 percent of trips are anticipated to/from the north of Barnes Road.
- ◆ **Francis Avenue.** 6 percent of project trips are anticipated to/from the west of Indian Trail Road and 25 percent to/from the east of the Maple/Ash Couplet.
- ◆ **A Street.** 8 percent of project trips are anticipated to/from the south of Francis Avenue.
- ◆ **Alberta Street.** 12 percent of project trips are anticipated to/from the south and 3 percent to/from the north of Francis Avenue.
- ◆ **Belt Street.** 1 percent of project trips are anticipated to/from the south of Francis Avenue.
- ◆ **Maple/Ash Couplet.** 9 percent of project trips are anticipated to/from the south and 6 percent to/from the north of Francis Avenue.
- ◆ **Local Generators.** 2 percent of project trips are anticipated via local trip generators such as the Sundance Plaza shopping center.

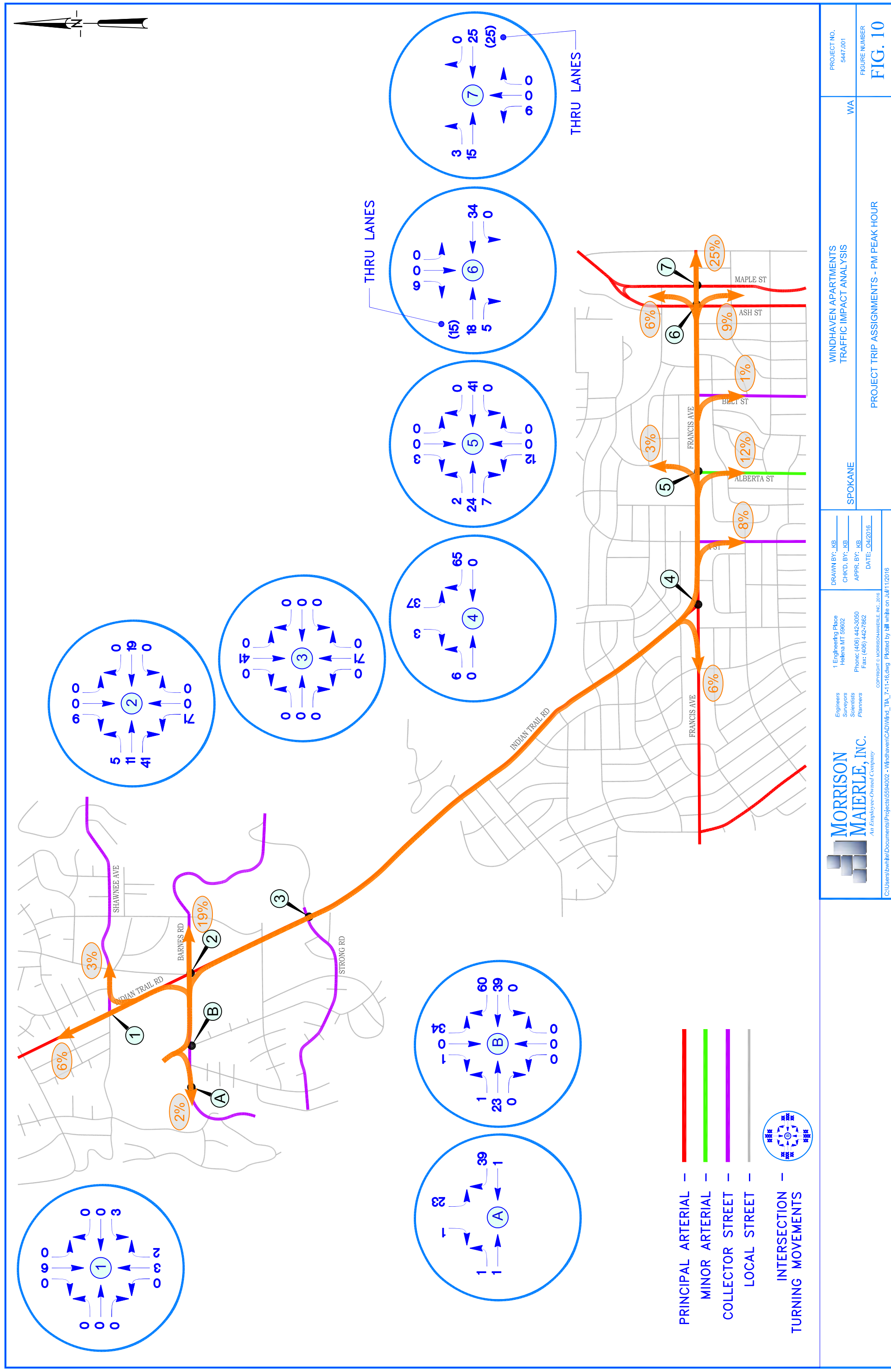
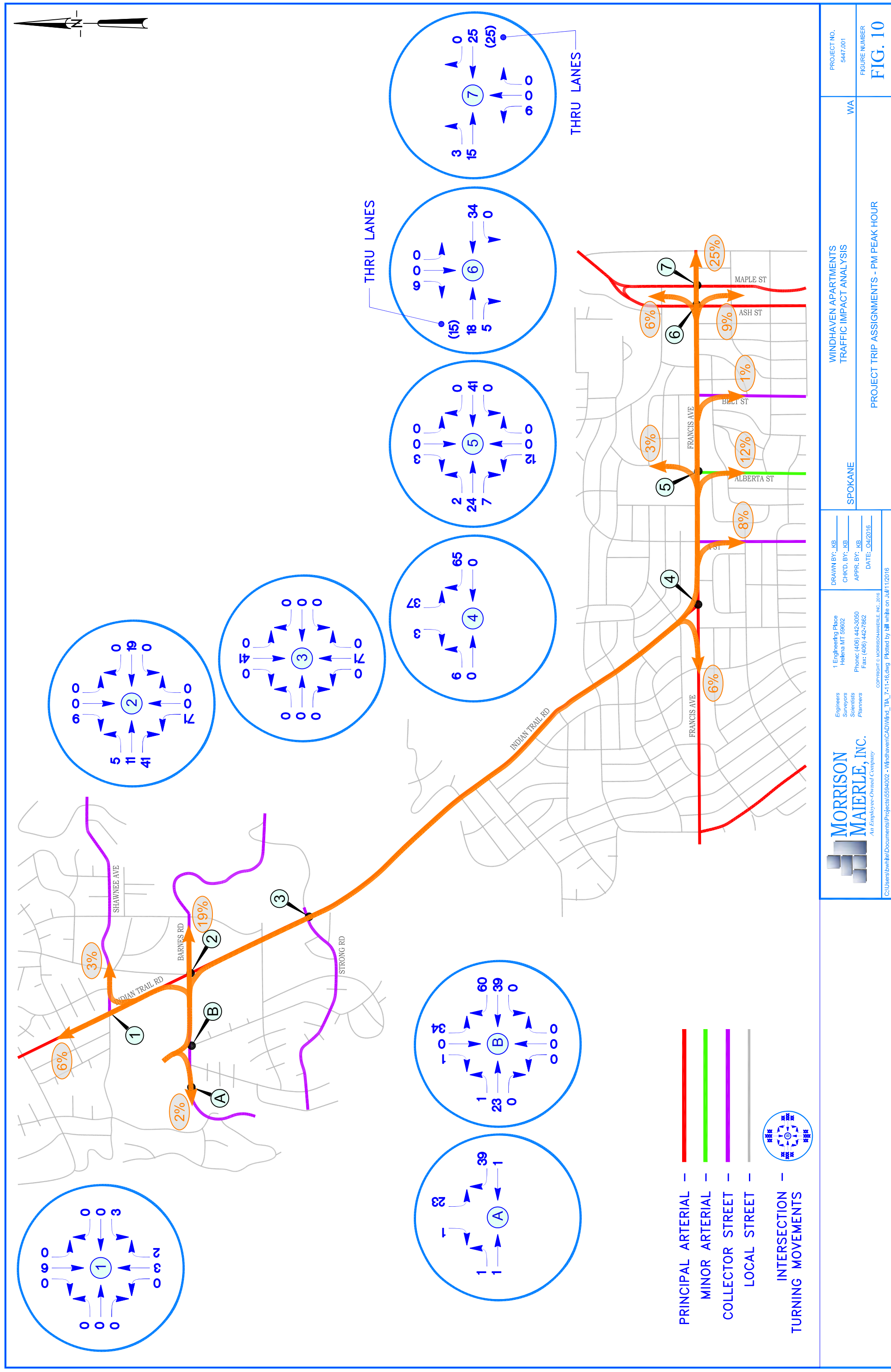
The resulting trip gain assignments are shown on Figure 9 for the AM peak hour and Figure 10 for the PM peak hour. Future with project traffic volumes and project trip assignments were then combined to generate the future year 2021 with project traffic forecasts, as shown on Figure 11 for the AM peak hour and Figure 12 for the PM peak hour.

Indian Trail Traffic Gains. As indicated, traffic has historically increased on Indian Trail Road at a rate of 1.0 to 1.5 percent annually. The resulting future with project traffic volumes result in growth rates that range between 6 and 7 percent annually during the AM and PM peak hours (ranging between 30 and 40 percent overall). Thus, traffic forecasts are very conservative for year 2021; more likely reflecting traffic forecasts several years beyond this horizon as pipeline projects will require more than five years to be fully developed and occupied.

Barnes Road Extension. As indicated, the City has programmed the Barnes Road, Phoebe to Strong “Safety” project for construction in year 2017. The traffic diverted/forecast by this TIA as a result of this improvement for Barnes Road east of Indian Trail Road includes: the assignment of pipeline project trips, the assignment of Windhaven project trips, and some background traffic growth. The results are traffic projections that are 75 percent to 100 percent higher than counts during the PM and AM peak hours, respectively.

City officials reviewed the potential traffic gains associated with this project as a factor studied with a February 2015 Street Department Technical Memorandum prepared for the Five Mile and Strong Road intersection. Generally, the analysis concludes that a 5.5 percent annual traffic increase can be expected by year 2040 as a result of the Barnes Road extension project; which reflect the diversion of traffic to the new route plus the increase of traffic as a result of development growth. This growth was established based upon information City officials





secured from the Spokane regional travel demand model. Thus, the hand forecasting methodologies used in this study result in a 10 to 15 percent annual increase on the roadway connection during peak hours, which well exceeds City projections.

These paragraphs have been added to this section to confirm that, while traffic increases on Barnes Road and Strong Road may occur (as a result of the extension) for numerous reasons (i.e. access to the Sundance Plaza Shopping Center, schools, alternative emergency routes, weather conditions, etc.), the overall forecasts are conservative when compared with the results of the City Memorandum and, by extension, the results generated by the regional travel demand model. Thus, no additional traffic diversions of forecasts were addressed, as the resulting traffic forecasts would likely be unrealistic for the year 2021 analysis horizon of this study.

3.3 TRAFFIC OPERATIONS

LOS and capacity analyses were performed based on traffic forecasts, as summarized in Section 3.2, versus the road geometrics and traffic control conditions described in Section 3.1. This analysis was performed initially based on the current geometric conditions, as the Barnes Road extension only causes traffic to divert and does not impact capacity. Indian Trail Road widening was not included as the project is not fully funded. Table 11 provides a summary of resulting future without and with project LOS and control delays for the AM and PM peak hours.

Table 11. Forecast Year 2021 LOS and Delay - AM and PM Peak Hours								
Year 2021 Condition	Future Without Project Traffic				Future With Project Traffic			
	AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
Signalized Intersections	LOS ¹	Delay ²	LOS ¹	Delay ²	LOS ¹	Delay ²	LOS ¹	Delay ²
Shawnee Ave/Indian Trail Rd	B	17.9	A	8.2	B	17.9	A	8.3
Barnes Rd/Indian Trail Rd	C	26.9	B	19.9	D	43.7	C	22.9
Strong Rd/Indian Trail Rd	C	20.2	D	52.4	D	37.3	E	68.8
Indian Trail Rd/Francis Ave	C	20.3	B	10.1	C	29.6	B	10.7
Alberta St/Francis Ave	E	65.6	D	53.7	E	78.3	E	59.4
Ash St/Francis Ave	C	26.1	C	21.3	C	28.9	C	21.5
Maple St/Francis Ave	B	17.6	E	55.9	B	17.1	E	58.7
	AM Peak Hour		PM Peak Hour		AM Peak Hour		PM Peak Hour	
Unsignalized Intersections	LOS ¹	Delay	LOS ¹	Delay	LOS ¹	Delay	LOS ¹	Delay
Forest Ln/Barnes Rd	B	10.6	B	10.2	B	11.4	B	10.6
Pamela Ln/Barnes Rd	B	13.1	B	12.0	C	19.0	C	14.0
1. LOS = Levels-of-Service 2. Del = Delay in seconds								

As indicated, LOS E is the threshold for signalized and unsignalized intersections along principal arterials within the City of Spokane. As shown, there are no intersection forecast to function below minimum thresholds during the forecast AM and PM peak hours. To be clear, this does not say the typical driver may not experience some frustration as the result of longer wait times at intersections during peak hours, as compared with other timeframes of the typical

weekday. However, principal arterials are intended to move high traffic volumes within the City and this LOS standard reflects this condition. Thus, citizens within the City have come to expect delays and higher traffic volumes along principal arterials; especially as the regional continues to grow. A summary of conditions for each intersection is as follows:

- ◆ **Shawnee Avenue/Indian Trail Road.** This intersection operates within the LOS A/B range during peak hours, which is well above minimum thresholds. The highest traffic impacts at this intersection occur during the AM peak hour when the work commute and school traffic activities overlap.
- ◆ **Barnes Road/Indian Trail Road.** This signalized intersection will operate at acceptable LOS during the AM and PM peak hours, both without and with project development in year 2021. The work commute and shopping activities have the highest impacts upon this intersection during the AM peak hour.
- ◆ **Strong Road/Indian Trail Road.** This signalized intersection will operate at acceptable LOS during both peak hours. The work commute has the highest impact upon this intersection during the PM peak hour.
- ◆ **Barnes Road/Indian Trail Road.** This signalized intersection will operate at acceptable LOS during the AM and PM peak hours, both without and with project development in year 2021. The morning work commute will have the highest impact upon the intersection, as Indian Trail Road drivers wait to turn onto Francis Avenue.
- ◆ **Alberta Street/Francis Avenue.** This signalized intersection will function primarily within the LOS E range during the AM and PM peak hours. The works commutes, and to a lesser extent Salk Middle school travel demands, have high impacts at this intersection. Although operating within LOS tolerances, this intersection was identified to have the worse congestion analytically and through field observations and was the least improved by signal optimization evaluation (see below).
- ◆ **Ash Street/Francis Avenue.** This signalized intersection will operate at acceptable LOS C during the AM and PM peak hours, both without and with project development in year 2021. Impacts principally occur as a result of the work commute.
- ◆ **Maple Street/Francis Avenue.** This signalized intersection will operate at acceptable LOS during the AM and PM peak hours, both without and with project development in year 2021. The highest impacts occur during the evening/homebound work commute.

Note although overall intersection LOS were forecast to be acceptable during the peak hours, meeting City concurrency requirements, the westbound approach to Maple Street/Francis Avenue intersection is forecast to have 89 seconds of average control delay during the PM peak hour; representing a LOS F condition. The maximum phase split for the approach is currently 43 seconds (the available green time during one signal cycle). A comparison of control delay with this phase split confirms individual vehicles would wait about three full signal cycles before clearing the intersection.

It should be noted City of Spokane traffic engineering staff routinely works to “optimize” traffic signal performance in order to improve intersection and corridor mobility; especially along principal arterials such as Francis Avenue and Indian Trail. Although this study demonstrates no overall LOS issues at study intersections, as compared with code, it should be noted that enhanced performances (via improved LOS and/or reduced average vehicle delay) were identified analytically by modifying signal cycle lengths or phase splits in response to the higher travel demands identified with forecast traffic volumes. City staff should have the ability to maintain current traffic operations for some time as the area continues to grow in the future.

Queue Potentials. Future with-project queue potentials were reviewed for signalized study intersections. Future without-project queuing was not shown as there was no difference in queue results. Again, most acceptable conditions are those where average and 95th percentile queues do not exceed lane/pocket storage. Tolerable conditions are those where average queues do not exceed lane storage/pocket length, even when 95th percentile queues do exceed storage. Unacceptable conditions are noted where both average and 95th percentile queues exceed available lane/pocket storage. A summary of queue conditions is shown by Table 12 for the AM and PM peak hours.

Table 12. Future With-Project Queue Potentials - AM and PM Peak Hours					
Signalized Intersections	Lane Capacity	AM Peak		PM Peak	
		Avg.	95%	Avg.	95%
Shawnee Ave/Indian Trail Rd – Northbound Left-Turn Lane – Northbound Right-Turn Lane – Southbound Left-Turn Lane – Southbound Right-Turn Lane – Westbound Left-Turn Lane – Eastbound Left-Turn Lane	7 vehicles ¹ 3 vehicles 3 vehicles ¹ 3 vehicles 3 vehicles 3 vehicles	1 vehicle 1 vehicle 1 vehicle 0 vehicle 5 vehicle 1 vehicle	1 vehicles 1 vehicle 1 vehicle 0 vehicle 7 vehicles 1 vehicles	1 vehicle 1 vehicle 1 vehicle 1 vehicle 1 vehicle 0 vehicle	1 vehicle 1 vehicle 1 vehicle 1 vehicle 2 vehicles 1 vehicles
Barnes Rd/Indian Trail Rd – Northbound Left-Turn Lane – Northbound Right-Turn Lane – Southbound Left-Turn Lane – Westbound Left-Turn Lane – Eastbound Left-Turn Lane	8 vehicles ¹ 5 vehicles 7 vehicles ¹ 6 vehicles 4 vehicles	1 vehicle 0 vehicle 1 vehicle 4 vehicles 1 vehicle	3 vehicles 2 vehicle 2 vehicles 9 vehicles 3 vehicles	4 vehicles 1 vehicle 1 vehicle 2 vehicles 2 vehicles	14 vehicles 6 vehicles 2 vehicles 5 vehicles 4 vehicles
Strong Rd/Indian Trail Rd – Northbound Left-Turn Lane – Northbound Right-Turn Lane – Southbound Left-Turn Lane – Southbound Right-Turn Lane – Eastbound Right-Turn Lane	7 vehicles ¹ 4 vehicles 7 vehicles ¹ 4 vehicles 8 vehicles	1 vehicle 0 vehicle 1 vehicle 1 vehicle 2 vehicles	2 vehicles 0 vehicle 1 vehicle 1 vehicle 3 vehicles	1 vehicle 0 vehicle 1 vehicle 1 vehicle 1 vehicle	3 vehicles 0 vehicle 1 vehicle 1 vehicle 1 vehicle
Indian Trail Rd/Francis Ave – Westbound Right-Turn Lane – Eastbound Left-Turn Lane	16 vehicles ² 2 vehicles	0 vehicle 1 vehicle	2 vehicles 2 vehicles	22 vehicles 2 vehicle	33 vehicles 7 vehicles
Alberta St/Francis Ave – Northbound Left-Turn Lane – Southbound Left-Turn Lane – Westbound Left-Turn Lane – Eastbound Left-Turn Lane	9 vehicles ¹ 4 vehicles 8 vehicles ¹ 8 vehicles ¹	5 vehicles 2 vehicles 3 vehicles 1 vehicle	8 vehicles 4 vehicles 9 vehicles 2 vehicles	11 vehicles 2 vehicle 5 vehicles 1 vehicle	21 vehicles 3 vehicles 10 vehicles 3 vehicles
Ash St/Francis Ave – Southbound Left-Turn Lane – Southbound Right-Turn Lane – Westbound Left-Turn Lane	21 vehicles 21 vehicles 20 vehicles ^{1,3}	6 vehicles 5 vehicles 3 vehicles	10 vehicles 9 vehicles 6 vehicles	5 vehicles 9 vehicles 6 vehicles	8 vehicles 18 vehicles 7 vehicles
Maple St/Francis Ave – Northbound Left-Turn Lane – Eastbound Left-Turn Lane	13 vehicles 20 vehicles ^{1,3}	1 vehicle 7 vehicles	2 vehicle 9 vehicles	8 vehicles 6 vehicles	20 vehicle 17 vehicles
<ol style="list-style-type: none"> 1. Transitions into a TWLTL, so additional storage can be available. 2. Free movement which turns into a designated receiving lane, so queues not as critical. 3. The designated left-turn lane is broken by an intersection so queue pocket is a two-length measurement. 					

As shown, all average queues are accommodated within available turn lane/pocket lengths, again with the exception of the westbound left-turns at Shawnee Avenue/Indian Trail Road during the short duration of school traffic. 95th percentile exceptions are noted as follows:

- ◆ Shawnee Avenue/Indian Trail Road – The 95th percentile queue exceeds the turn pocket by 4 vehicles during the AM peak hour.
- ◆ Barnes Road/Indian Trail Road – 95th percentile queues will exceed storage within the northbound left-turn lane, northbound right turn lane, and westbound left-turn lane between the peak hours. There are no average queue exceptions within the northbound right-turn or westbound left-turn lanes. There were queue issues noted in the northbound left-turn lane turning the PM peak hour.
- ◆ Indian Trail Road/Francis Avenue – Eastbound left-turn 95th percentile demands exceed storage by 5 vehicles during the PM peak hour; although average queues are within lane storage. Average and 95th percentile queues exceed storage “on paper” within the westbound right-turn lane. This issue may be overstated though, as in the field this designated right turn has free movement that transitions directly into a northbound lane with no immediate conflict.
- ◆ Alberta Street/Francis Avenue – Average and 95th percentile queues exceed storage within the northbound left-turn lane during both peak hours; although again there is a shared left-turn lane at this intersection. Thus, this issue may be moderately overstated (although drivers do indicate long wait times at the intersection). 95th percentile queues exceed storage within the westbound left-turn lane during both peak hours; although there are no average queue issues. This lane does transition into a TWLTL, so additional storage is available outside of through lanes.
- ◆ Maple Street/Francis Avenue – 95th percentile queues exceed available storage within the northbound left-turn lane at the intersection during the PM peak hour. Average queues are accommodated with the lane.

It should be noted that westbound queues were noted in the field to exceed beyond Cedar Road, aligned east of Maple Street. This current condition will likely be worsened with traffic growth. This analysis predicts queues in the approach would increase by nearly 25 percent, as measured during the PM peak hour between the existing and future with-project conditions.

Indian Trail Lane Capacity. Forecast lane capacities were reviewed for the three count locations identified previously along on Indian Trail Road. Capacities were reviewed for the future with-project condition, as there was minimal difference between without and with project forecasts. A summary of the forecast lane capacity analysis is shown in Table 13.

Table 13. Future With-Project Indian Trail Lane Capacity - AM and PM Peak Hours									
Indian Trail Road	Capacity			AM Peak Hour			PM Peak Hour		
	NB	SB	Tot	NB	SB	Tot	NB	SB	Tot
N/of Weile Ave	1,800	1,800	3,600	376	1,396	1,772	1,351	732	2,083
N/of Kathleen Ave	900	900	1,800	385	1,483	1,868	1,410	781	2,191
N/of Lowell Ave	900	900	1,800	371	1,360	1,731	1,211	790	2,001

As shown, lane capacity is still sufficient within the four lane section of Indian Trail Road north of Weile Avenue. Forecast traffic volumes further demonstrate the need for lane widening along Indian Trail Road, as volumes will exceed single lane capacity in the southbound direction during the AM peak hour and the northbound direction during the PM peak hour.

3.4 TRANSIT

STA is responsible for adjusting transit service throughout the City. Routes can be changed, alternated, diverted, or increased upon petition; however, there needs to be a very compelling reason to make a change. The completion of Windhaven alone would not provide the platform for any change. And given there is adequate weekday service, this TIA does not find any reason to do so regardless. In addition, the close proximity of transit access, within ¼ mile to the east, does not dictate the need for service to be diverted nearer to the Windhaven site.

3.5 PEDESTRIAN AND BICYCLE FACILITIES

As indicated, pedestrian access/mobility and circulation is generally well-served within the project study area; with adequate sidewalk access provided between Windhaven and nearby public facilities, transit, and shopping centers. No improvements seem to be necessary in relation to project development.

Designated commuter bike routes are available within the study area on Indian Trail Road and Barnes Road. Again, these are facilities where vehicle and bike activity share common right-of-way along both streets. Ideally, a recreational bike route would be of benefit to the Indian Trail neighborhood, as delineated via designated bike lanes and/or off-street roadways or pathways. However, while identified via this study as a need for the area, this is a non-project related issue.

3.6 MICROSIMULATION

A Microsimulation analysis was submitted to the City on 5/24/16. The microsimulation analysis was performed to review the cumulative impact of traffic within the context of closely spaced intersections such as those aligned along Francis Avenue. This is somewhat different than the “spot” analyses provided through Highway Capacity Manual (HCM) methodologies and the software that generates HCM results (such as Synchro used with the Windhaven TIA). Cumulative results can be different with micro-simulation because the effect of the traffic influences from upstream and downstream intersections are addressed, whereas spot analysis focuses on traffic conditions predominantly at an intersection only. Spillback between intersections, spillback beyond turning bays, forced lane changes, unbalanced lane use for downstream turns, and other traffic flow interactions are examples of traffic conditions that can have a cumulative impact upon the operation of a single intersection.

The intersections of Francis Avenue with Indian Trail Road, Alberta Street, Ash Street, and Maple Street were reviewed with this supplemental study, as based on existing counts, future without, and future with-project traffic forecasts during the PM peak hour. The analyses confirms traffic growth will increase cumulative impacts upon study intersections located along Francis Avenue, as measured by gains in intersection delay, block time, and queue penalty. The typical driver will experience an average delay of between 12 and 30 additional seconds per intersection by year 2021, assuming development of all projected specified within the TIA. On average, blockage time is anticipated to increase between the peak hours by: up to 7

percent at the Indian Trail Road/Francis Avenue intersection, up to 3 percent at the Alberta Street/Francis Avenue intersection, up to 2 percent at the Ash Street/Francis Avenue intersection, and up to 19 percent at the Maple Street/Francis Avenue intersection, assuming; assuming development of all projected specified within the TIA. Finally, the number of vehicles impacted by queues between peak hours will elevate by up to: 61 for the Indian Trail Road/Francis Avenue intersection, 62 for the Alberta Street/Francis Avenue intersection, 8 for the Ash Street/Francis Avenue intersection, and 155 for the Maple Street/Francis Avenue intersection, assuming development of all projected specified within the TIA.

However, the analysis confirms marginal changes between the future without and with project conditions. Drivers are forecast to potentially experience an average delay increase of between 2 and 5 additional seconds per intersection by year 2021, along Francis Avenue, which is a moderate change. The analysis also confirms the project proposal will have a minimal impact upon cumulative traffic operations for intersections located along Francis Avenue.

It should be noted Microsimulation analyses highlights average vehicle delays and queue potentials that moderately exceed those highlighted on Table 11 and 12, because of the cumulative impact of traffic congestion between closely spaced intersections. This is relevant because it highlights the congestion issues noted for the westbound approach to the Maple Street/Francis Avenue intersection may be worse than what is stated in Section 3.3.

The microsimulation analysis was entitled “Windhaven Apartments, Summary Microsimulation/SimTraffic Analysis” is provided in Section E of the Technical Appendix.

4 IMPROVEMENT RECOMMENDATION & MITIGATION

There were no overall operational deficiencies (LOS issues) for study intersections. Some 95th percentile queue issues were noted with this analyses; however, it is not typical nor recommended by this study to recommend maximum queues as these are conditions that only occur a few times each peak hour (minimal cost-to-benefit). The study generally concludes LOS and queue results are in compliance with thresholds identified per City standard for study intersections.

With that said, existing and forecast traffic volumes were noted to exceed lane capacities within and north of the traffic bottleneck area of Indian Trail Road (north of Kathleen Avenue). In addition, additional congestion (vehicle delay and queue increases) are forecast within the westbound approach to the Maple Street/Francis Avenue intersection, as per standard analyses and microsimulation results.

As such, this section recommends improvements and/or transportation demand management strategies to minimize the impact of the proposed development along Indian Trail Road and at the Maple Street/Francis Avenue intersection. Also discussed are the development mitigation fee potential and a recommended use of development funds.

4.1 INDIAN TRAIL ROAD RESTRIPIING AND WIDENING

Currently, Indian Trail Road is comprised of a three-lane cross section north of Kathleen Avenue to Lowell Avenue, a distance of about 4,600 feet. This includes one northbound, one southbound, and one center two-way left-turn lane (TWLTL). The width of the roadway ranges from 43 and 44 feet between Kathleen Avenue and Lowell Avenue. The northbound and southbound lanes have a width of about 15 feet, respectively, and the TWLTL about 13 feet.

A single vehicle through lane capacity along Indian Trail Road is 900 vehicles per hour. Through lane capacity is limited to 1,800 vehicles per hour between Kathleen Avenue and Lowell Avenue due to the provision of only one northbound and one southbound travel lane in the “bottleneck” area. Existing and forecast travel demands would exceed single lane capacity in the southbound direction during the AM peak hour and in the northbound direction during the PM peak hour. As such, this study recommends the restriping with some widening of Indian Trail Road between Kathleen Avenue and Lowell Avenue to include two northbound and two southbound travel lanes. This would increase through capacity to 3,600 vehicles per hour; sufficient to accommodate forecast traffic volumes.

The project proposal has been coordinated with City officials. The plan would include the widening of Indian Trail Road to accommodate four lanes with an additional two-way left-turn lane (TWLTL) north from Janice Avenue for approximately 650 feet. The TWLTL would be dropped at this point and two northbound and two southbound travel lanes would be maintained through Lowell Avenue. In addition to the widening area, some curb relocations would be required at the intersections of Pacific Park Drive and Lowell Avenue to accommodate through lanes and the relocation of right turn lanes.

The cross section would include 11.5 foot curb lanes and 10.5 foot inner lanes throughout the project improvement area. The width of the TWLTL would be 11 feet. Note these widths are

moderately narrower than what currently exists. Narrower streets have the advantages of slowing travel speeds which would help improve roadway safety, given high existing travel speeds were noted for the arterial.

Note this improvement recommendation does not reflect the City's ultimate plans to widening Indian Trail Road to five lanes with bike lanes in the future, as discussed in Section 3.1. Rather, this would be an interim measure to assure an acceptable level of mobility until long term widening plans can be accomplished.

4.2 MAPLE STREET/FRANCIS AVENUE CONGESTION RELIEF

Traditional analyses indicate the westbound approach to the intersection will experience less tolerable LOS, delays, and vehicle queues. This was confirmed with microsimulation analysis. Two options are being considered for managing/minimizing project impacts on Francis Avenue: 1) Adaptive signal controls retrofitted to the Francis Avenue intersections with Ash Street and Maple Street or 2) development travel demand management (TDM) strategies.

Adaptive Signal Control. According to the U.S. DOT website, adaptive signal control technology adjusts the timing of red, yellow and green lights to accommodate changing traffic patterns and ease traffic congestion. The main benefits of adaptive signal control technology over conventional signal systems are that it can:

- ◆ Continuously distribute green light time equitably for all traffic movements.
- ◆ Improve travel time reliability by progressively moving vehicles through green lights.
- ◆ Reduce congestion by creating smoother flow.
- ◆ Prolong the effectiveness of traffic signal timing

Adaptive signal controls would increase the operational efficiency of study intersections. Traffic sensors collect data; traffic data is evaluated and signal timing improvements are developed; and finally signal timing updates are implemented. The process is repeated every few minutes to keep traffic flowing smoothly. On average these improvements improve travel time by more than 10 percent due to faster response conditions.

Travel Demand Management. Page 18 Bullet C of the Spokane Regional Commute Trip Reduction Plan (STRC, 2008) indicates a goal of the regional commute trip reduction (CTR) program is to "reduce drive alone trips by 10 percent". Therefore, the second option for reducing travel demands is a 10 percent reduction of Windhaven development travel demands.

The most feasible and quantifiable TDM option is for management to offer transit passes from Spokane Transit Authority to residence of Windhaven. The minimum use of 80 monthly bus passes would affect a 10 percent decrease in project trip generation (as reviewed on the basis of equations), meeting regional CTR goals.

4.3 PROJECT MITIGATION

TIF's and Indian Trail Road. The project is responsible for mitigating traffic impacts via transportation impact fee (TIF) contribution, as defined in Spokane Municipal Code Chapter 17D.075. The fee scheduled for the Northwest Service Area, within which the project is located, is \$483.49 per unit for two-story apartments and \$296.33 for three-story apartments. Thus, the

Windhaven development would be conditioned with up to **\$362,620** of traffic impact fees (\$483.49 * 750 two-story apartments).

Normally, a development TIF contribution is placed into an account dedicated towards improvements located within a specific service area: in this instance, the Northwest Service Area. However, upon coordination with City officials, it was determined the restriping and widening of Indian Trail Road must be a priority. Therefore, the \$362,620 owed/conditioned for the project as a TIF would be utilized directly for the Indian Trail Road project.

City officials have confirmed that even with this direct TIF allocation, funding would still be approximately 40 percent short of the construction costs needed to timely implement the project described in Section 4.1. This funding shortfall does include use additional funds available within the City Northwest Service area TIF account. As such, the project proponent for Windhaven has offered to front the capital funds not covered by the City to assure the completion of this improvement proposal, to help assure operations and capacity for the arterial. Reimbursement for this additional expenditure would be assured by the City through future latecomer's contribution (financial reimbursement provided by other development projects) and/or through TIF credits provided on future development proposals located within the City Northwest Service area.

As mentioned in Section 3.1, the City has a pavement rehabilitation project programed for Indian Trail Road. The project is scheduled for construction in the summer of 2018. It is anticipated the roadway restriping and widening project can be designed and constructed concurrently with this rehabilitation project (by year 2018). City officials have agreed to design the project. The aforementioned mitigation proposal would be identified as SEPA mitigation and enforced via a development agreement between the City and project proponent.

Maple Street/Francis Avenue Congestion Relief. Two alternatives were offered to help reduce project impacts upon the Maple Street/Francis Avenue intersection: adaptive signal control or development transit passes to affect a 10 percent reduction in trip generation (a TDM practice). The project proponent will coordinate with City and WSDOT officials to determine what improvement option is fair/proportionate and ultimately best benefits to this intersection. The project proponent would then provide adaptive control or implement a transit pass policy for Windhaven to mitigate impacts upon Maple Street/Francis Avenue. The mitigation proposal would be identified as SEPA mitigation and enforced via a development agreement between the City and project proponent.

5 PUBLIC INVOLVEMENT

A traffic information meeting was performed on May 25, 2016 to present details of the draft TIA and to answer questions. The meeting was conducted a special session/meeting of the North Indian Trail Neighborhood Council (NITNC). The lingering questions of the NITNC were presented to the City via a June 2 comment letter and a follow up letter provided by their consultant on June 20. The bulk of public commentary falls in line with these comments; thus, these questions are reviewed/addressed in this section of the TIA. The question is highlighted in bold lettering with the response provided thereafter.

The TIA being limited to signalized intersections, ignores the already congested and dangerous intersection of IT and Woodside. The proposed development would increase congestion and danger.

The TIA did not study Woodside, which already has some 4,000 trips per day, and would likely see more from further development in the NIT Neighborhood. The traffic calming Traffic Circles to be built, (June 2016) may or may not reduce trips on Woodside. Any reduction would increase traffic on Francis.

The scope for the study was developed in coordination with technical staff from the City of Spokane and WSDOT. Indian Trail Road/Woodside Avenue was not requested as a study intersection by technical officials; likely because the impacts of the development on Indian Trail are more quantifiable at signalized versus unsignalized intersections in this situation and because project impacts will be minimal at this intersection.

The impact of the Windhaven development should primarily be limited to north-south through movements on Indian Trail Road at this intersection. Woodside Avenue does not offer travel time savings which would cause development traffic to divert from Indian Trail Road in order to access commute arterials such as Francis Avenue. Traffic calming improvements (traffic circles) programmed by the City along Woodside Avenue at F Street, A Street, and Alberta Street would further minimize the advent of development “cut-through” traffic on this route (Windhaven and other projects), as travel times would be further diminished. Thus, the impact of any turning traffic at this intersection, causing potential slow-downs on Indian Trail Road, is not anticipated to be the result of the Windhaven development.

Note a supplemental Indian Trail Safety/Collision analysis was submitted to the City on 6/8/10. Table 1 of this study indicates about 1.8 collisions are occurring per year at the Woodside Avenue/Indian Trail Road intersection. This total is somewhat high when compared with other unsignalized intersections located along the corridor. However, statistically speaking, the intersection wouldn’t be flagged as a high accident location (HAL) because collisions versus traffic volume densities are below industry thresholds for the identification of such locations. This is not meant to infer that every collision isn’t important; only that the thresholds for identifying an HAL are not apparently met. The *Indian Trail Safety/Collision Analysis* is provided in Technical Appendix F.

The minimal impact of turning traffic on this unsignalized intersection, the likely reduction in turning traffic as the result of Woodside Avenue traffic circles, and the reduced collision rate are all likely reasons City officials did not request analysis of Indian Trail Road/Woodside Avenue.

No “Collision Analysis” was done with this Traffic Study. The 2012 Traffic Study conducted by the City concluded that IT is a dangerous street if a major emergency or crash occurred due to the bottleneck at Kathleen and IT. The 2 fires that we had are perfect examples of the in-grass and e-grass safety issues on IT.

The *Windhaven Apartments, Indian Trail Safety/Collision Analysis* was submitted to the City on June 8, 2016 in response to comments of the NITNC. This is provided in Technical Appendix F of this report. The analysis does not highlight a high accident location (HAL) along Indian Trail Road, nor does it conclude that Indian Trail Road is a high accident corridor (HAC). All collisions are important. However collision-to-volume densities were not sufficient to alert City officials to the potential for HAL's along Indian Trail, nor does data support a HAC, which is why the memorandum makes this conclusion.

In regards to the second point, the *City of Spokane Six Year Capital Improvement Program* (City of Spokane, 2016) highlights the Barnes Road, Phoebe to Strong “Safety” project programmed for construction in year 2017. The project includes the construction of a two lane paved roadway with offset sidewalks constructed about 2,200 feet between Phoebe Drive (west) and Strong Road (east) in order to provide a secondary outlet to the Indian Trail neighborhood. Admittedly, the route would be somewhat circuitous and would require travel via Five Mile Road, another busy City street. But the neighborhood and emergency service would have a paved secondary route of travel in the event some emergency forced the closure of Indian Trail Road through the highlighted bottleneck area.

The Indian Trail and Five Mile Neighborhoods are housing growth neighborhoods and there was inadequate consideration of future development. Vacant land which will eventually be developed, but is not currently platted, is not considered in the TIA for future impacts. One example being the land on the East side of IT and Strong Rd that is owned by Douglass that is zoned for multi-family apartments. As Mr. Douglass stated at our Board meeting, “When we get done with Morningside we would be heading South.”

The City requires that each successive traffic impact analysis review the impacts of previously approved, but yet to be developed, land use projects. Known as “pipeline” projects, these developments have been granted rights to future roadway capacity but have yet to generate traffic which would be reflected in traffic counts. In this way, the cumulative impacts of development are addressed.

Forecasts from the Windhaven TIA reflects the trips generated by 11 vested pipeline projects and recommends mitigations to help minimize traffic from all forecast traffic growth. Any subsequent developments will have to consider these projects in addition to Windhaven, recommending new or revised roadway infrastructure strategy, as a function of Concurrency and SEPA policy. This includes any land use action that Douglass Properties may have for other properties located along Indian Trail Road. Section 3.2.1 of this report provides further discussion on pipeline projects reviewed with the TIA.

The currently vested trips for the 286 units do not actually exist, but they are credited against the trips to be generated by the proposed development. (Am 65 in 145 out, PM 179 in 92 out). If the amendment is approved, those trips will become “real” and will add to the traffic impact forecast by the TIA.

The trips generated by the currently approved 286 homes on the Windhaven site were treated as a pipeline project, as they are already approved/vested by City officials. This means these trips are addressed in in the TIA via future without-project traffic forecasts. The additional trips generated with the current land use proposal, increasing density to 750 apartment units, were then added to these forecasts to generate total future with-project traffic forecasts. Thus, the TIA appropriate trip generation (traffic forecasts) assuming the development of 750 apartment units (in-lieu of 286 single family homes).

The possibility of residential units being built within the Sundance Center in lieu of businesses is not addressed. The 96 unit Apartments being constructed in an 0-35 zone is an example of what could be done in the Sundance Center.

As described previously, any sizeable development/land use action would be precipitate the need for a traffic study under various City process (SEPA, Comp. Plan Amendment, etc.). The study would consider the impact of vested “pipeline” projects; thus, addressing the cumulative impact of traffic growth upon Indian Trail Road.

The City identified the pipeline projects to be included in the study, as these are approved and vested developments. No other projects (such as the one described via the comment) were identified because, we assume, there are no development/land use proposals on file at the City for these properties. Or they submitted application after the process was initiated for Windhaven. Thus and again, and subsequent development will have to address pipeline projects, including Windhaven, to assure cumulative consideration of future development traffic.

Future development on Five Mile Prairie, in both the City and the County will add traffic to that already existing, but is not included in the TIA projections. With Barnes Rd connecting to IT traffic would probably increase.

Conservative traffic forecasts were developed for the Barnes Road connection to Strong Road; reflecting specified and non-specified development/pipeline project traffic. The traffic forecasts presented in the TIA are more conservative (higher) than traffic studies generated by the City Street Department for the roadway. Thus, the TIA sufficiently addresses the impact of this improved arterial connection upon Indian Trail Road. Section 3.2 of the TIA describes traffic forecasts.

The Traffic Study states that 21% of project traffic will use Barnes Rd, based on traffic modeling software, which likely doesn't take topography or weather into consideration. Completing Barnes RD will not significantly reduce peak hour traffic on IT or Francis-as acknowledged by Mr. White due to limited roads off Five Mile, (3 single lanes roads), and because only people working in the far North side are likely to use it.

The City has directed that the final TIA reduce the assumption to 19% assignment and reassign the remaining trips to other destinations along Indian Trail Road (such as the shopping center). However, note this will only be a moderate adjustment. Trip distribution and assignment for this project were established based on direction from the regional travel demand model. This data was provided by the City and they have confirmed that they trust the results and assumption.

Future development to the North, (9 mile and Suncrest, for example), will add traffic to Francis and likely IT, but is not considered in the TIA.

Please refer to previous discussions regarding pipeline projects and the City requirements of future traffic studies. However, to provide context, traffic has increased historically by a 1 to 1.5 percent annual growth rate on Indian Trail Road throughout the last 20 years; reflecting development growth within the area. The City forecasts a resulting 1.3 percent annual growth rate by year 2040 via the *Indian Trail Widening Roadway Capacity Justification Report* (City of Spokane, 2015). The year 2021 traffic forecasts of the TIA reflect 6 to 7 percent annual growth rates; well exceeding historical trends and outpacing City projections. Thus, the TIA establishes conservative traffic forecasts upon which system recommendations were based.

If IT is eventually widened to a full 4 lanes and center turn lane, and the signal timing “tweeks” are done and a turn lane constructed at Alberta, all possible capacity improvements will be done. Any future increases in traffic will not be remediable. There is not possible route parallel to IT, no feasible even if possible, route to the West, such as extending Barnes Rd; and no possible additional lanes or road to/from 5 mile Prairie.

The comment is noted. The City will have to determine at that time if further development is feasible within the region without further roadway connections.

Britton Enterprises is a consultant hired by NITNC and provided additional questions/comments, with traffic-related comments addressed via the following bullets.

- ◆ The first primary comment of the letter generally indicates the development can be accepted/approved only if funding is in place for roadway improvement proposals, as specified via the City 6-Year Street Program. The comment continues to describe Indian Trail Road widening project, as referred to in the TIA, is programmed only in the Transportation Impact Fee project list and not the 6-Year Plan. The inference is the project should not be approved, or at least scaled back, until a fully funded widening project can be programmed in the 6-Year Plan.

The premise presented by Britton Enterprises is partially correct. A development can be approved if a programmed and funded roadway improvement is scheduled in the 6-Year Plan, but this is applicable only when concurrency (i.e. acceptable LOS) cannot be demonstrated. In this case, LOS were demonstrated to be adequate along Indian Trail Road and therefore concurrency is met for the corridor, as prescribed by City LOS standards and definitions. Only a secondary analysis provided the bases for recommendation, outside of City requirement/definition. Thus, there is no requirement roadway widening be programmed in the 6-Year Plan at this time.

With that said, this Final TIA does recommend an alternate improvement strategy, to be coordinated with City officials. In coordination with City engineers, a minimum four lane roadway with two northbound and two southbound lanes will be constructed along Indian Trail Road, within the Kathleen Avenue and Lowell Avenue “bottleneck” area, as a condition of development. The Windhaven project proponent will dedicate TIF’s to the improvement and front whatever construction costs cannot be covered by the City (with any pay-back arrangement to be coordinated with City officials). The City has a roadway rehabilitation project programmed for Indian Trail Road in year 2018. The roadway restriping and partial widening project would be coupled with rehabilitation; thus, Indian Trail Road four-lane would be available by the end of year 2018. This mitigates the issues highlighted by the secondary capacity analyses of the TIA and, because a project is programmed within 6-Years, addresses the first concern of Britton Enterprises.

- ◆ The letter seems to infer that a 0.5 percent annual traffic growth rate was used in forecast analyses. To the contrary, a resultant 6 to 7 percent annual growth rate was forecast when accounting for baseline growth, pipeline projects, and Windhaven development. The 0.5 percent mentioned in this TIA is a background growth rate, used to account for any unspecified development or pipeline projects that may have been neglected outside of the immediate project study area. In other words, the baseline growth rate is used to help assure conservative traffic forecasts.

As indicated on the prior page, the *Indian Trail Widening Roadway Capacity Justification Report* provided by City Engineers predicts 1.3 percent annual growth on Indian Trail Road by year 2040. This TIA reflects 6 to 7 percent annual growth by year 2021 which can be extrapolated to a 1.4 percent annual growth rate if extrapolated to year 2040. Thus, the TIA uses conservative traffic forecasts that exceeds the projections of even City Engineers.

- ◆ The letter questions the use of the ITE, suggesting actual trip generation may be higher than predicted using this nationally and locally accepted resource. This was also a concern of citizens of the May 25 community meeting.

To help address this concern, a summary field study was performed for the Lusitano Apartment complex, which is located adjacent to the proposed Windhaven development along Barnes Road. Counts were performed on the weekdays of June 8 and June 13, 2016 for timeframes extending between 7 and 9 AM and 4 and 6 PM in order to identify the peak hours of commute traffic. The highest hourly count in the morning occurred between 7:30 and 8:30 AM with 65 vehicles on June 8 and highest afternoon/evening count occurred between 4:45 and 5:45 PM with 75 vehicles on June 13. This apartment complex has 212 units similar to that proposed with Windhaven, with peak resulting trip generation rates of 0.31 trips per unit during the AM peak hour and 0.39 trips per unit during the PM peak hour.

By comparison, a rate resultant rate of 0.49 trips per unit during the AM peak hour and 0.57 trips per unit during the PM peak hour was used to forecast Windhaven trips, as based on the ITE. Therefore, the rates used in this study are nearly 60 percent higher in the AM and over 45 percent higher in the PM versus rates established on local field counts. This means this TIA well overestimates traffic versus what is likely to occur in the future with Windhaven development.

The remaining comments of the Britton Enterprises letter regards non-traffic issues, have been addressed by previous points (within this Section), refer to editorial issues, or highlight minor disagreement with TIA assumptions; none of which have been identified by City Engineers for being addressed with the final TIA. Thus, no further comments from this letter were highlighted.

The comments highlighted above address majority comments highlighted by citizens within the North Indian Trail neighborhood. There were numerous other comments that didn't involve traffic or would be overwhelming to address with this Final TIA on a case-by-case basis; sufficed all comments were thoughtful and helpful to the development of this TIA. The level of involvement from this community is not common and their diligence has made this study more comprehensive and thorough. Thus, the comments and questions have been appreciated throughout the project process.

6 SUMMARY AND CONCLUSIONS

Windhaven First Addition is an approved City residential development that occupies 49.48 acres aligned north of Barnes Road and west of Indian Trail Road within the Indian Trail neighborhood of Spokane. The project was initially approved in year 2006 for the construction of 286 single family homes. No homes have been constructed yet; although the street infrastructure for the development is complete. This includes primary vehicle access to Barnes Road via Forest Lane and Pamela Lane, with secondary access provided to the adjacent apartment development (to the east) via Jamestown Lane. The project is within an RSF zone of the City with a site Comprehensive Plan designation of Residential 4-10.

Due to evolving market conditions, the project proponent has recently proposed to develop up to 750 apartment units on the site as opposed to single family homes. The proposal results in a density of 15.2 homes per acres, which exceeds the approved residential density. Thus, a Comprehensive Plan amendment and zone change would be needed to accommodate the proposal; specifically to a RMF zone and Comprehensive Plan designation of Residential 15-30.

Note the proposed apartment density marginally exceeds minimum zoning and Comprehensive Plan allowances, and is just under half of maximum allowable densities (of up to 30 apartments per acre). The reduced density was accommodated to minimize the traffic impacts of the proposed development on the Indian Trail neighborhood; as this was expressed as a concern of citizens living within the area. The developers have reduced site densities considerable from initial development proposals.

Site access is promoted as described previously, with primary access provided via Forest Lane and Pamela Street and secondary access via Jamestown Lane. Currently, pedestrian access only is proposed via Moore Street intersecting with Shawnee Avenue to the north, as this is a pedestrian/school route. However, this can be revisited during the design process if City officials determine vehicle access would benefit the neighborhood in the future.

Per City concurrency evaluations, Windhaven First Addition with 286 homes is vested to generate 210 trips during the AM peak hour and 271 trips during the PM peak hour. This would represent the trip generation equivalent of 460 apartment units. This distinction is important because it demonstrates that 46 percent of the current apartment proposal could be developed before surpassing vested/programmed traffic generation levels.

This TIA is responsible for addressing the net gain in trips over those vested/identified above. The current 750 unit apartment proposal represents a net gain in trip generation of 161 trips during the AM peak hour and 159 trips during the PM peak hour over those vested/associated with single family home development. About 19 percent of project trips are anticipated to/from the east on Barnes Road (via the new extension and connection to Strong Road). About 9 percent of project trips are anticipated to/from the north and 70 percent to/from the south on Indian Trail Road. About 2 percent are anticipated from adjacent businesses, services, and retail. The majority of project trips along Indian Trail Road south will travel to/from the east on Francis Avenue; distributing throughout a study area that addresses the Alberta Street and Maple/Ash Couplet intersections with Francis Avenue. Note forecast traffic volumes do address trip generation for a 750 unit apartment complex. The analysis was performed in future without and with-project stages/conditions due trips that are currently vested for the site.

6.1 TRAFFIC FORECASTS AND CAPACITY

City officials require this study address traffic operations principally for site access intersections and seven off-site intersections most impacted by development within the Indian Trail neighborhood. The analysis was required for the AM and PM peak hours of the typical weekday, as based on the forecast year 2021 completion year of the project.

Existing Conditions. Traffic counts were performed during typical weekdays in March and April to capture the peak demands of the morning and afternoon commutes. These counts were performed specifically while local schools were in session, as to capture the travel demands of these special traffic generators.

City of Spokane Administrative Policy and Procedure for Transportation Concurrency Level of Service Standards defines a LOS E standard for signalized and unsignalized intersections aligned along a principal arterial. An analysis of existing traffic operations indicates there were no levels-of-service (LOS) issues identified within the field, as all intersections were shown to function at LOS E or better between the AM and PM peak hours.

Secondary lane capacity analyses and speed counts were performed discretionarily to support conclusions for Indian Trail Road. The lane analysis was used to help identify whether adequate capacity exists for through traffic (northbound and southbound movements) outside of study intersections along Indian Trail Road. Lane capacities were reviewed for three count locations within the vicinity of the “bottleneck” on Indian Trail Road: 1) north of Weile Avenue (south of bottleneck); 2) north of Kathleen Avenue (within bottleneck); and 3) north of Lowell Avenue (north of Bottleneck).

The analysis indicates lane capacity is sufficient within the four lane section of Indian Trail north Road north of Weile Avenue. However, existing counts are shown to exceed directional lane capacities within specifically within the bottleneck area north of Kathleen Avenue. There is minor lane capacity exceptions noted north of Lowell Avenue, but overall capacity appears to be sufficient north of the bottleneck. A comparison/review of this data does suggest need for lane widening as based on existing count data.

Despite lane capacity results, travel speeds within the corridor do not seem to be overly compromised. Speed counts were performed at the locations identified/reviewed above, south of, within, and north of the bottleneck area along Indian Trail Road. Average travel speeds were found to be 3 to 6 mph above the posted 30 mph speed limit along the roadway during AM and PM peak hours in both travel directions. The conclusion from this is that, while additional capacity is needed, the travel time of typical commuters is not yet impacted.

Future Conditions. Future 2021 traffic volumes were developed for operational analyses assuming: 1) baseline (non-development associated) traffic growth, 2) the development of eleven study area pipeline projects (including vested Windhaven First Addition), and 3) the assignment of project trips. A 0.5 percent annual growth rate was applied to counts to reflect baseline (non-development) traffic growth. This growth was combined with the trips generated by pipeline projects to generate future without project traffic forecasts.

Finally, project trip assignments and future without project traffic volumes were combined to generate future with-project traffic forecasts. The resulting traffic forecasts result in growth rates

of between 6 and 7 percent annually on Indian Trail Road, which far exceeds historical growth rates ranging between 1 and 1.5 percent annually. Thus, traffic forecasts are very conservative for year 2021 and may be more representative of long term traffic growth (beyond year 2021).

Future intersection analyses indicated that no LOS issues were noted based upon a review of future year 2021 traffic forecasts. This determination is made because no study intersection is forecast to function below LOS E on the principal arterials of Indian Trail Road or Francis Avenue during the peak hours. LOS at site access intersections are also shown to operate acceptably at LOS C or better during the peak hours.

Note although overall intersection LOS were forecast to be acceptable during the peak hours, meeting City concurrency requirements, the westbound approach to Maple Street/Francis Avenue intersection is forecast to have 89 seconds of average control delay during the PM peak hour; representing a LOS F condition. The maximum phase split for the approach is currently 43 seconds (the available green time during one signal cycle). A comparison of control delay with this phase split confirms individual vehicles would wait about three full signal cycles before clearing the intersection. Queue conditions are forecast to be extensive within this approach.

City of Spokane traffic engineering staff routinely works to “optimize” traffic signal performance in order to improve intersection and corridor mobility; especially along arterials such as Francis Avenue and Indian Trail. Although this study demonstrates no LOS issues at study intersections, compared with code, it should be noted that enhanced performances (via improved LOS and/or reduced average vehicle delay) were identified analytically by modifying signal cycle lengths or phase splits in response to the higher travel demands identified with forecast traffic volumes. This confirms City staff should have the ability to maintain traffic operations beyond levels stated in the report as the area continues to grow in the future.

Forecast lane capacity was still shown to be sufficient within the four lane section of Indian Trail north Road north of Weile Avenue. Forecast traffic volumes further demonstrate the need for lane widening along Indian Trail Road north of Kathleen Avenue (within bottleneck) and north of Lowell Avenue (north of Bottleneck). This determination is confirmed because forecast traffic volumes well exceed single lane capacity in the southbound direction during the AM peak hour and the northbound direction during the PM peak hour.

Pedestrian, Bike, and Transit. Pedestrian, bicycle, and transit access conditions are favorable within the project vicinity. Sidewalk is contiguous between the developments and nearby transit stops, shopping centers, and public facilities (a library and a park). There are commute bicycle routes on Indian Trail Road and Barnes Road; although some form of designated bike lanes for recreational facilities would be ideal in the future (such remediation is beyond the scope of development projects). Finally STA transit access to Indian Trail Road is sufficient on weekdays, with transit stops located within walking distance about ¼- mile east of Windhaven.

Supplemental Studies. Two supplemental studies were performed to support this TIA: 1) a Microsimulation analysis submitted to the City on 5/24/16 (provided in Technical Appendix E) and 2) an analysis of collision data submitted to the City on 6/8/16 (provided in Technical Appendix F).

The microsimulation analysis was performed to review the cumulative impact of traffic within the context of closely spaced intersections such as those aligned along Francis Avenue. The analysis addresses conditions such as spillback between intersections,

spillback beyond turning bays, forced lane changes, and unbalanced lane use for downstream turns.

The intersections of Francis Avenue with Indian Trail Road, Alberta Street, Ash Street, and Maple Street were reviewed with this supplemental study, as based on existing counts, future without, and future with-project traffic forecasts during the PM peak hour. The analysis generally concludes the cumulative impact of traffic congestion between the Francis Avenue intersections with Ash Street and Maple Street may cause average delays and queues that moderately surpass those stated by this TIA. Thus, the microsimulation analysis indicates the westbound approach issues specified for the Maple Street/Francis Avenue may be greater than identified based on traditional LOS and delay analyses.

The collision analysis was performed for Indian Trail Road and indicates 52 recorded collisions occurred along the roadway between January 1, 2013 and May 31, 2016. Overall, 42 percent of collisions involved vehicle property damage only with 58 percent involving injuries. There were no fatalities within the study timeframe.

An average of 15.2 collisions occur the study arterial segment each year that, when compared with an average of 15,892 ADT, results in rate of 0.98 collisions per million miles of vehicle travel. Comparatively, the Washington State Department of Transportation 2014 Annual Collision Summary Report indicates Spokane County experiences a system/network-wide rate of 168.7 collisions per 100 million miles of travel, or 1.687 collisions per million miles of travel. Thus, by comparison, the calculated corridor rate is well below the average for Spokane County suggesting no unusual collision issue exists along Indian Trail Road. This conclusion was confirmed based on a review of intersections and driveways on an individual basis.

6.2 IMPROVEMENT RECOMMENDATIONS AND MITIGATION

The project is responsible for mitigating traffic impacts via transportation impact fee (TIF) contribution. The fee scheduled for the Northwest Service Area, within which the project is located, is \$483.49 per unit for two-story apartments and \$296.33 for three-story apartments. Thus, the Windhaven development would be conditioned with up to **\$362,620** of traffic impact fees ($\$483.49 \times 750$ two-story apartments), as collected prior to the issuance of any building permit on a per-unit/home or development phase basis.

The study concludes that adequate overall LOS is maintained at study intersections in accordance with City of Spokane Standards. However, secondary and supplemental analyses identify transportation improvements or demand strategies are needed to help improve traffic mobility for two study area locations, as based on a review of forecast traffic conditions.

- 3. Improvement – Indian Trail Road.** The lane capacity analysis indicates additional through lanes are needed in the northbound and southbound travel directions of Indian Trail Road, respectively. Upon coordination with City officials, it has been determined that the arterial can be restriped with some widening in locations to provide a minimum four-lane cross section throughout the current “bottleneck” extending between Kathleen Avenue and Lowell Avenue. This would provide needed lane capacity and address one of the top neighborhood concerns expressed via comment letters and emails, and also via the 5/25/15 public meeting.

Mitigation. The project proponent has offered to front the costs of improving Indian Trail Road, to be constructed with a City pavement rehabilitation project scheduled summer of

year 2018. The City pavement rehabilitation project is funded. The Windhaven TIF of \$362,620 would be dedicated specifically to Indian Trail improvements as SEPA (and future concurrency) mitigation. Additional costs not covered by the City would be fronted by the Windhaven developer and would be reimbursed either by TIF credits (for future developments within the Northwest Service Area) or via latecomers reimbursement provided via other Indian Trail Neighborhood developments. City officials indicate they will provide design services. The specifics of mitigation will be coordinated with City officials and enforced via developer agreements.

4. **Improvement – Maple Street/Francis Avenue Congestion.** Traditional analyses indicate the westbound approach to the intersection will experience less tolerable LOS, delays, and vehicle queues. This was confirmed with microsimulation analysis. Two alternatives are being considered for managing/minimizing project impacts on Francis Avenue: 1) Adaptive signal controls retrofitted to the Francis Avenue intersections with Ash Street and Maple Street or 2) development travel demand management strategies. Adaptive signal controls would increase the operational efficiency of study intersections. Travel demand strategy would reduce development travel demands on Francis Avenue.

Mitigation. Adaptive signal control would be a direct mitigation of development; with design and installation coordinated with City and WSDOT officials. The prevailing travel demand strategy is to offer STA bus passes to residence of Windhaven. The Spokane Regional Commute Trip Reduction Plan has a 10 percent travel reduction goal. Thus, a minimum of 80 monthly bus passes would be offered to residences of Windhaven, as provided on a first-come basis. This would affect a 10 percent decrease in project trip generation meeting regional CTR goals. The preferred alternative would be advanced in coordination with City officials, as enforced with a developer agreement.

6.3 PUBLIC PARTICIPATION

Primary questions/points from the public involvement process performed to support this project are addressed as follows:

- ◆ The scope for this study was set in coordination with officials from the City of Spokane and WSDOT. Any locations/areas not included (in this study) were likely because project impacts were anticipated to be minimal outside of the specified and highlighted study area (reviewed by this TIA).
- ◆ The study did not review impacts to Woodside Avenue because trips from Windhaven are not likely to turn to/from this unsignalized intersection; especially because traffic circles programmed along Woodside Avenue should deter the occurrence of neighborhood cut through traffic. Note it is understood overall that turning traffic at this intersection is a public concern, but the collision rate determined for this intersection currently does not denote the potential for a high accident location.
- ◆ A collision analysis was performed in response to neighborhood concerns. The analysis does not highlight a high accident location (HAL) along Indian Trail Road, nor does it conclude that Indian Trail Road is a high accident corridor (HAC).
- ◆ The Barnes Road, Phoebe to Strong “Safety” project programmed for construction in year 2017 will provide a paved, secondary route of travel in the event some emergency forced the closure of Indian Trail Road.
- ◆ The project reviews a number of concurrent development projects (i.e. pipeline projects), specifically in the development of traffic forecasts. Any subsequent developments must

review Windhaven and these pipeline projects in order to assure cumulative traffic growth and capacity commitments are considered as the region continues to mature.

- ◆ City officials identified the pipeline projects to be included with this development.
- ◆ The TIA addresses the full traffic impacts associated with trip generation for 750 apartment units. The TIA phases the analysis into future without and then future with project conditions because a number of trips are already vested for the site and are treated as a pipeline project. But trip gains/increases are then combined to reflect total-apartment build trip totals.
- ◆ Conservative traffic forecasts were developed for the Barnes Road connection to Strong Road; reflecting specified and non-specified development/pipeline project traffic. The traffic forecasts presented in the TIA are more conservative (higher) than traffic studies generated by the City Street Department for the roadway.
- ◆ The City has directed that the final TIA moderately the Barnes Road assignments from 21% to 19% with the remaining trips directed to other destinations along Indian Trail Road (such as the shopping center).
- ◆ This TIA reflects a resultant 6 to 7 percent annual growth by year 2021 which can be extrapolated to a 1.4 percent annual growth rate through year 2040. By comparison, the Indian Trail Widening Roadway Capacity Justification Report provided by City Engineers predicts 1.3 percent annual growth on Indian Trail Road by year 2040. Thus, the TIA uses conservative traffic forecasts that exceeds the projections of even City officials.
- ◆ LOS were demonstrated to be adequate along Indian Trail Road with this TIA, as defined by City LOS Standards. As such, any recommendations of this report do not have to be programmed within the City 6-Transportation Improvement Program/Plan. With that said, this Final TIA does recommend a minimum four lane roadway with two northbound and two southbound lanes will be constructed along Indian Trail Road, within the Kathleen Avenue and Lowell Avenue “bottleneck” area, as a condition of development. The improvement would be developed with the City roadway rehabilitation project programmed for Indian Trail Road in year 2018.
- ◆ A summary field study was performed for the Lusitano Apartment complex located adjacent to the proposed Windhaven development along Barnes Road. The field study indicates the resultant trip generation rates used in the TIA are nearly 60 percent higher in the AM and over 45 percent higher in the PM versus rates established on local field counts. This means this TIA well overestimates traffic versus what is likely to occur in the future with Windhaven development.

A summary field study was performed for the Lusitano Apartment complex located adjacent to the proposed Windhaven development along Barnes Road. The field study indicates the resultant trip generation rates used in the TIA are nearly 60 percent higher in the AM and over 45 percent higher in the PM versus rates established on local field counts. This means this TIA well overestimates traffic versus what is likely to occur in the future with Windhaven development.

6.4 SUMMARY

The improvements and mitigation described will address project-related deficiencies noted throughout the TIA (specifically for Indian Trail Road). The project will contribute \$362,620 towards mitigation of area deficiencies, via the TIF; specifically working to Indian Trail Road

improvements. The project will also either provide adaptive traffic controls for the Maple Street/Francis Avenue intersection or promote travel demand management strategies to minimize project impacts to Francis Avenue. Thus, this TIA should successfully support the zone change and comprehensive plan modifications being sought with the 750 unit apartment project proposal being sought for Windhaven, as project impacts will be addressed.

No further recommendations are provided by this TIA.

Appendix A

Glossary of Terms

This section of the Technical Appendix provides a glossary of terms. The *Highway Capacity Manual* (TRB, 2010) and the *Transportation Impact Analyses for Site Development* (ITE, 2005) were used to help with the development of the following definitions:

- ◆ **Access point** – An intersection, driveway, or opening on a roadway that provides access to a land use or facility.
- ◆ **All-way stop-controlled** – An intersection with stop signs located on all approaches.
- ◆ **Arterial** – (General Definition) A signalized street that primarily serves through-traffic and secondarily provides access to abutting properties.
- ◆ **Average daily traffic (ADT)** – The average 24 hour traffic volume at a given location on a roadway.
- ◆ **Capacity** – The number of vehicles or persons that can be accommodated on a roadway, roadway section, or at an intersection over a specified period of time. Capacity is also a term used to define limits for transit, pedestrian, and bicycle facilities. Concept typically expressed as vehicles per hour, vehicles per day, or persons per hour or per day.
- ◆ **Collector street** – (General Definition) A surface street providing land access and traffic circulation within residential, commercial, and industrial areas.
- ◆ **Cycle** – A complete sequence of cycle indicators.
- ◆ **Cycle length** – The total time for a signal to complete one cycle.
- ◆ **Delay** – The additional travel time experienced by a driver, passenger, or pedestrian.
- ◆ **Demand** – The number of users desiring service on a highway system or street over a specified time period. Concept typically expressed as vehicles per hour, vehicles per day, or persons per hour or per day.
- ◆ **Departing sight distance** – The length of road required for a vehicle to turn from a stopped position at an intersection (or driveway) and accelerate to travel speed.
- ◆ **Downstream** – The direction of traffic flow.
- ◆ **Functional class** – A transportation facility defined by the traffic service it provides.
- ◆ **Growth factor** – A percentage increase applied to current traffic demands or counts to estimate future demands/volumes.
- ◆ **Level of Service** – The standard used to evaluate traffic operating conditions of the transportation system. This is a qualitative assessment of the quantitative effect of factors such as speed, volume of traffic, geometric features, traffic interruptions, delays and freedom to maneuver. Operating conditions are categorized as LOS A through LOS “F”. LOS A generally represents the most favorable driving conditions and LOS F represents the least favorable conditions.
- ◆ **Mainline** – The primary through roadway as distinct from ramps, auxiliary lanes, and collector-distributor roads.
- ◆ **Major Street** – The street not controlled by stop signs at a two-way stop-controlled intersection.
- ◆ **Minor arterial** – (General Definition) A functional category of a street allowing trips of moderate length within a relatively small geographical area.
- ◆ **Operational analysis** – A use of capacity analysis to determine the level of service on an existing or projected facility, with known or projected traffic, roadway, and control conditions.

- ◆ **Peak Generator Hour** – The single hour (or hours) in a day during which trip generation for a development or land use is highest.
- ◆ **Peak hour** – Single hour (or hours) in a day during which the maximum traffic volume occurs on a given facility (roadway, intersection, etc.). Typically the peak hour is known as the “rush” hour that occurs during the AM or PM work commutes of the typical weekday. The absolute peak hour of the day can also be referred to as the design hour.
- ◆ **Peak Generator Hour** – The peak hourly volume generated by a particular development or land use. In the context of traffic reports, the generator hour can occur in the morning and afternoon, described as AM and PM peak generator hours, respectively.
- ◆ **Peak hour factor** – The hourly volume during the maximum-volume hour of the day divided by the peak 15-minute flow rate within the peak hour; a measure of traffic demand fluctuation within the peak hour.
- ◆ **Principal Arterial** - (General Definition) A major surface street with relatively long trips between major points, and with through-trips entering, leaving, and passing through the urban area.
- ◆ **Queue** – A line of vehicles, bicycles, or persons waiting to be served by the system in which the flow rate from the front of the queue determines the average speed within the queue. Slower moving vehicles or people joining the rear of the queue are usually considered a part of the queue.
- ◆ **Roadside obstruction** – An object or barrier along a roadside or median that affects traffic flow, whether continuous (e.g., a retaining wall) or not continuous (e.g., light supports or a bridge abutment).
- ◆ **Road characteristic** – A geometric characteristic of a street or highway, including the type of facility, number and width of lanes, shoulder widths and lateral clearances, design speed, and horizontal and vertical alignment.
- ◆ **Roundabout** – An unsignalized intersection with a circulatory roadway around a central island with all entering vehicles yielding to the circulating traffic.
- ◆ **Shoulder** – A portion of the roadway contiguous with the traveled way for accommodation of stopped vehicles, emergency use, and lateral support of the subbase, base, and surface courses.
- ◆ **Stopping sight distance** – The length of road needed for a moving vehicle to come to a complete stop prior to an obstruction sighted on the road.
- ◆ **Traffic conditions** – A characteristic of traffic flow, including distribution of vehicle types in the traffic stream, directional distribution of traffic, lane use distribution of traffic, and type of driver population on a given facility.
- ◆ **Travel speed** – The average speed, in miles per hour, of a traffic computed as the length of roadway segment divided by the average travel time of the vehicles traversing the segment.
- ◆ **Travel time** – The average time spent by vehicles traversing a highway segment, including control delay, in seconds per vehicle or minutes per vehicle.
- ◆ **Trip Distribution and Assignment** – The predicted travel patterns of vehicle trips as they approach and depart a land use. Distribution refers to the travel pattern, usually defined in percentages or fractions, and assignment refers to vehicle trip ends.

- ◆ **Traffic forecast** – The predicted traffic volume of the analysis horizon year or time period. Most typically predicted for the weekday, AM peak hour, PM peak hour, or AM or PM peak generator hours of the typical weekday.
 - ◆ **Traffic impact analysis** – A *traffic impact analysis* (TIA) is an engineering and planning study that forecasts the potential traffic and transportation impacts of a proposed development on an area, neighborhood, or community. Reports can also be referred to as a traffic impact study (TIS).
 - ◆ **Trip generation** – The number of vehicle trips generated by a development or land use. Most typically predicted for the weekday, AM peak hour, PM peak hour, or AM or PM peak generator hours of the typical weekday.
 - ◆ **Two-way left-turn lane** – A lane in the median area that extends continuously along a street or highway and is marked to provide a deceleration and storage area, out of the through-traffic stream, for vehicles traveling in either direction to use in marking left turns at intersections and driveways.
 - ◆ **Two-way stop-controlled** – The type of traffic control at an intersection where drivers on the minor street or driver turning left from the major street wait for a gap in the major-street traffic to complete a maneuver. Typically the minor approaches are stop-controlled.
 - ◆ **Unsignalized intersection** – An intersection not controlled by traffic signals.
 - ◆ **Upstream** – The direction from which traffic is flowing.
 - ◆ **Volume** – The number of persons or vehicles passing a point on a lane, roadway, or other traffic-way during some time interval, often one hour, expressed in vehicles, bicycles, or persons per hour.
 - ◆ **Volume-to-capacity ratio** – The ratio of flow rate to capacity for a transportation facility.
 - ◆ **Walkway** – A facility provided for pedestrian movement and segregated from vehicle traffic by a curb, or provide for on a separate right-of-way.
-

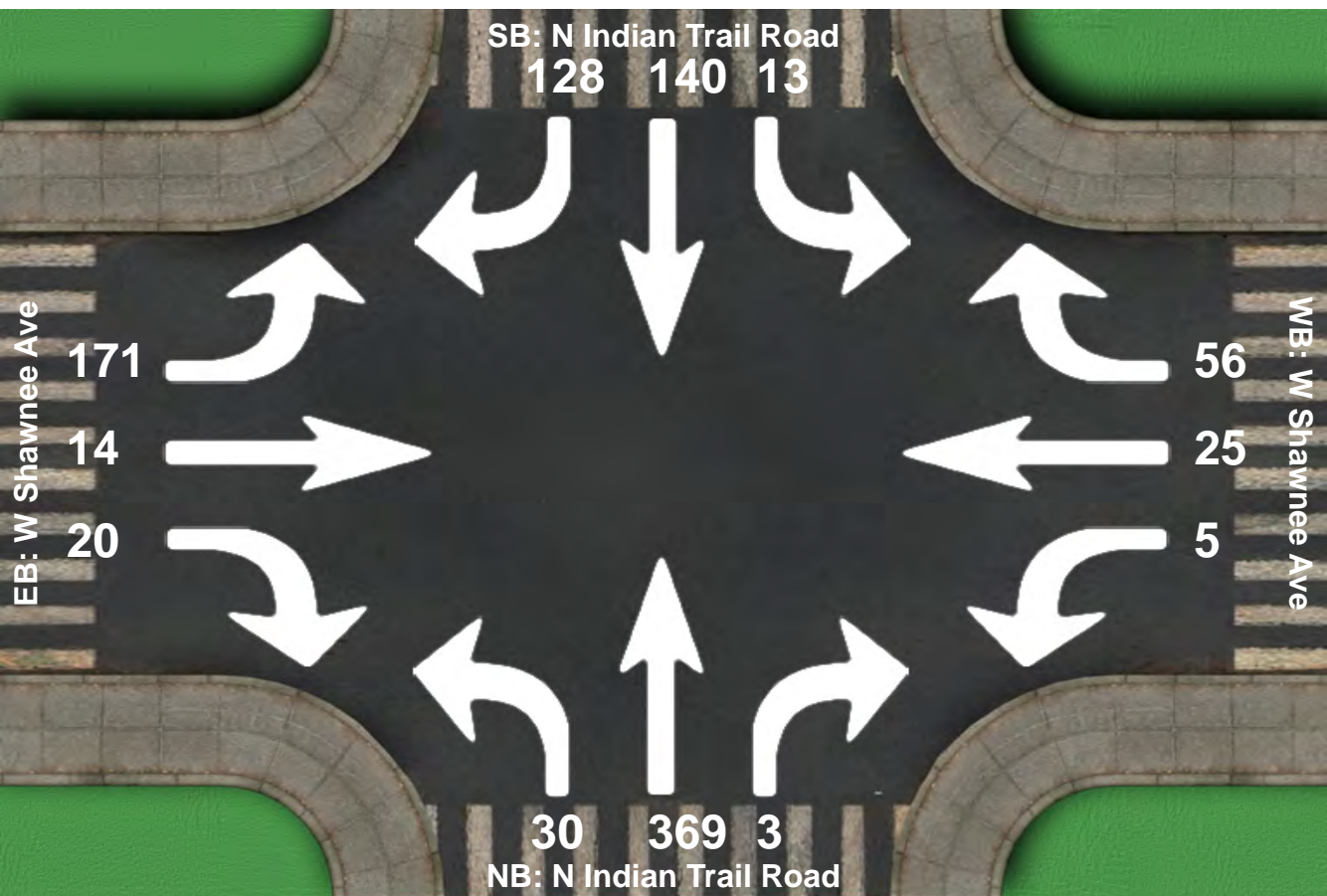
Appendix B

Summary Traffic Counts

Intersection Peak Hour

Location: N Indian Trail Road at W Shawnee Ave, Spokane, WA
GPS Coordinates:
Date: 2016-04-28
Day of week: Thursday
Weather:
Analyst: MMI

NORTH
(COUNT BOARD
REVERSED)



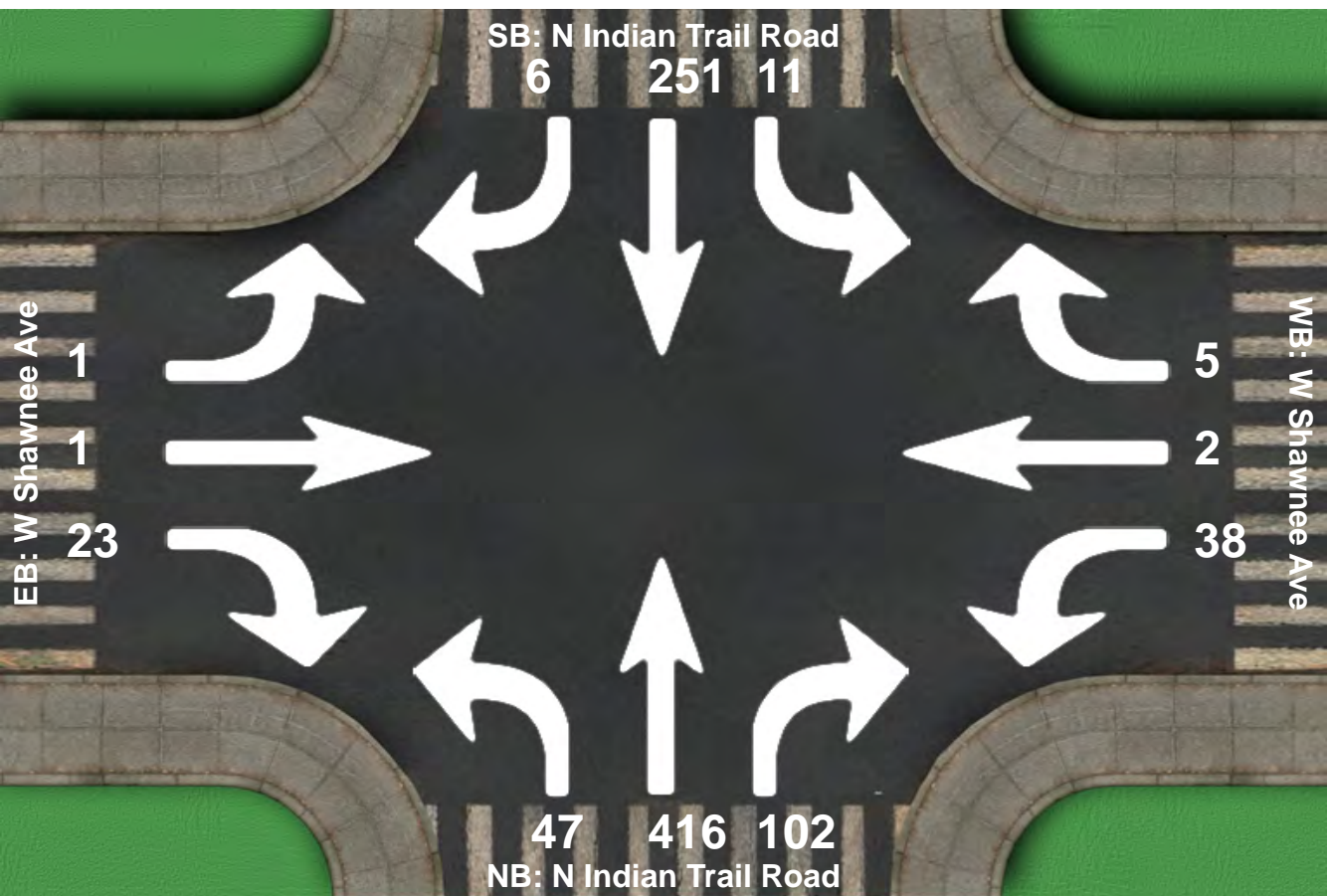
Intersection Peak Hour

07:45 - 08:45

	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
Vehicle Total	13	140	128	5	25	56	30	369	3	171	14	20	974
Factor	0.65	0.71	0.71	0.62	0.37	0.74	0.75	0.81	0.75	0.59	0.44	0.62	0.73
Approach Factor	0.76			0.72			0.81			0.58			

Intersection Peak Hour

Location: N Indian Trail Road at W Shawnee Ave, Spokane, WA
GPS Coordinates:
Date: 2016-04-27
Day of week: Wednesday
Weather:
Analyst: MMI



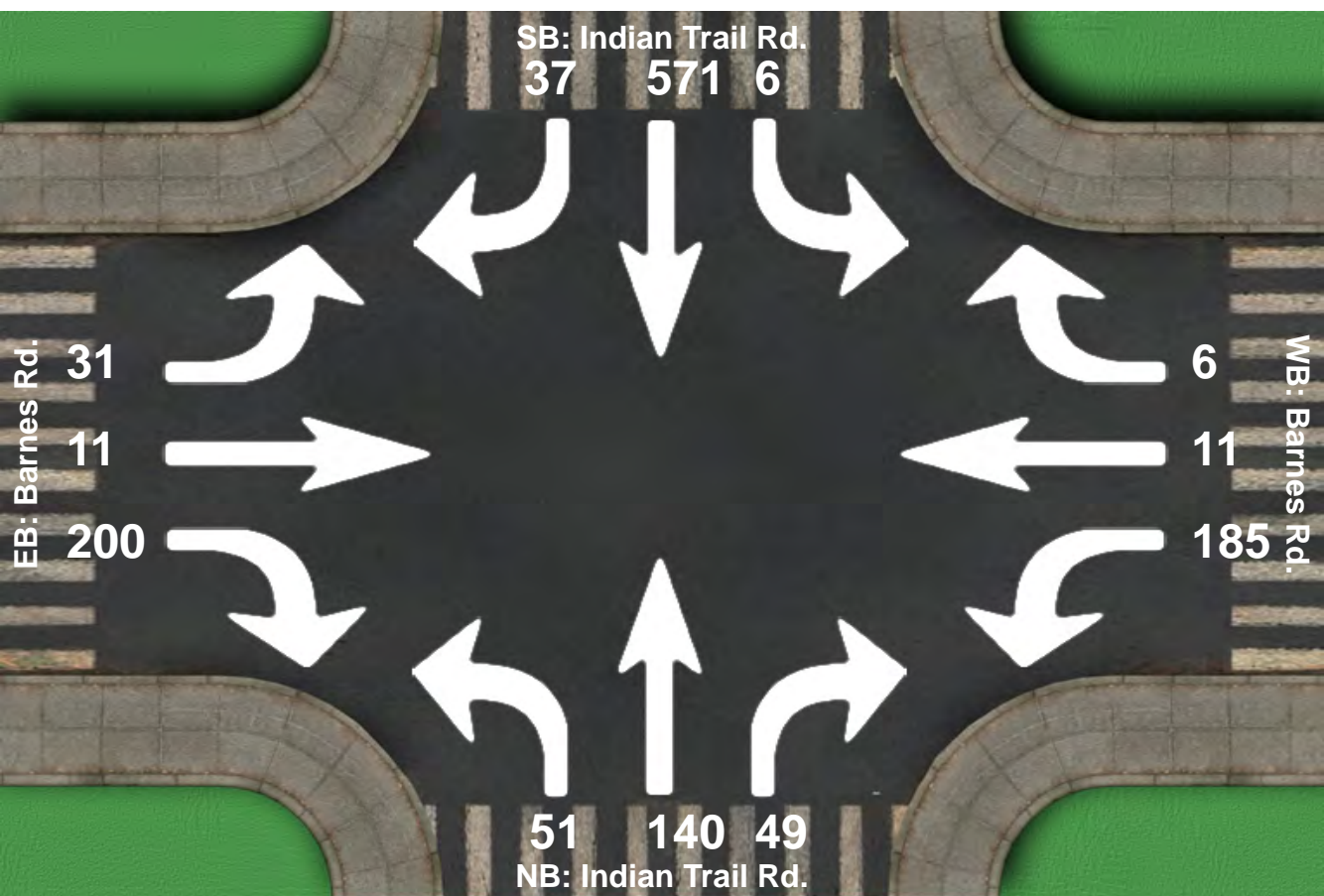
Intersection Peak Hour

16:45 - 17:45

	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
Vehicle Total	11	251	6	38	2	5	47	416	102	1	1	23	903
Factor	0.55	0.92	0.50	0.79	0.50	0.42	0.69	0.94	0.82	0.25	0.25	0.57	0.93
Approach Factor	0.96			0.80			0.94			0.62			

Intersection Peak Hour

Location: Indian Trail Rd. at Barnes Rd., Spokane, WA.
GPS Coordinates:
Date: 2016-03-02
Day of week: Wednesday
Weather: Showers
Analyst: Mike McCluskey



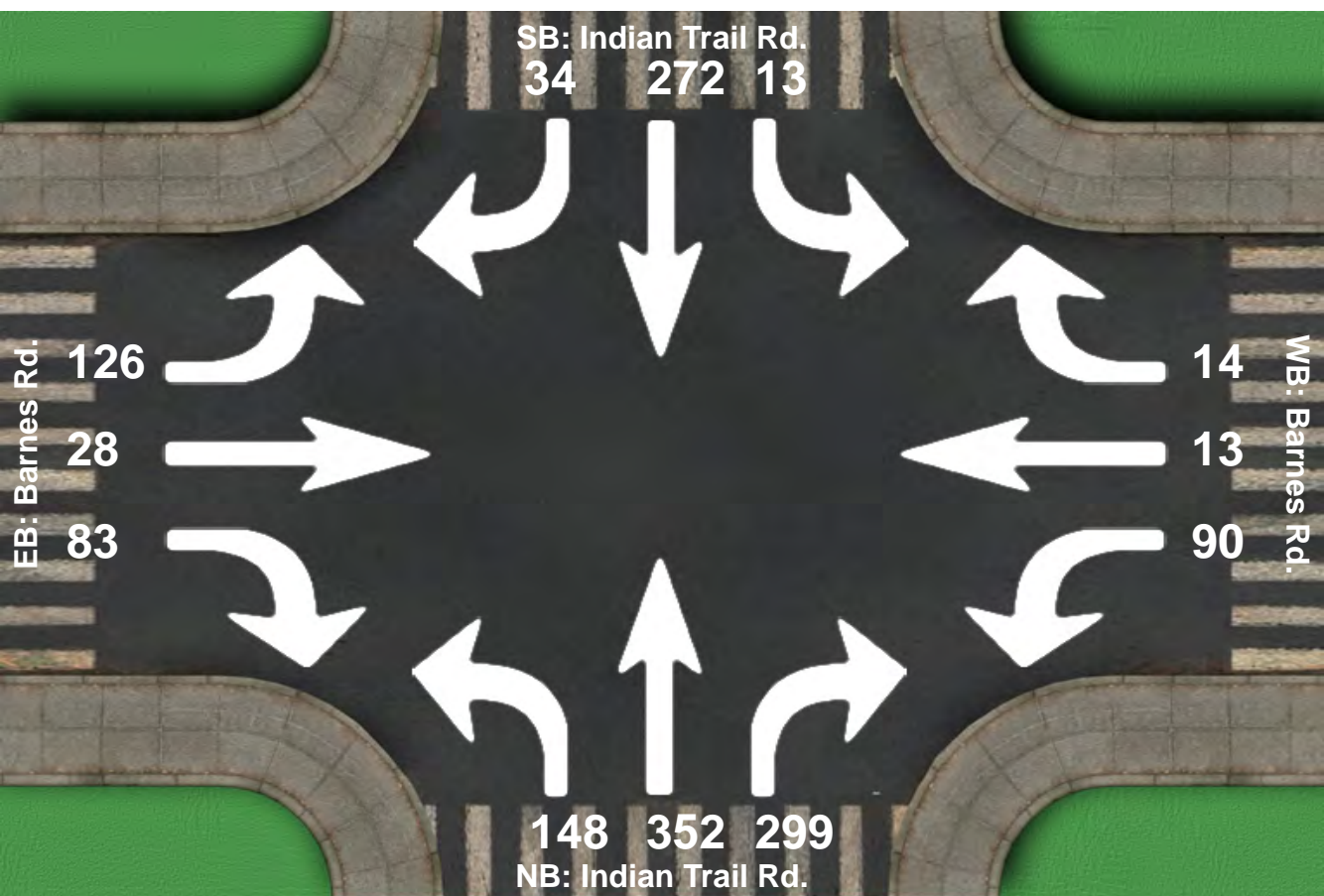
Intersection Peak Hour

07:00 - 08:00

	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
Vehicle Total	6	571	37	185	11	6	51	140	49	31	11	200	1298
Factor	0.75	0.86	0.77	0.89	0.55	0.50	0.75	0.80	0.58	0.60	0.55	0.85	0.92
Approach Factor	0.86			0.89			0.78			0.89			

Intersection Peak Hour

Location: Indian Trail Rd. at Barnes Rd., Spokane, WA.
GPS Coordinates:
Date: 2016-03-02
Day of week: Wednesday
Weather: Cloudy
Analyst: Mike McCluskey



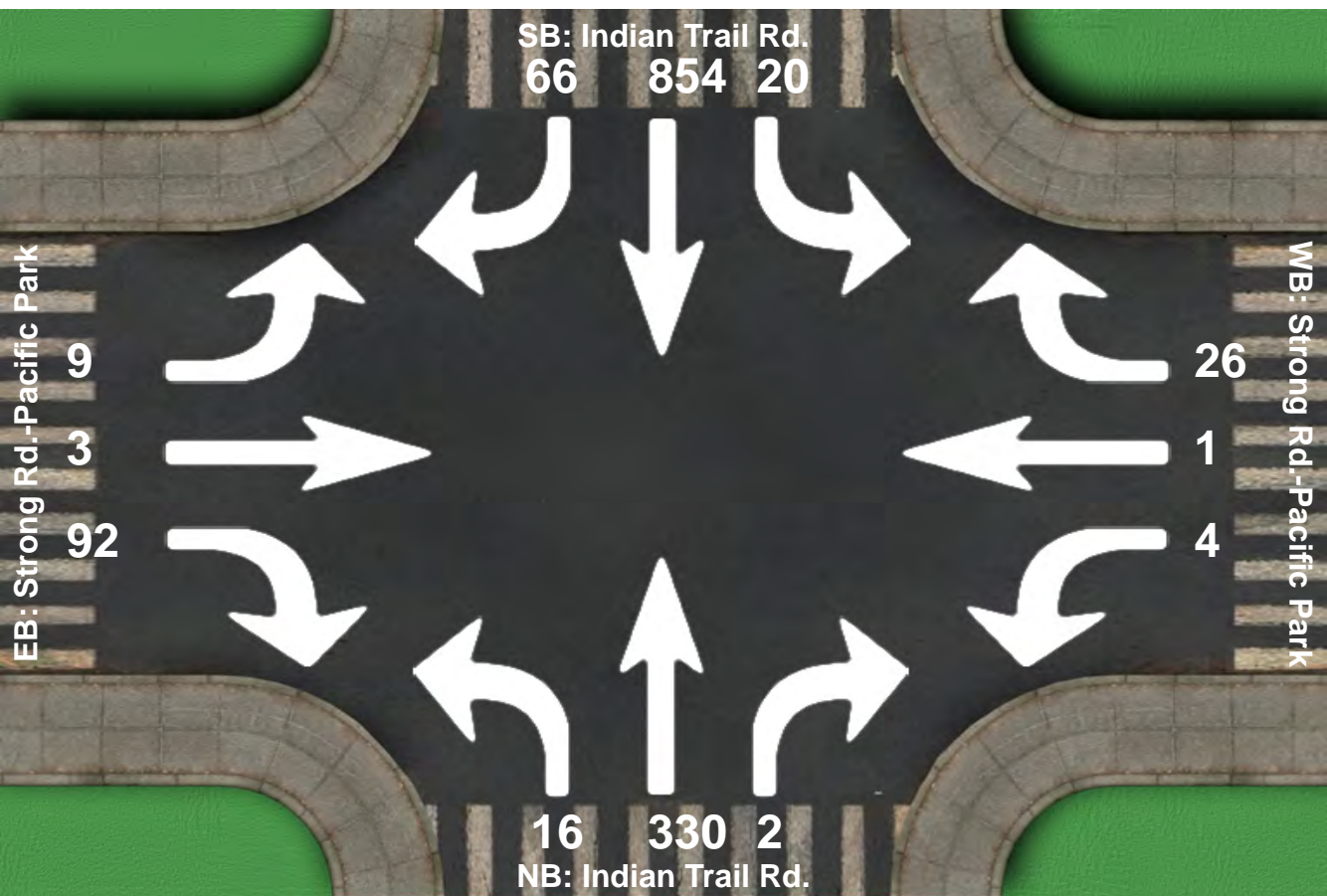
Intersection Peak Hour

17:00 - 18:00

	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
Vehicle Total	13	272	34	90	13	14	148	352	299	126	28	83	1472
Factor	0.65	0.80	0.77	0.83	0.54	0.70	0.82	0.81	0.79	0.88	0.58	0.90	0.92
Approach Factor	0.82			0.94			0.89			0.83			

Intersection Peak Hour

Location: Indian Trail Rd. at Strong Rd.-Pacific Park, Spokane, WA.
GPS Coordinates:
Date: 2016-03-03
Day of week: Thursday
Weather: Rain
Analyst: Mike McCluskey



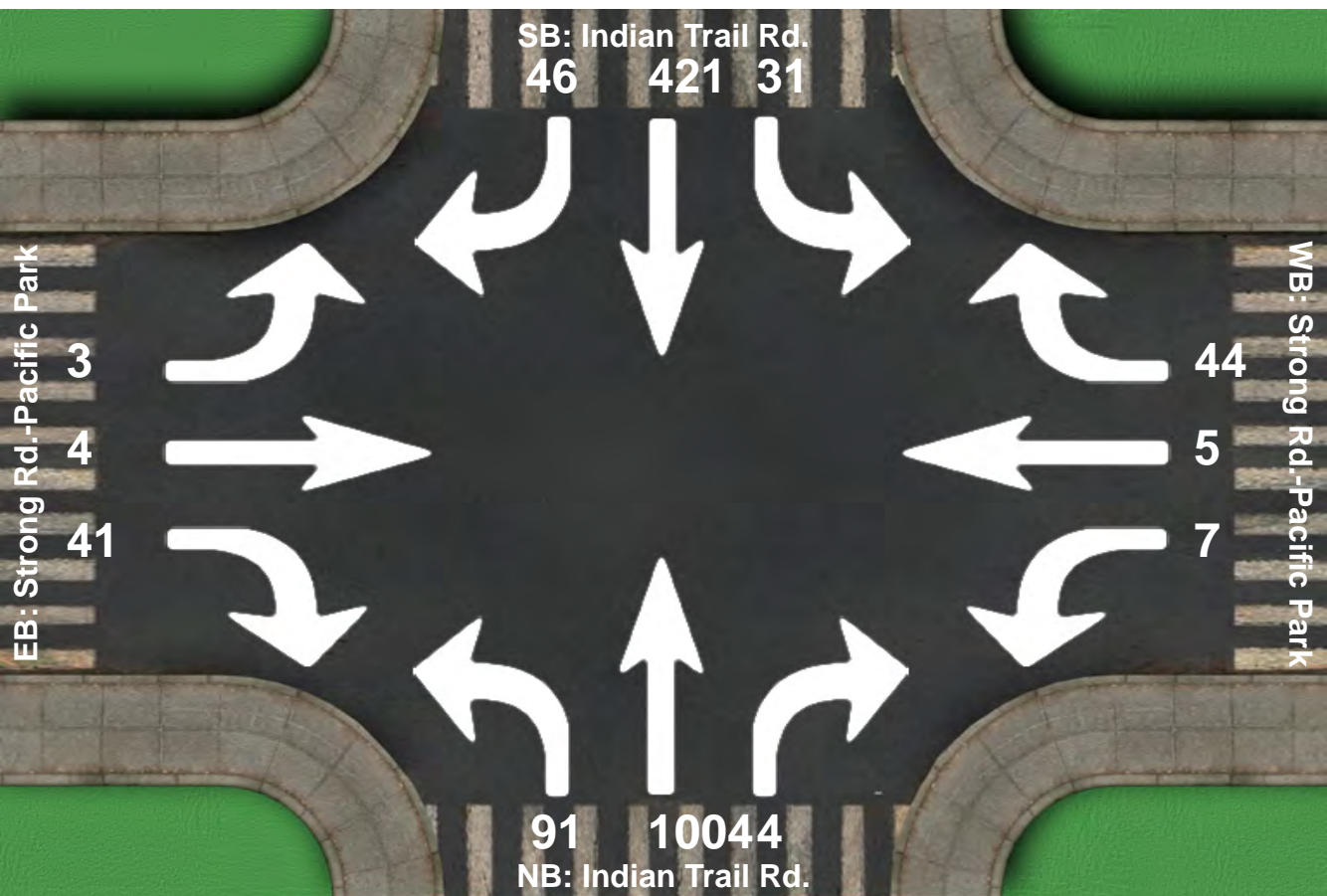
Intersection Peak Hour

07:30 - 08:30

	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
Vehicle Total	20	854	66	4	1	26	16	330	2	9	3	92	1423
Factor	0.50	0.86	0.53	0.33	0.25	0.72	0.57	0.91	0.25	0.75	0.38	0.79	0.90
Approach Factor	0.84			0.70			0.92			0.81			

Intersection Peak Hour

Location: Indian Trail Rd. at Strong Rd.-Pacific Park, Spokane, WA.
GPS Coordinates:
Date: 2016-03-03
Day of week: Thursday
Weather: Cloudy
Analyst: Mike McCluskey



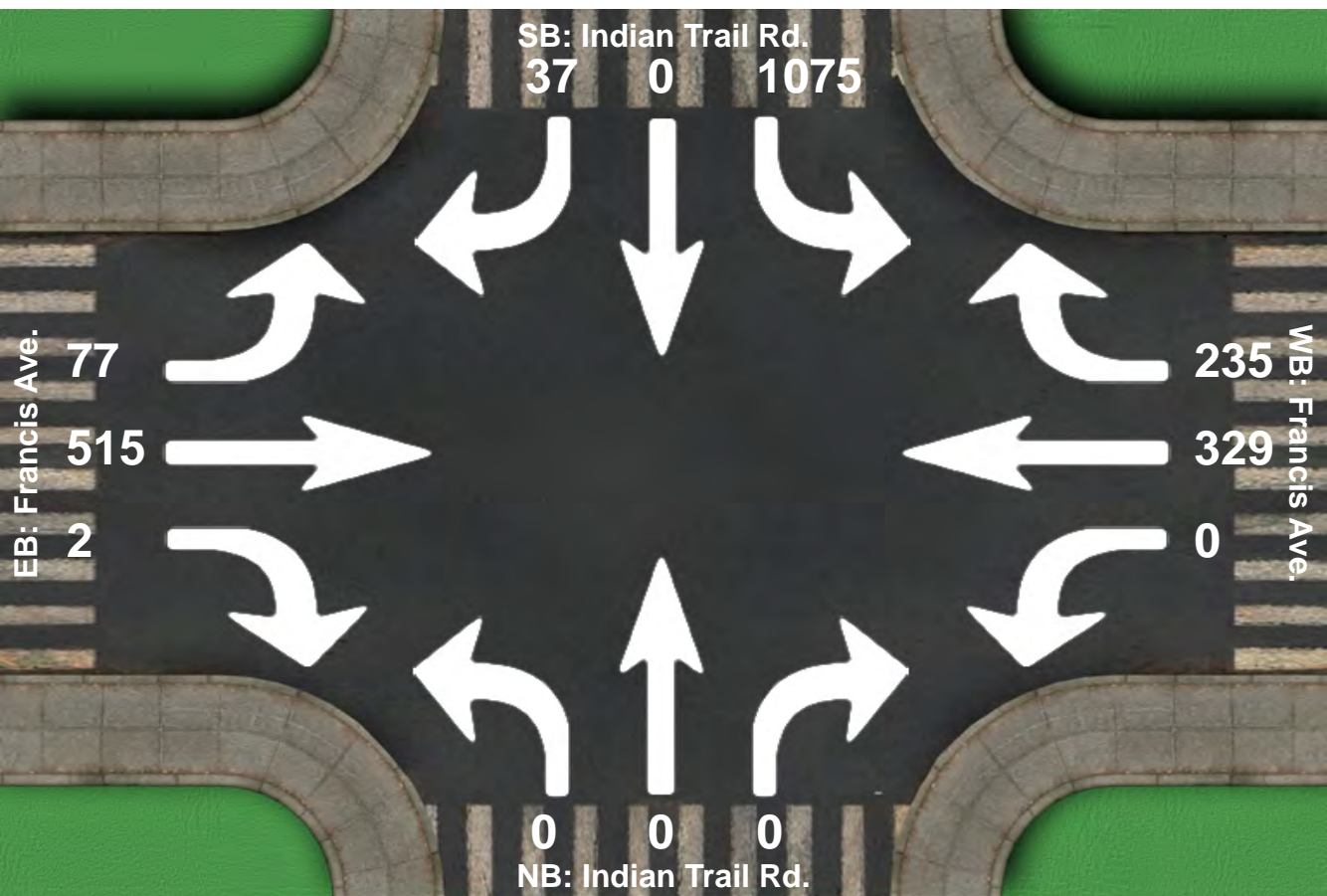
Intersection Peak Hour

17:00 - 18:00

	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
Vehicle Total	31	421	46	7	5	44	91	1004	4	3	4	41	1701
Factor	0.77	0.92	0.77	0.58	0.42	0.73	0.84	0.87	0.50	0.25	0.50	0.68	0.94
Approach Factor	0.94			0.74			0.89			0.75			

Intersection Peak Hour

Location: Indian Trail Rd. at Francis Ave., Spokane WA.
GPS Coordinates:
Date: 2016-03-08
Day of week: Tuesday
Weather: Sunny
Analyst: Mike McCluskey



Intersection Peak Hour

07:00 - 08:00

	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
Vehicle Total	1075	0	37	0	329	235	0	0	0	77	515	2	2270
Factor	0.88	0.00	0.51	0.00	0.89	0.74	0.00	0.00	0.00	0.64	0.84	0.25	0.90
Approach Factor	0.86			0.83			0.00			0.89			

Intersection: Indian Trail Rd/Francis Ave
 Project: Windhaven
 City: Spokane, WA

Date: 3/8/2016
 Time: 5:00 PM
 Analyst: MMI

Francis Avenue	N - S Street:				Indian Trail Road								Francis Avenue
					IN	0.84	OUT						
					522	0%	1149						
						0							
					77	SBT	445						
						SBR		SBL					
	OUT	705	141	EBL					WBR	1008	1636	IN	
	0.93	0%	454	EBT					WBT	628	0.0067	0.98	
	IN	595	0	EBR					WBL	0	900	OUT	
	Total PHF: 0.94 Total Trucks: 0 Total Entering: 2754				NBL		NBR						
0					NBT	1							
					0								
0					100%	1							
OUT					0.25	IN							
E - W Street	N - S Street:				Indian Trail Road								E - W Street

Total Volumes:

	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR	Total
0 - 15	0	0	1	90	0	17	42	110	0	0	154	242	656
15 - 30	0	0	0	109	0	28	34	117	0	0	170	244	702
30 - 45	0	0	0	134	0	21	42	118	0	0	147	270	732
45 - 60	0	0	0	112	0	11	23	109	0	0	157	252	664
Total	0	0	1	445	0	77	141	454	0	0	628	1008	2754

Automobiles:

	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR	Total
0 - 15				90		17	42	109			152	241	651
15 - 30				109		28	34	116			168	243	698
30 - 45				134		21	42	118			147	269	731
45 - 60				112		11	23	109			156	249	660
Total	0	0	0	445	0	77	141	452	0	0	623	1002	2740

Heavy Vehicles: Approach Entered only - TM not correct

	NB Approach			SB Approach			EB Approach			WB Approach			Total
0 - 15	0		1				0	1			2	1	5
15 - 30	0		0				0	1			2	1	4
30 - 45	0		0				0	0			0	1	1
45 - 60	0		0				0	0			1	3	4
Total	0	0	1	0	0	0	0	2	0	0	5	6	14

Intersection: Alberta St/Francis Ave
 Project: Windhaven
 City: Spokane, WA

Date: 3/15/2016
 Time: 7:15 AM
 Analyst: MMI

Francis Avenue	N - S Street:				Alberta Street								Francis Avenue
					IN	0.70	OUT						
					221	0%	65						
						114							
					29	SBT	78						
					SBR		SBL						
	OUT	712	15	EBL					WBR	27	716	IN	
	0.88	1%	1036	EBT					WBT	536	0.0307	0.86	
	IN	1175	124	EBR					WBL	153	1212	OUT	
					NBL		NBR						
147					NBT	98							
Total PHF: 0.93					23								
Total Trucks: 0					391	4%	268						
Total Entering: 2380					OUT	0.77	IN						
E - W Street	N - S Street:				Alberta Street								E - W Street

Total Volumes:

	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR	Total
0 - 15	19	2	16	24	27	7	4	286	45	33	102	10	575
15 - 30	30	7	24	29	43	7	2	298	35	32	126	7	640
30 - 45	47	4	36	14	26	10	5	254	26	47	147	3	619
45 - 60	51	10	22	11	18	5	4	198	18	41	161	7	546
Total	147	23	98	78	114	29	15	1036	124	153	536	27	2380

Automobiles:

	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR	Total
0 - 15	17	2	15	24	26	7	4	286	45	33	98	10	567
15 - 30	30	7	24	29	43	7	2	294	35	31	120	7	629
30 - 45	42	3	36	14	26	10	5	252	26	45	144	3	606
45 - 60	48	10	22	11	18	5	4	194	18	40	156	7	533
Total	137	22	97	78	113	29	15	1026	124	149	518	27	2335

Heavy Vehicles: Approach Entered only - TM not correct

	NB Approach			SB Approach			EB Approach			WB Approach			Total
0 - 15	2	0	1	0	1	0	0	0	0	0	4	0	8
15 - 30	0	0	0	0	0	0	0	4	0	1	6	0	11
30 - 45	5	1	0	0	0	0	0	2	0	2	3	0	13
45 - 60	3	0	0	0	0	0	0	4	0	1	5	0	13
Total	10	1	1	0	1	0	0	10	0	4	18	0	45

Intersection: Alberta St/Francis Ave
 Project: Windhaven
 City: Spokane, WA

Date: 3/15/2016
 Time: 5:00 PM
 Analyst: MMI

Francis Avenue	N - S Street:				Alberta Street										Francis Avenue
					IN	0.69	OUT								
					113	1%	159								
						49									
					25	SBT	39								
									SBR		SBL				
	OUT	1637	33	EBL					WBR	18	1399	IN			
	0.87	0%	862	EBT					WBT	1240	0.0214	0.97			
	IN	972	77	EBR					WBL	141	1025	OUT			
					NBL		NBR								
E - W Street					372	NBT	124								E - W Street
	Total PHF: 0.96					108									
	Total Trucks: 0				267	0%	604								
	Total Entering: 3088				OUT	0.95	IN								
	N - S Street:				Alberta Street										

Total Volumes:

	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR	Total
0 - 15	96	28	27	6	8	7	6	206	12	30	313	7	746
15 - 30	88	29	40	11	14	7	10	207	18	39	298	4	765
30 - 45	85	28	24	16	21	4	5	206	22	34	326	2	773
45 - 60	103	23	33	6	6	7	12	243	25	38	303	5	804
Total	372	108	124	39	49	25	33	862	77	141	1240	18	3088

Automobiles:

	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR	Total
0 - 15	96	28	27	6	8	6	6	206	12	30	303	7	735
15 - 30	87	29	40	11	14	7	10	207	18	39	295	4	761
30 - 45	84	28	24	16	21	4	5	206	22	34	317	2	763
45 - 60	102	23	33	6	6	7	12	243	25	38	295	5	795
Total	369	108	124	39	49	24	33	862	77	141	1210	18	3054

Heavy Vehicles: Approach Entered only - TM not correct

	NB Approach			SB Approach			EB Approach			WB Approach			Total
0 - 15	0		0			1		0			10		11
15 - 30	1		0			0		0			3		4
30 - 45	1		0			0		0			9		10
45 - 60	1		0			0		0			8		9
Total	3	0	0	0	0	1	0	0	0	0	30	0	34

Intersection: Ash St/Francis Ave
 Project: Windhaven
 City: Spokane, WA

Date: 3/10/2016
 Time: 7:15 AM
 Analyst: MMI

Francis Avenue	N - S Street:				Ash Street										Francis Avenue
					IN	0.95	OUT								
					1374	3%	0								
						673									
					393	SBT	308								
					SBR		SBL								
	OUT	895	0	EBL					WBR	0	610	IN			
	0.87	1%	1053	EBT					WBT	502	0.0656	0.83			
	IN	1234	181	EBR					WBL	108	1361	OUT			
	Total PHF: 0.93 Total Trucks: 0 Total Entering: 3218				NBL		NBR								
0					NBT	0									
					0										
962					#DIV/0!	0									
OUT					#DIV/0!	IN									
E - W Street	N - S Street:				Ash Street										E - W Street

Total Volumes:

	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR	Total
0 - 15	0	0	0	86	185	88	0	260	50	24	99	0	792
15 - 30	0	0	0	92	171	98	0	299	56	23	130	0	869
30 - 45	0	0	0	63	172	88	0	293	37	34	150	0	837
45 - 60	0	0	0	67	145	119	0	201	38	27	123	0	720
Total	0	0	0	308	673	393	0	1053	181	108	502	0	3218

Automobiles:

	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR	Total
0 - 15				84	183	86		258	50	24	89		774
15 - 30				89	165	96		295	53	20	124		842
30 - 45				60	159	86		292	37	34	141		809
45 - 60				65	142	117		201	38	27	111		701
Total	0	0	0	298	649	385	0	1046	178	105	465	0	3126

Heavy Vehicles: Approach Entered only - TM not correct

	NB Approach			SB Approach			EB Approach			WB Approach			Total
0 - 15				2	2	2		2	0	0	10		18
15 - 30				3	6	2		4	3	3	6		27
30 - 45				3	13	2		1	0	0	9		28
45 - 60				2	3	2		0	0	0	12		19
Total	0	0	0	10	24	8	0	7	3	3	37	0	92

Intersection: Ash St/Francis Ave
 Project: Windhaven
 City: Spokane, WA

Date: 3/10/2016
 Time: 5:00 PM
 Analyst: MMI

Francis Avenue	N - S Street:				Ash Street										Francis Avenue
					IN	0.94	OUT								
					1140	4%	0								
						562									
					362	SBT	216								
					SBR		SBL								
	OUT	1666	0	EBL					WBR	0	1523	IN			
	0.98	1%	961	EBT					WBT	1304	0.0492	0.96			
	IN	1054	93	EBR					WBL	219	1177	OUT			
	E - W Street					NBL		NBR							
0						NBT	0								
Total PHF: 0.98 Total Trucks: 0 Total Entering: 3717				874	#DIV/0!	0									
				OUT	#DIV/0!	IN									
N - S Street:				Ash Street											

Intersection: Maple St/Francis Ave
 Project: Windhaven
 City: Spokane, WA

Date: 3/9/2016
 Time: 7:15 AM
 Analyst: MMI

Francis Avenue	N - S Street:				Maple Street								Francis Avenue
					IN	#DIV/0!	OUT						
					0	#DIV/0!	788						
						0							
					0	SBT	0						
					SBR		SBL						
	OUT	510	235	EBL					WBR	78	582	IN	
	0.88	1%	1089	EBT					WBT	504	0.0275	0.87	
	IN	1324	0	EBR					WBL	0	1234	OUT	
					NBL		NBR						
6					NBT	145							
Total PHF: 0.93					475								
Total Trucks: 0					0	4%	626						
Total Entering: 2532					OUT	0.97	IN						
E - W Street	N - S Street:				Maple Street								E - W Street

Total Volumes:

	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR	Total
0 - 15	2	120	33	0	0	0	40	293	0	0	117	17	622
15 - 30	2	122	34	0	0	0	70	308	0	0	110	14	660
30 - 45	0	118	44	0	0	0	69	283	0	0	141	26	681
45 - 60	2	115	34	0	0	0	56	205	0	0	136	21	569
Total	6	475	145	0	0	0	235	1089	0	0	504	78	2532

Automobiles:

	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR	Total
0 - 15		118	32				39	290			114	14	607
15 - 30		116	33				69	306			106	13	643
30 - 45		116	43				68	278			141	23	669
45 - 60		115	31				56	203			135	20	560
Total	0	465	139	0	0	0	232	1077	0	0	496	70	2479

Heavy Vehicles: Approach Entered only - TM not correct

	NB Approach			SB Approach			EB Approach			WB Approach			Total
0 - 15	2	2	1				1	3			3	3	15
15 - 30	2	6	1				1	2			4	1	17
30 - 45	0	2	1				1	5			0	3	12
45 - 60	2	0	3				0	2			1	1	9
Total	6	10	6	0	0	0	3	12	0	0	8	8	53

Intersection: Maple St/Francis Ave
 Project: Windhaven
 City: Spokane, WA

Date: 3/9/2016
 Time: 5:00 PM
 Analyst: MMI

Francis Avenue	N - S Street:				Maple Street										
					IN	#DIV/0!	OUT								
					0	#DIV/0!	1378								
					0										
					0	SBT	0								
					SBR						SBL				
	OUT	1501	308	EBL						WBR	207	1362	IN		
	0.96	1%	879	EBT						WBT	1155	0.0338	0.96		
	IN	1187	0	EBR						WBL	0	1044	OUT		
					NBL						NBR				
346					NBT	165									
Total PHF: 0.97					863		1374								
Total Trucks: 0					0%										
Total Entering: 3923					0.95										
E - W Street	N - S Street:				Maple Street										

Total Volumes:

	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR	Total
0 - 15	83	202	35	0	0	0	72	222	0	0	295	48	957
15 - 30	81	221	50	0	0	0	80	228	0	0	297	58	1015
30 - 45	96	231	36	0	0	0	83	221	0	0	284	49	1000
45 - 60	86	209	44	0	0	0	73	208	0	0	279	52	951
Total	346	863	165	0	0	0	308	879	0	0	1155	207	3923

Automobiles:

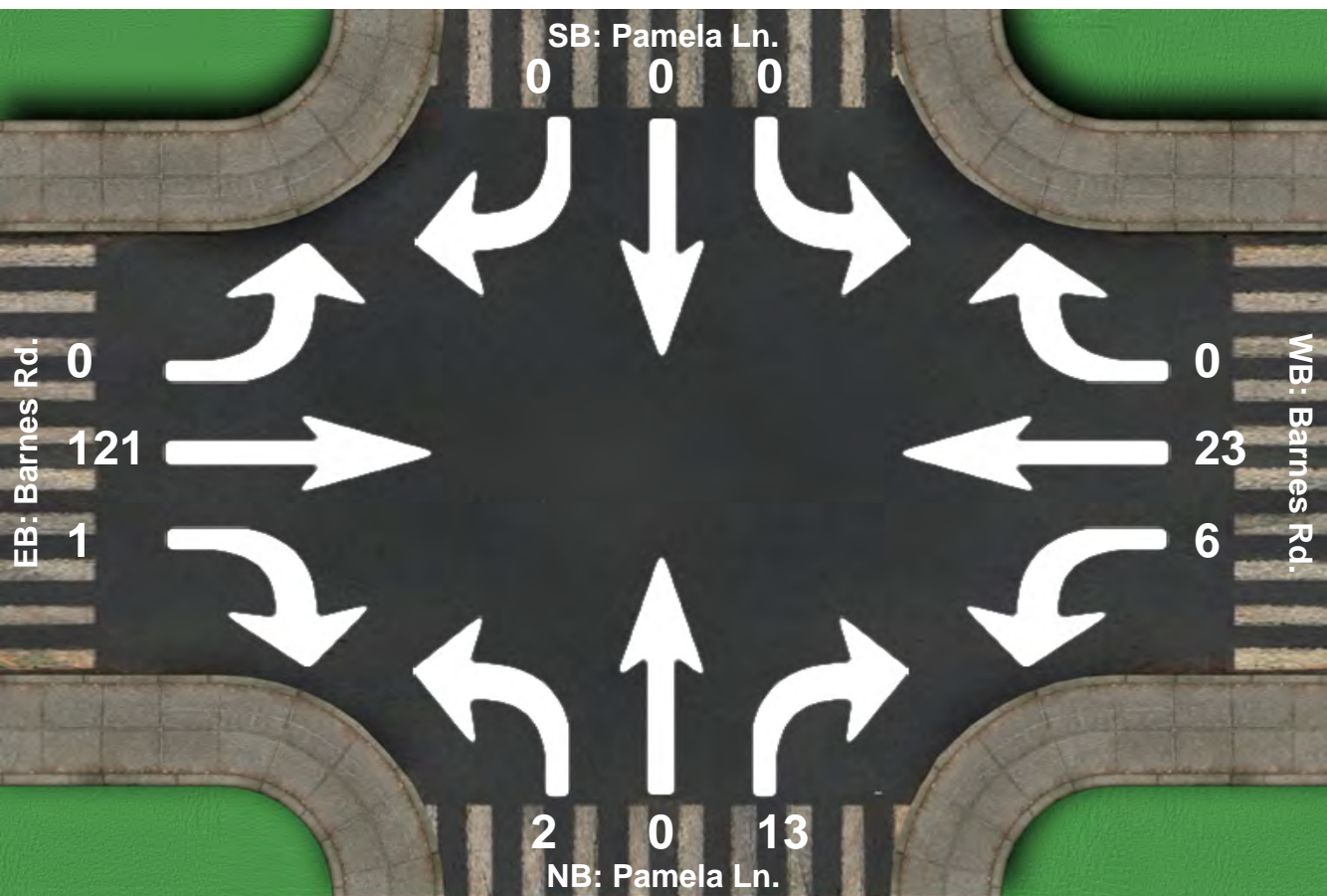
	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR	Total
0 - 15	83	202	34				71	221			288	45	944
15 - 30	81	221	50				79	228			285	56	1000
30 - 45	96	230	36				83	221			274	48	988
45 - 60	86	208	44				71	205			270	50	934
Total	346	861	164	0	0	0	304	875	0	0	1117	199	3866

Heavy Vehicles: Approach Entered only - TM not correct

	NB Approach			SB Approach			EB Approach			WB Approach			Total
0 - 15	0	0	1				1	1			7	3	13
15 - 30	0	0	0				1	0			12	2	15
30 - 45	0	1	0				0	0			10	1	12
45 - 60	0	1	0				2	3			9	2	17
Total	0	2	1	0	0	0	4	4	0	0	38	8	57

Intersection Peak Hour

Location: Pamela Ln. at Barnes Rd., Spokane, WA.
GPS Coordinates:
Date: 2016-03-01
Day of week: Tuesday
Weather: Clear
Analyst: Mike McCluskey



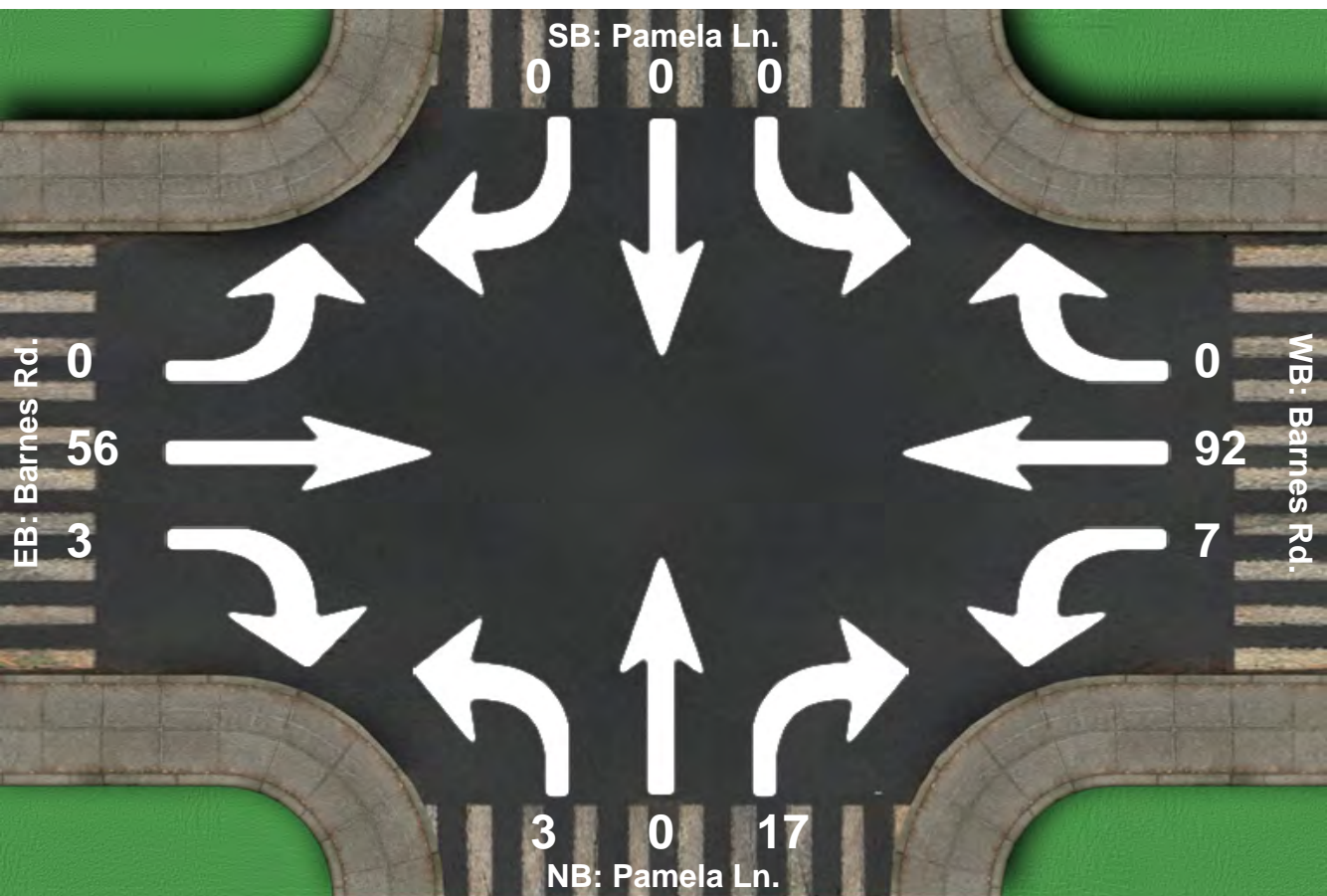
Intersection Peak Hour

07:00 - 08:00

	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
Vehicle Total	0	0	0	6	23	0	2	0	13	0	121	1	166
Factor	0.00	0.00	0.00	0.38	0.64	0.00	0.50	0.00	0.81	0.00	0.70	0.25	0.74
Approach Factor	0.00			0.66			0.94			0.71			

Intersection Peak Hour

Location: Pamela Ln. at Barnes Rd., Spokane, WA.
GPS Coordinates:
Date: 2016-03-01
Day of week: Tuesday
Weather: Rain
Analyst: Mike McCluskey



Intersection Peak Hour

17:00 - 18:00























	SouthBound			Westbound			Northbound			Eastbound			Total
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	
Vehicle Total	0	0	0	7	92	0	3	0	17	0	56	3	178
Factor	0.00	0.00	0.00	0.44	0.77	0.00	0.38	0.00	0.71	0.00	0.88	0.38	0.95
Approach Factor	0.00			0.82			0.83			0.82			

Appendix C

LOS Summary Worksheets

1: Indian Trail Road & Shawnee Ave
Existing - AM Peak Hour
























Windhaven Apartments Traffic Impact Analysis

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	5	25	56	171	14	20	13	140	128	30	363	3
Future Volume (veh/h)	5	25	56	171	14	20	13	140	128	30	363	3
Number	3	8	18	7	4	14	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.99	0.99		0.99	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1800	1800	1800	1748	1800	1800	1800	1800	1872	1800	1782	1872
Adj Flow Rate, veh/h	7	34	77	234	19	27	18	192	175	41	497	4
Adj No. of Lanes	1	1	0	1	1	0	1	1	1	1	1	1
Peak Hour Factor	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73
Percent Heavy Veh, %	0	0	0	3	0	0	0	0	0	0	1	0
Cap, veh/h	418	126	286	348	174	247	480	945	835	659	966	862
Arrive On Green	0.26	0.26	0.26	0.26	0.26	0.26	0.03	0.52	0.52	0.05	0.54	0.54
Sat Flow, veh/h	1369	488	1105	1255	670	952	1714	1800	1591	1714	1782	1591
Grp Volume(v), veh/h	7	0	111	234	0	46	18	192	175	41	497	4
Grp Sat Flow(s),veh/h/ln	1369	0	1592	1255	0	1621	1714	1800	1591	1714	1782	1591
Q Serve(g_s), s	0.3	0.0	4.3	14.2	0.0	1.7	0.4	4.4	4.6	0.8	13.8	0.1
Cycle Q Clear(g_c), s	2.0	0.0	4.3	18.6	0.0	1.7	0.4	4.4	4.6	0.8	13.8	0.1
Prop In Lane	1.00		0.69	1.00		0.59	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	418	0	413	348	0	420	480	945	835	659	966	862
V/C Ratio(X)	0.02	0.00	0.27	0.67	0.00	0.11	0.04	0.20	0.21	0.06	0.51	0.00
Avail Cap(c_a), veh/h	418	0	413	348	0	420	664	945	835	815	966	862
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	22.8	0.0	23.0	30.4	0.0	22.1	8.7	9.9	9.9	7.4	11.3	8.2
Incr Delay (d2), s/veh	0.0	0.0	0.3	5.0	0.0	0.1	0.0	0.5	0.6	0.0	2.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	0.0	2.0	5.4	0.0	0.8	0.2	2.3	2.1	0.4	7.3	0.0
LnGrp Delay(d),s/veh	22.8	0.0	23.4	35.4	0.0	22.2	8.8	10.3	10.5	7.4	13.3	8.2
LnGrp LOS	C		C	D		C	A	B	B	A	B	A
Approach Vol, veh/h		118			280			385			542	
Approach Delay, s/veh		23.4			33.2			10.3			12.8	
Approach LOS		C			C			B			B	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	7.9	45.0		25.0	6.6	46.3		25.0				
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0				
Max Green Setting (Gmax), s	10.0	40.0		20.0	10.0	40.0		20.0				
Max Q Clear Time (g_c+I1), s	2.8	6.6		20.6	2.4	15.8		6.3				
Green Ext Time (p_c), s	0.0	6.4		0.0	0.0	5.9		1.8				
Intersection Summary												
HCM 2010 Ctrl Delay				17.3								
HCM 2010 LOS				B								
Notes												

2: Indian Trail Road & Barnes Rd























Existing - AM Peak Hour

Windhaven Apartments Traffic Impact Analysis

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	31	11	200	185	11	6	51	140	49	6	571	37
Future Volume (veh/h)	31	11	200	185	11	6	51	140	49	6	571	37
Number	3	8	18	7	4	14	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.99	1.00		1.00	1.00		1.00	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1588	1588	1588	1588	1652	1685	1543	1605	1543	1543	1543	1620
Adj Flow Rate, veh/h	34	12	217	201	12	7	55	152	53	7	621	40
Adj No. of Lanes	1	1	1	1	1	0	1	1	1	1	2	0
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
Percent Heavy Veh, %	2	2	2	2	2	2	5	5	5	5	5	5
Cap, veh/h	457	349	294	545	306	179	314	611	499	476	951	61
Arrive On Green	0.04	0.22	0.22	0.14	0.31	0.30	0.06	0.38	0.38	0.02	0.34	0.34
Sat Flow, veh/h	1513	1588	1341	1513	978	570	1469	1605	1310	1469	2796	180
Grp Volume(v), veh/h	34	12	217	201	0	19	55	152	53	7	325	336
Grp Sat Flow(s),veh/h/ln	1513	1588	1341	1513	0	1548	1469	1605	1310	1469	1466	1510
Q Serve(g_s), s	1.0	0.4	9.2	5.7	0.0	0.5	1.4	4.0	1.6	0.2	11.5	11.6
Cycle Q Clear(g_c), s	1.0	0.4	9.2	5.7	0.0	0.5	1.4	4.0	1.6	0.2	11.5	11.6
Prop In Lane	1.00		1.00	1.00		0.37	1.00		1.00	1.00		0.12
Lane Grp Cap(c), veh/h	457	349	294	545	0	485	314	611	499	476	499	514
V/C Ratio(X)	0.07	0.03	0.74	0.37	0.00	0.04	0.18	0.25	0.11	0.01	0.65	0.65
Avail Cap(c_a), veh/h	797	674	569	745	0	657	625	1074	877	846	981	1010
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	17.0	18.8	22.3	13.2	0.0	14.7	11.9	13.0	12.2	12.5	17.1	17.1
Incr Delay (d2), s/veh	0.1	0.0	3.6	0.4	0.0	0.0	0.3	0.3	0.1	0.0	2.1	2.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.4	0.2	3.7	2.4	0.0	0.2	0.6	1.8	0.6	0.1	4.9	5.0
LnGrp Delay(d),s/veh	17.1	18.8	25.9	13.6	0.0	14.7	12.2	13.3	12.4	12.5	19.2	19.2
LnGrp LOS	B	B	C	B		B	B	B	B	B	B	B
Approach Vol, veh/h		263			220			260			668	
Approach Delay, s/veh		24.4			13.7			12.9			19.1	
Approach LOS		C			B			B			B	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	4.6	27.3	6.2	23.2	7.0	24.8	11.9	17.5				
Change Period (Y+Rc), s	4.0	4.9	4.0	4.5	4.0	4.9	4.0	4.5				
Max Green Setting (Gmax), s	16.0	40.1	16.0	25.5	16.0	40.1	16.0	25.5				
Max Q Clear Time (g_c+I1), s	2.2	6.0	3.0	2.5	3.4	13.6	7.7	11.2				
Green Ext Time (p_c), s	0.0	6.1	0.0	1.1	0.1	5.8	0.5	0.9				
Intersection Summary												
HCM 2010 Ctrl Delay			18.1									
HCM 2010 LOS			B									
Notes												













3: Indian Trail Road & Pacific Park Dr/Strong Rd Existing - AM Peak Hour

Windhaven Apartments Traffic Impact Analysis

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	9	3	92	4	1	26	16	330	2	20	854	66
Future Volume (veh/h)	9	3	92	4	1	26	16	330	2	20	854	66
Number	3	8	18	7	4	14	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		1.00	1.00		0.99	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1800	1765	1765	1800	1765	1765	1714	1714	1714	1714	1714	1714
Adj Flow Rate, veh/h	10	3	102	4	1	29	18	367	2	22	949	73
Adj No. of Lanes	0	1	1	0	1	1	1	1	1	1	1	1
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	2	2	2	2	2	2	5	5	5	5	5	5
Cap, veh/h	278	66	223	280	55	221	309	1187	1007	739	1187	1006
Arrive On Green	0.15	0.15	0.15	0.15	0.15	0.15	0.69	0.69	0.69	0.69	0.69	0.69
Sat Flow, veh/h	1017	446	1500	1014	372	1486	534	1714	1455	979	1714	1453
Grp Volume(v), veh/h	13	0	102	5	0	29	18	367	2	22	949	73
Grp Sat Flow(s),veh/h/ln	1463	0	1500	1385	0	1486	534	1714	1455	979	1714	1453
Q Serve(g_s), s	0.0	0.0	3.1	0.0	0.0	0.9	1.2	4.2	0.0	0.5	19.2	0.8
Cycle Q Clear(g_c), s	0.3	0.0	3.1	0.1	0.0	0.9	20.4	4.2	0.0	4.7	19.2	0.8
Prop In Lane	0.77		1.00	0.80		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	344	0	223	335	0	221	309	1187	1007	739	1187	1006
V/C Ratio(X)	0.04	0.00	0.46	0.01	0.00	0.13	0.06	0.31	0.00	0.03	0.80	0.07
Avail Cap(c_a), veh/h	875	0	777	837	0	770	323	1230	1044	764	1230	1042
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	18.3	0.0	19.5	18.3	0.0	18.6	12.4	3.0	2.4	3.9	5.3	2.5
Incr Delay (d2), s/veh	0.0	0.0	1.5	0.0	0.0	0.3	0.4	0.7	0.0	0.1	5.7	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.2	0.0	1.4	0.1	0.0	0.4	0.2	2.2	0.0	0.1	10.6	0.4
LnGrp Delay(d),s/veh	18.4	0.0	21.0	18.3	0.0	18.8	12.7	3.7	2.4	4.0	11.0	2.6
LnGrp LOS	B		C	B		B	B	A	A	A	B	A
Approach Vol, veh/h		115			34			387			1044	
Approach Delay, s/veh		20.7			18.7			4.1			10.3	
Approach LOS		C			B			A			B	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		38.7		11.5		38.7		11.5				
Change Period (Y+Rc), s		4.9		* 4.2		4.9		* 4.2				
Max Green Setting (Gmax), s		35.1		* 26		35.1		* 26				
Max Q Clear Time (g_c+I1), s		22.4		2.9		21.2		5.1				
Green Ext Time (p_c), s		11.5		0.6		12.5		0.6				
Intersection Summary												
HCM 2010 Ctrl Delay			9.7									
HCM 2010 LOS			A									
Notes												

4: Francis Ave #14 & Indian Trail Road Existing - AM Peak Hour





















Windhaven Apartments Traffic Impact Analysis

								
Movement	EBL	EBT	WBT	WBR	SEL	SER		
Lane Configurations								
Traffic Volume (veh/h)	77	517	329	235	1111	38		
Future Volume (veh/h)	77	517	329	235	1111	38		
Number	1	6	2	12	3	18		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00		
Parking Bus, Adj	1.00	1.00	1.00	0.99	1.00	1.00		
Adj Sat Flow, veh/h/ln	1714	1714	1714	1714	1714	1800		
Adj Flow Rate, veh/h	86	574	366	0	1234	0		
Adj No. of Lanes	1	2	2	1	2	1		
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90		
Percent Heavy Veh, %	5	5	5	5	5	0		
Cap, veh/h	422	1154	1154	512	1546	695		
Arrive On Green	0.35	0.35	0.35	0.00	0.47	0.00		
Sat Flow, veh/h	981	3343	3343	1445	3265	1530		
Grp Volume(v), veh/h	86	574	366	0	1234	0		
Grp Sat Flow(s),veh/h/ln	981	1629	1629	1445	1633	1530		
Q Serve(g_s), s	3.2	6.4	3.8	0.0	14.9	0.0		
Cycle Q Clear(g_c), s	7.0	6.4	3.8	0.0	14.9	0.0		
Prop In Lane	1.00			1.00	1.00	1.00		
Lane Grp Cap(c), veh/h	422	1154	1154	512	1546	695		
V/C Ratio(X)	0.20	0.50	0.32	0.00	0.80	0.00		
Avail Cap(c_a), veh/h	835	2524	2524	1120	1828	827		
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	1.00	0.00	1.00	0.00		
Uniform Delay (d), s/veh	13.5	11.8	10.9	0.0	10.4	0.0		
Incr Delay (d2), s/veh	0.3	0.4	0.2	0.0	2.2	0.0		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	0.9	2.9	1.7	0.0	7.0	0.0		
LnGrp Delay(d),s/veh	13.8	12.2	11.1	0.0	12.6	0.0		
LnGrp LOS	B	B	B		B			
Approach Vol, veh/h		660	366		1234			
Approach Delay, s/veh		12.4	11.1		12.6			
Approach LOS		B	B		B			
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2				6		8
Phs Duration (G+Y+Rc), s		20.5				20.5		26.0
Change Period (Y+Rc), s		4.9				4.9		4.9
Max Green Setting (Gmax), s		35.1				35.1		25.1
Max Q Clear Time (g_c+I1), s		5.8				9.0		16.9
Green Ext Time (p_c), s		6.7				6.5		4.2
Intersection Summary								
HCM 2010 Ctrl Delay			12.3					
HCM 2010 LOS			B					
Notes								

5: Alberta St & Francis Ave #14

Existing - AM Peak Hour


Windhaven Apartments Traffic Impact Analysis

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	18	1246	149	153	536	27	147	23	98	78	114	29
Future Volume (veh/h)	18	1246	149	153	536	27	147	23	98	78	114	29
Number	1	6	16	5	2	12	7	4	14	3	8	18
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.97	1.00		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1800	1767	1800	1731	1800	1800	1800	1832	1872	1800	1872	1872
Adj Flow Rate, veh/h	19	1340	160	165	576	29	144	45	105	84	123	31
Adj No. of Lanes	1	2	0	1	2	0	1	1	0	1	1	0
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	0	2	2	4	0	0	0	0	0	0	0	0
Cap, veh/h	494	1425	169	240	1681	85	258	72	168	237	198	50
Arrive On Green	0.06	0.47	0.46	0.10	0.51	0.50	0.15	0.15	0.13	0.14	0.14	0.12
Sat Flow, veh/h	1714	3022	359	1648	3314	167	1714	479	1117	1714	1433	361
Grp Volume(v), veh/h	19	741	759	165	297	308	144	0	150	84	0	154
Grp Sat Flow(s),veh/h/ln	1714	1678	1702	1648	1710	1770	1714	0	1595	1714	0	1794
Q Serve(g_s), s	0.6	43.3	44.1	4.9	10.7	10.8	8.1	0.0	9.2	4.6	0.0	8.4
Cycle Q Clear(g_c), s	0.6	43.3	44.1	4.9	10.7	10.8	8.1	0.0	9.2	4.6	0.0	8.4
Prop In Lane	1.00		0.21	1.00		0.09	1.00		0.70	1.00		0.20
Lane Grp Cap(c), veh/h	494	791	803	240	867	898	258	0	240	237	0	248
V/C Ratio(X)	0.04	0.94	0.95	0.69	0.34	0.34	0.56	0.00	0.62	0.35	0.00	0.62
Avail Cap(c_a), veh/h	576	816	828	256	867	898	445	0	414	362	0	379
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	12.5	25.9	26.3	22.1	15.2	15.3	40.8	0.0	41.9	40.4	0.0	42.2
Incr Delay (d2), s/veh	0.0	17.2	18.8	5.6	0.1	0.1	0.7	0.0	1.0	0.3	0.0	0.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.3	23.7	24.9	2.6	5.1	5.2	3.9	0.0	4.1	2.2	0.0	4.2
LnGrp Delay(d),s/veh	12.5	43.1	45.0	27.7	15.3	15.3	41.5	0.0	42.9	40.8	0.0	43.2
LnGrp LOS	B	D	D	C	B	B	D		D	D		D
Approach Vol, veh/h		1519			770			294			238	
Approach Delay, s/veh		43.7			18.0			42.2			42.3	
Approach LOS		D			B			D			D	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	10.0	57.5		18.7	14.0	53.5		17.5				
Change Period (Y+Rc), s	4.0	6.0		5.0	4.0	6.0		5.0				
Max Green Setting (Gmax), s	11.0	49.0		25.0	11.0	49.0		20.0				
Max Q Clear Time (g_c+I1), s	2.6	12.8		11.2	6.9	46.1		10.4				
Green Ext Time (p_c), s	0.0	6.3		0.8	0.1	1.3		0.5				
Intersection Summary												
HCM 2010 Ctrl Delay				36.4								
HCM 2010 LOS				D								
Notes												

6: Ash St #4S & Francis Ave #14

Existing - AM Peak Hour

Windhaven Apartments Traffic Impact Analysis


















												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑		↖	↑↑					↖	↑↑	↖
Traffic Volume (vph)	0	855	181	108	502	0	0	0	0	308	673	393
Future Volume (vph)	0	855	181	108	502	0	0	0	0	308	673	393
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	11	12	12	11	12	12	12	12	12	13	12	13
Total Lost time (s)		4.0		4.0	4.0					4.0	4.0	4.0
Lane Util. Factor		0.95		1.00	0.95					1.00	0.95	1.00
Frpb, ped/bikes		1.00		1.00	1.00					1.00	1.00	0.98
Flpb, ped/bikes		1.00		1.00	1.00					1.00	1.00	1.00
Frt		0.97		1.00	1.00					1.00	1.00	0.85
Flt Protected		1.00		0.95	1.00					0.95	1.00	1.00
Satd. Flow (prot)		3175		1605	3353					1716	3307	1523
Flt Permitted		1.00		0.95	1.00					0.95	1.00	1.00
Satd. Flow (perm)		3175		1605	3353					1716	3307	1523
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	0	919	195	116	540	0	0	0	0	331	724	423
RTOR Reduction (vph)	0	18	0	0	0	0	0	0	0	0	0	198
Lane Group Flow (vph)	0	1096	0	116	540	0	0	0	0	331	724	225
Confl. Peds. (#/hr)			3	3					1			4
Heavy Vehicles (%)	0%	4%	5%	3%	2%	0%	2%	2%	2%	3%	3%	2%
Bus Blockages (#/hr)	0	2	0	0	0	0	0	0	0	0	2	0
Turn Type		NA		Prot	NA					Perm	NA	Perm
Protected Phases		5		6	2						4	
Permitted Phases										4		4
Actuated Green, G (s)		38.0		9.1	52.0					28.5	28.5	28.5
Effective Green, g (s)		38.9		10.0	52.9					29.1	29.1	29.1
Actuated g/C Ratio		0.43		0.11	0.59					0.32	0.32	0.32
Clearance Time (s)		4.9		4.9	4.9					4.6	4.6	4.6
Vehicle Extension (s)		3.0		2.0	3.0					3.0	3.0	3.0
Lane Grp Cap (vph)		1372		178	1970					554	1069	492
v/s Ratio Prot		c0.35		c0.07	0.16						c0.22	
v/s Ratio Perm										0.19		0.15
v/c Ratio		0.80		0.65	0.27					0.60	0.68	0.46
Uniform Delay, d1		22.2		38.3	9.1					25.5	26.4	24.2
Progression Factor		1.00		0.94	0.39					0.85	0.86	0.94
Incremental Delay, d2		4.9		6.2	0.3					1.6	1.6	0.6
Delay (s)		27.1		42.2	3.9					23.3	24.4	23.3
Level of Service		C		D	A					C	C	C
Approach Delay (s)		27.1			10.7			0.0			23.8	
Approach LOS		C			B			A			C	
Intersection Summary												
HCM 2000 Control Delay			22.3			HCM 2000 Level of Service				C		
HCM 2000 Volume to Capacity ratio			0.73									
Actuated Cycle Length (s)			90.0			Sum of lost time (s)				12.0		
Intersection Capacity Utilization			67.1%			ICU Level of Service				C		
Analysis Period (min)			15									

c Critical Lane Group

7: Maple St #3N & Francis Ave #14

Existing - AM Peak Hour

Windhaven Apartments Traffic Impact Analysis

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	235	1089	0	0	396	78	6	475	145	0	0	0
Future Volume (vph)	235	1089	0	0	396	78	6	475	145	0	0	0
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	11	12	12	12	12	12	12	12	12	12	12	12
Total Lost time (s)	4.0	4.0			4.0		4.0	4.0				
Lane Util. Factor	1.00	0.95			0.95		0.86	*0.80				
Frpb, ped/bikes	1.00	1.00			1.00		1.00	1.00				
Flpb, ped/bikes	1.00	1.00			1.00		1.00	1.00				
Frt	1.00	1.00			0.98		1.00	0.96				
Flt Protected	0.95	1.00			1.00		0.95	1.00				
Satd. Flow (prot)	1621	3288			3260		1454	4104				
Flt Permitted	0.95	1.00			1.00		0.95	1.00				
Satd. Flow (perm)	1621	3288			3260		1454	4104				
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	253	1171	0	0	426	84	6	511	156	0	0	0
RTOR Reduction (vph)	0	0	0	0	17	0	0	56	0	0	0	0
Lane Group Flow (vph)	253	1171	0	0	493	0	5	612	0	0	0	0
Confl. Peds. (#/hr)			2			4	1					1
Confl. Bikes (#/hr)						1			2			
Heavy Vehicles (%)	2%	4%	0%	0%	2%	2%	1%	1%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	4	0	0	0	0	0	0
Turn Type	Prot	NA			NA		Perm	NA				
Protected Phases	2	6			1			4				
Permitted Phases							4					
Actuated Green, G (s)	24.1	60.5			31.5		20.0	20.0				
Effective Green, g (s)	25.0	61.4			32.4		20.6	20.6				
Actuated g/C Ratio	0.28	0.68			0.36		0.23	0.23				
Clearance Time (s)	4.9	4.9			4.9		4.6	4.6				
Vehicle Extension (s)	2.0	3.0			3.0		3.0	3.0				
Lane Grp Cap (vph)	450	2243			1173		332	939				
v/s Ratio Prot	0.16	c0.36			0.15							
v/s Ratio Perm							0.00	0.15				
v/c Ratio	0.56	0.52			0.42		0.02	0.65				
Uniform Delay, d1	27.8	7.1			21.7		26.9	31.4				
Progression Factor	0.91	0.61			1.00		1.00	1.00				
Incremental Delay, d2	0.7	0.7			1.1		0.0	1.6				
Delay (s)	26.0	5.0			22.8		26.9	33.1				
Level of Service	C	A			C		C	C				
Approach Delay (s)		8.7			22.8			33.0			0.0	
Approach LOS		A			C			C			A	
Intersection Summary												
HCM 2000 Control Delay			17.7				HCM 2000 Level of Service		B			
HCM 2000 Volume to Capacity ratio			0.58									
Actuated Cycle Length (s)			90.0				Sum of lost time (s)		12.0			
Intersection Capacity Utilization			67.1%				ICU Level of Service		C			
Analysis Period (min)			15									
Description: Count Date 7/20/09												























9: Barnes & Pamela
Existing - AM Peak Hour

Windhaven Apartments Traffic Impact Analysis

Intersection												
Int Delay, s/veh	1.1											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Vol, veh/h	0	121	1	6	23	0	2	0	13	0	0	0
Future Vol, veh/h	0	121	1	6	23	0	2	0	13	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	75	-	-	75	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	74	74	74	74	74	74	74	74	74	74	74	74
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	164	1	8	31	0	3	0	18	0	0	0
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	31	0	0	165	0	0	211	211	164	220	212	31
Stage 1	-	-	-	-	-	-	164	164	-	47	47	-
Stage 2	-	-	-	-	-	-	47	47	-	173	165	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1582	-	-	1413	-	-	746	686	881	736	685	1043
Stage 1	-	-	-	-	-	-	838	762	-	967	856	-
Stage 2	-	-	-	-	-	-	967	856	-	829	762	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1582	-	-	1413	-	-	743	682	881	718	681	1043
Mov Cap-2 Maneuver	-	-	-	-	-	-	743	682	-	718	681	
Stage 1	-	-	-	-	-	-	838	762	-	967	851	-
Stage 2	-	-	-	-	-	-	962	851	-	812	762	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0			1.6			9.3			0		
HCM LOS							A			A		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	860	1582	-	-	1413	-	-	-				
HCM Lane V/C Ratio	0.024	-	-	-	0.006	-	-	-				
HCM Control Delay (s)	9.3	0	-	-	7.6	-	-	0				
HCM Lane LOS	A	A	-	-	A	-	-	A				
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	-				

1: Indian Trail Road & Shawnee Ave
Existing - PM Peak Hour
























Windhaven Apartments Traffic Impact Analysis

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	1	1	23	38	2	5	47	416	102	11	251	6
Future Volume (veh/h)	1	1	23	38	2	5	47	416	102	11	251	6
Number	3	8	18	7	4	14	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.98		0.98	0.98		0.98	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1800	1800	1800	1748	1800	1800	1800	1800	1872	1800	1782	1872
Adj Flow Rate, veh/h	1	1	25	41	2	5	51	447	110	12	270	6
Adj No. of Lanes	1	1	0	1	1	0	1	1	1	1	1	1
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	0	0	0	3	0	0	0	0	0	0	1	0
Cap, veh/h	289	8	193	265	60	149	820	1160	1025	613	1093	976
Arrive On Green	0.13	0.13	0.13	0.13	0.13	0.13	0.06	0.64	0.64	0.03	0.61	0.61
Sat Flow, veh/h	1405	58	1456	1342	451	1128	1714	1800	1591	1714	1782	1591
Grp Volume(v), veh/h	1	0	26	41	0	7	51	447	110	12	270	6
Grp Sat Flow(s),veh/h/ln	1405	0	1514	1342	0	1579	1714	1800	1591	1714	1782	1591
Q Serve(g_s), s	0.0	0.0	1.0	1.9	0.0	0.3	0.7	7.8	1.8	0.2	4.6	0.1
Cycle Q Clear(g_c), s	0.3	0.0	1.0	2.9	0.0	0.3	0.7	7.8	1.8	0.2	4.6	0.1
Prop In Lane	1.00		0.96	1.00		0.71	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	289	0	201	265	0	209	820	1160	1025	613	1093	976
V/C Ratio(X)	0.00	0.00	0.13	0.15	0.00	0.03	0.06	0.39	0.11	0.02	0.25	0.01
Avail Cap(c_a), veh/h	528	0	459	494	0	478	998	1160	1025	844	1093	976
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	25.3	0.0	25.6	26.8	0.0	25.3	3.9	5.6	4.5	4.6	5.9	5.0
Incr Delay (d2), s/veh	0.0	0.0	0.3	0.3	0.0	0.1	0.0	1.0	0.2	0.0	0.5	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.0	0.4	0.7	0.0	0.1	0.3	4.2	0.8	0.1	2.4	0.0
LnGrp Delay(d),s/veh	25.3	0.0	25.9	27.1	0.0	25.3	3.9	6.6	4.7	4.6	6.4	5.0
LnGrp LOS	C		C	C		C	A	A	A	A	A	A
Approach Vol, veh/h		27			48			608			288	
Approach Delay, s/veh		25.9			26.8			6.0			6.3	
Approach LOS		C			C			A			A	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	6.0	47.1		13.6	8.1	45.0		13.6				
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0				
Max Green Setting (Gmax), s	10.0	40.0		20.0	10.0	40.0		20.0				
Max Q Clear Time (g_c+I1), s	2.2	9.8		4.9	2.7	6.6		3.0				
Green Ext Time (p_c), s	0.0	5.8		0.2	0.0	5.9		0.2				
Intersection Summary												
HCM 2010 Ctrl Delay			7.7									
HCM 2010 LOS			A									
Notes												

2: Indian Trail Road & Barnes Rd























Existing - PM Peak Hour

Windhaven Apartments Traffic Impact Analysis

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	83	28	126	90	13	14	148	352	299	13	272	34
Future Volume (veh/h)	83	28	126	90	13	14	148	352	299	13	272	34
Number	3	8	18	7	4	14	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.99	0.99		0.99	1.00		1.00	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1588	1588	1588	1588	1652	1685	1543	1605	1543	1543	1543	1620
Adj Flow Rate, veh/h	90	30	137	98	14	15	161	383	325	14	296	37
Adj No. of Lanes	1	1	1	1	1	0	1	1	1	1	2	0
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
Percent Heavy Veh, %	2	2	2	2	2	2	5	5	5	5	5	5
Cap, veh/h	498	336	283	471	156	167	515	641	524	322	833	103
Arrive On Green	0.08	0.21	0.21	0.08	0.21	0.20	0.12	0.40	0.40	0.03	0.32	0.32
Sat Flow, veh/h	1513	1588	1340	1513	728	780	1469	1605	1310	1469	2624	325
Grp Volume(v), veh/h	90	30	137	98	0	29	161	383	325	14	164	169
Grp Sat Flow(s),veh/h/ln	1513	1588	1340	1513	0	1507	1469	1605	1310	1469	1466	1483
Q Serve(g_s), s	2.4	0.8	4.8	2.6	0.0	0.8	3.5	10.0	10.6	0.3	4.6	4.7
Cycle Q Clear(g_c), s	2.4	0.8	4.8	2.6	0.0	0.8	3.5	10.0	10.6	0.3	4.6	4.7
Prop In Lane	1.00		1.00	1.00		0.52	1.00		1.00	1.00		0.22
Lane Grp Cap(c), veh/h	498	336	283	471	0	323	515	641	524	322	465	471
V/C Ratio(X)	0.18	0.09	0.48	0.21	0.00	0.09	0.31	0.60	0.62	0.04	0.35	0.36
Avail Cap(c_a), veh/h	847	774	653	816	0	735	809	1233	1007	737	1126	1140
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	14.3	16.9	18.5	14.3	0.0	16.9	8.9	12.6	12.8	11.6	14.0	14.0
Incr Delay (d2), s/veh	0.2	0.1	1.3	0.2	0.0	0.1	0.3	1.3	1.7	0.1	0.6	0.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.0	0.4	1.9	1.1	0.0	0.4	1.4	4.6	4.0	0.1	1.9	2.0
LnGrp Delay(d),s/veh	14.5	17.0	19.8	14.5	0.0	17.0	9.2	13.9	14.5	11.7	14.6	14.7
LnGrp LOS	B	B	B	B		B	A	B	B	B	B	B
Approach Vol, veh/h		257			127			869			347	
Approach Delay, s/veh		17.6			15.1			13.3			14.5	
Approach LOS		B			B			B			B	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	4.9	25.3	7.7	15.4	9.3	20.9	7.8	15.3				
Change Period (Y+Rc), s	4.0	4.9	4.0	4.5	4.0	4.9	4.0	4.5				
Max Green Setting (Gmax), s	16.0	40.1	16.0	25.5	16.0	40.1	16.0	25.5				
Max Q Clear Time (g_c+I1), s	2.3	12.6	4.4	2.8	5.5	6.7	4.6	6.8				
Green Ext Time (p_c), s	0.0	7.5	0.2	0.8	0.4	7.9	0.2	0.7				
Intersection Summary												
HCM 2010 Ctrl Delay			14.4									
HCM 2010 LOS			B									
Notes												

3: Indian Trail Road & Pacific Park Dr/Strong Rd Existing - PM Peak Hour













Windhaven Apartments Traffic Impact Analysis

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	3	4	41	7	5	44	91	1004	4	31	421	46
Future Volume (veh/h)	3	4	41	7	5	44	91	1004	4	31	421	46
Number	3	8	18	7	4	14	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		1.00	1.00		0.99	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1800	1765	1765	1800	1765	1765	1714	1714	1714	1714	1714	1714
Adj Flow Rate, veh/h	3	4	44	7	5	47	97	1068	4	33	448	49
Adj No. of Lanes	0	1	1	0	1	1	1	1	1	1	1	1
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	2	2	2	2	2	2	5	5	5	5	5	5
Cap, veh/h	196	218	299	256	154	297	595	1123	953	174	1123	951
Arrive On Green	0.20	0.20	0.20	0.20	0.20	0.20	0.65	0.65	0.65	0.65	0.65	0.65
Sat Flow, veh/h	511	1090	1500	761	771	1490	870	1714	1455	509	1714	1453
Grp Volume(v), veh/h	7	0	44	12	0	47	97	1068	4	33	448	49
Grp Sat Flow(s),veh/h/ln	1602	0	1500	1532	0	1490	870	1714	1455	509	1714	1453
Q Serve(g_s), s	0.0	0.0	1.3	0.0	0.0	1.4	3.2	31.3	0.1	3.5	6.7	0.7
Cycle Q Clear(g_c), s	0.2	0.0	1.3	0.3	0.0	1.4	9.9	31.3	0.1	34.8	6.7	0.7
Prop In Lane	0.43		1.00	0.58		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	413	0	299	410	0	297	595	1123	953	174	1123	951
V/C Ratio(X)	0.02	0.00	0.15	0.03	0.00	0.16	0.16	0.95	0.00	0.19	0.40	0.05
Avail Cap(c_a), veh/h	838	0	709	819	0	705	595	1123	953	174	1123	951
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	17.7	0.0	18.1	17.7	0.0	18.2	6.8	8.7	3.3	24.6	4.4	3.4
Incr Delay (d2), s/veh	0.0	0.0	0.2	0.0	0.0	0.2	0.6	17.4	0.0	2.4	1.1	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	0.0	0.6	0.1	0.0	0.6	0.9	19.7	0.0	0.6	3.4	0.3
LnGrp Delay(d),s/veh	17.7	0.0	18.4	17.8	0.0	18.4	7.3	26.1	3.3	27.0	5.5	3.5
LnGrp LOS	B		B	B		B	A	C	A	C	A	A
Approach Vol, veh/h		51			59			1169			530	
Approach Delay, s/veh		18.3			18.3			24.5			6.6	
Approach LOS		B			B			C			A	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		40.0		15.0		40.0		15.0				
Change Period (Y+Rc), s		4.9		* 4.2		4.9		* 4.2				
Max Green Setting (Gmax), s		35.1		* 26		35.1		* 26				
Max Q Clear Time (g_c+I1), s		33.3		3.4		36.8		3.3				
Green Ext Time (p_c), s		1.7		0.4		0.0		0.4				
Intersection Summary												
HCM 2010 Ctrl Delay			18.9									
HCM 2010 LOS			B									
Notes												

4: Francis Ave #14 & Indian Trail Road





















Existing - PM Peak Hour

Windhaven Apartments Traffic Impact Analysis

								
Movement	EBL	EBT	WBT	WBR	SEL	SER		
Lane Configurations								
Traffic Volume (veh/h)	141	454	628	1008	445	77		
Future Volume (veh/h)	141	454	628	1008	445	77		
Number	1	6	2	12	3	18		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00		
Parking Bus, Adj	1.00	1.00	1.00	0.99	1.00	1.00		
Adj Sat Flow, veh/h/ln	1714	1714	1714	1714	1714	1800		
Adj Flow Rate, veh/h	150	483	668	0	473	0		
Adj No. of Lanes	1	2	2	1	2	1		
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94		
Percent Heavy Veh, %	5	5	5	5	5	0		
Cap, veh/h	495	1795	1795	797	844	363		
Arrive On Green	0.55	0.55	0.55	0.00	0.26	0.00		
Sat Flow, veh/h	743	3343	3343	1445	3265	1530		
Grp Volume(v), veh/h	150	483	668	0	473	0		
Grp Sat Flow(s),veh/h/ln	743	1629	1629	1445	1633	1530		
Q Serve(g_s), s	6.0	3.3	4.9	0.0	5.3	0.0		
Cycle Q Clear(g_c), s	10.9	3.3	4.9	0.0	5.3	0.0		
Prop In Lane	1.00			1.00	1.00	1.00		
Lane Grp Cap(c), veh/h	495	1795	1795	797	844	363		
V/C Ratio(X)	0.30	0.27	0.37	0.00	0.56	0.00		
Avail Cap(c_a), veh/h	810	3178	3178	1411	2409	1096		
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	1.00	0.00	1.00	0.00		
Uniform Delay (d), s/veh	8.4	5.0	5.3	0.0	13.5	0.0		
Incr Delay (d2), s/veh	0.4	0.1	0.2	0.0	0.6	0.0		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	1.3	1.5	2.2	0.0	2.4	0.0		
LnGrp Delay(d),s/veh	8.8	5.1	5.5	0.0	14.1	0.0		
LnGrp LOS	A	A	A		B			
Approach Vol, veh/h		633	668		473			
Approach Delay, s/veh		6.0	5.5		14.1			
Approach LOS		A	A		B			
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2				6		8
Phs Duration (G+Y+Rc), s		27.2				27.2		14.9
Change Period (Y+Rc), s		4.9				4.9		4.9
Max Green Setting (Gmax), s		40.1				40.1		30.1
Max Q Clear Time (g_c+I1), s		6.9				12.9		7.3
Green Ext Time (p_c), s		10.0				9.4		2.3
Intersection Summary								
HCM 2010 Ctrl Delay			7.9					
HCM 2010 LOS			A					
Notes								

5: Alberta St & Francis Ave #14
Existing - PM Peak Hour


Windhaven Apartments Traffic Impact Analysis

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	33	862	77	141	1240	18	372	108	124	39	49	25
Future Volume (veh/h)	33	862	77	141	1240	18	372	108	124	39	49	25
Number	1	6	16	5	2	12	7	4	14	3	8	18
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.98	1.00		0.95
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1800	1766	1800	1731	1800	1800	1800	1849	1872	1800	1872	1872
Adj Flow Rate, veh/h	34	898	80	147	1292	19	314	215	129	41	51	26
Adj No. of Lanes	1	2	0	1	2	0	1	1	0	1	1	0
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	0	2	2	4	0	0	0	0	0	0	0	0
Cap, veh/h	213	1200	107	317	1463	22	425	267	160	182	122	62
Arrive On Green	0.06	0.39	0.37	0.11	0.42	0.41	0.25	0.25	0.23	0.11	0.11	0.09
Sat Flow, veh/h	1714	3116	278	1648	3450	51	1714	1076	646	1714	1150	586
Grp Volume(v), veh/h	34	483	495	147	640	671	314	0	344	41	0	77
Grp Sat Flow(s),veh/h/ln	1714	1678	1716	1648	1710	1791	1714	0	1722	1714	0	1736
Q Serve(g_s), s	1.1	23.7	23.7	4.7	32.8	32.8	16.0	0.0	17.9	2.1	0.0	4.0
Cycle Q Clear(g_c), s	1.1	23.7	23.7	4.7	32.8	32.8	16.0	0.0	17.9	2.1	0.0	4.0
Prop In Lane	1.00		0.16	1.00		0.03	1.00		0.38	1.00		0.34
Lane Grp Cap(c), veh/h	213	646	661	317	725	759	425	0	427	182	0	184
V/C Ratio(X)	0.16	0.75	0.75	0.46	0.88	0.88	0.74	0.00	0.81	0.23	0.00	0.42
Avail Cap(c_a), veh/h	393	801	820	421	811	850	575	0	578	395	0	400
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	20.3	25.2	25.4	17.9	25.2	25.2	32.9	0.0	34.0	38.9	0.0	40.1
Incr Delay (d2), s/veh	0.1	2.2	2.1	0.4	9.7	9.3	1.9	0.0	4.3	0.2	0.0	0.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.5	11.3	11.5	2.1	17.2	18.2	7.8	0.0	9.0	1.0	0.0	1.9
LnGrp Delay(d),s/veh	20.4	27.4	27.5	18.3	34.9	34.6	34.9	0.0	38.2	39.1	0.0	40.6
LnGrp LOS	C	C	C	B	C	C	C		D	D		D
Approach Vol, veh/h		1012			1458			658			118	
Approach Delay, s/veh		27.2			33.1			36.6			40.1	
Approach LOS		C			C			D			D	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	10.0	45.2		26.7	14.0	41.2		13.2				
Change Period (Y+Rc), s	4.0	6.0		5.0	4.0	6.0		5.0				
Max Green Setting (Gmax), s	16.0	44.0		30.0	16.0	44.0		20.0				
Max Q Clear Time (g_c+I1), s	3.1	34.8		19.9	6.7	25.7		6.0				
Green Ext Time (p_c), s	0.0	4.4		1.7	0.2	6.0		0.2				
Intersection Summary												
HCM 2010 Ctrl Delay				32.2								
HCM 2010 LOS				C								
Notes												

6: Ash St #4S & Francis Ave #14

Existing - PM Peak Hour

Windhaven Apartments Traffic Impact Analysis






















												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑		↑	↑↑					↑	↑↑	↑
Traffic Volume (vph)	0	653	93	219	1304	0	0	0	0	216	562	362
Future Volume (vph)	0	653	93	219	1304	0	0	0	0	216	562	362
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	11	12	12	11	12	12	12	12	12	13	12	13
Total Lost time (s)		4.0		4.0	4.0					4.0	4.0	4.0
Lane Util. Factor		0.95		1.00	0.95					1.00	0.95	1.00
Frpb, ped/bikes		1.00		1.00	1.00					1.00	1.00	0.98
Flpb, ped/bikes		1.00		1.00	1.00					1.00	1.00	1.00
Frt		0.98		1.00	1.00					1.00	1.00	0.85
Flt Protected		1.00		0.95	1.00					0.95	1.00	1.00
Satd. Flow (prot)		3203		1605	3353					1716	3307	1524
Flt Permitted		1.00		0.95	1.00					0.95	1.00	1.00
Satd. Flow (perm)		3203		1605	3353					1716	3307	1524
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	0	666	95	223	1331	0	0	0	0	220	573	369
RTOR Reduction (vph)	0	11	0	0	0	0	0	0	0	0	0	54
Lane Group Flow (vph)	0	750	0	223	1331	0	0	0	0	220	573	315
Confl. Peds. (#/hr)			3	3					1			4
Heavy Vehicles (%)	0%	4%	5%	3%	2%	0%	2%	2%	2%	3%	3%	2%
Bus Blockages (#/hr)	0	2	0	0	0	0	0	0	0	0	2	0
Turn Type		NA		Prot	NA					Perm	NA	Perm
Protected Phases		5		6	2						4	
Permitted Phases										4		4
Actuated Green, G (s)		38.6		20.1	63.6					26.9	26.9	26.9
Effective Green, g (s)		39.5		21.0	64.5					27.5	27.5	27.5
Actuated g/C Ratio		0.40		0.21	0.64					0.28	0.28	0.28
Clearance Time (s)		4.9		4.9	4.9					4.6	4.6	4.6
Vehicle Extension (s)		3.0		2.0	3.0					3.0	3.0	3.0
Lane Grp Cap (vph)		1265		337	2162					471	909	419
v/s Ratio Prot		0.23		0.14	c0.40						0.17	
v/s Ratio Perm										0.13		c0.21
v/c Ratio		0.59		0.66	0.62					0.47	0.63	0.75
Uniform Delay, d1		23.9		36.2	10.5					30.2	31.8	33.1
Progression Factor		1.00		0.83	0.40					0.90	0.91	0.90
Incremental Delay, d2		2.1		2.2	0.8					0.7	1.4	7.3
Delay (s)		25.9		32.2	5.0					27.9	30.5	37.0
Level of Service		C		C	A					C	C	D
Approach Delay (s)		25.9			8.9			0.0			32.1	
Approach LOS		C			A			A			C	
Intersection Summary												
HCM 2000 Control Delay			20.4		HCM 2000 Level of Service				C			
HCM 2000 Volume to Capacity ratio			0.69									
Actuated Cycle Length (s)			100.0		Sum of lost time (s)				12.0			
Intersection Capacity Utilization			85.9%		ICU Level of Service				E			
Analysis Period (min)			15									

c Critical Lane Group

7: Maple St #3N & Francis Ave #14

Existing - PM Peak Hour

Windhaven Apartments Traffic Impact Analysis

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		 			 			  				
Traffic Volume (vph)	308	897	0	0	960	211	362	903	172	0	0	0
Future Volume (vph)	308	897	0	0	960	211	362	903	172	0	0	0
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	11	12	12	12	12	12	12	12	12	12	12	12
Total Lost time (s)	4.0	4.0			4.0		4.0	4.0				
Lane Util. Factor	1.00	0.95			0.95		0.86	*0.80				
Frpb, ped/bikes	1.00	1.00			1.00		1.00	1.00				
Flpb, ped/bikes	1.00	1.00			1.00		1.00	1.00				
Frt	1.00	1.00			0.97		1.00	0.98				
Flt Protected	0.95	1.00			1.00		0.95	1.00				
Satd. Flow (prot)	1621	3288			3251		1454	4156				
Flt Permitted	0.95	1.00			1.00		0.95	1.00				
Satd. Flow (perm)	1621	3288			3251		1454	4156				
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	318	925	0	0	990	218	373	931	177	0	0	0
RTOR Reduction (vph)	0	0	0	0	19	0	0	22	0	0	0	0
Lane Group Flow (vph)	318	925	0	0	1189	0	336	1123	0	0	0	0
Confl. Peds. (#/hr)			2			4	1					1
Confl. Bikes (#/hr)						1			2			
Heavy Vehicles (%)	2%	4%	0%	0%	2%	2%	1%	1%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	4	0	0	0	0	0	0
Turn Type	Prot	NA			NA		Perm	NA				
Protected Phases	2	6			1			4				
Permitted Phases							4					
Actuated Green, G (s)	20.1	63.1			38.1		27.4	27.4				
Effective Green, g (s)	21.0	64.0			39.0		28.0	28.0				
Actuated g/C Ratio	0.21	0.64			0.39		0.28	0.28				
Clearance Time (s)	4.9	4.9			4.9		4.6	4.6				
Vehicle Extension (s)	2.0	3.0			3.0		3.0	3.0				
Lane Grp Cap (vph)	340	2104			1267		407	1163				
v/s Ratio Prot	c0.20	0.28			c0.37							
v/s Ratio Perm							0.23	0.27				
v/c Ratio	0.94	0.44			0.94		0.83	0.97				
Uniform Delay, d1	38.8	9.0			29.3		33.7	35.5				
Progression Factor	1.19	1.14			1.00		1.00	1.00				
Incremental Delay, d2	30.5	0.6			14.3		12.8	18.6				
Delay (s)	76.7	10.9			43.6		46.5	54.1				
Level of Service	E	B			D		D	D				
Approach Delay (s)		27.8			43.6			52.4			0.0	
Approach LOS		C			D			D			A	
Intersection Summary												
HCM 2000 Control Delay			41.9				HCM 2000 Level of Service		D			
HCM 2000 Volume to Capacity ratio			0.95									
Actuated Cycle Length (s)			100.0				Sum of lost time (s)		12.0			
Intersection Capacity Utilization			85.9%				ICU Level of Service		E			
Analysis Period (min)			15									
Description: Count Date 7/20/09												























9: Barnes & Pamela Lane
Existing - PM Peak Hour

Windhaven Apartments Traffic Impact Analysis

Intersection												
Int Delay, s/veh	1.3											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Vol, veh/h	0	56	3	7	92	0	3	0	17	0	0	0
Future Vol, veh/h	0	56	3	7	92	0	3	0	17	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	75	-	-	75	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	0	59	3	7	97	0	3	0	18	0	0	0
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	97	0	0	62	0	0	173	173	61	181	174	97
Stage 1	-	-	-	-	-	-	61	61	-	112	112	-
Stage 2	-	-	-	-	-	-	112	112	-	69	62	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1496	-	-	1541	-	-	790	720	1004	781	719	959
Stage 1	-	-	-	-	-	-	950	844	-	893	803	-
Stage 2	-	-	-	-	-	-	893	803	-	941	843	-
Platoon blocked, %			-	-		-						
Mov Cap-1 Maneuver	1496	-	-	1541	-	-	787	717	1004	764	716	959
Mov Cap-2 Maneuver	-	-	-	-	-	-	787	717	-	764	716	
Stage 1	-	-	-	-	-	-	950	844	-	893	799	-
Stage 2	-	-	-	-	-	-	889	799	-	924	843	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0			0.5			8.8			0		
HCM LOS							A			A		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	964	1496	-	-	1541	-	-	-				
HCM Lane V/C Ratio	0.022	-	-	-	0.005	-	-	-				
HCM Control Delay (s)	8.8	0	-	-	7.3	-	-	0				
HCM Lane LOS	A	A	-	-	A	-	-	A				
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	-				

1: Indian Trail Road & Shawnee Ave
Future Without-Project - AM Peak Hour
























Windhaven Apartments Traffic Impact Analysis

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	5	26	57	181	14	21	13	169	140	31	387	3
Future Volume (veh/h)	5	26	57	181	14	21	13	169	140	31	387	3
Number	3	8	18	7	4	14	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.99	0.99		0.99	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1800	1800	1800	1748	1800	1800	1800	1800	1872	1800	1782	1872
Adj Flow Rate, veh/h	7	36	78	248	19	29	18	232	192	42	530	4
Adj No. of Lanes	1	1	0	1	1	0	1	1	1	1	1	1
Peak Hour Factor	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73
Percent Heavy Veh, %	0	0	0	3	0	0	0	0	0	0	1	0
Cap, veh/h	415	130	283	345	166	253	455	944	834	622	966	863
Arrive On Green	0.26	0.26	0.26	0.26	0.26	0.26	0.03	0.52	0.52	0.05	0.54	0.54
Sat Flow, veh/h	1367	504	1091	1252	640	977	1714	1800	1591	1714	1782	1591
Grp Volume(v), veh/h	7	0	114	248	0	48	18	232	192	42	530	4
Grp Sat Flow(s),veh/h/ln	1367	0	1595	1252	0	1616	1714	1800	1591	1714	1782	1591
Q Serve(g_s), s	0.3	0.0	4.5	15.4	0.0	1.8	0.4	5.5	5.1	0.8	15.1	0.1
Cycle Q Clear(g_c), s	2.1	0.0	4.5	19.8	0.0	1.8	0.4	5.5	5.1	0.8	15.1	0.1
Prop In Lane	1.00		0.68	1.00		0.60	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	415	0	413	345	0	419	455	944	834	622	966	863
V/C Ratio(X)	0.02	0.00	0.28	0.72	0.00	0.11	0.04	0.25	0.23	0.07	0.55	0.00
Avail Cap(c_a), veh/h	415	0	413	345	0	419	640	944	834	776	966	863
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	22.9	0.0	23.1	31.0	0.0	22.1	9.0	10.1	10.0	7.4	11.6	8.2
Incr Delay (d2), s/veh	0.0	0.0	0.4	7.1	0.0	0.1	0.0	0.6	0.6	0.0	2.2	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	0.0	2.0	6.0	0.0	0.8	0.2	2.9	2.4	0.4	8.0	0.0
LnGrp Delay(d),s/veh	22.9	0.0	23.5	38.0	0.0	22.2	9.0	10.7	10.7	7.5	13.9	8.2
LnGrp LOS	C		C	D		C	A	B	B	A	B	A
Approach Vol, veh/h		121			296			442			576	
Approach Delay, s/veh		23.4			35.5			10.6			13.4	
Approach LOS		C			D			B			B	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	8.0	45.0		25.0	6.6	46.4		25.0				
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0				
Max Green Setting (Gmax), s	10.0	40.0		20.0	10.0	40.0		20.0				
Max Q Clear Time (g_c+I1), s	2.8	7.5		21.8	2.4	17.1		6.5				
Green Ext Time (p_c), s	0.0	7.2		0.0	0.0	6.5		1.9				
Intersection Summary												
HCM 2010 Ctrl Delay				17.9								
HCM 2010 LOS				B								
Notes												

2: Indian Trail Road & Barnes Rd























Future Without-Project - AM Peak Hour

Windhaven Apartments Traffic Impact Analysis

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	44	41	304	256	30	40	95	131	93	34	573	43
Future Volume (veh/h)	44	41	304	256	30	40	95	131	93	34	573	43
Number	3	8	18	7	4	14	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		1.00	1.00		1.00	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1588	1588	1588	1588	1652	1685	1543	1605	1543	1543	1543	1620
Adj Flow Rate, veh/h	48	45	330	278	33	43	103	142	101	37	623	47
Adj No. of Lanes	1	1	1	1	1	0	1	1	1	1	2	0
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
Percent Heavy Veh, %	2	2	2	2	2	2	5	5	5	5	5	5
Cap, veh/h	486	441	373	556	253	329	273	550	449	430	863	65
Arrive On Green	0.05	0.28	0.28	0.16	0.39	0.38	0.08	0.34	0.34	0.05	0.31	0.31
Sat Flow, veh/h	1513	1588	1343	1513	651	848	1469	1605	1310	1469	2762	208
Grp Volume(v), veh/h	48	45	330	278	0	76	103	142	101	37	330	340
Grp Sat Flow(s),veh/h/ln	1513	1588	1343	1513	0	1498	1469	1605	1310	1469	1466	1505
Q Serve(g_s), s	1.8	1.7	19.4	10.0	0.0	2.7	3.7	5.3	4.5	1.4	16.5	16.5
Cycle Q Clear(g_c), s	1.8	1.7	19.4	10.0	0.0	2.7	3.7	5.3	4.5	1.4	16.5	16.5
Prop In Lane	1.00		1.00	1.00		0.57	1.00		1.00	1.00		0.14
Lane Grp Cap(c), veh/h	486	441	373	556	0	582	273	550	449	430	458	470
V/C Ratio(X)	0.10	0.10	0.88	0.50	0.00	0.13	0.38	0.26	0.23	0.09	0.72	0.72
Avail Cap(c_a), veh/h	718	501	424	621	0	582	463	798	652	664	729	748
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	19.4	22.1	28.5	14.9	0.0	16.3	18.0	19.5	19.3	17.5	25.2	25.2
Incr Delay (d2), s/veh	0.1	0.1	18.0	0.7	0.0	0.1	0.9	0.4	0.4	0.1	3.1	3.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.8	0.8	9.1	4.3	0.0	1.1	1.5	2.4	1.7	0.6	7.0	7.2
LnGrp Delay(d),s/veh	19.5	22.2	46.5	15.6	0.0	16.4	18.9	19.9	19.7	17.6	28.2	28.2
LnGrp LOS	B	C	D	B		B	B	B	B	B	C	C
Approach Vol, veh/h		423			354			346			707	
Approach Delay, s/veh		40.9			15.8			19.5			27.6	
Approach LOS		D			B			B			C	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	6.9	32.2	7.3	36.0	9.3	29.8	16.4	26.9				
Change Period (Y+Rc), s	4.0	4.9	4.0	4.5	4.0	4.9	4.0	4.5				
Max Green Setting (Gmax), s	16.0	40.1	16.0	25.5	16.0	40.1	16.0	25.5				
Max Q Clear Time (g_c+I1), s	3.4	7.3	3.8	4.7	5.7	18.5	12.0	21.4				
Green Ext Time (p_c), s	0.0	6.5	0.1	2.1	0.2	5.8	0.4	0.7				
Intersection Summary												
HCM 2010 Ctrl Delay			26.9									
HCM 2010 LOS			C									
Notes												













3: Indian Trail Road & Pacific Park Dr/Strong Rd Future Without-Project - AM Peak Hour

Windhaven Apartments Traffic Impact Analysis

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	36	1	144	1	2	5	38	406	1	4	1031	81
Future Volume (veh/h)	36	1	144	1	2	5	38	406	1	4	1031	81
Number	3	8	18	7	4	14	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		1.00	1.00		0.99	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1800	1765	1765	1800	1765	1765	1714	1714	1714	1714	1714	1714
Adj Flow Rate, veh/h	40	1	160	1	2	6	42	451	1	4	1146	90
Adj No. of Lanes	0	1	1	0	1	1	1	1	1	1	1	1
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	2	2	2	2	2	2	5	5	5	5	5	5
Cap, veh/h	347	7	234	140	206	232	167	1184	1005	665	1184	1003
Arrive On Green	0.16	0.16	0.16	0.16	0.16	0.16	0.69	0.69	0.69	0.69	0.69	0.69
Sat Flow, veh/h	1349	45	1500	309	1318	1486	436	1714	1455	908	1714	1453
Grp Volume(v), veh/h	41	0	160	3	0	6	42	451	1	4	1146	90
Grp Sat Flow(s),veh/h/ln	1394	0	1500	1627	0	1486	436	1714	1455	908	1714	1453
Q Serve(g_s), s	1.3	0.0	5.3	0.0	0.0	0.2	3.5	5.8	0.0	0.1	32.5	1.1
Cycle Q Clear(g_c), s	1.3	0.0	5.3	0.1	0.0	0.2	36.0	5.8	0.0	5.9	32.5	1.1
Prop In Lane	0.98		1.00	0.33		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	354	0	234	346	0	232	167	1184	1005	665	1184	1003
V/C Ratio(X)	0.12	0.00	0.68	0.01	0.00	0.03	0.25	0.38	0.00	0.01	0.97	0.09
Avail Cap(c_a), veh/h	832	0	748	872	0	741	167	1184	1005	665	1184	1003
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	19.1	0.0	20.8	18.6	0.0	18.6	24.9	3.4	2.5	4.6	7.5	2.7
Incr Delay (d2), s/veh	0.1	0.0	3.5	0.0	0.0	0.0	3.6	0.9	0.0	0.0	19.5	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.5	0.0	2.4	0.0	0.0	0.1	0.8	2.9	0.0	0.0	21.1	0.5
LnGrp Delay(d),s/veh	19.3	0.0	24.3	18.6	0.0	18.7	28.4	4.3	2.5	4.6	27.0	2.8
LnGrp LOS	B		C	B		B	C	A	A	A	C	A
Approach Vol, veh/h		201			9			494			1240	
Approach Delay, s/veh		23.3			18.7			6.4			25.2	
Approach LOS		C			B			A			C	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		40.0		12.1		40.0		12.1				
Change Period (Y+Rc), s		4.9		* 4.2		4.9		* 4.2				
Max Green Setting (Gmax), s		35.1		* 26		35.1		* 26				
Max Q Clear Time (g_c+I1), s		38.0		2.2		34.5		7.3				
Green Ext Time (p_c), s		0.0		0.9		0.6		0.8				
Intersection Summary												
HCM 2010 Ctrl Delay			20.2									
HCM 2010 LOS			C									
Notes												





















4: Francis Ave #14 & Indian Trail Road
Future Without-Project - AM Peak Hour

Windhaven Apartments Traffic Impact Analysis

								
Movement	EBL	EBT	WBT	WBR	SEL	SER		
Lane Configurations								
Traffic Volume (veh/h)	89	530	337	342	1385	64		
Future Volume (veh/h)	89	530	337	342	1385	64		
Number	1	6	2	12	3	18		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00		
Parking Bus, Adj	1.00	1.00	1.00	0.99	1.00	1.00		
Adj Sat Flow, veh/h/ln	1714	1714	1714	1714	1714	1800		
Adj Flow Rate, veh/h	99	589	374	0	1539	0		
Adj No. of Lanes	1	2	2	1	2	1		
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90		
Percent Heavy Veh, %	5	5	5	5	5	0		
Cap, veh/h	397	1141	1141	507	1622	734		
Arrive On Green	0.35	0.35	0.35	0.00	0.50	0.00		
Sat Flow, veh/h	974	3343	3343	1445	3265	1530		
Grp Volume(v), veh/h	99	589	374	0	1539	0		
Grp Sat Flow(s),veh/h/ln	974	1629	1629	1445	1633	1530		
Q Serve(g_s), s	4.3	7.5	4.4	0.0	23.5	0.0		
Cycle Q Clear(g_c), s	8.8	7.5	4.4	0.0	23.5	0.0		
Prop In Lane	1.00			1.00	1.00	1.00		
Lane Grp Cap(c), veh/h	397	1141	1141	507	1622	734		
V/C Ratio(X)	0.25	0.52	0.33	0.00	0.95	0.00		
Avail Cap(c_a), veh/h	725	2240	2240	994	1622	734		
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	1.00	0.00	1.00	0.00		
Uniform Delay (d), s/veh	15.7	13.5	12.5	0.0	12.5	0.0		
Incr Delay (d2), s/veh	0.4	0.4	0.2	0.0	12.3	0.0		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	1.2	3.4	2.0	0.0	13.3	0.0		
LnGrp Delay(d),s/veh	16.1	13.9	12.7	0.0	24.9	0.0		
LnGrp LOS	B	B	B		C			
Approach Vol, veh/h		688	374		1539			
Approach Delay, s/veh		14.2	12.7		24.9			
Approach LOS		B	B		C			
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2				6		8
Phs Duration (G+Y+Rc), s		22.3				22.3		30.0
Change Period (Y+Rc), s		4.9				4.9		4.9
Max Green Setting (Gmax), s		35.1				35.1		25.1
Max Q Clear Time (g_c+I1), s		6.4				10.8		25.5
Green Ext Time (p_c), s		7.0				6.7		0.0
Intersection Summary								
HCM 2010 Ctrl Delay			20.3					
HCM 2010 LOS			C					
Notes								













5: Alberta St & Francis Ave #14
Future Without-Project - AM Peak Hour

Windhaven Apartments Traffic Impact Analysis

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	27	1444	196	157	617	28	168	24	101	80	117	34
Future Volume (veh/h)	27	1444	196	157	617	28	168	24	101	80	117	34
Number	1	6	16	5	2	12	7	4	14	3	8	18
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.97	1.00		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1800	1767	1800	1731	1800	1800	1800	1833	1872	1800	1872	1872
Adj Flow Rate, veh/h	29	1553	211	169	663	30	158	58	109	86	126	37
Adj No. of Lanes	1	2	0	1	2	0	1	1	0	1	1	0
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	0	2	2	4	0	0	0	0	0	0	0	0
Cap, veh/h	447	1400	187	221	1683	76	269	88	165	242	195	57
Arrive On Green	0.06	0.47	0.46	0.09	0.51	0.49	0.16	0.16	0.14	0.14	0.14	0.12
Sat Flow, veh/h	1714	2976	398	1648	3332	151	1714	560	1052	1714	1380	405
Grp Volume(v), veh/h	29	866	898	169	340	353	158	0	167	86	0	163
Grp Sat Flow(s),veh/h/ln	1714	1678	1695	1648	1710	1773	1714	0	1611	1714	0	1785
Q Serve(g_s), s	0.9	50.4	50.4	6.2	13.2	13.2	9.2	0.0	10.5	4.9	0.0	9.3
Cycle Q Clear(g_c), s	0.9	50.4	50.4	6.2	13.2	13.2	9.2	0.0	10.5	4.9	0.0	9.3
Prop In Lane	1.00		0.23	1.00		0.08	1.00		0.65	1.00		0.23
Lane Grp Cap(c), veh/h	447	790	798	221	864	896	269	0	252	242	0	252
V/C Ratio(X)	0.06	1.10	1.13	0.76	0.39	0.39	0.59	0.00	0.66	0.36	0.00	0.65
Avail Cap(c_a), veh/h	527	790	798	237	864	896	431	0	405	351	0	365
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	13.3	28.3	28.5	27.3	16.4	16.4	42.0	0.0	43.1	41.6	0.0	43.7
Incr Delay (d2), s/veh	0.0	61.4	72.4	11.3	0.1	0.1	0.8	0.0	1.1	0.3	0.0	1.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.4	36.7	39.6	5.5	6.2	6.4	4.4	0.0	4.7	2.3	0.0	4.7
LnGrp Delay(d),s/veh	13.3	89.8	101.0	38.6	16.5	16.5	42.7	0.0	44.2	41.9	0.0	44.7
LnGrp LOS	B	F	F	D	B	B	D		D	D		D
Approach Vol, veh/h		1793			862			325			249	
Approach Delay, s/veh		94.1			20.8			43.5			43.8	
Approach LOS		F			C			D			D	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	10.0	59.0		19.9	14.0	55.0		18.2				
Change Period (Y+Rc), s	4.0	6.0		5.0	4.0	6.0		5.0				
Max Green Setting (Gmax), s	11.0	49.0		25.0	11.0	49.0		20.0				
Max Q Clear Time (g_c+I1), s	2.9	15.2		12.5	8.2	52.4		11.3				
Green Ext Time (p_c), s	0.0	8.4		0.8	0.1	0.0		0.5				
Intersection Summary												
HCM 2010 Ctrl Delay				65.6								
HCM 2010 LOS				E								
Notes												


















6: Ash St #4S & Francis Ave #14
Future Without-Project - AM Peak Hour

Windhaven Apartments Traffic Impact Analysis

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑		↑	↑↑					↑	↑↑	↑
Traffic Volume (vph)	0	966	233	111	571	0	0	0	0	322	697	414
Future Volume (vph)	0	966	233	111	571	0	0	0	0	322	697	414
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	11	12	12	11	12	12	12	12	12	13	12	13
Total Lost time (s)		4.0		4.0	4.0					4.0	4.0	4.0
Lane Util. Factor		0.95		1.00	0.95					1.00	0.95	1.00
Frpb, ped/bikes		1.00		1.00	1.00					1.00	1.00	0.98
Flpb, ped/bikes		1.00		1.00	1.00					1.00	1.00	1.00
Frt		0.97		1.00	1.00					1.00	1.00	0.85
Flt Protected		1.00		0.95	1.00					0.95	1.00	1.00
Satd. Flow (prot)		3164		1605	3353					1716	3307	1523
Flt Permitted		1.00		0.95	1.00					0.95	1.00	1.00
Satd. Flow (perm)		3164		1605	3353					1716	3307	1523
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	0	1039	251	119	614	0	0	0	0	346	749	445
RTOR Reduction (vph)	0	22	0	0	0	0	0	0	0	0	0	163
Lane Group Flow (vph)	0	1268	0	119	614	0	0	0	0	346	749	282
Confl. Peds. (#/hr)			3	3					1			4
Heavy Vehicles (%)	0%	4%	5%	3%	2%	0%	2%	2%	2%	3%	3%	2%
Bus Blockages (#/hr)	0	2	0	0	0	0	0	0	0	0	2	0
Turn Type		NA		Prot	NA					Perm	NA	Perm
Protected Phases		5		6	2						4	
Permitted Phases										4		4
Actuated Green, G (s)		37.6		9.1	51.6					28.9	28.9	28.9
Effective Green, g (s)		38.5		10.0	52.5					29.5	29.5	29.5
Actuated g/C Ratio		0.43		0.11	0.58					0.33	0.33	0.33
Clearance Time (s)		4.9		4.9	4.9					4.6	4.6	4.6
Vehicle Extension (s)		3.0		2.0	3.0					3.0	3.0	3.0
Lane Grp Cap (vph)		1353		178	1955					562	1083	499
v/s Ratio Prot		c0.40		c0.07	0.18						c0.23	
v/s Ratio Perm										0.20		0.18
v/c Ratio		0.94		0.67	0.31					0.62	0.69	0.56
Uniform Delay, d1		24.6		38.4	9.6					25.5	26.3	25.0
Progression Factor		1.00		0.94	0.44					0.86	0.87	0.79
Incremental Delay, d2		13.5		6.9	0.4					1.9	1.8	1.4
Delay (s)		38.1		43.2	4.6					23.7	24.7	21.0
Level of Service		D		D	A					C	C	C
Approach Delay (s)		38.1			10.9			0.0			23.4	
Approach LOS		D			B			A			C	
Intersection Summary												
HCM 2000 Control Delay			26.1			HCM 2000 Level of Service				C		
HCM 2000 Volume to Capacity ratio			0.81									
Actuated Cycle Length (s)			90.0			Sum of lost time (s)				12.0		
Intersection Capacity Utilization			72.9%			ICU Level of Service				C		
Analysis Period (min)			15									
c Critical Lane Group												

7: Maple St #3N & Francis Ave #14
Future Without-Project - AM Peak Hour

Windhaven Apartments Traffic Impact Analysis

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	267	1212	0	0	443	83	25	490	149	0	0	0
Future Volume (vph)	267	1212	0	0	443	83	25	490	149	0	0	0
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	11	12	12	12	12	12	12	12	12	12	12	12
Total Lost time (s)	4.0	4.0			4.0		4.0	4.0				
Lane Util. Factor	1.00	0.95			0.95		0.86	*0.80				
Frpb, ped/bikes	1.00	1.00			1.00		1.00	1.00				
Flpb, ped/bikes	1.00	1.00			1.00		1.00	1.00				
Frt	1.00	1.00			0.98		1.00	0.97				
Flt Protected	0.95	1.00			1.00		0.95	1.00				
Satd. Flow (prot)	1621	3288			3264		1454	4105				
Flt Permitted	0.95	1.00			1.00		0.95	1.00				
Satd. Flow (perm)	1621	3288			3264		1454	4105				
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	287	1303	0	0	476	89	27	527	160	0	0	0
RTOR Reduction (vph)	0	0	0	0	16	0	0	48	0	0	0	0
Lane Group Flow (vph)	287	1303	0	0	549	0	24	642	0	0	0	0
Confl. Peds. (#/hr)			2			4	1					1
Confl. Bikes (#/hr)						1			2			
Heavy Vehicles (%)	2%	4%	0%	0%	2%	2%	1%	1%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	4	0	0	0	0	0	0
Turn Type	Prot	NA			NA		Perm	NA				
Protected Phases	2	6			1			4				
Permitted Phases							4					
Actuated Green, G (s)	24.1	59.9			30.9		20.6	20.6				
Effective Green, g (s)	25.0	60.8			31.8		21.2	21.2				
Actuated g/C Ratio	0.28	0.68			0.35		0.24	0.24				
Clearance Time (s)	4.9	4.9			4.9		4.6	4.6				
Vehicle Extension (s)	2.0	3.0			3.0		3.0	3.0				
Lane Grp Cap (vph)	450	2221			1153		342	966				
v/s Ratio Prot	0.18	c0.40			0.17							
v/s Ratio Perm							0.02	0.16				
v/c Ratio	0.64	0.59			0.48		0.07	0.66				
Uniform Delay, d1	28.5	7.8			22.6		26.7	31.2				
Progression Factor	0.87	0.55			1.00		1.00	1.00				
Incremental Delay, d2	1.5	0.8			1.4		0.1	1.7				
Delay (s)	26.4	5.1			24.0		26.8	32.9				
Level of Service	C	A			C		C	C				
Approach Delay (s)		8.9			24.0			32.7			0.0	
Approach LOS		A			C			C			A	
Intersection Summary												
HCM 2000 Control Delay			17.8				HCM 2000 Level of Service			B		
HCM 2000 Volume to Capacity ratio			0.64									
Actuated Cycle Length (s)			90.0				Sum of lost time (s)			12.0		
Intersection Capacity Utilization			72.9%				ICU Level of Service			C		
Analysis Period (min)			15									
Description: Count Date 7/20/09												

8: Barnes & Forest Lane
Future Without-Project - AM Peak Hour

Windhaven Apartments Traffic Impact Analysis

Intersection						
Int Delay, s/veh	1.5					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Traffic Vol, veh/h	1	173	53	17	39	1
Future Vol, veh/h	1	173	53	17	39	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	75	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	74	74	74	74	74	74
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1	234	72	23	53	1
Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	95	0	-	0	319	83
Stage 1	-	-	-	-	83	-
Stage 2	-	-	-	-	236	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1499	-	-	-	674	976
Stage 1	-	-	-	-	940	-
Stage 2	-	-	-	-	803	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1499	-	-	-	674	976
Mov Cap-2 Maneuver	-	-	-	-	694	-
Stage 1	-	-	-	-	940	-
Stage 2	-	-	-	-	802	-
Approach	EB		WB		SB	
HCM Control Delay, s	0		0		10.6	
HCM LOS					B	
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	
Capacity (veh/h)	1499	-	-	-	699	
HCM Lane V/C Ratio	0.001	-	-	-	0.077	
HCM Control Delay (s)	7.4	-	-	-	10.6	
HCM Lane LOS	A	-	-	-	B	
HCM 95th %tile Q(veh)	0	-	-	-	0.3	























9: Barnes & Pamela
Future Without-Project - AM Peak Hour

Windhaven Apartments Traffic Impact Analysis

Intersection												
Int Delay, s/veh	2.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Vol, veh/h	1	212	1	6	68	25	2	1	13	59	1	1
Future Vol, veh/h	1	212	1	6	68	25	2	1	13	59	1	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	75	-	-	75	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	74	74	74	74	74	74	74	74	74	74	74	74
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	1	286	1	8	92	34	3	1	18	80	1	1
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	126	0	0	288	0	0	416	432	287	424	416	109
Stage 1	-	-	-	-	-	-	290	290	-	125	125	-
Stage 2	-	-	-	-	-	-	126	142	-	299	291	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1460	-	-	1274	-	-	547	516	752	540	527	945
Stage 1	-	-	-	-	-	-	718	672	-	879	792	-
Stage 2	-	-	-	-	-	-	878	779	-	710	672	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1460	-	-	1274	-	-	542	512	752	524	523	945
Mov Cap-2 Maneuver	-	-	-	-	-	-	542	512	-	524	523	
Stage 1	-	-	-	-	-	-	718	672	-	878	787	-
Stage 2	-	-	-	-	-	-	870	774	-	692	672	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0			0.5			10.3			13.1		
HCM LOS							B			B		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	698	1460	-	-	1274	-	-	528				
HCM Lane V/C Ratio	0.031	0.001	-	-	0.006	-	-	0.156				
HCM Control Delay (s)	10.3	7.5	-	-	7.8	-	-	13.1				
HCM Lane LOS	B	A	-	-	A	-	-	B				
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0.6				

1: Indian Trail Road & Shawnee Ave
Future Without-Project - PM Peak Hour
























Windhaven Apartments Traffic Impact Analysis

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	1	1	24	49	2	5	48	446	112	11	286	6
Future Volume (veh/h)	1	1	24	49	2	5	48	446	112	11	286	6
Number	3	8	18	7	4	14	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.98		0.98	0.98		0.98	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1800	1800	1800	1748	1800	1800	1800	1800	1872	1800	1782	1872
Adj Flow Rate, veh/h	1	1	26	53	2	5	52	480	120	12	308	6
Adj No. of Lanes	1	1	0	1	1	0	1	1	1	1	1	1
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	0	0	0	3	0	0	0	0	0	0	1	0
Cap, veh/h	297	8	203	273	63	157	779	1151	1017	578	1084	968
Arrive On Green	0.14	0.14	0.14	0.14	0.14	0.14	0.06	0.64	0.64	0.03	0.61	0.61
Sat Flow, veh/h	1406	56	1457	1342	451	1127	1714	1800	1591	1714	1782	1591
Grp Volume(v), veh/h	1	0	27	53	0	7	52	480	120	12	308	6
Grp Sat Flow(s),veh/h/ln	1406	0	1513	1342	0	1578	1714	1800	1591	1714	1782	1591
Q Serve(g_s), s	0.0	0.0	1.1	2.4	0.0	0.3	0.7	8.8	2.0	0.2	5.5	0.1
Cycle Q Clear(g_c), s	0.3	0.0	1.1	3.5	0.0	0.3	0.7	8.8	2.0	0.2	5.5	0.1
Prop In Lane	1.00		0.96	1.00		0.71	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	297	0	210	273	0	219	779	1151	1017	578	1084	968
V/C Ratio(X)	0.00	0.00	0.13	0.19	0.00	0.03	0.07	0.42	0.12	0.02	0.28	0.01
Avail Cap(c_a), veh/h	524	0	455	489	0	474	954	1151	1017	808	1084	968
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	25.2	0.0	25.5	26.9	0.0	25.1	4.1	6.0	4.7	4.8	6.2	5.2
Incr Delay (d2), s/veh	0.0	0.0	0.3	0.3	0.0	0.1	0.0	1.1	0.2	0.0	0.7	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.0	0.5	0.9	0.0	0.1	0.3	4.6	0.9	0.1	2.9	0.0
LnGrp Delay(d),s/veh	25.2	0.0	25.7	27.3	0.0	25.2	4.1	7.1	5.0	4.8	6.9	5.2
LnGrp LOS	C		C	C		C	A	A	A	A	A	A
Approach Vol, veh/h	28					60		652		326		
Approach Delay, s/veh	25.7					27.0		6.5		6.8		
Approach LOS	C					C		A		A		
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2			4	5	6	8				
Phs Duration (G+Y+Rc), s	6.0	47.1			14.2	8.1	45.0	14.2				
Change Period (Y+Rc), s	5.0	5.0			5.0	5.0	5.0	5.0				
Max Green Setting (Gmax), s	10.0	40.0			20.0	10.0	40.0	20.0				
Max Q Clear Time (g_c+I1), s	2.2	10.8			5.5	2.7	7.5	3.1				
Green Ext Time (p_c), s	0.0	6.5			0.3	0.0	6.6	0.3				
Intersection Summary												
HCM 2010 Ctrl Delay			8.2									
HCM 2010 LOS			A									
Notes												

2: Indian Trail Road & Barnes Rd























Future Without-Project - PM Peak Hour

Windhaven Apartments Traffic Impact Analysis

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	92	52	189	153	49	64	269	330	374	52	264	49
Future Volume (veh/h)	92	52	189	153	49	64	269	330	374	52	264	49
Number	3	8	18	7	4	14	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.99	1.00		0.99	1.00		1.00	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1588	1588	1588	1588	1652	1685	1543	1605	1543	1543	1543	1620
Adj Flow Rate, veh/h	100	57	205	166	53	70	292	359	407	57	287	53
Adj No. of Lanes	1	1	1	1	1	0	1	1	1	1	2	0
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
Percent Heavy Veh, %	2	2	2	2	2	2	5	5	5	5	5	5
Cap, veh/h	424	334	282	458	161	213	537	655	535	334	732	133
Arrive On Green	0.08	0.21	0.21	0.12	0.25	0.24	0.17	0.41	0.41	0.06	0.30	0.30
Sat Flow, veh/h	1513	1588	1340	1513	644	851	1469	1605	1310	1469	2475	451
Grp Volume(v), veh/h	100	57	205	166	0	123	292	359	407	57	168	172
Grp Sat Flow(s),veh/h/ln	1513	1588	1340	1513	0	1495	1469	1605	1310	1469	1466	1460
Q Serve(g_s), s	3.6	2.1	10.2	5.8	0.0	4.8	8.9	12.2	19.0	1.9	6.5	6.7
Cycle Q Clear(g_c), s	3.6	2.1	10.2	5.8	0.0	4.8	8.9	12.2	19.0	1.9	6.5	6.7
Prop In Lane	1.00		1.00	1.00		0.57	1.00		1.00	1.00		0.31
Lane Grp Cap(c), veh/h	424	334	282	458	0	374	537	655	535	334	434	432
V/C Ratio(X)	0.24	0.17	0.73	0.36	0.00	0.33	0.54	0.55	0.76	0.17	0.39	0.40
Avail Cap(c_a), veh/h	657	579	489	632	0	545	632	923	754	594	843	839
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	19.4	23.0	26.2	17.3	0.0	22.0	12.1	16.1	18.1	15.5	20.0	20.0
Incr Delay (d2), s/veh	0.3	0.2	3.6	0.5	0.0	0.5	0.9	1.0	3.8	0.2	0.8	0.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.5	0.9	4.0	2.4	0.0	2.0	3.6	5.6	7.4	0.8	2.7	2.8
LnGrp Delay(d),s/veh	19.7	23.3	29.8	17.7	0.0	22.5	12.9	17.1	21.9	15.8	20.8	20.9
LnGrp LOS	B	C	C	B		C	B	B	C	B	C	C
Approach Vol, veh/h		362			289			1058			397	
Approach Delay, s/veh		26.0			19.8			17.8			20.1	
Approach LOS		C			B			B			C	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	7.4	33.1	9.0	21.8	15.4	25.1	11.8	19.0				
Change Period (Y+Rc), s	4.0	4.9	4.0	4.5	4.0	4.9	4.0	4.5				
Max Green Setting (Gmax), s	16.0	40.1	16.0	25.5	16.0	40.1	16.0	25.5				
Max Q Clear Time (g_c+I1), s	3.9	21.0	5.6	6.8	10.9	8.7	7.8	12.2				
Green Ext Time (p_c), s	0.1	7.1	0.2	1.6	0.5	8.5	0.4	1.4				
Intersection Summary												
HCM 2010 Ctrl Delay			19.9									
HCM 2010 LOS			B									
Notes												













3: Indian Trail Road & Pacific Park Dr/Strong Rd Future Without-Project - PM Peak Hour

Windhaven Apartments Traffic Impact Analysis

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	22	2	72	1	2	9	152	1200	1	6	528	81
Future Volume (veh/h)	22	2	72	1	2	9	152	1200	1	6	528	81
Number	3	8	18	7	4	14	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		1.00	1.00		0.99	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1800	1765	1765	1800	1765	1765	1714	1714	1714	1714	1714	1714
Adj Flow Rate, veh/h	23	2	77	1	2	10	162	1277	1	6	562	86
Adj No. of Lanes	0	1	1	0	1	1	1	1	1	1	1	1
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	2	2	2	2	2	2	5	5	5	5	5	5
Cap, veh/h	384	28	303	160	260	302	496	1119	950	131	1119	948
Arrive On Green	0.20	0.20	0.20	0.20	0.20	0.20	0.65	0.65	0.65	0.65	0.65	0.65
Sat Flow, veh/h	1278	139	1500	358	1284	1490	757	1714	1455	419	1714	1453
Grp Volume(v), veh/h	25	0	77	3	0	10	162	1277	1	6	562	86
Grp Sat Flow(s),veh/h/ln	1416	0	1500	1642	0	1490	757	1714	1455	419	1714	1453
Q Serve(g_s), s	0.6	0.0	2.4	0.0	0.0	0.3	7.8	36.0	0.0	0.0	9.3	1.2
Cycle Q Clear(g_c), s	0.7	0.0	2.4	0.1	0.0	0.3	17.1	36.0	0.0	36.0	9.3	1.2
Prop In Lane	0.92		1.00	0.33		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	412	0	303	419	0	302	496	1119	950	131	1119	948
V/C Ratio(X)	0.06	0.00	0.25	0.01	0.00	0.03	0.33	1.14	0.00	0.05	0.50	0.09
Avail Cap(c_a), veh/h	791	0	707	845	0	703	496	1119	950	131	1119	948
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	17.8	0.0	18.5	17.6	0.0	17.7	9.4	9.6	3.3	27.6	5.0	3.5
Incr Delay (d2), s/veh	0.1	0.0	0.4	0.0	0.0	0.0	1.7	74.7	0.0	0.7	1.6	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.3	0.0	1.0	0.0	0.0	0.1	1.9	39.7	0.0	0.1	4.9	0.5
LnGrp Delay(d),s/veh	17.9	0.0	18.9	17.6	0.0	17.7	11.1	84.3	3.3	28.2	6.6	3.7
LnGrp LOS	B		B	B		B	B	F	A	C	A	A
Approach Vol, veh/h		102			13			1440			654	
Approach Delay, s/veh		18.7			17.7			76.0			6.4	
Approach LOS		B			B			E			A	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		40.0		15.2		40.0		15.2				
Change Period (Y+Rc), s		4.9		* 4.2		4.9		* 4.2				
Max Green Setting (Gmax), s		35.1		* 26		35.1		* 26				
Max Q Clear Time (g_c+I1), s		38.0		2.3		38.0		4.4				
Green Ext Time (p_c), s		0.0		0.4		0.0		0.4				
Intersection Summary												
HCM 2010 Ctrl Delay			52.4									
HCM 2010 LOS			D									
Notes												





















4: Francis Ave #14 & Indian Trail Road
Future Without-Project - PM Peak Hour

Windhaven Apartments Traffic Impact Analysis

								
Movement	EBL	EBT	WBT	WBR	SEL	SER		
Lane Configurations								
Traffic Volume (veh/h)	172	465	644	1310	598	93		
Future Volume (veh/h)	172	465	644	1310	598	93		
Number	1	6	2	12	3	18		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00		
Parking Bus, Adj	1.00	1.00	1.00	0.99	1.00	1.00		
Adj Sat Flow, veh/h/ln	1714	1714	1714	1714	1714	1800		
Adj Flow Rate, veh/h	183	495	685	0	636	0		
Adj No. of Lanes	1	2	2	1	2	1		
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94		
Percent Heavy Veh, %	5	5	5	5	5	0		
Cap, veh/h	459	1796	1796	797	947	417		
Arrive On Green	0.55	0.55	0.55	0.00	0.29	0.00		
Sat Flow, veh/h	731	3343	3343	1445	3265	1530		
Grp Volume(v), veh/h	183	495	685	0	636	0		
Grp Sat Flow(s),veh/h/ln	731	1629	1629	1445	1633	1530		
Q Serve(g_s), s	9.6	4.1	6.0	0.0	8.7	0.0		
Cycle Q Clear(g_c), s	15.6	4.1	6.0	0.0	8.7	0.0		
Prop In Lane	1.00			1.00	1.00	1.00		
Lane Grp Cap(c), veh/h	459	1796	1796	797	947	417		
V/C Ratio(X)	0.40	0.28	0.38	0.00	0.67	0.00		
Avail Cap(c_a), veh/h	649	2644	2644	1173	2004	912		
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	1.00	0.00	1.00	0.00		
Uniform Delay (d), s/veh	10.9	6.0	6.4	0.0	15.8	0.0		
Incr Delay (d2), s/veh	0.7	0.1	0.2	0.0	0.8	0.0		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	2.0	1.8	2.7	0.0	4.0	0.0		
LnGrp Delay(d),s/veh	11.5	6.1	6.6	0.0	16.6	0.0		
LnGrp LOS	B	A	A		B			
Approach Vol, veh/h		678	685		636			
Approach Delay, s/veh		7.6	6.6		16.6			
Approach LOS		A	A		B			
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2				6		8
Phs Duration (G+Y+Rc), s		31.9				31.9		18.7
Change Period (Y+Rc), s		4.9				4.9		4.9
Max Green Setting (Gmax), s		40.1				40.1		30.1
Max Q Clear Time (g_c+I1), s		8.0				17.6		10.7
Green Ext Time (p_c), s		10.7				9.4		3.1
Intersection Summary								
HCM 2010 Ctrl Delay			10.1					
HCM 2010 LOS			B					
Notes								



















5: Alberta St & Francis Ave #14
Future Without-Project - PM Peak Hour

Windhaven Apartments Traffic Impact Analysis

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	39	979	104	145	1456	18	430	111	128	40	50	36
Future Volume (veh/h)	39	979	104	145	1456	18	430	111	128	40	50	36
Number	1	6	16	5	2	12	7	4	14	3	8	18
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.98	1.00		0.96
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1800	1766	1800	1731	1800	1800	1800	1850	1872	1800	1872	1872
Adj Flow Rate, veh/h	41	1020	108	151	1517	19	348	255	133	42	52	38
Adj No. of Lanes	1	2	0	1	2	0	1	1	0	1	1	0
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	0	2	2	4	0	0	0	0	0	0	0	0
Cap, veh/h	97	1165	123	181	1490	19	450	299	156	186	107	78
Arrive On Green	0.06	0.38	0.37	0.11	0.43	0.42	0.26	0.26	0.24	0.11	0.11	0.09
Sat Flow, veh/h	1714	3062	324	1648	3459	43	1714	1140	594	1714	986	721
Grp Volume(v), veh/h	41	559	569	151	749	787	348	0	388	42	0	90
Grp Sat Flow(s),veh/h/ln	1714	1678	1708	1648	1710	1792	1714	0	1734	1714	0	1707
Q Serve(g_s), s	2.5	32.9	33.0	9.6	45.8	45.8	20.0	0.0	22.7	2.4	0.0	5.3
Cycle Q Clear(g_c), s	2.5	32.9	33.0	9.6	45.8	45.8	20.0	0.0	22.7	2.4	0.0	5.3
Prop In Lane	1.00		0.19	1.00		0.02	1.00		0.34	1.00		0.42
Lane Grp Cap(c), veh/h	97	638	650	181	737	772	450	0	455	186	0	185
V/C Ratio(X)	0.42	0.88	0.88	0.84	1.02	1.02	0.77	0.00	0.85	0.23	0.00	0.49
Avail Cap(c_a), veh/h	258	716	729	248	737	772	514	0	520	353	0	351
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	48.5	30.6	30.8	46.4	30.3	30.3	36.3	0.0	37.6	43.3	0.0	45.0
Incr Delay (d2), s/veh	1.1	10.0	9.9	12.2	37.6	37.2	5.3	0.0	10.6	0.2	0.0	0.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.2	17.0	17.3	5.0	29.2	30.5	10.1	0.0	12.2	1.1	0.0	2.5
LnGrp Delay(d),s/veh	49.6	40.7	40.7	58.7	67.9	67.5	41.6	0.0	48.2	43.6	0.0	45.7
LnGrp LOS	D	D	D	E	F	F	D		D	D		D
Approach Vol, veh/h		1169			1687			736			132	
Approach Delay, s/veh		41.0			66.9			45.1			45.0	
Approach LOS		D			E			D			D	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	10.0	50.7		31.0	15.7	45.1		14.7				
Change Period (Y+Rc), s	4.0	6.0		5.0	4.0	6.0		5.0				
Max Green Setting (Gmax), s	16.0	44.0		30.0	16.0	44.0		20.0				
Max Q Clear Time (g_c+I1), s	4.5	47.8		24.7	11.6	35.0		7.3				
Green Ext Time (p_c), s	0.0	0.0		1.4	0.1	4.1		0.3				
Intersection Summary												
HCM 2010 Ctrl Delay				53.7								
HCM 2010 LOS				D								
Notes												


















6: Ash St #4S & Francis Ave #14
Future Without-Project - PM Peak Hour

Windhaven Apartments Traffic Impact Analysis

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	0	722	122	225	1490	0	0	0	0	224	580	400
Future Volume (vph)	0	722	122	225	1490	0	0	0	0	224	580	400
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	11	12	12	11	12	12	12	12	12	13	12	13
Total Lost time (s)		4.0		4.0	4.0					4.0	4.0	4.0
Lane Util. Factor		0.95		1.00	0.95					1.00	0.95	1.00
Frpb, ped/bikes		1.00		1.00	1.00					1.00	1.00	0.98
Flpb, ped/bikes		1.00		1.00	1.00					1.00	1.00	1.00
Frt		0.98		1.00	1.00					1.00	1.00	0.85
Flt Protected		1.00		0.95	1.00					0.95	1.00	1.00
Satd. Flow (prot)		3192		1605	3353					1716	3307	1524
Flt Permitted		1.00		0.95	1.00					0.95	1.00	1.00
Satd. Flow (perm)		3192		1605	3353					1716	3307	1524
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	0	737	124	230	1520	0	0	0	0	229	592	408
RTOR Reduction (vph)	0	14	0	0	0	0	0	0	0	0	0	53
Lane Group Flow (vph)	0	847	0	230	1520	0	0	0	0	229	592	355
Confl. Peds. (#/hr)			3	3					1			4
Heavy Vehicles (%)	0%	4%	5%	3%	2%	0%	2%	2%	2%	3%	3%	2%
Bus Blockages (#/hr)	0	2	0	0	0	0	0	0	0	0	2	0
Turn Type		NA		Prot	NA					Perm	NA	Perm
Protected Phases		5		6	2						4	
Permitted Phases										4		4
Actuated Green, G (s)		37.7		20.1	62.7					27.8	27.8	27.8
Effective Green, g (s)		38.6		21.0	63.6					28.4	28.4	28.4
Actuated g/C Ratio		0.39		0.21	0.64					0.28	0.28	0.28
Clearance Time (s)		4.9		4.9	4.9					4.6	4.6	4.6
Vehicle Extension (s)		3.0		2.0	3.0					3.0	3.0	3.0
Lane Grp Cap (vph)		1232		337	2132					487	939	432
v/s Ratio Prot		0.27		0.14	c0.45						0.18	
v/s Ratio Perm										0.13		c0.23
v/c Ratio		0.69		0.68	0.71					0.47	0.63	0.82
Uniform Delay, d1		25.7		36.4	12.1					29.6	31.2	33.4
Progression Factor		1.00		0.82	0.43					0.89	0.90	0.89
Incremental Delay, d2		3.1		1.8	0.8					0.7	1.3	11.6
Delay (s)		28.8		31.6	6.1					27.0	29.5	41.3
Level of Service		C		C	A					C	C	D
Approach Delay (s)		28.8			9.5			0.0			32.9	
Approach LOS		C			A			A			C	
Intersection Summary												
HCM 2000 Control Delay			21.3			HCM 2000 Level of Service				C		
HCM 2000 Volume to Capacity ratio			0.78									
Actuated Cycle Length (s)			100.0			Sum of lost time (s)				12.0		
Intersection Capacity Utilization			92.8%			ICU Level of Service				F		
Analysis Period (min)			15									
c Critical Lane Group												

7: Maple St #3N & Francis Ave #14
Future Without-Project - PM Peak Hour

Windhaven Apartments Traffic Impact Analysis

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	331	956	0	0	1086	222	422	933	176	0	0	0
Future Volume (vph)	331	956	0	0	1086	222	422	933	176	0	0	0
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	11	12	12	12	12	12	12	12	12	12	12	12
Total Lost time (s)	4.0	4.0			4.0		4.0	4.0				
Lane Util. Factor	1.00	0.95			0.95		0.86	*0.80				
Frpb, ped/bikes	1.00	1.00			1.00		1.00	1.00				
Flpb, ped/bikes	1.00	1.00			1.00		1.00	1.00				
Frt	1.00	1.00			0.97		1.00	0.98				
Flt Protected	0.95	1.00			1.00		0.95	1.00				
Satd. Flow (prot)	1621	3288			3257		1454	4156				
Flt Permitted	0.95	1.00			1.00		0.95	1.00				
Satd. Flow (perm)	1621	3288			3257		1454	4156				
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	341	986	0	0	1120	229	435	962	181	0	0	0
RTOR Reduction (vph)	0	0	0	0	17	0	0	21	0	0	0	0
Lane Group Flow (vph)	341	986	0	0	1332	0	387	1170	0	0	0	0
Confl. Peds. (#/hr)			2			4	1					1
Confl. Bikes (#/hr)						1			2			
Heavy Vehicles (%)	2%	4%	0%	0%	2%	2%	1%	1%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	4	0	0	0	0	0	0
Turn Type	Prot	NA			NA		Perm	NA				
Protected Phases	2	6			1			4				
Permitted Phases							4					
Actuated Green, G (s)	20.1	63.1			38.1		27.4	27.4				
Effective Green, g (s)	21.0	64.0			39.0		28.0	28.0				
Actuated g/C Ratio	0.21	0.64			0.39		0.28	0.28				
Clearance Time (s)	4.9	4.9			4.9		4.6	4.6				
Vehicle Extension (s)	2.0	3.0			3.0		3.0	3.0				
Lane Grp Cap (vph)	340	2104			1270		407	1163				
v/s Ratio Prot	c0.21	0.30			c0.41							
v/s Ratio Perm							0.27	0.28				
v/c Ratio	1.00	0.47			1.05		0.95	1.01				
Uniform Delay, d1	39.5	9.3			30.5		35.3	36.0				
Progression Factor	1.16	1.04			1.00		1.00	1.00				
Incremental Delay, d2	47.1	0.7			39.1		32.1	27.9				
Delay (s)	92.9	10.3			69.6		67.4	63.9				
Level of Service	F	B			E		E	E				
Approach Delay (s)		31.5			69.6		64.8				0.0	
Approach LOS		C			E		E				A	
Intersection Summary												
HCM 2000 Control Delay			55.9				HCM 2000 Level of Service		E			
HCM 2000 Volume to Capacity ratio			1.02									
Actuated Cycle Length (s)			100.0				Sum of lost time (s)		12.0			
Intersection Capacity Utilization			92.8%				ICU Level of Service		F			
Analysis Period (min)			15									
Description: Count Date 7/20/09												

8: Barnes & Forest Lane
Future Without-Project - PM Peak Hour

Windhaven Apartments Traffic Impact Analysis

Intersection

Int Delay, s/veh 0.8

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Traffic Vol, veh/h	1	95	155	47	24	1
Future Vol, veh/h	1	95	155	47	24	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	75	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1	103	168	51	26	1

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	220	0	299
Stage 1	-	-	194
Stage 2	-	-	105
Critical Hdwy	4.12	-	6.42
Critical Hdwy Stg 1	-	-	5.42
Critical Hdwy Stg 2	-	-	5.42
Follow-up Hdwy	2.218	-	3.518
Pot Cap-1 Maneuver	1349	-	692
Stage 1	-	-	839
Stage 2	-	-	919
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	1349	-	691
Mov Cap-2 Maneuver	-	-	713
Stage 1	-	-	839
Stage 2	-	-	918

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	10.2
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1349	-	-	-	718
HCM Lane V/C Ratio	0.001	-	-	-	0.038
HCM Control Delay (s)	7.7	-	-	-	10.2
HCM Lane LOS	A	-	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.1

9: Barnes & Pamela
Future Without-Project - PM Peak Hour























Windhaven Apartments Traffic Impact Analysis

Intersection												
Int Delay, s/veh	1.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Vol, veh/h	1	116	3	7	199	70	3	1	17	36	1	1
Future Vol, veh/h	1	116	3	7	199	70	3	1	17	36	1	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	75	-	-	75	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	1	122	3	7	209	74	3	1	18	38	1	1
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	283	0	0	125	0	0	388	424	124	396	388	246
Stage 1	-	-	-	-	-	-	126	126	-	261	261	-
Stage 2	-	-	-	-	-	-	262	298	-	135	127	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1279	-	-	1462	-	-	571	522	927	564	547	793
Stage 1	-	-	-	-	-	-	878	792	-	744	692	-
Stage 2	-	-	-	-	-	-	743	667	-	868	791	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1279	-	-	1462	-	-	567	519	927	550	544	793
Mov Cap-2 Maneuver	-	-	-	-	-	-	567	519	-	550	544	
Stage 1	-	-	-	-	-	-	877	791	-	743	689	-
Stage 2	-	-	-	-	-	-	737	664	-	849	790	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.1			0.2			9.5			12		
HCM LOS							A			B		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	822	1279	-	-	1462	-	-	554				
HCM Lane V/C Ratio	0.027	0.001	-	-	0.005	-	-	0.072				
HCM Control Delay (s)	9.5	7.8	-	-	7.5	-	-	12				
HCM Lane LOS	A	A	-	-	A	-	-	B				
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0.2				

1: Indian Trail Road & Shawnee Ave

Future With-Project - AM Peak Hour
























Windhaven Apartments Traffic Impact Analysis

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	5	26	57	182	14	21	13	178	144	31	388	3
Future Volume (veh/h)	5	26	57	182	14	21	13	178	144	31	388	3
Number	3	8	18	7	4	14	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.99	0.99		0.99	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1800	1800	1800	1748	1800	1800	1800	1800	1872	1800	1782	1872
Adj Flow Rate, veh/h	7	36	78	249	19	29	18	244	197	42	532	4
Adj No. of Lanes	1	1	0	1	1	0	1	1	1	1	1	1
Peak Hour Factor	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73
Percent Heavy Veh, %	0	0	0	3	0	0	0	0	0	0	1	0
Cap, veh/h	415	130	283	345	166	253	454	944	834	611	966	863
Arrive On Green	0.26	0.26	0.26	0.26	0.26	0.26	0.03	0.52	0.52	0.05	0.54	0.54
Sat Flow, veh/h	1367	504	1091	1252	640	977	1714	1800	1591	1714	1782	1591
Grp Volume(v), veh/h	7	0	114	249	0	48	18	244	197	42	532	4
Grp Sat Flow(s),veh/h/ln	1367	0	1595	1252	0	1616	1714	1800	1591	1714	1782	1591
Q Serve(g_s), s	0.3	0.0	4.5	15.5	0.0	1.8	0.4	5.8	5.2	0.8	15.2	0.1
Cycle Q Clear(g_c), s	2.1	0.0	4.5	19.9	0.0	1.8	0.4	5.8	5.2	0.8	15.2	0.1
Prop In Lane	1.00		0.68	1.00		0.60	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	415	0	413	345	0	419	454	944	834	611	966	863
V/C Ratio(X)	0.02	0.00	0.28	0.72	0.00	0.11	0.04	0.26	0.24	0.07	0.55	0.00
Avail Cap(c_a), veh/h	415	0	413	345	0	419	638	944	834	765	966	863
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	22.9	0.0	23.1	31.0	0.0	22.1	9.0	10.2	10.1	7.5	11.7	8.2
Incr Delay (d2), s/veh	0.0	0.0	0.4	7.2	0.0	0.1	0.0	0.7	0.7	0.0	2.3	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.1	0.0	2.0	6.0	0.0	0.8	0.2	3.0	2.5	0.4	8.0	0.0
LnGrp Delay(d),s/veh	22.9	0.0	23.5	38.2	0.0	22.2	9.0	10.9	10.7	7.5	13.9	8.2
LnGrp LOS	C		C	D		C	A	B	B	A	B	A
Approach Vol, veh/h		121			297			459			578	
Approach Delay, s/veh		23.4			35.6			10.7			13.4	
Approach LOS		C			D			B			B	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	8.0	45.0		25.0	6.6	46.4		25.0				
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0				
Max Green Setting (Gmax), s	10.0	40.0		20.0	10.0	40.0		20.0				
Max Q Clear Time (g_c+I1), s	2.8	7.8		21.9	2.4	17.2		6.5				
Green Ext Time (p_c), s	0.0	7.3		0.0	0.0	6.7		1.9				
Intersection Summary												
HCM 2010 Ctrl Delay			17.9									
HCM 2010 LOS			B									
Notes												

2: Indian Trail Road & Barnes Rd























Future With-Project - AM Peak Hour

Windhaven Apartments Traffic Impact Analysis

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	57	69	410	256	32	40	101	131	93	34	573	44
Future Volume (veh/h)	57	69	410	256	32	40	101	131	93	34	573	44
Number	3	8	18	7	4	14	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		1.00	1.00		1.00	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1588	1588	1588	1588	1652	1685	1543	1605	1543	1543	1543	1620
Adj Flow Rate, veh/h	62	75	446	278	35	43	110	142	101	37	623	48
Adj No. of Lanes	1	1	1	1	1	0	1	1	1	1	2	0
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
Percent Heavy Veh, %	2	2	2	2	2	2	5	5	5	5	5	5
Cap, veh/h	508	471	399	518	268	330	267	547	446	421	845	65
Arrive On Green	0.05	0.30	0.30	0.15	0.40	0.39	0.08	0.34	0.34	0.04	0.31	0.31
Sat Flow, veh/h	1513	1588	1343	1513	674	828	1469	1605	1310	1469	2757	212
Grp Volume(v), veh/h	62	75	446	278	0	78	110	142	101	37	331	340
Grp Sat Flow(s),veh/h/ln	1513	1588	1343	1513	0	1502	1469	1605	1310	1469	1466	1504
Q Serve(g_s), s	2.4	3.1	26.0	10.4	0.0	2.9	4.2	5.6	4.8	1.5	17.7	17.8
Cycle Q Clear(g_c), s	2.4	3.1	26.0	10.4	0.0	2.9	4.2	5.6	4.8	1.5	17.7	17.8
Prop In Lane	1.00		1.00	1.00		0.55	1.00		1.00	1.00		0.14
Lane Grp Cap(c), veh/h	508	471	399	518	0	598	267	547	446	421	449	461
V/C Ratio(X)	0.12	0.16	1.12	0.54	0.00	0.13	0.41	0.26	0.23	0.09	0.74	0.74
Avail Cap(c_a), veh/h	717	471	399	573	0	598	435	751	613	639	686	704
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	19.5	22.7	30.8	15.2	0.0	16.8	19.3	20.9	20.6	19.0	27.2	27.2
Incr Delay (d2), s/veh	0.1	0.2	81.5	0.9	0.0	0.1	1.0	0.4	0.4	0.1	3.4	3.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.0	1.4	18.6	4.4	0.0	1.2	1.8	2.5	1.8	0.6	7.6	7.8
LnGrp Delay(d),s/veh	19.6	22.9	112.3	16.1	0.0	16.9	20.3	21.2	21.0	19.1	30.6	30.5
LnGrp LOS	B	C	F	B		B	C	C	C	B	C	C
Approach Vol, veh/h		583			356			353			708	
Approach Delay, s/veh		90.9			16.3			20.9			30.0	
Approach LOS		F			B			C			C	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	7.0	33.9	7.9	38.9	10.0	30.8	16.8	30.0				
Change Period (Y+Rc), s	4.0	4.9	4.0	4.5	4.0	4.9	4.0	4.5				
Max Green Setting (Gmax), s	16.0	40.1	16.0	25.5	16.0	40.1	16.0	25.5				
Max Q Clear Time (g_c+I1), s	3.5	7.6	4.4	4.9	6.2	19.8	12.4	28.0				
Green Ext Time (p_c), s	0.0	6.5	0.1	2.9	0.2	5.7	0.4	0.0				
Intersection Summary												
HCM 2010 Ctrl Delay			43.7									
HCM 2010 LOS			D									
Notes												













3: Indian Trail Road & Pacific Park Dr/Strong Rd Future With-Project - AM Peak Hour

Windhaven Apartments Traffic Impact Analysis

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	36	1	144	1	2	5	38	412	1	4	1138	81
Future Volume (veh/h)	36	1	144	1	2	5	38	412	1	4	1138	81
Number	3	8	18	7	4	14	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		1.00	1.00		0.99	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1800	1765	1765	1800	1765	1765	1714	1714	1714	1714	1714	1714
Adj Flow Rate, veh/h	40	1	160	1	2	6	42	458	1	4	1264	90
Adj No. of Lanes	0	1	1	0	1	1	1	1	1	1	1	1
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Percent Heavy Veh, %	2	2	2	2	2	2	5	5	5	5	5	5
Cap, veh/h	347	7	234	140	206	232	138	1184	1005	659	1184	1003
Arrive On Green	0.16	0.16	0.16	0.16	0.16	0.16	0.69	0.69	0.69	0.69	0.69	0.69
Sat Flow, veh/h	1349	45	1500	309	1318	1486	389	1714	1455	902	1714	1453
Grp Volume(v), veh/h	41	0	160	3	0	6	42	458	1	4	1264	90
Grp Sat Flow(s),veh/h/ln	1394	0	1500	1627	0	1486	389	1714	1455	902	1714	1453
Q Serve(g_s), s	1.3	0.0	5.3	0.0	0.0	0.2	0.0	5.9	0.0	0.1	36.0	1.1
Cycle Q Clear(g_c), s	1.3	0.0	5.3	0.1	0.0	0.2	36.0	5.9	0.0	6.0	36.0	1.1
Prop In Lane	0.98		1.00	0.33		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	354	0	234	346	0	232	138	1184	1005	659	1184	1003
V/C Ratio(X)	0.12	0.00	0.68	0.01	0.00	0.03	0.30	0.39	0.00	0.01	1.07	0.09
Avail Cap(c_a), veh/h	832	0	748	872	0	741	138	1184	1005	659	1184	1003
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	19.1	0.0	20.8	18.6	0.0	18.6	26.1	3.4	2.5	4.7	8.1	2.7
Incr Delay (d2), s/veh	0.1	0.0	3.5	0.0	0.0	0.0	5.6	1.0	0.0	0.0	46.2	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.5	0.0	2.4	0.0	0.0	0.1	0.8	3.0	0.0	0.0	31.7	0.5
LnGrp Delay(d),s/veh	19.3	0.0	24.3	18.6	0.0	18.7	31.7	4.4	2.5	4.7	54.3	2.8
LnGrp LOS	B		C	B		B	C	A	A	A	F	A
Approach Vol, veh/h		201			9			501			1358	
Approach Delay, s/veh		23.3			18.7			6.6			50.8	
Approach LOS		C			B			A			D	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		40.0		12.1		40.0		12.1				
Change Period (Y+Rc), s		4.9		* 4.2		4.9		* 4.2				
Max Green Setting (Gmax), s		35.1		* 26		35.1		* 26				
Max Q Clear Time (g_c+I1), s		38.0		2.2		38.0		7.3				
Green Ext Time (p_c), s		0.0		0.9		0.0		0.8				
Intersection Summary												
HCM 2010 Ctrl Delay			37.3									
HCM 2010 LOS			D									
Notes												





















4: Francis Ave #14 & Indian Trail Road
Future With-Project - AM Peak Hour

Windhaven Apartments Traffic Impact Analysis

								
Movement	EBL	EBT	WBT	WBR	SEL	SER		
Lane Configurations								
Traffic Volume (veh/h)	90	530	337	348	1483	73		
Future Volume (veh/h)	90	530	337	348	1483	73		
Number	1	6	2	12	3	18		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00		
Parking Bus, Adj	1.00	1.00	1.00	0.99	1.00	1.00		
Adj Sat Flow, veh/h/ln	1714	1714	1714	1714	1714	1800		
Adj Flow Rate, veh/h	100	589	374	0	1648	0		
Adj No. of Lanes	1	2	2	1	2	1		
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90		
Percent Heavy Veh, %	5	5	5	5	5	0		
Cap, veh/h	397	1144	1144	508	1620	733		
Arrive On Green	0.35	0.35	0.35	0.00	0.50	0.00		
Sat Flow, veh/h	974	3343	3343	1445	3265	1530		
Grp Volume(v), veh/h	100	589	374	0	1648	0		
Grp Sat Flow(s),veh/h/ln	974	1629	1629	1445	1633	1530		
Q Serve(g_s), s	4.4	7.5	4.4	0.0	26.0	0.0		
Cycle Q Clear(g_c), s	8.8	7.5	4.4	0.0	26.0	0.0		
Prop In Lane	1.00			1.00	1.00	1.00		
Lane Grp Cap(c), veh/h	397	1144	1144	508	1620	733		
V/C Ratio(X)	0.25	0.52	0.33	0.00	1.02	0.00		
Avail Cap(c_a), veh/h	724	2238	2238	993	1620	733		
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	1.00	0.00	1.00	0.00		
Uniform Delay (d), s/veh	15.7	13.5	12.5	0.0	13.2	0.0		
Incr Delay (d2), s/veh	0.4	0.4	0.2	0.0	26.7	0.0		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	1.2	3.4	2.0	0.0	17.5	0.0		
LnGrp Delay(d),s/veh	16.1	13.9	12.7	0.0	39.9	0.0		
LnGrp LOS	B	B	B		F			
Approach Vol, veh/h		689	374		1648			
Approach Delay, s/veh		14.2	12.7		39.9			
Approach LOS		B	B		D			
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2				6		8
Phs Duration (G+Y+Rc), s		22.4				22.4		30.0
Change Period (Y+Rc), s		4.9				4.9		4.9
Max Green Setting (Gmax), s		35.1				35.1		25.1
Max Q Clear Time (g_c+I1), s		6.4				10.8		28.0
Green Ext Time (p_c), s		7.0				6.7		0.0
Intersection Summary								
HCM 2010 Ctrl Delay			29.6					
HCM 2010 LOS			C					
Notes								













5: Alberta St & Francis Ave #14
Future With-Project - AM Peak Hour

Windhaven Apartments Traffic Impact Analysis

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	32	1506	214	157	621	28	170	24	101	80	117	34
Future Volume (veh/h)	32	1506	214	157	621	28	170	24	101	80	117	34
Number	1	6	16	5	2	12	7	4	14	3	8	18
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.97	1.00		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1800	1767	1800	1731	1800	1800	1800	1833	1872	1800	1872	1872
Adj Flow Rate, veh/h	34	1619	230	169	668	30	159	60	109	86	126	37
Adj No. of Lanes	1	2	0	1	2	0	1	1	0	1	1	0
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	0	2	2	4	0	0	0	0	0	0	0	0
Cap, veh/h	444	1391	194	221	1682	76	270	90	164	242	195	57
Arrive On Green	0.06	0.47	0.46	0.09	0.50	0.49	0.16	0.16	0.14	0.14	0.14	0.12
Sat Flow, veh/h	1714	2959	412	1648	3334	150	1714	573	1041	1714	1380	405
Grp Volume(v), veh/h	34	905	944	169	342	356	159	0	169	86	0	163
Grp Sat Flow(s),veh/h/ln	1714	1679	1693	1648	1710	1773	1714	0	1614	1714	0	1785
Q Serve(g_s), s	1.1	50.4	50.4	6.2	13.3	13.3	9.2	0.0	10.6	4.9	0.0	9.3
Cycle Q Clear(g_c), s	1.1	50.4	50.4	6.2	13.3	13.3	9.2	0.0	10.6	4.9	0.0	9.3
Prop In Lane	1.00		0.24	1.00		0.08	1.00		0.64	1.00		0.23
Lane Grp Cap(c), veh/h	444	789	796	221	863	895	270	0	254	242	0	252
V/C Ratio(X)	0.08	1.15	1.19	0.77	0.40	0.40	0.59	0.00	0.66	0.36	0.00	0.65
Avail Cap(c_a), veh/h	524	789	796	236	863	895	430	0	405	350	0	365
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	13.4	28.4	28.6	27.3	16.5	16.5	41.9	0.0	43.1	41.6	0.0	43.7
Incr Delay (d2), s/veh	0.0	80.5	96.5	11.4	0.1	0.1	0.8	0.0	1.1	0.3	0.0	1.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.5	40.9	44.8	5.5	6.3	6.6	4.4	0.0	4.8	2.3	0.0	4.7
LnGrp Delay(d),s/veh	13.4	108.9	125.1	38.7	16.6	16.6	42.7	0.0	44.2	42.0	0.0	44.8
LnGrp LOS	B	F	F	D	B	B	D		D	D		D
Approach Vol, veh/h		1883			867			328			249	
Approach Delay, s/veh		115.3			20.9			43.5			43.8	
Approach LOS		F			C			D			D	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	10.0	59.0		20.0	14.0	55.0		18.2				
Change Period (Y+Rc), s	4.0	6.0		5.0	4.0	6.0		5.0				
Max Green Setting (Gmax), s	11.0	49.0		25.0	11.0	49.0		20.0				
Max Q Clear Time (g_c+I1), s	3.1	15.3		12.6	8.2	52.4		11.3				
Green Ext Time (p_c), s	0.0	9.1		0.8	0.1	0.0		0.5				
Intersection Summary												
HCM 2010 Ctrl Delay				78.3								
HCM 2010 LOS				E								
Notes												


















6: Ash St #4S & Francis Ave #14
Future With-Project - AM Peak Hour

Windhaven Apartments Traffic Impact Analysis

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑		↑	↑↑					↑	↑↑	↑
Traffic Volume (vph)	0	1004	247	111	574	0	0	0	0	322	697	415
Future Volume (vph)	0	1004	247	111	574	0	0	0	0	322	697	415
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	11	12	12	11	12	12	12	12	12	13	12	13
Total Lost time (s)		4.0		4.0	4.0					4.0	4.0	4.0
Lane Util. Factor		0.95		1.00	0.95					1.00	0.95	1.00
Frpb, ped/bikes		1.00		1.00	1.00					1.00	1.00	0.98
Flpb, ped/bikes		1.00		1.00	1.00					1.00	1.00	1.00
Frt		0.97		1.00	1.00					1.00	1.00	0.85
Flt Protected		1.00		0.95	1.00					0.95	1.00	1.00
Satd. Flow (prot)		3162		1605	3353					1716	3307	1523
Flt Permitted		1.00		0.95	1.00					0.95	1.00	1.00
Satd. Flow (perm)		3162		1605	3353					1716	3307	1523
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	0	1080	266	119	617	0	0	0	0	346	749	446
RTOR Reduction (vph)	0	22	0	0	0	0	0	0	0	0	0	162
Lane Group Flow (vph)	0	1324	0	119	617	0	0	0	0	346	749	284
Confl. Peds. (#/hr)			3	3					1			4
Heavy Vehicles (%)	0%	4%	5%	3%	2%	0%	2%	2%	2%	3%	3%	2%
Bus Blockages (#/hr)	0	2	0	0	0	0	0	0	0	0	2	0
Turn Type		NA		Prot	NA					Perm	NA	Perm
Protected Phases		5		6	2						4	
Permitted Phases										4		4
Actuated Green, G (s)		37.6		9.1	51.6					28.9	28.9	28.9
Effective Green, g (s)		38.5		10.0	52.5					29.5	29.5	29.5
Actuated g/C Ratio		0.43		0.11	0.58					0.33	0.33	0.33
Clearance Time (s)		4.9		4.9	4.9					4.6	4.6	4.6
Vehicle Extension (s)		3.0		2.0	3.0					3.0	3.0	3.0
Lane Grp Cap (vph)		1352		178	1955					562	1083	499
v/s Ratio Prot		c0.42		c0.07	0.18						c0.23	
v/s Ratio Perm										0.20		0.19
v/c Ratio		0.98		0.67	0.32					0.62	0.69	0.57
Uniform Delay, d1		25.4		38.4	9.6					25.5	26.3	25.0
Progression Factor		1.00		0.95	0.44					0.84	0.86	0.78
Incremental Delay, d2		20.0		6.9	0.4					1.9	1.8	1.4
Delay (s)		45.3		43.2	4.6					23.4	24.4	20.9
Level of Service		D		D	A					C	C	C
Approach Delay (s)		45.3			10.9			0.0			23.2	
Approach LOS		D			B			A			C	
Intersection Summary												
HCM 2000 Control Delay			28.9			HCM 2000 Level of Service				C		
HCM 2000 Volume to Capacity ratio			0.83									
Actuated Cycle Length (s)			90.0			Sum of lost time (s)				12.0		
Intersection Capacity Utilization			74.5%			ICU Level of Service				D		
Analysis Period (min)			15									
c Critical Lane Group												

7: Maple St #3N & Francis Ave #14
Future With-Project - AM Peak Hour

Windhaven Apartments Traffic Impact Analysis

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	276	1250	0	0	556	83	26	490	149	0	0	0
Future Volume (vph)	276	1250	0	0	556	83	26	490	149	0	0	0
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	11	12	12	12	12	12	12	12	12	12	12	12
Total Lost time (s)	4.0	4.0			4.0		4.0	4.0				
Lane Util. Factor	1.00	0.95			0.95		0.86	*0.80				
Frpb, ped/bikes	1.00	1.00			1.00		1.00	1.00				
Flpb, ped/bikes	1.00	1.00			1.00		1.00	1.00				
Frt	1.00	1.00			0.98		1.00	0.97				
Flt Protected	0.95	1.00			1.00		0.95	1.00				
Satd. Flow (prot)	1621	3288			3280		1454	4105				
Flt Permitted	0.95	1.00			1.00		0.95	1.00				
Satd. Flow (perm)	1621	3288			3280		1454	4105				
Peak-hour factor, PHF	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Adj. Flow (vph)	297	1344	0	0	598	89	28	527	160	0	0	0
RTOR Reduction (vph)	0	0	0	0	12	0	0	44	0	0	0	0
Lane Group Flow (vph)	297	1344	0	0	675	0	25	646	0	0	0	0
Confl. Peds. (#/hr)			2			4	1					1
Confl. Bikes (#/hr)						1			2			
Heavy Vehicles (%)	2%	4%	0%	0%	2%	2%	1%	1%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	4	0	0	0	0	0	0
Turn Type	Prot	NA			NA		Perm	NA				
Protected Phases	2	6			1			4				
Permitted Phases							4					
Actuated Green, G (s)	24.1	59.8			30.8		20.7	20.7				
Effective Green, g (s)	25.0	60.7			31.7		21.3	21.3				
Actuated g/C Ratio	0.28	0.67			0.35		0.24	0.24				
Clearance Time (s)	4.9	4.9			4.9		4.6	4.6				
Vehicle Extension (s)	2.0	3.0			3.0		3.0	3.0				
Lane Grp Cap (vph)	450	2217			1155		344	971				
v/s Ratio Prot	0.18	c0.41			0.21							
v/s Ratio Perm							0.02	0.16				
v/c Ratio	0.66	0.61			0.58		0.07	0.67				
Uniform Delay, d1	28.7	8.1			23.8		26.7	31.1				
Progression Factor	0.76	0.39			1.00		1.00	1.00				
Incremental Delay, d2	0.3	0.1			2.2		0.1	1.7				
Delay (s)	22.1	3.2			25.9		26.8	32.9				
Level of Service	C	A			C		C	C				
Approach Delay (s)		6.7			25.9			32.6			0.0	
Approach LOS		A			C			C			A	
Intersection Summary												
HCM 2000 Control Delay			17.1				HCM 2000 Level of Service		B			
HCM 2000 Volume to Capacity ratio			0.65									
Actuated Cycle Length (s)			90.0				Sum of lost time (s)		12.0			
Intersection Capacity Utilization			82.5%				ICU Level of Service		E			
Analysis Period (min)			15									
Description: Count Date 7/20/09												

8: Barnes & Forest Lane
Future With-Project - AM Peak Hour

Windhaven Apartments Traffic Impact Analysis

Intersection						
Int Delay, s/veh	3.3					
Movement	EBL	EBT	WBT	WBR	SBL	SBR
Traffic Vol, veh/h	1	173	54	20	99	2
Future Vol, veh/h	1	173	54	20	99	2
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	75	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	74	74	74	74	74	74
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1	234	73	27	134	3
Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	100	0	-	0	322	86
Stage 1	-	-	-	-	86	-
Stage 2	-	-	-	-	236	-
Critical Hdwy	4.12	-	-	-	6.42	6.22
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.218	-	-	-	3.518	3.318
Pot Cap-1 Maneuver	1493	-	-	-	672	973
Stage 1	-	-	-	-	937	-
Stage 2	-	-	-	-	803	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1493	-	-	-	672	973
Mov Cap-2 Maneuver	-	-	-	-	693	-
Stage 1	-	-	-	-	937	-
Stage 2	-	-	-	-	802	-
Approach	EB		WB		SB	
HCM Control Delay, s	0		0		11.4	
HCM LOS	B					
Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	
Capacity (veh/h)	1493	-	-	-	697	
HCM Lane V/C Ratio	0.001	-	-	-	0.196	
HCM Control Delay (s)	7.4	-	-	-	11.4	
HCM Lane LOS	A	-	-	-	B	
HCM 95th %tile Q(veh)	0	-	-	-	0.7	























9: Barnes & Pamela
Future With-Project - AM Peak Hour

Windhaven Apartments Traffic Impact Analysis

Intersection												
Int Delay, s/veh	5.7											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Vol, veh/h	1	271	1	6	71	31	2	1	13	149	1	2
Future Vol, veh/h	1	271	1	6	71	31	2	1	13	149	1	2
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	75	-	-	75	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	74	74	74	74	74	74	74	74	74	74	74	74
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	1	366	1	8	96	42	3	1	18	201	1	3
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	138	0	0	368	0	0	505	524	367	512	503	117
Stage 1	-	-	-	-	-	-	370	370	-	133	133	-
Stage 2	-	-	-	-	-	-	135	154	-	379	370	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1446	-	-	1191	-	-	478	458	678	472	471	935
Stage 1	-	-	-	-	-	-	650	620	-	870	786	-
Stage 2	-	-	-	-	-	-	868	770	-	643	620	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1446	-	-	1191	-	-	473	455	678	456	468	935
Mov Cap-2 Maneuver	-	-	-	-	-	-	473	455	-	456	468	
Stage 1	-	-	-	-	-	-	650	620	-	869	781	-
Stage 2	-	-	-	-	-	-	858	765	-	625	620	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0			0.4			11			19		
HCM LOS							B			C		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	625	1446	-	-	1191	-	-	459				
HCM Lane V/C Ratio	0.035	0.001	-	-	0.007	-	-	0.448				
HCM Control Delay (s)	11	7.5	-	-	8	-	-	19				
HCM Lane LOS	B	A	-	-	A	-	-	C				
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	2.3				

1: Indian Trail Road & Shawnee Ave
Future With-Project - PM Peak Hour
























Windhaven Apartments Traffic Impact Analysis

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	1	1	24	52	2	5	48	450	114	11	292	6
Future Volume (veh/h)	1	1	24	52	2	5	48	450	114	11	292	6
Number	3	8	18	7	4	14	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.98		0.98	0.98		0.98	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1800	1800	1800	1748	1800	1800	1800	1800	1872	1800	1782	1872
Adj Flow Rate, veh/h	1	1	26	56	2	5	52	484	123	12	314	6
Adj No. of Lanes	1	1	0	1	1	0	1	1	1	1	1	1
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	0	0	0	3	0	0	0	0	0	0	1	0
Cap, veh/h	299	8	205	274	63	158	772	1149	1016	573	1082	966
Arrive On Green	0.14	0.14	0.14	0.14	0.14	0.14	0.06	0.64	0.64	0.03	0.61	0.61
Sat Flow, veh/h	1406	56	1457	1342	451	1127	1714	1800	1591	1714	1782	1591
Grp Volume(v), veh/h	1	0	27	56	0	7	52	484	123	12	314	6
Grp Sat Flow(s),veh/h/ln	1406	0	1513	1342	0	1578	1714	1800	1591	1714	1782	1591
Q Serve(g_s), s	0.0	0.0	1.1	2.6	0.0	0.3	0.7	9.0	2.0	0.2	5.7	0.1
Cycle Q Clear(g_c), s	0.3	0.0	1.1	3.6	0.0	0.3	0.7	9.0	2.0	0.2	5.7	0.1
Prop In Lane	1.00		0.96	1.00		0.71	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	299	0	212	274	0	222	772	1149	1016	573	1082	966
V/C Ratio(X)	0.00	0.00	0.13	0.20	0.00	0.03	0.07	0.42	0.12	0.02	0.29	0.01
Avail Cap(c_a), veh/h	523	0	454	488	0	473	947	1149	1016	802	1082	966
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	25.1	0.0	25.4	26.9	0.0	25.1	4.1	6.0	4.8	4.9	6.3	5.2
Incr Delay (d2), s/veh	0.0	0.0	0.3	0.4	0.0	0.1	0.0	1.1	0.2	0.0	0.7	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.0	0.0	0.5	1.0	0.0	0.1	0.3	4.8	1.0	0.1	2.9	0.0
LnGrp Delay(d),s/veh	25.1	0.0	25.7	27.3	0.0	25.1	4.1	7.2	5.0	4.9	7.0	5.2
LnGrp LOS	C		C	C		C	A	A	A	A	A	A
Approach Vol, veh/h		28			63			659			332	
Approach Delay, s/veh		25.7			27.1			6.5			6.9	
Approach LOS		C			C			A			A	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	6.0	47.1		14.3	8.1	45.0		14.3				
Change Period (Y+Rc), s	5.0	5.0		5.0	5.0	5.0		5.0				
Max Green Setting (Gmax), s	10.0	40.0		20.0	10.0	40.0		20.0				
Max Q Clear Time (g_c+I1), s	2.2	11.0		5.6	2.7	7.7		3.1				
Green Ext Time (p_c), s	0.0	6.6		0.3	0.0	6.8		0.3				
Intersection Summary												
HCM 2010 Ctrl Delay			8.3									
HCM 2010 LOS			A									
Notes												

2: Indian Trail Road & Barnes Rd























Future With-Project - PM Peak Hour

Windhaven Apartments Traffic Impact Analysis

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	97	63	229	153	68	64	339	330	374	52	264	58
Future Volume (veh/h)	97	63	229	153	68	64	339	330	374	52	264	58
Number	3	8	18	7	4	14	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		0.99	1.00		0.99	1.00		1.00	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1588	1588	1588	1588	1652	1685	1543	1605	1543	1543	1543	1620
Adj Flow Rate, veh/h	105	68	249	166	74	70	368	359	407	57	287	63
Adj No. of Lanes	1	1	1	1	1	0	1	1	1	1	2	0
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
Percent Heavy Veh, %	2	2	2	2	2	2	5	5	5	5	5	5
Cap, veh/h	423	373	315	452	210	198	537	658	537	322	619	134
Arrive On Green	0.08	0.23	0.23	0.11	0.27	0.26	0.21	0.41	0.41	0.06	0.26	0.26
Sat Flow, veh/h	1513	1588	1341	1513	779	737	1469	1605	1310	1469	2395	518
Grp Volume(v), veh/h	105	68	249	166	0	144	368	359	407	57	174	176
Grp Sat Flow(s),veh/h/ln	1513	1588	1341	1513	0	1517	1469	1605	1310	1469	1466	1447
Q Serve(g_s), s	4.0	2.7	13.7	6.2	0.0	6.0	13.3	13.3	20.8	2.2	7.8	8.0
Cycle Q Clear(g_c), s	4.0	2.7	13.7	6.2	0.0	6.0	13.3	13.3	20.8	2.2	7.8	8.0
Prop In Lane	1.00		1.00	1.00		0.49	1.00		1.00	1.00		0.36
Lane Grp Cap(c), veh/h	423	373	315	452	0	408	537	658	537	322	379	374
V/C Ratio(X)	0.25	0.18	0.79	0.37	0.00	0.35	0.68	0.55	0.76	0.18	0.46	0.47
Avail Cap(c_a), veh/h	624	527	445	601	0	504	548	840	686	556	767	758
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	20.0	24.0	28.2	18.0	0.0	23.2	14.6	17.6	19.8	19.1	24.4	24.5
Incr Delay (d2), s/veh	0.3	0.2	6.3	0.5	0.0	0.5	3.4	1.0	4.4	0.3	1.2	1.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.7	1.2	5.6	2.6	0.0	2.6	5.7	6.1	8.1	0.9	3.3	3.4
LnGrp Delay(d),s/veh	20.3	24.2	34.4	18.5	0.0	23.7	18.0	18.6	24.2	19.4	25.7	25.8
LnGrp LOS	C	C	C	B		C	B	B	C	B	C	C
Approach Vol, veh/h		422			310			1134			407	
Approach Delay, s/veh		29.2			20.9			20.4			24.8	
Approach LOS		C			C			C			C	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	7.6	36.1	9.6	25.1	19.4	24.2	12.3	22.4				
Change Period (Y+Rc), s	4.0	4.9	4.0	4.5	4.0	4.9	4.0	4.5				
Max Green Setting (Gmax), s	16.0	40.1	16.0	25.5	16.0	40.1	16.0	25.5				
Max Q Clear Time (g_c+I1), s	4.2	22.8	6.0	8.0	15.3	10.0	8.2	15.7				
Green Ext Time (p_c), s	0.1	6.9	0.2	1.9	0.1	8.5	0.3	1.5				
Intersection Summary												
HCM 2010 Ctrl Delay			22.9									
HCM 2010 LOS			C									
Notes												













3: Indian Trail Road & Pacific Park Dr/Strong Rd Future With-Project - PM Peak Hour

Windhaven Apartments Traffic Impact Analysis

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	22	2	72	1	2	9	152	1271	1	6	569	81
Future Volume (veh/h)	22	2	72	1	2	9	152	1271	1	6	569	81
Number	3	8	18	7	4	14	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		1.00	1.00		0.99	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1800	1765	1765	1800	1765	1765	1714	1714	1714	1714	1714	1714
Adj Flow Rate, veh/h	23	2	77	1	2	10	162	1352	1	6	605	86
Adj No. of Lanes	0	1	1	0	1	1	1	1	1	1	1	1
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.94
Percent Heavy Veh, %	2	2	2	2	2	2	5	5	5	5	5	5
Cap, veh/h	384	28	303	160	260	302	468	1119	950	131	1119	948
Arrive On Green	0.20	0.20	0.20	0.20	0.20	0.20	0.65	0.65	0.65	0.65	0.65	0.65
Sat Flow, veh/h	1278	139	1500	358	1284	1490	727	1714	1455	390	1714	1453
Grp Volume(v), veh/h	25	0	77	3	0	10	162	1352	1	6	605	86
Grp Sat Flow(s),veh/h/ln	1416	0	1500	1642	0	1490	727	1714	1455	390	1714	1453
Q Serve(g_s), s	0.6	0.0	2.4	0.0	0.0	0.3	8.5	36.0	0.0	0.0	10.4	1.2
Cycle Q Clear(g_c), s	0.7	0.0	2.4	0.1	0.0	0.3	18.9	36.0	0.0	36.0	10.4	1.2
Prop In Lane	0.92		1.00	0.33		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	412	0	303	419	0	302	468	1119	950	131	1119	948
V/C Ratio(X)	0.06	0.00	0.25	0.01	0.00	0.03	0.35	1.21	0.00	0.05	0.54	0.09
Avail Cap(c_a), veh/h	791	0	707	845	0	703	468	1119	950	131	1119	948
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	17.8	0.0	18.5	17.6	0.0	17.7	10.2	9.6	3.3	27.6	5.1	3.5
Incr Delay (d2), s/veh	0.1	0.0	0.4	0.0	0.0	0.0	2.0	102.3	0.0	0.7	1.9	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.3	0.0	1.0	0.0	0.0	0.1	1.9	48.3	0.0	0.1	5.5	0.5
LnGrp Delay(d),s/veh	17.9	0.0	18.9	17.6	0.0	17.7	12.3	111.9	3.3	28.2	7.0	3.7
LnGrp LOS	B		B	B		B	B	F	A	C	A	A
Approach Vol, veh/h		102			13			1515			697	
Approach Delay, s/veh		18.7			17.7			101.2			6.8	
Approach LOS		B			B			F			A	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		40.0		15.2		40.0		15.2				
Change Period (Y+Rc), s		4.9		* 4.2		4.9		* 4.2				
Max Green Setting (Gmax), s		35.1		* 26		35.1		* 26				
Max Q Clear Time (g_c+I1), s		38.0		2.3		38.0		4.4				
Green Ext Time (p_c), s		0.0		0.4		0.0		0.4				
Intersection Summary												
HCM 2010 Ctrl Delay			68.8									
HCM 2010 LOS			E									
Notes												





















4: Francis Ave #14 & Indian Trail Road Future With-Project - PM Peak Hour

Windhaven Apartments Traffic Impact Analysis

								
Movement	EBL	EBT	WBT	WBR	SEL	SER		
Lane Configurations								
Traffic Volume (veh/h)	178	465	644	1375	635	97		
Future Volume (veh/h)	178	465	644	1375	635	97		
Number	1	6	2	12	3	18		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00		
Parking Bus, Adj	1.00	1.00	1.00	0.99	1.00	1.00		
Adj Sat Flow, veh/h/ln	1714	1714	1714	1714	1714	1800		
Adj Flow Rate, veh/h	189	495	685	0	676	0		
Adj No. of Lanes	1	2	2	1	2	1		
Peak Hour Factor	0.94	0.94	0.94	0.94	0.94	0.94		
Percent Heavy Veh, %	5	5	5	5	5	0		
Cap, veh/h	450	1787	1787	793	979	432		
Arrive On Green	0.55	0.55	0.55	0.00	0.30	0.00		
Sat Flow, veh/h	731	3343	3343	1445	3265	1530		
Grp Volume(v), veh/h	189	495	685	0	676	0		
Grp Sat Flow(s),veh/h/ln	731	1629	1629	1445	1633	1530		
Q Serve(g_s), s	10.5	4.3	6.3	0.0	9.6	0.0		
Cycle Q Clear(g_c), s	16.8	4.3	6.3	0.0	9.6	0.0		
Prop In Lane	1.00			1.00	1.00	1.00		
Lane Grp Cap(c), veh/h	450	1787	1787	793	979	432		
V/C Ratio(X)	0.42	0.28	0.38	0.00	0.69	0.00		
Avail Cap(c_a), veh/h	617	2533	2533	1124	1920	874		
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	1.00	0.00	1.00	0.00		
Uniform Delay (d), s/veh	11.6	6.3	6.8	0.0	16.3	0.0		
Incr Delay (d2), s/veh	0.8	0.1	0.2	0.0	0.9	0.0		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	2.2	1.9	2.8	0.0	4.4	0.0		
LnGrp Delay(d),s/veh	12.4	6.4	7.0	0.0	17.2	0.0		
LnGrp LOS	B	A	A		B			
Approach Vol, veh/h		684	685		676			
Approach Delay, s/veh		8.1	7.0		17.2			
Approach LOS		A	A		B			
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2				6		8
Phs Duration (G+Y+Rc), s		32.9				32.9		19.8
Change Period (Y+Rc), s		4.9				4.9		4.9
Max Green Setting (Gmax), s		40.1				40.1		30.1
Max Q Clear Time (g_c+I1), s		8.3				18.8		11.6
Green Ext Time (p_c), s		10.8				9.2		3.3
Intersection Summary								
HCM 2010 Ctrl Delay			10.7					
HCM 2010 LOS			B					
Notes								

5: Alberta St & Francis Ave #14
Future With-Project - PM Peak Hour

Windhaven Apartments Traffic Impact Analysis

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	41	1003	111	145	1498	18	442	111	128	40	50	39
Future Volume (veh/h)	41	1003	111	145	1498	18	442	111	128	40	50	39
Number	1	6	16	5	2	12	7	4	14	3	8	18
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.98	1.00		0.96
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1800	1766	1800	1731	1800	1800	1800	1851	1872	1800	1872	1872
Adj Flow Rate, veh/h	43	1045	116	151	1560	19	354	264	133	42	52	41
Adj No. of Lanes	1	2	0	1	2	0	1	1	0	1	1	0
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	0	2	2	4	0	0	0	0	0	0	0	0
Cap, veh/h	95	1154	128	180	1487	18	455	306	154	188	104	82
Arrive On Green	0.06	0.38	0.37	0.11	0.43	0.42	0.27	0.27	0.25	0.11	0.11	0.09
Sat Flow, veh/h	1714	3046	338	1648	3460	42	1714	1155	582	1714	951	750
Grp Volume(v), veh/h	43	575	586	151	770	809	354	0	397	42	0	93
Grp Sat Flow(s),veh/h/ln	1714	1678	1706	1648	1710	1792	1714	0	1737	1714	0	1701
Q Serve(g_s), s	2.6	35.0	35.1	9.7	46.5	46.5	20.7	0.0	23.6	2.4	0.0	5.6
Cycle Q Clear(g_c), s	2.6	35.0	35.1	9.7	46.5	46.5	20.7	0.0	23.6	2.4	0.0	5.6
Prop In Lane	1.00		0.20	1.00		0.02	1.00		0.34	1.00		0.44
Lane Grp Cap(c), veh/h	95	636	646	180	735	770	455	0	461	188	0	186
V/C Ratio(X)	0.45	0.91	0.91	0.84	1.05	1.05	0.78	0.00	0.86	0.22	0.00	0.50
Avail Cap(c_a), veh/h	254	705	716	244	735	770	506	0	513	347	0	345
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	49.4	31.7	31.9	47.2	30.8	30.8	36.8	0.0	38.1	43.9	0.0	45.7
Incr Delay (d2), s/veh	1.2	13.6	13.5	13.1	46.4	46.2	5.9	0.0	11.9	0.2	0.0	0.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.3	18.5	18.9	5.1	31.3	32.8	10.5	0.0	12.8	1.2	0.0	2.7
LnGrp Delay(d),s/veh	50.7	45.3	45.4	60.3	77.3	77.0	42.6	0.0	50.0	44.1	0.0	46.5
LnGrp LOS	D	D	D	E	F	F	D		D	D		D
Approach Vol, veh/h		1204			1730			751			135	
Approach Delay, s/veh		45.6			75.7			46.6			45.8	
Approach LOS		D			E			D			D	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	10.0	51.4		31.8	15.8	45.5		15.0				
Change Period (Y+Rc), s	4.0	6.0		5.0	4.0	6.0		5.0				
Max Green Setting (Gmax), s	16.0	44.0		30.0	16.0	44.0		20.0				
Max Q Clear Time (g_c+I1), s	4.6	48.5		25.6	11.7	37.1		7.6				
Green Ext Time (p_c), s	0.0	0.0		1.2	0.1	2.4		0.3				
Intersection Summary												
HCM 2010 Ctrl Delay				59.4								
HCM 2010 LOS				E								
Notes												


















6: Ash St #4S & Francis Ave #14
Future With-Project - PM Peak Hour

Windhaven Apartments Traffic Impact Analysis

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↑↑		↑	↑↑					↑	↑↑	↑
Traffic Volume (vph)	0	736	127	225	1524	0	0	0	0	224	580	406
Future Volume (vph)	0	736	127	225	1524	0	0	0	0	224	580	406
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	11	12	12	11	12	12	12	12	12	13	12	13
Total Lost time (s)		4.0		4.0	4.0					4.0	4.0	4.0
Lane Util. Factor		0.95		1.00	0.95					1.00	0.95	1.00
Frpb, ped/bikes		1.00		1.00	1.00					1.00	1.00	0.98
Flpb, ped/bikes		1.00		1.00	1.00					1.00	1.00	1.00
Frt		0.98		1.00	1.00					1.00	1.00	0.85
Flt Protected		1.00		0.95	1.00					0.95	1.00	1.00
Satd. Flow (prot)		3190		1605	3353					1716	3307	1524
Flt Permitted		1.00		0.95	1.00					0.95	1.00	1.00
Satd. Flow (perm)		3190		1605	3353					1716	3307	1524
Peak-hour factor, PHF	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Adj. Flow (vph)	0	751	130	230	1555	0	0	0	0	229	592	414
RTOR Reduction (vph)	0	14	0	0	0	0	0	0	0	0	0	53
Lane Group Flow (vph)	0	867	0	230	1555	0	0	0	0	229	592	361
Confl. Peds. (#/hr)			3	3					1			4
Heavy Vehicles (%)	0%	4%	5%	3%	2%	0%	2%	2%	2%	3%	3%	2%
Bus Blockages (#/hr)	0	2	0	0	0	0	0	0	0	0	2	0
Turn Type		NA		Prot	NA					Perm	NA	Perm
Protected Phases		5		6	2						4	
Permitted Phases										4		4
Actuated Green, G (s)		37.6		20.1	62.6					27.9	27.9	27.9
Effective Green, g (s)		38.5		21.0	63.5					28.5	28.5	28.5
Actuated g/C Ratio		0.38		0.21	0.64					0.28	0.28	0.28
Clearance Time (s)		4.9		4.9	4.9					4.6	4.6	4.6
Vehicle Extension (s)		3.0		2.0	3.0					3.0	3.0	3.0
Lane Grp Cap (vph)		1228		337	2129					489	942	434
v/s Ratio Prot		0.27		0.14	c0.46						0.18	
v/s Ratio Perm										0.13		c0.24
v/c Ratio		0.71		0.68	0.73					0.47	0.63	0.83
Uniform Delay, d1		26.0		36.4	12.4					29.5	31.1	33.5
Progression Factor		1.00		0.81	0.44					0.88	0.90	0.88
Incremental Delay, d2		3.4		1.7	0.8					0.7	1.3	12.4
Delay (s)		29.4		31.4	6.3					26.8	29.2	42.0
Level of Service		C		C	A					C	C	D
Approach Delay (s)		29.4			9.6			0.0			33.0	
Approach LOS		C			A			A			C	
Intersection Summary												
HCM 2000 Control Delay			21.5		HCM 2000 Level of Service				C			
HCM 2000 Volume to Capacity ratio			0.80									
Actuated Cycle Length (s)			100.0		Sum of lost time (s)				12.0			
Intersection Capacity Utilization			93.9%		ICU Level of Service				F			
Analysis Period (min)			15									
c Critical Lane Group												

7: Maple St #3N & Francis Ave #14
Future With-Project - PM Peak Hour

Windhaven Apartments Traffic Impact Analysis

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	335	971	0	0	1111	222	431	933	176	0	0	0
Future Volume (vph)	335	971	0	0	1111	222	431	933	176	0	0	0
Ideal Flow (vphpl)	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800	1800
Lane Width	11	12	12	12	12	12	12	12	12	12	12	12
Total Lost time (s)	4.0	4.0			4.0		4.0	4.0				
Lane Util. Factor	1.00	0.95			0.95		0.86	*0.80				
Frpb, ped/bikes	1.00	1.00			1.00		1.00	1.00				
Flpb, ped/bikes	1.00	1.00			1.00		1.00	1.00				
Frt	1.00	1.00			0.97		1.00	0.98				
Flt Protected	0.95	1.00			1.00		0.95	1.00				
Satd. Flow (prot)	1621	3288			3259		1454	4156				
Flt Permitted	0.95	1.00			1.00		0.95	1.00				
Satd. Flow (perm)	1621	3288			3259		1454	4156				
Peak-hour factor, PHF	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Adj. Flow (vph)	345	1001	0	0	1145	229	444	962	181	0	0	0
RTOR Reduction (vph)	0	0	0	0	16	0	0	21	0	0	0	0
Lane Group Flow (vph)	345	1001	0	0	1358	0	391	1175	0	0	0	0
Confl. Peds. (#/hr)			2			4	1					1
Confl. Bikes (#/hr)						1			2			
Heavy Vehicles (%)	2%	4%	0%	0%	2%	2%	1%	1%	2%	2%	2%	2%
Bus Blockages (#/hr)	0	0	0	0	0	4	0	0	0	0	0	0
Turn Type	Prot	NA			NA		Perm	NA				
Protected Phases	2	6			1			4				
Permitted Phases							4					
Actuated Green, G (s)	20.1	63.1			38.1		27.4	27.4				
Effective Green, g (s)	21.0	64.0			39.0		28.0	28.0				
Actuated g/C Ratio	0.21	0.64			0.39		0.28	0.28				
Clearance Time (s)	4.9	4.9			4.9		4.6	4.6				
Vehicle Extension (s)	2.0	3.0			3.0		3.0	3.0				
Lane Grp Cap (vph)	340	2104			1271		407	1163				
v/s Ratio Prot	c0.21	0.30			c0.42							
v/s Ratio Perm							0.27	0.28				
v/c Ratio	1.01	0.48			1.07		0.96	1.01				
Uniform Delay, d1	39.5	9.3			30.5		35.5	36.0				
Progression Factor	1.15	1.02			1.00		1.00	1.00				
Incremental Delay, d2	50.0	0.7			45.6		34.4	29.0				
Delay (s)	95.5	10.2			76.1		69.8	65.0				
Level of Service	F	B			E		E	E				
Approach Delay (s)		32.1			76.1			66.2			0.0	
Approach LOS		C			E			E			A	
Intersection Summary												
HCM 2000 Control Delay			58.7				HCM 2000 Level of Service		E			
HCM 2000 Volume to Capacity ratio			1.04									
Actuated Cycle Length (s)			100.0				Sum of lost time (s)		12.0			
Intersection Capacity Utilization			93.9%				ICU Level of Service		F			
Analysis Period (min)			15									
Description: Count Date 7/20/09												

8: Barnes & Forest Lane
Future With-Project - PM Peak Hour

Windhaven Apartments Traffic Impact Analysis

Intersection

Int Delay, s/veh 1.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Traffic Vol, veh/h	1	96	155	86	46	1
Future Vol, veh/h	1	96	155	86	46	1
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	75	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	1	104	168	93	50	1

Major/Minor	Major1	Major2	Minor2
Conflicting Flow All	262	0	322
Stage 1	-	-	215
Stage 2	-	-	107
Critical Hdwy	4.12	-	6.42
Critical Hdwy Stg 1	-	-	5.42
Critical Hdwy Stg 2	-	-	5.42
Follow-up Hdwy	2.218	-	3.518
Pot Cap-1 Maneuver	1302	-	672
Stage 1	-	-	821
Stage 2	-	-	917
Platoon blocked, %	-	-	-
Mov Cap-1 Maneuver	1302	-	671
Mov Cap-2 Maneuver	-	-	697
Stage 1	-	-	821
Stage 2	-	-	916

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	10.6
HCM LOS			B

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1302	-	-	-	699
HCM Lane V/C Ratio	0.001	-	-	-	0.073
HCM Control Delay (s)	7.8	-	-	-	10.6
HCM Lane LOS	A	-	-	-	B
HCM 95th %tile Q(veh)	0	-	-	-	0.2

9: Barnes & Pamela
Future With-Project - PM Peak Hour











Windhaven Apartments Traffic Impact Analysis

Intersection												
Int Delay, s/veh	2.1											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Traffic Vol, veh/h	1	138	3	7	238	130	3	1	17	70	1	1
Future Vol, veh/h	1	138	3	7	238	130	3	1	17	70	1	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	75	-	-	75	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	2	2	2
Mvmt Flow	1	145	3	7	251	137	3	1	18	74	1	1
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	387	0	0	148	0	0	484	551	147	492	485	319
Stage 1	-	-	-	-	-	-	149	149	-	334	334	-
Stage 2	-	-	-	-	-	-	335	402	-	158	151	-
Critical Hdwy	4.12	-	-	4.12	-	-	7.12	6.52	6.22	7.12	6.52	6.22
Critical Hdwy Stg 1	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.12	5.52	-	6.12	5.52	-
Follow-up Hdwy	2.218	-	-	2.218	-	-	3.518	4.018	3.318	3.518	4.018	3.318
Pot Cap-1 Maneuver	1171	-	-	1434	-	-	493	442	900	487	482	722
Stage 1	-	-	-	-	-	-	854	774	-	680	643	-
Stage 2	-	-	-	-	-	-	679	600	-	844	772	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1171	-	-	1434	-	-	489	439	900	474	479	722
Mov Cap-2 Maneuver	-	-	-	-	-	-	489	439	-	474	479	
Stage 1	-	-	-	-	-	-	853	773	-	679	640	-
Stage 2	-	-	-	-	-	-	674	597	-	825	771	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.1			0.1			9.8			14		
HCM LOS							A			B		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	769	1171	-	-	1434	-	-	476				
HCM Lane V/C Ratio	0.029	0.001	-	-	0.005	-	-	0.159				
HCM Control Delay (s)	9.8	8.1	-	-	7.5	-	-	14				
HCM Lane LOS	A	A	-	-	A	-	-	B				
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0.6				

1: Indian Trail Road & Shawnee Ave

Existing - AM Peak Hour

Windhaven Apartments Traffic Impact Analysis

										
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	7	111	234	46	18	192	175	41	497	4
v/c Ratio	0.02	0.22	0.75	0.10	0.04	0.20	0.19	0.06	0.50	0.00
Control Delay	21.6	10.3	42.7	12.9	8.2	13.8	3.1	8.0	16.1	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	21.6	10.3	42.7	12.9	8.2	13.8	3.1	8.0	16.1	0.0
Queue Length 50th (ft)	3	13	113	7	3	51	0	7	111	0
Queue Length 95th (ft)	10	34	151	24	11	90	17	19	235	0
Internal Link Dist (ft)		582		639		1510			2454	
Turn Bay Length (ft)	75		100		110		110	80		125
Base Capacity (vph)	360	521	327	497	548	946	914	742	992	948
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.02	0.21	0.72	0.09	0.03	0.20	0.19	0.06	0.50	0.00











Intersection Summary

Description: Northwest TSA

2: Indian Trail Road & Barnes Rd

Existing - AM Peak Hour

Windhaven Apartments Traffic Impact Analysis

										
Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	34	12	217	201	19	55	152	53	7	661
v/c Ratio	0.07	0.03	0.46	0.38	0.03	0.19	0.24	0.09	0.02	0.68
Control Delay	16.3	29.2	7.8	20.7	19.5	16.8	19.7	1.6	15.8	29.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	16.3	29.2	7.8	20.7	19.5	16.8	19.7	1.6	15.8	29.7
Queue Length 50th (ft)	9	5	0	83	5	13	38	0	2	137
Queue Length 95th (ft)	33	22	58	150	23	46	131	8	11	291
Internal Link Dist (ft)		645			932		1282			1510
Turn Bay Length (ft)	115			125		125		125	150	
Base Capacity (vph)	634	623	654	541	658	417	951	802	545	1666
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.05	0.02	0.33	0.37	0.03	0.13	0.16	0.07	0.01	0.40

Intersection Summary

Description: Count Date: 6/23/2009

Northwest TSA

3: Indian Trail Road & Pacific Park Dr/Strong Rd Existing - AM Peak Hour

Windhaven Apartments Traffic Impact Analysis

	→	↘	←	↖	↙	↑	↗	↘	↓	↖
Lane Group	EBT	EBR	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	13	102	5	29	18	367	2	22	949	73
v/c Ratio	0.05	0.30	0.02	0.10	0.07	0.29	0.00	0.03	0.75	0.07
Control Delay	17.7	8.2	17.0	7.9	5.4	5.0	0.0	4.5	13.6	2.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	17.7	8.2	17.0	7.9	5.4	5.0	0.0	4.5	13.6	2.7
Queue Length 50th (ft)	4	3	1	0	1	33	0	2	151	2
Queue Length 95th (ft)	14	32	8	15	12	118	0	12	#584	19
Internal Link Dist (ft)	592		788			1204			76	
Turn Bay Length (ft)		100		75	125		100	125		100
Base Capacity (vph)	665	727	676	683	265	1273	1061	686	1273	1064
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.02	0.14	0.01	0.04	0.07	0.29	0.00	0.03	0.75	0.07

Intersection Summary

Description: Count Date 6/3/09

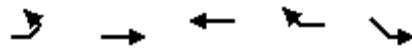
Northwest TSA

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

4: Francis Ave #14 & Indian Trail Road Existing - AM Peak Hour

Windhaven Apartments Traffic Impact Analysis



Lane Group	EBL	EBT	WBT	WBR	SEL
Lane Group Flow (vph)	86	574	366	261	1276
v/c Ratio	0.30	0.54	0.34	0.40	0.80
Control Delay	15.2	15.7	13.3	3.8	17.5
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	15.2	15.7	13.3	3.8	17.5
Queue Length 50th (ft)	19	72	42	0	139
Queue Length 95th (ft)	45	107	67	35	#360
Internal Link Dist (ft)		1085	1073		1042
Turn Bay Length (ft)	75			255	
Base Capacity (vph)	596	2202	2278	1078	1602
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.14	0.26	0.16	0.24	0.80

Intersection Summary

Description: Count Date 6/12/15









Northwest TSA

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

5: Alberta St & Francis Ave #14

Existing - AM Peak Hour

Windhaven Apartments Traffic Impact Analysis

								
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	19	1500	165	605	142	146	84	154
v/c Ratio	0.04	0.99	0.74	0.32	0.56	0.45	0.33	0.55
Control Delay	12.9	51.2	44.5	16.3	52.7	21.9	46.2	48.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	12.9	51.2	44.5	16.3	52.7	21.9	46.2	48.9
Queue Length 50th (ft)	5	500	62	94	96	33	53	94
Queue Length 95th (ft)	19	#868	#206	217	177	103	107	171
Internal Link Dist (ft)		1154		1366		1768		464
Turn Bay Length (ft)	175		175		150		100	
Base Capacity (vph)	526	1519	227	1896	399	451	353	390
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.04	0.99	0.73	0.32	0.36	0.32	0.24	0.39

Intersection Summary

Description: Northwest TSA

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

6: Ash St #4S & Francis Ave #14

Existing - AM Peak Hour

Windhaven Apartments Traffic Impact Analysis

	→	↙	←	↘	↓	↗
Lane Group	EBT	WBL	WBT	SBL	SBT	SBR
Lane Group Flow (vph)	1114	116	540	331	724	423
v/c Ratio	0.80	0.65	0.27	0.60	0.68	0.61
Control Delay	28.4	54.2	4.2	25.6	25.6	10.6
Queue Delay	0.0	0.0	0.3	0.0	0.0	0.0
Total Delay	28.4	54.2	4.5	25.6	25.6	10.6
Queue Length 50th (ft)	280	70	25	157	187	89
Queue Length 95th (ft)	#438	#143	37	230	233	187
Internal Link Dist (ft)	1572		250		508	
Turn Bay Length (ft)						400
Base Capacity (vph)	1390	178	1970	648	1249	757
Starvation Cap Reductn	0	0	810	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.80	0.65	0.47	0.51	0.58	0.56

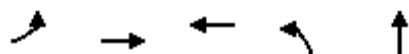
Intersection Summary

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

7: Maple St #3N & Francis Ave #14

Existing - AM Peak Hour

Windhaven Apartments Traffic Impact Analysis



Lane Group	EBL	EBT	WBT	NBL	NBT
Lane Group Flow (vph)	253	1171	510	5	668
v/c Ratio	0.56	0.52	0.42	0.02	0.64
Control Delay	29.7	5.3	22.6	24.0	29.8
Queue Delay	0.7	0.7	0.0	0.0	0.0
Total Delay	30.5	6.0	22.6	24.0	29.8
Queue Length 50th (ft)	146	99	104	2	118
Queue Length 95th (ft)	m194	128	167	11	145
Internal Link Dist (ft)		250	280		1251
Turn Bay Length (ft)				115	
Base Capacity (vph)	450	2265	1211	436	1383
Starvation Cap Reductn	49	677	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.63	0.74	0.42	0.01	0.48

Intersection Summary

Description: Count Date 7/20/09











Northwest TSA

m Volume for 95th percentile queue is metered by upstream signal.

1: Indian Trail Road & Shawnee Ave

Existing - PM Peak Hour

Windhaven Apartments Traffic Impact Analysis

										
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	1	26	41	7	51	447	110	12	270	6
v/c Ratio	0.00	0.07	0.15	0.02	0.06	0.33	0.09	0.02	0.22	0.01
Control Delay	22.0	9.8	24.6	15.4	6.9	10.0	3.1	7.6	12.2	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	22.0	9.8	24.6	15.4	6.9	10.0	3.1	7.6	12.2	0.0
Queue Length 50th (ft)	0	0	16	1	5	54	0	1	54	0
Queue Length 95th (ft)	4	18	41	10	28	276	28	10	163	0
Internal Link Dist (ft)		582		639		1510			2454	
Turn Bay Length (ft)	75		100		110		110	80		125
Base Capacity (vph)	405	498	385	511	848	1357	1218	773	1230	1154
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.00	0.05	0.11	0.01	0.06	0.33	0.09	0.02	0.22	0.01











Intersection Summary

Description: Northwest TSA

2: Indian Trail Road & Barnes Rd

Existing - PM Peak Hour

Windhaven Apartments Traffic Impact Analysis

										
Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	90	30	137	98	29	161	383	325	14	333
v/c Ratio	0.20	0.08	0.33	0.23	0.07	0.33	0.51	0.44	0.04	0.39
Control Delay	17.3	26.8	7.6	17.6	17.5	15.7	23.4	8.2	14.8	25.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	17.3	26.8	7.6	17.6	17.5	15.7	23.4	8.2	14.8	25.7
Queue Length 50th (ft)	21	10	0	24	4	30	88	14	2	52
Queue Length 95th (ft)	69	39	46	75	29	111	338	119	17	141
Internal Link Dist (ft)		645			932		1282			1510
Turn Bay Length (ft)	115			125		125		125	150	
Base Capacity (vph)	557	648	623	519	620	552	956	869	577	1714
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.16	0.05	0.22	0.19	0.05	0.29	0.40	0.37	0.02	0.19

Intersection Summary











Description: Count Date: 6/23/2009

Northwest TSA

3: Indian Trail Road & Pacific Park Dr/Strong Rd

Existing - PM Peak Hour

Windhaven Apartments Traffic Impact Analysis

										
Lane Group	EBT	EBR	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	7	44	12	47	97	1068	4	33	448	49
v/c Ratio	0.02	0.11	0.03	0.12	0.15	0.81	0.00	0.17	0.34	0.04
Control Delay	16.4	6.8	16.6	6.7	5.8	18.3	0.5	8.6	5.9	2.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	16.4	6.8	16.6	6.7	5.8	18.3	0.5	8.6	5.9	2.1
Queue Length 50th (ft)	2	0	3	0	12	300	0	4	64	0
Queue Length 95th (ft)	10	19	14	20	38	#690	1	22	151	11
Internal Link Dist (ft)	592		788			1204			76	
Turn Bay Length (ft)		100		75	125		100	125		100
Base Capacity (vph)	729	701	700	693	637	1314	1095	191	1314	1099
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.01	0.06	0.02	0.07	0.15	0.81	0.00	0.17	0.34	0.04

Intersection Summary

Description: Count Date 6/3/09

Northwest TSA

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

4: Francis Ave #14 & Indian Trail Road

Existing - PM Peak Hour

Windhaven Apartments Traffic Impact Analysis



Lane Group	EBL	EBT	WBT	WBR	SEL
Lane Group Flow (vph)	150	483	668	1072	555
v/c Ratio	0.48	0.29	0.39	0.85	0.57
Control Delay	14.5	7.5	8.1	9.4	18.0
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	14.5	7.5	8.1	9.4	18.0
Queue Length 50th (ft)	23	34	51	0	61
Queue Length 95th (ft)	82	76	108	#177	144
Internal Link Dist (ft)		1085	1073		1042
Turn Bay Length (ft)	75			255	
Base Capacity (vph)	485	2560	2648	1359	2015
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.31	0.19	0.25	0.79	0.28

Intersection Summary

Description: Count Date 6/12/15

Northwest TSA









95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

5: Alberta St & Francis Ave #14

Existing - PM Peak Hour

Windhaven Apartments Traffic Impact Analysis

								
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	34	978	147	1311	318	312	41	77
v/c Ratio	0.20	0.73	0.52	0.85	0.82	0.75	0.19	0.31
Control Delay	18.7	34.1	21.8	35.6	58.7	49.4	46.7	40.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.7	34.1	21.8	35.6	58.7	49.4	46.7	40.0
Queue Length 50th (ft)	10	284	47	412	203	180	26	38
Queue Length 95th (ft)	33	497	109	#720	#426	#360	64	91
Internal Link Dist (ft)		1154		1366		1768		464
Turn Bay Length (ft)	175		175		150		100	
Base Capacity (vph)	327	1431	344	1544	494	519	367	402
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.10	0.68	0.43	0.85	0.64	0.60	0.11	0.19

Intersection Summary

Description: Northwest TSA

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

6: Ash St #4S & Francis Ave #14

Existing - PM Peak Hour

Windhaven Apartments Traffic Impact Analysis

	→	↘	←	↙	↓	↗
Lane Group	EBT	WBL	WBT	SBL	SBT	SBR
Lane Group Flow (vph)	761	223	1331	220	573	369
v/c Ratio	0.60	0.66	0.62	0.47	0.63	0.78
Control Delay	26.2	36.6	5.2	30.3	32.2	35.8
Queue Delay	0.1	0.0	1.9	0.0	0.0	0.0
Total Delay	26.3	36.6	7.2	30.3	32.2	35.8
Queue Length 50th (ft)	196	150	141	117	169	177
Queue Length 95th (ft)	267	m175	m159	185	223	284
Internal Link Dist (ft)	1572		250		508	
Turn Bay Length (ft)						400
Base Capacity (vph)	1275	337	2161	514	992	509
Starvation Cap Reductn	0	0	635	0	0	0
Spillback Cap Reductn	47	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.62	0.66	0.87	0.43	0.58	0.72






Intersection Summary

m Volume for 95th percentile queue is metered by upstream signal.

7: Maple St #3N & Francis Ave #14

Existing - PM Peak Hour

Windhaven Apartments Traffic Impact Analysis

					
Lane Group	EBL	EBT	WBT	NBL	NBT
Lane Group Flow (vph)	318	925	1208	336	1145
v/c Ratio	0.94	0.44	0.94	0.83	0.90
Control Delay	80.4	11.1	43.6	52.2	44.4
Queue Delay	0.0	1.4	0.9	0.0	0.0
Total Delay	80.4	12.5	44.5	52.2	44.4
Queue Length 50th (ft)	216	164	375	232	265
Queue Length 95th (ft)	#378	177	#523	#405	#353
Internal Link Dist (ft)		250	280		1251
Turn Bay Length (ft)				115	
Base Capacity (vph)	340	2104	1286	407	1274
Starvation Cap Reductn	0	918	0	0	0
Spillback Cap Reductn	0	0	15	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.94	0.78	0.95	0.83	0.90

Intersection Summary

Description: Count Date 7/20/09











Northwest TSA

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

1: Indian Trail Road & Shawnee Ave
Future Without-Project - AM Peak Hour

Windhaven Apartments Traffic Impact Analysis











										
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	7	114	248	48	18	232	192	42	530	4
v/c Ratio	0.02	0.22	0.78	0.10	0.04	0.25	0.21	0.06	0.54	0.00
Control Delay	21.6	10.3	44.7	12.6	8.2	14.2	3.1	8.0	16.9	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	21.6	10.3	44.7	12.6	8.2	14.2	3.1	8.0	16.9	0.0
Queue Length 50th (ft)	3	14	122	7	3	63	0	7	121	0
Queue Length 95th (ft)	10	35	161	24	11	107	17	19	254	0
Internal Link Dist (ft)		582		639		1510			2454	
Turn Bay Length (ft)	75		100		110		110	80		125
Base Capacity (vph)	358	521	326	495	518	933	912	700	981	938
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.02	0.22	0.76	0.10	0.03	0.25	0.21	0.06	0.54	0.00

Intersection Summary

Description: Northwest TSA

2: Indian Trail Road & Barnes Rd
Future Without-Project - AM Peak Hour

Windhaven Apartments Traffic Impact Analysis

										
Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	48	51	330	278	79	103	142	101	37	670
v/c Ratio	0.12	0.15	0.61	0.52	0.13	0.34	0.23	0.18	0.08	0.72
Control Delay	18.6	32.3	9.0	23.2	14.7	17.9	22.9	5.9	15.3	33.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.6	32.3	9.0	23.2	14.7	17.9	22.9	5.9	15.3	33.5
Queue Length 50th (ft)	14	22	0	96	13	24	46	0	8	145
Queue Length 95th (ft)	46	63	76	225	57	76	125	36	34	311
Internal Link Dist (ft)		645			932		1282			1510
Turn Bay Length (ft)	115			125		125		125	150	
Base Capacity (vph)	557	563	685	539	610	396	840	724	561	1494
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.09	0.09	0.48	0.52	0.13	0.26	0.17	0.14	0.07	0.45

Intersection Summary

Description: Count Date: 6/23/2009

Northwest TSA

3: Indian Trail Road & Pacific Park Dr/Strong Rd Future Without-Project - AM Peak Hour

Windhaven Apartments Traffic Impact Analysis

	→	↘	←	↖	↙	↑	↗	↘	↓	↖
Lane Group	EBT	EBR	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	41	160	3	6	42	451	1	4	1146	90
v/c Ratio	0.16	0.48	0.01	0.02	0.34	0.36	0.00	0.01	0.93	0.09
Control Delay	19.1	18.0	16.3	0.2	17.7	6.0	0.0	4.8	27.2	3.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	19.1	18.0	16.3	0.2	17.7	6.0	0.0	4.8	27.2	3.2
Queue Length 50th (ft)	11	30	1	0	4	48	0	0	273	4
Queue Length 95th (ft)	31	72	6	1	#50	152	0	4	#758	24
Internal Link Dist (ft)	592		788			1204			76	
Turn Bay Length (ft)		100		75	125		100	125		100
Base Capacity (vph)	613	721	762	698	123	1236	1031	592	1236	1035
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.07	0.22	0.00	0.01	0.34	0.36	0.00	0.01	0.93	0.09

Intersection Summary

Description: Count Date 6/3/09

Northwest TSA

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

4: Francis Ave #14 & Indian Trail Road Future Without-Project - AM Peak Hour

Windhaven Apartments Traffic Impact Analysis



Lane Group	EBL	EBT	WBT	WBR	SEL
Lane Group Flow (vph)	99	589	374	380	1610
v/c Ratio	0.35	0.55	0.34	0.52	1.01
Control Delay	16.0	15.7	13.2	4.3	43.6
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	16.0	15.7	13.2	4.3	43.6
Queue Length 50th (ft)	22	74	43	0	217
Queue Length 95th (ft)	52	111	68	41	#508
Internal Link Dist (ft)		1085	1073		1042
Turn Bay Length (ft)	75			255	
Base Capacity (vph)	584	2185	2260	1108	1587
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.17	0.27	0.17	0.34	1.01

Intersection Summary

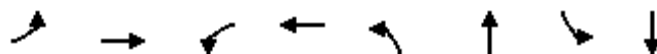
Description: Count Date 6/12/15

Northwest TSA

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

5: Alberta St & Francis Ave #14
Future Without-Project - AM Peak Hour

Windhaven Apartments Traffic Impact Analysis



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	29	1764	169	693	163	153	86	163
v/c Ratio	0.08	1.18	0.75	0.41	0.62	0.47	0.34	0.57
Control Delay	13.4	116.0	45.3	20.5	54.8	23.6	46.8	50.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	13.4	116.0	45.3	20.5	54.8	23.6	46.8	50.1
Queue Length 50th (ft)	8	~765	64	150	113	40	55	101
Queue Length 95th (ft)	26	#1125	#213	262	201	112	110	182
Internal Link Dist (ft)		1154		1366		1768		464
Turn Bay Length (ft)	175		175		150		100	
Base Capacity (vph)	461	1500	228	1676	395	445	349	385
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.06	1.18	0.74	0.41	0.41	0.34	0.25	0.42

Intersection Summary

Description: Northwest TSA

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

6: Ash St #4S & Francis Ave #14
Future Without-Project - AM Peak Hour

Windhaven Apartments Traffic Impact Analysis

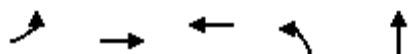
	→	↖	←	↗	↓	↙
Lane Group	EBT	WBL	WBT	SBL	SBT	SBR
Lane Group Flow (vph)	1290	119	614	346	749	445
v/c Ratio	0.94	0.67	0.31	0.61	0.69	0.67
Control Delay	39.9	55.5	5.0	26.0	25.9	13.6
Queue Delay	0.4	0.0	0.4	0.0	0.0	0.0
Total Delay	40.4	55.5	5.4	26.0	25.9	13.6
Queue Length 50th (ft)	360	72	34	165	193	110
Queue Length 95th (ft)	#555	#147	47	243	243	210
Internal Link Dist (ft)	1572		250		508	
Turn Bay Length (ft)						400
Base Capacity (vph)	1373	178	1954	648	1249	726
Starvation Cap Reductn	0	0	778	0	0	0
Spillback Cap Reductn	8	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.95	0.67	0.52	0.53	0.60	0.61

Intersection Summary

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

7: Maple St #3N & Francis Ave #14
Future Without-Project - AM Peak Hour

Windhaven Apartments Traffic Impact Analysis



Lane Group	EBL	EBT	WBT	NBL	NBT
Lane Group Flow (vph)	287	1303	565	24	690
v/c Ratio	0.64	0.58	0.48	0.07	0.65
Control Delay	30.2	5.4	23.9	25.3	30.9
Queue Delay	1.2	1.4	0.0	0.0	0.0
Total Delay	31.4	6.8	23.9	25.3	30.9
Queue Length 50th (ft)	159	107	120	12	127
Queue Length 95th (ft)	m201	m128	187	33	156
Internal Link Dist (ft)		250	280		1251
Turn Bay Length (ft)				115	
Base Capacity (vph)	450	2241	1188	436	1368
Starvation Cap Reductn	49	678	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.72	0.83	0.48	0.06	0.50

Intersection Summary











Description: Count Date 7/20/09

Northwest TSA

m Volume for 95th percentile queue is metered by upstream signal.

1: Indian Trail Road & Shawnee Ave
Future Without-Project - PM Peak Hour

Windhaven Apartments Traffic Impact Analysis











										
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	1	27	53	7	52	480	120	12	308	6
v/c Ratio	0.00	0.08	0.20	0.02	0.07	0.35	0.10	0.02	0.25	0.01
Control Delay	22.0	9.6	25.4	15.4	6.9	10.2	3.4	7.6	12.5	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	22.0	9.6	25.4	15.4	6.9	10.2	3.4	7.6	12.5	0.0
Queue Length 50th (ft)	0	0	21	1	5	60	1	1	63	0
Queue Length 95th (ft)	4	19	50	10	28	303	33	10	187	0
Internal Link Dist (ft)		582		639		1510			2454	
Turn Bay Length (ft)	75		100		110		110	80		125
Base Capacity (vph)	405	499	384	511	818	1357	1219	749	1230	1154
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.00	0.05	0.14	0.01	0.06	0.35	0.10	0.02	0.25	0.01

Intersection Summary

Description: Northwest TSA

2: Indian Trail Road & Barnes Rd
Future Without-Project - PM Peak Hour

Windhaven Apartments Traffic Impact Analysis

										
Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	100	61	205	166	132	292	359	407	57	340
v/c Ratio	0.25	0.18	0.46	0.36	0.29	0.60	0.54	0.56	0.15	0.45
Control Delay	18.6	30.8	8.1	19.8	20.4	22.0	27.9	9.3	16.0	28.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.6	30.8	8.1	19.8	20.4	22.0	27.9	9.3	16.0	28.6
Queue Length 50th (ft)	28	24	0	49	32	71	128	22	12	64
Queue Length 95th (ft)	77	69	57	122	99	214	337	145	47	145
Internal Link Dist (ft)		645			932		1282			1510
Turn Bay Length (ft)	115			125		125		125	150	
Base Capacity (vph)	520	558	600	492	571	500	811	815	534	1464
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.19	0.11	0.34	0.34	0.23	0.58	0.44	0.50	0.11	0.23

Intersection Summary

Description: Count Date: 6/23/2009

Northwest TSA

3: Indian Trail Road & Pacific Park Dr/Strong Rd Future Without-Project - PM Peak Hour

Windhaven Apartments Traffic Impact Analysis

	→	↘	←	↖	↙	↑	↗	↘	↓	↖
Lane Group	EBT	EBR	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	25	77	3	10	162	1277	1	6	562	86
v/c Ratio	0.07	0.18	0.01	0.03	0.30	0.97	0.00	0.05	0.43	0.08
Control Delay	17.2	6.1	16.0	2.4	7.4	36.2	0.0	6.7	6.8	2.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	17.2	6.1	16.0	2.4	7.4	36.2	0.0	6.7	6.8	2.0
Queue Length 50th (ft)	7	0	1	0	22	~546	0	1	88	1
Queue Length 95th (ft)	22	25	6	4	72	#873	0	6	206	16
Internal Link Dist (ft)	592		788			1204			76	
Turn Bay Length (ft)		100		75	125		100	125		100
Base Capacity (vph)	626	721	748	685	543	1312	1094	123	1312	1105
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.04	0.11	0.00	0.01	0.30	0.97	0.00	0.05	0.43	0.08

Intersection Summary

Description: Count Date 6/3/09

Northwest TSA

~ Volume exceeds capacity, queue is theoretically infinite.

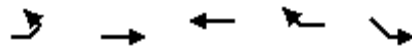
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

4: Francis Ave #14 & Indian Trail Road
Future Without-Project - PM Peak Hour

Windhaven Apartments Traffic Impact Analysis



Lane Group	EBL	EBT	WBT	WBR	SEL
Lane Group Flow (vph)	183	495	685	1394	735
v/c Ratio	0.55	0.27	0.37	1.09	0.75
Control Delay	19.3	8.8	9.5	60.1	26.4
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	19.3	8.8	9.5	60.1	26.4
Queue Length 50th (ft)	45	51	76	~476	142
Queue Length 95th (ft)	#140	97	138	#757	198
Internal Link Dist (ft)		1085	1073		1042
Turn Bay Length (ft)	75			255	
Base Capacity (vph)	330	1810	1873	1283	1373
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.55	0.27	0.37	1.09	0.54

Intersection Summary

Description: Count Date 6/12/15

Northwest TSA

~ Volume exceeds capacity, queue is theoretically infinite.









Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

5: Alberta St & Francis Ave #14
Future Without-Project - PM Peak Hour

Windhaven Apartments Traffic Impact Analysis

								
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	41	1128	151	1536	354	343	42	90
v/c Ratio	0.36	0.91	0.76	1.01	0.86	0.79	0.20	0.37
Control Delay	65.7	47.9	76.8	59.3	64.9	54.0	49.4	40.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	65.7	47.9	76.8	59.3	64.9	54.0	49.4	40.4
Queue Length 50th (ft)	31	418	112	604	267	236	31	48
Queue Length 95th (ft)	72	#660	#234	#978	#501	#440	66	100
Internal Link Dist (ft)		1154		1366		1768		464
Turn Bay Length (ft)	175		175		150		100	
Base Capacity (vph)	238	1304	228	1522	450	475	336	370
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.17	0.87	0.66	1.01	0.79	0.72	0.13	0.24

Intersection Summary

Description: Northwest TSA

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

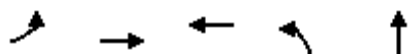
6: Ash St #4S & Francis Ave #14
Future Without-Project - PM Peak Hour

Windhaven Apartments Traffic Impact Analysis

	→	↙	←	↘	↓	↖
Lane Group	EBT	WBL	WBT	SBL	SBT	SBR
Lane Group Flow (vph)	861	230	1520	229	592	408
v/c Ratio	0.69	0.68	0.71	0.47	0.63	0.84
Control Delay	29.0	35.1	6.4	29.4	31.2	40.4
Queue Delay	0.2	0.0	11.3	0.0	0.0	0.0
Total Delay	29.2	35.1	17.7	29.4	31.2	40.4
Queue Length 50th (ft)	238	153	170	120	172	203
Queue Length 95th (ft)	312	m162	m169	192	230	#357
Internal Link Dist (ft)	1572		250		508	
Turn Bay Length (ft)						400
Base Capacity (vph)	1243	337	2130	514	992	509
Starvation Cap Reductn	0	0	605	0	0	0
Spillback Cap Reductn	46	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.72	0.68	1.00	0.45	0.60	0.80
Intersection Summary						
#	95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.					
m	Volume for 95th percentile queue is metered by upstream signal.					

7: Maple St #3N & Francis Ave #14
Future Without-Project - PM Peak Hour

Windhaven Apartments Traffic Impact Analysis



Lane Group	EBL	EBT	WBT	NBL	NBT
Lane Group Flow (vph)	341	986	1349	387	1191
v/c Ratio	1.00	0.47	1.05	0.95	0.94
Control Delay	93.6	10.5	69.0	70.8	48.7
Queue Delay	0.0	2.0	15.8	0.0	0.0
Total Delay	93.6	12.5	84.8	70.8	48.7
Queue Length 50th (ft)	~234	128	~490	281	280
Queue Length 95th (ft)	#414	182	#627	#495	#378
Internal Link Dist (ft)		250	280		1251
Turn Bay Length (ft)				115	
Base Capacity (vph)	340	2104	1287	407	1273
Starvation Cap Reductn	0	925	0	0	0
Spillback Cap Reductn	0	0	47	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	1.00	0.84	1.09	0.95	0.94

Intersection Summary

Description: Count Date 7/20/09

Northwest TSA

~ Volume exceeds capacity, queue is theoretically infinite.











Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

1: Indian Trail Road & Shawnee Ave
Future With-Project - AM Peak Hour

Windhaven Apartments Traffic Impact Analysis











										
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	7	114	249	48	18	244	197	42	532	4
v/c Ratio	0.02	0.22	0.78	0.10	0.04	0.26	0.22	0.06	0.54	0.00
Control Delay	21.6	10.3	44.8	12.6	8.2	14.4	3.1	8.0	17.0	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	21.6	10.3	44.8	12.6	8.2	14.4	3.1	8.0	17.0	0.0
Queue Length 50th (ft)	3	14	123	7	3	67	0	7	122	0
Queue Length 95th (ft)	10	35	162	24	11	112	17	19	255	0
Internal Link Dist (ft)		582		639		1510			2454	
Turn Bay Length (ft)	75		100		110		110	80		125
Base Capacity (vph)	358	520	326	495	517	932	914	690	979	937
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.02	0.22	0.76	0.10	0.03	0.26	0.22	0.06	0.54	0.00

Intersection Summary

Description: Northwest TSA

2: Indian Trail Road & Barnes Rd
Future With-Project - AM Peak Hour

Windhaven Apartments Traffic Impact Analysis

										
Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	62	83	446	278	81	110	142	101	37	671
v/c Ratio	0.16	0.24	0.78	0.53	0.15	0.35	0.23	0.18	0.08	0.72
Control Delay	18.9	33.8	17.5	23.6	15.6	18.2	23.0	5.9	15.4	33.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.9	33.8	17.5	23.6	15.6	18.2	23.0	5.9	15.4	33.8
Queue Length 50th (ft)	19	38	35	99	15	27	48	0	9	152
Queue Length 95th (ft)	56	94	176	225	60	81	125	36	34	311
Internal Link Dist (ft)		645			932		1282			1510
Turn Bay Length (ft)	115			125		125		125	150	
Base Capacity (vph)	556	558	707	530	584	395	834	719	561	1480
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.11	0.15	0.63	0.52	0.14	0.28	0.17	0.14	0.07	0.45

Intersection Summary

Description: Count Date: 6/23/2009

Northwest TSA

3: Indian Trail Road & Pacific Park Dr/Strong Rd Future With-Project - AM Peak Hour

Windhaven Apartments Traffic Impact Analysis

	→	↘	←	↖	↙	↑	↗	↘	↓	↙
Lane Group	EBT	EBR	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	41	160	3	6	42	458	1	4	1264	90
v/c Ratio	0.15	0.49	0.01	0.02	0.34	0.37	0.00	0.01	1.03	0.09
Control Delay	18.9	19.8	16.3	0.2	17.8	6.2	0.0	5.0	49.1	3.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.9	19.8	16.3	0.2	17.8	6.2	0.0	5.0	49.1	3.4
Queue Length 50th (ft)	11	35	1	0	5	52	0	0	~480	4
Queue Length 95th (ft)	31	78	6	1	#50	155	0	4	#861	25
Internal Link Dist (ft)	592		788			1204			76	
Turn Bay Length (ft)		100		75	125		100	125		100
Base Capacity (vph)	613	710	759	695	123	1231	1027	584	1231	1029
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.07	0.23	0.00	0.01	0.34	0.37	0.00	0.01	1.03	0.09

Intersection Summary

Description: Count Date 6/3/09

Northwest TSA

~ Volume exceeds capacity, queue is theoretically infinite.

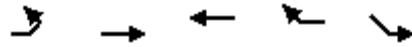
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

4: Francis Ave #14 & Indian Trail Road
Future With-Project - AM Peak Hour

Windhaven Apartments Traffic Impact Analysis



Lane Group	EBL	EBT	WBT	WBR	SEL
Lane Group Flow (vph)	100	589	374	387	1729
v/c Ratio	0.35	0.55	0.34	0.52	1.09
Control Delay	16.1	15.7	13.2	4.3	68.4
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	16.1	15.7	13.2	4.3	68.4
Queue Length 50th (ft)	22	74	43	0	~306
Queue Length 95th (ft)	52	111	68	41	#561
Internal Link Dist (ft)		1085	1073		1042
Turn Bay Length (ft)	75			255	
Base Capacity (vph)	584	2185	2260	1110	1589
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.17	0.27	0.17	0.35	1.09

Intersection Summary

Description: Count Date 6/12/15

Northwest TSA

~ Volume exceeds capacity, queue is theoretically infinite.

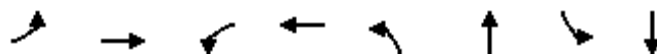
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

5: Alberta St & Francis Ave #14
Future With-Project - AM Peak Hour

Windhaven Apartments Traffic Impact Analysis



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	34	1849	169	698	165	153	86	163
v/c Ratio	0.09	1.23	0.75	0.42	0.62	0.47	0.34	0.57
Control Delay	13.4	140.4	45.5	20.6	55.0	23.5	46.9	50.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	13.4	140.4	45.5	20.6	55.0	23.5	46.9	50.1
Queue Length 50th (ft)	9	~834	65	152	114	40	55	101
Queue Length 95th (ft)	30	#1202	#214	266	203	112	110	183
Internal Link Dist (ft)		1154		1366		1768		464
Turn Bay Length (ft)	175		175		150		100	
Base Capacity (vph)	458	1498	227	1672	394	444	349	385
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.07	1.23	0.74	0.42	0.42	0.34	0.25	0.42

Intersection Summary

Description: Northwest TSA

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

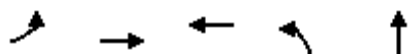
6: Ash St #4S & Francis Ave #14
Future With-Project - AM Peak Hour

Windhaven Apartments Traffic Impact Analysis

	→	↙	←	↘	↓	↗
Lane Group	EBT	WBL	WBT	SBL	SBT	SBR
Lane Group Flow (vph)	1346	119	617	346	749	446
v/c Ratio	0.98	0.67	0.32	0.61	0.69	0.67
Control Delay	47.3	55.5	5.0	25.7	25.5	13.6
Queue Delay	1.7	0.0	0.4	0.0	0.0	0.0
Total Delay	49.0	55.5	5.4	25.7	25.5	13.6
Queue Length 50th (ft)	~395	72	34	165	193	112
Queue Length 95th (ft)	#591	#148	47	241	243	215
Internal Link Dist (ft)	1572		250		508	
Turn Bay Length (ft)						400
Base Capacity (vph)	1373	178	1954	648	1249	725
Starvation Cap Reductn	0	0	777	0	0	0
Spillback Cap Reductn	13	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.99	0.67	0.52	0.53	0.60	0.62
Intersection Summary						
~ Volume exceeds capacity, queue is theoretically infinite. Queue shown is maximum after two cycles.						
# 95th percentile volume exceeds capacity, queue may be longer. Queue shown is maximum after two cycles.						

7: Maple St #3N & Francis Ave #14
Future With-Project - AM Peak Hour

Windhaven Apartments Traffic Impact Analysis



Lane Group	EBL	EBT	WBT	NBL	NBT
Lane Group Flow (vph)	297	1344	567	25	690
v/c Ratio	0.66	0.60	0.48	0.07	0.65
Control Delay	30.2	5.4	24.0	25.3	31.2
Queue Delay	1.4	1.7	0.0	0.0	0.0
Total Delay	31.7	7.1	24.0	25.3	31.2
Queue Length 50th (ft)	162	109	121	12	128
Queue Length 95th (ft)	m201	m126	188	33	157
Internal Link Dist (ft)		250	280		1251
Turn Bay Length (ft)				115	
Base Capacity (vph)	450	2238	1185	436	1363
Starvation Cap Reductn	49	677	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.74	0.86	0.48	0.06	0.51

Intersection Summary











Description: Count Date 7/20/09

Northwest TSA

m Volume for 95th percentile queue is metered by upstream signal.

1: Indian Trail Road & Shawnee Ave
Future With-Project - PM Peak Hour

Windhaven Apartments Traffic Impact Analysis











										
Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	1	27	56	7	52	484	123	12	314	6
v/c Ratio	0.00	0.08	0.21	0.02	0.07	0.36	0.10	0.02	0.26	0.01
Control Delay	22.0	9.6	25.6	15.4	6.9	10.3	3.4	7.6	12.5	0.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	22.0	9.6	25.6	15.4	6.9	10.3	3.4	7.6	12.5	0.0
Queue Length 50th (ft)	0	0	23	1	5	60	1	1	65	0
Queue Length 95th (ft)	4	19	52	10	28	306	33	10	192	0
Internal Link Dist (ft)		582		639		1510			2454	
Turn Bay Length (ft)	75		100		110		110	80		125
Base Capacity (vph)	405	499	384	511	812	1357	1219	746	1230	1154
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.00	0.05	0.15	0.01	0.06	0.36	0.10	0.02	0.26	0.01

Intersection Summary

Description: Northwest TSA

2: Indian Trail Road & Barnes Rd
Future With-Project - PM Peak Hour

Windhaven Apartments Traffic Impact Analysis

										
Lane Group	EBL	EBT	EBR	WBL	WBT	NBL	NBT	NBR	SBL	SBT
Lane Group Flow (vph)	105	73	249	166	153	368	359	407	57	350
v/c Ratio	0.26	0.22	0.52	0.37	0.35	0.74	0.53	0.56	0.15	0.46
Control Delay	18.8	31.3	8.3	20.0	24.1	29.1	27.6	9.2	16.0	28.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	18.8	31.3	8.3	20.0	24.1	29.1	27.6	9.2	16.0	28.6
Queue Length 50th (ft)	29	29	0	49	45	95	128	22	12	65
Queue Length 95th (ft)	80	80	62	122	126	#353	337	145	47	147
Internal Link Dist (ft)		645			932		1282			1510
Turn Bay Length (ft)	115			125		125		125	150	
Base Capacity (vph)	508	550	623	483	561	497	797	807	529	1435
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.21	0.13	0.40	0.34	0.27	0.74	0.45	0.50	0.11	0.24

Intersection Summary

Description: Count Date: 6/23/2009

Northwest TSA

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

3: Indian Trail Road & Pacific Park Dr/Strong Rd Future With-Project - PM Peak Hour

Windhaven Apartments Traffic Impact Analysis

	→	↘	←	↖	↙	↑	↗	↘	↓	↖
Lane Group	EBT	EBR	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Group Flow (vph)	25	77	3	10	162	1352	1	6	605	86
v/c Ratio	0.07	0.18	0.01	0.03	0.32	1.03	0.00	0.05	0.46	0.08
Control Delay	17.2	6.1	16.0	2.4	7.9	50.6	0.0	6.7	7.2	2.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	17.2	6.1	16.0	2.4	7.9	50.6	0.0	6.7	7.2	2.2
Queue Length 50th (ft)	7	0	1	0	23	~601	0	1	99	1
Queue Length 95th (ft)	22	25	6	4	75	#938	0	6	231	17
Internal Link Dist (ft)	592		788			1204			76	
Turn Bay Length (ft)		100		75	125		100	125		100
Base Capacity (vph)	626	721	748	685	510	1312	1094	123	1312	1104
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.04	0.11	0.00	0.01	0.32	1.03	0.00	0.05	0.46	0.08

Intersection Summary

Description: Count Date 6/3/09

Northwest TSA

~ Volume exceeds capacity, queue is theoretically infinite.

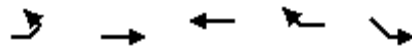
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

4: Francis Ave #14 & Indian Trail Road Future With-Project - PM Peak Hour

Windhaven Apartments Traffic Impact Analysis



Lane Group	EBL	EBT	WBT	WBR	SEL
Lane Group Flow (vph)	189	495	685	1463	779
v/c Ratio	0.59	0.28	0.37	1.14	0.77
Control Delay	21.9	9.4	10.1	83.5	26.7
Queue Delay	0.0	0.0	0.0	0.0	0.0
Total Delay	21.9	9.4	10.1	83.5	26.7
Queue Length 50th (ft)	50	54	80	~549	154
Queue Length 95th (ft)	#171	102	145	#843	213
Internal Link Dist (ft)		1085	1073		1042
Turn Bay Length (ft)	75			255	
Base Capacity (vph)	321	1779	1840	1279	1348
Starvation Cap Reductn	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	0.59	0.28	0.37	1.14	0.58

Intersection Summary

Description: Count Date 6/12/15

Northwest TSA

~ Volume exceeds capacity, queue is theoretically infinite.

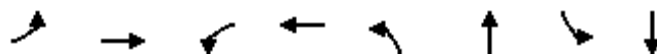
Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

5: Alberta St & Francis Ave #14
Future With-Project - PM Peak Hour

Windhaven Apartments Traffic Impact Analysis



Lane Group	EBL	EBT	WBL	WBT	NBL	NBT	SBL	SBT
Lane Group Flow (vph)	43	1161	151	1579	359	350	42	93
v/c Ratio	0.38	0.92	0.78	1.02	0.88	0.81	0.20	0.39
Control Delay	66.5	48.2	79.2	63.1	68.2	56.7	49.5	39.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	66.5	48.2	79.2	63.1	68.2	56.7	49.5	39.8
Queue Length 50th (ft)	32	437	112	~682	272	244	31	49
Queue Length 95th (ft)	75	#692	#234	#1021	#512	#456	66	101
Internal Link Dist (ft)		1154		1366		1768		464
Turn Bay Length (ft)	175		175		150		100	
Base Capacity (vph)	232	1270	223	1542	439	463	327	362
Starvation Cap Reductn	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.19	0.91	0.68	1.02	0.82	0.76	0.13	0.26

Intersection Summary

Description: Northwest TSA

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

6: Ash St #4S & Francis Ave #14
Future With-Project - PM Peak Hour

Windhaven Apartments Traffic Impact Analysis

	→	↙	←	↘	↓	↖
Lane Group	EBT	WBL	WBT	SBL	SBT	SBR
Lane Group Flow (vph)	881	230	1555	229	592	414
v/c Ratio	0.71	0.68	0.73	0.47	0.63	0.85
Control Delay	29.6	34.7	6.7	29.2	30.9	41.2
Queue Delay	0.2	0.0	16.8	0.0	0.0	0.0
Total Delay	29.8	34.7	23.5	29.2	30.9	41.2
Queue Length 50th (ft)	246	153	173	120	171	207
Queue Length 95th (ft)	322	m157	m171	192	231	#366
Internal Link Dist (ft)	1572		250		508	
Turn Bay Length (ft)						400
Base Capacity (vph)	1240	337	2127	514	992	509
Starvation Cap Reductn	0	0	600	0	0	0
Spillback Cap Reductn	47	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.74	0.68	1.02	0.45	0.60	0.81

Intersection Summary

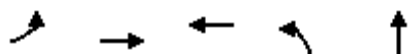
95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

m Volume for 95th percentile queue is metered by upstream signal.

7: Maple St #3N & Francis Ave #14
Future With-Project - PM Peak Hour

Windhaven Apartments Traffic Impact Analysis



Lane Group	EBL	EBT	WBT	NBL	NBT
Lane Group Flow (vph)	345	1001	1374	391	1196
v/c Ratio	1.01	0.48	1.07	0.96	0.94
Control Delay	95.8	10.4	75.4	72.8	49.2
Queue Delay	0.0	2.3	13.4	0.0	0.0
Total Delay	95.8	12.6	88.8	72.8	49.2
Queue Length 50th (ft)	~241	132	~507	284	281
Queue Length 95th (ft)	#420	184	#645	#502	#380
Internal Link Dist (ft)		250	280		1251
Turn Bay Length (ft)				115	
Base Capacity (vph)	340	2104	1287	407	1273
Starvation Cap Reductn	0	925	0	0	0
Spillback Cap Reductn	0	0	59	0	0
Storage Cap Reductn	0	0	0	0	0
Reduced v/c Ratio	1.01	0.85	1.12	0.96	0.94

Intersection Summary

Description: Count Date 7/20/09

Northwest TSA

~ Volume exceeds capacity, queue is theoretically infinite.

Queue shown is maximum after two cycles.

95th percentile volume exceeds capacity, queue may be longer.

Queue shown is maximum after two cycles.

Appendix D

Individual Pipeline Project Assignments

Windhaven Apartments

TAZ29 Assignment Total - AM Peak Hour

Indian Trail Road/Shawnee Road													
		12	30	17									
		IN		OUT									
		0	12	0									
		SBR	SBT	SBL									
0	OUT	0	EBL	TEV =		WBR	0	IN	6				
0		0	EBT	42		WBT	0		13				
0	IN	0	EBR			WBL	6	OUT	7				
		NBL	NBT	NBR									
		0	17	7									
		OUT		IN									
		18	42	25									
Indian Trail Road/Barnes Road													
		17	41	24									
		IN		OUT									
		5	4	8									
		SBR	SBT	SBL									
		WBR	3	IN	24								
		WBT	11		79								
		WBL	9	OUT	55								
		NBL	NBT	NBR									
		42	9	21									
		OUT		IN									
		111	183	72									
Indian Trail Road/Strong Road													
		111	183	72									
		IN		OUT									
		11	101	0									
		SBR	SBT	SBL									
32	OUT	25	EBL	TEV =		WBR	0	IN	0				
106		0	EBT	254		WBT	0		0				
74	IN	49	EBR			WBL	0	OUT	0				
		NBL	NBT	NBR									
		21	47	0									
		OUT		IN									
		150	219	68									
Indian Trail Road/Multiple Middle													
		150	219	68									
		IN		OUT									
		2	148	0									
		SBR	SBT	SBL									
28	OUT	5	EBL	TEV =		WBR	0	IN	0				
92		0	EBT	303		WBT	0		0				
64	IN	59	EBR			WBL	0	OUT	0				
		NBL	NBT	NBR									
		25	64	0									
		OUT		IN									
		207	296	89									
Indian Trail Road/Francis Avenue													
		207	296	89									
		IN		OUT									
		18	0	189									
		SBR	SBT	SBL									
18	OUT	8	EBL	TEV =		WBR	81	IN	81				
25		0	EBT	296		WBT	0		271				
8	IN	0	EBR			WBL	0	OUT	189				
		NBL	NBT	NBR									
		0	0	0									
		OUT		IN									
		0	0	0									
Alberta Avenue/Francis Avenue													
		4	13	9									
		IN		OUT									
		4	0	0									
		SBR	SBT	SBL									
		WBR	0	IN	52								
		WBT	52		173								
		WBL	0	OUT	121								
		NBL	NBT	NBR									
		15	0	0									
		OUT		IN									
		36	51	15									
Ash Street/Francis Avenue													
		8	8	8	0								
		IN		OUT									
		8	0	0									
		SBR	SBT	SBL									
		EBL	0	OUT	51								
		EBT			169								
		EBR			118								
		NBL	NBT	NBR									
		0	0	0									
		OUT		IN									
		27	27	0									
Maple Street/Francis Avenue													
		0	18	18									
		IN		OUT									
		0	0	0									
		SBR	SBT	SBL									
		WBR	0	IN	43								
		WBT	43		135								
		WBL	0	OUT	92								
		NBL	NBT	NBR									
		0	0	0									
		OUT		IN									
		11	0	0									
		OUT		IN									
		0	11	11									
		OUT		IN									
		0	0	0									

Windhaven Apartments

TAZ29 Assignment Total - PM Peak Hour

Indian Trail Road/Shawnee Avenue									

Windhaven Apartments

TAZ30 Assignment Total - PM Peak Hour

Indian Trail Road/Shawnee Avenue																																					
																			6	10	3																
																			IN		OUT																
																			0	6	0																
																			SBR	SBT	SBL	TEV =	WBR	0	IN	1	WBT	0									
0	OUT	0	EBL	11														WBL	1	OUT	1																
0		0	EBT																																		
0	IN	0	EBR																																		
																			NBL	NBT	NBR																
																			0	3	1																
																			OUT		IN																
																			7	11	4																
Indian Trail Road/Barnes Road																																					
																			7	11	4																
																			IN		OUT																
																			0	0	7																
																			SBR	SBT	SBL	TEV =	WBR	4	IN	32	WBT	3	OUT	60							
3	OUT	0	EBL	92														WBL	25	OUT	60																
10		6	EBT																																		
6	IN	0	EBR																																		
																			NBL	NBT	NBR																
																			0	0	47																
																			OUT		IN																
																			25	71	47																
Indian Trail Road/Strong Road																																					
																			25	71	47																
																			IN		OUT																
																			1	24	0																
																			SBR	SBT	SBL	TEV =	WBR	0	IN	1	WBT	1									
1	OUT	1	EBL	73														WBL	0	OUT	1																
3		1	EBT																																		
2	IN	0	EBR																																		
																			NBL	NBT	NBR																
																			0	46	0																
																			OUT		IN																
																			24	70	46																
Indian Trail Road/Multiple Middle																																					
																			24	70	46																
																			IN		OUT																
																			0	24	0																
																			SBR	SBT	SBL	TEV =	WBR	0	IN	6	WBT	0									
0	OUT	0	EBL	86														WBL	6	OUT	11																
0		0	EBT																																		
0	IN	0	EBR																																		
																			NBL	NBT	NBR																
																			0	46	11																
																			OUT		IN																
																			30	86	56																
Indian Trail Road/Francis Avenue																																					
																			30	86	56																
																			IN		OUT																
																			3	0	27																
																			SBR	SBT	SBL	TEV =	WBR	51	IN	51	WBT	0									
3	OUT	5	EBL	86														WBL	0	OUT	27																
8		0	EBT																																		
5	IN	0	EBR																																		
																			NBL	NBT	NBR																
																			0	0	0																
																			OUT		IN																
																			0	0	0																
Alberta Avenue/Francis Avenue																																					
																			0	0	0																
																			IN		OUT																
																			0	0	0																
																			SBR	SBT	SBL	TEV =	WBR	0	IN	40	WBT	40									
0	OUT	0	EBL	71														WBR	0	IN	40	WBT	40														
0		0	EBT															WBL	0	OUT	21	WBL	0														
0	IN	0	EBR																																		
																			NBL	NBT	NBR																
																			6	0	0																
																			OUT		IN																
																			3	10	6																
Ash Street/Francis Avenue																																					
																			7	7	0																
																			IN		OUT																
																			7	0	0																
																			SBR	SBT	SBL	TEV =	WBR	0	IN	33	WBT	33									
0	OUT	0	EBL	62														WBR	0	IN	33	WBT	33														
0		0	EBT															WBL	0	OUT	11	WBL	0														
0	IN	0	EBR																																		
																			NBL	NBT	NBR																
																			0	0	0																
																			OUT		IN																
																			10	10	0																
Maple Street/Francis Avenue																																					
																			0	4	4																
																			IN		OUT																
																			0	0	0																
																			SBR	SBT	SBL	TEV =	WBR	0	IN	33	WBT	33									
0	OUT	0	EBL	44														WBR	0	IN	33	WBT	33														
0		0	EBT															WBL	0	OUT	11	WBL	0														
0	IN	0	EBR																																		
																			NBL	NBT	NBR																
																			19	0	0																
																			OUT		IN																
																			0	19	19																

Windhaven Apartments

TAZ31 Assignment Total - AM Peak Hour

[illegible]

Windhaven Apartments

TAZ31 Assignment Total - PM Peak Hour

Indian Trail Road/Shawnee Avenue																																							
												1				1				0																			
												IN				OUT				0																			
												0				1				0																			
												SBR				SBT				SBL																			
0				OUT				0				EBL				TEV = 2				WBR				0				IN				0							
0				0				EBT				0				WBT				0				WBL				0				OUT				0			
0				IN				0				EBR				0				NBL				NBT				NBR											
				0				0				0				0				0				0				0				1							
				OUT																1				2				1											
				1				2				1																											
Indian Trail Road/Barnes Road												Indian Trail Road/Barnes Road																											
												0				0				0																			
												IN				OUT				0																			
												0				0				0																			
												SBR				SBT				SBL																			
0				OUT				0				EBL				TEV = 1				WBR				0				IN				0							
1				1				EBT				1				EBT				WBT				0				1				1							
1				IN				0				EBR				1				WBL				0				OUT				1							
				NBL				NBT				NBR																											
				0				0				0				0				0				0				0											
				OUT				IN				OUT				IN				0				0				0											
				0				0				0				0				0				0				0											
Indian Trail Road/Strong Road												Indian Trail Road/Strong Road																											
												1				4				2																			
												IN				OUT				0																			
												0				1				0																			
												SBR				SBT				SBL																			
0				OUT				0				EBL				TEV = 4				WBR				0				IN				0							
1				0				EBT				0				WBT				0				WBL				0				0							
1				IN				0				EBR				1				WBL				0				OUT				0							
				NBL				NBT				NBR																											
				0				2				0				0				2				0															
				OUT				IN				OUT				IN																							
				1				3				2																											
Indian Trail Road/Multiple Middle												Indian Trail Road/Multiple Middle																											
												1				3				2																			
												IN				OUT				0																			
												0				1				0																			
												SBR				SBT				SBL																			
0				OUT				0				EBL				TEV = 4				WBR				0				IN				0							
0				0				EBT				0				WBT				0				WBL				0				1							
0				IN				0				EBR				0				WBL				0				OUT				1							
				NBL				NBT				NBR																											
				0				2				1				1				0				0															
				OUT				IN				OUT				IN																							
				1				4				3																											
Indian Trail Road/Francis Avenue												Indian Trail Road/Francis Avenue																											
												1				4				3																			
												IN				OUT				1																			
												1				0				1																			
												SBR				SBT				SBL																			
1				OUT				1				EBL				TEV = 4				WBR				1				IN				1							
2				0				EBT				0				WBT				0				WBL				0				2							
1				IN				0				EBR				1				WBL				0				OUT				1							
				NBL				NBT				NBR																											
				0				0				0				0				0				0															
				OUT				IN				OUT				IN																							
				0				0				0				0				0				0				0											

Appendix E

Microsimulation Analysis

TO: Inga Note, P.E. - City of Spokane Street Department
Lisa Key - City of Spokane Planning and Development
Tirrell Black - City of Spokane Planning Department

FROM: Bill White
Kennet Bertelsen, P.E.

DATE: May 23, 2016

JOB NO.: 5594.002

RE: Windhaven Apartments, Summary Micro-simulation/SimTraffic Analysis

CC: Jay Bonnet, P.E. - Bonnett Engineering
Del Stratton - Douglass Properties
Greg Figg - WSDOT

☐ Urgent ☒ For Review ☒ Please Comment ☒ Please Reply ☐ For Your Use

This memorandum summarizes the micro-simulation analysis developed in SimTraffic for the Windhaven Apartments project proposed in Spokane, WA. Provided is additional information to support the *Windhaven Apartments Traffic Impact Analysis* (MMI, May 2016), as developed per the request of officials with the Washington State Department of Transportation (WSDOT) specifically for Francis Avenue study intersections. Source material such as project data, traffic forecasts, and comparative analyses can be reviewed with the project Traffic Impact Analysis (TIA), as this provides analytical results only and is not intended as a stand-alone document.

SIMTRAFFIC ANALYSIS

SimTraffic (Trafficware, 2016) is a micro-simulation program used to review the cumulative impact of traffic within the context of roadway and intersection networks. This is somewhat different than the “spot” analyses provided through Highway Capacity Manual (HCM) methodologies and the software that generates HCM results (such as Synchro used with the Windhaven TIA). Cumulative results can be different with micro-simulation because the effect of the traffic influences from upstream and downstream intersections are addressed, whereas spot analysis focuses on traffic conditions predominantly at an intersection only. Spillback between intersections, spillback beyond turning bays, forced lane changes, unbalanced lane use for downstream turns, and other traffic flow interactions are examples of traffic conditions that can have a cumulative impact upon the operation of a single intersection.

Intersection delay, block time, and queue penalties are micro-simulation results requested by WSDOT for Francis Avenue study intersections. A description of intersection delay, block time, and queue penalties are as follows:

- **Block Time.** This represents the proportion of time during the peak hour that a turn lane is queued at the top or back of a storage area (i.e. lane length), thus access to the lane is effectively blocked. Or this represents the proportion of time that a turn lane is blocked due to queues in the adjacent through lane. Results are presented in terms of a percentage of time blocked during the peak hour. Block time is shown in Table 2.
- **Intersection Delay.** Presented by Table 1, this is the average delay experienced by vehicles at an intersection. Different than control delay (as presented by the TIA), this includes the effects of vehicle slow-downs and arrival/departure influences caused by

the factors mentioned previously (spillback, etc.). The information is presented as the average delay experienced by vehicles/drivers at an intersection in seconds.

- **Queue Penalty.** This is a rough measure of how many vehicles are impacted by blocking throughout the peak hour. As a quick way to quantify the effects of queuing at an intersection, this represents the vehicles that cannot access a turn lane because of queues or cannot make it through the intersection, because of volume/queuing, during the peak hour. The queue penalty is shown in Table 2.

Delay, block time, and queue penalty analyses were developed in SimTraffic assuming a 60 minute analysis using a 10 minute “seed” time. Five micro-simulation runs/iterations were performed for all analysis conditions. The results of these five runs were then averaged to generate information shown on the following pages. Note that summary worksheets and PDF reports for each run are attached to this memorandum for existing, future without, and future-with project analysis conditions.

The results of the delay analyses are provided on Table 1 for the AM and PM peak hours of the typical weekday. The analysis was prepared based on existing traffic counts, future without-project traffic forecasts, and future with-project traffic forecasts. The “spot” HCM delay results are shown for from the TIA as a means for comparing/quantifying the incidental delay associated with off-intersection traffic impacts/influences. However, please note these are not direct comparisons as they are quantifying somewhat different aspects of intersection operation.

Table 1. Existing and Forecast Micro-Simulation Intersection Delays												
Year 2021 Condition	Existing Condition				Future Without Project Traffic				Future With Project Traffic			
	AM Peak		PM Peak		AM Peak		PM Peak		AM Peak		PM Peak	
Signalized Intersections	Sim ¹	HCM ²	Sim ¹	HCM ²	Sim ¹	HCM ²	Sim ¹	HCM ²	Sim ¹	HCM ²	Sim ¹	HCM ²
Indian Trail Rd/Francis Ave	14.3	12.3	15.3	7.9	38.1	20.3	33.2	10.4	43.5	29.6	36.7	10.7
Alberta St/Francis Ave	56.6	36.4	92.4	32.2	76.3	65.6	132.3	53.7	76.0	78.3	149.9	59.4
Ash St/Francis Ave	16.9	22.3	17.1	20.4	16.6	26.1	19.0	21.3	19.5	28.9	20.6	21.5
Maple St/Francis Ave	14.5	17.4	78.5	38.8	11.3	17.6	117.9	51.4	11.8	17.6	116.8	54.0
1. Sim = SimTraffic Results 2. HCM = Highway Capacity Manual Comparison												

A comparison confirms that future without-project intersection delays are nearly 10 seconds higher, on average between intersections, versus existing intersection delays during the AM peak hour. Futures without project delays are nearly 25 seconds higher, as averaged between intersections, during the PM peak hour. This means the typical driver will experience an average delay of between 10 and 25 additional seconds per intersection by year 2021, assuming no project development.

Comparatively, a comparison of without and with-project conditions confirms a 2 second increase of average delay, between intersection, during the AM peak hour. Also an approximate 5 second increase is forecast between intersections during the PM peak hour. This means the typical driver will experience an average delay of between 2 and 5 additional seconds per intersection by year 2021, assuming no project development.

Also note that SimTraffic delays do tend to exceed HCM control delays, as one would expect, when other incidental delays are considered for study intersections.

Block time and queue penalty data are shown in [Table 2](#). The analysis was prepared initially based on existing counts, future without-project forecasts, and future-with project forecasts. However, there were minimal differences noted in results between the future without and future with-project conditions. As such, only existing and future-with project conditions are shown for the peak hours. Also, SimTraffic did not note blockage or excessive queues for a number of intersection movements. Thus, data was reported only for reasonably impacted movements at study intersections. Note the attached summary sheets and SimTraffic reports can be reviewed for all analysis conditions and all movements, as desired.

Table 2. Existing and Forecast Micro-Simulation Block Time and Queue Penalties								
Signalized Intersections	Existing Condition				Future-With Project			
	AM Peak		PM Peak		AM Peak		PM Peak	
	Queue ¹	%Block ²	Queue ¹	%Block ²	Queue ¹	%Block ²	Queue ¹	%Block ²
Indian Trail Rd/Francis Ave								
– Westbound Right-Turn Lane	0%	0	3%	9	0%	0	17%	53
– Eastbound Through	5%	4	2%	3	5%	4	2%	4
– Eastbound Left-Turn Lane	2%	5	19%	42	5%	13	25%	58
Alberta St/Francis Ave								
– Northbound Left-Turn	0%	0	4%	18	0%	0	4%	18
– Northbound Left-Turn/Through	8%	5	68%	127	8%	7	72%	158
– Southbound Through	13%	8	2%	1	13%	10	2%	1
– Southbound Left-Turn	3%	4	0%	0	3%	4	0%	0
– Westbound Through	0%	1	49%	69	1%	1	50%	75
– Westbound Left-Turn	1%	4	1%	6	5%	16	3%	24
– Eastbound Through	51%	9	21%	7	60%	19	33%	14
Ash St/Francis Ave								
– Eastbound Through	0%	0	1%	2	2%	8	2%	4
Maple St/Francis Ave								
– Northbound Left-Turn/Through	1%	1	65%	118	2%	1	72%	155
– Westbound Through	0%	0	5%	15	0%	0	36%	133
1. Queue = Queue Penalty 2. %Block = Block Time								

As shown, queue penalties and block time increase between the existing and future with-project condition. A general description is provided on the intersection basis as follows:

- Indian Trail Road/Francis Avenue.** There is an existing average block time of 2 percent (between movements) during the AM peak hour and 8 percent during the PM peak hour. This increases overall in the future condition to 3 percent during the AM peak hour and 15 percent during the PM peak hour. There are currently a total of 9 vehicles impacted by queues in the AM peak hour and 54 vehicles during the PM peak hour (i.e. the queue penalty). This impact increases to 17 vehicles during the AM peak hour and 115 vehicles during the PM peak hour, in total.
- Alberta Street/Francis Avenue.** The average intersection block time is 31 percent during the AM peak hour and 21 percent during the PM peak hour; increasing in the forecast condition to 13 percent and 23 percent between the AM and PM peak hours, respectively. There are 31 total vehicles impacted by queues during the AM peak hour and 228 during the PM peak hour. This increases to 57 AM peak hour and 290 PM peak hour vehicles impacted by queues, as based on the future condition.
- Ash Street/Francis Avenue.** No block time or queue penalties were currently identified during the AM peak hour. However, there is an average 2 percent block and 8 vehicle queue penalty forecast during the AM peak hour, averaged at the intersection. The

existing block time increases from 1 to 2 percent, on average, between existing and forecast conditions with an associated queue penalty increase of 2 to 4 vehicles during the PM peak hour.

- **Maple Street/Francis Avenue.** The AM peak hour block time and queue penalty, at 1 percent and 1 vehicle, does not increase between the existing and future conditions. The PM peak hour block time does increase from 35 to 54 percent between the existing and future condition. The 133 vehicles currently impacted by queues increases to 288 vehicles during the forecast PM peak hour.

SUMMARY

SimTraffic analyses confirms traffic growth will increase cumulative impacts upon study intersections located along Francis Avenue, as measured by gains in intersection delay, block time, and queue penalty. The typical driver will experience an average delay of between 12 and 30 additional seconds per intersection by year 2021, assuming development of all projected specified within the TIA. On average, blockage time is anticipated to increase between the peak hours by: up to 7 percent at the Indian Trail Road/Francis Avenue intersection, up to 3 percent at the Alberta Street/Francis Avenue intersection, up to 2 percent at the Ash Street/Francis Avenue intersection, and up to 19 percent at the Maple Street/Francis Avenue intersection, assuming; assuming development of all projected specified within the TIA. Finally, the number of vehicles impacted by queues between peak hours will elevate by up to: 61 for the Indian Trail Road/Francis Avenue intersection, 62 for the Alberta Street/Francis Avenue intersection, 8 for the Ash Street/Francis Avenue intersection, and 155 for the Maple Street/Francis Avenue intersection, assuming development of all projected specified within the TIA.

However, the analysis confirms marginal changes between the future without and with project conditions. Drivers are forecast to potentially experience an average delay increase of between 2 and 5 additional seconds per intersection by year 2021, along Francis Avenue, which is a moderate change. The difference in block time and queue penalties was not summarized as the differences were negligible (although they are attached for review, as needed). Thus, the SimTraffic analysis also confirms the project proposal will have a minimal impact upon cumulative traffic operations for intersections located along Francis Avenue.

We hope this provides sufficient information to help WSDOT with their consideration and comment on the Windhaven project. Please contact our office with questions or comments.

Existing

	AM Peak Hour , Run/Seed					PM Peak Hour , Run/Seed				
	1	2	3	4	Avg	1	2	3	4	Avg
Indian Trail/Francis Avenue	13.5	13.7	14.0	14.6	15.7	15.4	14.8	13.8	14.5	15.3
Alberta Street/Francis Avenue	44.3	37.2	87.8	57.1	56.8	105.0	86.5	74.8	87.7	92.4
Ash Sireet/Francis Avenue	17.2	16.9	16.7	17.2	16.6	18.0	16.0	16.7	17.3	17.1
Maple Street/Francis Avenue	14.4	13.6	15.4	14.2	14.7	48.9	120.3	55.7	61.0	78.5

	AM Peak Hour					PM Peak Hour				
	EB-L	EB-TT	WB-TT	WB-R	SB-L	EB-L	EB-TT	WB-TT	WB-R	SB-L
Indian Trail/Francis Avenue	Indian Trail/Francis Avenue					Indian Trail/Francis Avenue				
AM-1	- Queuing Penalty (%)	1%	7%	0%	0%	- Queuing Penalty (%)	20%	2%	1%	4%
	- Blocking Report (veh)	3	5	0	0	- Blocking Report (veh)	45	3	1	11
AM-2	- Queuing Penalty (%)	2%	5%	0%	0%	- Queuing Penalty (%)	29%	2%	0%	3%
	- Blocking Report (veh)	5	4	0	0	- Blocking Report (veh)	65	2	0	9
AM-3	- Queuing Penalty (%)	2%	6%	0%	0%	- Queuing Penalty (%)	8%	2%	0%	2%
	- Blocking Report (veh)	5	5	0	0	- Blocking Report (veh)	18	3	1	6
AM-4	- Queuing Penalty (%)	2%	6%	0%	0%	- Queuing Penalty (%)	21%	2%	0%	2%
	- Blocking Report (veh)	5	5	0	0	- Blocking Report (veh)	49	3	1	5
AM-5	- Queuing Penalty (%)	2%	3%	0%	0%	- Queuing Penalty (%)	15%	2%	0%	5%
	- Blocking Report (veh)	6	2	0	0	- Blocking Report (veh)	33	2	1	16
AM-Avg	- Queuing Penalty (%)	2%	5%	0%	0%	- Queuing Penalty (%)	19%	2%	0%	3%
	- Blocking Report (veh)	5	4	0	0	- Blocking Report (veh)	42	3	1	9

	AM Peak Hour					PM Peak Hour				
	EB-L	EB-T	EB-TR	WB-L	WB-T	EB-L	EB-T	EB-TR	WB-L	WB-T
Alberts Sireet/Francis Avenue	Alberts Sireet/Francis Avenue					Alberts Sireet/Francis Avenue				
AM-1	- Queuing Penalty (%)	0%	51%	0%	0%	- Queuing Penalty (%)	0%	22%	0%	2%
	- Blocking Report (veh)	0	9	0	5	- Blocking Report (veh)	0	7	0	13
AM-2	- Queuing Penalty (%)	0%	42%	0%	0%	- Queuing Penalty (%)	0%	13%	0%	0%
	- Blocking Report (veh)	0	8	0	7	- Blocking Report (veh)	0	4	0	0
AM-3	- Queuing Penalty (%)	0%	59%	0%	0%	- Queuing Penalty (%)	0%	18%	0%	1%
	- Blocking Report (veh)	0	11	0	5	- Blocking Report (veh)	0	6	0	6
AM-4	- Queuing Penalty (%)	0%	49%	0%	1%	- Queuing Penalty (%)	0%	27%	0%	2%
	- Blocking Report (veh)	0	9	0	2	- Blocking Report (veh)	0	9	0	13
AM-5	- Queuing Penalty (%)	0%	54%	0%	0%	- Queuing Penalty (%)	0%	23%	0%	0%
	- Blocking Report (veh)	0	10	0	1	- Blocking Report (veh)	0	8	0	0
AM-Avg	- Queuing Penalty (%)	0%	51%	0%	1%	- Queuing Penalty (%)	0%	21%	0%	1%
	- Blocking Report (veh)	0	9	0	4	- Blocking Report (veh)	0	7	0	6

	AM Peak Hour					PM Peak Hour				
	EB-IT	EB-TR	WB-L	WB-TT	SB-L	EB-IT	EB-TR	WB-L	WB-TT	SB-L
Alberta Sireet/Francis Avenue	Alberta Sireet/Francis Avenue					Alberta Sireet/Francis Avenue				
AM-1	- Queuing Penalty (%)	0%	0%	0%	0%	- Queuing Penalty (%)	5%	0%	0%	0%
	- Blocking Report (veh)	1	0	0	0	- Blocking Report (veh)	10	0	0	0
AM-2	- Queuing Penalty (%)	0%	0%	0%	0%	- Queuing Penalty (%)	0%	0%	0%	0%
	- Blocking Report (veh)	1	0	0	0	- Blocking Report (veh)	0	0	2	0
AM-3	- Queuing Penalty (%)	0%	0%	0%	0%	- Queuing Penalty (%)	0%	0%	1%	0%
	- Blocking Report (veh)	0	0	0	0	- Blocking Report (veh)	0	0	3	0
AM-4	- Queuing Penalty (%)	0%	0%	0%	0%	- Queuing Penalty (%)	1%	0%	0%	0%
	- Blocking Report (veh)	0	0	0	0	- Blocking Report (veh)	2	0	0	0
AM-5	- Queuing Penalty (%)	0%	0%	0%	0%	- Queuing Penalty (%)	0%	0%	0%	0%
	- Blocking Report (veh)	0	0	0	0	- Blocking Report (veh)	0	0	1	0
AM-Avg	- Queuing Penalty (%)	0%	0%	0%	0%	- Queuing Penalty (%)	1%	0%	0%	0%
	- Blocking Report (veh)	0	0	0	0	- Blocking Report (veh)	2	0	1	0

	AM Peak Hour					PM Peak Hour				
	EB-L	EB-TT	WB-T	WB-TR	NB-L	EB-L	EB-TT	WB-T	WB-TR	NB-L
Alberta Sireet/Francis Avenue	Alberta Sireet/Francis Avenue					Alberta Sireet/Francis Avenue				
AM-1	- Queuing Penalty (%)	0%	0%	0%	0%	- Queuing Penalty (%)	0%	0%	0%	0%
	- Blocking Report (veh)	0	0	0	0	- Blocking Report (veh)	0	0	13	0
AM-2	- Queuing Penalty (%)	0%	0%	0%	0%	- Queuing Penalty (%)	0%	0%	10%	0%
	- Blocking Report (veh)	0	0	0	0	- Blocking Report (veh)	0	0	33	0
AM-3	- Queuing Penalty (%)	1%	0%	0%	0%	- Queuing Penalty (%)	0%	0%	2%	0%
	- Blocking Report (veh)	2	0	0	0	- Blocking Report (veh)	0	0	7	0
AM-4	- Queuing Penalty (%)	0%	0%	0%	0%	- Queuing Penalty (%)	0%	0%	4%	0%
	- Blocking Report (veh)	0	0	0	0	- Blocking Report (veh)	0	0	12	0
AM-5	- Queuing Penalty (%)	0%	0%	0%	0%	- Queuing Penalty (%)	0%	0%	3%	0%
	- Blocking Report (veh)	0	0	0	0	- Blocking Report (veh)	0	0	10	0
AM-Avg	- Queuing Penalty (%)	0%	0%	0%	1%	- Queuing Penalty (%)	0%	0%	5%	0%
	- Blocking Report (veh)	0	0	0	0	- Blocking Report (veh)	0	0	15	0

Future Without-Project

	AM Peak Hour, Run/Seed					PM Peak Hour, Run/Seed					Avg	HCM
	1	2	3	4	5	1	2	3	4	5		
Indian Trail/Francis Avenue	38.5	24.4	30.1	54.4	43.3	20.3	38.1	20.3	33.0	29.0	33.2	10.4
Alberta Street/Francis Avenue	71.8	80.6	74.4	78.5	76.3	65.6	76.3	65.6	135.6	131.6	131.5	53.7
Ash Street/Francis Avenue	15.5	16.9	16.5	16.9	16.6	16.5	16.5	26.1	19.5	18.8	18.5	21.3
Maple Street/Francis Avenue	11.3	10.9	11.5	10.9	12	11.3	11.3	17.6	102.3	114.0	124.8	51.4

Indian Trail/Francis Avenue		AM Peak Hour					PM Peak Hour					Indian Trail/Francis Avenue		PM Peak Hour				
		EB-L	EB-TT	WB-TT	WB-R	SB-L	SB-LR	EB-L	EB-TT	WB-TT	WB-R			SB-L	SB-LR			
AM-1	- Queuing Penalty (%)	5%	1%	0%	0%	0%	0%	PM-1	- Queuing Penalty (%)	31%	2%	0%	24%	0%	0%			
	- Blocking Report (veh)	13	1	0	0	0	0		- Blocking Report (veh)	71	4	0	76	0	0			
AM-2	- Queuing Penalty (%)	4%	4%	0%	0%	0%	0%	PM-2	- Queuing Penalty (%)	14%	2%	0%	11%	0%	0%			
	- Blocking Report (veh)	12	3	0	0	0	0		- Blocking Report (veh)	34	3	4	34	0	0			
AM-3	- Queuing Penalty (%)	2%	2%	0%	0%	0%	0%	PM-3	- Queuing Penalty (%)	23%	3%	1%	14%	0%	0%			
	- Blocking Report (veh)	5	2	0	0	0	0		- Blocking Report (veh)	53	5	10	46	0	0			
AM-4	- Queuing Penalty (%)	2%	2%	0%	0%	0%	0%	PM-4	- Queuing Penalty (%)	22%	3%	0%	13%	0%	0%			
	- Blocking Report (veh)	7	2	0	0	0	0		- Blocking Report (veh)	51	4	2	41	0	0			
AM-5	- Queuing Penalty (%)	1%	2%	0%	0%	0%	0%	PM-5	- Queuing Penalty (%)	29%	3%	0%	8%	0%	0%			
	- Blocking Report (veh)	2	2	0	0	0	0		- Blocking Report (veh)	67	5	5	25	0	0			
AM-Avg	- Queuing Penalty (%)	3%	2%	0%	0%	0%	0%	PM-Avg	- Queuing Penalty (%)	24%	3%	0%	14%	0%	0%			
	- Blocking Report (veh)	8	2	0	0	0	0		- Blocking Report (veh)	55	4	4	44	0	0			

AM Peak Hour										PM Peak Hour									
Alberts Street/Francis Avenue					Alberts Street/Francis Avenue					Alberts Street/Francis Avenue					Alberts Street/Francis Avenue				
EB-L	EB-T	EB-TR	WB-L	WB-T	WB-TR	NB-L	NB-LTR	SB-L	SB-TR	EB-L	EB-T	EB-TR	WB-L	WB-T	WB-TR	NB-L	NB-LTR	SB-L	SB-TR
AM-1										PM-1									
- Queuing Penalty (%)	0%	58%	0	16	0	0%	13%	4%	10%	- Queuing Penalty (%)	0%	27%	0%	4%	0%	3%	73%	0%	0%
- Blocking Report (veh)	0	16	0	40	1	0	40	5	8	- Blocking Report (veh)	0	11	0	28	74	0	15	0	0
AM-2										PM-2									
- Queuing Penalty (%)	0%	59%	0%	1%	1%	0%	1%	3%	15%	- Queuing Penalty (%)	0%	32%	0%	7%	48%	0%	70%	0%	0%
- Blocking Report (veh)	0	16	0	2	2	0	2	4	12	- Blocking Report (veh)	0	12	0	51	70	0	18	151	0
AM-3										PM-3									
- Queuing Penalty (%)	0%	60%	0%	0%	1%	0%	0%	8%	4%	- Queuing Penalty (%)	0%	43%	0%	8%	46%	0%	68%	0%	4%
- Blocking Report (veh)	0	16	0	1	1	0	1	7	4	- Blocking Report (veh)	0	17	0	59	66	0	8	147	2
AM-4										PM-4									
- Queuing Penalty (%)	0%	57%	0%	1%	2%	0%	1%	2%	17%	- Queuing Penalty (%)	0%	34%	0%	3%	52%	0%	8%	71%	7%
- Blocking Report (veh)	0	15	0	3	3	0	3	4	13	- Blocking Report (veh)	0	13	0	23	75	0	37	154	3
AM-5										PM-5									
- Queuing Penalty (%)	0%	57%	0%	1%	2%	0%	1%	0%	17%	- Queuing Penalty (%)	0%	36%	0%	3%	48%	0%	6%	72%	4%
- Blocking Report (veh)	0	15	0	3	2	0	3	0	14	- Blocking Report (veh)	0	14	0	25	70	0	27	154	1
AM-Avg										PM-Avg									
- Queuing Penalty (%)	0%	58%	0%	3%	1%	0%	3%	3%	13%	- Queuing Penalty (%)	0%	34%	0%	5%	49%	0%	5%	71%	3%
- Blocking Report (veh)	0	16	0	10	2	0	10	4	10	- Blocking Report (veh)	0	13	0	37	71	0	21	153	1

AM Peak Hour						PM Peak Hour							
Alberta Street/Francis Avenue	EB-TT	EB-TR	WB-L	WB-TT	SB-R	Alberta Street/Francis Avenue	EB-TT	EB-TR	WB-L	WB-TT	SB-L	SB-TT	SB-R
- Queuing Penalty (%)	0%	0%	0%	0%	0%	- Queuing Penalty (%)	0%	0%	0%	0%	0%	0%	0%
- Blocking Report (veh)	0	0	0	0	0	- Blocking Report (veh)	0	0	0	0	0	0	0
AM-1						PM-1							
- Queuing Penalty (%)	0%	0%	0%	0%	0%	- Queuing Penalty (%)	1%	0%	0%	0%	0%	0%	0%
- Blocking Report (veh)	0	0	0	0	0	- Blocking Report (veh)	1	0	0	0	0	0	0
AM-2						PM-2							
- Queuing Penalty (%)	0%	0%	0%	0%	0%	- Queuing Penalty (%)	0%	0%	0%	0%	0%	0%	0%
- Blocking Report (veh)	0	0	0	0	0	- Blocking Report (veh)	1	0	0	0	0	0	0
AM-3						PM-3							
- Queuing Penalty (%)	0%	0%	0%	0%	0%	- Queuing Penalty (%)	0%	0%	0%	0%	0%	0%	0%
- Blocking Report (veh)	0	0	0	0	0	- Blocking Report (veh)	1	0	0	0	0	0	0
AM-4						PM-4							
- Queuing Penalty (%)	0%	0%	0%	0%	0%	- Queuing Penalty (%)	0%	0%	0%	0%	0%	0%	0%
- Blocking Report (veh)	0	0	0	0	0	- Blocking Report (veh)	0	0	1	0	0	0	0
AM-5						PM-5							
- Queuing Penalty (%)	0%	0%	0%	0%	0%	- Queuing Penalty (%)	0%	0%	0%	0%	0%	0%	0%
- Blocking Report (veh)	0	0	0	0	0	- Blocking Report (veh)	0	0	0	0	0	0	0
AM-Avg						PM-Avg							
- Queuing Penalty (%)	0%	0%	0%	0%	0%	- Queuing Penalty (%)	0%	0%	0%	0%	0%	0%	0%
- Blocking Report (veh)	0	0	0	0	0	- Blocking Report (veh)	0	0	0	0	0	0	0

Alberta Street/Francis Avenue		AM Peak Hour					PM Peak Hour										
		EB-L	EB-TT	WB-T	WB-TR	NB-L	NB-LT	NB-T	NB-TR	EB-L	EB-TT	WB-T	WB-TR	NB-L	NB-LT	NB-T	NB-TR
AM-1	- Queuing Penalty (%)	0%	0%	0%	0%	0%	2%	0%	0%	0%	0%	0%	0%	0%	73%	0%	0%
	- Blocking Report (veh)	0	0	0	0	0	0	0	0	0	137	0	0	154	0	0	0
AM-2	- Queuing Penalty (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	35%	0%	0%	65%	0%	0%	0%
	- Blocking Report (veh)	2	0	0	0	0	0	0	0	0	127	0	0	137	0	0	0
AM-3	- Queuing Penalty (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%	39%	0%	0%	69%	0%	0%	0%
	- Blocking Report (veh)	0	0	0	0	0	0	0	0	0	144	0	0	146	0	0	0
AM-4	- Queuing Penalty (%)	0%	0%	0%	0%	0%	0%	2%	0%	0%	52%	0%	0%	72%	0%	0%	0%
	- Blocking Report (veh)	2	0	0	0	0	0	0	0	0	188	0	0	152	0	0	0
AM-5	- Queuing Penalty (%)	0%	0%	0%	0%	0%	1%	0%	0%	0%	20%	0%	0%	64%	0%	0%	0%
	- Blocking Report (veh)	0	0	0	0	0	0	0	0	0	74	0	0	135	0	0	0
AM-Avg	- Queuing Penalty (%)	0%	0%	0%	0%	0%	1%	0%	0%	0%	29%	0%	0%	69%	0%	0%	0%
	- Blocking Report (veh)	1	0	0	0	0	0	0	0	0	134	0	0	145	0	0	0

Future Wit-Project

	1	2	3	4	5	Avg	HCM	1	2	3	4	5	Avg	HCM
Indian Trail/Francis Avenue	35.7	52.8	46.8	41.9	40.2	43.5	29.6	36.2	40.4	35.3	37.5	34.3	36.7	10.7
Alberta Street/Francis Avenue	69.8	82.2	75.3	78.2	74.7	76.0	78.3	128.6	162.9	155.6	172.7	129.7	149.9	59.4
Ash Street/Francis Avenue	21.2	17.7	19.2	19.1	20.1	19.5	28.9	17.8	27.2	22.3	17.1	18.8	20.6	21.5
Maple Street/Francis Avenue	12.6	11.8	11.2	11.9	11.6	11.8	17.6	115.8	97.0	135.5	115.9	119.9	116.8	54.0

AM Peak Hour							PM Peak Hour						
Indian Trail/Francis Avenue							Indian Trail/Francis Avenue						
	EB-L	EB-TT	WB-TT	WB-R	SB-L	SB-LR		EB-L	EB-TT	WB-TT	WB-R	SB-L	SB-LR
AM-1	- Queuing Penalty (%)	4%	3%	0%	0%	0%	PM-1	- Queuing Penalty (%)	16%	3%	0%	16%	0%
	- Blocking Report (veh)	10	2	0	0	0		- Blocking Report (veh)	37	6	3	50	0
AM-2	- Queuing Penalty (%)	6%	3%	0%	0%	0%	PM-2	- Queuing Penalty (%)	32%	2%	0%	20%	0%
	- Blocking Report (veh)	16	3	0	0	0		- Blocking Report (veh)	74	3	5	63	0
AM-3	- Queuing Penalty (%)	8%	1%	0%	0%	0%	PM-3	- Queuing Penalty (%)	32%	2%	1%	16%	0%
	- Blocking Report (veh)	22	1	0	0	0		- Blocking Report (veh)	74	4	11	52	0
AM-4	- Queuing Penalty (%)	5%	2%	0%	0%	0%	PM-4	- Queuing Penalty (%)	21%	2%	0%	16%	0%
	- Blocking Report (veh)	15	2	0	0	0		- Blocking Report (veh)	48	4	5	52	0
AM-5	- Queuing Penalty (%)	2%	3%	0%	0%	0%	PM-5	- Queuing Penalty (%)	25%	1%	1%	16%	0%
	- Blocking Report (veh)	4	3	0	0	0		- Blocking Report (veh)	57	3	8	50	0
AM-Avg	- Queuing Penalty (%)	5%	2%	0%	0%	0%	PM-Avg	- Queuing Penalty (%)	25%	2%	0%	17%	0%
	- Blocking Report (veh)	13	2	0	0	0		- Blocking Report (veh)	58	4	6	53	0

	AM Peak Hour					PM Peak Hour				
	EB-L	EB-T	EB-TR	WB-L	WB-TT	WB-TR	NB-L	NB-LTR	SB-L	SB-TR
Alberts Street/Francis Avenue	EB-L	EB-T	EB-TR	WB-L	WB-TT	WB-TR	NB-L	NB-LTR	SB-L	SB-TR
AM-1	- Queuing Penalty (%)	0%	59%	0%	3%	1%	1%	9%	3%	9%
	- Blocking Report (veh)	0	19	0	10	1	2	8	5	7
AM-2	- Queuing Penalty (%)	0%	60%	0%	9%	1%	0%	9%	2%	13%
	- Blocking Report (veh)	0	19	0	29	1	0	8	3	10
AM-3	- Queuing Penalty (%)	0%	59%	0%	7%	1%	0%	5%	4%	17%
	- Blocking Report (veh)	0	19	0	22	1	0	4	6	14
AM-4	- Queuing Penalty (%)	0%	60%	0%	5%	0%	0%	10%	3%	11%
	- Blocking Report (veh)	0	19	0	15	0	0	9	4	9
AM-5	- Queuing Penalty (%)	0%	60%	0%	1%	3%	0%	7%	1%	15%
	- Blocking Report (veh)	0	19	0	2	4	0	6	2	12
AM-Avg	- Queuing Penalty (%)	0%	60%	0%	5%	1%	0%	8%	3%	13%
	- Blocking Report (veh)	0	19	0	16	1	0	7	4	10

Alberts Street/Francis Avenue					PM Peak Hour				
PM-1	PM-2	PM-3	PM-4	PM-5	PM-Avg	EB-T	EB-TR	WB-L	WB-TR
- Queuing Penalty (%)	- Queuing Penalty (%)	- Queuing Penalty (%)	- Queuing Penalty (%)	- Queuing Penalty (%)	- Queuing Penalty (%)	0%	36%	0%	48%
- Blocking Report (veh)	- Blocking Report (veh)	- Blocking Report (veh)	- Blocking Report (veh)	- Blocking Report (veh)	- Blocking Report (veh)	0	15	0	78
						0	36%	0%	52%
						0	15	0	75
						0	36%	0%	54%
						0	15	0	79
						0	34%	0%	54%
						0	14	0	28
						0%	24%	0%	44%
						0	10	0	45
						0%	33%	0%	50%
						0	14	0	75

	AM Peak Hour					PM Peak Hour				
	EB-TT	EB-TR	WB-L	WB-TT	SB-L	SB-TR	Alberta Street/Francis Avenue	EB-TT	EB-TR	WB-L
Alberta Street/Francis Avenue	EB-TT	EB-TR	WB-L	WB-TT	SB-L	SB-TR	Alberta Street/Francis Avenue	EB-TT	EB-TR	WB-L
AM-1	- Queuing Penalty (%)	0%	2%	0%	0%	0%	PM-1	- Queuing Penalty (%)	0%	0%
	- Blocking Report (veh)	0	9	0	0	0		- Blocking Report (veh)	0	2
AM-2	- Queuing Penalty (%)	0%	1%	0%	0%	0%	PM-2	- Queuing Penalty (%)	7%	0%
	- Blocking Report (veh)	0	4	0	0	0		- Blocking Report (veh)	17	0
AM-3	- Queuing Penalty (%)	0%	2%	0%	0%	0%	PM-3	- Queuing Penalty (%)	0%	0%
	- Blocking Report (veh)	1	10	0	0	0		- Blocking Report (veh)	0	0
AM-4	- Queuing Penalty (%)	0%	1%	0%	0%	0%	PM-4	- Queuing Penalty (%)	0%	0%
	- Blocking Report (veh)	0	4	0	0	0		- Blocking Report (veh)	0	0
AM-5	- Queuing Penalty (%)	0%	2%	0%	0%	0%	PM-5	- Queuing Penalty (%)	2%	0%
	- Blocking Report (veh)	1	11	0	0	0		- Blocking Report (veh)	4	0
AM-Avg	- Queuing Penalty (%)	0%	2%	0%	0%	0%	PM-Avg	- Queuing Penalty (%)	2%	0%
	- Blocking Report (veh)	0	8	0	0	0		- Blocking Report (veh)	4	0

Alberta Street/Francis Avenue					PM Peak Hour				
PM-1	PM-2	PM-3	PM-4	PM-5	PM-Avg	EB-TT	EB-TR	WB-L	WB-TR
- Queuing Penalty (%)	- Queuing Penalty (%)	- Queuing Penalty (%)	- Queuing Penalty (%)	- Queuing Penalty (%)	- Queuing Penalty (%)	0%	0%	0%	0%
- Blocking Report (veh)	- Blocking Report (veh)	- Blocking Report (veh)	- Blocking Report (veh)	- Blocking Report (veh)	- Blocking Report (veh)	0	0	2	0
						0	7%	0%	0%
						0	17	0	0
						0	0	0	2
						0	0	0	0
						0	0	0	0
						0	0	0	0
						0	0	0	0
						0	0	0	0
						0	0	0	0
						0	0	0	0

	AM Peak Hour					PM Peak Hour				
	EB-L	EB-TT	WB-T	WB-TR	NB-L	NB-LT	Alberta Street/Francis Avenue	EB-L	EB-TT	WB-T
Alberta Street/Francis Avenue	EB-L	EB-TT	WB-T	WB-TR	NB-L	NB-LT	Alberta Street/Francis Avenue	EB-L	EB-TT	WB-T
AM-1	- Queuing Penalty (%)	0%	0%	0%	0%	0%	PM-1	- Queuing Penalty (%)	0%	0%
	- Blocking Report (veh)	0	0	0	0	0		- Blocking Report (veh)	0	51
AM-2	- Queuing Penalty (%)	0%	0%	0%	2%	0%	PM-2	- Queuing Penalty (%)	0%	53%
	- Blocking Report (veh)	0	0	0	0	0		- Blocking Report (veh)	0	196
AM-3	- Queuing Penalty (%)	0%	0%	0%	2%	0%	PM-3	- Queuing Penalty (%)	0%	42%
	- Blocking Report (veh)	0	0	0	0	0		- Blocking Report (veh)	0	158
AM-4	- Queuing Penalty (%)	0%	0%	0%	3%	0%	PM-4	- Queuing Penalty (%)	0%	37%
	- Blocking Report (veh)	0	0	0	0	0		- Blocking Report (veh)	0	141
AM-5	- Queuing Penalty (%)	0%	0%	0%	2%	0%	PM-5	- Queuing Penalty (%)	0%	33%
	- Blocking Report (veh)	0	0	0	0	0		- Blocking Report (veh)	0	118
AM-Avg	- Queuing Penalty (%)	0%	0%	0%	2%	0%	PM-Avg	- Queuing Penalty (%)	0%	36%
	- Blocking Report (veh)	0	0	0	0	0		- Blocking Report (veh)	0	133

Alberta Street/Francis Avenue					PM Peak Hour				
PM-1	PM-2	PM-3	PM-4	PM-5	PM-Avg	EB-TT	EB-TR	WB-L	WB-TR
- Queuing Penalty (%)	- Queuing Penalty (%)	- Queuing Penalty (%)	- Queuing Penalty (%)	- Queuing Penalty (%)	- Queuing Penalty (%)	0%	0%	0%	0%
- Blocking Report (veh)	- Blocking Report (veh)	- Blocking Report (veh)	- Blocking Report (veh)	- Blocking Report (veh)	- Blocking Report (veh)	0	0	0	0
						0	51	0	162
						0	0%	0%	76%
						0	0	0	163
						0	0	0	154
						0	0%	0%	70%
						0	0	0	150
						0	0%	0%	67%
						0	0	0	145
						0	0%	0%	72%
						0	0	0	155

4: Francis Ave #14 & Indian Trail Road Performance by movement

Movement	EBL	EBT	WBT	WBR	SEL	SET	SER	All
Denied Del/Veh (s)	0.7	0.0	0.0	0.2	0.0	0.0	0.0	0.1
Total Del/Veh (s)	19.6	11.7	6.7	4.8	19.5	1.2	11.0	13.5

5: Alberta St & Francis Ave #14 Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.1	0.3	3.9	0.4	0.4
Total Del/Veh (s)	49.1	58.5	65.3	42.2	12.8	18.1	48.4	49.8	45.8	43.8	47.8	27.5

5: Alberta St & Francis Ave #14 Performance by movement

Movement	All
Denied Del/Veh (s)	0.1
Total Del/Veh (s)	44.3

6: Ash St #4S & Francis Ave #14 Performance by movement

Movement	EBT	EBR	WBL	WBT	SBL	SBT	SBR	All
Denied Del/Veh (s)	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0
Total Del/Veh (s)	20.1	23.9	37.9	8.2	25.1	16.4	8.2	17.2

7: Maple St #3N & Francis Ave #14 Performance by movement

Movement	EBL	EBT	WBT	WBR	NBL	NBT	NBR	All
Denied Del/Veh (s)	0.6	0.1	0.0	0.0	0.0	0.0	0.0	0.1
Total Del/Veh (s)	24.8	5.4	12.5	5.8	45.9	29.7	24.7	14.4

Total Zone Performance

Movement	All
Denied Del/Veh (s)	0.8
Total Del/Veh (s)	210.7

Queuing and Blocking Report
Existing - AM Peak Hour

5/23/2016

Intersection: 4: Francis Ave #14 & Indian Trail Road

Movement	EB	EB	EB	WB	WB	SE	SE
Directions Served	L	T	T	T	T	L	LR
Maximum Queue (ft)	99	158	145	120	98	281	273
Average Queue (ft)	39	76	78	48	51	179	186
95th Queue (ft)	79	127	117	91	82	263	259
Link Distance (ft)		1080	1080	1066	1066	1036	1036
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)	75						
Storage Blk Time (%)	1	7					
Queuing Penalty (veh)	3	5					

Intersection: 5: Alberta St & Francis Ave #14

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	LTR	L	TR
Maximum Queue (ft)	199	788	837	199	262	181	175	254	125	249
Average Queue (ft)	20	496	520	86	98	118	87	146	58	94
95th Queue (ft)	81	698	715	156	178	173	180	230	112	185
Link Distance (ft)		1169	1169		1382	1382		1801		497
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	175			175			150		100	
Storage Blk Time (%)		51		2	0		0	11	3	11
Queuing Penalty (veh)		9		5	0		0	8	4	8

Intersection: 6: Ash St #4S & Francis Ave #14

Movement	EB	EB	EB	WB	WB	WB	SB	SB	SB	SB
Directions Served	T	T	TR	L	T	T	L	T	T	R
Maximum Queue (ft)	153	340	318	153	137	132	293	201	190	218
Average Queue (ft)	54	170	201	73	71	41	143	136	133	82
95th Queue (ft)	115	304	323	130	124	114	217	196	192	140
Link Distance (ft)		1577	1577	256	256	256	499	499	499	
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	300									400
Storage Blk Time (%)		0								
Queuing Penalty (veh)		1								

Queuing and Blocking Report
Existing - AM Peak Hour

5/23/2016

Intersection: 7: Maple St #3N & Francis Ave #14

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB
Directions Served	L	T	T	T	T	TR	L	LT	T	TR
Maximum Queue (ft)	189	136	115	93	136	132	30	168	227	265
Average Queue (ft)	109	66	61	31	71	63	2	69	110	143
95th Queue (ft)	184	126	116	63	117	114	14	146	184	219
Link Distance (ft)	256	256	256		287	287		1256	1256	1256
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)				300			115			
Storage Blk Time (%)								1		
Queuing Penalty (veh)								0		

Zone Summary

Zone wide Queuing Penalty: 44

4: Francis Ave #14 & Indian Trail Road Performance by movement

Movement	EBL	EBT	WBT	WBR	SEL	SET	SER	All
Denied Del/Veh (s)	0.7	0.0	0.0	0.2	0.0	0.0	0.2	0.0
Total Del/Veh (s)	20.9	11.5	7.6	4.8	19.6	0.8	13.6	13.7

5: Alberta St & Francis Ave #14 Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.1	0.2	3.9	0.4	0.4
Total Del/Veh (s)	46.8	48.4	56.4	39.7	12.8	18.5	42.2	49.6	31.9	40.1	46.5	22.5

5: Alberta St & Francis Ave #14 Performance by movement

Movement	All
Denied Del/Veh (s)	0.2
Total Del/Veh (s)	37.2

6: Ash St #4S & Francis Ave #14 Performance by movement

Movement	EBT	EBR	WBL	WBT	SBL	SBT	SBR	All
Denied Del/Veh (s)	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0
Total Del/Veh (s)	18.9	24.1	37.3	7.3	24.8	16.4	9.0	16.9

7: Maple St #3N & Francis Ave #14 Performance by movement

Movement	EBL	EBT	WBT	WBR	NBL	NBT	NBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	25.2	5.2	13.5	11.9	18.0	25.9	19.8	13.6

Total Zone Performance

Movement	All
Denied Del/Veh (s)	0.7
Total Del/Veh (s)	199.2

Queuing and Blocking Report
Existing - AM Peak Hour

5/23/2016

Intersection: 4: Francis Ave #14 & Indian Trail Road

Movement	EB	EB	EB	WB	WB	SE	SE
Directions Served	L	T	T	T	T	L	LR
Maximum Queue (ft)	99	137	158	95	116	338	306
Average Queue (ft)	43	72	80	46	61	168	176
95th Queue (ft)	84	123	135	91	105	268	270
Link Distance (ft)		1080	1080	1066	1066	1036	1036
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)	75						
Storage Blk Time (%)	2	5					
Queuing Penalty (veh)	5	4					

Intersection: 5: Alberta St & Francis Ave #14

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	LTR	L	TR
Maximum Queue (ft)	199	679	732	200	238	240	174	228	124	216
Average Queue (ft)	28	420	442	98	92	119	55	117	64	87
95th Queue (ft)	125	643	670	185	186	195	131	187	111	167
Link Distance (ft)		1169	1169		1382	1382		1801		497
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	175			175			150		100	
Storage Blk Time (%)		42		2	0		0	4	2	14
Queuing Penalty (veh)		8		7	1		0	3	3	11

Intersection: 6: Ash St #4S & Francis Ave #14

Movement	EB	EB	EB	WB	WB	WB	SB	SB	SB	SB
Directions Served	T	T	TR	L	T	T	L	T	T	R
Maximum Queue (ft)	158	306	391	132	155	152	320	180	208	141
Average Queue (ft)	50	154	185	81	57	36	157	127	137	84
95th Queue (ft)	126	266	322	126	122	106	262	180	203	136
Link Distance (ft)		1577	1577	256	256	256	499	499	499	
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	300									400
Storage Blk Time (%)		0								
Queuing Penalty (veh)		1								

Queuing and Blocking Report
Existing - AM Peak Hour

5/23/2016

Intersection: 7: Maple St #3N & Francis Ave #14

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB
Directions Served	L	T	T	T	T	TR	LT	T	TR
Maximum Queue (ft)	265	162	164	92	138	194	129	183	220
Average Queue (ft)	114	77	77	34	90	89	52	95	133
95th Queue (ft)	197	132	136	74	129	161	105	156	199
Link Distance (ft)	256	256	256		287	287	1256	1256	1256
Upstream Blk Time (%)	0								
Queuing Penalty (veh)	1								
Storage Bay Dist (ft)				300					
Storage Blk Time (%)							0		
Queuing Penalty (veh)							0		

Zone Summary

Zone wide Queuing Penalty: 43

4: Francis Ave #14 & Indian Trail Road Performance by movement

Movement	EBL	EBT	WBT	WBR	SEL	SET	SER	All
Denied Del/Veh (s)	0.4	0.0	0.0	0.2	0.0	0.0	0.0	0.0
Total Del/Veh (s)	18.6	11.8	7.5	4.3	20.3	1.0	15.7	14.0

5: Alberta St & Francis Ave #14 Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.4	0.3	3.8	0.4	0.2
Total Del/Veh (s)	127.3	139.9	167.8	47.3	12.6	15.2	43.3	53.1	36.0	49.8	45.4	29.5

5: Alberta St & Francis Ave #14 Performance by movement

Movement	All
Denied Del/Veh (s)	0.2
Total Del/Veh (s)	87.8

6: Ash St #4S & Francis Ave #14 Performance by movement

Movement	EBT	EBR	WBL	WBT	SBL	SBT	SBR	All
Denied Del/Veh (s)	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0
Total Del/Veh (s)	18.9	20.8	38.0	7.0	26.7	16.9	7.0	16.7

7: Maple St #3N & Francis Ave #14 Performance by movement

Movement	EBL	EBT	WBT	WBR	NBL	NBT	NBR	All
Denied Del/Veh (s)	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	28.1	5.8	14.0	11.5	26.3	28.5	27.2	15.4

Total Zone Performance

Movement	All
Denied Del/Veh (s)	0.7
Total Del/Veh (s)	326.7

Queuing and Blocking Report
Existing - AM Peak Hour

5/23/2016

Intersection: 4: Francis Ave #14 & Indian Trail Road

Movement	EB	EB	EB	WB	WB	SE	SE
Directions Served	L	T	T	T	T	L	LR
Maximum Queue (ft)	98	134	129	134	144	339	354
Average Queue (ft)	49	78	83	53	60	185	191
95th Queue (ft)	89	126	126	99	107	278	272
Link Distance (ft)		1080	1080	1066	1066	1036	1036
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)	75						
Storage Blk Time (%)	2	6					
Queuing Penalty (veh)	5	5					

Intersection: 5: Alberta St & Francis Ave #14

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	LTR	L	TR
Maximum Queue (ft)	199	1207	1191	197	330	290	174	250	124	233
Average Queue (ft)	36	1007	1041	96	105	120	80	139	70	109
95th Queue (ft)	142	1361	1380	168	205	206	186	228	134	195
Link Distance (ft)		1169	1169		1382	1382		1801		497
Upstream Blk Time (%)		6	8							
Queuing Penalty (veh)		44	64							
Storage Bay Dist (ft)	175			175			150		100	
Storage Blk Time (%)	0	59		2	0		0	8	3	13
Queuing Penalty (veh)	0	11		5	1		0	5	4	10

Intersection: 6: Ash St #4S & Francis Ave #14

Movement	EB	EB	EB	WB	WB	WB	SB	SB	SB	SB
Directions Served	T	T	TR	L	T	T	L	T	T	R
Maximum Queue (ft)	301	263	322	132	165	128	254	214	214	130
Average Queue (ft)	77	162	178	74	61	24	143	131	137	72
95th Queue (ft)	195	281	309	113	127	84	229	186	180	108
Link Distance (ft)		1577	1577	256	256	256	499	499	499	
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	300									400
Storage Blk Time (%)	0									
Queuing Penalty (veh)	0									

Queuing and Blocking Report
Existing - AM Peak Hour

5/23/2016

Intersection: 7: Maple St #3N & Francis Ave #14

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB
Directions Served	L	T	T	T	T	TR	L	LT	T	TR
Maximum Queue (ft)	271	156	154	75	141	142	30	161	201	239
Average Queue (ft)	121	75	83	37	89	86	3	76	111	149
95th Queue (ft)	225	132	137	73	136	149	17	145	167	225
Link Distance (ft)	256	256	256		287	287		1256	1256	1256
Upstream Blk Time (%)	1									
Queuing Penalty (veh)	2									
Storage Bay Dist (ft)				300			115			
Storage Blk Time (%)								2		
Queuing Penalty (veh)								0		

Zone Summary

Zone wide Queuing Penalty: 157

4: Francis Ave #14 & Indian Trail Road Performance by movement

Movement	EBL	EBT	WBT	WBR	SEL	SET	SER	All
Denied Del/Veh (s)	0.5	0.0	0.0	0.2	0.0	0.0	0.3	0.0
Total Del/Veh (s)	21.6	11.8	6.9	5.4	20.9	1.3	15.3	14.6

5: Alberta St & Francis Ave #14 Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.2	0.3	3.9	0.5	0.3
Total Del/Veh (s)	71.8	83.2	88.1	36.9	14.0	10.4	44.5	56.8	36.2	46.5	48.4	32.7

5: Alberta St & Francis Ave #14 Performance by movement

Movement	All
Denied Del/Veh (s)	0.2
Total Del/Veh (s)	57.1

6: Ash St #4S & Francis Ave #14 Performance by movement

Movement	EBT	EBR	WBL	WBT	SBL	SBT	SBR	All
Denied Del/Veh (s)	0.0	0.0	0.9	0.2	0.0	0.0	0.0	0.1
Total Del/Veh (s)	18.2	22.2	50.2	6.9	25.3	16.2	9.7	17.2

7: Maple St #3N & Francis Ave #14 Performance by movement

Movement	EBL	EBT	WBT	WBR	NBL	NBT	NBR	All
Denied Del/Veh (s)	0.3	0.2	0.0	0.0	0.0	0.0	0.0	0.1
Total Del/Veh (s)	27.6	5.1	12.5	10.5	19.4	28.0	25.7	14.2

Total Zone Performance

Movement	All
Denied Del/Veh (s)	1.0
Total Del/Veh (s)	249.1

Queuing and Blocking Report
Existing - AM Peak Hour

5/23/2016

Intersection: 4: Francis Ave #14 & Indian Trail Road

Movement	EB	EB	EB	WB	WB	SE	SE
Directions Served	L	T	T	T	T	L	LR
Maximum Queue (ft)	74	136	188	116	140	320	309
Average Queue (ft)	44	76	86	53	56	189	199
95th Queue (ft)	73	127	142	106	101	297	283
Link Distance (ft)		1080	1080	1066	1066	1036	1036
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)	75						
Storage Blk Time (%)	2	6					
Queuing Penalty (veh)	5	5					

Intersection: 5: Alberta St & Francis Ave #14

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	LTR	L	TR
Maximum Queue (ft)	200	1194	1182	199	229	264	174	268	125	185
Average Queue (ft)	26	638	656	87	92	122	66	149	80	107
95th Queue (ft)	123	1180	1197	163	169	212	165	245	136	174
Link Distance (ft)		1169	1169		1382	1382		1801		497
Upstream Blk Time (%)		2	4							
Queuing Penalty (veh)		19	32							
Storage Bay Dist (ft)	175			175			150		100	
Storage Blk Time (%)		49		1	0		0	8	2	14
Queuing Penalty (veh)		9		2	1		0	6	3	11

Intersection: 6: Ash St #4S & Francis Ave #14

Movement	EB	EB	EB	WB	WB	WB	SB	SB	SB	SB
Directions Served	T	T	TR	L	T	T	L	T	T	R
Maximum Queue (ft)	249	252	370	245	134	141	265	223	244	203
Average Queue (ft)	60	157	188	99	53	38	163	124	138	82
95th Queue (ft)	147	256	312	188	110	104	247	200	213	153
Link Distance (ft)		1577	1577	256	256	256	499	499	499	
Upstream Blk Time (%)				0						
Queuing Penalty (veh)				0						
Storage Bay Dist (ft)	300									400
Storage Blk Time (%)										
Queuing Penalty (veh)										

Queuing and Blocking Report
Existing - AM Peak Hour

5/23/2016

Intersection: 7: Maple St #3N & Francis Ave #14

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB
Directions Served	L	T	T	T	T	TR	LT	T	TR
Maximum Queue (ft)	242	164	166	142	136	176	209	231	227
Average Queue (ft)	110	65	65	38	85	77	61	110	145
95th Queue (ft)	201	108	115	99	122	139	133	176	214
Link Distance (ft)	256	256	256		287	287	1256	1256	1256
Upstream Blk Time (%)	0								
Queuing Penalty (veh)	0								
Storage Bay Dist (ft)				300					
Storage Blk Time (%)							1		
Queuing Penalty (veh)							0		

Zone Summary

Zone wide Queuing Penalty: 91

4: Francis Ave #14 & Indian Trail Road Performance by movement

Movement	EBL	EBT	WBT	WBR	SEL	SET	SER	All
Denied Del/Veh (s)	0.4	0.0	0.0	0.1	0.0	0.0	0.1	0.0
Total Del/Veh (s)	23.0	10.8	6.8	4.3	23.8	1.1	17.1	15.7

5: Alberta St & Francis Ave #14 Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.2	3.8	0.4	0.4
Total Del/Veh (s)	84.3	83.5	99.7	42.3	13.7	18.6	40.8	45.6	33.3	33.7	47.1	23.8

5: Alberta St & Francis Ave #14 Performance by movement

Movement	All
Denied Del/Veh (s)	0.2
Total Del/Veh (s)	56.8

6: Ash St #4S & Francis Ave #14 Performance by movement

Movement	EBT	EBR	WBL	WBT	SBL	SBT	SBR	All
Denied Del/Veh (s)	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	18.8	26.8	37.1	6.6	24.1	16.4	7.7	16.6

7: Maple St #3N & Francis Ave #14 Performance by movement

Movement	EBL	EBT	WBT	WBR	NBL	NBT	NBR	All
Denied Del/Veh (s)	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	28.7	5.0	14.1	8.3	24.5	26.4	22.3	14.7

Total Zone Performance

Movement	All
Denied Del/Veh (s)	0.7
Total Del/Veh (s)	247.5

Queuing and Blocking Report
Existing - AM Peak Hour

5/23/2016

Intersection: 4: Francis Ave #14 & Indian Trail Road

Movement	EB	EB	EB	WB	WB	SE	SE
Directions Served	L	T	T	T	T	L	LR
Maximum Queue (ft)	100	112	100	80	94	381	348
Average Queue (ft)	42	63	62	45	49	193	202
95th Queue (ft)	77	97	96	76	86	310	304
Link Distance (ft)		1080	1080	1066	1066	1036	1036
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)	75						
Storage Blk Time (%)	2	3					
Queuing Penalty (veh)	6	2					

Intersection: 5: Alberta St & Francis Ave #14

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	LTR	L	TR
Maximum Queue (ft)	200	1054	1099	156	202	237	174	263	125	194
Average Queue (ft)	28	655	668	96	84	112	67	132	77	100
95th Queue (ft)	107	1062	1084	155	163	189	158	217	133	179
Link Distance (ft)		1169	1169		1382	1382		1801		497
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	175			175			150		100	
Storage Blk Time (%)		54		0	0		0	7	3	15
Queuing Penalty (veh)		10		0	1		0	5	5	12

Intersection: 6: Ash St #4S & Francis Ave #14

Movement	EB	EB	EB	WB	WB	WB	SB	SB	SB	SB
Directions Served	T	T	TR	L	T	T	L	T	T	R
Maximum Queue (ft)	249	271	321	132	112	89	271	250	223	146
Average Queue (ft)	79	150	183	73	52	21	136	119	129	75
95th Queue (ft)	162	260	303	121	99	65	217	185	186	130
Link Distance (ft)		1577	1577	256	256	256	499	499	499	
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	300									400
Storage Blk Time (%)										
Queuing Penalty (veh)										

Queuing and Blocking Report
Existing - AM Peak Hour

5/23/2016

Intersection: 7: Maple St #3N & Francis Ave #14

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB
Directions Served	L	T	T	T	T	TR	L	LT	T	TR
Maximum Queue (ft)	236	117	156	75	139	159	29	187	182	220
Average Queue (ft)	132	64	69	35	89	74	1	64	120	148
95th Queue (ft)	205	109	121	71	135	135	10	140	182	217
Link Distance (ft)	256	256	256		287	287		1256	1256	1256
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)				300			115			
Storage Blk Time (%)								2		
Queuing Penalty (veh)								0		

Zone Summary

Zone wide Queuing Penalty: 40

4: Francis Ave #14 & Indian Trail Road Performance by movement

Movement	EBL	EBT	WBT	WBR	SEL	SET	SER	All
Denied Del/Veh (s)	0.1	0.0	0.1	0.8	0.0	0.0	0.0	0.3
Total Del/Veh (s)	30.2	8.2	10.4	19.3	16.8	0.4	6.0	15.1

5: Alberta St & Francis Ave #14 Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.0	0.0	0.0	2.8	1.6	0.0	0.4	0.5	0.5	4.0	0.2	0.2
Total Del/Veh (s)	32.6	35.8	35.8	128.8	122.4	149.7	186.2	204.5	196.9	48.2	47.5	26.8

5: Alberta St & Francis Ave #14 Performance by movement

Movement	All
Denied Del/Veh (s)	0.9
Total Del/Veh (s)	105.0

6: Ash St #4S & Francis Ave #14 Performance by movement

Movement	EBT	EBR	WBL	WBT	SBL	SBT	SBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
Total Del/Veh (s)	23.4	24.2	32.8	5.5	30.9	23.7	23.1	18.0

7: Maple St #3N & Francis Ave #14 Performance by movement

Movement	EBL	EBT	WBT	WBR	NBL	NBT	NBR	All
Denied Del/Veh (s)	4.1	2.5	0.0	0.0	0.0	0.0	0.0	0.9
Total Del/Veh (s)	59.9	12.2	24.7	26.0	84.4	94.5	96.9	48.9

Total Zone Performance

Movement	All
Denied Del/Veh (s)	5.6
Total Del/Veh (s)	683.6

Queuing and Blocking Report
Existing - PM Peak Hour

5/23/2016

Intersection: 4: Francis Ave #14 & Indian Trail Road

Movement	EB	EB	EB	WB	WB	WB	SE	SE
Directions Served	L	T	T	T	T	R	L	LR
Maximum Queue (ft)	99	162	116	175	465	280	169	175
Average Queue (ft)	71	60	63	87	124	55	74	93
95th Queue (ft)	110	120	112	153	324	235	128	143
Link Distance (ft)		1080	1080	1066	1066		1036	1036
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)	75					255		
Storage Blk Time (%)	20	2			0	4		
Queuing Penalty (veh)	45	3			1	11		

Intersection: 5: Alberta St & Francis Ave #14

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	LTR	L	TR
Maximum Queue (ft)	200	406	383	200	1202	1243	174	1204	124	134
Average Queue (ft)	47	258	269	143	825	852	166	850	34	51
95th Queue (ft)	150	377	377	246	1229	1243	198	1221	78	105
Link Distance (ft)		1169	1169		1382	1382		1801		497
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	175			175			150		100	
Storage Blk Time (%)		22		2	55		6	73	1	4
Queuing Penalty (veh)		7		13	78		25	136	1	1

Intersection: 6: Ash St #4S & Francis Ave #14

Movement	EB	EB	EB	WB	WB	WB	SB	SB	SB	SB
Directions Served	T	T	TR	L	T	T	L	T	T	R
Maximum Queue (ft)	322	366	260	222	155	153	244	179	197	343
Average Queue (ft)	116	117	140	119	75	77	130	128	134	135
95th Queue (ft)	247	240	235	185	129	134	219	175	189	244
Link Distance (ft)		1577	1577	256	256	256	499	499	499	
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	300									400
Storage Blk Time (%)	5									
Queuing Penalty (veh)	10									

Queuing and Blocking Report
Existing - PM Peak Hour

5/23/2016

Intersection: 7: Maple St #3N & Francis Ave #14

Movement	EB	EB	EB	WB	WB	WB	B471	B471	NB	NB	NB	NB
Directions Served	L	T	T	T	T	TR	T	T	L	LT	T	TR
Maximum Queue (ft)	279	251	283	286	357	357	32	83	140	699	661	659
Average Queue (ft)	207	125	118	80	254	254	1	5	59	409	421	441
95th Queue (ft)	305	221	245	175	343	343	10	33	148	600	609	609
Link Distance (ft)	256	256	256		287	287	232	232		1256	1256	1256
Upstream Blk Time (%)	16	0	0	0	4	3						
Queuing Penalty (veh)	47	0	1	0	27	24						
Storage Bay Dist (ft)				300					115			
Storage Blk Time (%)				0	4					65		
Queuing Penalty (veh)				0	13					118		

Zone Summary

Zone wide Queuing Penalty: 561

4: Francis Ave #14 & Indian Trail Road Performance by movement

Movement	EBL	EBT	WBT	WBR	SEL	SET	SER	All
Denied Del/Veh (s)	0.2	0.0	0.0	0.3	0.0	0.0	0.0	0.1
Total Del/Veh (s)	42.4	7.8	8.5	17.8	17.6	0.8	7.0	14.8

5: Alberta St & Francis Ave #14 Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.2	0.0	0.5	0.5	0.6	3.7	0.3	0.4
Total Del/Veh (s)	32.7	33.4	28.5	93.2	101.1	106.5	141.0	139.1	135.7	49.2	44.3	25.3

5: Alberta St & Francis Ave #14 Performance by movement

Movement	All
Denied Del/Veh (s)	0.2
Total Del/Veh (s)	86.5

6: Ash St #4S & Francis Ave #14 Performance by movement

Movement	EBT	EBR	WBL	WBT	SBL	SBT	SBR	All
Denied Del/Veh (s)	0.0	0.0	0.7	0.2	0.0	0.0	0.0	0.1
Total Del/Veh (s)	15.1	18.3	35.7	6.2	25.9	23.6	21.0	16.0

7: Maple St #3N & Francis Ave #14 Performance by movement

Movement	EBL	EBT	WBT	WBR	NBL	NBT	NBR	All
Denied Del/Veh (s)	2.1	0.7	0.0	0.0	0.0	0.0	0.0	0.3
Total Del/Veh (s)	45.9	10.1	28.9	28.1	264.2	294.1	299.5	120.3

Total Zone Performance

Movement	All
Denied Del/Veh (s)	2.0
Total Del/Veh (s)	830.0

Queuing and Blocking Report
Existing - PM Peak Hour

5/23/2016

Intersection: 4: Francis Ave #14 & Indian Trail Road

Movement	EB	EB	EB	WB	WB	WB	SE	SE
Directions Served	L	T	T	T	T	R	L	LR
Maximum Queue (ft)	100	290	133	162	543	280	148	214
Average Queue (ft)	77	86	63	74	110	42	64	91
95th Queue (ft)	109	198	109	127	296	203	125	163
Link Distance (ft)		1080	1080	1066	1066		1036	1036
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)	75					255		
Storage Blk Time (%)	29	2				3		
Queuing Penalty (veh)	65	2				9		

Intersection: 5: Alberta St & Francis Ave #14

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	LTR	L	TR
Maximum Queue (ft)	199	394	375	199	980	994	174	1324	92	116
Average Queue (ft)	32	220	238	138	677	713	167	715	32	49
95th Queue (ft)	111	349	359	230	910	946	208	1102	71	88
Link Distance (ft)		1169	1169		1382	1382		1801		497
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	175			175			150		100	
Storage Blk Time (%)		13		0	54		2	69	0	1
Queuing Penalty (veh)		4		0	77		9	128	0	0

Intersection: 6: Ash St #4S & Francis Ave #14

Movement	EB	EB	EB	WB	WB	WB	SB	SB	SB	SB
Directions Served	T	T	TR	L	T	T	L	T	T	R
Maximum Queue (ft)	153	192	212	264	187	172	183	237	258	322
Average Queue (ft)	62	86	114	151	91	86	102	138	145	129
95th Queue (ft)	132	170	205	264	156	162	164	203	215	228
Link Distance (ft)		1577	1577	256	256	256	499	499	499	
Upstream Blk Time (%)				0						
Queuing Penalty (veh)				2						
Storage Bay Dist (ft)	300									400
Storage Blk Time (%)										
Queuing Penalty (veh)										

Queuing and Blocking Report
Existing - PM Peak Hour

5/23/2016

Intersection: 7: Maple St #3N & Francis Ave #14

Movement	EB	EB	EB	WB	WB	WB	B471	B471	NB	NB	NB	NB
Directions Served	L	T	T	T	T	TR	T	T	L	LT	T	TR
Maximum Queue (ft)	279	188	194	286	376	364	216	205	140	1345	1335	1344
Average Queue (ft)	183	100	92	172	279	284	34	27	52	1102	1092	1091
95th Queue (ft)	262	172	173	346	404	394	136	126	143	1557	1558	1554
Link Distance (ft)	256	256	256		287	287	232	232		1256	1256	1256
Upstream Blk Time (%)	3			0	10	12	0			44	32	29
Queuing Penalty (veh)	8			0	71	81	0			0	0	0
Storage Bay Dist (ft)				300					115			
Storage Blk Time (%)				0	10				0	67		
Queuing Penalty (veh)				1	33				0	121		

Intersection: 7: Maple St #3N & Francis Ave #14

Movement	B476	B476	B472	B472
Directions Served	T	T	T	T
Maximum Queue (ft)	765	766	234	234
Average Queue (ft)	255	265	21	17
95th Queue (ft)	731	749	117	97
Link Distance (ft)	691	691	219	219
Upstream Blk Time (%)	11	10	1	1
Queuing Penalty (veh)	0	0	0	0
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Zone Summary

Zone wide Queuing Penalty: 611

4: Francis Ave #14 & Indian Trail Road Performance by movement

Movement	EBL	EBT	WBT	WBR	SEL	SET	SER	All
Denied Del/Veh (s)	0.2	0.0	0.1	0.6	0.0	0.0	0.0	0.2
Total Del/Veh (s)	22.4	7.4	10.5	16.9	17.9	1.0	6.2	13.8

5: Alberta St & Francis Ave #14 Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.0	0.0	0.0	0.1	0.0	0.0	0.6	0.6	0.5	3.9	0.3	0.2
Total Del/Veh (s)	31.9	36.1	31.7	54.5	55.1	53.5	186.5	196.6	159.1	45.1	47.2	38.0

5: Alberta St & Francis Ave #14 Performance by movement

Movement	All
Denied Del/Veh (s)	0.2
Total Del/Veh (s)	74.8

6: Ash St #4S & Francis Ave #14 Performance by movement

Movement	EBT	EBR	WBL	WBT	SBL	SBT	SBR	All
Denied Del/Veh (s)	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0
Total Del/Veh (s)	18.8	20.3	34.5	5.4	28.7	24.1	19.8	16.7

7: Maple St #3N & Francis Ave #14 Performance by movement

Movement	EBL	EBT	WBT	WBR	NBL	NBT	NBR	All
Denied Del/Veh (s)	4.8	3.3	0.0	0.0	0.0	0.0	0.0	1.1
Total Del/Veh (s)	56.6	11.8	25.5	24.2	103.8	116.6	114.7	55.7

Total Zone Performance

Movement	All
Denied Del/Veh (s)	4.1
Total Del/Veh (s)	584.9

Queuing and Blocking Report
Existing - PM Peak Hour

5/23/2016

Intersection: 4: Francis Ave #14 & Indian Trail Road

Movement	EB	EB	EB	WB	WB	WB	SE	SE
Directions Served	L	T	T	T	T	R	L	LR
Maximum Queue (ft)	100	162	122	429	593	280	156	180
Average Queue (ft)	61	60	62	92	121	44	82	100
95th Queue (ft)	98	117	101	208	362	209	146	164
Link Distance (ft)		1080	1080	1066	1066		1036	1036
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)	75					255		
Storage Blk Time (%)	8	2			0	2		
Queuing Penalty (veh)	18	3			1	6		

Intersection: 5: Alberta St & Francis Ave #14

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	LTR	L	TR
Maximum Queue (ft)	200	441	444	200	590	673	174	1588	95	115
Average Queue (ft)	47	244	255	137	386	421	173	943	38	54
95th Queue (ft)	136	370	383	244	570	599	182	1625	79	98
Link Distance (ft)		1169	1169		1382	1382		1801		497
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	175			175			150		100	
Storage Blk Time (%)		18		1	40		5	63	0	1
Queuing Penalty (veh)		6		6	57		22	116	0	0

Intersection: 6: Ash St #4S & Francis Ave #14

Movement	EB	EB	EB	WB	WB	WB	SB	SB	SB	SB
Directions Served	T	T	TR	L	T	T	L	T	T	R
Maximum Queue (ft)	218	236	235	264	160	173	231	202	203	302
Average Queue (ft)	73	102	126	142	65	69	118	138	142	139
95th Queue (ft)	181	202	229	236	116	132	196	197	199	244
Link Distance (ft)		1577	1577	256	256	256	499	499	499	
Upstream Blk Time (%)				1						
Queuing Penalty (veh)				3						
Storage Bay Dist (ft)	300									400
Storage Blk Time (%)										
Queuing Penalty (veh)										

Queuing and Blocking Report
Existing - PM Peak Hour

5/23/2016

Intersection: 7: Maple St #3N & Francis Ave #14

Movement	EB	EB	EB	WB	WB	WB	B471	NB	NB	NB	NB
Directions Served	L	T	T	T	T	TR	T	L	LT	T	TR
Maximum Queue (ft)	274	194	245	286	357	341	31	140	836	737	777
Average Queue (ft)	197	120	102	102	249	250	1	65	478	479	495
95th Queue (ft)	288	181	179	229	327	341	10	151	733	719	726
Link Distance (ft)	256	256	256		287	287	232		1256	1256	1256
Upstream Blk Time (%)	8		0	0	2	4					
Queuing Penalty (veh)	24		0	0	14	25					
Storage Bay Dist (ft)				300				115			
Storage Blk Time (%)				0	2			0	62		
Queuing Penalty (veh)				1	6			0	113		

Zone Summary

Zone wide Queuing Penalty: 420

4: Francis Ave #14 & Indian Trail Road Performance by movement

Movement	EBL	EBT	WBT	WBR	SEL	SET	SER	All
Denied Del/Veh (s)	0.1	0.0	0.1	0.8	0.0	0.0	0.0	0.3
Total Del/Veh (s)	34.7	7.2	10.2	17.2	17.6	0.3	8.5	14.5

5: Alberta St & Francis Ave #14 Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.0	0.0	0.0	0.2	0.0	0.0	0.7	0.6	0.9	4.1	0.1	0.3
Total Del/Veh (s)	37.3	39.5	37.4	71.9	69.3	76.3	215.0	220.9	202.6	46.7	50.5	33.4

5: Alberta St & Francis Ave #14 Performance by movement

Movement	All
Denied Del/Veh (s)	0.2
Total Del/Veh (s)	87.7

6: Ash St #4S & Francis Ave #14 Performance by movement

Movement	EBT	EBR	WBL	WBT	SBL	SBT	SBR	All
Denied Del/Veh (s)	0.0	0.0	0.2	0.1	0.0	0.0	0.1	0.1
Total Del/Veh (s)	22.0	18.3	31.2	5.6	30.3	23.2	20.2	17.3

7: Maple St #3N & Francis Ave #14 Performance by movement

Movement	EBL	EBT	WBT	WBR	NBL	NBT	NBR	All
Denied Del/Veh (s)	5.7	3.6	0.0	0.0	0.0	0.0	0.0	1.3
Total Del/Veh (s)	63.5	14.2	25.4	26.6	112.9	129.0	130.8	61.0

Total Zone Performance

Movement	All
Denied Del/Veh (s)	4.8
Total Del/Veh (s)	622.0

Queuing and Blocking Report
Existing - PM Peak Hour

5/23/2016

Intersection: 4: Francis Ave #14 & Indian Trail Road

Movement	EB	EB	EB	WB	WB	WB	SE	SE
Directions Served	L	T	T	T	T	R	L	LR
Maximum Queue (ft)	100	282	189	152	528	280	246	250
Average Queue (ft)	72	91	73	80	121	28	98	113
95th Queue (ft)	109	207	146	133	313	167	177	199
Link Distance (ft)		1080	1080	1066	1066		1036	1036
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)	75					255		
Storage Blk Time (%)	21	2			0	2		
Queuing Penalty (veh)	49	3			1	5		

Intersection: 5: Alberta St & Francis Ave #14

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	LTR	L	TR
Maximum Queue (ft)	200	386	398	200	800	824	175	1816	92	97
Average Queue (ft)	65	270	283	134	511	545	168	1071	41	50
95th Queue (ft)	190	377	393	248	743	792	205	1975	81	88
Link Distance (ft)		1169	1169		1382	1382		1801		497
Upstream Blk Time (%)								3		
Queuing Penalty (veh)								0		
Storage Bay Dist (ft)	175			175			150		100	
Storage Blk Time (%)		27		2	45		5	71	0	1
Queuing Penalty (veh)		9		13	64		21	132	0	1

Intersection: 6: Ash St #4S & Francis Ave #14

Movement	EB	EB	EB	WB	WB	WB	SB	SB	SB	SB
Directions Served	T	T	TR	L	T	T	L	T	T	R
Maximum Queue (ft)	306	339	255	214	137	167	285	200	243	243
Average Queue (ft)	115	111	120	130	82	72	123	135	138	116
95th Queue (ft)	251	239	225	205	129	130	214	201	210	208
Link Distance (ft)		1577	1577	256	256	256	499	499	499	
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	300									400
Storage Blk Time (%)	1									
Queuing Penalty (veh)	2									

Queuing and Blocking Report
Existing - PM Peak Hour

5/23/2016

Intersection: 7: Maple St #3N & Francis Ave #14

Movement	EB	EB	EB	WB	WB	WB	B471	B471	NB	NB	NB	NB
Directions Served	L	T	T	T	T	TR	T	T	L	LT	T	TR
Maximum Queue (ft)	279	260	274	286	357	394	61	139	139	808	820	804
Average Queue (ft)	235	143	137	106	248	262	3	6	55	534	533	547
95th Queue (ft)	303	229	242	269	363	371	24	48	145	752	743	749
Link Distance (ft)	256	256	256		287	287	232	232		1256	1256	1256
Upstream Blk Time (%)	18	0	0	0	4	7						
Queuing Penalty (veh)	51	1	1	0	26	48						
Storage Bay Dist (ft)				300					115			
Storage Blk Time (%)				0	4					66		
Queuing Penalty (veh)				0	12					119		

Zone Summary

Zone wide Queuing Penalty: 557

4: Francis Ave #14 & Indian Trail Road Performance by movement

Movement	EBL	EBT	WBT	WBR	SEL	SET	SER	All
Denied Del/Veh (s)	0.1	0.0	0.3	0.7	0.0	0.0	0.0	0.3
Total Del/Veh (s)	28.1	7.8	8.6	19.0	18.2	1.0	8.0	14.8

5: Alberta St & Francis Ave #14 Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.0	0.0	0.0	0.4	0.4	0.0	1.1	1.1	0.9	4.0	0.2	0.4
Total Del/Veh (s)	36.6	37.5	32.7	109.8	112.5	103.7	223.9	227.2	239.0	30.4	45.8	17.1

5: Alberta St & Francis Ave #14 Performance by movement

Movement	All
Denied Del/Veh (s)	0.4
Total Del/Veh (s)	107.8

6: Ash St #4S & Francis Ave #14 Performance by movement

Movement	EBT	EBR	WBL	WBT	SBL	SBT	SBR	All
Denied Del/Veh (s)	0.0	0.0	0.7	0.1	0.0	0.0	0.0	0.1
Total Del/Veh (s)	18.3	18.3	33.1	5.7	26.7	24.1	31.3	17.7

7: Maple St #3N & Francis Ave #14 Performance by movement

Movement	EBL	EBT	WBT	WBR	NBL	NBT	NBR	All
Denied Del/Veh (s)	5.5	3.2	0.0	0.0	0.0	0.0	0.0	1.1
Total Del/Veh (s)	51.3	11.5	23.5	22.2	234.8	260.2	255.9	106.7

Total Zone Performance

Movement	All
Denied Del/Veh (s)	5.1
Total Del/Veh (s)	822.7

Queuing and Blocking Report
Existing - PM Peak Hour

5/23/2016

Intersection: 4: Francis Ave #14 & Indian Trail Road

Movement	EB	EB	EB	WB	WB	WB	SE	SE
Directions Served	L	T	T	T	T	R	L	LR
Maximum Queue (ft)	100	220	129	362	505	280	187	208
Average Queue (ft)	66	70	61	78	152	65	80	95
95th Queue (ft)	106	153	108	179	418	261	143	157
Link Distance (ft)		1080	1080	1066	1066		1036	1036
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)	75					255		
Storage Blk Time (%)	15	2			0	5		
Queuing Penalty (veh)	33	2			1	16		

Intersection: 5: Alberta St & Francis Ave #14

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	LTR	L	TR
Maximum Queue (ft)	199	400	417	200	1314	1320	174	1840	74	116
Average Queue (ft)	50	252	252	115	706	742	164	1066	28	44
95th Queue (ft)	163	361	365	233	1291	1322	217	1895	59	82
Link Distance (ft)		1169	1169		1382	1382		1801		497
Upstream Blk Time (%)								2		
Queuing Penalty (veh)								0		
Storage Bay Dist (ft)	175			175			150		100	
Storage Blk Time (%)		23		0	50		3	65		2
Queuing Penalty (veh)		8		0	70		14	122		1

Intersection: 6: Ash St #4S & Francis Ave #14

Movement	EB	EB	EB	WB	WB	WB	SB	SB	SB	SB
Directions Served	T	T	TR	L	T	T	L	T	T	R
Maximum Queue (ft)	178	240	278	256	135	138	270	242	364	371
Average Queue (ft)	71	115	131	142	78	81	114	149	155	169
95th Queue (ft)	138	217	227	247	124	122	211	234	255	312
Link Distance (ft)		1577	1577	256	256	256	499	499	499	
Upstream Blk Time (%)				0						
Queuing Penalty (veh)				1						
Storage Bay Dist (ft)	300									400
Storage Blk Time (%)										
Queuing Penalty (veh)										

Queuing and Blocking Report
Existing - PM Peak Hour

5/23/2016

Intersection: 7: Maple St #3N & Francis Ave #14

Movement	EB	EB	EB	WB	WB	WB	B471	NB	NB	NB	NB	B476
Directions Served	L	T	T	T	T	TR	T	L	LT	T	TR	T
Maximum Queue (ft)	280	227	222	286	356	357	30	140	1326	1324	1282	81
Average Queue (ft)	185	116	108	92	241	253	2	75	1011	1001	1004	5
95th Queue (ft)	267	200	199	228	351	361	12	170	1328	1314	1276	34
Link Distance (ft)	256	256	256		287	287	232		1256	1256	1256	691
Upstream Blk Time (%)	4			0	3	5			2	1	1	
Queuing Penalty (veh)	11			0	21	32			0	0	0	
Storage Bay Dist (ft)				300				115				
Storage Blk Time (%)				0	3			0	66			
Queuing Penalty (veh)				0	10			0	119			

Intersection: 7: Maple St #3N & Francis Ave #14

Movement	B476	B472
Directions Served	T	T
Maximum Queue (ft)	32	35
Average Queue (ft)	1	1
95th Queue (ft)	11	12
Link Distance (ft)	691	219
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Zone Summary

Zone wide Queuing Penalty: 461

4: Francis Ave #14 & Indian Trail Road Performance by movement

Movement	EBL	EBT	WBT	WBR	SEL	SER	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	4.0	0.1	4.1
Total Delay (hr)	0.6	1.8	1.1	0.4	33.1	1.6	38.5

5: Alberta St & Francis Ave #14 Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	0.2	31.6	5.8	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
Total Delay (hr)	0.7	50.1	8.8	2.7	3.3	0.2	1.9	0.5	1.0	0.8	1.5	0.2

5: Alberta St & Francis Ave #14 Performance by movement

Movement	All
Denied Delay (hr)	37.8
Total Delay (hr)	71.8

6: Ash St #4S & Francis Ave #14 Performance by movement

Movement	EBT	EBR	WBL	WBT	SBL	SBT	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (hr)	5.3	1.2	1.1	1.0	2.1	3.9	0.9	15.5

7: Maple St #3N & Francis Ave #14 Performance by movement

Movement	EBL	EBT	WBT	WBR	NBL	NBT	NBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (hr)	2.0	1.7	2.2	0.1	0.2	3.7	1.2	11.3

Total Zone Performance

Movement	All
Denied Delay (hr)	42.0
Total Delay (hr)	137.0

Queuing and Blocking Report
Future Without-Project - AM Peak Hour

5/24/2016

Intersection: 4: Francis Ave #14 & Indian Trail Road

Movement	EB	EB	EB	WB	WB	SE	SE
Directions Served	L	T	T	T	T	L	LR
Maximum Queue (ft)	99	142	174	121	119	1047	1058
Average Queue (ft)	47	60	104	59	58	597	638
95th Queue (ft)	95	117	161	111	111	1126	1124
Link Distance (ft)		1080	1080	1066	1066	1036	1036
Upstream Blk Time (%)						0	3
Queuing Penalty (veh)						3	17
Storage Bay Dist (ft)	75						
Storage Blk Time (%)	5	1					
Queuing Penalty (veh)	13	1					

Intersection: 5: Alberta St & Francis Ave #14

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	LTR	L	TR
Maximum Queue (ft)	200	1196	1196	200	304	297	174	226	124	258
Average Queue (ft)	31	936	958	112	139	144	69	138	54	95
95th Queue (ft)	127	1335	1339	208	255	233	161	218	114	189
Link Distance (ft)		1169	1169		1382	1382		1801		497
Upstream Blk Time (%)		7	8							
Queuing Penalty (veh)		55	62							
Storage Bay Dist (ft)	175			175			150		100	
Storage Blk Time (%)		58		13	0		0	9	4	10
Queuing Penalty (veh)		16		40	1		0	8	5	8

Intersection: 6: Ash St #4S & Francis Ave #14

Movement	EB	EB	EB	WB	WB	WB	SB	SB	SB	SB
Directions Served	T	T	TR	L	T	T	L	T	T	R
Maximum Queue (ft)	152	276	296	177	142	75	240	249	218	196
Average Queue (ft)	59	156	171	63	57	25	138	139	143	74
95th Queue (ft)	129	278	283	137	110	67	204	206	208	142
Link Distance (ft)		1577	1577	256	256	256	499	499	499	
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	300									400
Storage Blk Time (%)										
Queuing Penalty (veh)										

Queuing and Blocking Report
 Future Without-Project - AM Peak Hour

5/24/2016

Intersection: 7: Maple St #3N & Francis Ave #14

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB
Directions Served	L	T	T	T	T	TR	L	LT	T	TR
Maximum Queue (ft)	261	143	168	93	162	161	30	136	212	268
Average Queue (ft)	135	79	82	32	91	73	4	74	106	150
95th Queue (ft)	221	130	126	64	141	137	19	133	160	216
Link Distance (ft)	256	256	256		287	287		1256	1256	1256
Upstream Blk Time (%)	0									
Queuing Penalty (veh)	2									
Storage Bay Dist (ft)				300			115			
Storage Blk Time (%)								2		
Queuing Penalty (veh)								0		

Zone Summary

Zone wide Queuing Penalty: 230

4: Francis Ave #14 & Indian Trail Road Performance by movement

Movement	EBL	EBT	WBT	WBR	SEL	SER	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Total Delay (hr)	0.6	1.8	1.0	0.5	19.6	0.9	24.4

5: Alberta St & Francis Ave #14 Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	0.0	41.1	5.6	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
Total Delay (hr)	0.9	59.9	8.0	1.7	3.9	0.2	2.2	0.2	0.9	0.9	1.5	0.3

5: Alberta St & Francis Ave #14 Performance by movement

Movement	All
Denied Delay (hr)	46.8
Total Delay (hr)	80.6

6: Ash St #4S & Francis Ave #14 Performance by movement

Movement	EBT	EBR	WBL	WBT	SBL	SBT	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (hr)	5.6	1.4	1.0	1.2	2.6	4.0	1.0	16.9

7: Maple St #3N & Francis Ave #14 Performance by movement

Movement	EBL	EBT	WBT	WBR	NBL	NBT	NBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (hr)	1.8	1.8	2.5	0.3	0.2	3.4	0.9	10.9

Total Zone Performance

Movement	All
Denied Delay (hr)	47.0
Total Delay (hr)	132.9

Queuing and Blocking Report
Future Without-Project - AM Peak Hour

5/24/2016

Intersection: 4: Francis Ave #14 & Indian Trail Road

Movement	EB	EB	EB	WB	WB	SE	SE
Directions Served	L	T	T	T	T	L	LR
Maximum Queue (ft)	99	138	152	90	134	576	597
Average Queue (ft)	51	60	94	49	56	412	446
95th Queue (ft)	90	111	148	84	101	566	592
Link Distance (ft)		1080	1080	1066	1066	1036	1036
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)	75						
Storage Blk Time (%)	4	4					
Queuing Penalty (veh)	12	3					

Intersection: 5: Alberta St & Francis Ave #14

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	LTR	L	TR
Maximum Queue (ft)	199	1197	1213	199	243	251	174	270	125	203
Average Queue (ft)	25	1046	1050	105	116	152	70	119	59	110
95th Queue (ft)	105	1442	1449	172	193	231	154	201	126	193
Link Distance (ft)		1169	1169		1382	1382		1801		497
Upstream Blk Time (%)		17	20							
Queuing Penalty (veh)		129	151							
Storage Bay Dist (ft)	175			175			150		100	
Storage Blk Time (%)	0	59		1	1		0	4	3	15
Queuing Penalty (veh)	0	16		2	2		0	4	4	12

Intersection: 6: Ash St #4S & Francis Ave #14

Movement	EB	EB	EB	WB	WB	WB	SB	SB	SB	SB
Directions Served	T	T	TR	L	T	T	L	T	T	R
Maximum Queue (ft)	162	267	297	137	178	176	341	189	216	140
Average Queue (ft)	59	163	191	66	72	33	161	138	138	78
95th Queue (ft)	121	267	304	125	132	102	259	190	200	132
Link Distance (ft)		1577	1577	256	256	256	499	499	499	
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	300									400
Storage Blk Time (%)										
Queuing Penalty (veh)										

Queuing and Blocking Report
Future Without-Project - AM Peak Hour

5/24/2016

Intersection: 7: Maple St #3N & Francis Ave #14

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB
Directions Served	L	T	T	T	T	TR	L	LT	T	TR
Maximum Queue (ft)	264	154	138	122	180	158	31	151	173	190
Average Queue (ft)	135	84	81	39	104	80	4	56	92	128
95th Queue (ft)	228	143	126	92	153	138	21	108	139	187
Link Distance (ft)	256	256	256		287	287		1256	1256	1256
Upstream Blk Time (%)	0									
Queuing Penalty (veh)	2									
Storage Bay Dist (ft)				300			115			
Storage Blk Time (%)								0		
Queuing Penalty (veh)								0		

Zone Summary

Zone wide Queuing Penalty: 336

4: Francis Ave #14 & Indian Trail Road Performance by movement

Movement	EBL	EBT	WBT	WBR	SEL	SER	All
Denied Delay (hr)	0.0	0.0	0.0	0.1	0.5	0.0	0.5
Total Delay (hr)	0.4	1.8	1.3	0.5	25.0	1.1	30.1

5: Alberta St & Francis Ave #14 Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	0.2	28.3	2.5	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
Total Delay (hr)	1.2	52.4	8.5	1.5	3.9	0.2	2.7	0.3	1.1	1.1	1.2	0.2

5: Alberta St & Francis Ave #14 Performance by movement

Movement	All
Denied Delay (hr)	31.1
Total Delay (hr)	74.4

6: Ash St #4S & Francis Ave #14 Performance by movement

Movement	EBT	EBR	WBL	WBT	SBL	SBT	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (hr)	5.4	1.0	1.3	1.2	2.2	3.9	1.4	16.5

7: Maple St #3N & Francis Ave #14 Performance by movement

Movement	EBL	EBT	WBT	WBR	NBL	NBT	NBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Total Delay (hr)	1.8	1.7	2.2	0.2	0.2	4.1	1.3	11.5

Total Zone Performance

Movement	All
Denied Delay (hr)	31.8
Total Delay (hr)	132.5

Queuing and Blocking Report
Future Without-Project - AM Peak Hour

5/24/2016

Intersection: 4: Francis Ave #14 & Indian Trail Road

Movement	EB	EB	EB	WB	WB	SE	SE
Directions Served	L	T	T	T	T	L	LR
Maximum Queue (ft)	90	144	159	149	135	827	826
Average Queue (ft)	42	59	105	63	65	478	518
95th Queue (ft)	87	108	155	117	112	779	790
Link Distance (ft)		1080	1080	1066	1066	1036	1036
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)	75						
Storage Blk Time (%)	2	2					
Queuing Penalty (veh)	5	2					

Intersection: 5: Alberta St & Francis Ave #14

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	LTR	L	TR
Maximum Queue (ft)	200	1196	1193	197	217	230	174	303	124	219
Average Queue (ft)	52	960	976	90	128	157	92	147	65	82
95th Queue (ft)	163	1301	1314	145	188	227	187	234	121	159
Link Distance (ft)		1169	1169		1382	1382		1801		497
Upstream Blk Time (%)		7	8							
Queuing Penalty (veh)		52	64							
Storage Bay Dist (ft)	175			175			150		100	
Storage Blk Time (%)		60		0	1		0	10	5	4
Queuing Penalty (veh)		16		1	1		0	9	7	4

Intersection: 6: Ash St #4S & Francis Ave #14

Movement	EB	EB	EB	WB	WB	WB	SB	SB	SB	SB
Directions Served	T	T	TR	L	T	T	L	T	T	R
Maximum Queue (ft)	232	299	311	153	214	231	313	256	203	282
Average Queue (ft)	64	141	164	72	76	44	155	146	145	101
95th Queue (ft)	149	278	301	130	149	135	243	215	209	179
Link Distance (ft)		1577	1577	256	256	256	499	499	499	
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	300									400
Storage Blk Time (%)		0								
Queuing Penalty (veh)		0								

Queuing and Blocking Report
 Future Without-Project - AM Peak Hour

5/24/2016

Intersection: 7: Maple St #3N & Francis Ave #14

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB
Directions Served	L	T	T	T	T	TR	L	LT	T	TR
Maximum Queue (ft)	268	152	142	93	199	178	30	163	207	264
Average Queue (ft)	134	73	77	37	98	90	5	76	116	154
95th Queue (ft)	215	131	131	76	176	167	23	138	169	227
Link Distance (ft)	256	256	256		287	287		1256	1256	1256
Upstream Blk Time (%)	0									
Queuing Penalty (veh)	1									
Storage Bay Dist (ft)				300			115			
Storage Blk Time (%)								0		
Queuing Penalty (veh)								0		

Zone Summary

Zone wide Queuing Penalty: 161

4: Francis Ave #14 & Indian Trail Road Performance by movement

Movement	EBL	EBT	WBT	WBR	SEL	SER	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	10.5	0.6	11.1
Total Delay (hr)	0.5	2.0	1.3	0.5	47.1	3.0	54.4

5: Alberta St & Francis Ave #14 Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	0.8	38.0	3.8	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
Total Delay (hr)	1.0	56.9	7.8	1.6	4.0	0.2	2.4	0.4	1.1	1.0	1.6	0.4

5: Alberta St & Francis Ave #14 Performance by movement

Movement	All
Denied Delay (hr)	42.8
Total Delay (hr)	78.5

6: Ash St #4S & Francis Ave #14 Performance by movement

Movement	EBT	EBR	WBL	WBT	SBL	SBT	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (hr)	5.9	1.5	1.4	1.4	2.4	3.3	1.1	16.9

7: Maple St #3N & Francis Ave #14 Performance by movement

Movement	EBL	EBT	WBT	WBR	NBL	NBT	NBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (hr)	1.9	1.5	2.4	0.2	0.2	3.7	1.0	10.9

Total Zone Performance

Movement	All
Denied Delay (hr)	53.9
Total Delay (hr)	160.7

Queuing and Blocking Report
Future Without-Project - AM Peak Hour

5/24/2016

Intersection: 4: Francis Ave #14 & Indian Trail Road

Movement	EB	EB	EB	WB	WB	SE	SE
Directions Served	L	T	T	T	T	L	LR
Maximum Queue (ft)	100	124	166	142	122	1070	1061
Average Queue (ft)	43	61	111	71	69	819	842
95th Queue (ft)	84	111	160	120	114	1134	1133
Link Distance (ft)		1080	1080	1066	1066	1036	1036
Upstream Blk Time (%)						1	2
Queuing Penalty (veh)						9	14
Storage Bay Dist (ft)	75						
Storage Blk Time (%)	2	2					
Queuing Penalty (veh)	7	2					

Intersection: 5: Alberta St & Francis Ave #14

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	LTR	L	TR
Maximum Queue (ft)	200	1189	1205	199	254	248	174	313	124	313
Average Queue (ft)	50	1020	1034	95	129	156	72	151	69	126
95th Queue (ft)	175	1405	1422	166	219	238	172	257	130	221
Link Distance (ft)		1169	1169		1382	1382		1801		497
Upstream Blk Time (%)		13	16							
Queuing Penalty (veh)		101	121							
Storage Bay Dist (ft)	175			175			150		100	
Storage Blk Time (%)		57		1	2		0	10	2	17
Queuing Penalty (veh)		15		3	3		0	9	4	13

Intersection: 6: Ash St #4S & Francis Ave #14

Movement	EB	EB	EB	WB	WB	WB	SB	SB	SB	SB
Directions Served	T	T	TR	L	T	T	L	T	T	R
Maximum Queue (ft)	153	282	325	151	159	159	311	203	209	211
Average Queue (ft)	51	170	200	81	75	43	171	120	129	85
95th Queue (ft)	113	278	305	129	140	110	280	176	182	157
Link Distance (ft)		1577	1577	256	256	256	499	499	499	
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	300									400
Storage Blk Time (%)		0								
Queuing Penalty (veh)		0								

Queuing and Blocking Report
 Future Without-Project - AM Peak Hour

5/24/2016

Intersection: 7: Maple St #3N & Francis Ave #14

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB
Directions Served	L	T	T	T	T	TR	L	LT	T	TR
Maximum Queue (ft)	256	119	143	107	181	157	30	147	173	240
Average Queue (ft)	134	65	68	39	102	83	3	71	97	142
95th Queue (ft)	236	111	132	85	158	146	17	126	149	222
Link Distance (ft)	256	256	256		287	287		1256	1256	1256
Upstream Blk Time (%)	0									
Queuing Penalty (veh)	1									
Storage Bay Dist (ft)				300			115			
Storage Blk Time (%)								2		
Queuing Penalty (veh)								0		

Zone Summary

Zone wide Queuing Penalty: 303

4: Francis Ave #14 & Indian Trail Road Performance by movement

Movement	EBL	EBT	WBT	WBR	SEL	SER	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	5.1	0.0	5.2
Total Delay (hr)	0.4	1.9	1.2	0.5	37.4	1.8	43.3

5: Alberta St & Francis Ave #14 Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	0.5	27.2	3.7	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
Total Delay (hr)	1.3	55.0	7.6	2.1	3.7	0.1	2.1	0.4	1.1	0.9	1.5	0.4

5: Alberta St & Francis Ave #14 Performance by movement

Movement	All
Denied Delay (hr)	31.5
Total Delay (hr)	76.3

6: Ash St #4S & Francis Ave #14 Performance by movement

Movement	EBT	EBR	WBL	WBT	SBL	SBT	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (hr)	5.8	1.4	1.2	1.1	2.4	3.6	1.1	16.6

7: Maple St #3N & Francis Ave #14 Performance by movement

Movement	EBL	EBT	WBT	WBR	NBL	NBT	NBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (hr)	1.7	1.9	2.5	0.3	0.2	3.9	1.4	12.0

Total Zone Performance

Movement	All
Denied Delay (hr)	36.7
Total Delay (hr)	148.1

Queuing and Blocking Report
Future Without-Project - AM Peak Hour

5/24/2016

Intersection: 4: Francis Ave #14 & Indian Trail Road

Movement	EB	EB	EB	WB	WB	SE	SE
Directions Served	L	T	T	T	T	L	LR
Maximum Queue (ft)	93	149	205	132	115	1003	1012
Average Queue (ft)	45	69	109	68	66	668	716
95th Queue (ft)	69	127	174	111	104	976	986
Link Distance (ft)		1080	1080	1066	1066	1036	1036
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)	75						
Storage Blk Time (%)	1	2					
Queuing Penalty (veh)	2	2					

Intersection: 5: Alberta St & Francis Ave #14

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	LTR	L	TR
Maximum Queue (ft)	200	1201	1203	200	253	252	174	266	125	205
Average Queue (ft)	57	993	1009	113	122	147	69	135	57	110
95th Queue (ft)	187	1420	1439	185	208	220	171	222	115	195
Link Distance (ft)		1169	1169		1382	1382		1801		497
Upstream Blk Time (%)		11	14							
Queuing Penalty (veh)		87	105							
Storage Bay Dist (ft)	175			175			150		100	
Storage Blk Time (%)	0	57		1	2		0	9	0	17
Queuing Penalty (veh)	0	15		3	2		0	8	0	14

Intersection: 6: Ash St #4S & Francis Ave #14

Movement	EB	EB	EB	WB	WB	WB	SB	SB	SB	SB
Directions Served	T	T	TR	L	T	T	L	T	T	R
Maximum Queue (ft)	238	292	300	137	159	92	282	221	237	178
Average Queue (ft)	63	163	183	79	54	27	160	127	141	86
95th Queue (ft)	151	277	297	131	116	72	264	184	203	138
Link Distance (ft)		1577	1577	256	256	256	499	499	499	
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	300									400
Storage Blk Time (%)		0								
Queuing Penalty (veh)		0								

Queuing and Blocking Report
Future Without-Project - AM Peak Hour

5/24/2016

Intersection: 7: Maple St #3N & Francis Ave #14

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB
Directions Served	L	T	T	T	T	TR	L	LT	T	TR
Maximum Queue (ft)	201	172	132	136	182	169	38	198	183	270
Average Queue (ft)	122	84	84	43	96	85	4	68	110	156
95th Queue (ft)	203	136	124	92	160	132	22	137	163	239
Link Distance (ft)	256	256	256		287	287		1256	1256	1256
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)				300				115		
Storage Blk Time (%)								1		
Queuing Penalty (veh)								0		

Zone Summary

Zone wide Queuing Penalty: 238

4: Francis Ave #14 & Indian Trail Road Performance by movement

Movement	EBL	EBT	WBT	WBR	SEL	SER	All
Denied Del/Veh (s)	0.2	0.0	77.0	85.5	0.0	0.1	46.5
Total Del/Veh (s)	32.8	10.0	10.9	82.2	18.0	7.5	40.5

5: Alberta St & Francis Ave #14 Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.0	0.0	0.0	6.2	22.2	68.1	17.6	22.3	15.6	4.0	0.3	0.3
Total Del/Veh (s)	52.8	40.0	37.9	192.8	169.3	187.9	262.8	261.8	274.4	48.2	37.5	29.4

5: Alberta St & Francis Ave #14 Performance by movement

Movement	All
Denied Del/Veh (s)	13.3
Total Del/Veh (s)	142.6

6: Ash St #4S & Francis Ave #14 Performance by movement

Movement	EBT	EBR	WBL	WBT	SBL	SBT	SBR	All
Denied Del/Veh (s)	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1
Total Del/Veh (s)	21.7	19.5	31.4	6.5	29.7	25.9	32.1	18.5

7: Maple St #3N & Francis Ave #14 Performance by movement

Movement	EBL	EBT	WBT	WBR	NBL	NBT	NBR	All
Denied Del/Veh (s)	4.1	1.8	0.0	0.0	0.0	0.0	0.0	0.7
Total Del/Veh (s)	57.1	11.6	44.1	50.2	285.3	253.6	243.4	117.6

Total Zone Performance

Movement	All
Denied Del/Veh (s)	120.2
Total Del/Veh (s)	1176.4

Queuing and Blocking Report
Future Without-Project - PM Peak Hour

5/23/2016

Intersection: 4: Francis Ave #14 & Indian Trail Road

Movement	EB	EB	EB	WB	WB	WB	SE	SE
Directions Served	L	T	T	T	T	R	L	LR
Maximum Queue (ft)	100	323	266	1099	1097	280	208	201
Average Queue (ft)	84	101	79	525	958	261	103	110
95th Queue (ft)	114	230	162	1268	1404	376	184	183
Link Distance (ft)		1080	1080	1066	1066		1036	1036
Upstream Blk Time (%)				0	6			
Queuing Penalty (veh)				1	57			
Storage Bay Dist (ft)	75					255		
Storage Blk Time (%)	31	2			0	24		
Queuing Penalty (veh)	71	4			5	76		

Intersection: 5: Alberta St & Francis Ave #14

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	LTR	L	TR
Maximum Queue (ft)	199	438	458	200	1416	1428	175	1840	73	94
Average Queue (ft)	51	279	287	133	1103	1120	173	1273	23	55
95th Queue (ft)	152	398	408	238	1711	1693	177	2039	56	93
Link Distance (ft)		1169	1169		1382	1382		1801		497
Upstream Blk Time (%)					12	16		28		
Queuing Penalty (veh)					97	125		0		
Storage Bay Dist (ft)	175			175			150		100	
Storage Blk Time (%)		27		4	51		3	73		0
Queuing Penalty (veh)		11		28	74		15	157		0

Intersection: 6: Ash St #4S & Francis Ave #14

Movement	EB	EB	EB	WB	WB	WB	SB	SB	SB	SB
Directions Served	T	T	TR	L	T	T	L	T	T	R
Maximum Queue (ft)	286	289	286	263	193	211	205	217	238	338
Average Queue (ft)	105	113	130	118	91	95	119	141	139	193
95th Queue (ft)	224	216	235	210	152	174	190	203	211	316
Link Distance (ft)		1577	1577	256	256	256	499	499	499	
Upstream Blk Time (%)				1						
Queuing Penalty (veh)				3						
Storage Bay Dist (ft)	300									400
Storage Blk Time (%)	0	0								
Queuing Penalty (veh)	0	0								

Queuing and Blocking Report
Future Without-Project - PM Peak Hour

5/23/2016

Intersection: 7: Maple St #3N & Francis Ave #14

Movement	EB	EB	EB	WB	WB	WB	B471	B471	NB	NB	NB	NB
Directions Served	L	T	T	T	T	TR	T	T	L	LT	T	TR
Maximum Queue (ft)	273	244	253	286	405	357	324	306	140	1336	1325	1326
Average Queue (ft)	212	117	107	209	340	343	174	164	71	1110	1081	1032
95th Queue (ft)	293	197	207	390	420	401	382	354	166	1581	1580	1534
Link Distance (ft)	256	256	256		287	287	232	232		1256	1256	1256
Upstream Blk Time (%)	11	0	0	0	38	44	16	12		36	22	18
Queuing Penalty (veh)	36	0	0	0	284	334	120	92		0	0	0
Storage Bay Dist (ft)				300					115			
Storage Blk Time (%)				0	38					73		
Queuing Penalty (veh)				1	136					154		

Intersection: 7: Maple St #3N & Francis Ave #14

Movement	B476	B476	B472	B472
Directions Served	T	T	T	T
Maximum Queue (ft)	765	766	234	234
Average Queue (ft)	217	227	34	29
95th Queue (ft)	717	740	163	151
Link Distance (ft)	691	691	219	219
Upstream Blk Time (%)	14	14	7	7
Queuing Penalty (veh)	0	0	0	0
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Zone Summary

Zone wide Queuing Penalty: 1881

4: Francis Ave #14 & Indian Trail Road Performance by movement

Movement	EBL	EBT	WBT	WBR	SEL	SER	All
Denied Del/Veh (s)	0.1	0.0	19.0	21.0	0.0	0.0	11.7
Total Del/Veh (s)	28.8	8.8	13.1	54.6	20.2	10.8	30.5

5: Alberta St & Francis Ave #14 Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.5	0.0	0.0	0.9	0.5	0.1	93.7	80.2	90.2	3.9	0.3	0.1
Total Del/Veh (s)	61.7	40.7	35.5	120.0	91.6	114.9	329.4	336.3	332.9	31.8	41.6	23.4

5: Alberta St & Francis Ave #14 Performance by movement

Movement	All
Denied Del/Veh (s)	18.0
Total Del/Veh (s)	120.1

6: Ash St #4S & Francis Ave #14 Performance by movement

Movement	EBT	EBR	WBL	WBT	SBL	SBT	SBR	All
Denied Del/Veh (s)	0.0	0.0	0.3	0.1	0.0	0.0	0.0	0.0
Total Del/Veh (s)	23.3	22.1	30.1	5.4	30.0	25.0	36.8	19.5

7: Maple St #3N & Francis Ave #14 Performance by movement

Movement	EBL	EBT	WBT	WBR	NBL	NBT	NBR	All
Denied Del/Veh (s)	7.2	3.4	0.0	0.0	0.0	0.0	0.0	1.3
Total Del/Veh (s)	61.0	13.1	42.3	45.0	223.8	224.9	233.2	102.3

Total Zone Performance

Movement	All
Denied Del/Veh (s)	68.1
Total Del/Veh (s)	1032.8

Queuing and Blocking Report
Future Without-Project - PM Peak Hour

5/23/2016

Intersection: 4: Francis Ave #14 & Indian Trail Road

Movement	EB	EB	EB	WB	WB	WB	SE	SE
Directions Served	L	T	T	T	T	R	L	LR
Maximum Queue (ft)	100	178	136	952	1091	280	208	202
Average Queue (ft)	70	65	65	193	457	140	117	133
95th Queue (ft)	103	126	108	568	1130	371	184	205
Link Distance (ft)		1080	1080	1066	1066		1036	1036
Upstream Blk Time (%)					1			
Queuing Penalty (veh)					5			
Storage Bay Dist (ft)	75					255		
Storage Blk Time (%)	14	2			0	11		
Queuing Penalty (veh)	34	3			4	34		

Intersection: 5: Alberta St & Francis Ave #14

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	LTR	L	TR
Maximum Queue (ft)	199	396	433	200	930	984	175	1854	70	95
Average Queue (ft)	54	297	310	152	686	719	169	1656	26	45
95th Queue (ft)	152	392	398	241	966	1007	196	2274	61	85
Link Distance (ft)		1169	1169		1382	1382		1801		497
Upstream Blk Time (%)								73		
Queuing Penalty (veh)								0		
Storage Bay Dist (ft)	175			175			150		100	
Storage Blk Time (%)	0	32		7	48		4	70		0
Queuing Penalty (veh)	0	12		51	70		18	151		0

Intersection: 6: Ash St #4S & Francis Ave #14

Movement	EB	EB	EB	WB	WB	WB	SB	SB	SB	SB
Directions Served	T	T	TR	L	T	T	L	T	T	R
Maximum Queue (ft)	320	321	286	262	141	118	222	242	237	369
Average Queue (ft)	108	135	146	134	80	63	135	135	136	229
95th Queue (ft)	248	262	252	223	125	113	213	203	196	371
Link Distance (ft)		1577	1577	256	256	256	499	499	499	
Upstream Blk Time (%)				0						
Queuing Penalty (veh)				2						
Storage Bay Dist (ft)	300									400
Storage Blk Time (%)	1	0								
Queuing Penalty (veh)	1	0								

Queuing and Blocking Report
Future Without-Project - PM Peak Hour

5/23/2016

Intersection: 7: Maple St #3N & Francis Ave #14

Movement	EB	EB	EB	WB	WB	WB	B471	B471	NB	NB	NB	NB
Directions Served	L	T	T	T	T	TR	T	T	L	LT	T	TR
Maximum Queue (ft)	297	251	266	286	376	394	305	344	140	1326	1325	1323
Average Queue (ft)	221	134	128	193	317	317	163	153	58	931	898	895
95th Queue (ft)	299	216	233	370	430	440	373	365	151	1513	1496	1463
Link Distance (ft)	256	256	256		287	287	232	232		1256	1256	1256
Upstream Blk Time (%)	14	0	0	0	35	39	16	13		16	7	5
Queuing Penalty (veh)	43	0	0	0	262	294	122	101		0	0	0
Storage Bay Dist (ft)				300					115			
Storage Blk Time (%)				0	35					65		
Queuing Penalty (veh)				2	125					137		

Intersection: 7: Maple St #3N & Francis Ave #14

Movement	B476	B476
Directions Served	T	T
Maximum Queue (ft)	178	137
Average Queue (ft)	20	12
95th Queue (ft)	92	70
Link Distance (ft)	691	691
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Zone Summary

Zone wide Queuing Penalty: 1472

4: Francis Ave #14 & Indian Trail Road Performance by movement

Movement	EBL	EBT	WBT	WBR	SEL	SER	All
Denied Del/Veh (s)	0.2	0.0	67.4	61.3	0.0	0.0	35.4
Total Del/Veh (s)	29.5	9.2	12.0	64.8	19.2	9.0	33.0

5: Alberta St & Francis Ave #14 Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.0	0.0	0.1	9.9	20.5	0.2	78.7	76.7	68.0	3.9	0.2	0.3
Total Del/Veh (s)	88.6	54.7	56.8	150.3	131.7	121.1	299.9	323.7	311.8	47.4	47.0	29.4

5: Alberta St & Francis Ave #14 Performance by movement

Movement	All
Denied Del/Veh (s)	23.2
Total Del/Veh (s)	135.6

6: Ash St #4S & Francis Ave #14 Performance by movement

Movement	EBT	EBR	WBL	WBT	SBL	SBT	SBR	All
Denied Del/Veh (s)	0.0	0.0	0.5	0.1	0.0	0.0	0.1	0.1
Total Del/Veh (s)	24.4	22.2	30.6	5.3	31.7	26.1	35.0	19.6

7: Maple St #3N & Francis Ave #14 Performance by movement

Movement	EBL	EBT	WBT	WBR	NBL	NBT	NBR	All
Denied Del/Veh (s)	4.6	2.6	0.0	0.0	0.0	0.0	0.0	0.9
Total Del/Veh (s)	62.0	12.9	45.5	47.4	245.2	261.4	249.7	114.0

Total Zone Performance

Movement	All
Denied Del/Veh (s)	125.8
Total Del/Veh (s)	1112.1

Queuing and Blocking Report
Future Without-Project - PM Peak Hour

5/23/2016

Intersection: 4: Francis Ave #14 & Indian Trail Road

Movement	EB	EB	EB	WB	WB	WB	SE	SE
Directions Served	L	T	T	T	T	R	L	LR
Maximum Queue (ft)	99	184	141	1072	1087	280	234	249
Average Queue (ft)	79	77	74	345	775	242	109	135
95th Queue (ft)	109	146	124	910	1347	399	186	215
Link Distance (ft)		1080	1080	1066	1066		1036	1036
Upstream Blk Time (%)				0	1			
Queuing Penalty (veh)				0	14			
Storage Bay Dist (ft)	75					255		
Storage Blk Time (%)	23	3			1	14		
Queuing Penalty (veh)	53	5			10	46		

Intersection: 5: Alberta St & Francis Ave #14

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	LTR	L	TR
Maximum Queue (ft)	200	635	585	199	1400	1401	174	1836	124	223
Average Queue (ft)	72	367	369	153	907	932	170	1427	32	69
95th Queue (ft)	197	551	548	243	1607	1606	189	2392	76	154
Link Distance (ft)		1169	1169		1382	1382		1801		497
Upstream Blk Time (%)					6	7		62		
Queuing Penalty (veh)					43	58		0		
Storage Bay Dist (ft)	175			175			150		100	
Storage Blk Time (%)		43		8	46		2	68		4
Queuing Penalty (veh)		17		59	66		8	147		2

Intersection: 6: Ash St #4S & Francis Ave #14

Movement	EB	EB	EB	WB	WB	WB	SB	SB	SB	SB
Directions Served	T	T	TR	L	T	T	L	T	T	R
Maximum Queue (ft)	298	292	295	203	157	120	280	262	284	391
Average Queue (ft)	117	125	138	111	76	62	131	135	149	209
95th Queue (ft)	240	249	259	184	132	114	220	216	220	344
Link Distance (ft)		1577	1577	256	256	256	499	499	499	
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	300									400
Storage Blk Time (%)	0	0								0
Queuing Penalty (veh)	1	0								0

Queuing and Blocking Report
Future Without-Project - PM Peak Hour

5/23/2016

Intersection: 7: Maple St #3N & Francis Ave #14

Movement	EB	EB	EB	WB	WB	WB	B471	B471	NB	NB	NB	NB
Directions Served	L	T	T	T	T	TR	T	T	L	LT	T	TR
Maximum Queue (ft)	282	266	258	286	395	376	324	305	140	1326	1336	1328
Average Queue (ft)	226	141	135	214	352	350	161	145	51	1004	998	996
95th Queue (ft)	299	239	241	387	394	388	347	339	148	1487	1482	1465
Link Distance (ft)	256	256	256		287	287	232	232		1256	1256	1256
Upstream Blk Time (%)	18	0	0	0	39	43	11	9		29	24	22
Queuing Penalty (veh)	58	1	0	0	298	322	81	66		0	0	0
Storage Bay Dist (ft)				300					115			
Storage Blk Time (%)				0	39				0	69		
Queuing Penalty (veh)				1	143				0	146		

Intersection: 7: Maple St #3N & Francis Ave #14

Movement	B476	B476	B472	B472
Directions Served	T	T	T	T
Maximum Queue (ft)	765	803	234	253
Average Queue (ft)	224	224	45	38
95th Queue (ft)	771	771	194	180
Link Distance (ft)	691	691	219	219
Upstream Blk Time (%)	20	18	13	13
Queuing Penalty (veh)	0	0	0	0
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Zone Summary

Zone wide Queuing Penalty: 1647

4: Francis Ave #14 & Indian Trail Road Performance by movement

Movement	EBL	EBT	WBT	WBR	SEL	SER	All
Denied Del/Veh (s)	0.2	0.0	18.9	46.7	0.0	0.1	21.9
Total Del/Veh (s)	33.7	7.7	14.2	61.1	18.8	9.9	33.0

5: Alberta St & Francis Ave #14 Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.0	0.0	0.0	2.9	1.3	6.2	51.1	46.9	36.4	3.9	0.4	0.4
Total Del/Veh (s)	70.2	47.0	45.1	135.2	111.7	118.4	328.0	343.1	315.4	51.4	45.9	38.4

5: Alberta St & Francis Ave #14 Performance by movement

Movement	All
Denied Del/Veh (s)	10.0
Total Del/Veh (s)	131.6

6: Ash St #4S & Francis Ave #14 Performance by movement

Movement	EBT	EBR	WBL	WBT	SBL	SBT	SBR	All
Denied Del/Veh (s)	0.0	0.0	0.4	0.1	0.0	0.0	0.0	0.1
Total Del/Veh (s)	24.5	24.2	32.5	5.4	30.2	25.2	27.5	18.8

7: Maple St #3N & Francis Ave #14 Performance by movement

Movement	EBL	EBT	WBT	WBR	NBL	NBT	NBR	All
Denied Del/Veh (s)	8.0	4.0	0.0	0.0	0.0	0.0	0.0	1.5
Total Del/Veh (s)	67.5	14.8	51.6	56.1	271.1	309.9	307.3	130.8

Total Zone Performance

Movement	All
Denied Del/Veh (s)	64.9
Total Del/Veh (s)	1200.7

Queuing and Blocking Report
Future Without-Project - PM Peak Hour

5/23/2016

Intersection: 4: Francis Ave #14 & Indian Trail Road

Movement	EB	EB	EB	WB	WB	WB	SE	SE
Directions Served	L	T	T	T	T	R	L	LR
Maximum Queue (ft)	100	303	150	1064	1112	280	218	263
Average Queue (ft)	72	75	61	225	706	196	113	128
95th Queue (ft)	109	193	102	748	1427	408	184	210
Link Distance (ft)		1080	1080	1066	1066		1036	1036
Upstream Blk Time (%)				0	4			
Queuing Penalty (veh)				0	34			
Storage Bay Dist (ft)	75					255		
Storage Blk Time (%)	22	3			0	13		
Queuing Penalty (veh)	51	4			2	41		

Intersection: 5: Alberta St & Francis Ave #14

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	LTR	L	TR
Maximum Queue (ft)	199	546	515	200	1193	1200	174	1840	124	183
Average Queue (ft)	65	320	340	126	835	857	168	1658	34	65
95th Queue (ft)	191	484	494	238	1038	1071	208	2089	84	134
Link Distance (ft)		1169	1169		1382	1382		1801		497
Upstream Blk Time (%)								46		
Queuing Penalty (veh)								0		
Storage Bay Dist (ft)	175			175			150		100	
Storage Blk Time (%)		34		3	52		8	71	2	7
Queuing Penalty (veh)		13		23	75		37	154	2	3

Intersection: 6: Ash St #4S & Francis Ave #14

Movement	EB	EB	EB	WB	WB	WB	SB	SB	SB	SB
Directions Served	T	T	TR	L	T	T	L	T	T	R
Maximum Queue (ft)	236	244	288	267	139	146	181	229	256	317
Average Queue (ft)	118	124	141	129	79	76	124	138	142	155
95th Queue (ft)	243	239	259	225	128	121	179	203	207	266
Link Distance (ft)		1577	1577	256	256	256	499	499	499	
Upstream Blk Time (%)				0						
Queuing Penalty (veh)				1						
Storage Bay Dist (ft)	300									400
Storage Blk Time (%)										
Queuing Penalty (veh)										

Queuing and Blocking Report
Future Without-Project - PM Peak Hour

5/23/2016

Intersection: 7: Maple St #3N & Francis Ave #14

Movement	EB	EB	EB	WB	WB	WB	B471	B471	NB	NB	NB	NB
Directions Served	L	T	T	T	T	TR	T	T	L	LT	T	TR
Maximum Queue (ft)	283	262	274	286	376	405	305	306	140	1345	1325	1345
Average Queue (ft)	238	139	134	234	359	364	249	249	70	1127	1132	1124
95th Queue (ft)	315	237	228	387	367	385	360	361	159	1605	1603	1568
Link Distance (ft)	256	256	256		287	287	232	232		1256	1256	1256
Upstream Blk Time (%)	22	0	0	0	52	60	25	24		49	39	31
Queuing Penalty (veh)	70	1	1	0	391	450	186	185		0	0	0
Storage Bay Dist (ft)				300					115			
Storage Blk Time (%)				0	52				0	72		
Queuing Penalty (veh)				1	187				0	152		

Intersection: 7: Maple St #3N & Francis Ave #14

Movement	B476	B476	B472	B472
Directions Served	T	T	T	T
Maximum Queue (ft)	789	803	271	253
Average Queue (ft)	347	354	72	70
95th Queue (ft)	935	941	253	248
Link Distance (ft)	691	691	219	219
Upstream Blk Time (%)	29	30	25	26
Queuing Penalty (veh)	0	0	0	0
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Zone Summary

Zone wide Queuing Penalty: 2063

4: Francis Ave #14 & Indian Trail Road Performance by movement

Movement	EBL	EBT	WBT	WBR	SEL	SER	All
Denied Del/Veh (s)	0.1	0.0	15.4	19.0	0.0	0.0	10.1
Total Del/Veh (s)	33.9	9.1	12.2	50.7	20.3	10.1	29.0

5: Alberta St & Francis Ave #14 Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.0	0.0	0.0	0.8	2.2	9.3	122.6	116.3	111.9	4.0	0.2	0.2
Total Del/Veh (s)	72.8	45.7	45.0	132.6	105.9	122.2	347.1	369.9	344.2	29.8	48.3	35.8

5: Alberta St & Francis Ave #14 Performance by movement

Movement	All
Denied Del/Veh (s)	24.3
Total Del/Veh (s)	131.5

6: Ash St #4S & Francis Ave #14 Performance by movement

Movement	EBT	EBR	WBL	WBT	SBL	SBT	SBR	All
Denied Del/Veh (s)	0.0	0.1	0.3	0.1	0.0	0.0	0.0	0.1
Total Del/Veh (s)	19.3	26.3	35.5	6.1	28.5	24.4	31.2	18.5

7: Maple St #3N & Francis Ave #14 Performance by movement

Movement	EBL	EBT	WBT	WBR	NBL	NBT	NBR	All
Denied Del/Veh (s)	3.7	1.5	0.0	0.0	0.0	0.0	0.0	0.6
Total Del/Veh (s)	51.1	11.4	35.0	37.5	282.2	306.1	317.9	124.8

Total Zone Performance

Movement	All
Denied Del/Veh (s)	72.0
Total Del/Veh (s)	1166.7

Queuing and Blocking Report
Future Without-Project - PM Peak Hour

5/23/2016

Intersection: 4: Francis Ave #14 & Indian Trail Road

Movement	EB	EB	EB	WB	WB	WB	SE	SE
Directions Served	L	T	T	T	T	R	L	LR
Maximum Queue (ft)	99	206	171	1130	1096	280	185	244
Average Queue (ft)	80	87	62	234	537	170	111	127
95th Queue (ft)	112	183	107	788	1249	387	172	197
Link Distance (ft)		1080	1080	1066	1066		1036	1036
Upstream Blk Time (%)				1	3			
Queuing Penalty (veh)				5	25			
Storage Bay Dist (ft)	75					255		
Storage Blk Time (%)	29	3			0	8		
Queuing Penalty (veh)	67	5			5	25		

Intersection: 5: Alberta St & Francis Ave #14

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	LTR	L	TR
Maximum Queue (ft)	200	448	477	200	1352	1357	175	1835	125	180
Average Queue (ft)	53	326	329	137	775	805	171	1680	32	70
95th Queue (ft)	149	443	452	228	1281	1322	193	2137	75	127
Link Distance (ft)		1169	1169		1382	1382		1801		497
Upstream Blk Time (%)								75		
Queuing Penalty (veh)								0		
Storage Bay Dist (ft)	175			175			150		100	
Storage Blk Time (%)	0	36		3	48		6	72	0	4
Queuing Penalty (veh)	0	14		25	70		27	154	0	1

Intersection: 6: Ash St #4S & Francis Ave #14

Movement	EB	EB	EB	WB	WB	WB	SB	SB	SB	SB
Directions Served	T	T	TR	L	T	T	L	T	T	R
Maximum Queue (ft)	178	273	294	267	170	203	313	219	265	344
Average Queue (ft)	72	132	163	149	91	78	122	131	150	196
95th Queue (ft)	144	236	270	250	152	148	215	208	236	349
Link Distance (ft)		1577	1577	256	256	256	499	499	499	
Upstream Blk Time (%)				0						
Queuing Penalty (veh)				2						
Storage Bay Dist (ft)	300									400
Storage Blk Time (%)										
Queuing Penalty (veh)										

Queuing and Blocking Report
Future Without-Project - PM Peak Hour

5/23/2016

Intersection: 7: Maple St #3N & Francis Ave #14

Movement	EB	EB	EB	WB	WB	WB	B471	B471	NB	NB	NB	NB
Directions Served	L	T	T	T	T	TR	T	T	L	LT	T	TR
Maximum Queue (ft)	285	211	197	286	381	364	324	236	140	1350	1344	1340
Average Queue (ft)	205	121	105	180	316	313	63	53	81	1160	1149	1146
95th Queue (ft)	285	192	177	362	424	411	193	161	176	1535	1533	1520
Link Distance (ft)	256	256	256		287	287	232	232		1256	1256	1256
Upstream Blk Time (%)	6			0	20	23	1	0		50	37	34
Queuing Penalty (veh)	18			0	154	174	7	2		0	0	0
Storage Bay Dist (ft)				300					115			
Storage Blk Time (%)				0	20				0	64		
Queuing Penalty (veh)				1	74				0	135		

Intersection: 7: Maple St #3N & Francis Ave #14

Movement	B476	B476	B472	B472
Directions Served	T	T	T	T
Maximum Queue (ft)	789	813	234	258
Average Queue (ft)	339	351	75	80
95th Queue (ft)	918	931	251	267
Link Distance (ft)	691	691	219	219
Upstream Blk Time (%)	33	33	24	25
Queuing Penalty (veh)	0	0	0	0
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Zone Summary

Zone wide Queuing Penalty: 992

4: Francis Ave #14 & Indian Trail Road Performance by movement

Movement	EBL	EBT	WBT	WBR	SEL	SER	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	22.3	0.7	23.1
Total Delay (hr)	0.6	1.8	1.3	0.6	38.7	1.7	44.6

5: Alberta St & Francis Ave #14 Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	0.9	59.3	10.2	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
Total Delay (hr)	1.0	55.9	8.4	1.9	4.1	0.1	2.3	0.3	1.1	1.3	1.8	0.4

5: Alberta St & Francis Ave #14 Performance by movement

Movement	All
Denied Delay (hr)	70.6
Total Delay (hr)	78.7

6: Ash St #4S & Francis Ave #14 Performance by movement

Movement	EBT	EBR	WBL	WBT	SBL	SBT	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (hr)	9.1	1.8	1.2	1.3	2.2	3.9	1.2	20.8

7: Maple St #3N & Francis Ave #14 Performance by movement

Movement	EBL	EBT	WBT	WBR	NBL	NBT	NBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (hr)	1.7	1.6	3.3	0.3	0.2	4.1	0.9	12.0

Total Zone Performance

Movement	All
Denied Delay (hr)	93.7
Total Delay (hr)	156.1

Queuing and Blocking Report
Future With-Project - AM Peak Hour

5/23/2016

Intersection: 4: Francis Ave #14 & Indian Trail Road

Movement	EB	EB	EB	WB	WB	SE	SE
Directions Served	L	T	T	T	T	L	LR
Maximum Queue (ft)	99	124	181	136	138	907	922
Average Queue (ft)	48	62	105	66	68	679	709
95th Queue (ft)	79	109	161	117	121	937	934
Link Distance (ft)		1080	1080	1066	1066	1036	1036
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)	75						
Storage Blk Time (%)	1	1					
Queuing Penalty (veh)	4	1					

Intersection: 5: Alberta St & Francis Ave #14

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	LTR	L	TR
Maximum Queue (ft)	199	1195	1208	199	226	252	174	268	125	333
Average Queue (ft)	43	1020	1029	118	125	152	75	135	77	119
95th Queue (ft)	160	1320	1322	191	202	230	168	206	130	231
Link Distance (ft)		1169	1169		1382	1382		1801		497
Upstream Blk Time (%)		11	13							
Queuing Penalty (veh)		87	97							
Storage Bay Dist (ft)	175			175			150		100	
Storage Blk Time (%)		60		2	1		0	8	4	17
Queuing Penalty (veh)		19		5	2		0	7	6	13

Intersection: 6: Ash St #4S & Francis Ave #14

Movement	EB	EB	EB	WB	WB	WB	SB	SB	SB	SB
Directions Served	T	T	TR	L	T	T	L	T	T	R
Maximum Queue (ft)	324	423	468	189	136	168	309	257	269	138
Average Queue (ft)	111	242	261	79	55	36	151	135	154	85
95th Queue (ft)	273	364	389	152	106	98	262	213	222	139
Link Distance (ft)		1577	1577	256	256	256	499	499	499	
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	300									400
Storage Blk Time (%)	0	2								
Queuing Penalty (veh)	0	8								

Queuing and Blocking Report
Future With-Project - AM Peak Hour

5/23/2016

Intersection: 7: Maple St #3N & Francis Ave #14

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB
Directions Served	L	T	T	T	T	TR	L	LT	T	TR
Maximum Queue (ft)	221	104	117	96	229	194	48	155	225	244
Average Queue (ft)	132	59	58	42	135	120	5	79	113	147
95th Queue (ft)	209	92	104	97	200	179	24	143	187	231
Link Distance (ft)	256	256	256		287	287		1256	1256	1256
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)				300			115			
Storage Blk Time (%)								2		
Queuing Penalty (veh)								0		

Zone Summary

Zone wide Queuing Penalty: 249

4: Francis Ave #14 & Indian Trail Road Performance by movement

Movement	EBL	EBT	WBT	WBR	SEL	SER	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	5.9	0.2	6.2
Total Delay (hr)	0.5	1.8	1.2	0.6	33.4	1.4	39.0

5: Alberta St & Francis Ave #14 Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	1.1	67.8	4.7	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
Total Delay (hr)	1.3	52.7	8.7	1.8	4.1	0.1	2.8	0.4	1.4	1.3	1.3	0.3

5: Alberta St & Francis Ave #14 Performance by movement

Movement	All
Denied Delay (hr)	73.8
Total Delay (hr)	76.2

6: Ash St #4S & Francis Ave #14 Performance by movement

Movement	EBT	EBR	WBL	WBT	SBL	SBT	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (hr)	8.7	1.7	1.1	1.0	2.1	3.9	1.0	19.6

7: Maple St #3N & Francis Ave #14 Performance by movement

Movement	EBL	EBT	WBT	WBR	NBL	NBT	NBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (hr)	1.6	1.6	3.0	0.3	0.2	3.5	0.9	11.1

Total Zone Performance

Movement	All
Denied Delay (hr)	80.0
Total Delay (hr)	146.0

Queuing and Blocking Report
Future With-Project - AM Peak Hour

5/23/2016

Intersection: 4: Francis Ave #14 & Indian Trail Road

Movement	EB	EB	EB	WB	WB	SE	SE
Directions Served	L	T	T	T	T	L	LR
Maximum Queue (ft)	99	155	158	94	96	799	872
Average Queue (ft)	45	60	98	55	65	620	647
95th Queue (ft)	84	121	144	90	93	855	890
Link Distance (ft)		1080	1080	1066	1066	1036	1036
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)	75						
Storage Blk Time (%)	2	2					
Queuing Penalty (veh)	6	1					

Intersection: 5: Alberta St & Francis Ave #14

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	LTR	L	TR
Maximum Queue (ft)	200	1200	1198	199	210	227	174	268	125	227
Average Queue (ft)	47	981	1004	105	123	163	91	154	74	103
95th Queue (ft)	147	1308	1318	171	191	228	196	235	133	202
Link Distance (ft)		1169	1169		1382	1382		1801		497
Upstream Blk Time (%)		7	7							
Queuing Penalty (veh)		52	55							
Storage Bay Dist (ft)	175			175			150		100	
Storage Blk Time (%)	0	59		0	1		1	15	6	11
Queuing Penalty (veh)	0	19		1	2		1	13	8	9

Intersection: 6: Ash St #4S & Francis Ave #14

Movement	EB	EB	EB	WB	WB	WB	SB	SB	SB	SB
Directions Served	T	T	TR	L	T	T	L	T	T	R
Maximum Queue (ft)	324	462	405	148	147	139	263	256	279	205
Average Queue (ft)	97	216	226	76	54	37	158	138	151	81
95th Queue (ft)	233	370	365	130	101	103	230	216	235	150
Link Distance (ft)		1577	1577	256	256	256	499	499	499	
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	300									400
Storage Blk Time (%)		2								
Queuing Penalty (veh)		10								

Queuing and Blocking Report
 Future With-Project - AM Peak Hour

5/23/2016

Intersection: 7: Maple St #3N & Francis Ave #14

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB
Directions Served	L	T	T	T	T	TR	L	LT	T	TR
Maximum Queue (ft)	231	117	100	121	190	227	31	136	164	221
Average Queue (ft)	136	59	65	40	113	106	4	70	102	128
95th Queue (ft)	217	99	109	91	170	174	20	121	153	202
Link Distance (ft)	256	256	256		287	287		1256	1256	1256
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)				300				115		
Storage Blk Time (%)								1		
Queuing Penalty (veh)								0		

Zone Summary

Zone wide Queuing Penalty: 177

4: Francis Ave #14 & Indian Trail Road Performance by movement

Movement	EBL	EBT	WBT	WBR	SEL	SER	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	14.6	0.4	15.0
Total Delay (hr)	0.5	1.9	0.9	0.5	36.8	1.5	42.2

5: Alberta St & Francis Ave #14 Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	1.4	61.1	7.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
Total Delay (hr)	1.0	50.2	7.4	2.1	4.0	0.2	2.1	0.5	1.1	1.1	1.3	0.2

5: Alberta St & Francis Ave #14 Performance by movement

Movement	All
Denied Delay (hr)	69.6
Total Delay (hr)	71.2

6: Ash St #4S & Francis Ave #14 Performance by movement

Movement	EBT	EBR	WBL	WBT	SBL	SBT	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (hr)	9.8	1.9	1.0	1.0	2.4	3.7	1.3	21.1

7: Maple St #3N & Francis Ave #14 Performance by movement

Movement	EBL	EBT	WBT	WBR	NBL	NBT	NBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (hr)	1.7	1.6	3.0	0.3	0.2	3.8	1.0	11.5

Total Zone Performance

Movement	All
Denied Delay (hr)	84.6
Total Delay (hr)	146.0

Queuing and Blocking Report
Future With-Project - AM Peak Hour

5/23/2016

Intersection: 4: Francis Ave #14 & Indian Trail Road

Movement	EB	EB	EB	WB	WB	SE	SE
Directions Served	L	T	T	T	T	L	LR
Maximum Queue (ft)	100	142	230	130	116	868	833
Average Queue (ft)	54	75	108	59	47	657	680
95th Queue (ft)	93	137	173	108	89	909	913
Link Distance (ft)		1080	1080	1066	1066	1036	1036
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)	75						
Storage Blk Time (%)	4	4					
Queuing Penalty (veh)	10	3					

Intersection: 5: Alberta St & Francis Ave #14

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	LTR	L	TR
Maximum Queue (ft)	199	1172	1200	199	226	244	174	360	125	202
Average Queue (ft)	31	950	968	106	122	155	71	140	65	89
95th Queue (ft)	127	1269	1290	178	205	234	157	234	119	163
Link Distance (ft)		1169	1169		1382	1382		1801		497
Upstream Blk Time (%)		0	1							
Queuing Penalty (veh)		3	8							
Storage Bay Dist (ft)	175			175			150		100	
Storage Blk Time (%)	0	58		2	1		0	8	5	8
Queuing Penalty (veh)	0	18		7	2		0	7	7	7

Intersection: 6: Ash St #4S & Francis Ave #14

Movement	EB	EB	EB	WB	WB	WB	SB	SB	SB	SB
Directions Served	T	T	TR	L	T	T	L	T	T	R
Maximum Queue (ft)	324	476	509	150	165	124	358	211	203	196
Average Queue (ft)	100	243	261	70	46	28	164	131	134	87
95th Queue (ft)	234	390	420	117	110	99	285	198	192	152
Link Distance (ft)		1577	1577	256	256	256	499	499	499	
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	300									400
Storage Blk Time (%)	0	2								
Queuing Penalty (veh)	0	8								

Queuing and Blocking Report
 Future With-Project - AM Peak Hour

5/23/2016

Intersection: 7: Maple St #3N & Francis Ave #14

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB
Directions Served	L	T	T	T	T	TR	L	LT	T	TR
Maximum Queue (ft)	267	124	115	134	172	182	30	163	210	322
Average Queue (ft)	134	53	58	41	124	109	4	78	102	144
95th Queue (ft)	210	103	111	100	176	174	21	141	161	237
Link Distance (ft)	256	256	256		287	287		1256	1256	1256
Upstream Blk Time (%)	1									
Queuing Penalty (veh)	3									
Storage Bay Dist (ft)				300			115			
Storage Blk Time (%)								3		
Queuing Penalty (veh)								0		

Zone Summary

Zone wide Queuing Penalty: 84

4: Francis Ave #14 & Indian Trail Road Performance by movement

Movement	EBL	EBT	WBT	WBR	SEL	SER	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	21.0	1.3	22.4
Total Delay (hr)	0.5	1.6	1.0	0.5	38.3	2.1	44.0

5: Alberta St & Francis Ave #14 Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	1.5	35.2	7.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
Total Delay (hr)	0.9	41.1	6.6	1.8	4.2	0.2	2.7	0.4	1.0	1.2	1.7	0.2

5: Alberta St & Francis Ave #14 Performance by movement

Movement	All
Denied Delay (hr)	43.9
Total Delay (hr)	61.9

6: Ash St #4S & Francis Ave #14 Performance by movement

Movement	EBT	EBR	WBL	WBT	SBL	SBT	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1
Total Delay (hr)	7.9	2.0	1.2	1.2	2.0	3.9	1.2	19.4

7: Maple St #3N & Francis Ave #14 Performance by movement

Movement	EBL	EBT	WBT	WBR	NBL	NBT	NBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (hr)	1.5	1.4	3.2	0.3	0.2	4.0	1.0	11.7

Total Zone Performance

Movement	All
Denied Delay (hr)	66.4
Total Delay (hr)	136.9

Queuing and Blocking Report
Future With-Project - AM Peak Hour

5/23/2016

Intersection: 4: Francis Ave #14 & Indian Trail Road

Movement	EB	EB	EB	WB	WB	SE	SE
Directions Served	L	T	T	T	T	L	LR
Maximum Queue (ft)	98	132	172	119	116	849	870
Average Queue (ft)	46	59	95	50	60	675	715
95th Queue (ft)	84	104	155	91	97	900	941
Link Distance (ft)		1080	1080	1066	1066	1036	1036
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)	75						
Storage Blk Time (%)	3	3					
Queuing Penalty (veh)	8	2					

Intersection: 5: Alberta St & Francis Ave #14

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	LTR	L	TR
Maximum Queue (ft)	199	1169	1178	198	249	244	174	245	125	288
Average Queue (ft)	44	821	845	102	128	148	93	142	71	111
95th Queue (ft)	159	1242	1255	155	209	221	180	216	131	196
Link Distance (ft)		1169	1169		1382	1382		1801		497
Upstream Blk Time (%)		0	0							
Queuing Penalty (veh)		0	1							
Storage Bay Dist (ft)	175			175			150		100	
Storage Blk Time (%)	0	56		0	0		0	6	4	15
Queuing Penalty (veh)	0	18		0	1		0	5	6	12

Intersection: 6: Ash St #4S & Francis Ave #14

Movement	EB	EB	EB	WB	WB	WB	SB	SB	SB	SB
Directions Served	T	T	TR	L	T	T	L	T	T	R
Maximum Queue (ft)	324	366	428	157	169	127	267	229	247	203
Average Queue (ft)	99	206	242	77	55	29	139	135	144	96
95th Queue (ft)	233	326	381	134	109	81	234	198	216	165
Link Distance (ft)		1577	1577	256	256	256	499	499	499	
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	300									400
Storage Blk Time (%)		1								
Queuing Penalty (veh)		6								

Queuing and Blocking Report
Future With-Project - AM Peak Hour

5/23/2016

Intersection: 7: Maple St #3N & Francis Ave #14

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB
Directions Served	L	T	T	T	T	TR	L	LT	T	TR
Maximum Queue (ft)	227	93	116	97	184	166	30	133	170	313
Average Queue (ft)	120	58	59	43	119	105	4	78	107	152
95th Queue (ft)	200	91	117	86	165	161	19	135	158	240
Link Distance (ft)	256	256	256		287	287		1256	1256	1256
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)				300			115			
Storage Blk Time (%)								2		
Queuing Penalty (veh)								0		

Zone Summary

Zone wide Queuing Penalty: 60

4: Francis Ave #14 & Indian Trail Road Performance by movement

Movement	EBL	EBT	WBT	WBR	SEL	SER	All
Denied Delay (hr)	0.0	0.0	0.0	0.1	16.3	0.6	17.0
Total Delay (hr)	0.5	1.8	1.2	0.6	36.9	1.9	42.8

5: Alberta St & Francis Ave #14 Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	0.6	39.9	9.4	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
Total Delay (hr)	0.9	47.9	5.9	1.8	3.9	0.2	2.3	0.3	1.0	0.7	1.4	0.3

5: Alberta St & Francis Ave #14 Performance by movement

Movement	All
Denied Delay (hr)	50.0
Total Delay (hr)	66.7

6: Ash St #4S & Francis Ave #14 Performance by movement

Movement	EBT	EBR	WBL	WBT	SBL	SBT	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (hr)	8.3	1.9	1.3	1.0	2.2	3.7	1.0	19.4

7: Maple St #3N & Francis Ave #14 Performance by movement

Movement	EBL	EBT	WBT	WBR	NBL	NBT	NBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (hr)	1.6	1.4	3.0	0.3	0.2	3.8	1.0	11.4

Total Zone Performance

Movement	All
Denied Delay (hr)	67.1
Total Delay (hr)	140.3

Queuing and Blocking Report
Future With-Project - AM Peak Hour

5/23/2016

Intersection: 4: Francis Ave #14 & Indian Trail Road

Movement	EB	EB	EB	WB	WB	SE	SE
Directions Served	L	T	T	T	T	L	LR
Maximum Queue (ft)	93	148	208	131	141	881	902
Average Queue (ft)	45	67	96	60	66	660	696
95th Queue (ft)	79	129	154	107	122	909	921
Link Distance (ft)		1080	1080	1066	1066	1036	1036
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)	75						
Storage Blk Time (%)	2	2					
Queuing Penalty (veh)	7	2					

Intersection: 5: Alberta St & Francis Ave #14

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	LTR	L	TR
Maximum Queue (ft)	200	1174	1173	192	223	248	174	250	125	183
Average Queue (ft)	47	893	919	99	119	146	89	153	56	108
95th Queue (ft)	161	1155	1169	151	201	227	187	234	109	175
Link Distance (ft)		1169	1169		1382	1382		1801		497
Upstream Blk Time (%)		0	1							
Queuing Penalty (veh)		2	4							
Storage Bay Dist (ft)	175			175			150		100	
Storage Blk Time (%)	0	59		0	1		0	9	1	14
Queuing Penalty (veh)	0	19		1	2		0	8	1	11

Intersection: 6: Ash St #4S & Francis Ave #14

Movement	EB	EB	EB	WB	WB	WB	SB	SB	SB	SB
Directions Served	T	T	TR	L	T	T	L	T	T	R
Maximum Queue (ft)	318	345	364	135	143	119	287	237	221	176
Average Queue (ft)	97	221	243	80	44	23	161	133	143	85
95th Queue (ft)	226	343	367	143	94	72	239	194	209	147
Link Distance (ft)		1577	1577	256	256	256	499	499	499	
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	300									400
Storage Blk Time (%)		1								
Queuing Penalty (veh)		4								

Queuing and Blocking Report
Future With-Project - AM Peak Hour

5/23/2016

Intersection: 7: Maple St #3N & Francis Ave #14

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB
Directions Served	L	T	T	T	T	TR	L	LT	T	TR
Maximum Queue (ft)	247	137	116	146	184	177	52	117	179	197
Average Queue (ft)	125	52	50	50	115	107	5	59	102	132
95th Queue (ft)	211	95	89	103	161	166	26	100	161	190
Link Distance (ft)	256	256	256		287	287		1256	1256	1256
Upstream Blk Time (%)	0									
Queuing Penalty (veh)	0									
Storage Bay Dist (ft)				300			115			
Storage Blk Time (%)								0		
Queuing Penalty (veh)								0		

Zone Summary

Zone wide Queuing Penalty: 62

4: Francis Ave #14 & Indian Trail Road Performance by movement

Movement	EBL	EBT	WBT	WBR	SEL	SET	SER	All
Denied Del/Veh (s)	0.2	0.0	44.2	41.2	0.0	0.0	0.1	23.8
Total Del/Veh (s)	27.5	9.7	11.7	72.4	15.8	0.9	7.5	36.2

5: Alberta St & Francis Ave #14 Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.0	0.0	0.0	3.8	4.2	0.0	61.0	80.3	81.0	3.7	0.4	0.2
Total Del/Veh (s)	67.9	45.6	50.1	135.5	115.9	125.4	322.5	298.7	299.9	49.3	40.4	28.1

5: Alberta St & Francis Ave #14 Performance by movement

Movement	All
Denied Del/Veh (s)	15.4
Total Del/Veh (s)	128.6

6: Ash St #4S & Francis Ave #14 Performance by movement

Movement	EBT	EBR	WBL	WBT	SBL	SBT	SBR	All
Denied Del/Veh (s)	0.0	0.0	0.5	0.1	0.0	0.0	0.0	0.1
Total Del/Veh (s)	21.5	26.2	32.9	5.4	30.4	23.4	26.6	17.8

7: Maple St #3N & Francis Ave #14 Performance by movement

Movement	EBL	EBT	WBT	WBR	NBL	NBT	NBR	All
Denied Del/Veh (s)	4.7	1.6	0.0	0.0	0.0	0.0	0.0	0.7
Total Del/Veh (s)	50.0	11.7	31.1	34.0	290.3	277.4	284.0	115.8

Total Zone Performance

Movement	All
Denied Del/Veh (s)	83.3
Total Del/Veh (s)	971.4

Queuing and Blocking Report
Future With-Project - PM Peak Hour

5/23/2016

Intersection: 4: Francis Ave #14 & Indian Trail Road

Movement	EB	EB	EB	WB	WB	WB	SE	SE
Directions Served	L	T	T	T	T	R	L	LR
Maximum Queue (ft)	100	284	136	1114	1091	280	208	210
Average Queue (ft)	71	89	72	231	895	252	91	105
95th Queue (ft)	111	200	112	813	1425	390	161	166
Link Distance (ft)		1080	1080	1066	1066		1036	1036
Upstream Blk Time (%)				1	4			
Queuing Penalty (veh)				5	41			
Storage Bay Dist (ft)	75					255		
Storage Blk Time (%)	16	3			0	16		
Queuing Penalty (veh)	37	6			3	50		

Intersection: 5: Alberta St & Francis Ave #14

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	LTR	L	TR
Maximum Queue (ft)	200	483	491	200	1410	1415	175	1816	111	115
Average Queue (ft)	94	324	341	142	787	811	169	1536	34	58
95th Queue (ft)	229	458	474	248	1452	1461	211	2271	72	99
Link Distance (ft)		1169	1169		1382	1382		1801		497
Upstream Blk Time (%)					5	7		52		
Queuing Penalty (veh)					41	54		0		
Storage Bay Dist (ft)	175			175			150		100	
Storage Blk Time (%)		36		0	48		2	71	0	1
Queuing Penalty (veh)		15		0	70		11	157	0	1

Intersection: 6: Ash St #4S & Francis Ave #14

Movement	EB	EB	EB	WB	WB	WB	SB	SB	SB	SB
Directions Served	T	T	TR	L	T	T	L	T	T	R
Maximum Queue (ft)	198	254	290	260	160	154	266	257	233	362
Average Queue (ft)	86	140	161	142	74	64	133	145	141	163
95th Queue (ft)	165	252	278	241	137	122	226	219	209	282
Link Distance (ft)		1577	1577	256	256	256	499	499	499	
Upstream Blk Time (%)				0						
Queuing Penalty (veh)				2						
Storage Bay Dist (ft)	300									400
Storage Blk Time (%)										
Queuing Penalty (veh)										

Queuing and Blocking Report
Future With-Project - PM Peak Hour

5/23/2016

Intersection: 7: Maple St #3N & Francis Ave #14

Movement	EB	EB	EB	WB	WB	WB	B471	B471	NB	NB	NB	NB
Directions Served	L	T	T	T	T	TR	T	T	L	LT	T	TR
Maximum Queue (ft)	268	228	247	286	376	378	250	216	140	1363	1325	1326
Average Queue (ft)	193	121	106	172	314	313	42	41	52	1121	1086	1079
95th Queue (ft)	265	200	197	362	419	420	151	136	147	1532	1537	1510
Link Distance (ft)	256	256	256		287	287	232	232		1256	1256	1256
Upstream Blk Time (%)	3		0	0	14	19	0	0		47	34	25
Queuing Penalty (veh)	10		0	0	105	148	3	0		0	0	0
Storage Bay Dist (ft)				300					115			
Storage Blk Time (%)				0	14				0	75		
Queuing Penalty (veh)				1	50				0	162		

Intersection: 7: Maple St #3N & Francis Ave #14

Movement	B476	B476	B472	B472
Directions Served	T	T	T	T
Maximum Queue (ft)	784	803	271	253
Average Queue (ft)	311	319	58	62
95th Queue (ft)	898	911	226	229
Link Distance (ft)	691	691	219	219
Upstream Blk Time (%)	26	26	19	20
Queuing Penalty (veh)	0	0	0	0
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Zone Summary

Zone wide Queuing Penalty: 974

4: Francis Ave #14 & Indian Trail Road Performance by movement

Movement	EBL	EBT	WBT	WBR	SEL	SET	SER	All
Denied Del/Veh (s)	0.1	0.0	46.8	37.8	0.0	0.0	0.0	21.9
Total Del/Veh (s)	35.4	9.6	13.1	81.9	19.3	0.8	9.2	40.4

5: Alberta St & Francis Ave #14 Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.0	0.0	0.0	0.2	1.0	0.0	106.9	122.4	131.0	4.0	0.3	0.3
Total Del/Veh (s)	60.1	45.7	42.5	196.0	188.1	231.6	343.5	348.3	322.0	43.2	43.4	31.0

5: Alberta St & Francis Ave #14 Performance by movement

Movement	All
Denied Del/Veh (s)	23.0
Total Del/Veh (s)	162.9

6: Ash St #4S & Francis Ave #14 Performance by movement

Movement	EBT	EBR	WBL	WBT	SBL	SBT	SBR	All
Denied Del/Veh (s)	0.0	0.0	1.2	1.7	0.0	0.0	1.7	0.8
Total Del/Veh (s)	35.7	22.9	35.4	13.2	29.7	23.1	57.5	27.2

7: Maple St #3N & Francis Ave #14 Performance by movement

Movement	EBL	EBT	WBT	WBR	NBL	NBT	NBR	All
Denied Del/Veh (s)	17.4	11.0	0.0	0.0	0.0	0.0	0.0	3.8
Total Del/Veh (s)	75.2	14.4	53.3	54.2	221.2	183.3	182.4	97.0

Total Zone Performance

Movement	All
Denied Del/Veh (s)	112.0
Total Del/Veh (s)	1014.3

Queuing and Blocking Report
Future With-Project - PM Peak Hour

5/23/2016

Intersection: 4: Francis Ave #14 & Indian Trail Road

Movement	EB	EB	EB	WB	WB	WB	SE	SE
Directions Served	L	T	T	T	T	R	L	LR
Maximum Queue (ft)	100	339	276	1095	1109	280	183	195
Average Queue (ft)	83	97	77	251	1015	280	113	130
95th Queue (ft)	115	219	158	872	1278	280	179	187
Link Distance (ft)		1080	1080	1066	1066		1036	1036
Upstream Blk Time (%)				0	7			
Queuing Penalty (veh)				3	68			
Storage Bay Dist (ft)	75					255		
Storage Blk Time (%)	32	2			0	20		
Queuing Penalty (veh)	74	3			5	63		

Intersection: 5: Alberta St & Francis Ave #14

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	LTR	L	TR
Maximum Queue (ft)	199	515	516	200	1432	1431	175	1840	110	136
Average Queue (ft)	63	320	323	149	1174	1193	166	1557	31	58
95th Queue (ft)	170	460	461	242	1774	1737	205	2185	69	107
Link Distance (ft)		1169	1169		1382	1382		1801		497
Upstream Blk Time (%)					14	19		54		
Queuing Penalty (veh)					113	153		0		
Storage Bay Dist (ft)	175			175			150		100	
Storage Blk Time (%)		36		3	52		4	74	1	2
Queuing Penalty (veh)		15		23	75		18	163	1	1

Intersection: 6: Ash St #4S & Francis Ave #14

Movement	EB	EB	EB	WB	WB	WB	SB	SB	SB	SB
Directions Served	T	T	TR	L	T	T	L	T	T	R
Maximum Queue (ft)	324	436	421	275	290	284	255	199	499	425
Average Queue (ft)	199	133	153	141	131	129	129	135	204	265
95th Queue (ft)	309	291	297	244	260	268	205	192	419	439
Link Distance (ft)		1577	1577	256	256	256	499	499	499	
Upstream Blk Time (%)				1	2	4			0	
Queuing Penalty (veh)				5	9	18			2	
Storage Bay Dist (ft)	300									400
Storage Blk Time (%)	7	0							0	6
Queuing Penalty (veh)	17	0							2	17

Queuing and Blocking Report
Future With-Project - PM Peak Hour

5/23/2016

Intersection: 7: Maple St #3N & Francis Ave #14

Movement	EB	EB	EB	WB	WB	WB	B471	B471	NB	NB	NB	NB
Directions Served	L	T	T	T	T	TR	T	T	L	LT	T	TR
Maximum Queue (ft)	281	195	256	286	406	380	324	306	140	1326	1293	1256
Average Queue (ft)	262	125	129	247	359	359	280	273	67	827	790	788
95th Queue (ft)	301	198	231	389	396	370	388	389	167	1261	1209	1164
Link Distance (ft)	256	256	256		287	287	232	232		1256	1256	1256
Upstream Blk Time (%)	37		0	1	52	60	45	44		1	0	0
Queuing Penalty (veh)	120		0	0	409	465	352	343		0	0	0
Storage Bay Dist (ft)				300					115			
Storage Blk Time (%)				1	52					76		
Queuing Penalty (veh)				2	194					163		

Intersection: 7: Maple St #3N & Francis Ave #14

Movement	B476	B472
Directions Served	T	T
Maximum Queue (ft)	25	33
Average Queue (ft)	1	1
95th Queue (ft)	8	11
Link Distance (ft)	691	219
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Zone Summary

Zone wide Queuing Penalty: 2897

4: Francis Ave #14 & Indian Trail Road Performance by movement

Movement	EBL	EBT	WBT	WBR	SEL	SET	SER	All
Denied Del/Veh (s)	0.0	0.0	20.4	28.9	0.0	0.0	0.0	14.5
Total Del/Veh (s)	40.6	9.6	12.6	67.3	20.7	1.3	10.7	35.3

5: Alberta St & Francis Ave #14 Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.0	0.0	0.0	8.0	4.1	0.0	69.4	65.0	67.0	4.0	0.1	0.3
Total Del/Veh (s)	71.2	44.8	42.3	203.8	193.5	249.6	280.9	294.0	284.6	48.4	48.9	30.2

5: Alberta St & Francis Ave #14 Performance by movement

Movement	All
Denied Del/Veh (s)	15.4
Total Del/Veh (s)	155.6

6: Ash St #4S & Francis Ave #14 Performance by movement

Movement	EBT	EBR	WBL	WBT	SBL	SBT	SBR	All
Denied Del/Veh (s)	0.0	0.0	2.1	2.9	0.0	0.0	0.0	1.2
Total Del/Veh (s)	22.7	25.1	32.8	12.8	31.5	25.0	39.1	22.3

7: Maple St #3N & Francis Ave #14 Performance by movement

Movement	EBL	EBT	WBT	WBR	NBL	NBT	NBR	All
Denied Del/Veh (s)	6.1	2.4	0.0	0.0	0.0	0.0	0.0	1.0
Total Del/Veh (s)	61.6	11.5	48.5	50.3	322.0	308.8	321.2	135.5

Total Zone Performance

Movement	All
Denied Del/Veh (s)	70.3
Total Del/Veh (s)	1155.3

Queuing and Blocking Report
Future With-Project - PM Peak Hour

5/23/2016

Intersection: 4: Francis Ave #14 & Indian Trail Road

Movement	EB	EB	EB	WB	WB	WB	SE	SE
Directions Served	L	T	T	T	T	R	L	LR
Maximum Queue (ft)	100	197	137	1070	1096	280	222	272
Average Queue (ft)	79	91	63	224	867	252	122	139
95th Queue (ft)	114	179	107	711	1312	391	194	218
Link Distance (ft)		1080	1080	1066	1066		1036	1036
Upstream Blk Time (%)				0	2			
Queuing Penalty (veh)				0	18			
Storage Bay Dist (ft)	75					255		
Storage Blk Time (%)	32	2			1	16		
Queuing Penalty (veh)	74	4			11	52		

Intersection: 5: Alberta St & Francis Ave #14

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	LTR	L	TR
Maximum Queue (ft)	199	486	458	200	1421	1430	175	1836	124	132
Average Queue (ft)	47	329	333	143	1273	1283	162	1328	42	50
95th Queue (ft)	141	431	422	244	1615	1613	212	2272	86	103
Link Distance (ft)		1169	1169		1382	1382		1801		497
Upstream Blk Time (%)					15	17		37		
Queuing Penalty (veh)					124	141		0		
Storage Bay Dist (ft)	175			175			150		100	
Storage Blk Time (%)		36		3	54		4	69	0	3
Queuing Penalty (veh)		15		23	79		17	152	0	1

Intersection: 6: Ash St #4S & Francis Ave #14

Movement	EB	EB	EB	WB	WB	WB	SB	SB	SB	SB
Directions Served	T	T	TR	L	T	T	L	T	T	R
Maximum Queue (ft)	193	274	295	265	298	301	247	229	217	422
Average Queue (ft)	89	131	150	137	138	133	135	139	146	205
95th Queue (ft)	174	244	272	229	260	262	217	207	201	355
Link Distance (ft)		1577	1577	256	256	256	499	499	499	
Upstream Blk Time (%)				1	1	1				
Queuing Penalty (veh)				3	5	5				
Storage Bay Dist (ft)	300									400
Storage Blk Time (%)										1
Queuing Penalty (veh)										3

Queuing and Blocking Report
Future With-Project - PM Peak Hour

5/23/2016

Intersection: 7: Maple St #3N & Francis Ave #14

Movement	EB	EB	EB	WB	WB	WB	B471	B471	NB	NB	NB	NB
Directions Served	L	T	T	T	T	TR	T	T	L	LT	T	TR
Maximum Queue (ft)	295	176	193	286	405	376	310	275	140	1363	1325	1341
Average Queue (ft)	226	114	103	234	356	348	181	159	66	1236	1224	1210
95th Queue (ft)	305	174	172	383	401	387	356	311	163	1512	1498	1496
Link Distance (ft)	256	256	256		287	287	232	232		1256	1256	1256
Upstream Blk Time (%)	16			0	42	46	13	10		59	38	34
Queuing Penalty (veh)	51			0	329	362	104	78		0	0	0
Storage Bay Dist (ft)				300					115			
Storage Blk Time (%)				0	42					72		
Queuing Penalty (veh)				2	156					154		

Intersection: 7: Maple St #3N & Francis Ave #14

Movement	B476	B476	B472	B472
Directions Served	T	T	T	T
Maximum Queue (ft)	765	789	234	234
Average Queue (ft)	343	334	24	24
95th Queue (ft)	836	827	140	140
Link Distance (ft)	691	691	219	219
Upstream Blk Time (%)	11	11	7	7
Queuing Penalty (veh)	0	0	0	0
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Zone Summary

Zone wide Queuing Penalty: 1962

4: Francis Ave #14 & Indian Trail Road Performance by movement

Movement	EBL	EBT	WBT	WBR	SEL	SER	All
Denied Delay (hr)	0.0	0.0	0.0	0.1	18.8	0.2	19.1
Total Delay (hr)	0.6	1.8	1.1	0.5	35.9	1.9	41.9

5: Alberta St & Francis Ave #14 Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Delay (hr)	2.1	66.2	5.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
Total Delay (hr)	1.0	55.1	8.7	2.2	4.1	0.1	3.0	0.4	1.0	1.0	1.3	0.4

5: Alberta St & Francis Ave #14 Performance by movement

Movement	All
Denied Delay (hr)	73.5
Total Delay (hr)	78.2

6: Ash St #4S & Francis Ave #14 Performance by movement

Movement	EBT	EBR	WBL	WBT	SBL	SBT	SBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (hr)	8.2	1.7	0.9	1.1	2.5	3.7	1.0	19.1

7: Maple St #3N & Francis Ave #14 Performance by movement

Movement	EBL	EBT	WBT	WBR	NBL	NBT	NBR	All
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay (hr)	1.6	1.5	3.0	0.3	0.2	4.3	1.1	11.9

Total Zone Performance

Movement	All
Denied Delay (hr)	92.6
Total Delay (hr)	151.0

Queuing and Blocking Report
Future With-Project - AM Peak Hour

5/23/2016

Intersection: 4: Francis Ave #14 & Indian Trail Road

Movement	EB	EB	EB	WB	WB	SE	SE
Directions Served	L	T	T	T	T	L	LR
Maximum Queue (ft)	100	122	173	140	116	882	966
Average Queue (ft)	49	66	110	55	60	652	688
95th Queue (ft)	84	114	161	94	98	908	939
Link Distance (ft)		1080	1080	1066	1066	1036	1036
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)	75						
Storage Blk Time (%)	5	2					
Queuing Penalty (veh)	13	2					

Intersection: 5: Alberta St & Francis Ave #14

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	LTR	L	TR
Maximum Queue (ft)	200	1185	1198	199	272	304	174	395	125	223
Average Queue (ft)	37	1007	1019	109	131	148	86	169	64	104
95th Queue (ft)	144	1383	1391	196	238	237	160	289	112	191
Link Distance (ft)		1169	1169		1382	1382		1801		497
Upstream Blk Time (%)		14	18							
Queuing Penalty (veh)		111	136							
Storage Bay Dist (ft)	175			175			150		100	
Storage Blk Time (%)		60		5	2		0	10	3	11
Queuing Penalty (veh)		19		15	3		0	9	4	9

Intersection: 6: Ash St #4S & Francis Ave #14

Movement	EB	EB	EB	WB	WB	WB	SB	SB	SB	SB
Directions Served	T	T	TR	L	T	T	L	T	T	R
Maximum Queue (ft)	269	325	355	133	131	194	267	309	282	129
Average Queue (ft)	108	207	220	63	53	31	170	132	138	66
95th Queue (ft)	238	333	333	110	102	104	247	217	206	109
Link Distance (ft)		1577	1577	256	256	256	499	499	499	
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	300									400
Storage Blk Time (%)		1								
Queuing Penalty (veh)		4								

Queuing and Blocking Report
Future With-Project - AM Peak Hour

5/23/2016

Intersection: 7: Maple St #3N & Francis Ave #14

Movement	EB	EB	EB	WB	WB	WB	NB	NB	NB	NB
Directions Served	L	T	T	T	T	TR	L	LT	T	TR
Maximum Queue (ft)	249	126	134	73	203	200	30	143	163	204
Average Queue (ft)	122	58	58	32	120	101	3	78	114	149
95th Queue (ft)	218	119	118	60	177	161	17	142	168	206
Link Distance (ft)	256	256	256		287	287		1256	1256	1256
Upstream Blk Time (%)	0									
Queuing Penalty (veh)	0									
Storage Bay Dist (ft)				300			115			
Storage Blk Time (%)								3		
Queuing Penalty (veh)								0		

Zone Summary

Zone wide Queuing Penalty: 325

4: Francis Ave #14 & Indian Trail Road Performance by movement

Movement	EBL	EBT	WBT	WBR	SEL	SET	SER	All
Denied Del/Veh (s)	0.2	0.0	28.4	27.5	0.0	0.0	0.0	15.8
Total Del/Veh (s)	34.4	8.1	14.1	66.0	17.8	0.9	6.9	34.3

5: Alberta St & Francis Ave #14 Performance by movement

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Denied Del/Veh (s)	0.0	0.0	0.0	2.0	1.0	0.4	38.5	40.6	36.8	4.0	0.2	0.3
Total Del/Veh (s)	67.5	37.3	33.2	152.8	125.9	127.4	291.0	298.5	281.2	47.4	45.4	24.5

5: Alberta St & Francis Ave #14 Performance by movement

Movement	All
Denied Del/Veh (s)	8.1
Total Del/Veh (s)	129.7

6: Ash St #4S & Francis Ave #14 Performance by movement

Movement	EBT	EBR	WBL	WBT	SBL	SBT	SBR	All
Denied Del/Veh (s)	0.0	0.0	0.2	0.1	0.0	0.0	0.0	0.1
Total Del/Veh (s)	23.8	22.8	32.4	6.1	33.0	24.5	26.9	18.8

7: Maple St #3N & Francis Ave #14 Performance by movement

Movement	EBL	EBT	WBT	WBR	NBL	NBT	NBR	All
Denied Del/Veh (s)	15.6	10.4	0.0	0.0	0.0	0.0	0.0	3.4
Total Del/Veh (s)	61.4	12.7	41.0	43.6	271.5	275.4	270.4	119.9

Total Zone Performance

Movement	All
Denied Del/Veh (s)	60.9
Total Del/Veh (s)	954.4

Queuing and Blocking Report
Future With-Project - PM Peak Hour

5/23/2016

Intersection: 4: Francis Ave #14 & Indian Trail Road

Movement	EB	EB	EB	WB	WB	WB	SE	SE
Directions Served	L	T	T	T	T	R	L	LR
Maximum Queue (ft)	100	173	158	1088	1106	280	174	222
Average Queue (ft)	81	73	59	363	769	243	98	112
95th Queue (ft)	114	150	110	995	1320	400	151	176
Link Distance (ft)		1080	1080	1066	1066		1036	1036
Upstream Blk Time (%)				0	2			
Queuing Penalty (veh)				2	25			
Storage Bay Dist (ft)	75					255		
Storage Blk Time (%)	25	1			1	16		
Queuing Penalty (veh)	57	3			8	50		

Intersection: 5: Alberta St & Francis Ave #14

Movement	EB	EB	EB	WB	WB	WB	NB	NB	SB	SB
Directions Served	L	T	TR	L	T	TR	L	LTR	L	TR
Maximum Queue (ft)	199	380	405	200	1394	1398	175	1835	71	106
Average Queue (ft)	48	254	272	147	907	936	170	1476	32	52
95th Queue (ft)	151	345	371	231	1597	1600	200	2130	66	90
Link Distance (ft)		1169	1169		1382	1382		1801		497
Upstream Blk Time (%)					3	4		40		
Queuing Penalty (veh)					27	30		0		
Storage Bay Dist (ft)	175			175			150		100	
Storage Blk Time (%)		24		6	44		6	71		1
Queuing Penalty (veh)		10		45	65		28	157		0

Intersection: 6: Ash St #4S & Francis Ave #14

Movement	EB	EB	EB	WB	WB	WB	SB	SB	SB	SB
Directions Served	T	T	TR	L	T	T	L	T	T	R
Maximum Queue (ft)	305	233	278	256	176	142	274	247	242	325
Average Queue (ft)	114	129	139	143	96	88	126	155	158	173
95th Queue (ft)	245	235	255	237	146	144	218	222	229	281
Link Distance (ft)		1577	1577	256	256	256	499	499	499	
Upstream Blk Time (%)				0						
Queuing Penalty (veh)				0						
Storage Bay Dist (ft)	300									400
Storage Blk Time (%)	2									
Queuing Penalty (veh)	4									

Queuing and Blocking Report
Future With-Project - PM Peak Hour

5/23/2016

Intersection: 7: Maple St #3N & Francis Ave #14

Movement	EB	EB	EB	WB	WB	WB	B471	B471	NB	NB	NB	NB
Directions Served	L	T	T	T	T	TR	T	T	L	LT	T	TR
Maximum Queue (ft)	287	197	262	286	405	394	305	305	140	1350	1325	1344
Average Queue (ft)	222	118	121	212	346	338	131	116	64	1112	1095	1089
95th Queue (ft)	315	181	211	386	411	413	302	287	155	1469	1454	1438
Link Distance (ft)	256	256	256		287	287	232	232		1256	1256	1256
Upstream Blk Time (%)	15		0	1	32	35	8	7		29	17	18
Queuing Penalty (veh)	48		0	0	250	274	60	52		0	0	0
Storage Bay Dist (ft)				300					115			
Storage Blk Time (%)				1	32				0	67		
Queuing Penalty (veh)				3	118				0	145		

Intersection: 7: Maple St #3N & Francis Ave #14

Movement	B476	B476	B472	B472
Directions Served	T	T	T	T
Maximum Queue (ft)	765	793	59	134
Average Queue (ft)	143	143	3	9
95th Queue (ft)	577	572	24	64
Link Distance (ft)	691	691	219	219
Upstream Blk Time (%)	5	5		
Queuing Penalty (veh)	0	0		
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Zone Summary

Zone wide Queuing Penalty: 1461

Appendix F

Collision History Analysis

TO: Inga Note, P.E. - City of Spokane Street Department
 Lisa Key - City of Spokane Planning and Development
 Tirrell Black - City of Spokane Planning Department

FROM: Bill White
 Kennet Bertelsen, P.E.

DATE: June 8, 2016

JOB NO.: 5594.002

RE: Windhaven Apartments, Indian Trail Safety/Collision Analysis

CC: Jay Bonnet, P.E. - Bonnett Engineering
 Del Stratton - Douglass Properties

☐ Urgent ☒ For Review ☒ Please Comment ☒ Please Reply ☐ For Your Use

This memorandum summarizes the safety/collision analysis prepared for Indian Trail Road in north Spokane, WA. This has been provided the second supplement to the *Windhaven Apartments Traffic Impact Analysis* (MMI, May 2016), as prepared in response to citizen commentary/questions recorded at the Windhaven neighborhood public meeting performed on May 25, 2016 at Indian Trail Church. Source material such as project data, traffic forecasts, and comparative analyses can be reviewed with the project Traffic Impact Analysis (TIA).

METHODOLOGY

The purposes of collision analyses is to determine whether safety issues occur as a result of operational or design issues, such as signal phase issues, sight distance limitations, channelization alignment issues, etc. A location where numerous incidents occur could indicate a high accident location (HAL). A high number of collisions occurring along a street or street section may indicate a high accident corridor (HAC).

Any collision is important to consider and is relevant in safety analyses. However, collisions are reviewed on the basis of severity rates to help determine whether some form of remediation may be needed to address persistent, reoccurring collision issues within the context of traffic densities. An intersection or corridor section may have a high number of collisions/incidents, but this is not as statistically significant if the high traffic volumes are also experienced. Collision rates are calculated to provide a statistical means for quantifying collision density.

An intersection (or driveway) collision rate (ICR) quantifies severity based on the number of average accidents occurring per year, as compared with average daily traffic (ADT) entering the intersection per the following equation:

$$\begin{array}{lcl} \text{Intersection Collision Rate (ICR)} & = & \frac{\text{Average Accidents per Year} * 1,000,000}{365 * \text{Total Entering Intersection ADT}} \\ \text{(Collisions per million entering vehicles)} & & \end{array}$$

Similarly, the corridor collision rate (CCR) for a street or street section is based on the number of average accidents occurring per year compared with average daily traffic AND the length of the corridor, per the following equation:

$$\begin{array}{lcl} \text{Corridor Collision Rate (CCR)} & = & \frac{\text{Average Accidents per Year} * 1,000,000}{365 * \text{Section ADT} * \text{Section Length}} \\ \text{(Collisions per million miles of vehicle travel)} & & \end{array}$$

Typically jurisdictions such as Spokane have no set thresholds for identifying an HAL or HAC. However, a typical industry recommendation is that further evaluation/analysis should be considered if accident rates exceed 1.0 collisions per million entering vehicles for an intersection (or driveway).

The Washington State Department of Transportation provides collision statistics within annual summary reports. The “2014 Annual Collision Summary”, the most current report available, indicates Spokane County experiences a system/network-wide rate of 168.7 collisions per 100 million miles of travel, or 1.687 collisions per million miles of travel. Thus, by comparison, the use of a 1.0 threshold is conservative at least on the basis of corridor analyses. This at least provides some local context to safety/collision analyses.

ANALYSIS

Collision histories were reviewed for 2.67 miles of Indian Trail Road between Navaho Avenue and Francis Avenue. Intersections, driveways, and mid-block locations were considered, as well as for the corridor section overall. Histories were reviewed for nearly a three and a half-year period extending between January 1, 2013 and May 31, 2016, the most current three-plus year timeframe available, as per standard industry practices. Collision data was provided by City of Spokane officials.

Note the histories/data reviewed reflects recorded collisions, as identified through evidentiary reports provided by City of Spokane, Spokane County, and/or State law enforcement officials. Unreported collisions do occur throughout a community on roadways such as Indian Trail Road. However, Safety studies can be performed only based on recorded data. Most typically, unreported collisions would involve minor property damage only (typically non-injury).

Total collisions, average collisions, collisions rates, and severity were determined for each intersection or driveway with summary data provided in Table 1 (next page). Also summarized in bold, final row, is the overall corridor collision data for the 2.67 mile street section. Other factors to note from this table include:

- ◆ 3.4-Year refers to total collisions collected for the 3 year and 5 months analysis timeframe.
- ◆ Average annual would then be the average year collisions, taken by dividing total collisions by 3 years and 5 months.
- ◆ ADT refers to traffic entering the intersection from Indian Trail Road. The resulting ICR rates should be considered conservative as no side-street ADT is reflected.
- ◆ The average corridor ADT (in bold) was taken from three count locations of 13,555, 16,821, and 17,299, as these were performed to support the TIA and are prevalent for the study corridor section.
- ◆ PDO is a property damage only collision without injuries. These were reviewed on the basis of each incident, as to compare with other severity incidents. Each incident may actually have two or more vehicles with property damage.
- ◆ Inj. is an injury-related incident. Property damage is likely, but the worse-severity is recorded for comparison. Note injuries were also reviewed on the basis of each incident, as to compare with other severity incidents. Each incident may actually have two or more persons with injuries.
- ◆ Fat. refers to a fatality. It is acknowledge a fatality, predating this study timeframe, may have occurred and is well-remembered by citizens of the neighborhood. However, the occurrence is not recorded as it again predates available collected from City officials between January 1, 2013 and May 31, 2016.

Table 1. Summary Intersection Collision

Intersection	Traffic Control				Severity		
	3.4-Year Totals	Average Annual	ADT ¹	ICR ² or CCR ³	PDO ⁴	Inj. ⁵	Fat ⁶
Navaho Avenue	3	0.9	4100	0.59	67%	33%	0%
Shawnee Avenue	2	0.6	13555	0.12	50%	50%	0%
Mid-Block S/of Shawnee	1	0.3	13555	0.06	0%	100%	0%
Selkirk Apts Drive	0	0.0	13555	0.00	0%	0%	0%
Chase Bank Drive	0	0.0	13555	0.00	0%	0%	0%
Barnes Road	8	2.3	13555	0.47	25%	75%	0%
Sundance Plaza North Drive	3	0.9	13555	0.18	33%	67%	0%
Sundance Plaza South Drive	0	0.0	13555	0.00	0%	0%	0%
STCU Drive	0	0.0	13555	0.00	0%	0%	0%
Lowell Avenue	2	0.6	16821	0.10	50%	50%	0%
Pacific Park Dr./Strong Rd	4	1.2	16821	0.19	25%	75%	0%
Christian School Drive	1	0.3	16821	0.05	0%	100%	0%
Kathleen Avenue	1	0.3	17299	0.05	100%	0%	0%
Excel Avenue	0	0.0	17299	0.00	0%	0%	0%
Fleming Street	1	0.3	17299	0.05	0%	100%	0%
Weile Avenue	0	0.0	17299	0.00	0%	0%	0%
Assumption Parish School	0	0.0	17299	0.00	0%	0%	0%
Woodside Avenue	6	1.8	17299	0.28	50%	50%	0%
Beacon Avenue	1	0.3	17299	0.05	100%	0%	0%
Holyoke Avenue	1	0.3	17299	0.05	100%	0%	0%
Yokes North Drive	0	0.0	17299	0.00	0%	0%	0%
Yokes Central Drive	0	0.0	17299	0.00	0%	0%	0%
Indian Trail Dental North Drive	0	0.0	17299	0.00	0%	0%	0%
Indian Trail Dental South Drive	0	0.0	17299	0.00	0%	0%	0%
Elmhurst Street	2	0.6	17299	0.09	0%	100%	0%
Francis Avenue	16	4.7	17299	0.74	50%	50%	0%
Total Collisions	52	15.2	15892	0.98	42%	58%	0%
1. ADT = Entering from Indian Trail for intersections, or as a count average for the corridor. 2. ICR = Intersection Collision Rate 3. CCR = Collision Corridor Rate 4. PDO = Property Damage Only 5. Inj. = Injury Incident 6. Fat. = Fatality							

As shown, 52 recorded collisions occurred along Indian Trail Road between Indian Trail Road between January 1, 2013 and May 31, 2016. Overall, 42 percent of collisions involved vehicle property damage only with 58 percent involving injuries. There were no fatalities within the study timeframe. An average of 15.2 collisions occur along Indian Trail Road each year that, when compared with an average of 15,892 ADT, results in a CCR of 0.98 collisions per million miles of vehicle travel.

Three prevailing collision types along the corridor include:

1. **35% Rear-End Collisions** - A following vehicle collides with a preceding stopped or slowing vehicle);
2. **25% Left Angle** - A left turn “tee” collisions where a permissive left-turning vehicle crosses in front of a through vehicle at an intersection or driveway.
3. **19% Right Angle** - A right-turning vehicle at an intersection or driveway enters the roadway in front of a through vehicle.

The remaining 21 percent of collision types varied between same direction side-swipe, opposite direction side-swipe, opposite direction head-on, a collision with a fixed object (tree, pole, sign, or parked car), and a collision with a pedestrian or bicyclist.

A summary of intersection collision data for the highest three intersection locations, as determined on the basis of ICR comparisons, is summarized as follow:

1. **Francis Avenue/Indian Trail Road.** Sixteen collisions occurred over three years and five months with an average of 4.7 collisions occurring per year; calculating to an ICR of 0.74 collisions per million entering vehicles. Severities were equal between injury and property damage only collisions. The prevailing intersection types include left-angle (56-percent) and rear end (31 percent).
2. **Navaho Avenue/Indian Trail Road.** Three collisions occurred over three years and five months with an average of 0.9 collisions occurring per year; calculating to an ICR of 0.59 collisions per million entering vehicles. Two collisions involved property damage only with one injury accident. All collisions were right angle.
3. **Barnes Road/Indian Trail Road.** Eight collisions occurred over three years and five months with an average of 2.3 collisions occurring per year; calculating to an ICR of 0.47 collisions per million entering vehicles. 75 percent of collisions involved injuries with 25 percent property damage only. The prevailing intersection types include left and right-angle collisions (63 percent). A pedestrian was hit crossing at the intersection.

As shown on Table 1, respective intersection and driveway ICR do not exceed 1.0 collisions per million entering vehicles. Thus, it does not appear an HAL is prevalent on the basis of collision densities. Similarly, the CCR is just below 1.0 collisions per million entering vehicles, suggesting a HAC does not exist along Indian Trail Road. The rate is well below the average for roadways throughout Spokane County.

Other highlights and pertinent information from the safety analysis includes:

- ◆ No fatalities were noted within the three year and five month study timeframe.
- ◆ A pedestrian incident was noted at the Barnes Road intersections.
- ◆ A pedestrian incident was noted mid-block between Shawnee Avenue and Barnes Road.
- ◆ Nine collisions were attributed to “wet” roadway conditions, with four during rain, outside of snow/ice.
- ◆ Two additional collisions were attributed to snow/ice.
- ◆ Twelve collisions occurred at night (dark)

SUMMARY

The collision analysis does not highlight a potential HAL or HAC for Indian Trail Road; thus, no improvement considerations are recommended. With that said, the CCR is nearly at 1.0. Thus, it is recommended the City, via any staff study or through request of future private development

studies, continue to review collision rates to confirm that an HAL or HAC does not evolve for Indian Trail Road.

Note additional summary data on the intersection basis is provided on the next page for more detailed review, if/as needed.

Further Collision Summary Data

Location	Total Collisions	Average Annual	Mainline ADT	Corridor Intersection Rate	Property Damage Only	Injury Accident	Fatality	Rear End	Same Direction Sideswipe	Opposite Direction Left-Turn "Tee"	Drive/Intersect. Enter. Right Angle "Tee"	Opposite Direction Sideswipe	Opposite Direction Head On	Overturn Vehicle	Fixed Object or Parked Car	Pedestrian or Bicycle
Navaho Avenue	3	0.9	4100	0.59	2	1					3					
Shawnee Avenue	2	0.6	13555	0.12	1	1		1			1					
Mid-Block S/ of Shawnee	1	0.3	13555	0.06		1										1
Selkirk Apts Drive	0	0.0	13555	0.00												
Chase Bank Drive	0	0.0	13555	0.00												
Barnes Road	8	2.3	13555	0.47	2	6				2	3		1		1	1
Sundance Plaza North Drive	3	0.9	13555	0.18	1	2		1							2	
Sundance Plaza South Drive	0	0.0	13555	0.00												
STCU Drive	0	0.0	13555	0.00												
Lowell Avenue	2	0.6	16821	0.10	1	1		1					1			
Pacific Park Dr/Strong Rd	4	1.2	16821	0.19	1	3		3	1							
Christian School Drive	1	0.3	16821	0.05		1		1								
Kathleen Avenue	1	0.3	17299	0.05	1			1								
Excel Avenue	0	0.0	17299	0.00												
Fleming Street	1	0.3	17299	0.05		1		1								
Weile Avenue	0	0.0	17299	0.00												
Assumption Parish School	0	0.0	17299	0.00												
Woodside Avenue	6	1.8	17299	0.28	3	3		3		2	1					
Beacon Avenue	1	0.3	17299	0.05	1										1	
Holyoke Avenue	1	0.3	17299	0.05	1						1					
Yokes North Drive	0	0.0	17299	0.00												
Yokes Central Drive	0	0.0	17299	0.00												
Indian Trail Dental North Drive	0	0.0	17299	0.00												
Indian Trail Dental South Drive	0	0.0	17299	0.00												
Elmhurst Street	2	0.6	17299	0.09		2		1							1	
Francis Avenue	16	4.7	17299	0.74	8	8		5	1	9	1					
Total Collisions	52	15.2	15892	0.98	22	30	0	18	2	13	10	0	2	0	5	2
- Percent Collisions					42%	58%	0%	35%	4%	25%	19%	0%	4%	0%	10%	4%
Location	Total Collisions	Average Annual	Mainline ADT		Property Damage Only	Injury Accident	Fatality	Rear End	Same Direction Sideswipe	Opposite Direction Left-Turn "Tee"	Drive/Intersect. Enter. Right Angle "Tee"	Opposite Direction Sideswipe	Opposite Direction Head On	Overturn Vehicle	Fixed Object or Parked Car	Pedestrian or Bicycle

