February 17, 2016

Jason Wisniewski
Fischer Development Company
3940 Olympic Boulevard, Suite 100
Erlanger, Kentucky 41018

Dear Mr. Wisniewski:

Subject: Ferguson Property Development Traffic Impact Study
Pierce Township, Clermont County, Ohio

Enclosed is a traffic impact study for the proposed Ferguson Property development. The results of the study indicate no improvements to the roadway are needed as a result of this development.

Sincerely,

Matthew J. Hoying

Matthew J. Hoying, P.E.
Project Manager

West Central Ohio
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TRAFFIC IMPACT STUDY

ANALYSIS SNAPSHOT

This document details the following items prepared for the proposed Ferguson Property development located on the northwest quadrant of Merwin Ten Mile Road & White Oak Road in Pierce Township, Clermont County, Ohio. The proposed Ferguson Property development will include 224 single family homes at full build-out. This Traffic Impact Study, prepared for the Fischer Development Company at the request of Clermont County, includes: Existing Traffic Volumes, Trip Generation, Directional Distribution, 2017 Opening Year No-Build Traffic Volumes, 2017 Opening Year Build Traffic Volumes, 2037 Design Year No-Build Traffic Volumes, 2037 Design Year Build Traffic Volumes, Capacity Analysis, Turn Lane Analysis, Signal Warrant Analysis and Recommendations. The purpose of this study is to identify the traffic-related impacts of the proposed residential development during typical weekday AM and PM peak hours. The proposed Ferguson Property development has two (2) access points: one (1) along Merwin Ten Mile Road and one (1) along White Oak Road.

EXISTING TRAFFIC VOLUMES

Peak period manual turning movement counts were collected by Choice One Engineering on Tuesday, February 2, 2016 at the intersection of Merwin Ten Mile Road and White Oak Road. Data was collected from 7:00 to 9:00 AM and 4:30 to 6:30 PM. The peak hours were found to be from 7:15 to 8:15 AM and 5:15 to 6:15 PM. The 2016 Existing Traffic Volumes are attached.

TRIP GENERATION

Studies of similar developments throughout North America have shown that the amount of traffic generated will be functionally related to some unit of activity (i.e., number of employees, number of dwelling units, gross floor area). The weekday AM and PM Peak hours were based on the existing counts.

Using the average trip-generation rates given in the Institute of Transportation Engineers (ITE) Trip Generation Manual, 9th Edition, the inbound and outbound trips for the proposed Ferguson Property development were calculated. The site generated trips were estimated using 224 Single-Family Detached Housing (Land Use Code 210) dwelling units. According to ITE Trip Generation Manual, 9th Edition, the proposed Ferguson Property development is estimated to generate 168 vehicular trips during the Weekday AM Peak Hour (42 inbound and 126 outbound) and 224 vehicular trip during the Weekday PM Peak Hour (141 inbound and 83 outbound). The forecasted generated trips are attached and summarized below.

Table 1 – Summary of Trip Generation

Land Use Description	ITE Code	Size	Unit	AM Peak Hour Primary Trips			PM Peak Hour Primary Trips		
				Total	Entering	Exiting	Total	Entering	Exiting
Single-Family Detached Housing	210	224	Dwelling Units	168	42	126	224	141	83
Directional Distributions					*25%*	*75%*		*63%*	*37%*
Totals				**168**	**42**	**126**	**224**	**141**	**83**

DIRECTIONAL DISTRIBUTION

Choice One analyzed the existing AM and PM Peak Hour traffic volumes at the intersection of Merwin Ten Mile Road and White Oak Road (turning movements) along with anticipating the direction in which traffic will approach and depart the development to formulate the directional distribution. The directional distribution is attached.

2017 OPENING YEAR BUILD TRAFFIC VOLUMES

The 2017 Opening Year Build Traffic Volumes were calculated from the 2016 Existing Traffic Volumes multiplied by a 1% growth rate for one year, multiplied by a seasonal adjustment factor of 1.122, and then adding the additional trips generated by the proposed Ferguson Property development to each of the entering and exiting movements at the intersection of Merwin Ten Mile Road and White Oak Road. The 1% annual growth rate was provided by the Clermont County Engineer and the seasonal adjustment factor was provided by the ODOT Office of Technical Services. The 2017 Opening Year Build Traffic Volumes are attached.

2037 DESIGN YEAR BUILD TRAFFIC VOLUMES

The 2037 Design Year Build Traffic Volumes were calculated from the 2016 Existing Traffic Volumes multiplied by a 1% growth rate for twenty-one years, multiplied by a seasonal adjustment factor of 1.122, and then adding the additional trips generated by the proposed Ferguson Property development to each of the entering and exiting movements at the intersection of Merwin Ten Mile Road and White Oak Road. The 1% annual growth rate was provided by the Clermont County Engineer and the seasonal adjustment factor was provided by the ODOT Office of Technical Services. The 2037 Design Year Build Traffic Volumes are attached.

CAPACITY ANALYSIS

Utilizing the Peak Hour Traffic Volumes, capacity calculations were performed for the intersection of Merwin Ten Mile Road and White Oak Road. The calculations employed procedures documented in the Highway Capacity Manual (Transportation Research Board, Fifth Edition, Updated 2010). The capacity of an intersection (signalized or unsignalized) can best be described by its corresponding Level of Service (LOS). The LOS of an intersection is a qualitative measure of the various attributes of an intersection. There are six LOS ranging from "ideal" free flow conditions at LOS "A," to forced or "breakdown" conditions at LOS "F." The LOS for unsignalized intersections is based upon total delay. Total delay is defined in the Highway Capacity Manual as the total elapsed time from when a vehicle stops at the end of the queue until the vehicle departs from the stop line; this time includes the time required for the vehicle to travel from the last-in-queue position to the first-in-queue position.

Capacity calculations were performed in HCS 2010 for the intersection of Merwin Ten Mile Road and White Oak Road analyzing the 2016 Existing, 2017 Opening Year No-Build, 2017 Opening Year Build, 2037 Design Year No-Build Traffic Volumes and 2037 Design Year Build Traffic Volumes. The intersection is not significantly degraded by the proposed development so the chart below only displays a summary of the Existing and Build Year scenarios. All capacity analysis summaries are attached.

Table 2 – Summary of AM & PM Peak Hour Capacity Analysis

	AM Peak Hour			**PM Peak Hour**		
Direction	**2016 Existing**	**2017 Opening Year Build**	**2037 Design Year Build**	**2016 Existing**	**2017 Opening Year Build**	**2037 Design Year Build**
1: Merwin Ten Mile Road and White Oak Road						
White Oak Road						
Eastbound Approach	A(8.08)	A(8.47)	A(8.94)	B(10.09)	B(11.75)	B(14.60)
Westbound Approach	A(8.64)	A(9.32)	B(10.24)	A(9.06)	B(10.33)	B(12.06)
Merwin Ten Mile Road						
Northbound Approach	A(8.40)	A(9.02)	A(9.76)	A(9.54)	B(11.33)	B(13.93)
Southbound Approach	A(8.10)	A(8.81)	A(9.46)	A(10.14)	B(12.33)	C(15.40)
Total LOS (Delay)	**A(8.38)**	**A(8.99)**	**A(9.74)**	**A(9.80)**	**B(11.47)**	**B(14.22)**

All approaches during the studied traffic scenarios will operate at an acceptable LOS. A summary of the results of the analyses are attached.

TURN LANE ANALYSIS

Turn Lane Analysis were completed for the free flow approaches along Merwin Ten Mile Road and White Oak Road at the proposed access points using the 2017 Opening Year Build Traffic Volumes and 2037 Design Year Build Traffic Volumes. Turn lane warrants were checked against the 2-Lane Highway Left (or Right) Turn Lane Warrants figures for a 45 MPH roadway in the ODOT Access Management Manual.

Neither left nor right turn lanes were found to be warranted along Merwin Ten Mile Road and White Oak Road at the proposed access points. The turn lane analyses are attached.

SIGNAL WARRANT ANALYSIS

In accordance with the *2012 OMUTCD*, Chapter 4C, the studied intersection was tested against the following signal warrant:

Warrant 3 – Peak Hour

The Peak Hour Vehicular Volume warrants require that an intersection has a single hour where the volume of vehicles approaching the intersection is above a given threshold determined by the Ohio Department of Transportation (ODOT).

It is optional to use the 70 percent reduction factor when the posted speed limit is equal to or greater than 40 mph or if the intersection lies within an isolated community with a population of less than 10,000. The proposed development's location meets the criteria for both speed limit and population so 70 percent reduction factor was used.

The volume of vehicles approaching this intersection on both the major and minor street approaches does <u>not</u> meet the required volume to satisfy Warrant 3 – Peak Hour. The signal warrant analysis is attached.

RECOMMENDATIONS

The proposed Ferguson Property development does not significantly impact the surrounding roadway network and no improvements are recommended at this time.

The following included attachments detail the findings of Choice One:

1. Turning Movement Counts
2. Concept Plan
3. Trip Generation and Directional Distribution
4. Seasonal Adjustment Factor
5. Existing Traffic Volumes, 2017 Opening Year Build Traffic Volumes and 2037 Design Year Build Traffic Volumes
6. Capacity Analysis
7. Turn Lane Warrant Analyses
8. Signal Warrant Analysis

Choice One Engineering
Ferguson Property TIS
Merwin 10 Mile & White Oak
TMC: 2/3/2016

File Name : TMC 2016-02-03
Site Code : 00000000
Start Date : 2/2/2016
Page No : 1

Groups Printed- Unshifted - Bank 1

	White Oak Eastbound					White Oak Westbound					Merwin 10 Mile Northbound					Merwin Ten Mile Southbound					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
06:55 AM	0	5	3	0	8	9	23	10	0	42	5	19	7	0	31	15	11	4	0	30	111
07:10 AM	0	5	5	0	10	12	20	7	0	39	3	16	5	0	24	14	18	3	0	35	108
07:25 AM	0	3	4	0	7	5	32	4	0	41	4	26	2	0	32	7	11	7	0	25	105
07:40 AM	1	8	8	0	17	10	23	4	0	37	10	29	4	0	43	10	10	2	0	22	119
07:55 AM	1	5	4	0	10	6	22	12	0	40	7	22	2	0	31	10	13	3	0	26	107
08:10 AM	0	3	3	0	6	8	16	5	0	29	3	19	3	0	25	5	14	5	0	24	84
08:25 AM	0	6	11	0	17	5	24	4	0	33	4	18	6	0	28	14	10	7	0	31	109
08:40 AM	0	18	23	0	41	10	18	1	0	29	6	21	1	0	28	9	14	3	0	26	124
08:55 AM	0	2	2	0	4	2	4	1	0	7	1	4	0	0	5	2	4	1	0	7	23
*** BREAK ***																					
04:25 PM	1	18	9	0	28	6	3	9	0	18	8	14	1	0	23	10	20	3	0	33	102
04:40 PM	2	16	9	0	27	11	12	16	0	39	13	23	1	0	37	10	43	13	0	66	169
04:55 PM	2	26	8	0	36	16	9	6	0	31	21	30	1	0	52	8	31	6	0	45	164
05:10 PM	2	26	14	0	42	12	8	10	0	30	12	24	0	0	36	9	36	10	0	55	163
05:25 PM	6	25	15	0	46	8	11	7	0	26	13	28	1	0	42	11	36	4	0	51	165
05:40 PM	4	28	20	0	52	14	8	6	0	28	11	27	4	0	42	9	40	6	0	55	177
05:55 PM	6	22	12	0	40	15	9	4	1	29	7	40	2	0	49	8	29	13	0	50	168
06:10 PM	1	13	17	0	31	13	4	5	1	23	17	27	0	0	44	10	35	10	0	55	153
06:25 PM	0	5	2	0	7	2	3	1	0	6	3	12	0	0	15	1	8	3	0	12	40
Grand Total	26	234	169	0	429	164	249	112	2	527	148	399	40	0	587	162	383	103	0	648	2191
Apprch %	6.1	54.5	39.4	0		31.1	47.2	21.3	0.4		25.2	68	6.8	0		25	59.1	15.9	0		
Total %	1.2	10.7	7.7	0	19.6	7.5	11.4	5.1	0.1	24.1	6.8	18.2	1.8	0	26.8	7.4	17.5	4.7	0	29.6	
Unshifted	26	234	168	0	428	164	247	110	2	523	147	397	39	0	583	162	382	103	0	647	2181
% Unshifted	100	100	99.4	0	99.8	100	99.2	98.2	100	99.2	99.3	99.5	97.5	0	99.3	100	99.7	100	0	99.8	99.5
Bank 1	0	0	1	0	1	0	2	2	0	4	1	2	1	0	4	0	1	0	0	1	10
% Bank 1	0	0	0.6	0	0.2	0	0.8	1.8	0	0.8	0.7	0.5	2.5	0	0.7	0	0.3	0	0	0.2	0.5

Choice One Engineering
Ferguson Property TIS
Merwin 10 Mile & White Oak
TMC: 2/3/2016

File Name : TMC 2016-02-03
Site Code : 00000000
Start Date : 2/2/2016
Page No : 2

	White Oak Eastbound					White Oak Westbound					Merwin 10 Mile Northbound					Merwin Ten Mile Southbound					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 7:00:00 AM to 12:00:00 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 7:15:00 AM																					
7:15:00 AM	0	5	5	0	10	**12**	20	7	0	39	3	16	**5**	0	24	**14**	**18**			**35**	108
7:30:00 AM	0	3	4	0	7	5	**32**	4	0	**41**	4	26	2	0	32	7	11	**7**			
7:45:00 AM	**1**	**8**	**8**	**0**	**17**	10	23	4	0	37	**10**	**29**	4	0	**43**	10	10	2	0	22	**119**
8:00:00 AM	1	5	4	0	10	6	22	**12**	0	40	7	22	2	0	31	10	13	3	0	26	107
Total Volume	2	21	21	0	44	33	97	27	0	157	24	93	13	0	130	41	52	15	0	108	439
% App. Total	4.5	47.7	47.7	0		21	61.8	17.2	0		18.5	71.5	10	0		38	48.1	13.9	0		
PHF	.500	.656	.656	.000	.647	.688	.758	.563	.000	.957	.600	.802	.650	.000	.756	.732	.722	.536	.000	.771	.922

Choice One Engineering
Ferguson Property TIS
Merwin 10 Mile & White Oak
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File Name : TMC 2016-02-03
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	White Oak Eastbound					White Oak Westbound					Merwin 10 Mile Northbound					Merwin Ten Mile Southbound					
Start Time	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Right	Thru	Left	Peds	App. Total	Int. Total
Peak Hour Analysis From 12:00:00 PM to 6:30:00 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 5:15:00 PM																					
5:15:00 PM	2	26	14	0	42	12	8	**10**	0	**30**	12	24	0	0	36	9	36	10	0	**55**	163
5:30:00 PM	**6**	25	15	0	46	8	**11**	7	0	26	**13**					**11**	36	4	0	51	165
5:45:00 PM	4	**28**	**20**		**52**	14	8	6	0	28	11	27	**4**	0	42	9	**40**				**177**
6:00:00 PM	6	22	12	0	40	**15**	9	4	**1**			**40**	2	0	**49**	8	29	**13**			
Total Volume	**18**	**101**	**61**	**0**	**180**	**49**	**36**	**27**	**1**	**113**	**43**	**119**	**7**	**0**	**169**	**37**	**141**	**33**	**0**	**211**	**673**
% App. Total	**10**	**56.1**	**33.9**	**0**		**43.4**	**31.9**	**23.9**	**0.9**		**25.4**	**70.4**	**4.1**	**0**		**17.5**	**66.8**	**15.6**	**0**		
PHF	**.750**	**.902**	**.763**	**.000**	**.865**	**.817**	**.818**	**.675**	**.250**	**.942**	**.827**	**.744**	**.438**	**.000**	**.862**	**.841**	**.881**	**.635**	**.000**	**.959**	**.951**

Homesite Types	Total Homesites	Legend
Masterpiece (85' x 150')	93 homesites	40%
Patio (55' x 150')	131 homesites	60%
Total Homesites	**224 homesites**	**2.04 units per acre**

Land Use	Acreage	Percentage
Rights-of-Way	12.66 acres	11.56%
Open Space	32.61 acres	29.78%
Buffers (PUD)	6.79 acres	6.19%
Residential Lots	57.47 acres	52.47%
Total Site Acreage	**109.53 acres**	**100.00%**

Grand Communities, Ltd.

Ferguson Property

Pierce Township, Clermont County, Ohio

Conceptual Site Plan

0' 200' 400'

October 28th, 2015

FERGUSON PROPERTY

PIERCE TOWNSHIP, CLERMONT COUNTY, OHIO

Land Use Description	ITE Code	Size	Unit	Weekday				AM Peak Hour				PM Peak Hour			
				Total Trips	Primary Trips			Total Trips	Primary Trips			Total Trips	Primary Trips		
					Total	Entering	Exiting		Total	Entering	Exiting		Total	Entering	Exiting
Single-Family Detached	210	224	Dwelling Units	2,132	2,132	1066	1,066	168	168	42	126	224	224	141	83
Directional Distributions						*50%*	*50%*			*25%*	*75%*			*63%*	*37%*
Totals				**2,132**	**2,132**	**1,066**	**1,066**	**168**	**168**	**42**	**126**	**224**	**224**	**141**	**83**

TRIP ASSIGNMENT ROUTINGS

ORIGIN	DESTINATION	TRIP ROUTINGS O-D PERCENT	ROUTE SPLIT	INTERNAL SPLIT	AFFECTED MOVEMENTS BY TRIPS	AM TRIPS	PM TRIPS
Entering Trips							
White Oak Road (East)	2	15%	50%	100%	1WBT 2WBR	3	11
White Oak Road (East)	3	15%	50%	100%	1WBR 3NBL	3	11
White Oak Road (West)	2	30%	100%	100%	2EBL	13	42
Merwin Ten Mile Road (North)	3	35%	100%	100%	3SBR	15	49
Merwin Ten Mile Road (South)	2	20%	50%	100%	1NBL 2WBR	4	14
Merwin Ten Mile Road (South)	3	20%	50%	100%	1NBT 3NBL	4	14
						42	141
TOTAL ENTERING TRIPS						42	141
Exiting Trips							
2	White Oak Road (East)	15%	50%	100%	2SBL 1EBT	9	6
3	White Oak Road (East)	15%	50%	100%	3EBR 1SBL	9	6
2	White Oak Road (West)	30%	100%	100%	2SBR	38	25
3	Merwin Ten Mile Road (North)	35%	100%	100%	3EBL	44	29
2	Merwin Ten Mile Road (South)	20%	50%	100%	2SBL 1EBR	13	8
3	Merwin Ten Mile Road (South)	20%	50%	100%	3EBR 1SBT	13	8
						126	82
TOTAL EXITING TRIPS						126	82

Intersection Legend
1 - Merwin Ten Mile Road & White Oak Road
2 - White Oak Drive
3 - Merwin Ten Mile Drive

SEASONAL ADJUSTMENT FACTORS
ALL VEHICLE CLASSES
RURAL MAJOR COLLECTOR, MINOR COLLECTOR, LOCAL
FUNCTIONAL CLASSIFICATION = Rural 05, 06, 07
STATION: 7, 56, 67, 171, 205, 516, 520, 548, 549, 772, 773, 774, 776

MONTHLY AVERAGE									
MONTH	DAY OF WEEK	WEEK DAY MON-THUR	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
January	1.280	1.206	1.731	1.247	1.202	1.169	1.132	1.074	1.400
February	1.198	1.125	1.632	1.133	1.122	1.120	1.065	1.017	1.298
March	1.118	1.061	1.498	1.097	1.038	1.049	1.022	0.944	1.179
April	1.012	0.983	1.254	1.001	0.975	0.972	0.937	0.884	1.063
May	0.923	0.910	1.115	0.953	0.891	0.888	0.865	0.799	0.947
June	0.925	0.905	1.128	0.915	0.900	0.900	0.880	0.814	0.942
July	0.930	0.903	1.121	0.914	0.897	0.897	0.878	0.822	0.978
August	0.918	0.903	1.110	0.911	0.906	0.893	0.863	0.797	0.947
September	0.956	0.944	1.180	0.987	0.928	0.916	0.893	0.815	0.974
October	0.989	0.976	1.228	0.990	0.984	0.952	0.916	0.844	1.010
November	1.096	1.019	1.421	1.041	1.009	1.007	1.067	0.959	1.168
December	1.165	1.092	1.531	1.088	1.094	1.094	1.065	1.008	1.275

BASED ON 2012-2014 AUTOMATIC TRAFFIC RECORDERS DATA

24-hour count times (factor) = ADT

OHIO DEPARTMENT OF TRANSPORTATION
DIVISION OF PLANNING
OFFICE OF TECHNICAL SERVICES
January 2015

TRAFFIC PROJECTIONS - AM PEAK HOUR

Int. #	Movement	SA Factor	2016	2016	2017	Trips		2017	2037	2037
			Existing Counts	Adjusted Volumes	Opening Year No-Build Volumes	Primary Trips IN	Primary Trips OUT	Opening Year Build Volumes	Design Year No-Build Volumes	Design Year Build Volumes
1	EBL	1.122	21	24	24			24	29	29
1	EBT	1.122	21	24	24		9	33	29	38
1	EBR	1.122	2	2	2		13	15	3	16
1	WBL	1.122	27	30	31			31	37	37
1	WBT	1.122	97	109	110	3		113	132	135
1	WBR	1.122	33	37	37	3		40	45	48
1	NBL	1.122	13	15	15	4		19	18	22
1	NBT	1.122	93	104	105	4		109	126	130
1	NBR	1.122	24	27	27			27	33	33
1	SBL	1.122	15	17	17		9	26	20	29
1	SBT	1.122	52	58	59		13	72	71	84
1	SBR	1.122	41	46	46			46	56	56
2	EBL	1.000	0	0	0	13		13	0	13
2	EBT	1.122	44	49	50			50	60	60
2	WBT	1.122	151	169	171			171	205	205
2	WBR	1.000	0	0	0	7		7	0	7
2	SBL	1.000	0	0	0		22	22	0	22
2	SBR	1.000	0	0	0		38	38	0	38
3	EBL	1.000	0	0	0		44	44	0	44
3	EBR	1.000	0	0	0		22	22	0	22
3	NBL	1.000	0	0	0	7		7	0	7
3	NBT	1.122	147	165	167			167	200	200
3	SBT	1.122	108	121	122			122	147	147
3	SBR	1.000	0	0	0	15		15	0	15

Intersection Legend

1 - Merwin Ten Mile Road & White Oak Road
2 - White Oak Drive
3 - Merwin Ten Mile Drive

Seasonal Adjustment Factors

FC 5,7 1.122

Annual Growth Rate

Merwin & White 1%

TRAFFIC PROJECTIONS - PM PEAK HOUR

Int. #	Movement	SA Factor	2016	2016	2017	Trips		2017	2037	2037
			Existing Counts	Adjusted Volumes	Opening Year No-Build Volumes	Primary Trips IN	Primary Trips OUT	Opening Year Build Volumes	Design Year No-Build Volumes	Design Year Build Volumes
1	EBL	1.122	61	68	69			69	83	83
1	EBT	1.122	101	113	114		6	120	137	143
1	EBR	1.122	18	20	20		8	28	24	32
1	WBL	1.122	27	30	31			31	37	37
1	WBT	1.122	36	40	41	11		52	49	60
1	WBR	1.122	49	55	56	11		67	67	78
1	NBL	1.122	7	8	8	14		22	10	24
1	NBT	1.122	119	134	135	14		149	162	176
1	NBR	1.122	43	48	49			49	58	58
1	SBL	1.122	33	37	37		6	43	45	51
1	SBT	1.122	141	158	160		8	168	191	199
1	SBR	1.122	37	42	42			42	50	50
2	EBL	1.000	0	0	0	42		42	0	42
2	EBT	1.122	180	202	204			204	244	244
2	WBT	1.122	80	90	91			91	109	109
2	WBR	1.000	0	0	0	25		25	0	25
2	SBL	1.000	0	0	0		14	14	0	14
2	SBR	1.000	0	0	0		25	25	0	25
3	EBL	1.000	0	0	0		29	29	0	29
3	EBR	1.000	0	0	0		14	14	0	14
3	NBL	1.000	0	0	0	25		25	0	25
3	NBT	1.122	229	257	260			260	311	311
3	SBT	1.122	211	237	239			239	286	286
3	SBR	1.000	0	0	0	49		49	0	49

Intersection Legend

1 - Merwin Ten Mile Road & White Oak Road
2 - White Oak Drive
3 - Merwin Ten Mile Drive

Seasonal Adjustment Factors

FC 5,7 1.122

Annual Growth Rate

Merwin & White 1%

ALL-WAY STOP CONTROL ANALYSIS

General Information

Analyst	*MKG*
Agency/Co.	*Choice One Engineering*
Date Performed	*2/11/2016*
Analysis Time Period	*AM Peak*

Site Information

Intersection	*White Oak & Merwin Ten Mile*
Jurisdiction	*County*
Analysis Year	*2016 Existing*

Project ID *CLEPIE1602*

East/West Street: *White Oak Road* North/South Street: *Merwin Ten Mile Road*

Volume Adjustments and Site Characteristics

Approach	Eastbound			Westbound		
Movement	L	T	R	L	T	R
Volume (veh/h)	21	21	2	27	97	33
%Thrus Left Lane						

Approach	Northbound			Southbound		
Movement	L	T	R	L	T	R
Volume (veh/h)	13	93	24	15	52	41
%Thrus Left Lane						

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Configuration	LTR		LTR		LTR		LTR	
PHF	0.92		0.92		0.92		0.92	
Flow Rate (veh/h)	46		169		141		116	
% Heavy Vehicles	0		0		0		0	
No. Lanes	1		1		1		1	
Geometry Group	1		1		1		1	
Duration, T	0.25							

Saturation Headway Adjustment Worksheet

Prop. Left-Turns	0.5		0.2		0.1		0.1	
Prop. Right-Turns	0.0		0.2		0.2		0.4	
Prop. Heavy Vehicle	0.0		0.0		0.0		0.0	
hLT-adj	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
hRT-adj	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6
hHV-adj	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
hadj, computed	0.1		-0.1		-0.1		-0.2	

Departure Headway and Service Time

hd, initial value (s)	3.20		3.20		3.20		3.20	
x, initial	0.04		0.15		0.13		0.10	
hd, final value (s)	4.77		4.46		4.46		4.38	
x, final value	0.06		0.21		0.17		0.14	
Move-up time, m (s)	2.0		2.0		2.0		2.0	
Service Time, t_s (s)	2.8		2.5		2.5		2.4	

Capacity and Level of Service

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Capacity (veh/h)	296		419		391		366	
Delay (s/veh)	8.08		8.64		8.40		8.10	
LOS	A		A		A		A	
Approach: Delay (s/veh)	8.08		8.64		8.40		8.10	
LOS	A		A		A		A	
Intersection Delay (s/veh)	8.38							
Intersection LOS	A							

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ALL-WAY STOP CONTROL ANALYSIS

General Information

Analyst	*MKG*
Agency/Co.	*Choice One Engineering*
Date Performed	*2/11/2016*
Analysis Time Period	*AM Peak*

Site Information

Intersection	*White Oak & Merwin Ten Mile*
Jurisdiction	*County*
Analysis Year	*2017 No-Build*

Project ID *CLEPIE1602*

East/West Street: *White Oak Road* North/South Street: *Merwin Ten Mile Road*

Volume Adjustments and Site Characteristics

Approach	Eastbound			Westbound		
Movement	L	T	R	L	T	R
Volume (veh/h)	24	24	2	31	110	37
%Thrus Left Lane						

Approach	Northbound			Southbound		
Movement	L	T	R	L	T	R
Volume (veh/h)	15	105	27	17	59	46
%Thrus Left Lane						

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Configuration	LTR		LTR		LTR		LTR	
PHF	0.92		0.92		0.92		0.92	
Flow Rate (veh/h)	54		192		159		131	
% Heavy Vehicles	0		0		0		0	
No. Lanes	1		1		1		1	
Geometry Group	1		1		1		1	
Duration, T	0.25							

Saturation Headway Adjustment Worksheet

Prop. Left-Turns	0.5		0.2		0.1		0.1	
Prop. Right-Turns	0.0		0.2		0.2		0.4	
Prop. Heavy Vehicle	0.0		0.0		0.0		0.0	
hLT-adj	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
hRT-adj	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6
hHV-adj	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
hadj, computed	0.1		-0.1		-0.1		-0.2	

Departure Headway and Service Time

hd, initial value (s)	3.20		3.20		3.20		3.20	
x, initial	0.05		0.17		0.14		0.12	
hd, final value (s)	4.91		4.57		4.57		4.50	
x, final value	0.07		0.24		0.20		0.16	
Move-up time, m (s)	2.0		2.0		2.0		2.0	
Service Time, t_s (s)	2.9		2.6		2.6		2.5	

Capacity and Level of Service

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Capacity (veh/h)	304		442		409		381	
Delay (s/veh)	8.30		9.04		8.73		8.38	
LOS	A		A		A		A	
Approach: Delay (s/veh)	8.30		9.04		8.73		8.38	
LOS	A		A		A		A	
Intersection Delay (s/veh)	8.71							
Intersection LOS	A							

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ALL-WAY STOP CONTROL ANALYSIS

General Information

Analyst	*MKG*
Agency/Co.	*Choice One Engineering*
Date Performed	*2/11/2016*
Analysis Time Period	*AM Peak*

Site Information

Intersection	*White Oak & Merwin Ten Mile*
Jurisdiction	*County*
Analysis Year	*2017 Build*

Project ID *CLEPIE1602*

East/West Street: *White Oak Road* North/South Street: *Merwin Ten Mile Road*

Volume Adjustments and Site Characteristics

Approach	Eastbound			Westbound		
Movement	L	T	R	L	T	R
Volume (veh/h)	24	33	15	31	113	40
%Thrus Left Lane						

Approach	Northbound			Southbound		
Movement	L	T	R	L	T	R
Volume (veh/h)	19	109	27	26	72	46
%Thrus Left Lane						

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Configuration	LTR		LTR		LTR		LTR	
PHF	0.92		0.92		0.92		0.92	
Flow Rate (veh/h)	77		198		167		155	
% Heavy Vehicles	0		0		0		0	
No. Lanes	1		1		1		1	
Geometry Group	1		1		1		1	
Duration, T	0.25							

Saturation Headway Adjustment Worksheet

Prop. Left-Turns	0.3		0.2		0.1		0.2	
Prop. Right-Turns	0.2		0.2		0.2		0.3	
Prop. Heavy Vehicle	0.0		0.0		0.0		0.0	
hLT-adj	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
hRT-adj	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6
hHV-adj	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
hadj, computed	-0.1		-0.1		-0.1		-0.2	

Departure Headway and Service Time

hd, initial value (s)	3.20		3.20		3.20		3.20	
x, initial	0.07		0.18		0.15		0.14	
hd, final value (s)	4.90		4.69		4.71		4.65	
x, final value	0.10		0.26		0.22		0.20	
Move-up time, m (s)	2.0		2.0		2.0		2.0	
Service Time, t_s (s)	2.9		2.7		2.7		2.7	

Capacity and Level of Service

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Capacity (veh/h)	327		448		417		405	
Delay (s/veh)	8.47		9.32		9.02		8.81	
LOS	A		A		A		A	
Approach: Delay (s/veh)	8.47		9.32		9.02		8.81	
LOS	A		A		A		A	
Intersection Delay (s/veh)	8.99							
Intersection LOS	A							

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ALL-WAY STOP CONTROL ANALYSIS

General Information

Analyst	*MKG*
Agency/Co.	*Choice One Engineering*
Date Performed	*2/11/2016*
Analysis Time Period	*AM Peak*

Site Information

Intersection	*White Oak & Merwin Ten Mile*
Jurisdiction	*County*
Analysis Year	*2037 No-Build*

Project ID *CLEPIE1602*

East/West Street: *White Oak Road* North/South Street: *Merwin Ten Mile Road*

Volume Adjustments and Site Characteristics

Approach	Eastbound			Westbound		
Movement	L	T	R	L	T	R
Volume (veh/h)	29	29	3	37	132	45
%Thrus Left Lane						

Approach	Northbound			Southbound		
Movement	L	T	R	L	T	R
Volume (veh/h)	18	126	33	20	71	56
%Thrus Left Lane						

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Configuration	LTR		LTR		LTR		LTR	
PHF	0.92		0.92		0.92		0.92	
Flow Rate (veh/h)	65		231		190		158	
% Heavy Vehicles	0		0		0		0	
No. Lanes	1		1		1		1	
Geometry Group	1		1		1		1	
Duration, T	0.25							

Saturation Headway Adjustment Worksheet

Prop. Left-Turns	0.5		0.2		0.1		0.1	
Prop. Right-Turns	0.0		0.2		0.2		0.4	
Prop. Heavy Vehicle	0.0		0.0		0.0		0.0	
hLT-adj	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
hRT-adj	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6
hHV-adj	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
hadj, computed	0.1		-0.1		-0.1		-0.2	

Departure Headway and Service Time

hd, initial value (s)	3.20		3.20		3.20		3.20	
x, initial	0.06		0.21		0.17		0.14	
hd, final value (s)	5.15		4.76		4.78		4.71	
x, final value	0.09		0.31		0.25		0.21	
Move-up time, m (s)	2.0		2.0		2.0		2.0	
Service Time, t_s (s)	3.2		2.8		2.8		2.7	

Capacity and Level of Service

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Capacity (veh/h)	315		481		440		408	
Delay (s/veh)	8.68		9.85		9.38		8.93	
LOS	A		A		A		A	
Approach: Delay (s/veh)	8.68		9.85		9.38		8.93	
LOS	A		A		A		A	
Intersection Delay (s/veh)	9.37							
Intersection LOS	A							

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ALL-WAY STOP CONTROL ANALYSIS

General Information

Analyst	*MKG*
Agency/Co.	*Choice One Engineering*
Date Performed	*2/11/2016*
Analysis Time Period	*AM Peak*

Site Information

Intersection	*White Oak & Merwin Ten Mile*
Jurisdiction	*County*
Analysis Year	*2037 Build*

Project ID *CLEPIE1602*

East/West Street: *White Oak Road* North/South Street: *Merwin Ten Mile Road*

Volume Adjustments and Site Characteristics

Approach	Eastbound			Westbound		
Movement	L	T	R	L	T	R
Volume (veh/h)	29	38	16	37	135	48
%Thrus Left Lane						

Approach	Northbound			Southbound		
Movement	L	T	R	L	T	R
Volume (veh/h)	22	130	33	29	84	56
%Thrus Left Lane						

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Configuration	LTR		LTR		LTR		LTR	
PHF	0.92		0.92		0.92		0.92	
Flow Rate (veh/h)	89		238		199		182	
% Heavy Vehicles	0		0		0		0	
No. Lanes	1		1		1		1	
Geometry Group	1		1		1		1	
Duration, T	0.25							

Saturation Headway Adjustment Worksheet

Prop. Left-Turns	0.3		0.2		0.1		0.2	
Prop. Right-Turns	0.2		0.2		0.2		0.3	
Prop. Heavy Vehicle	0.0		0.0		0.0		0.0	
hLT-adj	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
hRT-adj	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6
hHV-adj	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
hadj, computed	-0.0		-0.1		-0.1		-0.2	

Departure Headway and Service Time

hd, initial value (s)	3.20		3.20		3.20		3.20	
x, initial	0.08		0.21		0.18		0.16	
hd, final value (s)	5.18		4.91		4.93		4.87	
x, final value	0.13		0.32		0.27		0.25	
Move-up time, m (s)	2.0		2.0		2.0		2.0	
Service Time, t_s (s)	3.2		2.9		2.9		2.9	

Capacity and Level of Service

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Capacity (veh/h)	339		488		449		432	
Delay (s/veh)	8.94		10.24		9.76		9.46	
LOS	A		B		A		A	
Approach: Delay (s/veh)	8.94		10.24		9.76		9.46	
LOS	A		B		A		A	
Intersection Delay (s/veh)	9.74							
Intersection LOS	A							

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ALL-WAY STOP CONTROL ANALYSIS

General Information

Analyst	*MKG*
Agency/Co.	*Choice One Engineering*
Date Performed	*2/11/2016*
Analysis Time Period	*PM Peak*

Site Information

Intersection	*White Oak & Merwin Ten Mile*
Jurisdiction	*County*
Analysis Year	*2016 Existing*

Project ID *CLEPIE1602*

East/West Street: *White Oak Road* North/South Street: *Merwin Ten Mile Road*

Volume Adjustments and Site Characteristics

Approach	Eastbound			Westbound		
Movement	L	T	R	L	T	R
Volume (veh/h)	61	101	18	27	36	49
%Thrus Left Lane						

Approach	Northbound			Southbound		
Movement	L	T	R	L	T	R
Volume (veh/h)	7	119	43	33	141	37
%Thrus Left Lane						

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Configuration	LTR		LTR		LTR		LTR	
PHF	0.92		0.92		0.92		0.92	
Flow Rate (veh/h)	194		121		182		228	
% Heavy Vehicles	0		0		0		0	
No. Lanes	1		1		1		1	
Geometry Group	1		1		1		1	
Duration, T	0.25							

Saturation Headway Adjustment Worksheet

Prop. Left-Turns	0.3		0.2		0.0		0.2	
Prop. Right-Turns	0.1		0.4		0.3		0.2	
Prop. Heavy Vehicle	0.0		0.0		0.0		0.0	
hLT-adj	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
hRT-adj	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6
hHV-adj	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
hadj, computed	0.0		-0.2		-0.1		-0.1	

Departure Headway and Service Time

hd, initial value (s)	3.20		3.20		3.20		3.20	
x, initial	0.17		0.11		0.16		0.20	
hd, final value (s)	5.14		5.04		4.92		4.92	
x, final value	0.28		0.17		0.25		0.31	
Move-up time, m (s)	2.0		2.0		2.0		2.0	
Service Time, t_s (s)	3.1		3.0		2.9		2.9	

Capacity and Level of Service

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Capacity (veh/h)	444		371		432		478	
Delay (s/veh)	10.09		9.06		9.54		10.14	
LOS	B		A		A		B	
Approach: Delay (s/veh)	10.09		9.06		9.54		10.14	
LOS	B		A		A		B	
Intersection Delay (s/veh)	9.80							
Intersection LOS	A							

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ALL-WAY STOP CONTROL ANALYSIS

General Information

Analyst	*MKG*
Agency/Co.	*Choice One Engineering*
Date Performed	*2/11/2016*
Analysis Time Period	*PM Peak*

Site Information

Intersection	*White Oak & Merwin Ten Mile*
Jurisdiction	*County*
Analysis Year	*2017 No-Build*

Project ID *CLEPIE1602*

East/West Street: *White Oak Road* North/South Street: *Merwin Ten Mile Road*

Volume Adjustments and Site Characteristics

Approach	Eastbound			Westbound		
Movement	L	T	R	L	T	R
Volume (veh/h)	69	114	20	31	41	56
%Thrus Left Lane						

Approach	Northbound			Southbound		
Movement	L	T	R	L	T	R
Volume (veh/h)	8	135	49	37	160	42
%Thrus Left Lane						

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Configuration	LTR		LTR		LTR		LTR	
PHF	0.92		0.92		0.92		0.92	
Flow Rate (veh/h)	218		137		207		258	
% Heavy Vehicles	0		0		0		0	
No. Lanes	1		1		1		1	
Geometry Group	1		1		1		1	
Duration, T	0.25							

Saturation Headway Adjustment Worksheet

Prop. Left-Turns	0.3		0.2		0.0		0.2	
Prop. Right-Turns	0.1		0.4		0.3		0.2	
Prop. Heavy Vehicle	0.0		0.0		0.0		0.0	
hLT-adj	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
hRT-adj	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6
hHV-adj	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
hadj, computed	0.0		-0.2		-0.1		-0.1	

Departure Headway and Service Time

hd, initial value (s)	3.20		3.20		3.20		3.20	
x, initial	0.19		0.12		0.18		0.23	
hd, final value (s)	5.37		5.30		5.14		5.14	
x, final value	0.33		0.20		0.30		0.37	
Move-up time, m (s)	2.0		2.0		2.0		2.0	
Service Time, t_s (s)	3.4		3.3		3.1		3.1	

Capacity and Level of Service

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Capacity (veh/h)	468		387		457		508	
Delay (s/veh)	10.94		9.63		10.29		11.10	
LOS	B		A		B		B	
Approach: Delay (s/veh)	10.94		9.63		10.29		11.10	
LOS	B		A		B		B	
Intersection Delay (s/veh)	10.61							
Intersection LOS	B							

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ALL-WAY STOP CONTROL ANALYSIS

General Information

Analyst	*MKG*
Agency/Co.	*Choice One Engineering*
Date Performed	*2/11/2016*
Analysis Time Period	*PM Peak*

Site Information

Intersection	*White Oak & Merwin Ten Mile*
Jurisdiction	*County*
Analysis Year	*2017 Build*

Project ID *CLEPIE1602*

East/West Street: *White Oak Road* North/South Street: *Merwin Ten Mile Road*

Volume Adjustments and Site Characteristics

Approach	Eastbound			Westbound		
Movement	L	T	R	L	T	R
Volume (veh/h)	69	120	28	31	52	67
%Thrus Left Lane						

Approach	Northbound			Southbound		
Movement	L	T	R	L	T	R
Volume (veh/h)	22	149	49	43	168	42
%Thrus Left Lane						

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Configuration	LTR		LTR		LTR		LTR	
PHF	0.92		0.92		0.92		0.92	
Flow Rate (veh/h)	234		161		237		273	
% Heavy Vehicles	0		0		0		0	
No. Lanes	1		1		1		1	
Geometry Group	1		1		1		1	
Duration, T	0.25							

Saturation Headway Adjustment Worksheet

Prop. Left-Turns	0.3		0.2		0.1		0.2	
Prop. Right-Turns	0.1		0.4		0.2		0.2	
Prop. Heavy Vehicle	0.0		0.0		0.0		0.0	
hLT-adj	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
hRT-adj	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6
hHV-adj	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
hadj, computed	-0.0		-0.2		-0.1		-0.1	

Departure Headway and Service Time

hd, initial value (s)	3.20		3.20		3.20		3.20	
x, initial	0.21		0.14		0.21		0.24	
hd, final value (s)	5.59		5.53		5.39		5.38	
x, final value	0.36		0.25		0.35		0.41	
Move-up time, m (s)	2.0		2.0		2.0		2.0	
Service Time, t_s (s)	3.6		3.5		3.4		3.4	

Capacity and Level of Service

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Capacity (veh/h)	484		411		487		523	
Delay (s/veh)	11.75		10.33		11.33		12.03	
LOS	B		B		B		B	
Approach: Delay (s/veh)	11.75		10.33		11.33		12.03	
LOS	B		B		B		B	
Intersection Delay (s/veh)	11.47							
Intersection LOS	B							

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ALL-WAY STOP CONTROL ANALYSIS

General Information

Analyst	*MKG*
Agency/Co.	*Choice One Engineering*
Date Performed	*2/11/2016*
Analysis Time Period	*PM Peak*

Site Information

Intersection	*White Oak & Merwin Ten Mile*
Jurisdiction	*County*
Analysis Year	*2037 No-Build*

Project ID *CLEPIE1602*

East/West Street: *White Oak Road* North/South Street: *Merwin Ten Mile Road*

Volume Adjustments and Site Characteristics

Approach	Eastbound			Westbound		
Movement	L	T	R	L	T	R
Volume (veh/h)	83	137	24	37	49	67
%Thrus Left Lane						

Approach	Northbound			Southbound		
Movement	L	T	R	L	T	R
Volume (veh/h)	10	162	58	45	191	50
%Thrus Left Lane						

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Configuration	LTR		LTR		LTR		LTR	
PHF	0.92		0.92		0.92		0.92	
Flow Rate (veh/h)	264		165		249		309	
% Heavy Vehicles	0		0		0		0	
No. Lanes	1		1		1		1	
Geometry Group	1		1		1		1	
Duration, T	0.25							

Saturation Headway Adjustment Worksheet

Prop. Left-Turns	0.3		0.2		0.0		0.2	
Prop. Right-Turns	0.1		0.4		0.3		0.2	
Prop. Heavy Vehicle	0.0		0.0		0.0		0.0	
hLT-adj	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
hRT-adj	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6
hHV-adj	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
hadj, computed	0.0		-0.2		-0.1		-0.1	

Departure Headway and Service Time

hd, initial value (s)	3.20		3.20		3.20		3.20	
x, initial	0.23		0.15		0.22		0.27	
hd, final value (s)	5.84		5.84		5.63		5.58	
x, final value	0.43		0.27		0.39		0.48	
Move-up time, m (s)	2.0		2.0		2.0		2.0	
Service Time, t_s (s)	3.8		3.8		3.6		3.6	

Capacity and Level of Service

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Capacity (veh/h)	514		415		499		559	
Delay (s/veh)	13.15		10.96		12.17		13.62	
LOS	B		B		B		B	
Approach: Delay (s/veh)	13.15		10.96		12.17		13.62	
LOS	B		B		B		B	
Intersection Delay (s/veh)	12.68							
Intersection LOS	B							

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ALL-WAY STOP CONTROL ANALYSIS

General Information

Analyst	*MKG*
Agency/Co.	*Choice One Engineering*
Date Performed	*2/11/2016*
Analysis Time Period	*PM Peak*

Site Information

Intersection	*White Oak & Merwin Ten Mile*
Jurisdiction	*County*
Analysis Year	*2037 Build*

Project ID *CLEPIE1602*

East/West Street: *White Oak Road* North/South Street: *Merwin Ten Mile Road*

Volume Adjustments and Site Characteristics

Approach	Eastbound			Westbound		
Movement	L	T	R	L	T	R
Volume (veh/h)	83	143	32	37	60	78
%Thrus Left Lane						

Approach	Northbound			Southbound		
Movement	L	T	R	L	T	R
Volume (veh/h)	24	176	58	51	199	50
%Thrus Left Lane						

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Configuration	LTR		LTR		LTR		LTR	
PHF	0.92		0.92		0.92		0.92	
Flow Rate (veh/h)	279		189		280		325	
% Heavy Vehicles	0		0		0		0	
No. Lanes	1		1		1		1	
Geometry Group	1		1		1		1	
Duration, T	0.25							

Saturation Headway Adjustment Worksheet

Prop. Left-Turns	0.3		0.2		0.1		0.2	
Prop. Right-Turns	0.1		0.4		0.2		0.2	
Prop. Heavy Vehicle	0.0		0.0		0.0		0.0	
hLT-adj	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
hRT-adj	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6	-0.6
hHV-adj	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
hadj, computed	-0.0		-0.2		-0.1		-0.1	

Departure Headway and Service Time

hd, initial value (s)	3.20		3.20		3.20		3.20	
x, initial	0.25		0.17		0.25		0.29	
hd, final value (s)	6.14		6.15		5.94		5.89	
x, final value	0.48		0.32		0.46		0.53	
Move-up time, m (s)	2.0		2.0		2.0		2.0	
Service Time, t_s (s)	4.1		4.2		3.9		3.9	

Capacity and Level of Service

	Eastbound		Westbound		Northbound		Southbound	
	L1	L2	L1	L2	L1	L2	L1	L2
Capacity (veh/h)	529		439		530		568	
Delay (s/veh)	14.60		12.06		13.93		15.40	
LOS	B		B		B		C	
Approach: Delay (s/veh)	14.60		12.06		13.93		15.40	
LOS	B		B		B		C	
Intersection Delay (s/veh)	14.22							
Intersection LOS	B							

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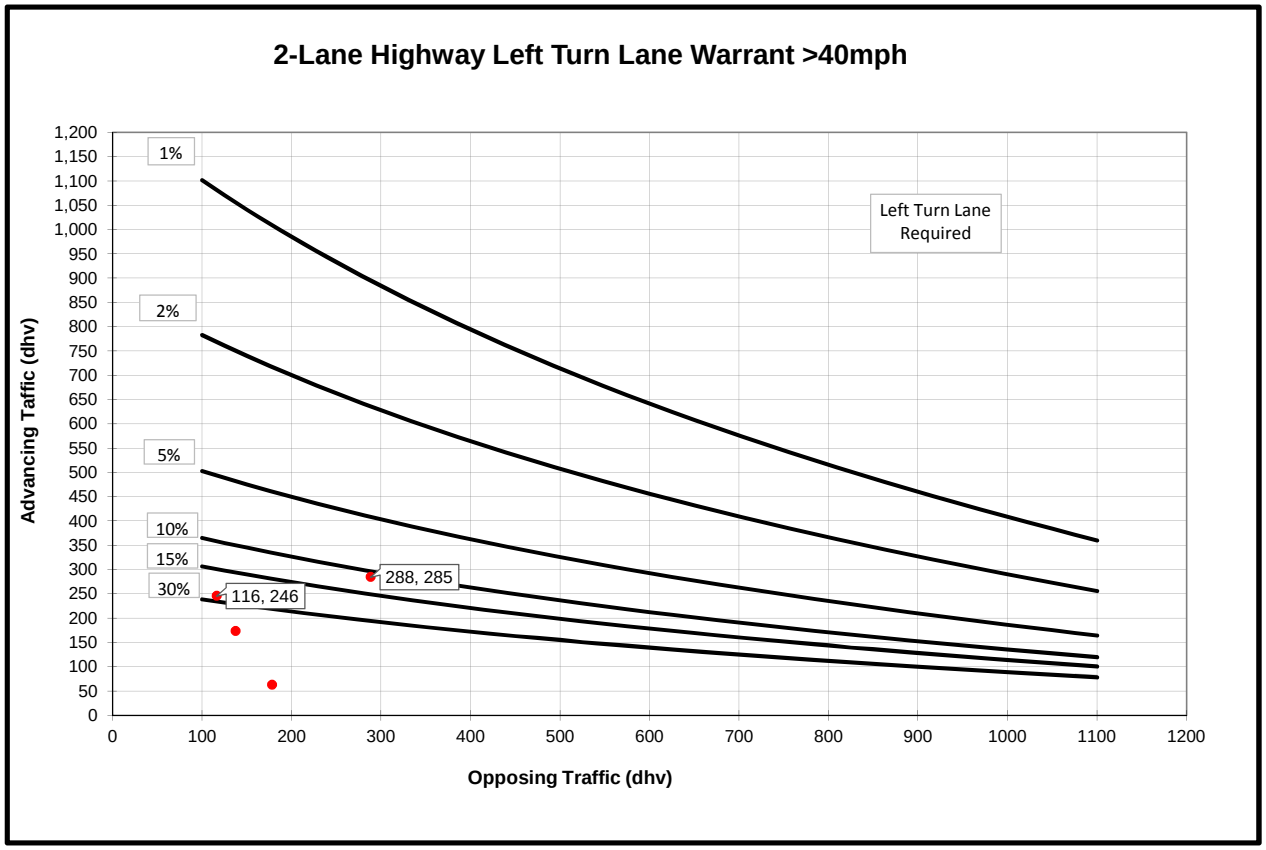
2017 PM Build Left Turn Lane Warrant				
Intersection	**Left Turning Vol**	**Advancing Vol**	**Opposing Vol**	**Left Turn %**
2EBL	42	246	116	17%
3NBL	25	285	288	9%

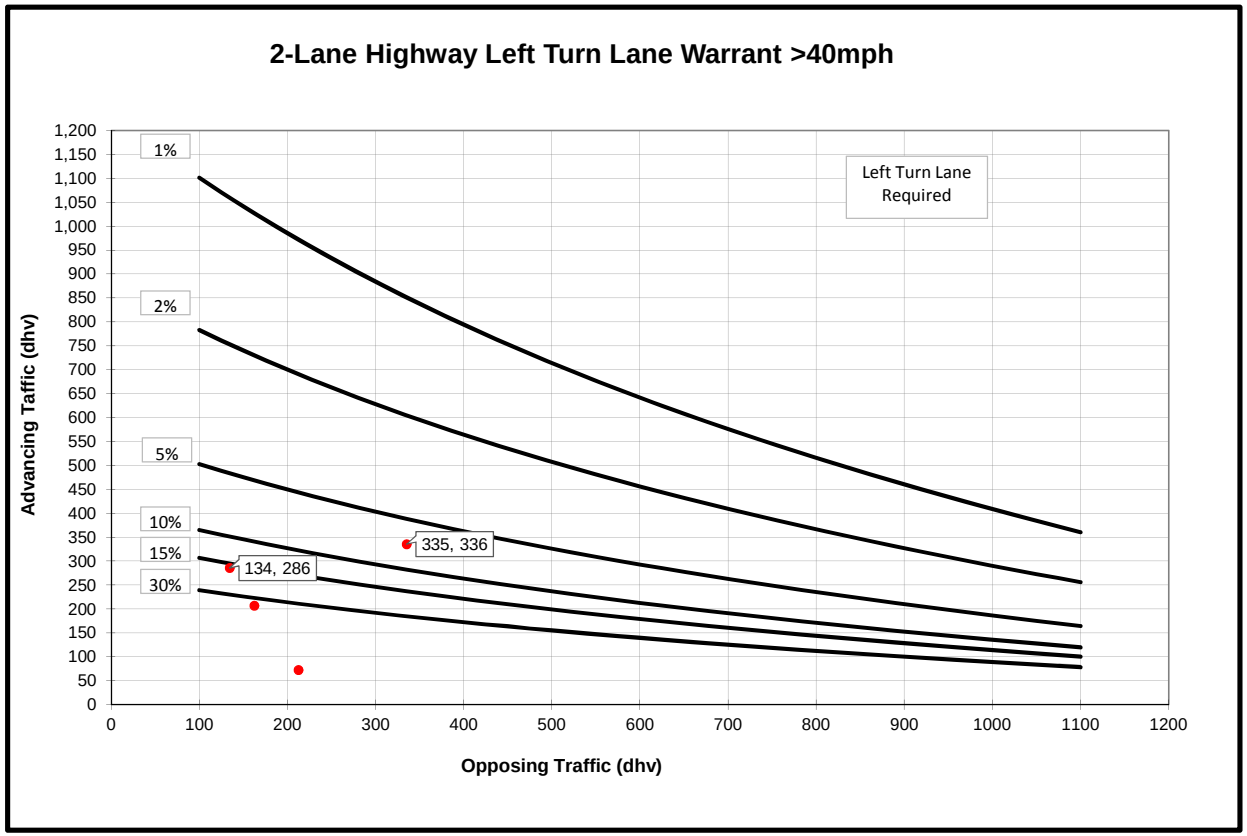
2017 AM Build Left Turn Lane Warrant				
Intersection	**Left Turning Vol**	**Advancing Vol**	**Opposing Vol**	**Left Turn %**
2EBL	13	63	178	21%
3NBL	7	174	137	4%



Intersection Legend
1 - Merwin Ten Mile Road & White Oak Road
2 - White Oak Drive
3 - Merwin Ten Mile Drive

2037 PM Build Left Turn Lane Warrant				
Intersection	**Left Turning Vol**	**Advancing Vol**	**Opposing Vol**	**Left Turn %**
2EBL	42	286	134	15%
3NBL	25	336	335	7%

2037 AM Build Left Turn Lane Warrant				
Intersection	**Left Turning Vol**	**Advancing Vol**	**Opposing Vol**	**Left Turn %**
2EBL	13	73	212	18%
3NBL	7	207	162	3%

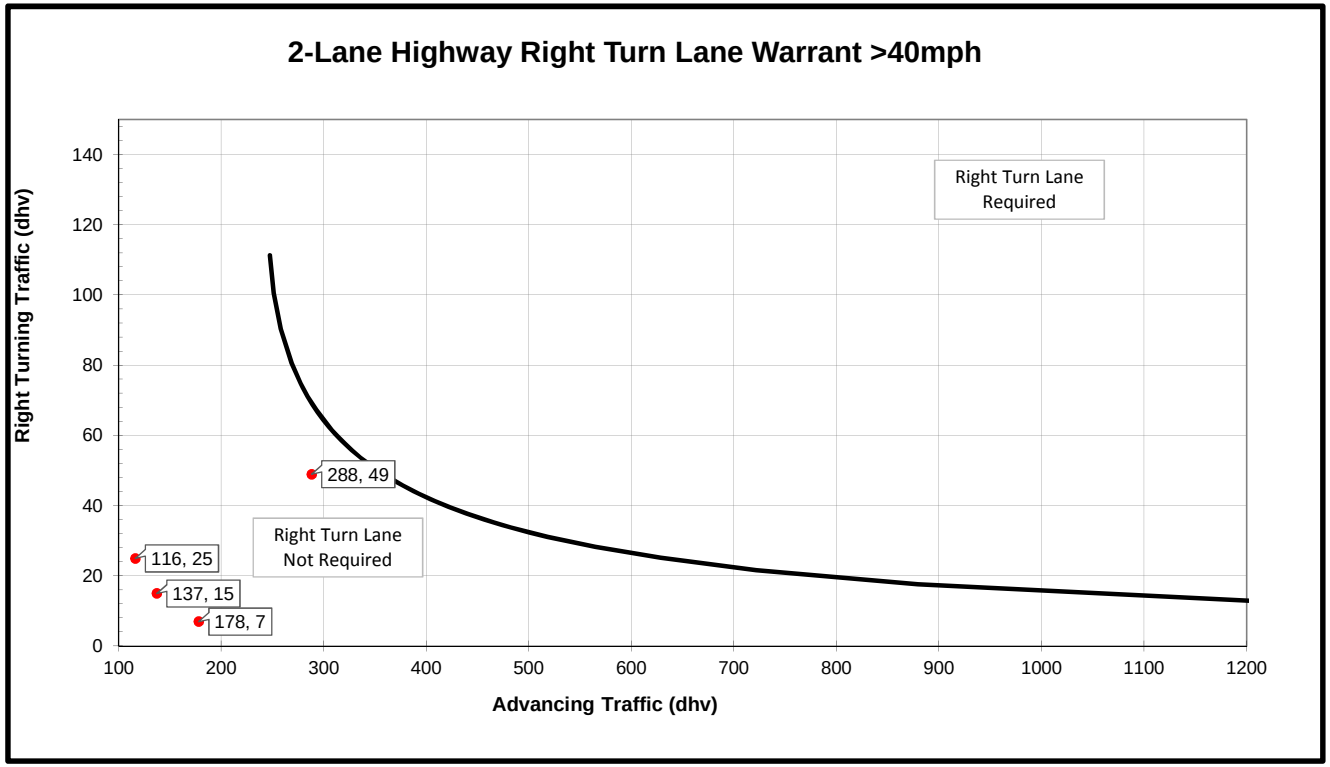


Intersection Legend
1 - Merwin Ten Mile Road & White Oak Road
2 - White Oak Drive
3 - Merwin Ten Mile Drive

2017 PM Build Right Turn Lane Warrant		
Intersection	**Right Turning Vol**	**Advancing Vol**
2WBR	25	116
3SBR	49	288

2017 AM Build Right Turn Lane Warrant		
Intersection	**Right Turning Vol**	**Advancing Vol**
2WBR	7	178
3SBR	15	137

Intersection Legend
1 - Merwin Ten Mile Road & White Oak Road
2 - White Oak Drive
3 - Merwin Ten Mile Drive

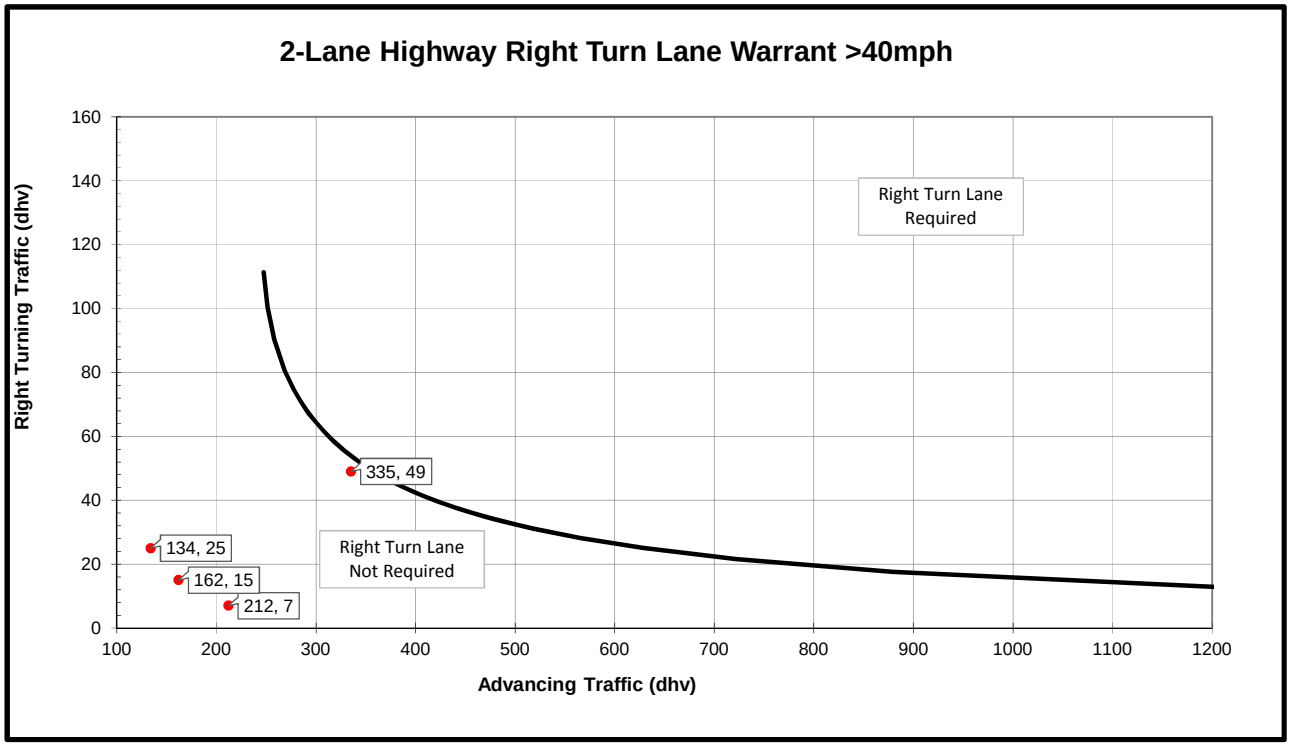


2037 PM Build Right Turn Lane Warrant		
Intersection	**Right Turning Vol**	**Advancing Vol**
2WBR	25	134
3SBR	49	335

2037 AM Build Right Turn Lane Warrant		
Intersection	**Right Turning Vol**	**Advancing Vol**
2WBR	7	212
3SBR	15	162

Intersection Legend

1 - Merwin Ten Mile Road & White Oak Road
2 - White Oak Drive
3 - Merwin Ten Mile Drive



Choice One Engineering

Merwin Ten Mile Rd & White Oak Rd

Pierce Township, Ohio

Signal Warrants - Summary

Major Street Approaches

Eastbound: **White Oak**

Number of Lanes: **1**

85% Speed > 40 MPH.

Total Approach Volume: **647**

Westbound: **White Oak**

Number of Lanes: **1**

85% Speed > 40 MPH.

Total Approach Volume: **521**

Minor Street Approaches

Northbound: **Merwin 10 Mile**

Number of Lanes: **1**

Total Approach Volume: **583**

Southbound: **Merwin Ten Mile**

Number of Lanes: **1**

Total Approach Volume: **428**

Warrant Summary

(Rural values apply.)

Warrant 1 - Eight Hour Vehicular Volumes ..... Not Evaluated

Warrant 1A - Minimum Vehicular Volume ..... Not Evaluated

Warrant 1B - Interruption of Continuous Traffic ..... Not Evaluated

Warrant 1C - Combination of Warrants ..... Not Evaluated

Warrant 2 - Four Hour Volumes ..... Not Evaluated

Warrant 3 - Peak Hour ..... Not Satisfied

Warrant 3A - Peak Hour Delay ..... Not Satisfied

Approach volumes on minor street don't exceed minimums for any hour. Delay data not evaluated.

Warrant 3B - Peak Hour Volumes ..... Not Satisfied

Volumes do not exceed minimums for any hour.

Warrant 4 - Pedestrian Volumes ..... Not Evaluated

Warrant 5 - School Crossing ..... Not Evaluated

Warrant 6 - Coordinated Signal System ..... Not Evaluated

Warrant 7 - Crash Experience ..... Not Evaluated

Warrant 8 - Roadway Network ..... Not Evaluated

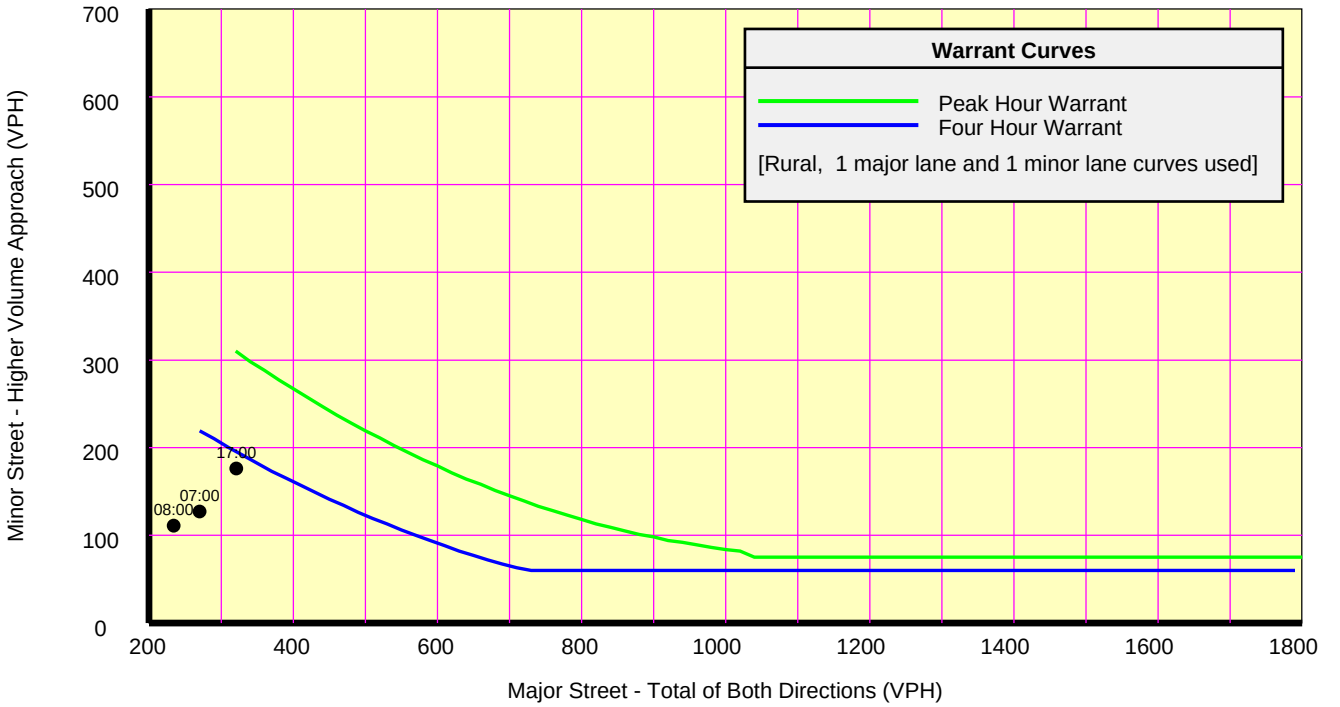
Warrant 9 - Intersection Near a Grade Crossing ..... Not Evaluated

Choice One Engineering

Merwin Ten Mile Rd & White Oak Rd

Pierce Township, Ohio

Signal Warrants - Summary



Analysis of 8-Hour Volume Warrants:

War 1A-Minimum Volume

Hour Begin	Major Total	Minor Vol	Minor Dir	Maj NA	Min NA
16:45	343	167	NB	No	No
17:15	323	180	SB	No	No
17:00	321	176	SB	No	No
16:30	317	148	NB	No	No
17:30	315	177	NB	No	No
07:00	270	127	NB	No	No
07:15	263	128	NB	No	No
17:45	256	150	NB	No	No
07:30	240	128	NB	No	No
07:45	238	126	NB	No	No
08:00	234	111	NB	No	No
16:15	232	112	NB	No	No
06:45	211	84	NB	No	No
08:15	183	85	NB	No	No
18:00	173	108	NB	No	No
16:00	156	60	NB	No	No
06:30	145	54	NB	No	No
08:30	133	62	SB	No	No
18:15	95	59	NB	No	No
06:15	72	30	NB	No	No
08:45	69	45	SB	No	No
15:45	51	28	SB	No	No
18:30	18	15	NB	No	No
09:00	14	5	NB	No	No

War 1B-Interruption of Traffic

Hour Begin	Major Total	Minor Vol	Minor Dir	Maj NA	Min NA
16:45	343	167	NB	No	No
17:15	323	180	SB	No	No
17:00	321	176	SB	No	No
16:30	317	148	NB	No	No
17:30	315	177	NB	No	No
07:00	270	127	NB	No	No
07:15	263	128	NB	No	No
17:45	256	150	NB	No	No
07:30	240	128	NB	No	No
07:45	238	126	NB	No	No
08:00	234	111	NB	No	No
16:15	232	112	NB	No	No
06:45	211	84	NB	No	No
08:15	183	85	NB	No	No
18:00	173	108	NB	No	No
16:00	156	60	NB	No	No
06:30	145	54	NB	No	No
08:30	133	62	SB	No	No
18:15	95	59	NB	No	No
06:15	72	30	NB	No	No
08:45	69	45	SB	No	No
15:45	51	28	SB	No	No
18:30	18	15	NB	No	No
09:00	14	5	NB	No	No

War 1C-Combination of Warrants

Hour Begin	Major Total	Minor Vol	Minor Dir	1A Met	1B Met
16:45	343	167	NB	No	No
17:15	323	180	SB	No	No
17:00	321	176	SB	No	No
16:30	317	148	NB	No	No
17:30	315	177	NB	No	No
07:00	270	127	NB	No	No
07:15	263	128	NB	No	No
17:45	256	150	NB	No	No
07:30	240	128	NB	No	No
07:45	238	126	NB	No	No
08:00	234	111	NB	No	No
16:15	232	112	NB	No	No
06:45	211	84	NB	No	No
08:15	183	85	NB	No	No
18:00	173	108	NB	No	No
16:00	156	60	NB	No	No
06:30	145	54	NB	No	No
08:30	133	62	SB	No	No
18:15	95	59	NB	No	No
06:15	72	30	NB	No	No
08:45	69	45	SB	No	No
15:45	51	28	SB	No	No
18:30	18	15	NB	No	No
09:00	14	5	NB	No	No