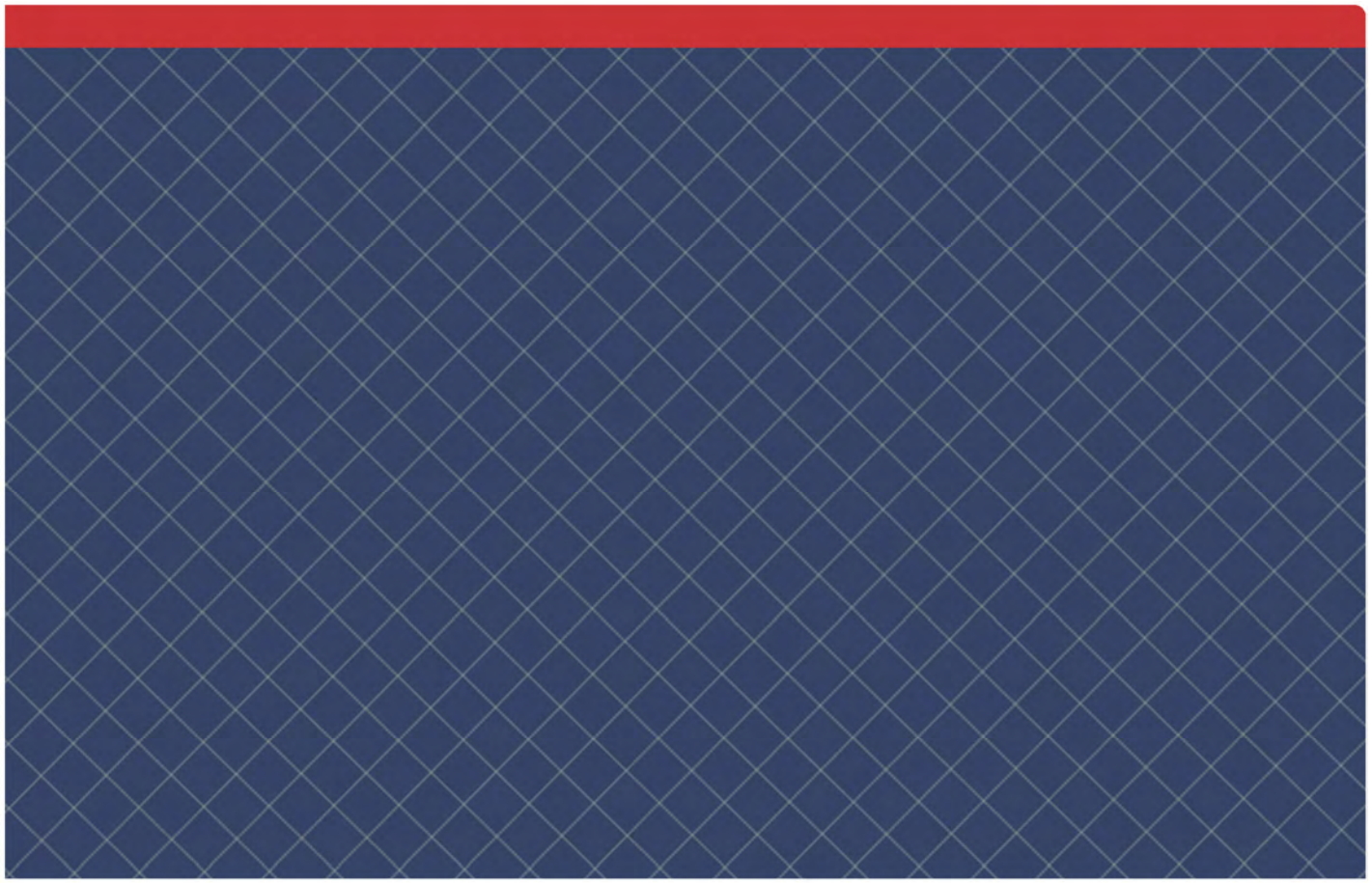
GEA-422-10.93/13.31 CORRIDOR STUDY
MAIN MARKET RD (US 422)
GEAUGA COUNTY, OHIO –
ODOT DISTRICT 12

October 15, 2014



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INTRODUCTION

PURPOSE AND NEED

The purpose of this study is to evaluate existing safety and traffic operations of US Route 422 and to identify potential countermeasures to reduce congestion and traffic crashes along US Route 422 from SLM 10.93 to SLM 13.31 in Geauga county, Ohio. The study area has several locations listed on the ODOT's safety program crash priority list (2013) as shown in **Figure 1** below. Four (4), rural non-freeway crash locations exist within the study area and range between #77 and #247 on the statewide ranking. Two (2) rural intersections of US Route 422 with Rapids Road and S.R. 700 also appear on the list ranked at 60 and 142, respectively.

FIGURE 1: ODOT'S CRASH PRIORITY LOCATIONS (2013)

A review of crash data provided by the Ohio Department of Transportation (ODOT) yielded a total of 96 reported crashes within study area during a 3-year period between 2011 and 2013. The following crash types and conditions are over represented at the study location compared to statewide averages (shown in parenthesis). Note the statewide crash averages are based on 2008-2012 data whereas the project data encompasses years 2011 to 2013.

- Total crashes: 96 total crashes
- Injury crashes: 30 crashes or 31.3 percent (25.4 percent)
- Rear end: 45 crashes or 46.9 percent (30.9 percent)
- Fixed Object: 24 crashes or 25.0 percent (14.6 percent)

BACKGROUND

US Route 422 is an east-west route that runs through Geauga County providing access to Cleveland to the west and Portage/Trumbull counties to the east and IR-80. US Route 422 is functionally classified as a rural principal arterial and also has an NHS route designation. Significant truck traffic is observed on US Route 422 within the study limits. Land uses are primarily rural undeveloped parcels with industrial land uses near the Great Lakes Parkway and the S.R. 700 intersections. A project location map is provided in **Figure 2**.

S.R. 700 is a north-south route that runs from the village of Burton at the north end to IR-80 to the south. S.R. 700 is a two lane roadway with a functional classification of a rural major collector and a posted speed limit of 45 miles per hour (MPH) within study limits.

Rapids Road (C.R. 1) is also a two lane north-south roadway, functionally classified as a rural local road.

PREVIOUS STUDIES

An abbreviated safety study dated January 2013 was prepared for the section of US Route 422 from SLM 12.30 (Cuyahoga River) to SLM 12.60. There were 5 documented crashes during the 2009 – 2011 analysis period with most attributed to the driveways of the Iron Horse Saloon property. The consolidation of driveways was recommended as a long term countermeasure. **Appendix A** includes excerpts from this safety study.

A technical memorandum dated June 2007 also was prepared by HNTB for the signalized intersection of US Route 422/S.R. 700. This memorandum summarized traffic operations under existing conditions (2007) and three alternatives.

- Alternative 1 was the no build alternative
- Alternative 2 added east/west left turn lanes in addition to a leading eastbound left phase.
- Alternative 3 added left turn lanes on all four approaches in addition to a leading eastbound and northbound left turn phases.

Appendix A also includes excerpts from this capacity analysis technical memorandum.

FIGURE 2: PROJECT LOCATION MAP

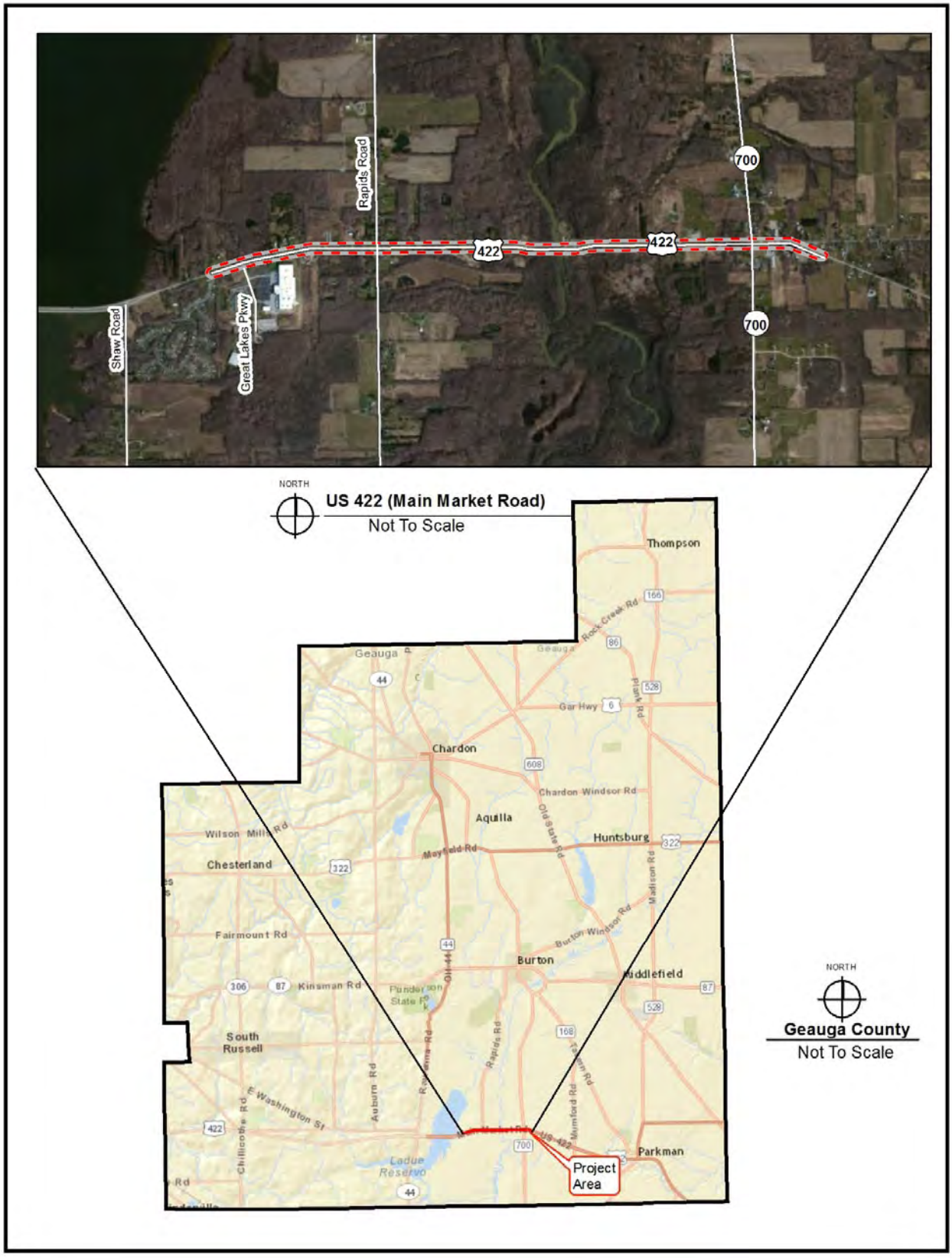


FIGURE 3: STUDY AREA MAP

EXISTING CONDITIONS

ROADWAY CONDITIONS

US Route 422 is a two lane undivided roadway within the study limits. US Route 422 is functionally classified as a rural principal arterial with a posted speed limit of 45 MPH. Existing roadway conditions are summarized in **Table 1** and described in additional detail below.

TABLE 1: EXISTING ROADWAY CONDITIONS

	US ROUTE 422 (SR 422)	RAPIDS RD (C.R. 1)	S.R. 700	GREAT LAKES PKWY
ODOT Functional Classification	Rural Principal Arterial	Rural Local	Rural Major Collector	Rural Local
Posted speed limit	45 MPH	55 MPH[1]	45 MPH	25 MPH
2012 ADT (Source: TIMS)	15,100 vpd	1,700 vpd	3,300 vpd	NA
Daily Truck percentage	13%	NA	3%	18%[2]
NHS Route	Yes	No	No	No

Note 1: Speed limit (unposted) per ORC code 4511.21
Note 2: Source - 2014 Turn count (6AM-7PM) at US Route 422/GLP intersection, approach volume

> **US Route 422 (east/west)**

- 2-lane roadway section comprised of one travel lane in each direction. Exclusive turn lanes exist at the intersection of Great Lakes Parkway. Turning maneuvers are made from shared lanes at other intersections within the study area.
- Center line rumble strips are installed on US Route 422 from east of Great Lakes Parkway (SLM 11.03) to 0.30 miles west of S.R. 700 (SLM 12.75).
- Guard rail is installed at various locations within study limits.
- Steep vertical grade of nearly 7 percent exists along US Route 422 approaching S.R. 700 in the eastbound direction. The steep grade affects trucks to have longer start up loss times from a stopped condition, resulting in much longer delays and travel times in that section of US Route 422.
- Reverse curves exist on the approach to the Cuyahoga River crossing near SLM 12.30

> **S.R. 700 (north/south)**

- 2-lane roadway section comprised one travel lane in each direction with paved shoulder within study limits.
- The posted speed limit is 45 mph within the project limits and changes to 55 mph, 0.30 miles north of US Route 422 and 0.40 miles south of US Route 422.
- School zone exists along S.R. 700, 100 feet south of US Route 422 intersection associated with an Agape Christian Academy within 500 feet of the intersection.

INTERSECTION CONDITIONS

Three primary intersections exist on US Route 422 corridor within study limits.

Great Lakes Parkway

Great Lakes Parkway provides access to Great Lakes Cheese facility and a Saint Gobain Crystals facility. This T- intersection is under signal control. Exclusive turn lanes exist along US Route 422 and Great Lakes Parkway. Advance signal warning signs are mounted on US Route 422

Rapids Road

Rapids Road is a local street and the intersection of US Route 422/Rapids Road is under two-way stop control. A flashing signal support is supplemented with dual stop signs on Rapids Road.

S.R. 700

The intersection of S.R. 700 with US Route 422 is under signal control. Both roadways are two-lane roadways (one lane in each direction). Exclusive turn lanes are not provided on all four approaches.

FIELD OBSERVATIONS

Other observations made during the site visit have been listed below:

- Extended queues were observed on US Route 422 during PM peak approaching S.R. 700 in the eastbound direction. These queues extended west of the Cuyahoga River crossing (5100 feet from the S.R. 700 intersection) between 4:25 pm and 5:10 pm. Picture 1 below shows eastbound queues (Source: ODOT's video log dated August 2012).

PICTURE 1: EASTBOUND QUEUE ON U.S. 422

- Significant truck traffic (15 percent) during peak hours
- Turning radius is constrained at the intersection of US Route 422/S.R. 700. A northbound truck turning right onto US Route 422 (Picture 2 and 3) required westbound vehicles to backup 80-100 feet to accommodate the turning maneuver.

PICTURE 2: NB RIGHT TURN MANUEVER-1

PICTURE 3: NB RIGHT TURN MANUEVER-2

Picture 4 below depicts the southbound right turn manuever, where the turning path falls in the eastbound approach lane. Similarly, turning manuevers from other approaches are deficient in required turning radius for tractor trailer trucks.

PICTURE 4: SB RIGHT TURN MANUEVER

- Chevron Alignment curve warning signs (W1-8) were found to be mounted at an approximate height of 7 feet in the reverse curve section near the Cuyahoga River crossing (SLM 12.05 to SLM 12.50). as shown in the picture to the right.

LAND USE AND PROPERTY ACCESS

Land uses along US Route 422 are primarily rural undeveloped farm land. Some industrial land uses exist at Great Lakes Parkway intersection, single family residential is observed along the corridor between Highland Drive and the Cuyahoga River crossing. East of S.R. 700 intersection, the land uses are a mix of commercial and residential land uses.

DATA COLLECTION

Turning movement counts were conducted using Miovision technology at the three study intersections (Great Lakes Parkway, Rapids Road and S.R. 700) with US Route 422 on September 9, 2014 from 6 AM-7 PM. Peak traffic volumes occur between 6:30 and 7:30 AM (morning peak hour) and between 4:45 and 5:45 PM (evening peak hour).

The turn count data was supplemented with field observation during the week of September 29, 2014. Significant queues were observed at the US-422/SR-700 intersection on the eastbound approach, the longest queue reaching about 5,100 feet from the S.R. 700 intersection during the afternoon peak hour. Traffic volume data was adjusted to account for the unserved demand. An additional 169 vehicles were added to the PM peak hour counted volume. The adjusted volumes were used in preparation of the detailed analyses contained in this report. Turn count data and manual adjustments are provided in **Appendix B**.

The approach grades at the US-422/SR-700 intersection range from 4% to 8%. Approximated values were used in calculation of change and clearance intervals for each movement as detailed later in this report. The eastbound grade was found to be most severe at +8% and the slope extends for approximately 2,400 feet approaching the intersection. The slope noticeably affected vehicle start-up time as observed during field visit. To account for this inefficiency, start-up time was modified to 3.0 seconds for the detailed capacity analysis contained in this report.

CHANGE AND CLEARANCE INTERVALS

Vehicular change and clearance intervals were calculated for the study intersection based on guidelines published in the Ohio Manual of Uniform Traffic Control Devices and the ITE Proposed Recommended Practice. A summary of existing and calculated clearance intervals is provided in **Table 2.** Detailed calculations and methodology is provided in **Appendix C.** Calculated clearance times differ from the existing timings suggesting that signal timing modifications may be warranted based on current industry best practices and lower operating speeds during peak periods.

TABLE 2: CHANGE AND CLEARANCE INTERVAL SUMMARY

Phase	Existing Yellow/ All Red [sec]	Existing TOTAL [sec]	Calculated Yellow/ All Red [sec]	Calculated TOTAL [sec]
US-422 and Great Lakes Pkwy				
Phase 1: WB Left	4.0 / 2.0	6.0	3.0 / 2.9	5.9
Phase 2: EB Through	4.0 / 2.0	6.0	4.3 / 1.4	5.7
Phase 6: WB Through	4.0 / 2.0	6.0	4.3 / 1.4	5.7
Phase 8: NB All	4.0 / 2.0	6.0	3.0 / 2.6	5.9
US-422 and Rapids Rd				
Phase 2: EB Through	N/A (Stop Control)		4.3 / 1.0	5.3
Phase 4: SB Through			5.0 / 1.0	6.0
Phase 5: EB Left			3.0 / 1.3	4.3
Phase 6: WB Through			4.3 / 1.0	5.3
Phase 8: NB Through			5.0 / 1.0	6.0

US-422 and SR-700				
Phase 2: EB Through	4.0 / 2.0	6.0	4.9 / 1.2	6.1
Phase 4: SB Through	4.0 / 2.0	6.0	4.8 / 1.4	6.2
Phase 5: EB Left	4.0 / 2.0	6.0	3.0 / 2.0	5.0
Phase 6: WB Through	4.0 / 2.0	6.0	4.9 / 1.2	6.1
Phase 8: NB Through	4.0 / 2.0	6.0	4.8 / 1.4	6.2

Recommended intervals exceed the existing timings at SR-700 on the southbound and westbound approaches. This is attributed to the approach grades at the intersection. The negative approach grades are approximated at -4% in the southbound direction and -5% in the westbound direction.

INTERSECTION CAPACITY

Intersection capacity was evaluated to assess existing operating conditions and to identify critical deficiencies that may contribute to safety issues. Analyses were prepared using existing (2014) peak hour volumes, adjusted for eastbound queues, and existing signal timing and phasing. Existing levels of service and vehicle delay are summarized in **Table 3.** Analysis methodology and detailed output reports are included in **Appendix D**.

Results indicate that under current conditions, there are capacity deficiencies at the US-422/Rapids Road intersection on the northbound and southbound approaches during the morning and afternoon peak hours.

Deficiencies are also present at the US-422/SR-700 intersection during the afternoon peak hour, especially in the eastbound direction. The volume to capacity ratio of the EB approach is 1.10 during the PM peak, which is 10% over capacity.

TABLE 3: EXISTING INTERSECTION CAPACITY SUMMARY

	EB APPROACH	WB APPROACH	NB APPROACH	SB APPROACH	INTERSECTION
US-422 & Great Lakes Pkwy					
2014 AM Peak - Existing (Signal)	B/14.2	B/19.2	D/38.2	-	C/21.4
2014 PM Peak - Existing (Signal)	D/45.3	A/5.2	D/36.4	-	C/33.5
US-422 & Rapids Rd					
2014 AM Peak - Existing (Stop)	A/1.0	A/0.1	**F/261.2**	**F/52.4**	B/13.3
2014 PM Peak - Existing (Stop)	A/1.4	A/0.3	**F/208.2**	**F/107.0**	A/9.7
US-422 & SR-700					
2014 AM Peak - Existing (Signal)	D/47.5	D/46.2	D/41.7	C/27.4	D/44.1
2014 PM Peak - Existing (Signal)	**F/289.5**	B/11.4	**E/77.7**	**E/77.2**	**F/190.9**

Note: Letter/Number - Level of Service/Average Delay per Vehicle

CRASH ANALYSIS

CRASH DATA

Crash data was furnished by the Ohio Department of Transportation for US Route 422 corridor from SLM 10.93 to SLM 13.31, encompassing a three-year study period between 2011 and 2013. The OH-1 report for each documented crash was reviewed to confirm accuracy and to locate crashes properly within the study limits. Crash diagrams are provided in **Appendix E.**

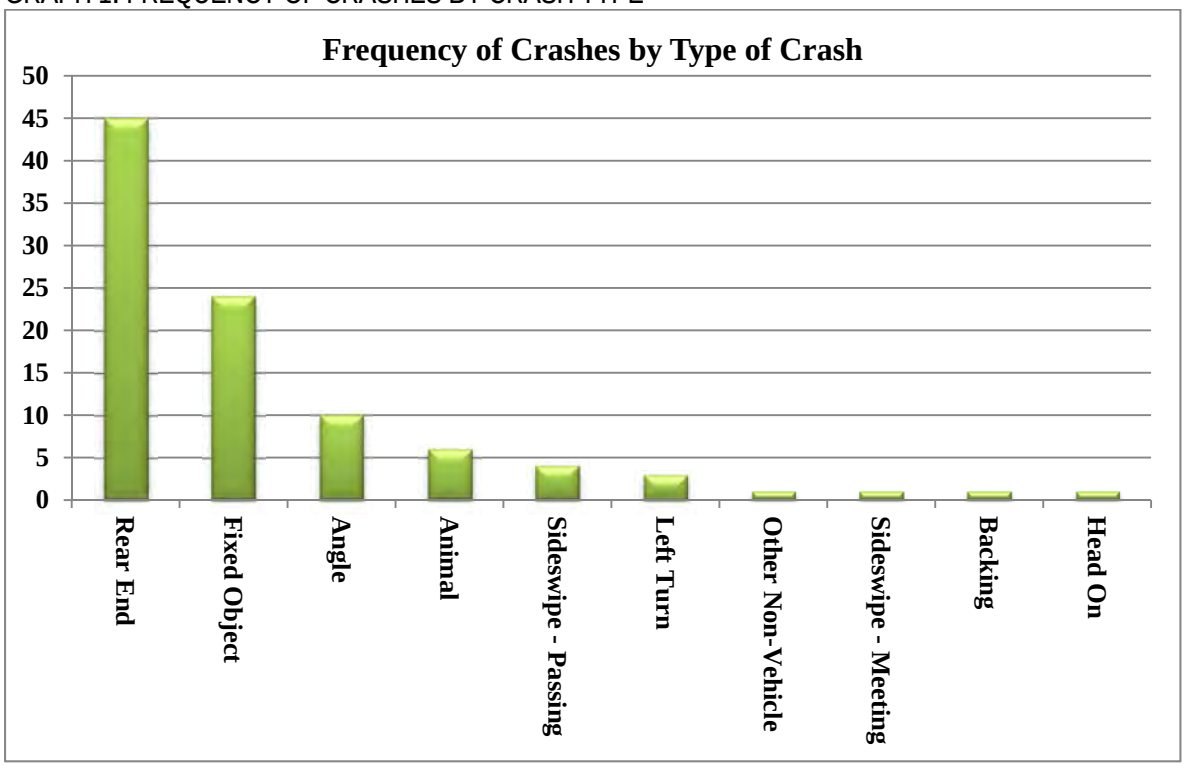
Noteworthy crash statistics for the three-year period are summarized below and shown graphically in **Graphs 1, 2** and **3**. Statewide averages for crashes on state system, non-freeway locations are shown in parentheses based on data for years 2008 through 2012.

- Total crashes: 96 total crashes
- Injury: 30 crashes or 31.3 percent (25.4 percent)
- Rear end: 45 crashes or 46.9 percent (30.9 percent)
- Fixed Object: 24 crashes or 25.0 percent (14.6 percent)

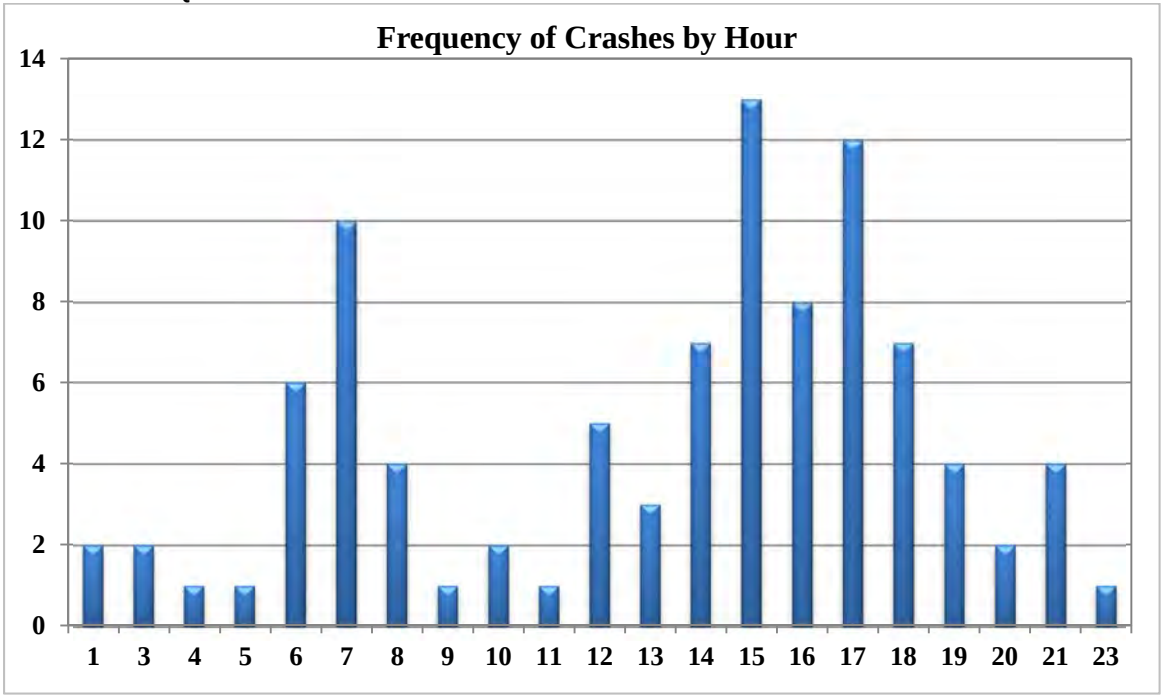
General crash observations include:

- Rear end, fixed object and angle crashes represent the top 3 crash types observed within study area as shown in Graph 1, accounting for over 80 percent of the total crashes.
- Seventy percent of crashes were recorded between the hours of 6AM-9AM and 2PM-7PM (Graph 2).
- Nineteen percent of crashes were recorded under dark – roadway not lighted conditions as shown in Graph 3.

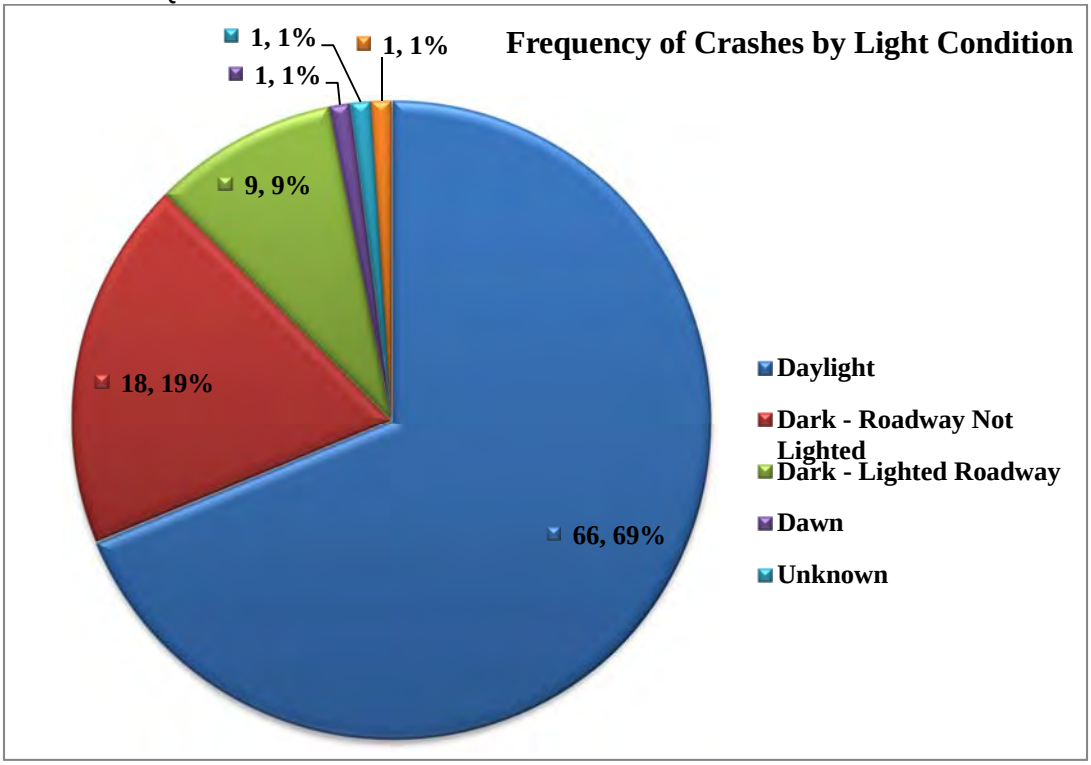
GRAPH 1: FREQUENCY OF CRASHES BY CRASH TYPE



GRAPH 2: FREQUENCY OF CRASHES BY TIME OF DAY



GRAPH 3: FREQUENCY OF CRASHES BY LIGHT CONDITION



Crashes recorded within the study area have been summarized by location and crash type in **Table 4**.

TABLE 4: CRASH SUMMARY

CRASH TYPE	DIRECTION	GREAT LAKES PARKWAY	SEGMENT (GLP TO RAPIDS)	RAPIDS ROAD	SEGMENT (RAPIDS TO S.R. 700)	S.R. 700	SEGMENT EAST OF S.R. 700	NASH ROAD
Rear End	Eastbound	4	2	7	11	5	1	3
	Westbound	2	1	3	1	4	--	--
Angle		--	--	3 – EB/NB 2 – EB/SB	--	4	1	--
Fixed Object	Eastbound	--	4	1	7	-	1	--
	Westbound	--	3	-	5	1	--	--
	Cross street	--	--	1	-	--	--	--
LeftTurn		--	--	--	1	2	--	--
Other		2	2	--	5	2	1	2
Injury Crashes		**0**	**5**	**5**	**9**	**7**	**1**	**1**
Total		**8**	**12**	**17**	**30**	**18**	**4**	**5**

REAR END CRASHES

A total of 45 rear end crashes were reported within the study area with 38 percent resulting in injury. A review of crashes by hour of day indicates that rear end crash patterns peak between 6AM and 9AM (24 percent) and between 3PM and 6PM (49 percent). Seventy three percent of the rear end crashes occurred during these six hours, indicating congestion as a contributing factor.

Of the 45 crashes, 33 crashes involved eastbound vehicles and the remaining 12 were related to westbound vehicles. These crashes resonate with field observations, where significant queues were observed in the eastbound direction approaching S.R. 700 intersection.

FIXED OBJECT CRASHES

Twenty four fixed object crashes were reported within study area with 21 percent resulting in injury. Thirteen of the fixed object crashes occurred under cloudy/rain/snow weather condition. A contributing factor for some of the fixed object crashes involved a vehicle leaving the roadway to avoid striking a stopped/slowing vehicle.

Roadway geometry elements that adversely impact fixed object/out-of control crashes include horizontal curvature and steep vertical grades along US Route 422, lack of safety grading of shoulders, and the presence of guard rail.

ANGLE CRASHES

Ten angle crashes were reported within the study area, nine of them reported at an intersection and one crash driveway related.

- Of the nine intersection related crashes, five crashes were reported at Rapids Road intersection and four crashes at the S.R. 700 intersection.
- Four of the five angle crashes at Rapids Road intersection involved a side street motorist at fault.
- Two of the four angle crashes at S.R. 700 intersection involved red light violation crashes.

INJURY CRASHES

The study area experienced thirty injury crashes, equivalent to 31 percent of all crashes recorded within the study period. Rear-end crashes and fixed object/out-of control crashes accounted for 77 percent of injuries.

CRASH SUMMARY BY LOCATION

US Route 422/Great Lakes Parkway – Intersection (SLM 11.03)

Eight crashes have been documented at the Great Lakes parkway intersection within the study period. These include six rear-end crashes (four eastbound and two westbound), one each of a backing and of a head-on crash.

US Route 422 – GLP to Rapids Road (SLM 11.08-SLM 11.50)

Within this section of US Route 422, twelve crashes have been documented. Prevalent crash types include rear-end (3 crashes), four eastbound out of control crashes, and three westbound out of control crashes.

US Route 422/Rapids Road – Intersection (SLM 11.55)

Seventeen crashes have been recorded at the Rapids road intersection within the study period. The most prevalent patterns are seven eastbound rear end crashes involving through vehicles stopped behind left turning vehicles and four angle crashes attributed to stop sign violations.

US Route 422 –Rapids Road to S.R. 700 (SLM 11.60 – 12.99)

Within this section of US Route 422 between Rapids road and S.R. 700, thirty crashes have been recorded. Rear-end and fixed object/out-of-control crashes, twelve crashes each are the prevalent crash types observed in this section.

Of the twelve rear-end crashes, ten crashes involve eastbound vehicles. A majority of these eastbound rear-end crashes were recorded between 3pm and7 pm, consistent with the PM peak extended queues in the eastbound direction of US Route 422 approaching S.R. 700 intersection as observed during site visit.

Fixed object/out of control crashes were concentrated (6 crashes), east of Cuyahoga River crossing on a curved section of US Route 422 (Crash Diagram - Sheet 9). In this section, 3 out of control crashes along with a rear-end crash involved eastbound vehicles and were also driveway related crashes. No contributing factor s were noted for the other 3 out of control crashes in the westbound direction.

US Route 422/S.R. 700 (SLM 13.04)

Eighteen crashes have been recorded at the S.R. 700 intersection within the study period. Most prevalent crash types include nine rear-end (5 – eastbound, 4 - westbound), angle (4 crashes) and left turn (2 crashes).

US Route 422 –East of S.R. 700 (SLM 13.09 – SLM 13.31)

This section of US Route 422 experienced nine crashes within the study period. Prevalent crash types include three eastbound rear end crashes and two westbound sideswipe passing crashes near the unsignalized intersection of Nash road.

Nash road is under stop control, and intersects with US Route 422 at an oblique angle. Westbound vehicles on Nash road approaching US Route 422 have limited intersection sight distance. Also, two other factors that contribute to crashes include horizontal curvature on this section of US Route 422 and wide pavement (access) to the Marathon gas station on the north side.

COUNTERMEASURES

The following section addresses contributing factors associated with the prevalent crashes patterns along the US Route 422 corridor and possible countermeasures to mitigate those crashes. Additional countermeasures are recommended to minimize potential safety issues that may not be directly attributed to historical crash trends. Detailed technical analyses including intersection clearance interval calculations, signal warrants, capacity analyses, signal warrants and turn lane sizing calculations are summarized in **Appendix C, D, F and G**, respectively.

The following are key factors that contribute to the most prevalent crash patterns observed along US Route 422 corridor and intersections: Countermeasure recommendations are intended to address these factors.

- **Absence of left turn lanes**. There are no exclusive turn lanes at the intersections of Rapids Road and of S.R. 700. Exclusive left turn lanes allow separation of turning vehicles from the through traffic and provide a dedicated space for turning vehicle before executing the desired movements. Auxiliary turn lane reduces the need for a through vehicle to slow or stop to avoid a rear end crash with a turning vehicle and thereby mitigate rear end crashes.
- **Fixed object/out of control crashes**. A contributing factor of some fixed object/out of control crashes include presence of shoulders and stopped vehicles in shared lanes.
- **Traffic control at the US Route 422/Rapids Road intersection.** Contributing factor of angle crashes and rear end crashes is extended delays for minor street approaches due to two-way stop control (i.e., stop condition for Rapids Road). Contributing factor of rear end crashes on US Route 422 is left turning vehicles blocking through vehicles. US Route 422 is free flow and drivers do not anticipate stop conditions resulting in crashes. Similarly, angle crashes can be attributed to infrequent gaps in mainline traffic for drivers on Rapids Road to identify a safe gap.

SHORT TERM COUNTERMEASURES

The following countermeasures are recommended to mitigate all crashes at the US Route 422/Rapids Road intersection.

- **Install traffic signal**: The installation of a traffic signal at the US Route 422/Rapids Road intersection is warranted based on existing traffic volumes. A traffic signal will decrease vehicle delay and mitigate angle crashes at the intersection. Recommended features of the proposed signal operation include three phase operation with an eastbound lead left turn movement to reduce queues on US Route 422. Warrants are contained in **Appendix F**.
- **Clear sight triangles.** Sight distance on the Rapids Road approaches is restricted due to poles and a telephone junction box (northwest quadrant). Vehicles on Rapids Road are obscured by vegetation. Measures to maintain clear sight triangles by removing vegetation, relocating telephone junction box are recommended along with traffic signal installation.
- **Revised centerline width.** Revise the centerline pavement marking on US Route 422 to be a standard solid, double yellow centerline. Increased shoulder width would mitigate the fixed object crashes within the study area by providing for a wider paved shoulder.
- **Upgrade clearance intervals**. Modification of the yellow change and all red clearance times is recommended. Calculations have been prepared in accordance with the ODOT Traffic Engineering Manual and ITE recommended practices, as summarized in **Appendix F**.

MEDIUM TERM COUNTERMEASURES

The following countermeasures are recommended to mitigate all crashes at the US Route 422/S.R. 700 intersection.

> **Install left turn lanes on US Route 422**. Widening of US Route 422 is recommended to provide dedicated lanes for left turning vehicles at the S.R. 700 intersection. Left turn lane sizing calculations are provided in **Appendix G.** A conceptual layout of the left turn lane improvement is shown in **Figure 4** assuming pavement widening on the south side of US Route 422.

  The eastbound left turn volume of 108 vph is only 11 percent of the approach volume during the PM peak hour, however for every stopped car waiting for a safe gap in opposing through volume, the through and right turning vehicles queue behind the stopped car, resulting in very long queues on an already congested segment. Separating through movements from left turning vehicles can decrease the headway between vehicles and improve the flow rate through the signal for both movements.

  The high traffic volumes on eastbound approach suggests that further delay to EB through traffic may be attributed to queues that form as a result of vehicles slowing or stopping to turn left to S.R. 700. The benefit of physically separating turning vehicles from through traffic removes slow or decelerating vehicles from the through lane, thus reducing the potential for rear end crashes. Dedicated left turn lanes on westbound US Route 422 will also likely mitigate the westbound rear end crash pattern.

  The FHWA publication titled *Signalized Intersections: Informational Guide* states that a left turn lane can be expected to decrease rear-end, left turn and red light running crashes. The crash reduction potential will depend on whether left turn phasing is provided, ranging from 15 to 35 percent. The FHWA signalized intersection guide provides eight criteria for justification of left turn phasing (protected-permissive, permissive-protected, or protected only). Left turn phasing should be considered if any one of the eight criteria is satisfied. The US Route 422/S.R. 700 intersection does not satisfy any of the left turn phasing criteria.

  Cost estimates for this improvement is included in **Appendix H**.

> **Interconnection of Signals.** The traffic signals at Great Lakes Parkway, Rapids Road and S.R. 700 are recommended to be interconnected as part of a coordinated signal system. Interconnection of signals on US Route 422 will reduce the number of stops. Near perfect progression can be achieved between the signalized intersections within the study area (based on a 90 second cycle length and operating speeds of 45 MPH).

> **Curve signing**. Existing warning signs on US Route 422 for the reverse curve section near Cuyahoga River crossing (SLM 12.05 to SLM 12.50) include a reverse curve sign (W1-4) on the tangent section and chevron warning signs (W1-8) are mounted on the outside of the curve.

  - Relocate the existing warning signs (350 feet in advance of the curve) to a distance in advance of the curves consistent with OMUTCD guidelines (175 feet) for no deceleration and a 45 MPH posted speed.
  - Replacement of W1-4 signs with winding road (W1-5) signs is recommended at a distance between 100 feet and 175 feet in advance of the curves.
  - The existing chevron warning signs (W1-8) mounted at a height of 7 feet in both directions are recommended to be lowered/replaced to a maximum height of 5 feet for improved visibility.

GEA-422-10.93-13.31
CORRIDOR STUDY

CONCEPT PLAN
MAIN MARKET RD. (US 422) AND CLARIDON RD. (SR 700)

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LONG TERM COUNTERMEASURES

- **Install left turn lanes on US Route 422 at Rapids Road**. The eastbound left turn demand at Rapids Road intersection is 145 vph (14 percent of approach volume) during PM peak hour. Even with a traffic signal installation at the intersection, delay to eastbound through traffic is expected due to queues that form as a result of vehicles slowing or stopping to turn left.

  Separate left-turn lanes provide a refuge while waiting for a gap and also reduce conflict between stopped left turning vehicles and through vehicles, thus reducing the potential for rear end crashes.

OTHER COUNTERMEASURES

Great Lakes Parkway Intersection

Following improvements to signal operation are recommended for improved efficiency at the intersection of US Route 422 and Great Lakes parkway intersection

- **Implement right turn overlap phase for eastbound approaches:** Right turn overlap phases will allow right turn movements from US Route 422 to utilize green time allotted to the minor street split phase on Great Lakes Parkway. This countermeasure would require installation of 5-section signal heads on eastbound approach.
- **Install advance detection on Great Lakes Parkway:** Green phase on Great Lakes Parkway has full extension time resulting in wasted green time. Install advance detection on Great Lakes parkway approach to reduce lost time on side street.

Nash Road

The following access management improvements are recommended to mitigate driveway-related/minor street related rear-end and sideswipe crashes on US Route 422 near Nash Road.

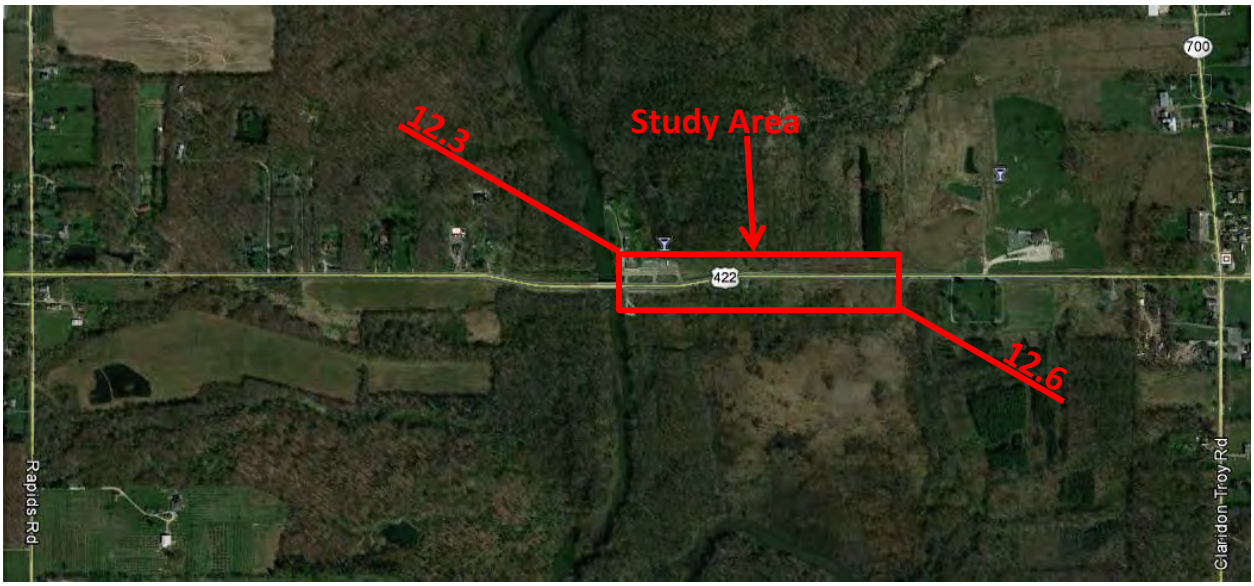
- Extend left turn lane at the S.R. 700 intersection as a two-way left turn lane to Nash Road. A number of driveways exist within this section of US Route 422, and this improvement will improve safety and operations by separating turning vehicles from through lanes along the corridor. This countermeasure may require additional right of way.

APPENDIX A
PROJECT
DOCUMENTATION

FORMAL SAFETY STUDY			
District: 12	County: Geauga	Route: US-422	Section: 12.3-12.6
GEA-422 (12.3-12.6) **2011 Safety Study Analyst Rank #12 Rural Non-Freeway**			
By: Drake Brauer, College Intern		Prepared: January 10, 2013	

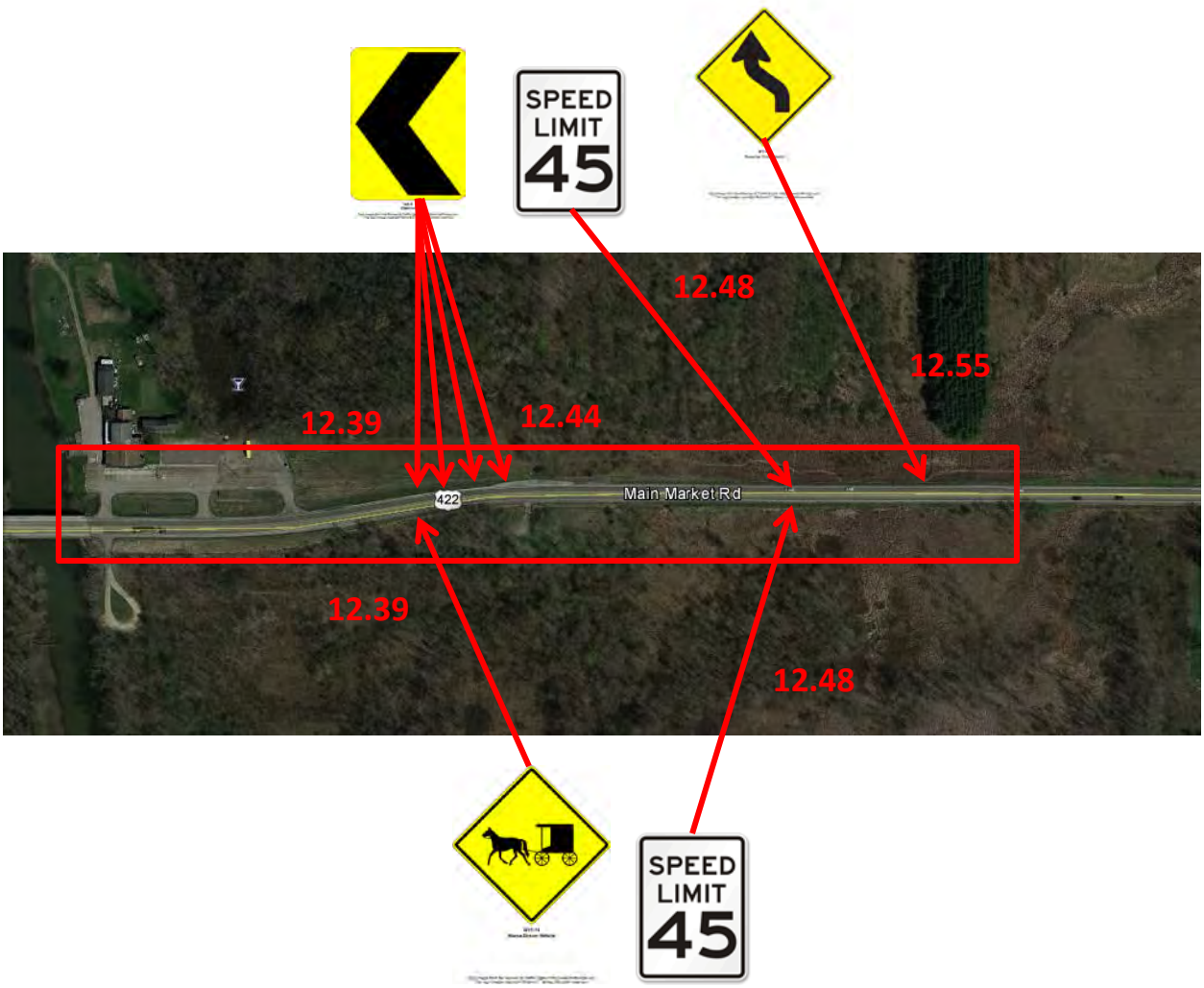
Background:

Between the years of 2009-2011, there were a total of nine crashes recorded to this section of US-422 causing it to be ranked 12th in the state on the 2011 rural non-freeway list. This high ranking has caused this section of US-422 to be flagged for possible safety concerns. The average daily traffic (ADT) for this section of US-422 is 14,795. For a visual of the site, see below.



Existing Conditions:

A crash analysis has been performed to review possible safety concerns associated with Main Market Rd (US-422) between log points 12.3 and 12.6. This section of US-422 begins right after a bridge over the Cuyahoga River and ends almost a half mile west of Claridon Troy Rd (SR-700). At the beginning of this section is the Iron Horse Saloon restaurant. Immediately after the restaurant there is a small curve in the roadway due to a previous realignment of US-422. The previous project added centerline rumble strips and created 12' lanes with 10' shoulders. Congestion due to the signal at SR 700 is a suspected contributing factor for crashes that occurred during weekday PM peak hours. See below for a visual of existing sign locations.



Crash Data:

A crash data analysis was performed to determine if the crashes showed any trends relating to a possible safety concern. The study period used for this crash analysis was 2009-2011. Using the GIS Crash Analysis Tool (GCAT), a query was run from log point 12.3 to log point 12.6 along US-422. The crash rate was then determined using the GCAT Rate Calc Sheet.

The query resulted in nine crashes, which were all reviewed to determine if they were logged correctly. After reviewing the crash reports it was determined that none of the crashes were logged in the correct locations. Of the nine crashes, five were logged to the Iron Horse Saloon driveway and four were logged to a location 0.4 miles east of mile marker 12. Two of the crashes logged to a location of 0.4 miles east of mile marker 12 didn't even occur within the 12.3 to 12.6 search query so they were pulled out of the safety study. Due to the fact that the Iron Horse Saloon has three driveways, it was difficult to determine which driveway the five crashes actually occurred in front of. Therefore, four of the five crashes logged to the Iron Horse Saloon driveway were given the revised log point of the middle driveway. All of the hand logged revisions made in this crash analysis were submitted for review.

CRASH_SEVERITY	Number	%
Injury Crash	2	28.6%
Property Damage Crash	5	71.4%
Grand Total	7	100.0%

TRAFFIC_CRASH_YEAR	Number	%
2009	1	14.3%
2010	3	42.9%
2011	3	42.9%
Grand Total	7	100.0%

DAY_OF_WEEK	Number	%
Friday	4	57.1%
Sunday	2	28.6%
Tuesday	1	14.3%
Grand Total	7	100.0%

HOUR_OF_DAY	Number	%
7	1	14.3%
14	2	28.6%
16	1	14.3%
19	2	28.6%
20	1	14.3%
Grand Total	7	100.0%

TYPE_OF_CRASH	Number	%
Rear End	4	57.1%
Fixed Object	3	42.9%
Grand Total	7	100.0%

ROAD_CONDITION	Number	%
Road - Dry	5	71.4%
Road - Wet	2	28.6%
Grand Total	7	100.0%

LOCATION	Number	%
Driveway/Alley Access	4	57.1%
Not An Intersection	3	42.9%
Grand Total	7	100.0%

CRASH_MONTH_NBR	Number	%
1	1	14.3%
4	1	14.3%
5	2	28.6%
8	2	28.6%
9	1	14.3%
Grand Total	7	100.0%

(See Appendix A for the complete 6 page CAM Tool Data Analysis Summary)

Observations:

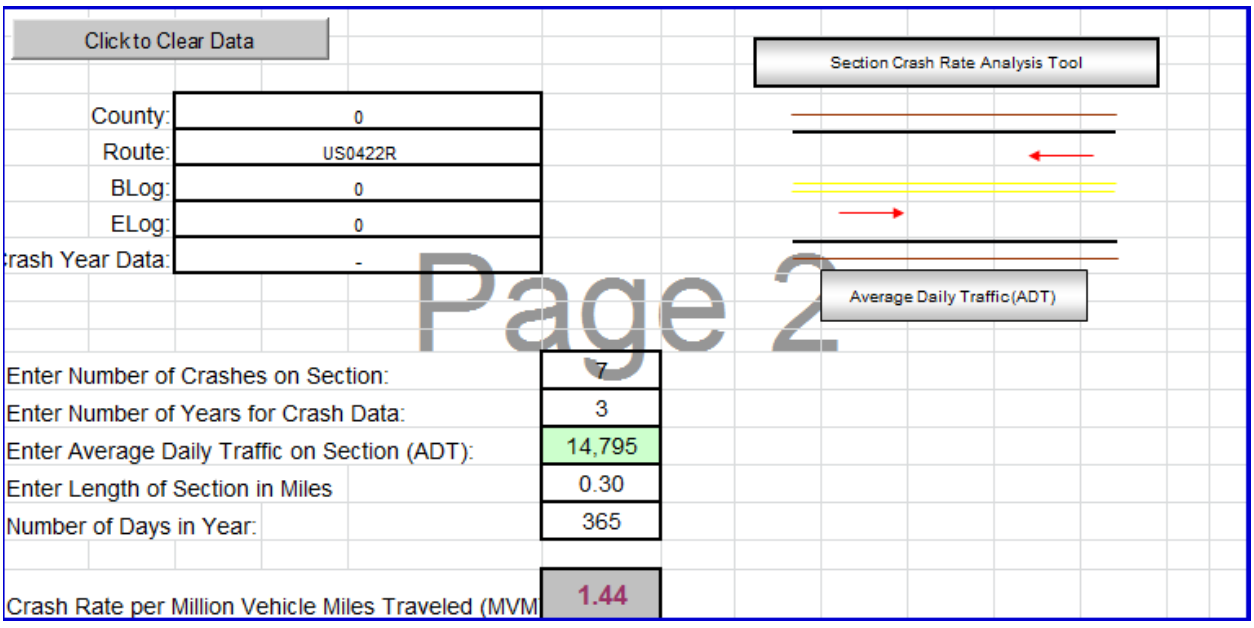
- **Crash Type**
  - 4 (57.1%) Rear end collisions.
  - 3 (42.9%) Fixed object collisions.
    - 2 of the 3 fixed object crashes involved guardrail.
- **Road Condition**
  - 5 (71.4%) Dry.
  - 2 (28.6%) Wet.
- **Direction**
  - 5 (71.4%) East.
  - 2 (28.6%) West.

Results:

- While using pathweb and going west on US-422, congestion was observed on US-422 East. The backup went from the intersection of US-422 and SR-700 all the way back to the Iron Horse Saloon. This distance is greater than a half mile and could cause problems with the curve visibility.

- Both of the crashes in the westbound direction occurred at the end of the curve and involved a guardrail. There is a curve warning sign and chevrons currently in place for westbound traffic approaching this curve. Therefore, lack of adequate warning does not appear to have been the cause of the westbound crashes.
- Of the crashes going eastbound, one crash occurred during peak hour traffic and the crash report mentions the presence of congestion. However, this is the only crash that occurred during the evening peak hours, so congestion does not appear to play a big role in these crashes.
- All four of the eastbound crashes logged to the middle driveway of the Iron Horse Saloon involved left turns into the restaurants parking lot. One driver made a bad turn and ended up in a ditch. Two of the crashes happened as a result of drivers not slowing down enough when a vehicle in front of them was making a left turn into the Iron Horse Saloon. One of the crashes happened because a driver did not slow down fast enough after one of the previously mentioned crashes occurred. Therefore, two of the crashes actually refer to the same incident. Sight distance should not play a role in these crashes because they occur on a straight and flat section of roadway and they did not occur during a time when the queue from SR-700 may have been a contributing factor.
- Due to the small number of crashes within the initial query, no trends were identifed. In order to gain a better idea of what is happening on this section of US-422, another query was run from the bridge all the way to the intersection of SR-700. A total of 25 crashes occurred between the bridge and the intersection with SR-700. Of the 25 crashes, 14 were rear ends. 13 of those 14 crashes occurred in the eastbound direction. The existing signal at SR 700 is over-capacity, resulting in long queues and delays for EB drivers during the PM peak hours. Queuing from SR 700 does not appear to be a major factor in the crashes between SLM 12.3-12.6.

Crash Rate:



Recommendations:
The review of accident reports in this segment did not identify a consistent trend among crashes observed. The appearance of this location on the 2011 rural non-freeway priority list appears to be an anomaly. District will monitor the site.

A long-term recommendation is to work with the owner of the Iron Horse Saloon to consolidate access points.

Countermeasures and Implementation Plan

No corrective action is recommended at this time. The appearance of this location on the 2011 Rural Non-Freeway priority list appears to be an anomaly. District will continue to monitor the site on future Safety Priority Lists.

Technical Memorandum

To: Ohio Department of Transportation, District 12

From: HNTB Ohio, Inc.

Re: GEA 422/700 Intersection Capacity Analysis

Date: June 2007

At the request of District 12 of the Ohio Department of Transportation, HNTB has conducted an Intersection Capacity Analysis for the intersection US 422 and SR 700 in Geauga County, Ohio. The purpose of this study is to identify possible capacity improvements at the US 422/SR 700 intersection and suggest actions that can be taken to improve operation. A location map of the site and surrounding area is included as **Page 2**.

Existing Conditions

On March 29, 2007 a field visit was performed, the existing conditions were observed and photographs were taken of each approach and are included in **Attachment A**.

US 422 is a rural principle arterial and SR 700 is a rural collector roadway. They both are two lane roadways (one lane in each direction) with a posted speed limit of 45 mph within the study area. The intersection is currently signalized with two-phase operation. A school zone is located on SR 700 just to the south of the intersection.

There is a high volume of trucks on US 422 passing through the intersection, approximately 15% throughout the day. All four corners of the intersection show evidence of truck tire tracks leaving the paved surface while attempting to negotiate right turns. There is a structure on the southwest corner of the intersection located close to the right of way.

Future Traffic

ODOT's Office of Technical Services certified 2010 and 2030 traffic for the intersection which is included as **Attachment B**. Design year traffic (2030) was used for the capacity analysis for this study. **Figure 2** below shows the AM and PM peak period traffic volumes.

Figure 2 – Design Year Traffic Volumes – AM (PM)

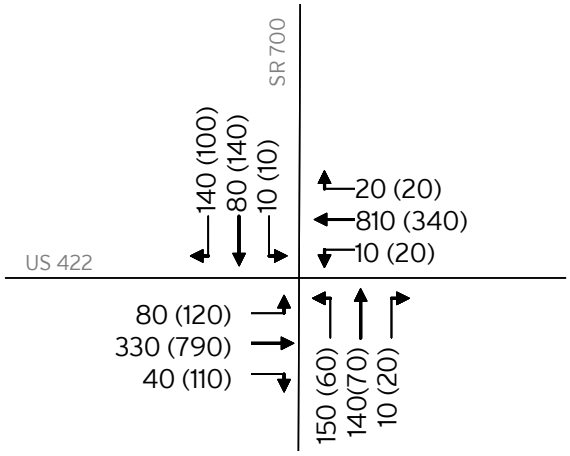
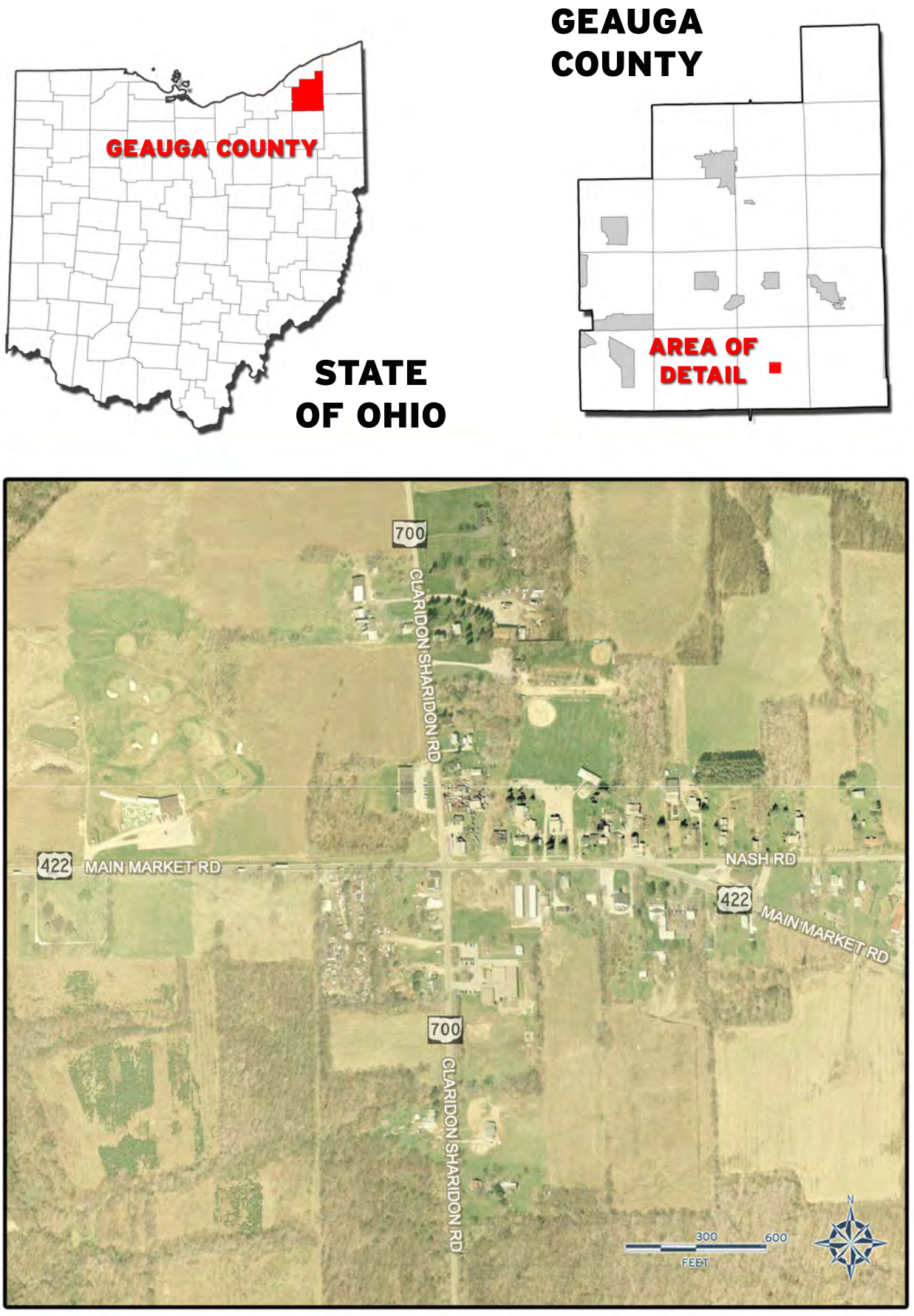


FIGURE 1: STUDY AREA



Alternatives

Two alternatives with multiple signal phasing options and the no build condition were examined at this intersection. **Table 1** below describes the geometry and signal operation of each of the alternatives. Alternatives 2 and 3 were run with the existing 2-phase signal operation as well as protected/permitted left turn schemes. Schematic figures of each alternative are included as **Attachment C**. Capacity (**Attachment D**), storage lane lengths (**Attachment E**), right of way impacts, and construction cost magnitude were examined for each alternative. These are summarized in the evaluation matrix included as **Attachment F**.

Table 1: Alternatives

	Description	Signal Operation
Alternative 1	Existing geometry	• 2-phase
Alternative 2	Add EB, WB left turn lanes	• 2-phase • Lead EB movement
Alternative 3	Add left turn lanes all approaches	• 2-phase • Lead EB and Lead NB movements

Alternative 1

Alternative 1 is the current condition. With existing geometry and 2-phase signal operation, the overall intersection currently operates at LOS D in the AM peak period and LOS D in the PM peak period. During the PM peak period, both the northbound and eastbound movements operate at LOS E. Safety is likely declining due to the lack of left turn lanes. Since this alternative is the no build condition, there would be no right of way costs and construction involvement is none.

Alternative 2

Alternative 2 widens the pavement on US 422 to include left turn lanes on both the eastbound and westbound approaches. When run with 2-phase signal operation, the LOS is improved slightly (LOS D – AM peak period, LOS D – PM peak period) when compared to the existing condition. If phased with a leading eastbound movement the LOS declines for the AM peak period to LOS E with westbound thru-right movement and northbound movement operating at LOS E, but improves for the PM peak period to LOS C. With this alternative, safety is improved along US 422 since the left turn lanes along US 422 allow the turning vehicles to line up with opposing turning vehicles and they are removed from the thru lanes. Also, proper turning radii are provided at the corners to accommodate trucks. However, with this improvement, two structure or total takes are required and another two partial right of way takes would be required. Construction involvement for this alternative is mid-range.

Alternative 3

Alternative 3 widens the pavement on both US 422 and SR 700 to include left turn lanes on all approaches. When run with 2-phase signal operation, the LOS is improved (LOS C – AM peak period, LOS C – PM peak period) when compared to the existing condition. If phased with a leading eastbound movement and leading northbound movement, the LOS is similar to the existing with LOS D in both AM and PM peak periods. With this alternative, safety is improved along both roadways since the left turn lanes along US 422 and SR 700 allow the turning vehicles to line up with opposing turning vehicles and they are removed from the thru lanes. Also, proper turning radii are provided at the corners to accommodate trucks. However, with this improvement, three structure or total takes are required and another two partial right of way takes would be required. Construction involvement for this alternative is high.

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U.S. 422 AND S.R. 700
ALTERNATE 2

CALCULATED MMB
CHECKED JEL

0 25 50 100
HORIZONTAL SCALE IN FEET

0 25 50 100
HORIZONTAL SCALE IN FEET

CALCULATED MMB
CHECKED JEL

U.S. 422 AND S.R. 700
ALTERNATE 3

\\clew00\pmwork\jobs\43605\techprod\Task 12\700AlternateSHT301.dgn 26-JUL-2007 10:48AM mblackburn

MEMO

To: Brian Blayney

From: Beth Sliemers. Scott Knebel

Date: October 10, 2014

Subject: Preliminary analysis and recommendations for US-422 and Rapids Road

Project #: 0107585A.13

The following serves as a summary of preliminary findings and recommendations for the intersection of US-422 and Rapids Road. LJB has prepared preliminary analyses including signal warrants and intersection capacity analysis. These results and recommendations will be included as part of a formal report for GEA-422-10.93/13.31.

Existing Conditions

The US-422/Rapids Road intersection is a two-way, stop controlled intersection with Rapids Road as the stop controlled approaches. There is a single lane on all approaches. The posted speed limit on US-422 is 45 miles per hour. Turn count data was supplied by ODOT using Miovision technology. Field observations from October 1, 2014 indicate that the longest queue on Rapids Road was four vehicles with the queue duration of three minutes.

Crash Evaluation

A total of 20 crashes were reported at the US-422/Rapids Road intersection during a three-year analysis period between January 1, 2011 and December 31, 2013. Of the total crashes, 30 percent resulted in injury. The most prevalent patterns are seven eastbound rear end crashes involving through vehicles stopped behind left turning vehicles and four right angle crashes involving vehicles entering US-422 from Rapids Road. A crash diagram for the US-422/Rapids Road intersection is attached to this memo.

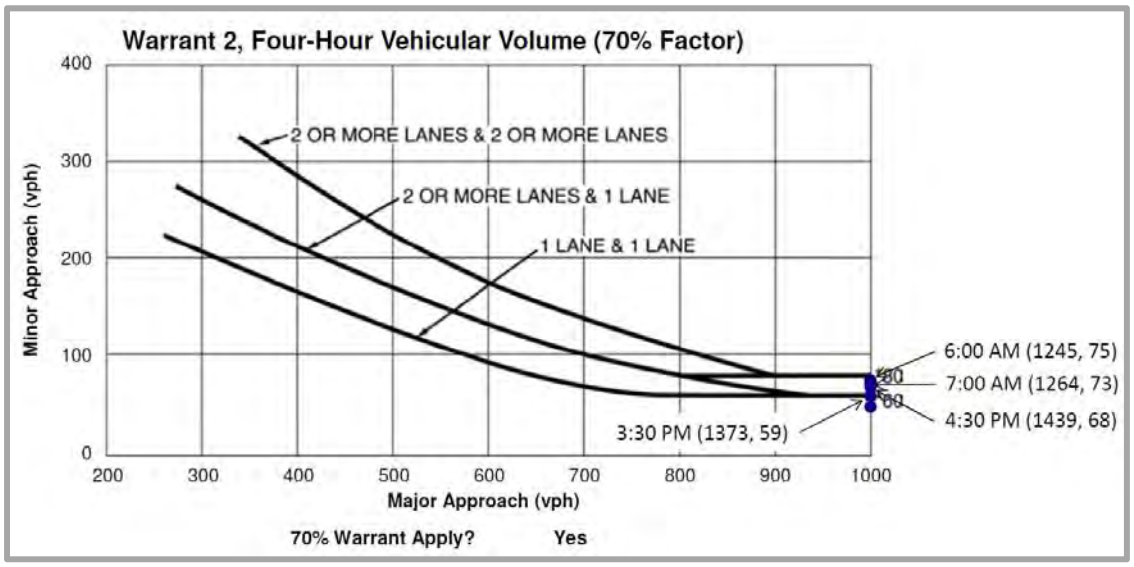
Traffic Signal Warrants

Traffic signal warrants were evaluated at the US-422/Rapids Road intersection to determine if signalization is warranted with current traffic volumes. Counted traffic volumes were evaluated against the warrants described below, as outlined in Section 4C of the Ohio Manual of Uniform Traffic Control Devices (OMUTCD). The warrants for US-422/Rapids Road were evaluated with the 70% factor applicable for roadways with posted speed limits greater than 40 MPH. Both US-422 and Rapids Road were evaluated as single-lane approaches. A reduction in right turning volume from the side street was not applied since the existing lane geometry consists of a single, shared lane. Detailed signal warrant worksheets are attached to this memo.

Warrant 1, Eight-Hour Vehicular Volume: The eight-hour warrant requires that for each of any 8 hours of an average day, volumes on both the major and minor street exceed minimum thresholds. The Rapids Road intersection does not satisfy requirements to meet the eight-hour warrant.

Warrant 2, Four-Hour Vehicular Volume: The four-hour warrant requires that for each of any 4 hours of an average day, volumes on both the major and minor street fall above the applicable curve in Figure 4C-1 (for speeds less than 40 MPH) or 4C-2 (for speeds greater than 40 MPH). As shown below in **Graph 1,** the minimum volume for a one-lane, minor street approach is 60 vehicles per hour. Rapids Road approach volumes exceed the 60 vph threshold during the 6AM hour (75 vph), the 7AM hour (73 vph) and the 4:30 PM hour (68 vph). The 3:30 PM hour approach volume of 59 vph is only 1 vehicle shy of the threshold. Based on these findings, it is concluded that the Rapids Road intersection satisfies four-hour signal warrant requirements.

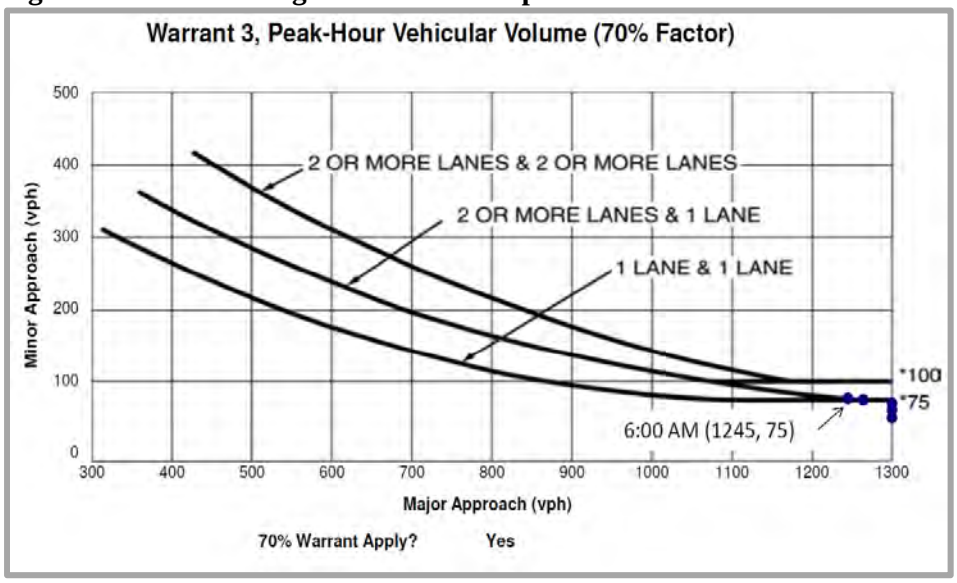
Graph 1: Four-Hour Signal Warrant Graph (4C-2)



Warrant 3, peak hour volume: The peak hour warrant requires that for any single hour of an average day, volumes on both the major and minor street fall above the applicable curve in Figure 4C-3 (for speeds less than 40 MPH) or 4C-4 (for speeds greater than 40 MPH). As shown in **Figure 2,** the minimum volume for a one-lane, minor street approach is 75 vehicles per hour. The Rapids Road approach volume meets the 75 vph threshold during the 6AM hour (75 vph). Based on this finding, it is concluded that the Rapids Road intersection satisfies peak hour signal warrant requirements.

Warrant 7, Crash Experience: The crash experience warrant requires that for any twelve month period, there must be five or more reported crashes involving personal injury or property damage that are susceptible to correction by signalization. In addition, for each of any eight hours of an average day, volumes on the major and minor street exceed minimum thresholds. The Rapids Road intersection does not satisfy requirements to meet the crash history warrant.

Figure 2: Peak Hour Signal Warrant Graph



Capacity Analysis

Field observations noted high vehicular delay on Rapids Road during peak hours, attributed to infrequent gaps in mainline traffic. Intersection capacity was evaluated with the assistance of Synchro traffic simulation software using counted traffic volumes. The northbound and southbound stop-controlled approaches operate at level of service F during the afternoon peak hour with average vehicle delays of 208 seconds for the northbound approach and 107 seconds for the southbound approach.

The following conditions were evaluated assuming signalization of the Rapids Road intersection:

- 2-phase signal operation (no left turn lanes on US-422): This condition represents the addition of a 2-phase traffic signal with no other changes to the existing condition.

- 3-phase signal operation (leading EB phase, no left turn lanes on US-422: During the PM peak hour, the demand volume for the eastbound approach is 1,008 vehicles per hour, compared to 461 vph for the westbound approach, 17 for the northbound approach and 57 for the southbound approach. Given the high eastbound demand volume coupled with an eastbound left turn demand of 145 vph, a leading eastbound left turn phase was modeled to more efficiently clear eastbound queues that could form at the signalized intersection.

- 2-phase signal operation with left turn lanes on US-422: The addition of left turn lanes on US-422 was evaluated to determine the level of benefit provided by dedicated left turn storage.

Capacity analysis results for the PM peak hour are summarized below in **Table 1**. Note that results reflect Synchro optimized green time splits. The critical approach delay balancing method was not used. Output reports reflective of HCM 2010 algorithms and Synchro reports with phasing/timing information are attached to this memo.

Table 1: Capacity analysis results

	AM PEAK HOUR					PM PEAK HOUR				
	EB APPROACH	WB APPROACH	NB APPROACH	SB APPROACH	INTERSECTION	EB APPROACH	WB APPROACH	NB APPROACH	SB APPROACH	INTERSECTION
Existing Condition (Stop Control)	A/1.0	A/0.1	**F/261.2**	**F/52.4**	B/13.3	A/1.4	A/0.3	**F/208.2**	**F/107.0**	A/9.7
Two-Phase Signal	A/4.2	A/7.8	C/24.1	C/25.1	A/8.1	B/14.9	A/3.2	C/33.7	D/36.6	B/12.9
Three-Phase Signal	A/3.7	B/20.0	D/35.5	D/38.0	B/16.1	B/10.6	A/6.7	D/35.5	D/38.6	B/11.2
Two-Phase Signal w/ Left Turn Storage	A/4.8	A/7.6	C/25.5	C/26.7	A/8.4	A/9.9	A/4.5	C/20.7	C/22.1	A/9.1

Note: Letter/Number - Level of Service/Average Delay per Vehicle

As supported by field observation, the existing condition capacity analysis shows long delay on Rapids Road during peak hours. Analysis shows that a traffic signal will mitigate this delay.

Eastbound left turn volumes are high during the PM peak hour (145 vehicles). Without dedicated storage for left turning vehicles, even one left turning vehicle stopped in the single approach lane waiting for a gap in approaching traffic will block through traffic from traversing the intersection. This condition will increase delay and vehicle queue lengths. A leading eastbound phase is recommended to provide protected green time to service all eastbound traffic which may reduce queuing on the eastbound approach. For this reason, three phase signal operation is recommended if left turn lanes are not constructed on US-422.

If left turn lanes are installed at the intersection, a two phase signal is sufficient for both the AM and PM peak hours. This configuration yields the lowest overall delay and all movements operate at a level of service of C or better.

Queue Analysis

In the existing stop controlled condition, the expected 95th percentile queue length is 290 feet for the eastbound approach. An evaluation of vehicle queue lengths was conducted for the three variations of traffic signal control described in the capacity analysis section. Introducing a stop condition on US-422 which is inherent to the traffic signal operation may increase queue lengths of US-422. Queue length results are summarized below in **Table 2**.

Table 2: 95th percentile queue length results

	AM PEAK HOUR				PM PEAK HOUR			
	EB APPROACH	WB APPROACH	NB APPROACH	SB APPROACH	EB APPROACH	WB APPROACH	NB APPROACH	SB APPROACH
US-422 & Rapids Rd								
Existing Condition (Stop Control)	115	20	50	60	290	180	60	80
Two-Phase Signal	190	210	65	75	410	210	35	100
Three-Phase Signal	165	420	75	100	445	285	40	90
Two-Phase Signal w/ Left Turn Storage	100	210	60	80	205	235	30	85

Note: Values given reflect 95th percentile queues measured in feet

Expected queue lengths are greatest during the PM peak hour when demand volumes on US-422 are the highest. With a 2-phase signal and no left turn lanes, the eastbound queue length exceeds 400 feet. While the simulation model with the leading eastbound phase indicates no significant change in the eastbound queue length compared to a 2-phase operation, experiences with similar sites suggests that the model output may be underestimating the effect of left turn blocking conditions. For this reason, a 3-phase signal operation is recommended. The addition of left turn lanes on US-422 is expected to reduce the eastbound queue length to less than the existing condition (with 2-phase operation).

Recommendations

A traffic signal is recommended at the US-422/Rapids Road intersection to decrease vehicle delay and mitigate rear end and angle crashes within the intersection. In the absence of left turn lanes on US-422, a three-phase signal operation is recommended to provide a leading eastbound phase to better accommodate the eastbound left turn demand and reduce queueing potential. If dedicated left turn lanes are constructed on US-422, then a two-phase signal operation is sufficient.

Please feel free to contract me with questions or for further discussion. I can be reached at (937) 259-5165 or by email at bsliemers@ljbinc.com.

APPENDIX B
TRAFFIC DATA

Ohio Department of Transportation
1980 West Broad Street
Mail Stop 5160
Columbus, Ohio, United States 43223
+16147528099 Stephanie.Marik@dot.state.oh.us
Office of Traffic Engineering

Count Name: GEA-422 @ Great Lakes Parkway
TMC
Site Code:
Start Date: 09/09/2014

Turning Movement Data

Start Time	Westbound Approach				Northbound Approach				Eastbound Approach				
	Westbound				Northbound				Eastbound				
	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
6:00 AM	191	18	0	209	30	5	0	35	5	55	0	60	304
6:15 AM	220	22	0	242	3	1	0	4	8	56	0	64	310
6:30 AM	233	51	0	284	4	3	0	7	16	62	0	78	369
6:45 AM	221	34	0	255	11	2	0	13	15	85	0	100	368
Hourly Total	865	125	0	990	48	11	0	59	44	258	0	302	1351
7:00 AM	233	8	0	241	79	4	0	83	5	74	0	79	403
7:15 AM	218	11	0	229	4	1	0	5	16	86	0	102	336
7:30 AM	228	11	0	239	3	1	0	4	12	107	0	119	362
7:45 AM	185	12	0	197	1	2	0	3	23	97	0	120	320
Hourly Total	864	42	0	906	87	8	0	95	56	364	0	420	1421
8:00 AM	192	11	0	203	0	0	0	0	11	80	0	91	294
8:15 AM	147	8	0	155	2	9	0	11	18	97	0	115	281
8:30 AM	153	3	0	156	1	6	0	7	10	87	0	97	260
8:45 AM	114	6	0	120	2	4	0	6	11	79	0	90	216
Hourly Total	606	28	0	634	5	19	0	24	50	343	0	393	1051
9:00 AM	129	2	0	131	2	5	0	7	7	76	0	83	221
9:15 AM	106	6	0	112	3	4	0	7	7	96	0	103	222
9:30 AM	102	3	0	105	3	4	0	7	6	92	0	98	210
9:45 AM	78	0	0	78	1	7	0	8	3	69	0	72	158
Hourly Total	415	11	0	426	9	20	0	29	23	333	0	356	811
10:00 AM	68	3	0	71	1	7	0	8	6	93	0	99	178
10:15 AM	103	3	0	106	3	2	0	5	2	78	0	80	191
10:30 AM	95	3	0	98	4	8	0	12	10	110	0	120	230
10:45 AM	76	5	0	81	4	11	1	16	6	65	0	71	168
Hourly Total	342	14	0	356	12	28	1	41	24	346	0	370	767
11:00 AM	83	1	0	84	6	3	0	9	3	79	0	82	175
11:15 AM	68	2	0	70	7	9	0	16	3	92	0	95	181
11:30 AM	83	6	0	89	3	4	0	7	3	84	0	87	183
11:45 AM	83	5	0	88	3	7	0	10	8	91	0	99	197
Hourly Total	317	14	0	331	19	23	0	42	17	346	0	363	736
12:00 PM	98	5	0	103	9	15	0	24	5	95	0	100	227
12:15 PM	87	7	0	94	4	7	0	11	11	85	0	96	201
12:30 PM	90	5	0	95	8	4	0	12	6	113	0	119	226
12:45 PM	81	12	0	93	2	4	0	6	11	98	0	109	208
Hourly Total	356	29	0	385	23	30	0	53	33	391	0	424	862
1:00 PM	81	14	0	95	4	3	0	7	5	101	0	106	208
1:15 PM	97	14	0	111	7	4	0	11	10	106	0	116	238

1:30 PM	86	13	0	99	3	3	0	6	10	94	0	104	209
1:45 PM	102	19	0	121	11	12	0	23	6	101	0	107	251
Hourly Total	366	60	0	426	25	22	0	47	31	402	0	433	906
2:00 PM	91	19	0	110	28	11	0	39	7	106	0	113	262
2:15 PM	112	28	0	140	12	4	0	16	8	127	0	135	291
2:30 PM	97	28	0	125	13	11	0	24	8	128	0	136	285
2:45 PM	101	15	0	116	11	10	0	21	2	147	0	149	286
Hourly Total	401	90	0	491	64	36	0	100	25	508	0	533	1124
3:00 PM	87	2	0	89	80	20	0	100	2	154	0	156	345
3:15 PM	98	4	0	102	22	7	0	29	6	193	0	199	330
3:30 PM	116	3	0	119	30	17	0	47	4	199	0	203	369
3:45 PM	93	0	0	93	4	10	0	14	0	218	0	218	325
Hourly Total	394	9	0	403	136	54	0	190	12	764	0	776	1369
4:00 PM	116	3	0	119	11	8	0	19	2	262	0	264	402
4:15 PM	103	0	0	103	11	8	0	19	0	255	0	255	377
4:30 PM	91	1	0	92	17	17	0	34	2	238	0	240	366
4:45 PM	107	3	0	110	7	9	0	16	1	222	0	223	349
Hourly Total	417	7	0	424	46	42	0	88	5	977	0	982	1494
5:00 PM	124	0	0	124	34	31	0	65	2	236	0	238	427
5:15 PM	133	1	0	134	7	24	0	31	3	240	0	243	408
5:30 PM	123	1	0	124	2	9	0	11	1	313	0	314	449
5:45 PM	102	0	0	102	2	6	0	8	3	204	0	207	317
Hourly Total	482	2	0	484	45	70	0	115	9	993	0	1002	1601
6:00 PM	103	2	0	105	2	9	0	11	2	211	0	213	329
6:15 PM	96	1	0	97	0	2	0	2	0	177	0	177	276
6:30 PM	71	2	0	73	2	4	0	6	0	132	0	132	211
6:45 PM	65	3	0	68	2	1	0	3	1	113	0	114	185
Hourly Total	335	8	0	343	6	16	0	22	3	633	0	636	1001
Grand Total	6160	439	0	6599	525	379	1	905	332	6658	0	6990	14494
Approach %	93.3	6.7	0.0	-	58.0	41.9	0.1	-	4.7	95.3	0.0	-	-
Total %	42.5	3.0	0.0	45.5	3.6	2.6	0.0	6.2	2.3	45.9	0.0	48.2	-
Lights	5364	377	0	5741	460	295	1	756	258	5862	0	6120	12617
% Lights	87.1	85.9	-	87.0	87.6	77.8	100.0	83.5	77.7	88.0	-	87.6	87.0
Mediums	216	19	0	235	18	21	0	39	21	255	0	276	550
% Mediums	3.5	4.3	-	3.6	3.4	5.5	0.0	4.3	6.3	3.8	-	3.9	3.8
Articulated Trucks	580	43	0	623	47	63	0	110	53	541	0	594	1327
% Articulated Trucks	9.4	9.8	-	9.4	9.0	16.6	0.0	12.2	16.0	8.1	-	8.5	9.2

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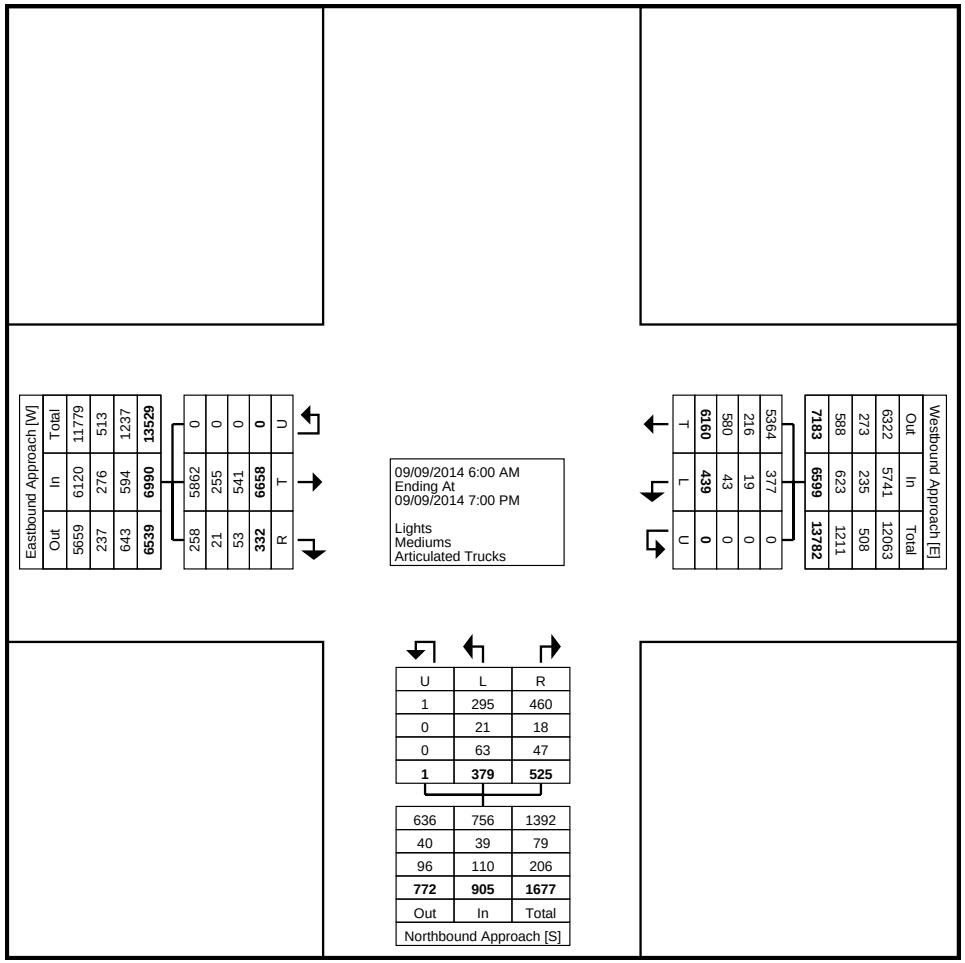
Office of Traffic Engineering

Count Name: GEA-422 @ Great Lakes Parkway
TMC
Site Code:
Start Date: 09/09/2014



Turning Movement Data Plot

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Count Name: GEA-422 @ Great Lakes Parkway
TMC
Site Code:
Start Date: 09/09/2014

Turning Movement Peak Hour Data (6:30 AM)

Start Time	Westbound Approach				Northbound Approach				Eastbound Approach				
	Westbound				Northbound				Eastbound				
	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
6:30 AM	233	51	0	284	4	3	0	7	16	62	0	78	369
6:45 AM	221	34	0	255	11	2	0	13	15	85	0	100	368
7:00 AM	233	8	0	241	79	4	0	83	5	74	0	79	403
7:15 AM	218	11	0	229	4	1	0	5	16	86	0	102	336
Total	905	104	0	1009	98	10	0	108	52	307	0	359	1476
Approach %	89.7	10.3	0.0	-	90.7	9.3	0.0	-	14.5	85.5	0.0	-	-
Total %	61.3	7.0	0.0	68.4	6.6	0.7	0.0	7.3	3.5	20.8	0.0	24.3	-
PHF	0.971	0.510	0.000	0.888	0.310	0.625	0.000	0.325	0.813	0.892	0.000	0.880	0.916
Lights	856	102	0	958	97	7	0	104	51	255	0	306	1368
% Lights	94.6	98.1	-	94.9	99.0	70.0	-	96.3	98.1	83.1	-	85.2	92.7
Mediums	16	2	0	18	0	1	0	1	1	14	0	15	34
% Mediums	1.8	1.9	-	1.8	0.0	10.0	-	0.9	1.9	4.6	-	4.2	2.3
Articulated Trucks	33	0	0	33	1	2	0	3	0	38	0	38	74
% Articulated Trucks	3.6	0.0	-	3.3	1.0	20.0	-	2.8	0.0	12.4	-	10.6	5.0

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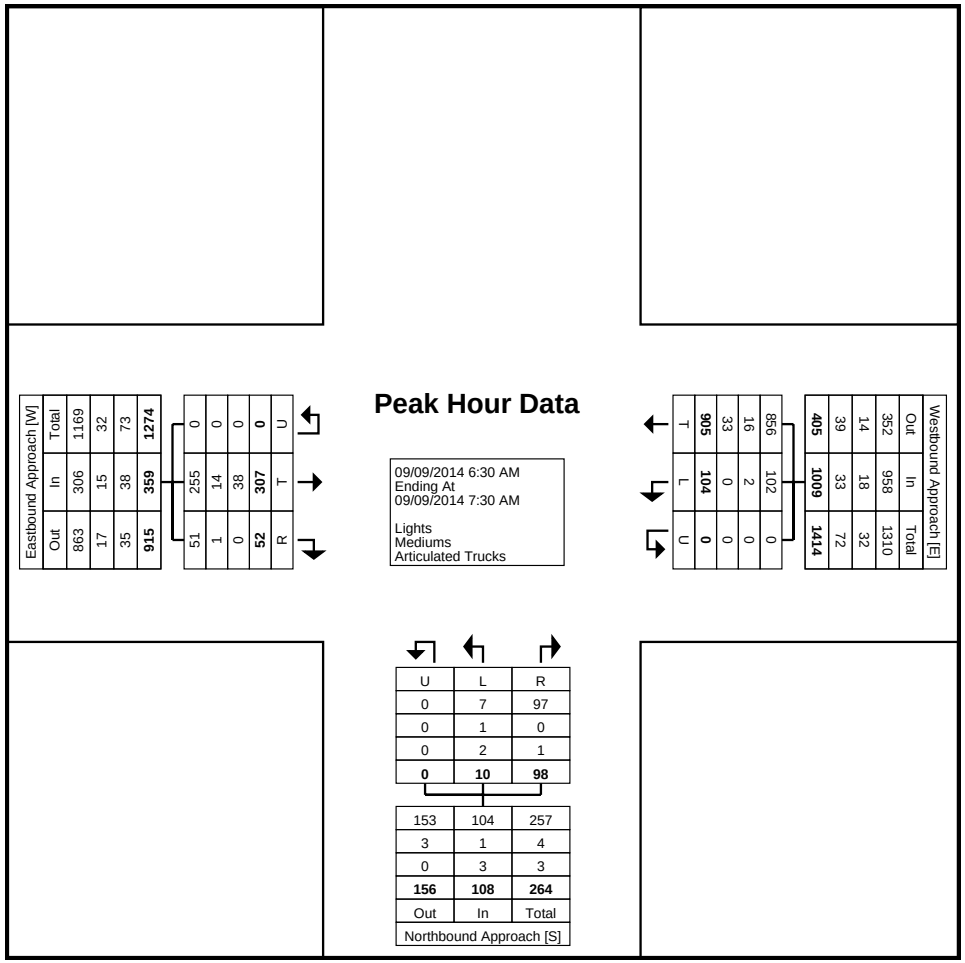
Site Code:
Start Date: 09/09/2014



Turning Movement Peak Hour Data Plot (6:30 AM)

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Count Name: GEA-422 @ Great Lakes Parkway
TMC
Site Code:
Start Date: 09/09/2014

Turning Movement Peak Hour Data (4:45 PM)

Start Time	Westbound Approach				Northbound Approach				Eastbound Approach				
	Westbound				Northbound				Eastbound				
	Thru	Left	U-Turn	App. Total	Right	Left	U-Turn	App. Total	Right	Thru	U-Turn	App. Total	Int. Total
4:45 PM	107	3	0	110	7	9	0	16	1	222	0	223	349
5:00 PM	124	0	0	124	34	31	0	65	2	236	0	238	427
5:15 PM	133	1	0	134	7	24	0	31	3	240	0	243	408
5:30 PM	123	1	0	124	2	9	0	11	1	313	0	314	449
Total	487	5	0	492	50	73	0	123	7	1011	0	1018	1633
Approach %	99.0	1.0	0.0	-	40.7	59.3	0.0	-	0.7	99.3	0.0	-	-
Total %	29.8	0.3	0.0	30.1	3.1	4.5	0.0	7.5	0.4	61.9	0.0	62.3	-
PHF	0.915	0.417	0.000	0.918	0.368	0.589	0.000	0.473	0.583	0.808	0.000	0.811	0.909
Lights	438	3	0	441	50	71	0	121	6	970	0	976	1538
% Lights	89.9	60.0	-	89.6	100.0	97.3	-	98.4	85.7	95.9	-	95.9	94.2
Mediums	13	0	0	13	0	0	0	0	0	19	0	19	32
% Mediums	2.7	0.0	-	2.6	0.0	0.0	-	0.0	0.0	1.9	-	1.9	2.0
Articulated Trucks	36	2	0	38	0	2	0	2	1	22	0	23	63
% Articulated Trucks	7.4	40.0	-	7.7	0.0	2.7	-	1.6	14.3	2.2	-	2.3	3.9

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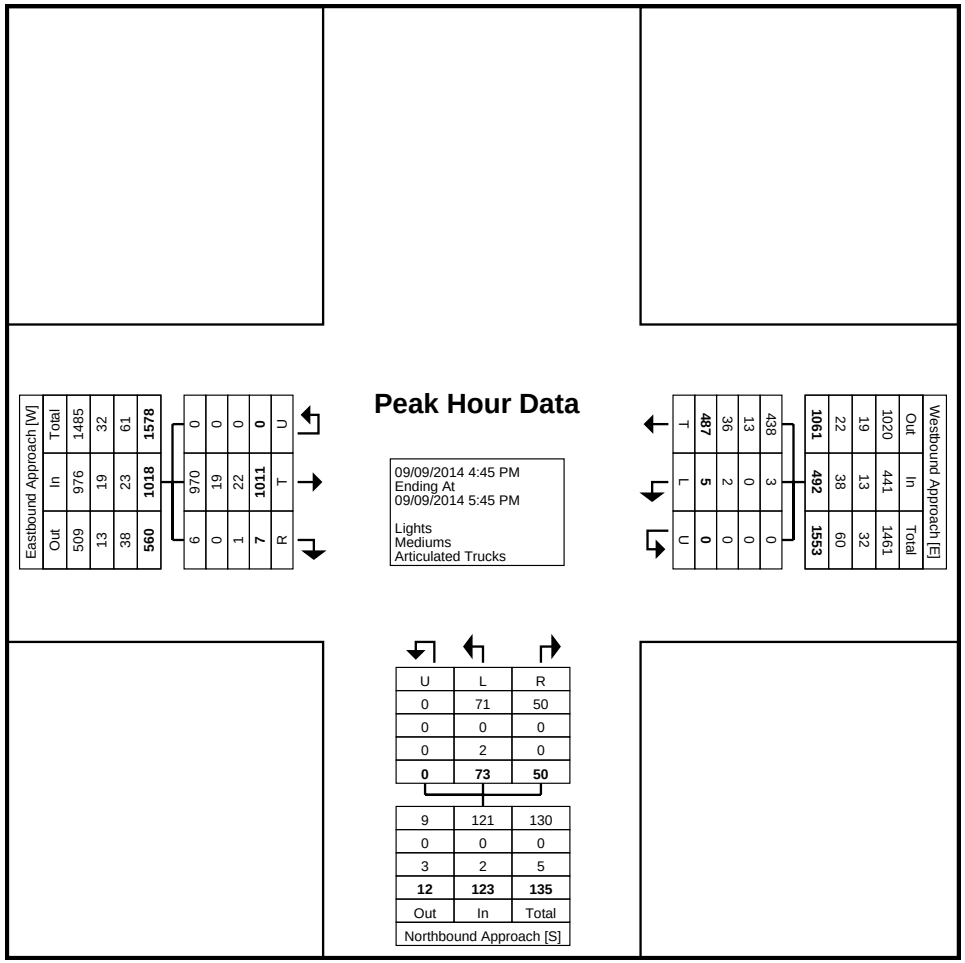

Turning Movement Peak Hour Data Plot (4:45 PM)

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Office of Traffic Engineering

Count Name: GEA-422 @ Rapids Rd TMC
Site Code:
Start Date: 09/09/2014

Turning Movement Data

Start Time	Southbound Approach					Westbound Approach					Northbound Approach					Eastbound Approach					
	Southbound					Westbound					Northbound					Eastbound					
	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
6:00 AM	17	1	0	0	18	1	195	1	0	197	0	0	6	0	6	0	75	8	0	83	304
6:15 AM	16	0	0	0	16	3	232	0	0	235	2	4	7	0	13	1	53	6	0	60	324
6:30 AM	20	2	2	0	24	1	260	0	0	261	1	4	4	0	9	0	62	7	0	69	363
6:45 AM	17	0	0	0	17	3	240	1	0	244	2	3	4	0	9	0	82	14	0	96	366
Hourly Total	70	3	2	0	75	8	927	2	0	937	5	11	21	0	37	1	272	35	0	308	1357
7:00 AM	16	0	0	0	16	3	204	2	0	209	4	7	4	0	15	3	137	14	0	154	394
7:15 AM	14	2	2	0	18	1	202	1	0	204	2	5	6	0	13	2	81	5	0	88	323
7:30 AM	24	0	1	0	25	1	217	0	0	218	1	1	4	0	6	2	98	15	0	115	364
7:45 AM	11	2	1	0	14	4	176	1	0	181	0	6	6	0	12	2	77	16	0	95	302
Hourly Total	65	4	4	0	73	9	799	4	0	812	7	19	20	0	46	9	393	50	0	452	1383
8:00 AM	9	1	1	0	11	3	166	0	0	169	3	3	7	0	13	1	75	8	0	84	277
8:15 AM	7	1	1	0	9	2	153	1	0	156	1	4	3	0	8	1	77	11	0	89	262
8:30 AM	12	0	2	0	14	2	138	1	0	141	0	1	2	0	3	1	77	11	0	89	247
8:45 AM	12	1	2	0	15	2	106	0	0	108	1	2	2	0	5	1	75	12	0	88	216
Hourly Total	40	3	6	0	49	9	563	2	0	574	5	10	14	0	29	4	304	42	0	350	1002
9:00 AM	11	3	1	0	15	1	113	0	0	114	0	0	4	0	4	2	60	6	0	68	201
9:15 AM	4	2	1	0	7	1	101	1	0	103	1	2	2	0	5	4	92	10	0	106	221
9:30 AM	2	1	1	0	4	0	99	1	0	100	5	0	1	0	6	1	80	11	0	92	202
9:45 AM	3	1	2	0	6	1	66	0	0	67	1	0	4	0	5	2	55	11	0	68	146
Hourly Total	20	7	5	0	32	3	379	2	0	384	7	2	11	0	20	9	287	38	0	334	770
10:00 AM	6	2	0	0	8	1	69	1	0	71	1	1	1	0	3	2	88	10	0	100	182
10:15 AM	7	0	0	0	7	3	101	1	0	105	2	2	1	0	5	3	73	8	0	84	201
10:30 AM	4	0	0	0	4	1	87	1	0	89	1	0	0	0	1	6	91	8	0	105	199
10:45 AM	5	0	1	0	6	2	71	1	0	74	0	1	2	0	3	0	67	8	0	75	158
Hourly Total	22	2	1	0	25	7	328	4	0	339	4	4	4	0	12	11	319	34	0	364	740
11:00 AM	5	1	1	0	7	1	71	0	0	72	2	0	0	0	2	4	75	6	0	85	166
11:15 AM	7	1	1	0	9	2	78	1	0	81	0	2	1	0	3	1	97	4	0	102	195
11:30 AM	4	0	2	0	6	2	84	1	0	87	1	1	2	0	4	2	76	3	0	81	178
11:45 AM	5	0	0	0	5	0	73	0	0	73	1	2	1	0	4	2	83	10	0	95	177
Hourly Total	21	2	4	0	27	5	306	2	0	313	4	5	4	0	13	9	331	23	0	363	716
12:00 PM	2	5	1	0	8	0	107	4	0	111	4	0	3	0	7	4	91	9	0	104	230
12:15 PM	6	3	0	0	9	0	83	2	0	85	1	2	3	0	6	4	74	16	0	94	194
12:30 PM	5	1	2	0	8	4	84	2	1	91	0	2	3	0	5	2	98	12	0	112	216
12:45 PM	9	2	0	0	11	1	80	0	0	81	1	1	1	0	3	3	87	14	0	104	199
Hourly Total	22	11	3	0	36	5	354	8	1	368	6	5	10	0	21	13	350	51	0	414	839
1:00 PM	7	6	0	0	13	0	97	1	0	98	0	3	2	0	5	7	88	11	0	106	222
1:15 PM	7	0	1	0	8	0	95	1	0	96	0	2	1	0	3	4	96	13	0	113	220

1:30 PM	6	0	0	0	6	0	105	1	0	106	1	1	1	0	3	3	77	12	0	92	207
1:45 PM	5	2	1	0	8	2	105	2	0	109	0	0	4	0	4	5	96	13	0	114	235
Hourly Total	25	8	2	0	35	2	402	5	0	409	1	6	8	0	15	19	357	49	0	425	884
2:00 PM	7	2	1	0	10	0	111	5	0	116	3	2	3	0	8	5	125	7	0	137	271
2:15 PM	15	1	1	0	17	2	124	0	0	126	1	1	2	0	4	3	126	12	0	141	288
2:30 PM	6	1	1	0	8	0	115	3	0	118	1	3	2	0	6	1	116	19	0	136	268
2:45 PM	7	4	1	0	12	1	94	2	0	97	1	1	1	0	3	3	151	15	0	169	281
Hourly Total	35	8	4	0	47	3	444	10	0	457	6	7	8	0	21	12	518	53	0	583	1108
3:00 PM	11	2	2	0	15	3	81	0	0	84	0	3	1	0	4	10	193	28	0	231	334
3:15 PM	10	2	0	0	12	0	86	0	0	86	3	0	2	0	5	13	192	16	0	221	324
3:30 PM	14	0	2	0	16	3	108	0	0	111	1	1	0	0	2	12	185	30	0	227	356
3:45 PM	10	2	1	0	13	0	70	0	0	70	1	1	2	0	4	10	199	24	0	233	320
Hourly Total	45	6	5	0	56	6	345	0	0	351	5	5	5	0	15	45	769	98	0	912	1334
4:00 PM	11	4	2	0	17	4	108	5	0	117	3	2	6	0	11	14	210	39	0	263	408
4:15 PM	7	5	1	0	13	1	97	4	0	102	1	2	0	0	3	14	211	33	0	258	376
4:30 PM	16	3	4	0	23	5	84	7	0	96	0	1	1	0	2	19	210	33	0	262	383
4:45 PM	12	0	0	0	12	0	96	4	0	100	1	1	0	0	2	15	185	26	0	226	340
Hourly Total	46	12	7	0	65	10	385	20	0	415	5	6	7	0	18	62	816	131	0	1009	1507
5:00 PM	14	4	1	0	19	0	115	4	0	119	3	0	4	0	7	15	196	46	0	257	402
5:15 PM	12	1	1	0	14	1	116	4	0	121	2	1	2	0	5	20	205	39	0	264	404
5:30 PM	8	1	3	0	12	2	117	2	0	121	0	1	2	0	3	12	215	34	0	261	397
5:45 PM	5	5	2	0	12	0	100	1	0	101	0	0	1	0	1	15	162	23	0	200	314
Hourly Total	39	11	7	0	57	3	448	11	0	462	5	2	9	0	16	62	778	142	0	982	1517
6:00 PM	11	3	1	0	15	0	91	1	0	92	1	3	2	0	6	8	183	19	0	210	323
6:15 PM	7	0	2	0	9	2	76	1	0	79	1	0	1	0	2	7	143	19	0	169	259
6:30 PM	6	2	0	0	8	0	65	0	0	65	2	1	3	0	6	8	116	14	0	138	217
6:45 PM	4	0	1	0	5	2	63	1	0	66	2	1	1	0	4	4	93	6	0	103	178
Hourly Total	28	5	4	0	37	4	295	3	0	302	6	5	7	0	18	27	535	58	0	620	977
Grand Total	478	82	54	0	614	74	5975	73	1	6123	66	87	128	0	281	283	6029	804	0	7116	14134
Approach %	77.9	13.4	8.8	0.0	-	1.2	97.6	1.2	0.0	-	23.5	31.0	45.6	0.0	-	4.0	84.7	11.3	0.0	-	-
Total %	3.4	0.6	0.4	0.0	4.3	0.5	42.3	0.5	0.0	43.3	0.5	0.6	0.9	0.0	2.0	2.0	42.7	5.7	0.0	50.3	-
Lights	453	82	51	0	586	69	5139	72	1	5281	62	82	126	0	270	279	5245	761	0	6285	12422
% Lights	94.8	100.0	94.4	-	95.4	93.2	86.0	98.6	100.0	86.2	93.9	94.3	98.4	-	96.1	98.6	87.0	94.7	-	88.3	87.9
Mediums	20	0	2	0	22	4	233	1	0	238	4	5	2	0	11	4	247	32	0	283	554
% Mediums	4.2	0.0	3.7	-	3.6	5.4	3.9	1.4	0.0	3.9	6.1	5.7	1.6	-	3.9	1.4	4.1	4.0	-	4.0	3.9
Articulated Trucks	5	0	1	0	6	1	603	0	0	604	0	0	0	0	0	0	537	11	0	548	1158
% Articulated Trucks	1.0	0.0	1.9	-	1.0	1.4	10.1	0.0	0.0	9.9	0.0	0.0	0.0	-	0.0	0.0	8.9	1.4	-	7.7	8.2

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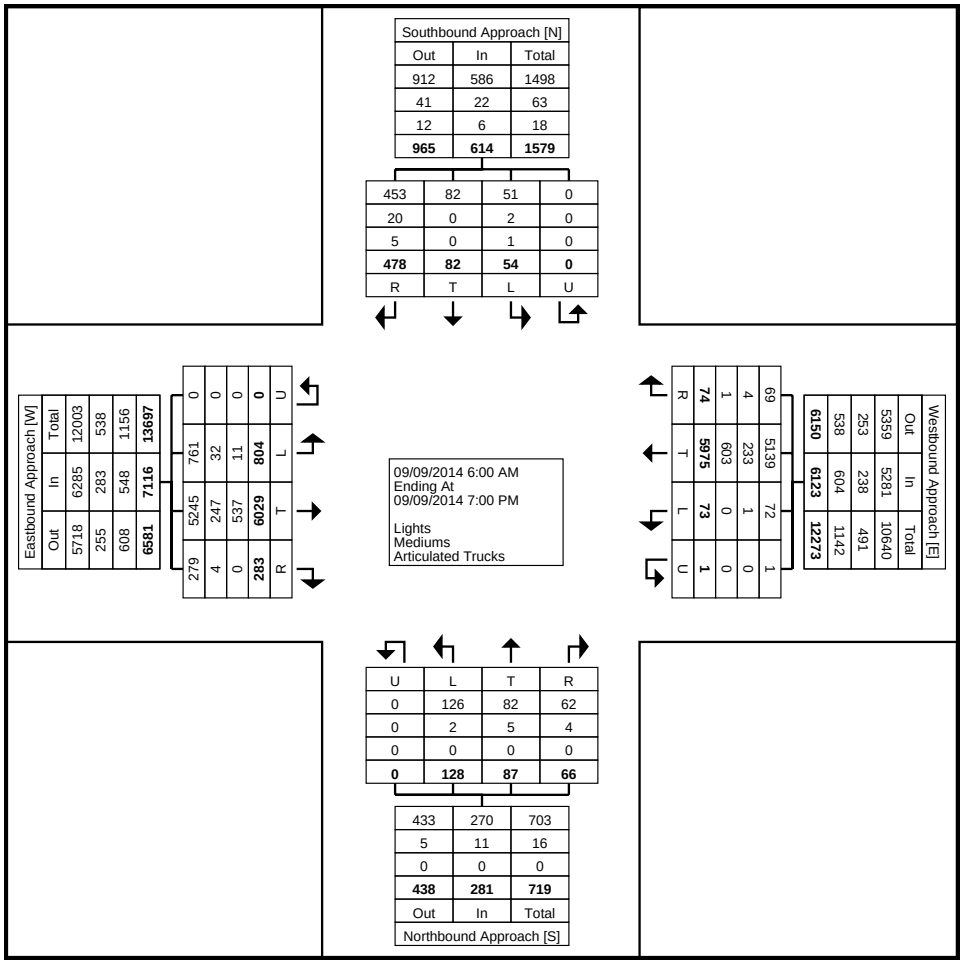

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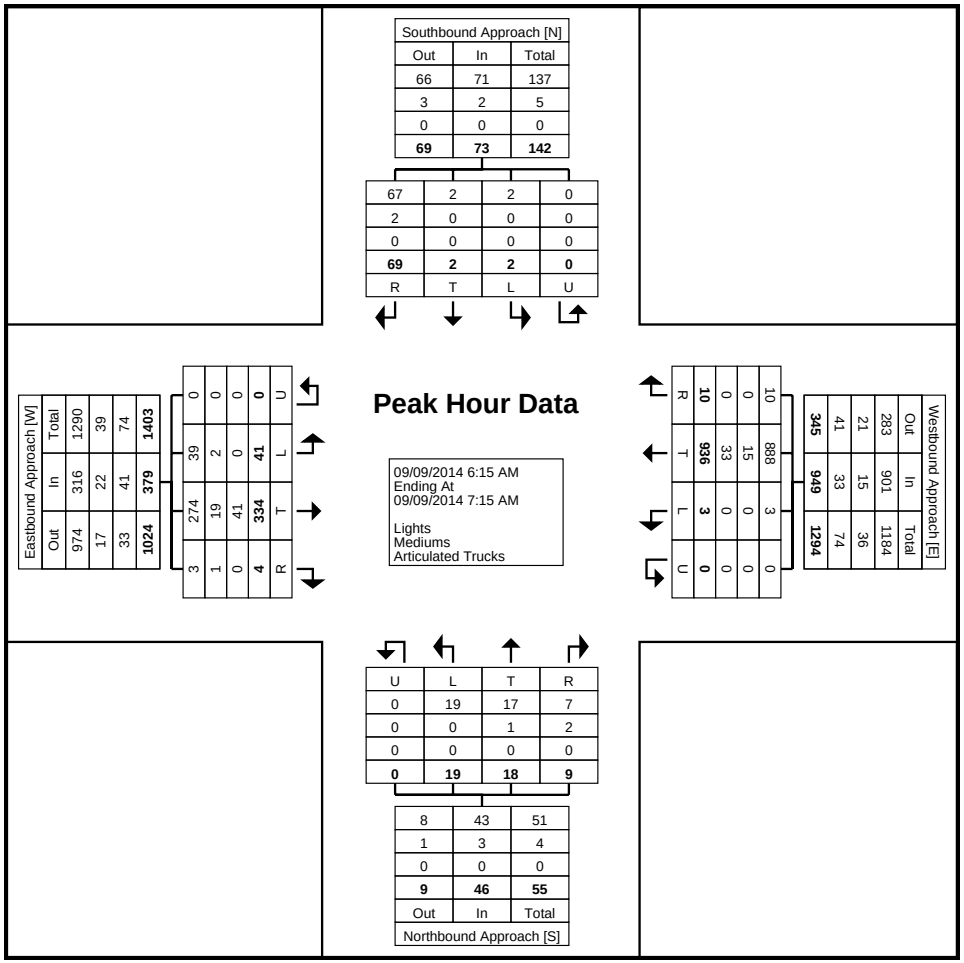
Count Name: GEA-422 @ Rapids Rd TMC
Site Code:
Start Date: 09/09/2014

Turning Movement Peak Hour Data (6:15 AM)

Start Time	Southbound Approach					Westbound Approach					Northbound Approach					Eastbound Approach					
	Southbound					Westbound					Northbound					Eastbound					
	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
6:15 AM	16	0	0	0	16	3	232	0	0	235	2	4	7	0	13	1	53	6	0	60	324
6:30 AM	20	2	2	0	24	1	260	0	0	261	1	4	4	0	9	0	62	7	0	69	363
6:45 AM	17	0	0	0	17	3	240	1	0	244	2	3	4	0	9	0	82	14	0	96	366
7:00 AM	16	0	0	0	16	3	204	2	0	209	4	7	4	0	15	3	137	14	0	154	394
Total	69	2	2	0	73	10	936	3	0	949	9	18	19	0	46	4	334	41	0	379	1447
Approach %	94.5	2.7	2.7	0.0	-	1.1	98.6	0.3	0.0	-	19.6	39.1	41.3	0.0	-	1.1	88.1	10.8	0.0	-	-
Total %	4.8	0.1	0.1	0.0	5.0	0.7	64.7	0.2	0.0	65.6	0.6	1.2	1.3	0.0	3.2	0.3	23.1	2.8	0.0	26.2	-
PHF	0.863	0.250	0.250	0.000	0.760	0.833	0.900	0.375	0.000	0.909	0.563	0.643	0.679	0.000	0.767	0.333	0.609	0.732	0.000	0.615	0.918
Lights	67	2	2	0	71	10	888	3	0	901	7	17	19	0	43	3	274	39	0	316	1331
% Lights	97.1	100.0	100.0	-	97.3	100.0	94.9	100.0	-	94.9	77.8	94.4	100.0	-	93.5	75.0	82.0	95.1	-	83.4	92.0
Mediums	2	0	0	0	2	0	15	0	0	15	2	1	0	0	3	1	19	2	0	22	42
% Mediums	2.9	0.0	0.0	-	2.7	0.0	1.6	0.0	-	1.6	22.2	5.6	0.0	-	6.5	25.0	5.7	4.9	-	5.8	2.9
Articulated Trucks	0	0	0	0	0	0	33	0	0	33	0	0	0	0	0	0	41	0	0	41	74
% Articulated Trucks	0.0	0.0	0.0	-	0.0	0.0	3.5	0.0	-	3.5	0.0	0.0	0.0	-	0.0	0.0	12.3	0.0	-	10.8	5.1

Ohio Department of Transportation
1980 West Broad Street
Mail Stop 5160
Columbus, Ohio, United States 43223
+16147528099 Stephanie.Marik@dot.state.oh.us
Office of Traffic Engineering



Turning Movement Peak Hour Data Plot (6:15 AM)

Ohio Department of Transportation
1980 West Broad Street
Mail Stop 5160
Columbus, Ohio, United States 43223
+16147528099 Stephanie.Marik@dot.state.oh.us
Office of Traffic Engineering

Count Name: GEA-422 @ Rapids Rd TMC
Site Code:
Start Date: 09/09/2014

Turning Movement Peak Hour Data (4:45 PM)

Start Time	Southbound Approach					Westbound Approach					Northbound Approach					Eastbound Approach					
	Southbound					Westbound					Northbound					Eastbound					
	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Right	Thru	Left	U-Turn	App. Total	Int. Total
4:45 PM	12	0	0	0	12	0	96	4	0	100	1	1	0	0	2	15	185	26	0	226	340
5:00 PM	14	4	1	0	19	0	115	4	0	119	3	0	4	0	7	15	196	46	0	257	402
5:15 PM	12	1	1	0	14	1	116	4	0	121	2	1	2	0	5	20	205	39	0	264	404
5:30 PM	8	1	3	0	12	2	117	2	0	121	0	1	2	0	3	12	215	34	0	261	397
Total	46	6	5	0	57	3	444	14	0	461	6	3	8	0	17	62	801	145	0	1008	1543
Approach %	80.7	10.5	8.8	0.0	-	0.7	96.3	3.0	0.0	-	35.3	17.6	47.1	0.0	-	6.2	79.5	14.4	0.0	-	-
Total %	3.0	0.4	0.3	0.0	3.7	0.2	28.8	0.9	0.0	29.9	0.4	0.2	0.5	0.0	1.1	4.0	51.9	9.4	0.0	65.3	-
PHF	0.821	0.375	0.417	0.000	0.750	0.375	0.949	0.875	0.000	0.952	0.500	0.750	0.500	0.000	0.607	0.775	0.931	0.788	0.000	0.955	0.955
Lights	44	6	5	0	55	3	395	14	0	412	5	3	8	0	16	62	763	141	0	966	1449
% Lights	95.7	100.0	100.0	-	96.5	100.0	89.0	100.0	-	89.4	83.3	100.0	100.0	-	94.1	100.0	95.3	97.2	-	95.8	93.9
Mediums	1	0	0	0	1	0	15	0	0	15	1	0	0	0	1	0	15	3	0	18	35
% Mediums	2.2	0.0	0.0	-	1.8	0.0	3.4	0.0	-	3.3	16.7	0.0	0.0	-	5.9	0.0	1.9	2.1	-	1.8	2.3
Articulated Trucks	1	0	0	0	1	0	34	0	0	34	0	0	0	0	0	0	23	1	0	24	59
% Articulated Trucks	2.2	0.0	0.0	-	1.8	0.0	7.7	0.0	-	7.4	0.0	0.0	0.0	-	0.0	0.0	2.9	0.7	-	2.4	3.8

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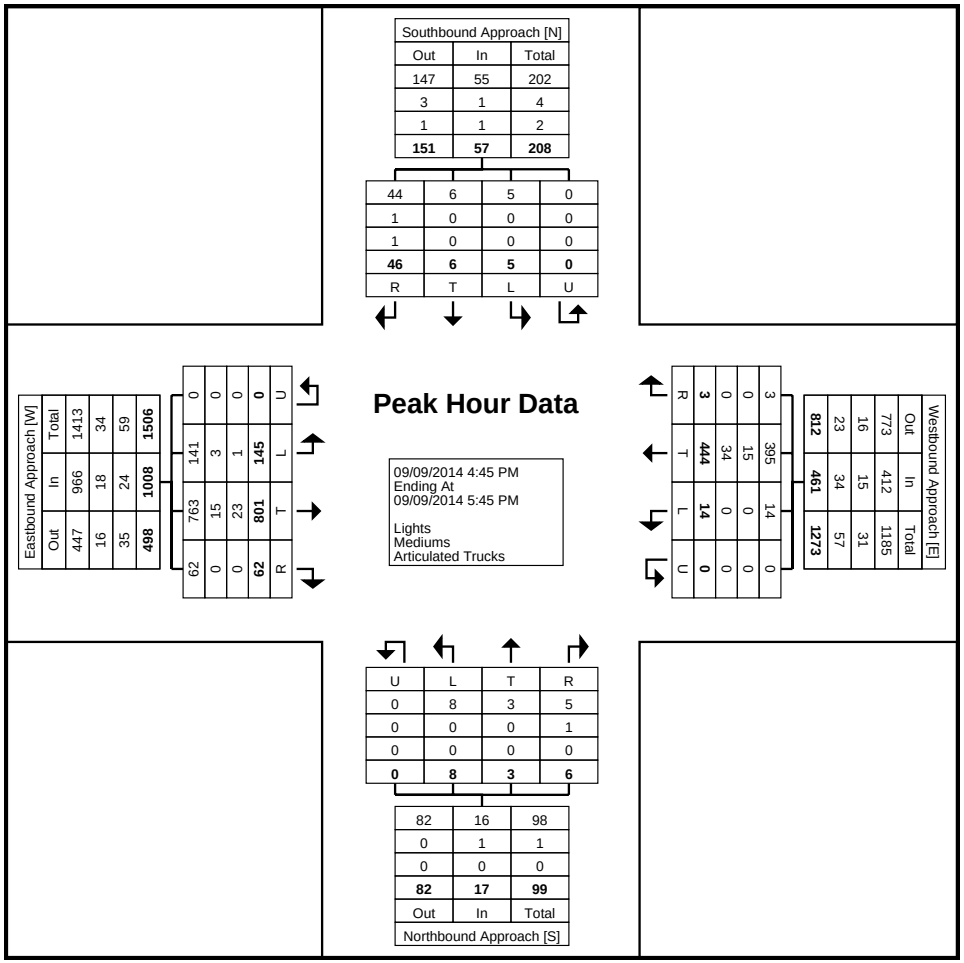

Turning Movement Peak Hour Data Plot (4:45 PM)

Ohio Department of Transportation
1980 West Broad Street
Mail Stop 5160
Columbus, Ohio, United States 43223
+16147528099 Stephanie.Marik@dot.state.oh.us
Office of Traffic Engineering

Count Name: GEA-422 @ SR-700 TMC
Site Code:
Start Date: 09/09/2014

Turning Movement Data

Start Time	Southbound Approach						Westbound Approach						Northbound Approach						Eastbound Approach						Int. Total
	Southbound						Westbound						Northbound						Eastbound						
	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	
6:00 AM	16	5	0	0	0	21	2	158	4	0	0	164	6	13	21	0	0	40	3	65	10	0	0	78	303
6:15 AM	22	8	0	0	0	30	4	188	5	0	0	197	3	10	29	0	0	42	2	34	11	0	0	47	316
6:30 AM	26	9	0	0	0	35	1	212	5	0	0	218	4	15	28	0	0	47	4	54	6	0	0	64	364
6:45 AM	30	14	0	0	0	44	2	184	2	0	0	188	3	16	23	0	0	42	7	66	18	0	0	91	365
Hourly Total	94	36	0	0	0	130	9	742	16	0	0	767	16	54	101	0	0	171	16	219	45	0	0	280	1348
7:00 AM	21	10	2	0	0	33	6	165	7	0	0	178	8	18	25	0	0	51	8	105	15	0	0	128	390
7:15 AM	20	12	3	0	0	35	4	155	5	0	0	164	13	17	21	0	0	51	8	62	18	0	0	88	338
7:30 AM	22	7	4	0	0	33	0	163	6	0	0	169	5	22	33	0	0	60	9	77	16	0	0	102	364
7:45 AM	19	18	5	0	0	42	6	130	11	0	0	147	8	18	26	0	0	52	13	48	22	0	0	83	324
Hourly Total	82	47	14	0	0	143	16	613	29	0	0	658	34	75	105	0	0	214	38	292	71	0	0	401	1416
8:00 AM	12	11	1	0	0	24	2	127	6	0	0	135	9	22	31	0	0	62	7	62	13	0	0	82	303
8:15 AM	15	10	0	0	0	25	5	131	8	0	0	144	5	19	20	0	0	44	7	60	13	0	0	80	293
8:30 AM	16	9	2	0	0	27	5	105	3	0	0	113	6	20	14	0	0	40	3	67	15	0	0	85	265
8:45 AM	20	13	1	0	0	34	1	77	3	0	0	81	3	18	8	0	0	29	10	41	10	0	0	61	205
Hourly Total	63	43	4	0	0	110	13	440	20	0	0	473	23	79	73	0	0	175	27	230	51	0	0	308	1066
9:00 AM	13	8	3	0	0	24	5	92	7	0	0	104	5	8	10	0	0	23	11	46	15	0	0	72	223
9:15 AM	9	5	1	0	0	15	4	84	0	0	0	88	0	10	6	0	0	16	9	63	9	0	0	81	200
9:30 AM	3	11	4	0	0	18	5	90	4	0	0	99	6	5	10	0	0	21	9	66	17	0	0	92	230
9:45 AM	6	7	3	0	0	16	2	53	7	0	0	62	10	13	6	0	0	29	7	54	13	0	0	74	181
Hourly Total	31	31	11	0	0	73	16	319	18	0	0	353	21	36	32	0	0	89	36	229	54	0	0	319	834
10:00 AM	10	7	4	0	0	21	1	60	4	0	0	65	1	7	4	0	0	12	16	49	8	0	0	73	171
10:15 AM	21	11	1	0	0	33	1	74	5	0	0	80	4	10	9	0	0	23	8	58	12	0	0	78	214
10:30 AM	14	6	2	0	0	22	2	69	2	0	0	73	7	10	7	0	0	24	10	75	12	0	0	97	216
10:45 AM	11	4	5	0	0	20	0	56	2	0	0	58	2	10	7	0	0	19	3	59	3	0	0	65	162
Hourly Total	56	28	12	0	0	96	4	259	13	0	0	276	14	37	27	0	0	78	37	241	35	0	0	313	763
11:00 AM	9	10	2	0	0	21	4	59	5	0	0	68	4	16	6	0	0	26	7	53	15	0	0	75	190
11:15 AM	9	14	3	0	0	26	3	61	5	0	0	69	8	6	9	0	0	23	9	72	15	0	0	96	214
11:30 AM	9	4	3	0	0	16	7	71	3	0	0	81	3	8	8	0	0	19	12	55	16	0	0	83	199
11:45 AM	12	8	4	0	0	24	4	58	4	0	0	66	4	14	4	0	0	22	5	52	14	0	0	71	183
Hourly Total	39	36	12	0	0	87	18	249	17	0	0	284	19	44	27	0	0	90	33	232	60	0	0	325	786
12:00 PM	12	11	1	0	0	24	2	89	5	0	0	96	3	10	10	0	0	23	14	73	16	0	0	103	246
12:15 PM	7	12	2	0	0	21	2	70	3	0	0	75	3	12	7	0	0	22	9	48	10	0	0	67	185
12:30 PM	12	6	2	0	0	20	4	66	3	0	0	73	8	5	11	0	0	24	9	68	19	0	0	96	213
12:45 PM	16	9	2	0	0	27	1	62	4	0	0	67	6	14	5	0	0	25	9	70	14	0	0	93	212
Hourly Total	47	38	7	0	0	92	9	287	15	0	0	311	20	41	33	0	0	94	41	259	59	0	0	359	856
1:00 PM	11	10	4	0	0	25	3	72	2	0	0	77	6	6	10	0	0	22	5	59	17	0	0	81	205

1:15 PM	11	8	3	0	0	22	3	78	3	0	0	84	3	13	7	0	0	23	12	76	12	0	0	100	229
1:30 PM	12	10	6	0	0	28	0	87	2	0	0	89	4	12	6	0	0	22	10	53	16	0	0	79	218
1:45 PM	14	13	1	0	0	28	3	87	6	0	0	96	8	16	7	0	0	31	9	71	10	0	0	90	245
Hourly Total	48	41	14	0	0	103	9	324	13	0	0	346	21	47	30	0	0	98	36	259	55	0	0	350	897
2:00 PM	16	12	4	0	0	32	2	83	2	0	0	87	6	7	15	0	0	28	11	107	15	0	0	133	280
2:15 PM	22	8	0	0	0	30	3	96	6	0	0	105	6	2	11	0	0	19	15	88	15	0	0	118	272
2:30 PM	15	12	4	0	0	31	2	86	5	0	0	93	4	18	13	0	0	35	11	104	11	0	0	126	285
2:45 PM	15	10	3	0	0	28	4	73	11	0	0	88	0	6	5	0	0	11	26	82	23	0	0	131	258
Hourly Total	68	42	11	0	0	121	11	338	24	0	0	373	16	33	44	0	0	93	63	381	64	0	0	508	1095
3:00 PM	13	11	0	0	0	24	3	61	10	0	0	74	17	10	11	0	0	38	17	148	29	0	0	194	330
3:15 PM	23	19	6	0	0	48	2	64	6	0	0	72	5	16	7	0	0	28	20	137	29	0	0	186	334
3:30 PM	18	17	3	0	0	38	4	76	7	0	0	87	7	16	10	0	0	33	14	160	15	0	0	189	347
3:45 PM	13	18	2	0	0	33	2	50	5	0	0	57	6	24	9	0	0	39	16	154	15	0	0	185	314
Hourly Total	67	65	11	0	0	143	11	251	28	0	0	290	35	66	37	0	0	138	67	599	88	0	0	754	1325
4:00 PM	18	16	5	0	0	39	4	87	7	0	0	98	7	12	11	0	0	30	19	143	21	0	0	183	350
4:15 PM	14	21	8	0	0	43	2	73	6	0	0	81	7	17	12	0	0	36	21	150	24	0	0	195	355
4:30 PM	17	16	10	0	0	43	5	62	2	0	0	69	9	16	9	0	0	34	23	166	24	0	0	213	359
4:45 PM	14	18	4	0	0	36	3	78	5	0	0	86	7	13	10	0	0	30	21	161	18	0	0	200	352
Hourly Total	63	71	27	0	0	161	14	300	20	0	0	334	30	58	42	0	0	130	84	620	87	0	0	791	1416
5:00 PM	26	22	1	0	0	49	1	89	5	0	0	95	6	12	4	0	0	22	28	165	20	0	0	213	379
5:15 PM	29	23	1	0	0	53	2	73	6	0	0	81	4	16	10	0	0	30	29	157	30	0	0	216	380
5:30 PM	23	12	4	0	0	39	3	88	4	0	0	95	4	14	10	0	0	28	27	165	22	0	0	214	376
5:45 PM	23	19	5	0	0	47	5	64	5	0	0	74	4	12	12	0	0	28	22	152	17	0	0	191	340
Hourly Total	101	76	11	0	0	188	11	314	20	0	0	345	18	54	36	0	0	108	106	639	89	0	0	834	1475
6:00 PM	12	17	2	0	0	31	4	60	0	0	0	64	6	13	15	0	0	34	24	121	22	0	0	167	296
6:15 PM	12	11	6	0	0	29	0	62	4	0	0	66	2	14	8	0	0	24	16	132	17	0	0	165	284
6:30 PM	5	7	5	0	0	17	2	54	7	0	0	63	6	11	7	0	0	24	23	88	11	0	0	122	226
6:45 PM	13	6	3	0	0	22	5	58	4	0	0	67	4	8	4	0	0	16	15	81	15	0	0	111	216
Hourly Total	42	41	16	0	0	99	11	234	15	0	0	260	18	46	34	0	0	98	78	422	65	0	0	565	1022
Grand Total	801	595	150	0	0	1546	152	4670	248	0	0	5070	285	670	621	0	0	1576	662	4622	823	0	0	6107	14299
Approach %	51.8	38.5	9.7	0.0	-	-	3.0	92.1	4.9	0.0	-	-	18.1	42.5	39.4	0.0	-	-	10.8	75.7	13.5	0.0	-	-	-
Total %	5.6	4.2	1.0	0.0	-	10.8	1.1	32.7	1.7	0.0	-	35.5	2.0	4.7	4.3	0.0	-	11.0	4.6	32.3	5.8	0.0	-	42.7	-
Lights	741	554	130	0	-	1425	134	3941	209	0	-	4284	235	618	586	0	-	1439	620	3922	745	0	-	5287	12435
% Lights	92.5	93.1	86.7	-	-	92.2	88.2	84.4	84.3	-	-	84.5	82.5	92.2	94.4	-	-	91.3	93.7	84.9	90.5	-	-	86.6	87.0
Mediums	39	29	15	0	-	83	16	165	21	0	-	202	24	31	26	0	-	81	27	164	42	0	-	233	599
% Mediums	4.9	4.9	10.0	-	-	5.4	10.5	3.5	8.5	-	-	4.0	8.4	4.6	4.2	-	-	5.1	4.1	3.5	5.1	-	-	3.8	4.2
Articulated Trucks	21	12	5	0	-	38	2	564	17	0	-	583	25	21	9	0	-	55	15	536	36	0	-	587	1263
% Articulated Trucks	2.6	2.0	3.3	-	-	2.5	1.3	12.1	6.9	-	-	11.5	8.8	3.1	1.4	-	-	3.5	2.3	11.6	4.4	-	-	9.6	8.8
Horse and Buggy	0	0	0	0	-	0	0	0	1	0	-	1	1	0	0	0	-	1	0	0	0	0	-	0	2
% Horse and Buggy	0.0	0.0	0.0	-	-	0.0	0.0	0.0	0.4	-	-	0.0	0.4	0.0	0.0	-	-	0.1	0.0	0.0	0.0	-	-	0.0	0.0
Pedestrians	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

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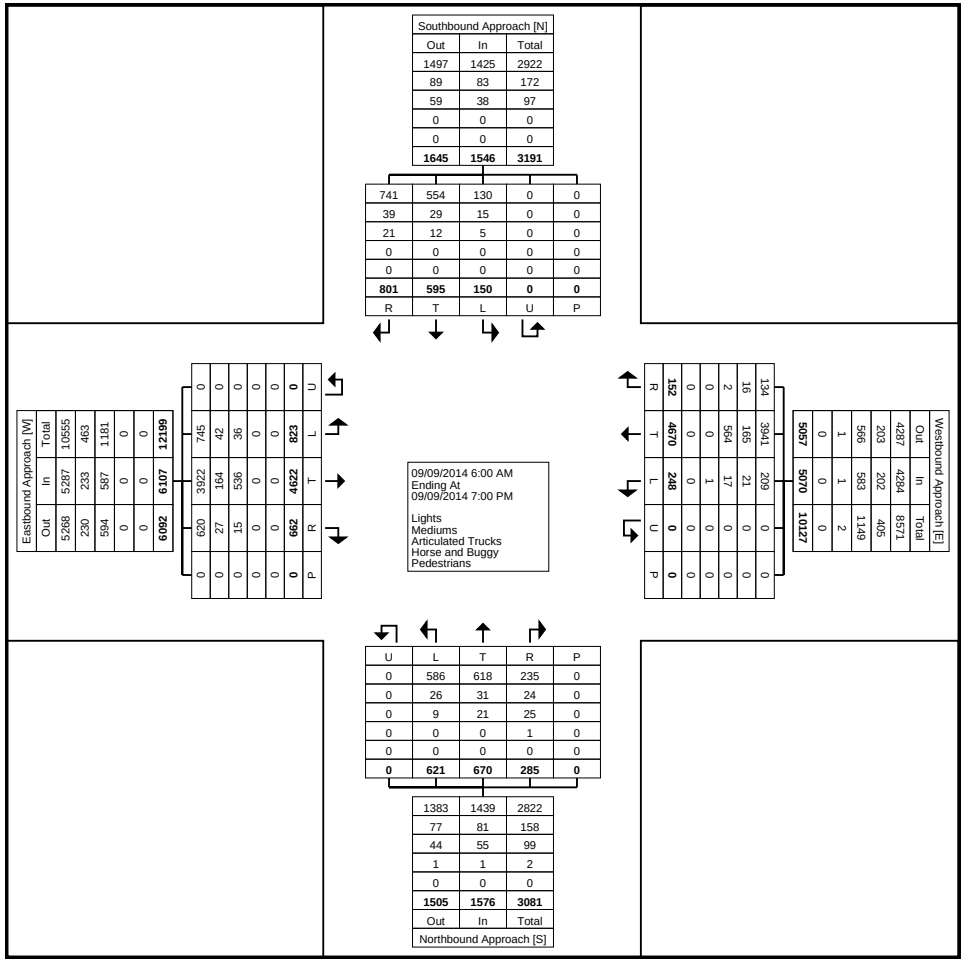
Count Name: GEA-422 @ SR-700 TMC
Site Code:
Start Date: 09/09/2014



Turning Movement Data Plot

Ohio Department of Transportation
1980 West Broad Street
Mail Stop 5160
Columbus, Ohio, United States 43223
+16147528099 Stephanie.Marik@dot.state.oh.us
Office of Traffic Engineering

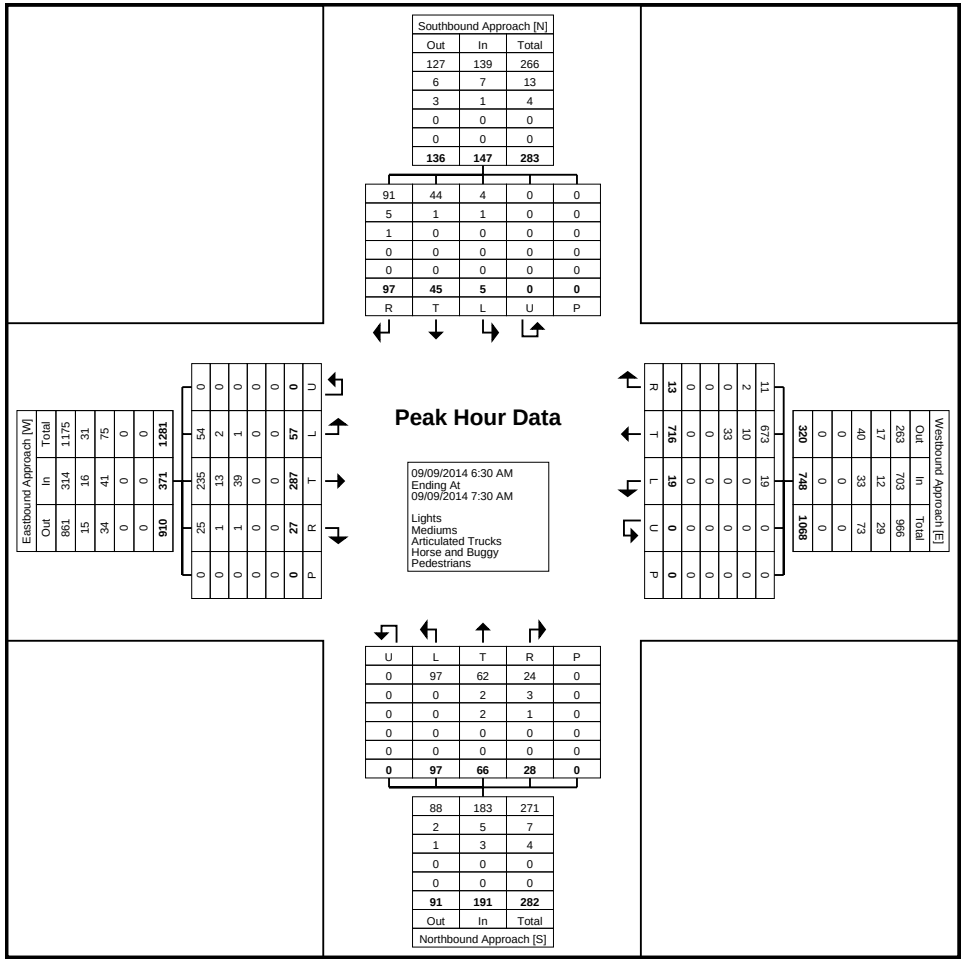
Count Name: GEA-422 @ SR-700 TMC
Site Code:
Start Date: 09/09/2014

Turning Movement Peak Hour Data (6:30 AM)

Start Time	Southbound Approach						Westbound Approach						Northbound Approach						Eastbound Approach						Int. Total
	Southbound						Westbound						Northbound						Eastbound						
	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	
6:30 AM	26	9	0	0	0	35	1	212	5	0	0	218	4	15	28	0	0	47	4	54	6	0	0	64	364
6:45 AM	30	14	0	0	0	44	2	184	2	0	0	188	3	16	23	0	0	42	7	66	18	0	0	91	365
7:00 AM	21	10	2	0	0	33	6	165	7	0	0	178	8	18	25	0	0	51	8	105	15	0	0	128	390
7:15 AM	20	12	3	0	0	35	4	155	5	0	0	164	13	17	21	0	0	51	8	62	18	0	0	88	338
Total	97	45	5	0	0	147	13	716	19	0	0	748	28	66	97	0	0	191	27	287	57	0	0	371	1457
Approach %	66.0	30.6	3.4	0.0	-	-	1.7	95.7	2.5	0.0	-	-	14.7	34.6	50.8	0.0	-	-	7.3	77.4	15.4	0.0	-	-	-
Total %	6.7	3.1	0.3	0.0	-	10.1	0.9	49.1	1.3	0.0	-	51.3	1.9	4.5	6.7	0.0	-	13.1	1.9	19.7	3.9	0.0	-	25.5	-
PHF	0.808	0.804	0.417	0.000	-	0.835	0.542	0.844	0.679	0.000	-	0.858	0.538	0.917	0.866	0.000	-	0.936	0.844	0.683	0.792	0.000	-	0.725	0.934
Lights	91	44	4	0	-	139	11	673	19	0	-	703	24	62	97	0	-	183	25	235	54	0	-	314	1339
% Lights	93.8	97.8	80.0	-	-	94.6	84.6	94.0	100.0	-	-	94.0	85.7	93.9	100.0	-	-	95.8	92.6	81.9	94.7	-	-	84.6	91.9
Mediums	5	1	1	0	-	7	2	10	0	0	-	12	3	2	0	0	-	5	1	13	2	0	-	16	40
% Mediums	5.2	2.2	20.0	-	-	4.8	15.4	1.4	0.0	-	-	1.6	10.7	3.0	0.0	-	-	2.6	3.7	4.5	3.5	-	-	4.3	2.7
Articulated Trucks	1	0	0	0	-	1	0	33	0	0	-	33	1	2	0	0	-	3	1	39	1	0	-	41	78
% Articulated Trucks	1.0	0.0	0.0	-	-	0.7	0.0	4.6	0.0	-	-	4.4	3.6	3.0	0.0	-	-	1.6	3.7	13.6	1.8	-	-	11.1	5.4
Horse and Buggy	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Horse and Buggy	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	0.0	-	-	0.0	0.0
Pedestrians	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Ohio Department of Transportation
1980 West Broad Street
Mail Stop 5160
Columbus, Ohio, United States 43223
+16147528099 Stephanie.Marik@dot.state.oh.us
Office of Traffic Engineering

Count Name: GEA-422 @ SR-700 TMC
Site Code:
Start Date: 09/09/2014



Turning Movement Peak Hour Data Plot (6:30 AM)

Ohio Department of Transportation
1980 West Broad Street
Mail Stop 5160
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Office of Traffic Engineering

Count Name: GEA-422 @ SR-700 TMC
Site Code:
Start Date: 09/09/2014

Turning Movement Peak Hour Data (4:45 PM)

Start Time	Southbound Approach						Westbound Approach						Northbound Approach						Eastbound Approach						
	Southbound						Westbound						Northbound						Eastbound						
	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Right	Thru	Left	U-Turn	Peds	App. Total	Int. Total
4:45 PM	14	18	4	0	0	36	3	78	5	0	0	86	7	13	10	0	0	30	21	161	18	0	0	200	352
5:00 PM	26	22	1	0	0	49	1	89	5	0	0	95	6	12	4	0	0	22	28	165	20	0	0	213	379
5:15 PM	29	23	1	0	0	53	2	73	6	0	0	81	4	16	10	0	0	30	29	157	30	0	0	216	380
5:30 PM	23	12	4	0	0	39	3	88	4	0	0	95	4	14	10	0	0	28	27	165	22	0	0	214	376
Total	92	75	10	0	0	177	9	328	20	0	0	357	21	55	34	0	0	110	105	648	90	0	0	843	1487
Approach %	52.0	42.4	5.6	0.0	-	-	2.5	91.9	5.6	0.0	-	-	19.1	50.0	30.9	0.0	-	-	12.5	76.9	10.7	0.0	-	-	-
Total %	6.2	5.0	0.7	0.0	-	11.9	0.6	22.1	1.3	0.0	-	24.0	1.4	3.7	2.3	0.0	-	7.4	7.1	43.6	6.1	0.0	-	56.7	-
PHF	0.793	0.815	0.625	0.000	-	0.835	0.750	0.921	0.833	0.000	-	0.939	0.750	0.859	0.850	0.000	-	0.917	0.905	0.982	0.750	0.000	-	0.976	0.978
Lights	91	74	10	0	-	175	9	284	17	0	-	310	20	52	33	0	-	105	102	618	85	0	-	805	1395
% Lights	98.9	98.7	100.0	-	-	98.9	100.0	86.6	85.0	-	-	86.8	95.2	94.5	97.1	-	-	95.5	97.1	95.4	94.4	-	-	95.5	93.8
Mediums	0	0	0	0	-	0	0	12	2	0	-	14	0	3	1	0	-	4	3	7	3	0	-	13	31
% Mediums	0.0	0.0	0.0	-	-	0.0	0.0	3.7	10.0	-	-	3.9	0.0	5.5	2.9	-	-	3.6	2.9	1.1	3.3	-	-	1.5	2.1
Articulated Trucks	1	1	0	0	-	2	0	32	1	0	-	33	1	0	0	0	-	1	0	23	2	0	-	25	61
% Articulated Trucks	1.1	1.3	0.0	-	-	1.1	0.0	9.8	5.0	-	-	9.2	4.8	0.0	0.0	-	-	0.9	0.0	3.5	2.2	-	-	3.0	4.1
Horse and Buggy	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Horse and Buggy	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	0.0	-	-	0.0	0.0
Pedestrians	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

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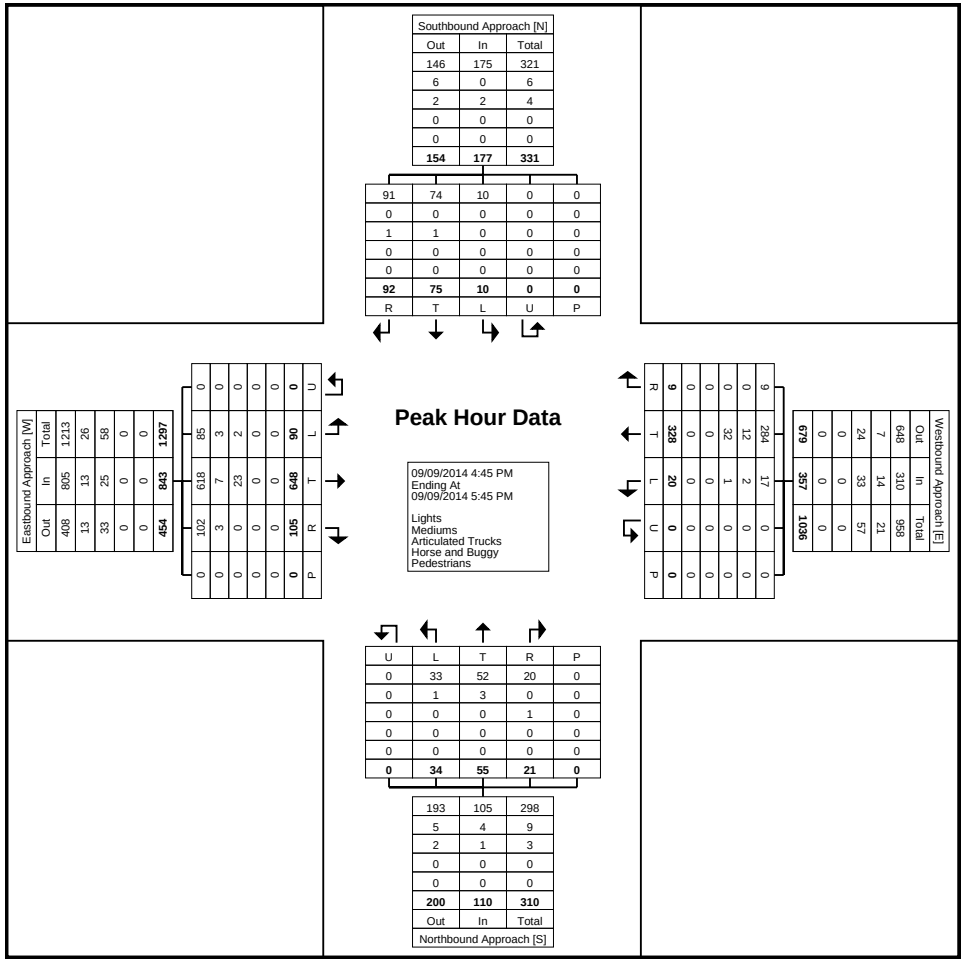


Turning Movement Peak Hour Data Plot (4:45 PM)

APPENDIX C
CLEARANCE INTERVAL CALCULATIONS

CLEARANCE INTERVALS

The National Cooperative Highway Research Program (NCHRP) Report 731: Guidelines for Timing Yellow and All-Red Intervals at Signalized Intersections was published July 2012. A number of conclusions were reached as a result of the comprehensive study that is important to the safety performance of signalized intersections.

> The Institute of Transportation Engineers (ITE) Proposed Recommended Practice for the calculation of yellow change intervals and all-red clearance intervals is the methodology used by the highest percentage of state and local agencies.

> Drivers were documented to decelerate when turning at an intersection. The NCHRP Report 731 recommended using a design speed of 20 mile per hour for the calculation of all red timing. Research conducted by the North Carolina Department of Transportation published by the ITE Journal determined that the average operating speed for left turning traffic is 17 miles per hour.

> Using the current ITE guidelines to calculate the duration of yellow change and red clearance intervals has been shown to reduce total crashes between 8 and 14 percent while reducing injury crashes by approximately 12 percent.

> Using the current ITE guidelines to calculate the duration of yellow change and red clearance intervals has been shown to reduce red light running occurrences between 36 and 50 percent.

Vehicular clearance times were calculated for each study area intersection based on guidelines published in the Ohio Manual of Uniform Traffic Control Devices and the ITE Proposed Recommended Practice. The following posted speeds were used to calculate clearance intervals for through phases:

- U.S. Hwy 422 and S.R. 70: 45 MPH
- Rapids Road: 55 MPH (unposted speed limit per Ohio Revised Code)
- Great Lakes Parkway: 25 MPH
- A 25 MPH speed was used to calculate clearance intervals for all leading left turn phases.

Calculated clearance intervals were included in the Synchro models for the proposed conditions, as described in the following section. A summary of the existing and calculated clearance intervals for the three signalized intersections is listed below in **Table C1** and the calculations are appended at the end of this section.

TABLE C1: PROPOSED CLEARANCE INTERVALS

Phase	Existing Yellow/ All Red [sec]	Existing TOTAL [sec]	Calculated Yellow/ All Red [sec]	Calculated TOTAL [sec]
US-422 and Great Lakes Pkwy				
Phase 1: WB Left	4.0 / 2.0	6.0	3.0 / 2.9	5.9
Phase 2: EB Through	4.0 / 2.0	6.0	4.3 / 1.4	5.7
Phase 6: WB Through	4.0 / 2.0	6.0	4.3 / 1.4	5.7
Phase 8: NB All	4.0 / 2.0	6.0	3.0 / 2.6	5.9
US-422 and Rapids Rd				
Phase 2: EB Through	N/A (Stop Control)		4.3 / 1.0	5.3
Phase 4: SB Through			5.0 / 1.0	6.0
Phase 5: EB Left			3.0 / 1.3	4.3
Phase 6: WB Through			4.3 / 1.0	5.3
Phase 8: NB Through			5.0 / 1.0	6.0
US-422 and SR-700				
Phase 2: EB Through	4.0 / 2.0	6.0	4.9 / 1.2	6.1
Phase 4: SB Through	4.0 / 2.0	6.0	4.8 / 1.4	6.2
Phase 5: EB Left	4.0 / 2.0	6.0	3.0 / 2.0	5.0
Phase 6: WB Through	4.0 / 2.0	6.0	4.9 / 1.2	6.1
Phase 8: NB Through	4.0 / 2.0	6.0	4.8 / 1.4	6.2

Note: The maximum all-red clearance time set at 3 seconds.
Calculated values may be longer than 3 seconds.

Recommended intervals exceed the existing timings at SR-700 on the southbound and westbound approaches. This is attributed to the approach grades at the intersection. The downward grades are approximated at -4% in the southbound direction and -5% in the westbound direction.

CLEARANCE INTERVAL CALCULATIONS

INTERSECTION: **US-422** AND **Great Lakes Parkway**
LOCATION: **ODOT District 12**
BY: **MLS**
DATE: **9/30/2014**

PEDESTRIAN CLEARANCE CALCULATIONS OMUTCD 4E.06-07	**Great Lakes Parkway Nb FDW (East XWalk)**	**Great Lakes Parkway Sb FDW (West Xwalk)**	**US-422 Eb FDW (South Xwalk)**	**US-422 Wb FDW (North Xwalk)**
Curb to Curb or Edge Line to Edge Line Distance (ft)	43	43	85	0
Walking Rate (ft/sec)*	3.5	3.5	3.5	3.5
Calculated Ped Clearance Time (sec) (includes buffer)	*12.3*	*12.3*	*24.3*	*0.0*

**4.0 ft-per-sec walk rate may be used if an extended pushbutton feature is available for slower moving pedestrians to have longer pedestrian clearance time.*

PEDESTRIAN WALK CALCULATIONS OMUTCD 4E.06-14				
Ped Detector to Curb Distance (ft) (6' if none)	10	10	10	10
Crossing Distance (ft) *(from above)*	43	43	85	0
Total Crossing Distance (ft) (Detector + Crossing)	*53*	*53*	*95*	*10*
Walking Rate (ft/sec)	3.0	3.0	3.0	3.0
Total Pedestrian Phase (sec) (Walk + Ped Clearance Time)	*17.7*	*17.7*	*31.7*	*3.3*
Minimum Walk Time (sec)**	7.0	7.0	7.0	7.0
Calculated Walk Interval (sec)	*5.4*	*5.4*	*7.4*	*3.3*
Recommended Walk Interval (sec)	**7**	**7**	**8**	**0**

***4 sec walk interval may be used if pedestrian volumes and characteristics do not require 7-second Walk.*

FLASHING DON'T WALK CALCULATION OMUTCD 4E.06-04				
Programmed Ped Change Interval (sec.) (FDW) (Ped Clear -Yellow - All-Red)	**13**	**13**	**19**	**-6**
Ped Change Interval (sec.) (FDW) (Through Yellow***)	**13**	**13**	**23**	**-2**

Note: Pedestrian calculation methods from the federal MUTCD 2009 edition.
****May not conform to OMTUCD requirements for 3 sec buffer*

YELLOW CHANGE INTERVAL	**Great Lakes Parkway**		**Great Lakes Parkway**		**US-422**		**US-422**	
	Nb	**Nb Lt**	**Sb**	**Sb Lt**	**Eb**	**Eb Lt**	**Wb**	**Wb Lt**
Signal Design Speed (mph)	25	25	45	25	45	25	45	25
Approximate Grade (%)	0	0	0	0	0	0	0	0
Calculated Yellow Int.	*2.8*	*2.8*	*4.3*	*2.8*	*4.3*	*2.8*	*4.3*	*2.8*
Yellow Interval Limit Check (sec)	*3.0*	*3.0*	*4.3*	*3.0*	*4.3*	*3.0*	*4.3*	*3.0*
Recommended Yellow Interval (sec)		**3.0**			**4.3**		**4.3**	**3.0**

Note: TCDH recommends yellow intervals lengths greater than 3 sec and no longer than 5 sec. OMUTCD recommends interval lengths between 3 - 6 sec. This table will recommend yellow intervals as calculated by the ITE Proposed Recommended Practice (1985) except where calculated intervals exceed 5 sec and extreme speed and grade conditions do not exist.

RED CLEARANCE INTERVAL	**Great Lakes Parkway**		**Great Lakes Parkway**		**US-422**		**US-422**	
	Nb	**Nb Lt**	**Sb**	**Sb Lt**	**Eb**	**Eb Lt**	**Wb**	**Wb Lt**
Signal Design Speed (mph)	25	25	45	25	45	25	45	25
Width of Intersection (ft)	0	97	0	0	91	0	83	106
Length of Vehicle (ft)	0	0	0	0	0	0	0	0
Calculated Red Int.	*0.0*	*2.6*	*0.0*	*0.0*	*1.4*	*0.0*	*1.3*	*2.9*
Red Interval Limit Check (sec)	*1.0*	*2.6*	*1.0*	*1.0*	*1.4*	*1.0*	*1.3*	*2.9*
Recommended Red Interval (sec)		**2.6**			**1.4**		**1.4**	**2.9**

Note: This table will recommend all-red intervals as calculated by the ITE Proposed Recommended Practice except where calculated intervals are greater than 3 sec. Red Clearance Interval based on (w+L)/v equation where L=0 ft.

REQUIRED SPLIT CHECK	**Nb**	**Sb**	**Eb**	**Wb**
Minimum Green time to accommodate Pedestrians (sec)	*19.3*	*19.3*	*26.6*	*-5.7*

LJB Inc.

Legend: Input Field Referenced *Calculated* **Recommended**

CLEARANCE INTERVAL CALCULATIONS

INTERSECTION: **US-422** AND **Rapids Rd**
LOCATION: **ODOT District 12**
BY: **MLS**
DATE: **9/30/2014**

PEDESTRIAN CLEARANCE CALCULATIONS OMUTCD 4E.06-07	**Rapids Rd Nb FDW (East XWalk)**	**Rapids Rd Sb FDW (West Xwalk)**	**US-422 Eb FDW (South Xwalk)**	**US-422 Wb FDW (North Xwalk)**
Curb to Curb or Edge Line to Edge Line Distance (ft)	37	39	40	41
Walking Rate (ft/sec)*	3.5	3.5	3.5	3.5
Calculated Ped Clearance Time (sec) (includes buffer)	*10.6*	*11.1*	*11.4*	*11.7*

**4.0 ft-per-sec walk rate may be used if an extended pushbutton feature is available for slower moving pedestrians to have longer pedestrian clearance time.*

PEDESTRIAN WALK CALCULATIONS OMUTCD 4E.06-14				
Ped Detector to Curb Distance (ft) (6' if none)	10	10	10	10
Crossing Distance (ft) *(from above)*	37	39	40	41
Total Crossing Distance (ft) (Detector + Crossing)	*47*	*49*	*50*	*51*
Walking Rate (ft/sec)	3.0	3.0	3.0	3.0
Total Pedestrian Phase (sec) (Walk + Ped Clearance Time)	*15.7*	*16.3*	*16.7*	*17.0*
Minimum Walk Time (sec)**	7.0	7.0	7.0	7.0
Calculated Walk Interval (sec)	*5.1*	*5.2*	*5.2*	*5.3*
Recommended Walk Interval (sec)	**7**	**7**	**7**	**7**

***4 sec walk interval may be used if pedestrian volumes and characteristics do not require 7-second Walk.*

FLASHING DON'T WALK CALCULATION OMUTCD 4E.06-04				
Programmed Ped Change Interval (sec.) (FDW) (Ped Clear -Yellow - All-Red)	**5**	**6**	**7**	**7**
Ped Change Interval (sec.) (FDW) (Through Yellow***)	**10**	**11**	**11**	**11**

Note: Pedestrian calculation methods from the federal MUTCD 2009 edition.
****May not conform to OMTUCD requirements for 3 sec buffer*

YELLOW CHANGE INTERVAL	**Rapids Rd**		**Rapids Rd**		**US-422**		**US-422**	
	Nb	**Nb Lt**	**Sb**	**Sb Lt**	**Eb**	**Eb Lt**	**Wb**	**Wb Lt**
Signal Design Speed (mph)	55	25	55	25	45	25	45	25
Approximate Grade (%)	0	0	0	0	0	0	0	0
Calculated Yellow Int.	*5.0*	*2.8*	*5.0*	*2.8*	*4.3*	*2.8*	*4.3*	*2.8*
Yellow Interval Limit Check (sec)	*5.0*	*3.0*	*5.0*	*3.0*	*4.3*	*3.0*	*4.3*	*3.0*
Recommended Yellow Interval (sec)	**5.0**	**3.0**	**5.0**	**3.0**	**4.3**	**3.0**	**4.3**	**3.0**

Note: TCDH recommends yellow intervals lengths greater than 3 sec and no longer than 5 sec. OMUTCD recommends interval lengths between 3 - 6 sec. This table will recommend yellow intervals as calculated by the ITE Proposed Recommended Practice (1985) except where calculated intervals exceed 5 sec and extreme speed and grade conditions do not exist.

RED CLEARANCE INTERVAL	**Rapids Rd**		**Rapids Rd**		**US-422**		**US-422**	
	Nb	**Nb Lt**	**Sb**	**Sb Lt**	**Eb**	**Eb Lt**	**Wb**	**Wb Lt**
Signal Design Speed (mph)	55	25	55	25	45	25	45	25
Width of Intersection (ft)	43	41	43	41	48	46	48	46
Length of Vehicle (ft)	0	0	0	0	0	0	0	0
Calculated Red Int.	*0.5*	*1.1*	*0.5*	*1.1*	*0.7*	*1.3*	*0.7*	*1.3*
Red Interval Limit Check (sec)	*1.0*	*1.1*	*1.0*	*1.1*	*1.0*	*1.3*	*1.0*	*1.3*
Recommended Red Interval (sec)	**1.0**	**1.1**	**1.0**	**1.1**	**1.0**	**1.3**	**1.0**	**1.3**

Note: This table will recommend all-red intervals as calculated by the ITE Proposed Recommended Practice except where calculated intervals are greater than 3 sec. Red Clearance Interval based on (w+L)/v equation where L=0 ft.

REQUIRED SPLIT CHECK	**Nb**	**Sb**	**Eb**	**Wb**
Minimum Green time to accommodate Pedestrians (sec)	*11.6*	*12.1*	*13.1*	*13.4*

LJB Inc.

Legend: Input Field Referenced *Calculated* **Recommended**

CLEARANCE INTERVAL CALCULATIONS

INTERSECTION: **US-422** AND **SR-700**
LOCATION: **ODOT District 12**
BY: **MLS**
DATE: **9/30/2014**

PEDESTRIAN CLEARANCE CALCULATIONS OMUTCD 4E.06-07	**SR-700 Nb FDW (East XWalk)**	**SR-700 Sb FDW (West Xwalk)**	**US-422 Eb FDW (South Xwalk)**	**US-422 Wb FDW (North Xwalk)**
Curb to Curb or Edge Line to Edge Line Distance (ft)	40	42	34	50
Walking Rate (ft/sec)*	3.5	3.5	3.5	3.5
Calculated Ped Clearance Time (sec) (includes buffer)	*11.4*	*12.0*	*9.7*	*14.3*

**4.0 ft-per-sec walk rate may be used if an extended pushbutton feature is available for slower moving pedestrians to have longer pedestrian clearance time.*

PEDESTRIAN WALK CALCULATIONS OMUTCD 4E.06-14				
Ped Detector to Curb Distance (ft) (6' if none)	10	10	10	10
Crossing Distance (ft) *(from above)*	40	42	34	50
Total Crossing Distance (ft) (Detector + Crossing)	*50*	*52*	*44*	*60*
Walking Rate (ft/sec)	3.0	3.0	3.0	3.0
Total Pedestrian Phase (sec) (Walk + Ped Clearance Time)	*16.7*	*17.3*	*14.7*	*20.0*
Minimum Walk Time (sec)**	7.0	7.0	7.0	7.0
Calculated Walk Interval (sec)	*5.2*	*5.3*	*5.0*	*5.7*
Recommended Walk Interval (sec)	**7**	**7**	**7**	**7**

***4 sec walk interval may be used if pedestrian volumes and characteristics do not require 7-second Walk.*

FLASHING DON'T WALK CALCULATION OMUTCD 4E.06-04				
Programmed Ped Change Interval (sec.) (FDW) (Ped Clear -Yellow - All-Red)	**6**	**6**	**4**	**9**
Ped Change Interval (sec.) (FDW) (Through Yellow***)	**11**	**11**	**9**	**14**

Note: Pedestrian calculation methods from the federal MUTCD 2009 edition.
****May not conform to OMTUCD requirements for 3 sec buffer*

YELLOW CHANGE INTERVAL	**SR-700**		**SR-700**		**US-422**		**US-422**	
	Nb	**Nb Lt**	**Sb**	**Sb Lt**	**Eb**	**Eb Lt**	**Wb**	**Wb Lt**
Signal Design Speed (mph)	45	25	45	25	45	25	45	25
Approximate Grade (%)	2.5	2.5	-4	-4	7	7	-5	-5
Calculated Yellow Int.	*4.1*	*2.7*	*4.8*	*3.1*	*3.7*	*2.5*	*4.9*	*3.2*
Yellow Interval Limit Check (sec)	*4.1*	*3.0*	*4.8*	*3.1*	*3.7*	*3.0*	*4.9*	*3.2*
Recommended Yellow Interval (sec)	**4.8**	**3.1**	**4.8**	**3.1**	**4.9**	**3.2**	**4.9**	**3.2**

Note: TCDH recommends yellow intervals lengths greater than 3 sec and no longer than 5 sec. OMUTCD recommends interval lengths between 3 - 6 sec. This table will recommend yellow intervals as calculated by the ITE Proposed Recommended Practice (1985) except where calculated intervals exceed 5 sec and extreme speed and grade conditions do not exist.

RED CLEARANCE INTERVAL	**SR-700**		**SR-700**		**US-422**		**US-422**	
	Nb	**Nb Lt**	**Sb**	**Sb Lt**	**Eb**	**Eb Lt**	**Wb**	**Wb Lt**
Signal Design Speed (mph)	45	25	45	25	45	25	45	25
Width of Intersection (ft)	82	80	95	84	78	66	78	75
Length of Vehicle (ft)	0	0	0	0	0	0	0	0
Calculated Red Int.	*1.2*	*2.2*	*1.4*	*2.3*	*1.2*	*1.8*	*1.2*	*2.0*
Red Interval Limit Check (sec)	*1.2*	*2.2*	*1.4*	*2.3*	*1.2*	*1.8*	*1.2*	*2.0*
Recommended Red Interval (sec)	**1.4**	**2.3**	**1.4**	**2.3**	**1.2**	**2.0**	**1.2**	**2.0**

Note: This table will recommend all-red intervals as calculated by the ITE Proposed Recommended Practice except where calculated intervals are greater than 3 sec. Red Clearance Interval based on (w+L)/v equation where L=0 ft.

REQUIRED SPLIT CHECK	**Nb**	**Sb**	**Eb**	**Wb**
Minimum Green time to accommodate Pedestrians (sec)	*12.2*	*12.8*	*10.6*	*15.2*

LJB Inc.

Legend: Input Field Referenced *Calculated* **Recommended**

APPENDIX D
CAPACITY ANALYSIS REPORTS

CAPACITY ANALYSIS

Capacity analysis was conducted for existing and Build conditions at the three study intersections. Signalized intersection analysis was performed with the assistance of Synchro traffic simulation software (version 8) with output reflective of HCS 2010 algorithms.

The following existing and build analysis scenarios were evaluated. Traffic volumes for all scenarios reflect 2014 counts. Capacity analysis results are summarized in **Table D2** with Synchro output reports appended to this section.

- **Existing Conditions – AM and PM peak hours**
  - Existing lane use
  - Existing signal timing and signal phasing
- **Build Conditions**
  - U.S. Hwy 422/Great Lakes Parkway
    - Optimized splits with an eastbound right turn overlap and calculated vehicle clearance times
  - U.S. Hwy 422/Rapids Road
    - Traffic signal control with a two-phase operation
    - Traffic signal control with a three-phase operation
    - Traffic signal control with eastbound and westbound left turn storage lanes
  - U.S. Hwy 422/S.R. 700
    - Optimized splits and calculated vehicle clearance times
    - Widen eastbound and westbound approaches to add left turn storage lanes, two phase signal operation
    - Widen eastbound and westbound approaches to add left turn storage lanes, three phase signal operation

Intersections are graded using a level of service (LOS) designation expressed in terms of letter grades. Level of service is a quality measure describing operational conditions with a traffic stream with LOS A representing the highest quality traffic flow and minimal delay, and LOS F representing poor traffic operations, significant delay, and substantial queuing. Level of service is defined in terms of vehicle delay, as published in the Highway Capacity Manual (Transportation Research Board, 2010). Levels of service thresholds for signalized intersections have been summarized in **Table D1**.

Modifications to the existing model were made to replicate the observed delay and queues at the U.S. Hwy 422 / S.R. 700 intersection as observed on site. Field observations noted high vehicular delay on and extensive eastbound queues forming during peak hours, attributed to infrequent gaps in mainline traffic. Vehicles were also observed to accelerate slowly from a stop when approaching the intersection. This is attributable to a high approach grade (7%) and heavy vehicles (4%). The following adjustments were made in synchro to reproduce these results in the capacity analysis model.

To account for eastbound left turn vehicles blocking the through and right turn movements while waiting for acceptable gaps in opposing traffic, the eastbound saturation flow rate was adjusted from

1,900 vehicles per hour to 1,450. This adjustment was applied to all models where left turn vehicles blocked through movements from entering the intersection.

To account for startup lost time, the standard value of 0 seconds was adjusted to 3 seconds for eastbound vehicles at the intersection. This adjustment was applied to all models since the approach grade is not affected by any recommended countermeasures.

TABLE D1 – LEVELS OF SERVICE THRESHOLDS FOR SIGNALIZED/UNSIGNALIZED INTERSECTIONS

Level of Service	Signalized Intersections Control Delay (sec/veh)	Unsignalized Intersections Control Delay (sec/veh)
A	≤ 10	≤ 10
B	> 10 and ≤ 20	> 10 and ≤ 15
C	> 20 and ≤ 35	> 15 and ≤ 25
D	> 35 and ≤ 55	> 25 and ≤ 35
E	> 55 and ≤ 80	> 35 and ≤ 50
F	> 80	> 50

Results indicate that under current conditions, there are capacity deficiencies at the US-422/Rapids Road intersection on the northbound and southbound approaches during the morning and afternoon peak hours. Deficiencies are also present at the US-422/SR-700 intersection during the afternoon peak hour, especially in the eastbound direction. The volume to capacity ratio of the EB approach is 1.10 during the PM peak, which is 10% over capacity.

TABLE D2: CAPACITY ANALYSIS RESULTS

	AM PEAK HOUR					PM PEAK HOUR				
	EB APPROACH	WB APPROACH	NB APPROACH	SB APPROACH	INTERSECTION	EB APPROACH	WB APPROACH	NB APPROACH	SB APPROACH	INTERSECTION
US-422 & Great Lakes Parkway										
Existing Condition	B/14.2	B/19.2	D/38.2	-	C/21.4	D/45.3	A/5.2	D/36.4	-	C/33.5
Optimized Signal	A/5.9	B/19.1	D/43.4	-	C/20.5	C/25.7	A/3.9	E/64.3	-	C/24.7
US-422 & Rapid Road										
Existing Condition (2-Way Stop)	A/1.0	A/0.1	**F/261.2**	**F/52.4**	B/13.3	A/1.4	A/0.3	**F/208.2**	**F/107.0**	A/9.7
Two-Phase Signal	A/4.2	A/7.8	C/24.1	C/25.1	A/8.1	B/14.9	A/3.2	C/33.7	D/36.6	B/12.9
Three-Phase Signal	A/3.7	B/20.0	D/35.5	D/38.0	B/16.1	B/10.6	A/6.7	D/35.5	D/38.6	B/11.2
Two-Phase Signal w/ Left Turn Storage	A/4.8	A/7.6	C/25.5	C/26.7	A/8.4	A/9.9	A/4.5	C/20.7	C/22.1	A/9.1
US-422 & SR-700 *										
Existing Condition	D/47.5	D/46.2	D/41.7	C/27.4	D/44.1	**F/289.5**	B/11.4	**F/77.7**	**F/77.2**	**F/190.9**
Optimized Signal	C/34.3	C/33.5	**E/63.9**	C/31.4	D/37.4	**F/222.9**	A/8.6	**F/356.7**	**F/189.4**	**F/183.2**
Two-Phase Signal w/ Left Turn Storage	B/13.0	C/28.8	D/49.9	C/30.0	C/27.1	D/38.7	A/5.9	D/44.1	D/48.3	C/33.3
Three-Phase Signal w/ Left Turn Storage	B/10.4	**E/61.5**	**E/79.1**	D/36.9	D/46.8	D/38.7	B/11.2	D/44.1	D/48.3	C/34.4

Note: Letter/Number - Level of Service/Average Delay per Vehicle

* Intersection was analyzed according to HCM 2000 methodology which more closely resembles the existing condition

As supported by field observation, the existing condition capacity analysis shows long delay on Rapids Road during peak hours. Analysis shows that a traffic signal will mitigate this delay. Existing conditions analysis also shows high delay at the US-422/SR-700 intersection on multiple approaches, particularly the eastbound approach. Analysis shows that the addition of eastbound and westbound left turn lanes will mitigate this delay.

US-422/Rapids Road Intersection Queue Analysis

In the existing stop controlled condition, the expected 95th percentile queue length is 290 feet for the eastbound approach. An evaluation of vehicle queue lengths was conducted for the three variations of traffic signal control described in the capacity analysis section. Introducing a stop condition on US-422 which is inherent to the traffic signal operation may increase queue lengths of US-422. Queue length results are summarized below in **Table D3**.

Table D3: 95th percentile queue length results

	AM PEAK HOUR				PM PEAK HOUR			
	EB APPROACH	WB APPROACH	NB APPROACH	SB APPROACH	EB APPROACH	WB APPROACH	NB APPROACH	SB APPROACH
US-422 & Rapids Rd								
Existing Condition (Stop Control)	115	20	50	60	290	180	60	80
Two-Phase Signal	190	210	65	75	410	210	35	100
Three-Phase Signal	165	420	75	100	445	285	40	90
Two-Phase Signal w/ Left Turn Storage	100	210	60	80	205	235	30	85

Note: Values given reflect 95th percentile queues measured in feet

Expected queue lengths are greatest during the PM peak hour when demand volumes on US-422 are the highest. With a 2-phase signal and no left turn lanes, the eastbound queue length exceeds 400 feet. While the simulation model with the leading eastbound phase indicates no significant change in the eastbound queue length compared to a 2-phase operation, experiences with similar sites suggests that the model output may be underestimating the effect of left turn blocking conditions. For this reason, a 3-phase signal operation is recommended. The addition of left turn lanes on US-422 is expected to reduce the eastbound queue length to less than the existing condition (with 2-phase operation).

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	307	52	104	905	10	98
Number	2	12	1	6	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	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	169.6	190.0	190.0	182.7	158.3	188.1
Lanes	1	1	1	1	1	1
Cap, veh/h	834	794	593	1157	341	362
Arrive On Green	0.49	0.49	0.08	0.63	0.23	0.23
Sat Flow, veh/h	1696	1615	1810	1827	1508	1599
Grp Volume(v), veh/h	345	64	204	1006	16	316
Grp Sat Flow(s),veh/h/ln	1696	1615	1810	1827	1508	1599
Q Serve(g_s), s	10.6	1.7	4.2	36.8	0.7	15.6
Cycle Q Clear(g_c), s	10.6	1.7	4.2	36.8	0.7	15.6
Prop In Lane		1.00	1.00		1.00	1.00
Lane Grp Cap(c), veh/h	834	794	593	1157	341	362
V/C Ratio(X)	0.41	0.08	0.34	0.87	0.05	0.87
Avail Cap(c_a), veh/h	1036	987	999	1786	553	586
HCM Platoon Ratio	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
Uniform Delay (d), s/veh	13.3	11.0	8.7	12.2	24.8	30.5
Incr Delay (d2), s/veh	1.5	0.2	0.3	9.0	0.1	8.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	4.3	0.6	1.6	16.3	0.3	6.9
Lane Grp Delay (d), s/veh	14.8	11.2	9.1	21.2	24.8	38.9
Lane Grp LOS	B	B	A	C	C	D
Approach Vol, veh/h	409			1210	332	
Approach Delay, s/veh	14.2			19.2	38.2	
Approach LOS	B			B	D	

Timer				
Assigned Phs	2		1	6
Phs Duration (G+Y+Rc), s	46.2		11.6	57.8
Change Period (Y+Rc), s	6.0		5.0	6.0
Max Green Setting (Gmax), s	50.0		25.0	80.0
Max Q Clear Time (g_c+I1), s	12.6		6.2	38.8
Green Ext Time (p_c), s	12.7		0.5	13.1

Intersection Summary	
HCM 2010 Ctrl Delay	21.4
HCM 2010 LOS	C

Notes

Intersection	
Intersection Delay, s/veh	13.3

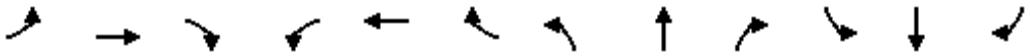
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	41	334	4	3	936	10	19	18	9	2	2	69
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	73	61	33	38	90	83	68	64	56	25	25	86
Heavy Vehicles, %	0	12	0	0	4	0	0	0	0	0	0	0
Mvmt Flow	56	548	12	8	1040	12	28	28	16	8	8	80

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	1052	0	0	560	0	0	1772	1734	554	1750	1734	1046
Stage 1	-	-	-	-	-	-	666	666	-	1062	1062	-
Stage 2	-	-	-	-	-	-	1106	1068	-	688	672	-
Follow-up Headway	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Capacity-1 Maneuver	669	-	-	1021	-	-	65	89	536	68	89	280
Stage 1	-	-	-	-	-	-	452	460	-	273	303	-
Stage 2	-	-	-	-	-	-	258	301	-	440	458	-
Time blocked-Platoon, %		-	-		-	-						
Mov Capacity-1 Maneuver	669	-	-	1021	-	-	38	77	536	43	77	280
Mov Capacity-2 Maneuver	-	-	-	-	-	-	38	77	-	43	77	-
Stage 1	-	-	-	-	-	-	397	404	-	240	297	-
Stage 2	-	-	-	-	-	-	176	295	-	349	402	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1	0.1	261.2	52.4
HCM LOS			F	F

Minor Lane / Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	64	669	-	-	1021	-	-	167
HCM Lane V/C Ratio	1.127	0.084	-	-	0.008	-	-	0.576
HCM Control Delay (s)	261.2	10.874	0	-	8.553	0	-	52.4
HCM Lane LOS	F	B	A		A	A		F
HCM 95th %tile Q(veh)	5.735	0.274	-	-	0.023	-	-	3.037

Notes
~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	57	287	27	19	716	13	97	66	28	5	45	97
Ideal Flow (vphpl)	1450	1450	1450	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		7%			-5%			2%			-4%	
Total Lost time (s)		9.0			6.0			6.0			6.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		0.99			1.00			0.97			0.91	
Flt Protected		0.99			1.00			0.98			1.00	
Satd. Flow (prot)		1161			1488			1779			1749	
Flt Permitted		0.80			0.98			0.71			0.97	
Satd. Flow (perm)		932			1455			1301			1707	
Peak-hour factor, PHF	0.79	0.68	0.84	0.68	0.84	0.54	0.87	0.90	0.54	0.42	0.80	0.81
Adj. Flow (vph)	72	422	32	28	852	24	111	73	52	12	56	120
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	526	0	0	904	0	0	236	0	0	188	0
Heavy Vehicles (%)	2%	23%	0%	1%	32%	0%	0%	0%	1%	0%	1%	1%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)		49.2			49.2			18.3			18.3	
Effective Green, g (s)		46.2			49.2			18.3			18.3	
Actuated g/C Ratio		0.58			0.62			0.23			0.23	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		541			900			299			392	
v/s Ratio Prot												
v/s Ratio Perm		0.56			c0.62			c0.18			0.11	
v/c Ratio		0.97			1.00			0.79			0.48	
Uniform Delay, d1		16.0			15.1			28.8			26.5	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		31.5			31.1			12.9			0.9	
Delay (s)		47.5			46.2			41.7			27.4	
Level of Service		D			D			D			C	
Approach Delay (s)		47.5			46.2			41.7			27.4	
Approach LOS		D			D			D			C	

Intersection Summary			
HCM 2000 Control Delay	44.1	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.99		
Actuated Cycle Length (s)	79.5	Sum of lost time (s)	15.0
Intersection Capacity Utilization	97.3%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	1011	7	5	487	73	50
Number	2	12	1	6	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	1.00	1.00	1.00
Adj Sat Flow veh/h/ln	186.3	166.7	135.7	177.6	184.5	190.0
Lanes	1	1	1	1	1	1
Cap, veh/h	1217	926	113	1303	204	188
Arrive On Green	0.65	0.65	0.01	0.73	0.12	0.12
Sat Flow, veh/h	1863	1417	1293	1776	1757	1615
Grp Volume(v), veh/h	1248	12	12	541	124	135
Grp Sat Flow(s),veh/h/ln	1863	1417	1293	1776	1757	1615
Q Serve(g_s), s	50.0	0.2	0.2	8.9	5.1	6.2
Cycle Q Clear(g_c), s	50.0	0.2	0.2	8.9	5.1	6.2
Prop In Lane		1.00	1.00		1.00	1.00
Lane Grp Cap(c), veh/h	1217	926	113	1303	204	188
V/C Ratio(X)	1.03	0.01	0.11	0.42	0.61	0.72
Avail Cap(c_a), veh/h	1217	926	516	1857	689	633
HCM Platoon Ratio	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
Uniform Delay (d), s/veh	13.3	4.6	21.3	3.9	32.2	32.6
Incr Delay (d2), s/veh	32.4	0.0	0.4	1.0	2.9	5.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile Back of Q (50%), veh/ln	28.2	0.1	0.2	2.9	2.4	2.7
Lane Grp Delay (d), s/veh	45.7	4.7	21.7	4.9	35.1	37.7
Lane Grp LOS	F	A	C	A	D	D
Approach Vol, veh/h	1260			553	259	
Approach Delay, s/veh	45.3			5.2	36.4	
Approach LOS	D			A	D	

Timer				
Assigned Phs	2		1	6
Phs Duration (G+Y+Rc), s	56.0		6.1	62.1
Change Period (Y+Rc), s	6.0		5.0	6.0
Max Green Setting (Gmax), s	50.0		25.0	80.0
Max Q Clear Time (g_c+I1), s	52.0		2.2	10.9
Green Ext Time (p_c), s	0.0		0.0	26.5

Intersection Summary	
HCM 2010 Ctrl Delay	33.5
HCM 2010 LOS	C

Notes

Intersection	
Intersection Delay, s/veh	9.7

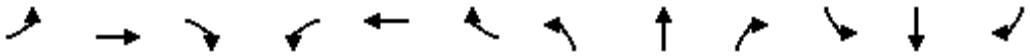
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Vol, veh/h	145	801	62	14	444	3	8	3	6	5	6	46
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	79	90	78	88	90	38	50	75	50	42	38	82
Heavy Vehicles, %	1	3	0	0	8	0	0	0	0	0	0	2
Mvmt Flow	184	890	79	16	493	8	16	4	12	12	16	56

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	501	0	0	969	0	0	1862	1830	930	1834	1866	497
Stage 1	-	-	-	-	-	-	1297	1297	-	529	529	-
Stage 2	-	-	-	-	-	-	565	533	-	1305	1337	-
Follow-up Headway	2.209	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.318
Pot Capacity-1 Maneuver	1068	-	-	719	-	-	57	77	327	59	73	573
Stage 1	-	-	-	-	-	-	201	234	-	537	530	-
Stage 2	-	-	-	-	-	-	513	528	-	199	224	-
Time blocked-Platoon, %		-	-		-	-						
Mov Capacity-1 Maneuver	1068	-	-	719	-	-	26	46	327	37	44	573
Mov Capacity-2 Maneuver	-	-	-	-	-	-	26	46	-	37	44	-
Stage 1	-	-	-	-	-	-	124	145	-	332	514	-
Stage 2	-	-	-	-	-	-	435	512	-	115	139	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	1.4	0.3	208.2	107
HCM LOS			F	F

Minor Lane / Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	43	1068	-	-	719	-	-	108
HCM Lane V/C Ratio	0.744	0.172	-	-	0.022	-	-	0.776
HCM Control Delay (s)	208.2	9.069	0	-	10.12	0	-	107
HCM Lane LOS	F	A	A		B	A		F
HCM 95th %tile Q(veh)	2.844	0.619	-	-	0.068	-	-	4.293

Notes
~ : Volume Exceeds Capacity; $: Delay Exceeds 300 Seconds; Error : Computation Not Defined



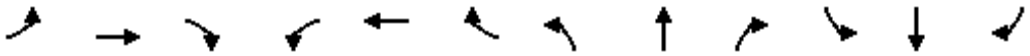
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	108	778	126	20	328	9	34	55	21	10	75	92
Ideal Flow (vphpl)	1450	1450	1450	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		7%			-5%			2%			-4%	
Total Lost time (s)		9.0			6.0			6.0			6.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		0.98			1.00			0.97			0.93	
Flt Protected		0.99			1.00			0.99			1.00	
Satd. Flow (prot)		1163			1497			1796			1779	
Flt Permitted		0.84			0.90			0.58			0.97	
Satd. Flow (perm)		981			1345			1054			1738	
Peak-hour factor, PHF	0.75	0.90	0.90	0.83	0.90	0.75	0.85	0.86	0.75	0.63	0.82	0.80
Adj. Flow (vph)	144	864	140	24	364	12	40	64	28	16	91	115
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	1148	0	0	400	0	0	132	0	0	222	0
Heavy Vehicles (%)	2%	23%	0%	1%	32%	0%	0%	0%	1%	0%	1%	1%
Turn Type	pm+pt	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases	5	2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)		110.2			98.2			23.7			23.7	
Effective Green, g (s)		107.2			98.2			23.7			23.7	
Actuated g/C Ratio		0.73			0.67			0.16			0.16	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		724			905			171			282	
v/s Ratio Prot		c0.03										
v/s Ratio Perm		c1.13			0.30			0.13			c0.13	
v/c Ratio		1.59			0.44			0.77			0.79	
Uniform Delay, d1		19.4			11.1			58.5			58.7	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		270.1			0.3			19.2			13.5	
Delay (s)		289.5			11.4			77.7			72.2	
Level of Service		F			B			E			E	
Approach Delay (s)		289.5			11.4			77.7			72.2	
Approach LOS		F			B			E			E	

Intersection Summary			
HCM 2000 Control Delay	190.9	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.46		
Actuated Cycle Length (s)	145.9	Sum of lost time (s)	18.0
Intersection Capacity Utilization	125.5%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	307	52	104	905	10	98
Number	2	12	1	6	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	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1696	1900	1900	1827	1583	1881
Adj Flow Rate, veh/h	345	64	204	1006	16	316
Adj No. of Lanes	1	1	1	1	1	1
Peak Hour Factor	0.89	0.81	0.51	0.90	0.63	0.31
Percent Heavy Veh, %	12	0	0	4	20	1
Cap, veh/h	1035	1347	611	1115	337	358
Arrive On Green	0.61	0.61	0.61	0.61	0.22	0.22
Sat Flow, veh/h	1696	1615	992	1827	1508	1599
Grp Volume(v), veh/h	345	64	204	1006	16	316
Grp Sat Flow(s),veh/h/ln	1696	1615	992	1827	1508	1599
Q Serve(g_s), s	6.9	0.5	8.8	33.1	0.6	13.2
Cycle Q Clear(g_c), s	6.9	0.5	15.7	33.1	0.6	13.2
Prop In Lane		1.00	1.00		1.00	1.00
Lane Grp Cap(c), veh/h	1035	1347	611	1115	337	358
V/C Ratio(X)	0.33	0.05	0.33	0.90	0.05	0.88
Avail Cap(c_a), veh/h	1127	1434	664	1214	381	404
HCM Platoon Ratio	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
Uniform Delay (d), s/veh	6.6	1.0	10.4	11.7	21.1	26.0
Incr Delay (d2), s/veh	0.2	0.0	0.3	9.1	0.1	18.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	3.2	0.5	2.4	19.0	0.2	7.6
LnGrp Delay(d),s/veh	6.8	1.0	10.8	20.8	21.1	44.5
LnGrp LOS	A	A	B	C	C	D
Approach Vol, veh/h	409			1210	332	
Approach Delay, s/veh	5.9			19.1	43.4	
Approach LOS	A			B	D	

Timer	1	2	3	4	5	6	7	8
Assigned Phs		2				6		8
Phs Duration (G+Y+Rc), s		48.2				48.2		21.0
Change Period (Y+Rc), s		6.0				6.0		5.5
Max Green Setting (Gmax), s		46.0				46.0		17.5
Max Q Clear Time (g_c+I1), s		8.9				35.1		15.2
Green Ext Time (p_c), s		14.5				7.2		0.3

Intersection Summary	
HCM 2010 Ctrl Delay	20.5
HCM 2010 LOS	C



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	57	287	27	19	716	13	97	66	28	5	45	97
Ideal Flow (vphpl)	1450	1450	1450	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		7%			-5%			2%			-4%	
Total Lost time (s)		9.0			6.0			6.0			6.0	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		0.99			1.00			0.97			0.91	
Flt Protected		0.99			1.00			0.98			1.00	
Satd. Flow (prot)		1161			1488			1779			1749	
Flt Permitted		0.80			0.98			0.68			0.97	
Satd. Flow (perm)		934			1455			1246			1710	
Peak-hour factor, PHF	0.79	0.68	0.84	0.68	0.84	0.54	0.87	0.90	0.54	0.42	0.80	0.81
Adj. Flow (vph)	72	422	32	28	852	24	111	73	52	12	56	120
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	526	0	0	904	0	0	236	0	0	188	0
Heavy Vehicles (%)	2%	23%	0%	1%	32%	0%	0%	0%	1%	0%	1%	1%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)		55.7			55.7			18.1			18.1	
Effective Green, g (s)		52.7			55.7			18.1			18.1	
Actuated g/C Ratio		0.61			0.65			0.21			0.21	
Clearance Time (s)		6.0			6.0			6.0			6.0	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		573			944			262			360	
v/s Ratio Prot												
v/s Ratio Perm		0.56			c0.62			c0.19			0.11	
v/c Ratio		0.92			0.96			0.90			0.52	
Uniform Delay, d1		14.6			14.0			33.0			30.0	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		19.6			19.6			30.9			1.4	
Delay (s)		34.3			33.5			63.9			31.4	
Level of Service		C			C			E			C	
Approach Delay (s)		34.3			33.5			63.9			31.4	
Approach LOS		C			C			E			C	

Intersection Summary			
HCM 2000 Control Delay	37.4	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	0.98		
Actuated Cycle Length (s)	85.8	Sum of lost time (s)	15.0
Intersection Capacity Utilization	97.3%	ICU Level of Service	F
Analysis Period (min)	15		
c Critical Lane Group			

Phase Number	2	6	8
Movement	EBT	WBTL	NBL
Lead/Lag			
Lead-Lag Optimize			
Recall Mode	Min	Min	None
Maximum Split (s)	52	52	23
Maximum Split (%)	69.3%	69.3%	30.7%
Minimum Split (s)	31	30	15.5
Yellow Time (s)	4	4	4
All-Red Time (s)	2	2	1.5
Minimum Initial (s)	6	6	6
Vehicle Extension (s)	3	3	3
Minimum Gap (s)	3	3	3
Time Before Reduce (s)	0	0	0
Time To Reduce (s)	0	0	0
Walk Time (s)			
Flash Dont Walk (s)			
Dual Entry	Yes	Yes	Yes
Inhibit Max	Yes	Yes	Yes
Start Time (s)	0	0	52
End Time (s)	52	52	0
Yield/Force Off (s)	46	46	69.5
Yield/Force Off 170(s)	46	46	69.5
Local Start Time (s)	29	29	6
Local Yield (s)	0	0	23.5
Local Yield 170(s)	0	0	23.5

Intersection Summary	
Cycle Length	75
Control Type	Actuated-Uncoordinated
Natural Cycle	75

Splits and Phases: 3: Great Lakes Pkwy & US-422

Phase Number	2	4	6	8
Movement	EBTL	SBTL	WBTL	NBTL
Lead/Lag				
Lead-Lag Optimize				
Recall Mode	Min	Min	Min	Min
Maximum Split (s)	66	24	66	24
Maximum Split (%)	73.3%	26.7%	73.3%	26.7%
Minimum Split (s)	30	15	30	15
Yellow Time (s)	4	4	4	4
All-Red Time (s)	2	2	2	2
Minimum Initial (s)	6	6	6	6
Vehicle Extension (s)	3	3	3	3
Minimum Gap (s)	3	3	3	3
Time Before Reduce (s)	0	0	0	0
Time To Reduce (s)	0	0	0	0
Walk Time (s)				
Flash Dont Walk (s)				
Dual Entry	Yes	Yes	Yes	Yes
Inhibit Max	Yes	Yes	Yes	Yes
Start Time (s)	0	66	0	66
End Time (s)	66	0	66	0
Yield/Force Off (s)	60	84	60	84
Yield/Force Off 170(s)	60	84	60	84
Local Start Time (s)	30	6	30	6
Local Yield (s)	0	24	0	24
Local Yield 170(s)	0	24	0	24

Intersection Summary	
Cycle Length	90
Control Type	Actuated-Uncoordinated
Natural Cycle	90

Splits and Phases: 9: SR-700 & US-422

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Volume (veh/h)	1011	7	5	487	73	50
Number	2	12	1	6	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	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1667	1357	1776	1845	1900
Adj Flow Rate, veh/h	1248	12	12	541	124	135
Adj No. of Lanes	1	1	1	1	1	1
Peak Hour Factor	0.81	0.58	0.42	0.90	0.59	0.37
Percent Heavy Veh, %	2	14	40	7	3	0
Cap, veh/h	1319	1145	132	1394	176	162
Arrive On Green	0.71	0.71	0.02	0.79	0.10	0.10
Sat Flow, veh/h	1863	1417	1293	1776	1757	1615
Grp Volume(v), veh/h	1248	12	12	541	124	135
Grp Sat Flow(s),veh/h/ln	1863	1417	1293	1776	1757	1615
Q Serve(g_s), s	58.4	0.2	0.2	9.3	6.7	8.1
Cycle Q Clear(g_c), s	58.4	0.2	0.2	9.3	6.7	8.1
Prop In Lane		1.00	1.00		1.00	1.00
Lane Grp Cap(c), veh/h	1319	1145	132	1394	176	162
V/C Ratio(X)	0.95	0.01	0.09	0.39	0.70	0.83
Avail Cap(c_a), veh/h	1375	1188	242	1599	176	162
HCM Platoon Ratio	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
Uniform Delay (d), s/veh	12.7	1.8	22.5	3.3	42.9	43.6
Incr Delay (d2), s/veh	13.2	0.0	0.3	0.2	11.9	29.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	34.3	0.1	0.2	4.6	3.9	4.9
LnGrp Delay(d),s/veh	26.0	1.8	22.8	3.5	54.8	72.9
LnGrp LOS	C	A	C	A	D	E
Approach Vol, veh/h	1260			553	259	
Approach Delay, s/veh	25.7			3.9	64.3	
Approach LOS	C			A	E	

Timer	1	2	3	4	5	6	7	8
Assigned Phs	1	2				6		8
Phs Duration (G+Y+Rc), s	7.6	75.6				83.1		15.5
Change Period (Y+Rc), s	5.9	* 5.7				* 5.7		5.6
Max Green Setting (Gmax), s	10.1	* 73				* 89		9.9
Max Q Clear Time (g_c+I1), s	2.2	60.4				11.3		10.1
Green Ext Time (p_c), s	0.0	9.4				27.3		0.0

Intersection Summary	
HCM 2010 Ctrl Delay	24.7
HCM 2010 LOS	C

Notes

* HCM 2010 computational engine requires equal clearance times for the phases crossing the barrier.

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	108	778	126	20	328	9	34	55	21	10	75	92
Ideal Flow (vphpl)	1450	1450	1450	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		7%			-5%			2%			-4%	
Total Lost time (s)		7.9			6.9			6.4			7.1	
Lane Util. Factor		1.00			1.00			1.00			1.00	
Frt		0.98			1.00			0.97			0.93	
Flt Protected		0.99			1.00			0.99			1.00	
Satd. Flow (prot)		1163			1497			1796			1779	
Flt Permitted		0.86			0.89			0.40			0.94	
Satd. Flow (perm)		1007			1343			734			1673	
Peak-hour factor, PHF	0.75	0.90	0.90	0.83	0.90	0.75	0.85	0.86	0.75	0.63	0.82	0.80
Adj. Flow (vph)	144	864	140	24	364	12	40	64	28	16	91	115
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	0	1148	0	0	400	0	0	132	0	0	222	0
Heavy Vehicles (%)	2%	23%	0%	1%	32%	0%	0%	0%	1%	0%	1%	1%
Turn Type	pm+pt	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases	5	2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)		121.1			108.1			17.6			16.9	
Effective Green, g (s)		118.1			108.1			17.6			16.9	
Actuated g/C Ratio		0.79			0.72			0.12			0.11	
Clearance Time (s)		4.9			6.9			6.4			7.1	
Vehicle Extension (s)		3.0			3.0			3.0			3.0	
Lane Grp Cap (vph)		795			967			86			188	
v/s Ratio Prot		c0.03										
v/s Ratio Perm		c1.11			0.30			c0.18			0.13	
v/c Ratio		1.44			0.41			1.53			1.18	
Uniform Delay, d1		16.0			8.3			66.2			66.5	
Progression Factor		1.00			1.00			1.00			1.00	
Incremental Delay, d2		206.9			0.3			290.5			122.8	
Delay (s)		222.9			8.6			356.7			189.4	
Level of Service		F			A			F			F	
Approach Delay (s)		222.9			8.6			356.7			189.4	
Approach LOS		F			A			F			F	

Intersection Summary			
HCM 2000 Control Delay	183.2	HCM 2000 Level of Service	F
HCM 2000 Volume to Capacity ratio	1.50		
Actuated Cycle Length (s)	150.0	Sum of lost time (s)	19.0
Intersection Capacity Utilization	125.7%	ICU Level of Service	H
Analysis Period (min)	15		
c Critical Lane Group			

Phase Number	1	2	6	8
Movement	WBL	EBT	WBTL	NBL
Lead/Lag	Lead	Lag		
Lead-Lag Optimize				
Recall Mode	None	Min	Min	None
Maximum Split (s)	16	78.5	94.5	15.5
Maximum Split (%)	14.5%	71.4%	85.9%	14.1%
Minimum Split (s)	16	31	30	15.5
Yellow Time (s)	3	4.3	4.3	3
All-Red Time (s)	2.9	1.4	1.4	2.6
Minimum Initial (s)	6	6	6	6
Vehicle Extension (s)	3	3	3	3
Minimum Gap (s)	3	3	3	3
Time Before Reduce (s)	0	0	0	0
Time To Reduce (s)	0	0	0	0
Walk Time (s)				
Flash Dont Walk (s)				
Dual Entry	No	Yes	Yes	Yes
Inhibit Max	Yes	Yes	Yes	Yes
Start Time (s)	0	16	0	94.5
End Time (s)	16	94.5	94.5	0
Yield/Force Off (s)	10.1	88.8	88.8	104.4
Yield/Force Off 170(s)	10.1	88.8	88.8	104.4
Local Start Time (s)	21.2	37.2	21.2	5.7
Local Yield (s)	31.3	0	0	15.6
Local Yield 170(s)	31.3	0	0	15.6

Intersection Summary	
Cycle Length	110
Control Type	Actuated-Uncoordinated
Natural Cycle	110

Splits and Phases: 3: Great Lakes Pkwy & US-422

Phase Number	2	4	5	6	8
Movement	EBTL	SBTL	EBL	WBTL	NBTL
Lead/Lag			Lead	Lag	
Lead-Lag Optimize					
Recall Mode	Min	None	Min	Min	None
Maximum Split (s)	126	24	12	114	24
Maximum Split (%)	84.0%	16.0%	8.0%	76.0%	16.0%
Minimum Split (s)	30	13.1	11	30	12.4
Yellow Time (s)	3.7	4.8	3	4.9	4.1
All-Red Time (s)	1.2	2.3	2	2	2.3
Minimum Initial (s)	6	6	6	6	6
Vehicle Extension (s)	3	3	3	3	3
Minimum Gap (s)	3	3	3	3	3
Time Before Reduce (s)	0	0	0	0	0
Time To Reduce (s)	0	0	0	0	0
Walk Time (s)					
Flash Dont Walk (s)					
Dual Entry	Yes	Yes	No	Yes	Yes
Inhibit Max	Yes	Yes	Yes	Yes	Yes
Start Time (s)	0	126	0	12	126
End Time (s)	126	0	12	126	0
Yield/Force Off (s)	121.1	142.9	7	119.1	143.6
Yield/Force Off 170(s)	121.1	142.9	7	119.1	143.6
Local Start Time (s)	30.9	6.9	30.9	42.9	6.9
Local Yield (s)	2	23.8	37.9	0	24.5
Local Yield 170(s)	2	23.8	37.9	0	24.5

Intersection Summary	
Cycle Length	150
Control Type	Actuated-Uncoordinated
Natural Cycle	150

Splits and Phases: 9: SR-700 & US-422

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	41	334	4	3	936	10	19	18	9	2	2	69
Number	5	2	12	1	6	16	3	8	18	7	4	14
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		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	190.0	171.7	190.0	190.0	182.8	190.0	190.0	190.0	190.0	190.0	190.0	190.0
Lanes	0	1	0	0	1	0	0	1	0	0	1	0
Cap, veh/h	124	997	21	68	1263	14	140	85	39	78	20	136
Arrive On Green	0.70	0.70	0.70	0.70	0.70	0.70	0.10	0.10	0.10	0.10	0.10	0.10
Sat Flow, veh/h	76	1418	30	4	1796	21	505	848	387	76	196	1360
Grp Volume(v), veh/h	616	0	0	1060	0	0	72	0	0	96	0	0
Grp Sat Flow(s),veh/h/ln	1524	0	0	1820	0	0	1740	0	0	1632	0	0
Q Serve(g_s), s	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	0.0	0.0
Cycle Q Clear(g_c), s	9.3	0.0	0.0	22.9	0.0	0.0	2.0	0.0	0.0	3.1	0.0	0.0
Prop In Lane	0.09		0.02	0.01		0.01	0.39		0.22	0.08		0.83
Lane Grp Cap(c), veh/h	1141	0	0	1345	0	0	263	0	0	233	0	0
V/C Ratio(X)	0.54	0.00	0.00	0.79	0.00	0.00	0.27	0.00	0.00	0.41	0.00	0.00
Avail Cap(c_a), veh/h	1448	0	0	1742	0	0	321	0	0	292	0	0
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	0.00	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	3.8	0.0	0.0	5.9	0.0	0.0	23.5	0.0	0.0	24.0	0.0	0.0
Incr Delay (d2), s/veh	0.4	0.0	0.0	1.9	0.0	0.0	0.6	0.0	0.0	1.2	0.0	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 Back of Q (50%), veh/ln	2.2	0.0	0.0	6.3	0.0	0.0	0.9	0.0	0.0	1.2	0.0	0.0
Lane Grp Delay (d), s/veh	4.2	0.0	0.0	7.8	0.0	0.0	24.1	0.0	0.0	25.1	0.0	0.0
Lane Grp LOS	A			A			C			C		
Approach Vol, veh/h		616			1060			72			96	
Approach Delay, s/veh		4.2			7.8			24.1			25.1	
Approach LOS		A			A			C			C	

Timer												
Assigned Phs		2			6			8			4	
Phs Duration (G+Y+Rc), s		44.8			44.8			11.0			11.0	
Change Period (Y+Rc), s		5.6			5.6			5.4			5.4	
Max Green Setting (Gmax), s		51.4			51.4			7.6			7.6	
Max Q Clear Time (g_c+I1), s		11.3			24.9			4.0			5.1	
Green Ext Time (p_c), s		17.3			14.2			0.2			0.2	

Intersection Summary												
HCM 2010 Ctrl Delay			8.1									
HCM 2010 LOS			A									

Notes

Phase Number	2	4	6	8
Movement	EBTL	SBTL	WBTL	NBTL
Lead/Lag				
Lead-Lag Optimize				
Recall Mode	Min	None	Min	None
Maximum Split (s)	57	13	57	13
Maximum Split (%)	81.4%	18.6%	81.4%	18.6%
Minimum Split (s)	30	11.4	30	11.4
Yellow Time (s)	4.3	4.3	4.3	4.3
All-Red Time (s)	1.3	1.1	1.3	1.1
Minimum Initial (s)	6	6	6	6
Vehicle Extension (s)	3	3	3	3
Minimum Gap (s)	3	3	3	3
Time Before Reduce (s)	0	0	0	0
Time To Reduce (s)	0	0	0	0
Walk Time (s)				
Flash Dont Walk (s)				
Dual Entry	Yes	Yes	Yes	Yes
Inhibit Max	Yes	Yes	Yes	Yes
Start Time (s)	0	57	0	57
End Time (s)	57	0	57	0
Yield/Force Off (s)	51.4	64.6	51.4	64.6
Yield/Force Off 170(s)	51.4	64.6	51.4	64.6
Local Start Time (s)	18.6	5.6	18.6	5.6
Local Yield (s)	0	13.2	0	13.2
Local Yield 170(s)	0	13.2	0	13.2

Intersection Summary	
Cycle Length	70
Control Type	Actuated-Uncoordinated
Natural Cycle	60

Splits and Phases: 2: Rapids Rd & US-422

Intersection: 2: Rapids Rd & US-422

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	232	234	68	78
Average Queue (ft)	89	119	28	39
95th Queue (ft)	192	208	64	77
Link Distance (ft)	2241	7768	1454	1274
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	41	334	4	3	936	10	19	18	9	2	2	69
Number	5	2	12	1	6	16	3	8	18	7	4	14
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		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	190.0	171.7	190.0	190.0	182.8	190.0	190.0	190.0	190.0	190.0	190.0	190.0
Lanes	0	1	0	0	1	0	0	1	0	0	1	0
Cap, veh/h	104	916	19	49	1134	13	102	60	28	56	15	107
Arrive On Green	0.78	0.78	0.78	0.63	0.63	0.63	0.08	0.08	0.08	0.08	0.08	0.08
Sat Flow, veh/h	68	1172	25	4	1795	21	490	776	362	81	197	1387
Grp Volume(v), veh/h	616	0	0	1060	0	0	72	0	0	96	0	0
Grp Sat Flow(s),veh/h/ln	1265	0	0	1820	0	0	1628	0	0	1665	0	0
Q Serve(g_s), s	6.0	0.0	0.0	4.9	0.0	0.0	0.0	0.0	0.0	1.1	0.0	0.0
Cycle Q Clear(g_c), s	9.6	0.0	0.0	39.8	0.0	0.0	3.2	0.0	0.0	4.3	0.0	0.0
Prop In Lane	0.09		0.02	0.01		0.01	0.39		0.22	0.08		0.83
Lane Grp Cap(c), veh/h	1040	0	0	1196	0	0	190	0	0	179	0	0
V/C Ratio(X)	0.59	0.00	0.00	0.89	0.00	0.00	0.38	0.00	0.00	0.54	0.00	0.00
Avail Cap(c_a), veh/h	1083	0	0	1256	0	0	190	0	0	179	0	0
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	0.00	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	2.9	0.0	0.0	12.6	0.0	0.0	34.5	0.0	0.0	35.1	0.0	0.0
Incr Delay (d2), s/veh	0.8	0.0	0.0	7.7	0.0	0.0	1.2	0.0	0.0	3.1	0.0	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 Back of Q (50%), veh/ln	2.3	0.0	0.0	16.4	0.0	0.0	1.4	0.0	0.0	1.9	0.0	0.0
Lane Grp Delay (d), s/veh	3.7	0.0	0.0	20.3	0.0	0.0	35.7	0.0	0.0	38.2	0.0	0.0
Lane Grp LOS	A			C			D			D		
Approach Vol, veh/h		616			1060			72			96	
Approach Delay, s/veh		3.7			20.3			35.7			38.2	
Approach LOS		A			C			D			D	

Timer												
Assigned Phs	5	2			6			8			4	
Phs Duration (G+Y+Rc), s	11.6	66.2			54.6			11.4			11.4	
Change Period (Y+Rc), s	5.6	5.6			5.6			5.4			5.4	
Max Green Setting (Gmax), s	6.0	63.0			51.6			6.0			6.0	
Max Q Clear Time (g_c+I1), s	0.0	11.6			41.8			5.2			6.3	
Green Ext Time (p_c), s	0.0	20.1			7.3			0.1			0.0	

Intersection Summary			
HCM 2010 Ctrl Delay		16.3	
HCM 2010 LOS		B	

Notes

Phase Number	2	4	5	6	8
Movement	EBTL	SBTL	EBL	WBTL	NBTL
Lead/Lag			Lead	Lag	
Lead-Lag Optimize					
Recall Mode	Min	None	Min	Min	None
Maximum Split (s)	68.6	11.4	11.6	57.2	11.4
Maximum Split (%)	85.5%	14.2%	14.5%	71.3%	14.2%
Minimum Split (s)	30	11.4	11.6	30	11.4
Yellow Time (s)	4.3	4.3	4.3	4.3	4.3
All-Red Time (s)	1.3	1.1	1.3	1.3	1.1
Minimum Initial (s)	6	6	6	6	6
Vehicle Extension (s)	3	3	3	3	3
Minimum Gap (s)	3	3	3	3	3
Time Before Reduce (s)	0	0	0	0	0
Time To Reduce (s)	0	0	0	0	0
Walk Time (s)					
Flash Dont Walk (s)					
Dual Entry	Yes	Yes	No	Yes	Yes
Inhibit Max	Yes	Yes	Yes	Yes	Yes
Start Time (s)	0	68.8	0	11.6	68.8
End Time (s)	68.8	0	11.6	68.8	0
Yield/Force Off (s)	63.2	74.8	6	63.2	74.8
Yield/Force Off 170(s)	63.2	74.8	6	63.2	74.8
Local Start Time (s)	17	5.6	17	28.6	5.6
Local Yield (s)	0	11.6	23	0	11.6
Local Yield 170(s)	0	11.6	23	0	11.6

Intersection Summary	
Cycle Length	80.2
Control Type	Actuated-Uncoordinated
Natural Cycle	80

Splits and Phases: 2: Rapids Rd & US-422

Intersection: 2: Rapids Rd & US-422

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	217	458	78	97
Average Queue (ft)	67	242	34	52
95th Queue (ft)	164	419	74	97
Link Distance (ft)	2241	7768	1454	1274
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	41	334	4	3	936	10	19	18	9	2	2	69
Number	5	2	12	1	6	16	3	8	18	7	4	14
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		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	190.0	170.0	190.0	190.0	182.8	190.0	190.0	190.0	190.0	190.0	190.0	190.0
Lanes	1	1	0	0	1	0	0	1	0	0	1	0
Cap, veh/h	299	1188	26	64	1287	15	134	81	37	74	19	130
Arrive On Green	0.72	0.72	0.72	0.72	0.72	0.72	0.10	0.10	0.10	0.10	0.10	0.10
Sat Flow, veh/h	545	1658	36	4	1796	21	513	847	389	76	195	1360
Grp Volume(v), veh/h	56	0	560	1060	0	0	72	0	0	96	0	0
Grp Sat Flow(s),veh/h/ln	545	0	1694	1820	0	0	1749	0	0	1632	0	0
Q Serve(g_s), s	4.5	0.0	8.2	0.0	0.0	0.0	0.0	0.0	0.0	0.9	0.0	0.0
Cycle Q Clear(g_c), s	27.6	0.0	8.2	23.0	0.0	0.0	2.1	0.0	0.0	3.3	0.0	0.0
Prop In Lane	1.00		0.02	0.01		0.01	0.39		0.22	0.08		0.83
Lane Grp Cap(c), veh/h	299	0	1214	1366	0	0	253	0	0	223	0	0
V/C Ratio(X)	0.19	0.00	0.46	0.78	0.00	0.00	0.28	0.00	0.00	0.43	0.00	0.00
Avail Cap(c_a), veh/h	387	0	1486	1657	0	0	306	0	0	278	0	0
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	0.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	14.9	0.0	3.5	5.6	0.0	0.0	24.9	0.0	0.0	25.4	0.0	0.0
Incr Delay (d2), s/veh	0.3	0.0	0.3	1.9	0.0	0.0	0.6	0.0	0.0	1.3	0.0	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 Back of Q (50%), veh/ln	0.6	0.0	1.8	6.3	0.0	0.0	0.9	0.0	0.0	1.3	0.0	0.0
Lane Grp Delay (d), s/veh	15.2	0.0	3.8	7.6	0.0	0.0	25.5	0.0	0.0	26.7	0.0	0.0
Lane Grp LOS	B		A	A			C			C		
Approach Vol, veh/h		616			1060			72			96	
Approach Delay, s/veh		4.8			7.6			25.5			26.7	
Approach LOS		A			A			C			C	

Timer												
Assigned Phs		2			6			8			4	
Phs Duration (G+Y+Rc), s		47.6			47.6			11.0			11.0	
Change Period (Y+Rc), s		5.6			5.6			5.4			5.4	
Max Green Setting (Gmax), s		51.4			51.4			7.6			7.6	
Max Q Clear Time (g_c+I1), s		29.6			25.0			4.1			5.3	
Green Ext Time (p_c), s		12.4			13.8			0.2			0.2	

Intersection Summary												
HCM 2010 Ctrl Delay			8.4									
HCM 2010 LOS			A									

Notes

Phase Number	2	4	6	8
Movement	EBTL	SBTL	WBTL	NBTL
Lead/Lag				
Lead-Lag Optimize				
Recall Mode	Min	None	Min	None
Maximum Split (s)	57	13	57	13
Maximum Split (%)	81.4%	18.6%	81.4%	18.6%
Minimum Split (s)	30	11.4	30	11.4
Yellow Time (s)	4.3	4.3	4.3	4.3
All-Red Time (s)	1.3	1.1	1.3	1.1
Minimum Initial (s)	6	6	6	6
Vehicle Extension (s)	3	3	3	3
Minimum Gap (s)	3	3	3	3
Time Before Reduce (s)	0	0	0	0
Time To Reduce (s)	0	0	0	0
Walk Time (s)				
Flash Dont Walk (s)				
Dual Entry	Yes	Yes	Yes	Yes
Inhibit Max	Yes	Yes	Yes	Yes
Start Time (s)	0	57	0	57
End Time (s)	57	0	57	0
Yield/Force Off (s)	51.4	64.6	51.4	64.6
Yield/Force Off 170(s)	51.4	64.6	51.4	64.6
Local Start Time (s)	18.6	5.6	18.6	5.6
Local Yield (s)	0	13.2	0	13.2
Local Yield 170(s)	0	13.2	0	13.2

Intersection Summary	
Cycle Length	70
Control Type	Actuated-Uncoordinated
Natural Cycle	60

Splits and Phases: 2: Rapids Rd & US-422

Intersection: 2: Rapids Rd & US-422

Movement	EB	EB	WB	NB	SB
Directions Served	L	TR	LTR	LTR	LTR
Maximum Queue (ft)	65	96	222	60	87
Average Queue (ft)	27	41	124	26	38
95th Queue (ft)	60	97	209	58	77
Link Distance (ft)		2241	7768	1448	1268
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)	245				
Storage Blk Time (%)					
Queuing Penalty (veh)					

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	145	801	62	14	444	3	8	3	6	5	6	46
Number	5	2	12	1	6	16	3	8	18	7	4	14
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		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	190.0	185.4	190.0	190.0	176.5	190.0	190.0	190.0	190.0	190.0	187.5	190.0
Lanes	0	1	0	0	1	0	0	1	0	0	1	0
Cap, veh/h	232	987	86	64	1311	21	114	34	46	65	28	78
Arrive On Green	0.78	0.78	0.78	0.78	0.78	0.78	0.07	0.07	0.07	0.07	0.07	0.07
Sat Flow, veh/h	226	1261	109	20	1675	27	598	464	638	154	390	1087
Grp Volume(v), veh/h	1153	0	0	517	0	0	32	0	0	84	0	0
Grp Sat Flow(s),veh/h/ln	1596	0	0	1721	0	0	1700	0	0	1631	0	0
Q Serve(g_s), s	34.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0
Cycle Q Clear(g_c), s	41.7	0.0	0.0	6.9	0.0	0.0	1.3	0.0	0.0	3.8	0.0	0.0
Prop In Lane	0.16		0.07	0.03		0.02	0.50		0.37	0.14		0.67
Lane Grp Cap(c), veh/h	1304	0	0	1397	0	0	194	0	0	172	0	0
V/C Ratio(X)	0.88	0.00	0.00	0.37	0.00	0.00	0.17	0.00	0.00	0.49	0.00	0.00
Avail Cap(c_a), veh/h	1583	0	0	1690	0	0	204	0	0	183	0	0
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	0.00	0.94	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	5.9	0.0	0.0	2.5	0.0	0.0	33.3	0.0	0.0	34.4	0.0	0.0
Incr Delay (d2), s/veh	9.0	0.0	0.0	0.7	0.0	0.0	0.4	0.0	0.0	2.1	0.0	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 Back of Q (50%), veh/ln	11.3	0.0	0.0	1.9	0.0	0.0	0.6	0.0	0.0	1.6	0.0	0.0
Lane Grp Delay (d), s/veh	14.9	0.0	0.0	3.2	0.0	0.0	33.7	0.0	0.0	36.6	0.0	0.0
Lane Grp LOS	B			A			C			D		
Approach Vol, veh/h		1153			517			32			84	
Approach Delay, s/veh		14.9			3.2			33.7			36.6	
Approach LOS		B			A			C			D	

Timer												
Assigned Phs		2			6			8			4	
Phs Duration (G+Y+Rc), s		65.1			65.1			10.9			10.9	
Change Period (Y+Rc), s		5.6			5.6			5.4			5.4	
Max Green Setting (Gmax), s		73.0			73.0			6.0			6.0	
Max Q Clear Time (g_c+I1), s		43.7			8.9			3.3			5.8	
Green Ext Time (p_c), s		15.8			21.6			0.1			0.0	

Intersection Summary												
HCM 2010 Ctrl Delay			12.9									
HCM 2010 LOS			B									

Notes

Phase Number	2	4	6	8
Movement	EBTL	SBTL	WBTL	NBTL
Lead/Lag				
Lead-Lag Optimize				
Recall Mode	C-Min	None	C-Min	None
Maximum Split (s)	78.6	11.4	78.6	11.4
Maximum Split (%)	87.3%	12.7%	87.3%	12.7%
Minimum Split (s)	30	11.4	30	11.4
Yellow Time (s)	4.3	4.3	4.3	4.3
All-Red Time (s)	1.3	1.1	1.3	1.1
Minimum Initial (s)	6	6	6	6
Vehicle Extension (s)	3	3	3	3
Minimum Gap (s)	3	3	3	3
Time Before Reduce (s)	0	0	0	0
Time To Reduce (s)	0	0	0	0
Walk Time (s)				
Flash Dont Walk (s)				
Dual Entry	Yes	Yes	Yes	Yes
Inhibit Max	Yes	Yes	Yes	Yes
Start Time (s)	17	5.6	17	5.6
End Time (s)	5.6	17	5.6	17
Yield/Force Off (s)	0	11.6	0	11.6
Yield/Force Off 170(s)	0	11.6	0	11.6
Local Start Time (s)	17	5.6	17	5.6
Local Yield (s)	0	11.6	0	11.6
Local Yield 170(s)	0	11.6	0	11.6

Intersection Summary	
Cycle Length	90
Control Type	Actuated-Coordinated
Natural Cycle	90
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Yellow, Master Intersection	

Splits and Phases: 2: Rapids Rd & US-422

Intersection: 2: Rapids Rd & US-422

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	422	276	38	107
Average Queue (ft)	221	82	12	48
95th Queue (ft)	411	212	37	96
Link Distance (ft)	2241	7767	1454	1274
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	145	801	62	14	444	3	8	3	6	5	6	46
Number	5	2	12	1	6	16	3	8	18	7	4	14
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		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	190.0	185.4	190.0	190.0	176.5	190.0	190.0	190.0	190.0	190.0	187.5	190.0
Lanes	0	1	0	0	1	0	0	1	0	0	1	0
Cap, veh/h	227	983	85	60	1109	18	109	32	44	63	27	76
Arrive On Green	0.79	0.79	0.79	0.66	0.66	0.66	0.07	0.07	0.07	0.07	0.07	0.07
Sat Flow, veh/h	220	1242	108	20	1674	27	590	458	629	154	389	1087
Grp Volume(v), veh/h	1153	0	0	517	0	0	32	0	0	84	0	0
Grp Sat Flow(s),veh/h/ln	1569	0	0	1721	0	0	1676	0	0	1631	0	0
Q Serve(g_s), s	6.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.2	0.0	0.0
Cycle Q Clear(g_c), s	45.6	0.0	0.0	11.2	0.0	0.0	1.4	0.0	0.0	4.0	0.0	0.0
Prop In Lane	0.16		0.07	0.03		0.02	0.50		0.37	0.14		0.67
Lane Grp Cap(c), veh/h	1297	0	0	1187	0	0	185	0	0	165	0	0
V/C Ratio(X)	0.89	0.00	0.00	0.44	0.00	0.00	0.17	0.00	0.00	0.51	0.00	0.00
Avail Cap(c_a), veh/h	1495	0	0	1381	0	0	193	0	0	175	0	0
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	0.00	1.00	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	4.3	0.0	0.0	6.4	0.0	0.0	35.0	0.0	0.0	36.2	0.0	0.0
Incr Delay (d2), s/veh	6.3	0.0	0.0	0.3	0.0	0.0	0.4	0.0	0.0	2.4	0.0	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 Back of Q (50%), veh/ln	5.4	0.0	0.0	3.7	0.0	0.0	0.6	0.0	0.0	1.7	0.0	0.0
Lane Grp Delay (d), s/veh	10.6	0.0	0.0	6.7	0.0	0.0	35.5	0.0	0.0	38.6	0.0	0.0
Lane Grp LOS	B			A			D			D		
Approach Vol, veh/h		1153			517			32			84	
Approach Delay, s/veh		10.6			6.7			35.5			38.6	
Approach LOS		B			A			D			D	

Timer												
Assigned Phs	5	2			6			8			4	
Phs Duration (G+Y+Rc), s	10.3	68.5			58.2			10.9			10.9	
Change Period (Y+Rc), s	4.3	5.6			5.6			5.4			5.4	
Max Green Setting (Gmax), s	6.7	73.0			62.0			6.0			6.0	
Max Q Clear Time (g_c+I1), s	0.0	47.6			13.2			3.4			6.0	
Green Ext Time (p_c), s	0.0	15.3			21.5			0.1			0.0	

Intersection Summary			
HCM 2010 Ctrl Delay		11.2	
HCM 2010 LOS		B	

Notes

Phase Number	2	4	5	6	8
Movement	EBTL	SBTL	EBL	WBTL	NBTL
Lead/Lag			Lead	Lag	
Lead-Lag Optimize			Yes	Yes	
Recall Mode	Min	None	Min	Min	None
Maximum Split (s)	78.6	11.4	11	67.6	11.4
Maximum Split (%)	87.3%	12.7%	12.2%	75.1%	12.7%
Minimum Split (s)	30	11.4	11	30	11.4
Yellow Time (s)	4.3	4.3	3	4.3	4.3
All-Red Time (s)	1.3	1.1	1.3	1.3	1.1
Minimum Initial (s)	6	6	6	6	6
Vehicle Extension (s)	3	3	3	3	3
Minimum Gap (s)	3	3	3	3	3
Time Before Reduce (s)	0	0	0	0	0
Time To Reduce (s)	0	0	0	0	0
Walk Time (s)					
Flash Dont Walk (s)					
Dual Entry	Yes	Yes	No	Yes	Yes
Inhibit Max	Yes	Yes	Yes	Yes	Yes
Start Time (s)	0	78.6	0	11	78.6
End Time (s)	78.6	0	11	78.6	0
Yield/Force Off (s)	73	84.6	6.7	73	84.6
Yield/Force Off 170(s)	73	84.6	6.7	73	84.6
Local Start Time (s)	17	5.6	17	28	5.6
Local Yield (s)	0	11.6	23.7	0	11.6
Local Yield 170(s)	0	11.6	23.7	0	11.6

Intersection Summary	
Cycle Length	90
Control Type	Actuated-Uncoordinated
Natural Cycle	90

Splits and Phases: 2: Rapids Rd & US-422

Intersection: 2: Rapids Rd & US-422

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	473	336	37	98
Average Queue (ft)	220	119	13	48
95th Queue (ft)	445	283	38	91
Link Distance (ft)	2241	7767	1454	1274
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	145	801	62	14	444	3	8	3	6	5	6	46
Number	5	2	12	1	6	16	3	8	18	7	4	14
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		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	188.1	184.9	190.0	190.0	176.5	190.0	190.0	190.0	190.0	190.0	187.5	190.0
Lanes	1	1	0	0	1	0	0	1	0	0	1	0
Cap, veh/h	640	1139	101	87	1142	18	164	46	60	98	38	105
Arrive On Green	0.68	0.68	0.68	0.68	0.68	0.68	0.10	0.10	0.10	0.10	0.10	0.10
Sat Flow, veh/h	902	1674	149	17	1678	27	564	475	623	152	392	1088
Grp Volume(v), veh/h	184	0	969	517	0	0	32	0	0	84	0	0
Grp Sat Flow(s),veh/h/ln	902	0	1823	1722	0	0	1662	0	0	1632	0	0
Q Serve(g_s), s	5.7	0.0	17.9	0.0	0.0	0.0	0.0	0.0	0.0	0.8	0.0	0.0
Cycle Q Clear(g_c), s	12.3	0.0	17.9	6.6	0.0	0.0	0.8	0.0	0.0	2.4	0.0	0.0
Prop In Lane	1.00		0.08	0.03		0.02	0.50		0.37	0.14		0.67
Lane Grp Cap(c), veh/h	640	0	1241	1247	0	0	270	0	0	241	0	0
V/C Ratio(X)	0.29	0.00	0.78	0.41	0.00	0.00	0.12	0.00	0.00	0.35	0.00	0.00
Avail Cap(c_a), veh/h	965	0	1897	1840	0	0	356	0	0	333	0	0
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	0.94	0.00	0.00	1.00	0.00	0.00	1.00	0.00	0.00
Uniform Delay (d), s/veh	6.3	0.0	5.4	3.6	0.0	0.0	20.5	0.0	0.0	21.2	0.0	0.0
Incr Delay (d2), s/veh	1.1	0.0	4.9	1.0	0.0	0.0	0.2	0.0	0.0	0.9	0.0	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 Back of Q (50%), veh/ln	1.1	0.0	5.5	1.6	0.0	0.0	0.3	0.0	0.0	0.9	0.0	0.0
Lane Grp Delay (d), s/veh	7.5	0.0	10.3	4.5	0.0	0.0	20.7	0.0	0.0	22.1	0.0	0.0
Lane Grp LOS	A		B	A			C			C		
Approach Vol, veh/h		1153			517			32			84	
Approach Delay, s/veh		9.9			4.5			20.7			22.1	
Approach LOS		A			A			C			C	

Timer												
Assigned Phs		2			6			8			4	
Phs Duration (G+Y+Rc), s		39.2			39.2			10.2			10.2	
Change Period (Y+Rc), s		5.6			5.6			5.4			5.4	
Max Green Setting (Gmax), s		51.4			51.4			7.6			7.6	
Max Q Clear Time (g_c+I1), s		19.9			8.6			2.8			4.4	
Green Ext Time (p_c), s		13.7			15.3			0.2			0.1	

Intersection Summary												
HCM 2010 Ctrl Delay			9.1									
HCM 2010 LOS			A									

Notes

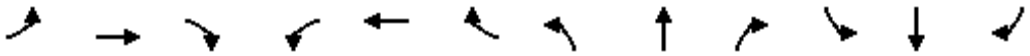
Phase Number	2	4	6	8
Movement	EBTL	SBTL	WBTL	NBTL
Lead/Lag				
Lead-Lag Optimize				
Recall Mode	C-Min	None	C-Min	None
Maximum Split (s)	57	13	57	13
Maximum Split (%)	81.4%	18.6%	81.4%	18.6%
Minimum Split (s)	30	11.4	30	11.4
Yellow Time (s)	4.3	4.3	4.3	4.3
All-Red Time (s)	1.3	1.1	1.3	1.1
Minimum Initial (s)	6	6	6	6
Vehicle Extension (s)	3	3	3	3
Minimum Gap (s)	3	3	3	3
Time Before Reduce (s)	0	0	0	0
Time To Reduce (s)	0	0	0	0
Walk Time (s)				
Flash Dont Walk (s)				
Dual Entry	Yes	Yes	Yes	Yes
Inhibit Max	Yes	Yes	Yes	Yes
Start Time (s)	18.6	5.6	18.6	5.6
End Time (s)	5.6	18.6	5.6	18.6
Yield/Force Off (s)	0	13.2	0	13.2
Yield/Force Off 170(s)	0	13.2	0	13.2
Local Start Time (s)	18.6	5.6	18.6	5.6
Local Yield (s)	0	13.2	0	13.2
Local Yield 170(s)	0	13.2	0	13.2

Intersection Summary	
Cycle Length	70
Control Type	Actuated-Coordinated
Natural Cycle	60
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBTL, Start of Yellow, Master Intersection	

Splits and Phases: 2: Rapids Rd & US-422

Intersection: 2: Rapids Rd & US-422

Movement	EB	EB	WB	NB	SB
Directions Served	L	TR	LTR	LTR	LTR
Maximum Queue (ft)	87	220	278	27	94
Average Queue (ft)	43	103	89	11	43
95th Queue (ft)	83	204	233	32	85
Link Distance (ft)		2241	7768	1448	1268
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)	245				
Storage Blk Time (%)		0			
Queuing Penalty (veh)		0			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	57	287	27	19	716	13	97	66	28	5	45	97
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		7%			-5%			2%			-4%	
Total Lost time (s)	6.1	9.1		6.1	6.1			6.2			6.6	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Frt	1.00	0.99		1.00	1.00			0.97			0.91	
Flt Protected	0.95	1.00		0.95	1.00			0.98			1.00	
Satd. Flow (prot)	1708	1495		1832	1479			1779			1749	
Flt Permitted	0.19	1.00		0.48	1.00			0.71			0.97	
Satd. Flow (perm)	341	1495		924	1479			1302			1708	
Peak-hour factor, PHF	0.79	0.68	0.84	0.68	0.84	0.54	0.87	0.90	0.54	0.42	0.80	0.81
Adj. Flow (vph)	72	422	32	28	852	24	111	73	52	12	56	120
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	72	454	0	28	876	0	0	236	0	0	188	0
Heavy Vehicles (%)	2%	23%	0%	1%	32%	0%	0%	0%	1%	0%	1%	1%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	52.4	52.4		52.4	52.4			18.4			18.0	
Effective Green, g (s)	52.4	49.4		52.4	52.4			18.4			18.0	
Actuated g/C Ratio	0.63	0.59		0.63	0.63			0.22			0.22	
Clearance Time (s)	6.1	6.1		6.1	6.1			6.2			6.6	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	215	888		582	932			288			369	
v/s Ratio Prot		0.30			c0.59							
v/s Ratio Perm	0.21			0.03				c0.18			0.11	
v/c Ratio	0.33	0.51		0.05	0.94			0.82			0.51	
Uniform Delay, d1	7.2	9.8		5.8	13.9			30.8			28.7	
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2	0.9	0.5		0.0	16.6			16.4			1.1	
Delay (s)	8.1	10.3		5.9	30.5			47.2			29.8	
Level of Service	A	B		A	C			D			C	
Approach Delay (s)		10.0			29.8			47.2			29.8	
Approach LOS		B			C			D			C	

Intersection Summary			
HCM 2000 Control Delay	26.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.95		
Actuated Cycle Length (s)	83.1	Sum of lost time (s)	15.7
Intersection Capacity Utilization	83.5%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Phase Number	2	4	6	8
Movement	EBTL	SBTL	WBTL	NBTL
Lead/Lag				
Lead-Lag Optimize				
Recall Mode	Min	Min	Min	Min
Maximum Split (s)	64	26	64	26
Maximum Split (%)	71.1%	28.9%	71.1%	28.9%
Minimum Split (s)	30	25.6	30	24.6
Yellow Time (s)	4.9	4.8	4.9	4.8
All-Red Time (s)	1.2	1.8	1.2	1.4
Minimum Initial (s)	6	6	6	6
Vehicle Extension (s)	3	3	3	3
Minimum Gap (s)	3	3	3	3
Time Before Reduce (s)	0	0	0	0
Time To Reduce (s)	0	0	0	0
Walk Time (s)	7	7	7	7
Flash Dont Walk (s)	9.7	12	14.3	11.4
Dual Entry	Yes	Yes	Yes	Yes
Inhibit Max	Yes	Yes	Yes	Yes
Start Time (s)	0	64	0	64
End Time (s)	64	0	64	0
Yield/Force Off (s)	57.9	83.4	57.9	83.8
Yield/Force Off 170(s)	57.9	83.4	57.9	83.8
Local Start Time (s)	32.1	6.1	32.1	6.1
Local Yield (s)	0	25.5	0	25.9
Local Yield 170(s)	0	25.5	0	25.9

Intersection Summary	
Cycle Length	90
Control Type	Actuated-Uncoordinated
Natural Cycle	90

Splits and Phases: 9: SR-700 & US-422

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	57	287	27	19	716	13	97	66	28	5	45	97
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		7%			-5%			2%			-4%	
Total Lost time (s)	5.0	9.1		6.1	6.1			6.2			6.6	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Frt	1.00	0.99		1.00	1.00			0.97			0.91	
Flt Protected	0.95	1.00		0.95	1.00			0.98			1.00	
Satd. Flow (prot)	1708	1495		1832	1479			1779			1749	
Flt Permitted	0.12	1.00		0.50	1.00			0.67			0.97	
Satd. Flow (perm)	219	1495		966	1479			1216			1706	
Peak-hour factor, PHF	0.79	0.68	0.84	0.68	0.84	0.54	0.87	0.90	0.54	0.42	0.80	0.81
Adj. Flow (vph)	72	422	32	28	852	24	111	73	52	12	56	120
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	72	454	0	28	876	0	0	236	0	0	188	0
Heavy Vehicles (%)	2%	23%	0%	1%	32%	0%	0%	0%	1%	0%	1%	1%
Turn Type	pm+pt	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases	5	2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	65.8	65.8		56.1	56.1			20.4			20.0	
Effective Green, g (s)	65.8	62.8		56.1	56.1			20.4			20.0	
Actuated g/C Ratio	0.67	0.64		0.57	0.57			0.21			0.20	
Clearance Time (s)	5.0	6.1		6.1	6.1			6.2			6.6	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	217	953		550	842			251			346	
v/s Ratio Prot	0.02	c0.30			c0.59							
v/s Ratio Perm	0.21			0.03				c0.19			0.11	
v/c Ratio	0.33	0.48		0.05	1.04			0.94			0.54	
Uniform Delay, d1	14.5	9.3		9.4	21.2			38.4			35.2	
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2	0.9	0.4		0.0	42.0			40.6			1.7	
Delay (s)	15.4	9.7		9.4	63.2			79.1			36.9	
Level of Service	B	A		A	E			E			D	
Approach Delay (s)		10.4			61.5			79.1			36.9	
Approach LOS		B			E			E			D	

Intersection Summary			
HCM 2000 Control Delay	46.8	HCM 2000 Level of Service	D
HCM 2000 Volume to Capacity ratio	1.00		
Actuated Cycle Length (s)	98.5	Sum of lost time (s)	17.7
Intersection Capacity Utilization	82.5%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Phase Number	2	4	5	6	8
Movement	EBTL	SBTL	EBL	WBTL	NBTL
Lead/Lag			Lead	Lag	
Lead-Lag Optimize					
Recall Mode	Min	Min	None	Min	Min
Maximum Split (s)	73	27	11	62	27
Maximum Split (%)	73.0%	27.0%	11.0%	62.0%	27.0%
Minimum Split (s)	30	25.6	11	30	24.6
Yellow Time (s)	4.9	4.8	3	4.9	4.8
All-Red Time (s)	1.2	1.8	2	1.2	1.4
Minimum Initial (s)	6	6	6	6	6
Vehicle Extension (s)	3	3	3	3	3
Minimum Gap (s)	3	3	3	3	3
Time Before Reduce (s)	0	0	0	0	0
Time To Reduce (s)	0	0	0	0	0
Walk Time (s)	7	7		7	7
Flash Dont Walk (s)	9.7	12		14.3	11.4
Dual Entry	Yes	Yes	No	Yes	Yes
Inhibit Max	Yes	Yes	Yes	Yes	Yes
Start Time (s)	0	73	0	11	73
End Time (s)	73	0	11	73	0
Yield/Force Off (s)	66.9	93.4	6	66.9	93.8
Yield/Force Off 170(s)	66.9	93.4	6	66.9	93.8
Local Start Time (s)	33.1	6.1	33.1	44.1	6.1
Local Yield (s)	0	26.5	39.1	0	26.9
Local Yield 170(s)	0	26.5	39.1	0	26.9

Intersection Summary	
Cycle Length	100
Control Type	Actuated-Uncoordinated
Natural Cycle	120

Splits and Phases: 9: SR-700 & US-422

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	108	778	126	20	328	9	34	55	21	10	75	92
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		7%			-5%			2%			-4%	
Total Lost time (s)	6.1	9.1		6.1	6.1			6.2			6.2	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Frt	1.00	0.98		1.00	1.00			0.97			0.93	
Flt Protected	0.95	1.00		0.95	1.00			0.99			1.00	
Satd. Flow (prot)	1708	1499		1832	1480			1796			1779	
Flt Permitted	0.53	1.00		0.16	1.00			0.66			0.97	
Satd. Flow (perm)	946	1499		314	1480			1206			1737	
Peak-hour factor, PHF	0.75	0.90	0.90	0.83	0.90	0.75	0.85	0.86	0.75	0.63	0.82	0.80
Adj. Flow (vph)	144	864	140	24	364	12	40	64	28	16	91	115
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	144	1004	0	24	376	0	0	132	0	0	222	0
Heavy Vehicles (%)	2%	23%	0%	1%	32%	0%	0%	0%	1%	0%	1%	1%
Turn Type	Perm	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases		2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	67.9	67.9		67.9	67.9			16.5			16.5	
Effective Green, g (s)	67.9	64.9		67.9	67.9			16.5			16.5	
Actuated g/C Ratio	0.70	0.67		0.70	0.70			0.17			0.17	
Clearance Time (s)	6.1	6.1		6.1	6.1			6.2			6.2	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	664	1006		220	1039			205			296	
v/s Ratio Prot		c0.67			0.25							
v/s Ratio Perm	0.15			0.08				0.11			c0.13	
v/c Ratio	0.22	1.00		0.11	0.36			0.64			0.75	
Uniform Delay, d1	5.1	15.8		4.6	5.7			37.4			38.1	
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2	0.2	27.7		0.2	0.2			6.8			10.2	
Delay (s)	5.2	43.5		4.9	6.0			44.1			48.3	
Level of Service	A	D		A	A			D			D	
Approach Delay (s)		38.7			5.9			44.1			48.3	
Approach LOS		D			A			D			D	

Intersection Summary			
HCM 2000 Control Delay	33.3	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.95		
Actuated Cycle Length (s)	96.7	Sum of lost time (s)	15.3
Intersection Capacity Utilization	89.0%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Phase Number	2	4	6	8
Movement	EBTL	SBTL	WBTL	NBTL
Lead/Lag				
Lead-Lag Optimize				
Recall Mode	Min	Min	Min	Min
Maximum Split (s)	73.9	26.1	73.9	26.1
Maximum Split (%)	73.9%	26.1%	73.9%	26.1%
Minimum Split (s)	23	26.1	28.2	25.5
Yellow Time (s)	4.9	4.8	4.9	4.8
All-Red Time (s)	1.2	1.4	1.2	1.4
Minimum Initial (s)	6	6	6	6
Vehicle Extension (s)	3	3	3	3
Minimum Gap (s)	3	3	3	3
Time Before Reduce (s)	0	0	0	0
Time To Reduce (s)	0	0	0	0
Walk Time (s)	7	7	7	7
Flash Dont Walk (s)	9.7	12	14.3	11.4
Dual Entry	Yes	Yes	Yes	Yes
Inhibit Max	Yes	Yes	Yes	Yes
Start Time (s)	0	73.9	0	73.9
End Time (s)	73.9	0	73.9	0
Yield/Force Off (s)	67.8	93.8	67.8	93.8
Yield/Force Off 170(s)	67.8	93.8	67.8	93.8
Local Start Time (s)	32.2	6.1	32.2	6.1
Local Yield (s)	0	26	0	26
Local Yield 170(s)	0	26	0	26

Intersection Summary		
Cycle Length		100
Control Type	Actuated-Uncoordinated	
Natural Cycle		100

Splits and Phases: 9: SR-700 & US-422

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (vph)	108	778	126	20	328	9	34	55	21	10	75	92
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Grade (%)		7%			-5%			2%			-4%	
Total Lost time (s)	5.0	9.1		6.1	6.1			6.2			6.2	
Lane Util. Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Frt	1.00	0.98		1.00	1.00			0.97			0.93	
Flt Protected	0.95	1.00		0.95	1.00			0.99			1.00	
Satd. Flow (prot)	1708	1499		1832	1480			1796			1779	
Flt Permitted	0.46	1.00		0.19	1.00			0.66			0.97	
Satd. Flow (perm)	820	1499		375	1480			1206			1737	
Peak-hour factor, PHF	0.75	0.90	0.90	0.83	0.90	0.75	0.85	0.86	0.75	0.63	0.82	0.80
Adj. Flow (vph)	144	864	140	24	364	12	40	64	28	16	91	115
RTOR Reduction (vph)	0	0	0	0	0	0	0	0	0	0	0	0
Lane Group Flow (vph)	144	1004	0	24	376	0	0	132	0	0	222	0
Heavy Vehicles (%)	2%	23%	0%	1%	32%	0%	0%	0%	1%	0%	1%	1%
Turn Type	pm+pt	NA		Perm	NA		Perm	NA		Perm	NA	
Protected Phases	5	2			6			8			4	
Permitted Phases	2			6			8			4		
Actuated Green, G (s)	67.9	67.9		56.9	56.9			16.5			16.5	
Effective Green, g (s)	67.9	64.9		56.9	56.9			16.5			16.5	
Actuated g/C Ratio	0.70	0.67		0.59	0.59			0.17			0.17	
Clearance Time (s)	5.0	6.1		6.1	6.1			6.2			6.2	
Vehicle Extension (s)	3.0	3.0		3.0	3.0			3.0			3.0	
Lane Grp Cap (vph)	630	1006		220	870			205			296	
v/s Ratio Prot	0.01	c0.67			0.25							
v/s Ratio Perm	0.15			0.06				0.11			c0.13	
v/c Ratio	0.23	1.00		0.11	0.43			0.64			0.75	
Uniform Delay, d1	5.2	15.8		8.8	11.0			37.4			38.1	
Progression Factor	1.00	1.00		1.00	1.00			1.00			1.00	
Incremental Delay, d2	0.2	27.7		0.2	0.3			6.8			10.2	
Delay (s)	5.4	43.5		9.0	11.3			44.1			48.3	
Level of Service	A	D		A	B			D			D	
Approach Delay (s)		38.7			11.2			44.1			48.3	
Approach LOS		D			B			D			D	

Intersection Summary			
HCM 2000 Control Delay	34.4	HCM 2000 Level of Service	C
HCM 2000 Volume to Capacity ratio	0.97		
Actuated Cycle Length (s)	96.7	Sum of lost time (s)	17.3
Intersection Capacity Utilization	89.0%	ICU Level of Service	E
Analysis Period (min)	15		
c Critical Lane Group			

Phase Number	2	4	5	6	8
Movement	EBTL	SBTL	EBL	WBTL	NBTL
Lead/Lag			Lead	Lag	
Lead-Lag Optimize					
Recall Mode	Min	Min	None	Min	Min
Maximum Split (s)	73.9	26.1	11	62.9	26.1
Maximum Split (%)	73.9%	26.1%	11.0%	62.9%	26.1%
Minimum Split (s)	23	26.1	11	28.2	25.5
Yellow Time (s)	4.9	4.8	3	4.9	4.8
All-Red Time (s)	1.2	1.4	2	1.2	1.4
Minimum Initial (s)	6	6	6	6	6
Vehicle Extension (s)	3	3	3	3	3
Minimum Gap (s)	3	3	3	3	3
Time Before Reduce (s)	0	0	0	0	0
Time To Reduce (s)	0	0	0	0	0
Walk Time (s)	7	7		7	7
Flash Dont Walk (s)	9.7	12		14.3	11.4
Dual Entry	Yes	Yes	No	Yes	Yes
Inhibit Max	Yes	Yes	Yes	Yes	Yes
Start Time (s)	0	73.9	0	11	73.9
End Time (s)	73.9	0	11	73.9	0
Yield/Force Off (s)	67.8	93.8	6	67.8	93.8
Yield/Force Off 170(s)	67.8	93.8	6	67.8	93.8
Local Start Time (s)	32.2	6.1	32.2	43.2	6.1
Local Yield (s)	0	26	38.2	0	26
Local Yield 170(s)	0	26	38.2	0	26

Intersection Summary	
Cycle Length	100
Control Type	Actuated-Uncoordinated
Natural Cycle	100

Splits and Phases: 9: SR-700 & US-422

APPENDIX E
CRASH DIAGRAMS

NUMBER OF CRASHES

7	PROPERTY DAMAGE ONLY
1	INJURY OR FATAL
8	TOTAL CRASHES

SYMBOLS

- MOVING VEHICLE
- BACKING VEHICLE
- NON-INVOLVED VEH.
- PEDESTRIAN
- PARKED VEHICLE
- FIXED OBJECT
- FATAL CRASH
- INJURY CRASH

TYPES OF COLLISIONS

- REAR END
- RIGHT ANGLE
- SIDE SWIPE
- OUT OF CONTROL
- LEFT TURN
- HEAD ON

SHOW FOR EACH CRASH

1. TIME, DAY, DATE
2. WEATHER AND ROAD SURFACE IF UNUSUAL CONDITION EXISTED
3. NITE - IF BETWEEN DUSK AND DAWN

COLLISION DIAGRAM

LOG POINT No. 10.90 TO 11.03

PERIOD 3 Years FROM 2011 TO 2013

COUNTY Geauga ROUTE NUMBER 422

DATE: 10/8/2014

NUMBER OF CRASHES	
3	PROPERTY DAMAGE ONLY
1	INJURY OR FATAL
4	TOTAL CRASHES

SYMBOLS	TYPES OF COLLISIONS
MOVING VEHICLE	REAR END
BACKING VEHICLE	RIGHT ANGLE
NON-INVOLVED VEH.	SIDE SWIPE
PEDESTRIAN	OUT OF CONTROL
PARKED VEHICLE	LEFT TURN
FIXED OBJECT	HEAD ON
FATAL CRASH	
INJURY CRASH	

SHOW FOR EACH CRASH

1. TIME, DAY, DATE
2. WEATHER AND ROAD SURFACE IF UNUSUAL CONDITION EXISTED
3. NITE - IF BETWEEN DUSK AND DAWN

COLLISION DIAGRAM

LOG POINT No. 11.03 TO 11.15

PERIOD 3 Years FROM 2011 TO 2013

COUNTY Geauga ROUTE NUMBER 422

DATE: 10/8/2014

NUMBER OF CRASHES		SYMBOLS	TYPES OF COLLISIONS	SHOW FOR EACH CRASH
2	PROPERTY DAMAGE ONLY	MOVING VEHICLE	REAR END	1. TIME, DAY, DATE
2	INJURY OR FATAL	BACKING VEHICLE	RIGHT ANGLE	2. WEATHER AND ROAD SURFACE IF UNUSUAL CONDITION EXISTED
4	TOTAL CRASHES	NON-INVOLVED VEH.	SIDE SWIPE	3. NITE - IF BETWEEN DUSK AND DAWN
		PEDESTRIAN	OUT OF CONTROL	
		PARKED VEHICLE	LEFT TURN	
		FIXED OBJECT	HEAD ON	
		FATAL CRASH		
		INJURY CRASH		

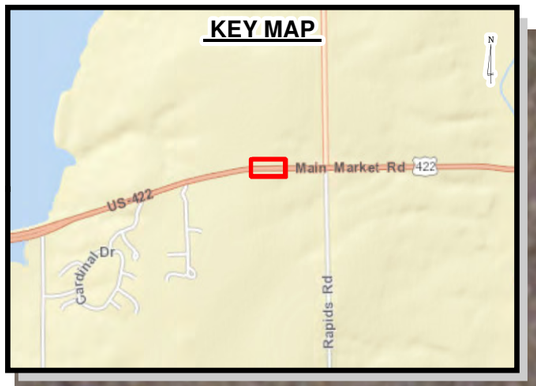
COLLISION DIAGRAM

LOG POINT No. 11.15 TO 11.27

PERIOD 3 Years FROM 2011 TO 2013

COUNTY Geauga ROUTE NUMBER 422

DATE: 10/8/2014



NUMBER OF CRASHES

3	PROPERTY DAMAGE ONLY
1	INJURY OR FATAL
4	TOTAL CRASHES

SYMBOLS

- MOVING VEHICLE
- BACKING VEHICLE
- NON-INVOLVED VEH.
- PEDESTRIAN
- PARKED VEHICLE
- FIXED OBJECT
- FATAL CRASH
- INJURY CRASH

TYPES OF COLLISIONS

- REAR END
- RIGHT ANGLE
- SIDE SWIPE
- OUT OF CONTROL
- LEFT TURN
- HEAD ON

SHOW FOR EACH CRASH

1. TIME, DAY, DATE
2. WEATHER AND ROAD SURFACE IF UNUSUAL CONDITION EXISTED
3. NITE - IF BETWEEN DUSK AND DAWN

COLLISION DIAGRAM

LOG POINT No. 11.30 TO 11.42

PERIOD 3 Years FROM 2011 TO 2013

COUNTY Geauga ROUTE NUMBER 422

DATE: 10/8/2014

NUMBER OF CRASHES

12	PROPERTY DAMAGE ONLY
6	INJURY OR FATAL
18	TOTAL CRASHES

SYMBOLS

- MOVING VEHICLE
- BACKING VEHICLE
- NON-INVOLVED VEH.
- PEDESTRIAN
- PARKED VEHICLE
- FIXED OBJECT
- FATAL CRASH
- INJURY CRASH

TYPES OF COLLISIONS

- REAR END
- RIGHT ANGLE
- SIDE SWIPE
- OUT OF CONTROL
- LEFT TURN
- HEAD ON

SHOW FOR EACH CRASH

1. TIME, DAY, DATE
2. WEATHER AND ROAD SURFACE IF UNUSUAL CONDITION EXISTED
3. NITE - IF BETWEEN DUSK AND DAWN

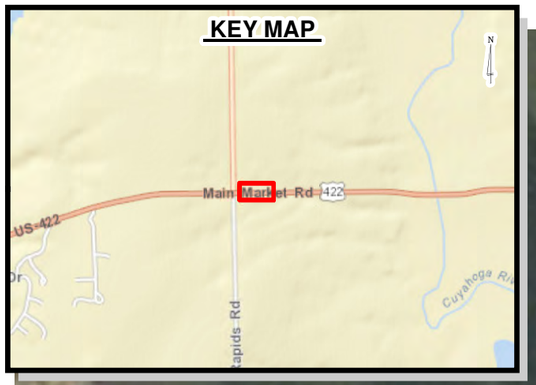
COLLISION DIAGRAM

LOG POINT No. 11.49 TO 11.61

PERIOD 3 Years FROM 2011 TO 2013

COUNTY Geauga ROUTE NUMBER 422

DATE: 10/8/2014



NUMBER OF CRASHES		SYMBOLS	TYPES OF COLLISIONS	SHOW FOR EACH CRASH
2	PROPERTY DAMAGE ONLY	MOVING VEHICLE	REAR END	1. TIME, DAY, DATE
0	INJURY OR FATAL	BACKING VEHICLE	RIGHT ANGLE	2. WEATHER AND ROAD SURFACE IF UNUSUAL CONDITION EXISTED
2	TOTAL CRASHES	NON-INVOLVED VEH.	SIDE SWIPE	3. NITE - IF BETWEEN DUSK AND DAWN
		PEDESTRIAN	OUT OF CONTROL	
		PARKED VEHICLE	LEFT TURN	
		FIXED OBJECT	HEAD ON	
		FATAL CRASH		
		INJURY CRASH		

COLLISION DIAGRAM

LOG POINT No. 11.59 TO 11.71

PERIOD 3 Years FROM 2011 TO 2013

COUNTY Geauga ROUTE NUMBER 422

DATE: 10/8/2014

NUMBER OF CRASHES

2	PROPERTY DAMAGE ONLY
0	INJURY OR FATAL
2	TOTAL CRASHES

SYMBOLS

- MOVING VEHICLE
- BACKING VEHICLE
- NON-INVOLVED VEH.
- PEDESTRIAN
- PARKED VEHICLE
- FIXED OBJECT
- FATAL CRASH
- INJURY CRASH

TYPES OF COLLISIONS

- REAR END
- RIGHT ANGLE
- SIDE SWIPE
- OUT OF CONTROL
- LEFT TURN
- HEAD ON

SHOW FOR EACH CRASH

1. TIME, DAY, DATE
2. WEATHER AND ROAD SURFACE IF UNUSUAL CONDITION EXISTED
3. NITE - IF BETWEEN DUSK AND DAWN

COLLISION DIAGRAM

LOG POINT No. 11.90 TO 12.02

PERIOD 3 Years FROM 2011 TO 2013

COUNTY Geauga ROUTE NUMBER 422

DATE: 10/8/2014

NUMBER OF CRASHES		SYMBOLS	TYPES OF COLLISIONS	SHOW FOR EACH CRASH
5	PROPERTY DAMAGE ONLY	MOVING VEHICLE	REAR END	1. TIME, DAY, DATE
1	INJURY OR FATAL	BACKING VEHICLE	RIGHT ANGLE	2. WEATHER AND ROAD SURFACE IF UNUSUAL CONDITION EXISTED
6	TOTAL CRASHES	NON-INVOLVED VEH.	SIDE SWIPE	3. NITE - IF BETWEEN DUSK AND DAWN
		PEDESTRIAN	OUT OF CONTROL	
		PARKED VEHICLE	LEFT TURN	
		FIXED OBJECT	HEAD ON	
		FATAL CRASH		
		INJURY CRASH		

COLLISION DIAGRAM

LOG POINT No. 12.09 TO 12.21

PERIOD 3 Years FROM 2011 TO 2013

COUNTY Geauga ROUTE NUMBER 422

DATE: 10/8/2014

NUMBER OF CRASHES	
5	PROPERTY DAMAGE ONLY
2	INJURY OR FATAL
7	TOTAL CRASHES

SYMBOLS

- MOVING VEHICLE
- BACKING VEHICLE
- NON-INVOLVED VEH.
- PEDESTRIAN
- PARKED VEHICLE
- FIXED OBJECT
- FATAL CRASH
- INJURY CRASH

TYPES OF COLLISIONS

- REAR END
- RIGHT ANGLE
- SIDE SWIPE
- OUT OF CONTROL
- LEFT TURN
- HEAD ON

SHOW FOR EACH CRASH

1. TIME, DAY, DATE
2. WEATHER AND ROAD SURFACE IF UNUSUAL CONDITION EXISTED
3. NITE - IF BETWEEN DUSK AND DAWN

COLLISION DIAGRAM

LOG POINT No. 12.30 TO 12.42

PERIOD 3 Years FROM 2011 TO 2013

COUNTY Geauga ROUTE NUMBER 422

DATE: 10/8/2014

NUMBER OF CRASHES	
1	PROPERTY DAMAGE ONLY
0	INJURY OR FATAL
1	TOTAL CRASHES

SYMBOLS
MOVING VEHICLE
BACKING VEHICLE
NON-INVOLVED VEH.
PEDESTRIAN
PARKED VEHICLE
FIXED OBJECT
FATAL CRASH
INJURY CRASH

TYPES OF COLLISIONS
REAR END
RIGHT ANGLE
SIDE SWIPE
OUT OF CONTROL
LEFT TURN
HEAD ON

SHOW FOR EACH CRASH

1. TIME, DAY, DATE
2. WEATHER AND ROAD SURFACE IF UNUSUAL CONDITION EXISTED
3. NITE - IF BETWEEN DUSK AND DAWN

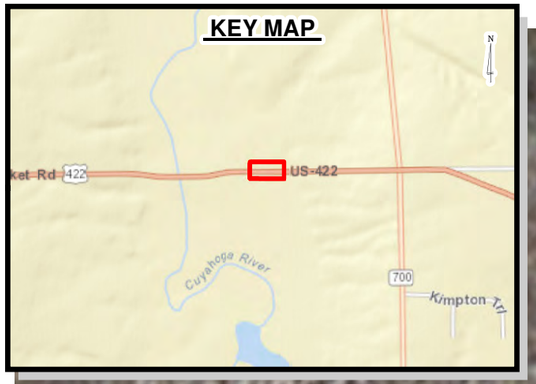
COLLISION DIAGRAM

LOG POINT No. 12.41 TO 12.53

PERIOD 3 Years FROM 2011 TO 2013

COUNTY Geauga ROUTE NUMBER 422

DATE: 10/8/2014



NUMBER OF CRASHES

0	PROPERTY DAMAGE ONLY
2	INJURY OR FATAL
2	TOTAL CRASHES

SYMBOLS

- MOVING VEHICLE
- BACKING VEHICLE
- NON-INVOLVED VEH.
- PEDESTRIAN
- PARKED VEHICLE
- FIXED OBJECT
- FATAL CRASH
- INJURY CRASH

TYPES OF COLLISIONS

- REAR END
- RIGHT ANGLE
- SIDE SWIPE
- OUT OF CONTROL
- LEFT TURN
- HEAD ON

SHOW FOR EACH CRASH

1. TIME, DAY, DATE
2. WEATHER AND ROAD SURFACE IF UNUSUAL CONDITION EXISTED
3. NITE - IF BETWEEN DUSK AND DAWN

COLLISION DIAGRAM

LOG POINT No. 12.53 TO 12.65

PERIOD 3 Years FROM 2011 TO 2013

COUNTY Geauga ROUTE NUMBER 422

DATE: 10/8/2014

NUMBER OF CRASHES		SYMBOLS	TYPES OF COLLISIONS	SHOW FOR EACH CRASH
2	PROPERTY DAMAGE ONLY	MOVING VEHICLE	REAR END	1. TIME, DAY, DATE
3	INJURY OR FATAL	BACKING VEHICLE	RIGHT ANGLE	2. WEATHER AND ROAD SURFACE IF UNUSUAL CONDITION EXISTED
5	TOTAL CRASHES	NON-INVOLVED VEH.	SIDE SWIPE	3. NITE - IF BETWEEN DUSK AND DAWN
		PEDESTRIAN	OUT OF CONTROL	
		PARKED VEHICLE	LEFT TURN	
		FIXED OBJECT	HEAD ON	
		FATAL CRASH		
		INJURY CRASH		

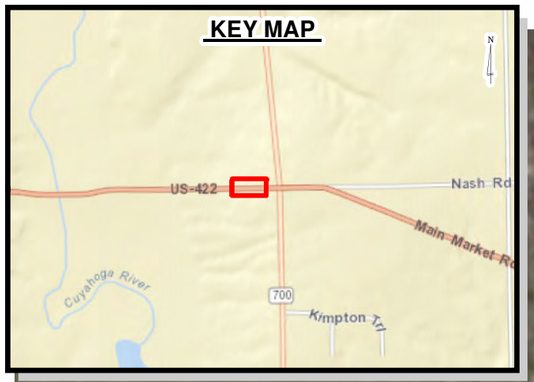
COLLISION DIAGRAM

LOG POINT No. 12.73 TO 12.85

PERIOD 3 Years FROM 2011 TO 2013

COUNTY Geauga ROUTE NUMBER 422

DATE: 10/8/2014



NUMBER OF CRASHES

5	PROPERTY DAMAGE ONLY
1	INJURY OR FATAL
6	TOTAL CRASHES

SYMBOLS

- MOVING VEHICLE
- BACKING VEHICLE
- NON-INVOLVED VEH.
- PEDESTRIAN
- PARKED VEHICLE
- FIXED OBJECT
- FATAL CRASH
- INJURY CRASH

TYPES OF COLLISIONS

- REAR END
- RIGHT ANGLE
- SIDE SWIPE
- OUT OF CONTROL
- LEFT TURN
- HEAD ON

SHOW FOR EACH CRASH

1. TIME, DAY, DATE
2. WEATHER AND ROAD SURFACE IF UNUSUAL CONDITION EXISTED
3. NITE - IF BETWEEN DUSK AND DAWN

COLLISION DIAGRAM

LOG POINT No. 12.88 TO 13.00

PERIOD 3 Years FROM 2011 TO 2013

COUNTY Geauga ROUTE NUMBER 422

DATE: 10/8/2014

NUMBER OF CRASHES		SYMBOLS	TYPES OF COLLISIONS	SHOW FOR EACH CRASH
11	PROPERTY DAMAGE ONLY	MOVING VEHICLE	REAR END	1. TIME, DAY, DATE
7	INJURY OR FATAL	BACKING VEHICLE	RIGHT ANGLE	2. WEATHER AND ROAD SURFACE IF UNUSUAL CONDITION EXISTED
18	TOTAL CRASHES	NON-INVOLVED VEH.	SIDE SWIPE	3. NITE - IF BETWEEN DUSK AND DAWN
		PEDESTRIAN	OUT OF CONTROL	
		PARKED VEHICLE	LEFT TURN	
		FIXED OBJECT	HEAD ON	
		FATAL CRASH		
		INJURY CRASH		

COLLISION DIAGRAM

LOG POINT No. 13.01 TO 13.12

PERIOD 3 Years FROM 2011 TO 2013

COUNTY Geauga ROUTE NUMBER 422

DATE: 10/8/2014

NUMBER OF CRASHES		SYMBOLS	TYPES OF COLLISIONS	SHOW FOR EACH CRASH
6	PROPERTY DAMAGE ONLY	MOVING VEHICLE	REAR END	1. TIME, DAY, DATE
2	INJURY OR FATAL	BACKING VEHICLE	RIGHT ANGLE	2. WEATHER AND ROAD SURFACE IF UNUSUAL CONDITION EXISTED
8	TOTAL CRASHES	NON-INVOLVED VEH.	SIDE SWIPE	3. NITE - IF BETWEEN DUSK AND DAWN
		PEDESTRIAN	OUT OF CONTROL	
		PARKED VEHICLE	LEFT TURN	
		FIXED OBJECT	HEAD ON	
		FATAL CRASH		
		INJURY CRASH		

COLLISION DIAGRAM

LOG POINT No. 13.17 TO 13.28

PERIOD 3 Years FROM 2011 TO 2013

COUNTY Geauga ROUTE NUMBER 422

DATE: 10/8/2014

NUMBER OF CRASHES	
1	PROPERTY DAMAGE ONLY
0	INJURY OR FATAL
1	TOTAL CRASHES

SYMBOLS

- MOVING VEHICLE
- BACKING VEHICLE
- NON-INVOLVED VEH.
- PEDESTRIAN
- PARKED VEHICLE
- FIXED OBJECT
- FATAL CRASH
- INJURY CRASH

TYPES OF COLLISIONS

- REAR END
- RIGHT ANGLE
- SIDE SWIPE
- OUT OF CONTROL
- LEFT TURN
- HEAD ON

SHOW FOR EACH CRASH

1. TIME, DAY, DATE
2. WEATHER AND ROAD SURFACE IF UNUSUAL CONDITION EXISTED
3. NITE - IF BETWEEN DUSK AND DAWN

COLLISION DIAGRAM

LOG POINT No. 13.30 TO 13.37

PERIOD 3 Years FROM 2011 TO 2013

COUNTY Geauga ROUTE NUMBER 422

DATE: 10/8/2014

APPENDIX F
SIGNAL WARRANTS

SIGNAL WARRANT ANALYSIS

Traffic signals should be installed only if an intersection meets at least one of the criteria specified in the Ohio Manual of Uniform Traffic Control Devices, Section 4C.02.

- **Warrant 1, Eight-Hour Vehicular Volume:** This warrant requires traffic volumes on both the major and minor street approaches to satisfy minimum criteria for eight hours of an average day.
- **Warrant #2: Four Hour Volume.** This warrant requires that for a minimum of four hours of an average day traffic volumes on both the major and minor street fall above the applicable curve in the attached figures. The Four-Hour signal warrant conditions are intended to be applied where the volume of intersecting traffic is the principal reason to consider installing a traffic signal.
- **Warrant 3, Peak Hour**: This warrant requires that for a minimum of one hour of an average day traffic volumes on both the major and minor street fall above the applicable curve in the attached figures. The minimum side street volume is 75 vehicles in the peak hour. Warrant 3 is intended for use where traffic conditions are such that for a minimum of one hour of an average day, minor street traffic experiences undue delay when entering or crossing the major street.

Existing traffic volumes were evaluated against eight-hour, four-hour and peak-hour signal warrant criteria at the three study intersections.

Warrants were evaluated based on high-speed criteria applicable for roadways with posted speed limits exceeding 40 miles per hour. U.S. Hwy 422 is defined as major street for signal warrant analysis purposes, and respective cross street as minor street approach. No reduction of right-turning vehicles was applied to side street traffic volumes.

Results indicate that all three intersections justify installation of traffic signal, as summarized in **Table F1.** Detailed signal warrant worksheets are appended.

TABLE F1: SIGNAL WARRANT SUMMARY

SIGNAL WARRANT	U.S. HWY 422/ GREAT LAKES PKWY	U.S. HWY 422/ RAPIDS RD	U.S. HWY 422/ S.R. 700
Warrant 1: 8 –Hour Vehicular Volume	**Warrant Not Met**	**Warrant Not Met**	**Warrant Met**
Warrant 2: 4-Hour Vehicular Volume	**Warrant Met**	**Warrant Not Met**	**Warrant Met**
Warrant 3: Peak Hour Volume	**Warrant Met**	**Warrant Met**	**Warrant Met**

U.S. HWY 422 AT S.R. 700

The intersection of U.S. Hwy 422 at S.R. 700 meets the criteria for all three warrants.

U.S. HWY 422 AT GREAT LAKES PARKWAY

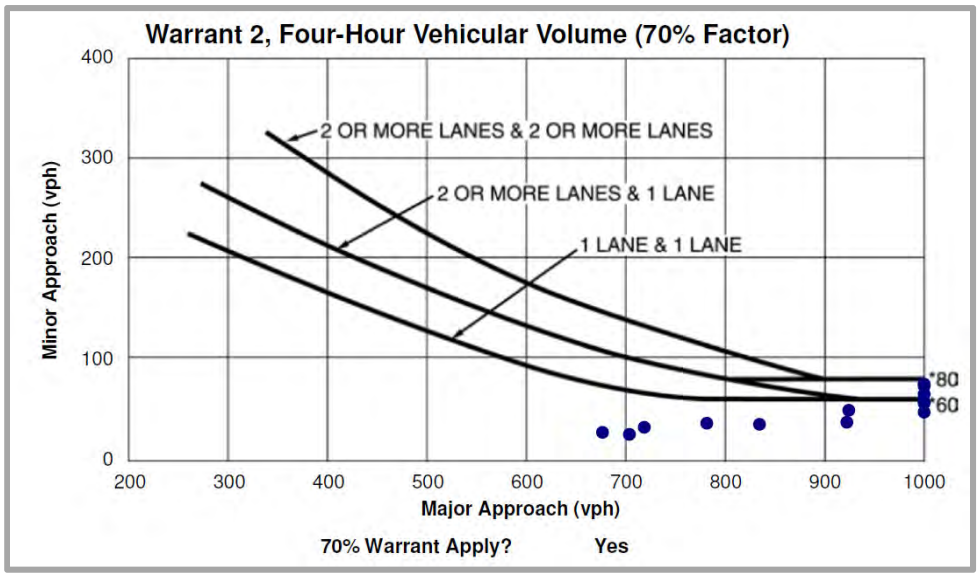
The intersection of U.S. Hwy 422 at Great Lakes Parkway justifies installation of traffic signal control based on warrants 2 and 3**.**

U.S. HWY 422 AT RAPIDS ROAD

The intersection of U.S. Hwy 422/Rapids Road meets warrant 3, peak hour volume.

The four-hour warrant requires that for each of any 4 hours of an average day, volumes on both the major and minor street fall above the applicable curve in Figure 4C-1 (for speeds less than 40 MPH) or 4C-2 (for speeds greater than 40 MPH). As shown below in **Graph F1,** the minimum volume for a one-lane, minor street approach is 60 vehicles per hour. Rapids Road approach volumes exceed the 60 vph threshold during the 6AM hour (75 vph), the 7AM hour (73 vph) and the 4:30 PM hour (68 vph). The 3:30 PM hour approach volume of 59 vph is only 1 vehicle shy of the threshold. Based on these findings, it is concluded that the Rapids Road intersection satisfies four-hour signal warrant requirements.

Graph F1: Four-Hour Signal Warrant Graph (4C-2)



Date: Tuesday, September 09, 2014
Jurisdiction: Geauga County, OHIO
Intersection: US 422 at Great Lakes Pkwy
Number of APPROACH Lanes:
Major Street = 1
Minor Street = 1
Speed Limit = 45 (mph)
Population above 10,000? Yes
70% Warrant Apply? Yes

Traffic Signal Warrant (OMUTCD - 2012)

	Warrant 1 - Condition A				Warrant 1 - Condition B			
	100%	80%	70%	56%	100%	80%	70%	56%
Major Approach:	500	400	350	280	750	600	525	420
Minor Approach:	150	120	105	84	75	60	53	42
Mid - 1AM								
1AM - 2AM								
2:00 AM								
3:00 AM								
4:00 AM								
5:00 AM								
6:00 AM							+	+
7:00 AM				+	+	+	+	+
8:00 AM								
9:00 AM								
10:00 AM								
11:00 AM								+
Noon - 1PM							+	+
1PM - 2PM								+
2:00 PM				+	+	+	+	+
3:00 PM	+	+	+	+	+	+	+	+
4:00 PM				+	+	+	+	+
5:00 PM			+	+	+	+	+	+
6:00 PM								
7:00 PM								
8:00 PM								
9:00 PM								
10:00 PM								
11:00 PM								
Hours Met =	1	1	2	5	5	5	7	9

Data:	Major St:		TOTAL	Minor St:		> OF TWO
Mid - 1AM	0	0	0	0	0	0
1AM - 2AM	0	0	0	0	0	0
2:00 AM	0	0	0	0	0	0
3:00 AM	0	0	0	0	0	0
4:00 AM	0	0	0	0	0	0
5:00 AM	0	0	0	0	0	0
6:00 AM	990	302	1292	0	59	59
7:00 AM	906	420	1326	0	95	95
8:00 AM	634	393	1027	0	24	24
9:00 AM	426	356	782	0	29	29
10:00 AM	356	370	726	0	40	40
11:00 AM	331	363	694	0	42	42
Noon - 1PM	385	424	809	0	53	53
1PM - 2PM	426	433	859	0	47	47
2:00 PM	491	533	1024	0	100	100
3:00 PM	403	776	1179	0	190	190
4:00 PM	424	982	1406	0	88	88
5:00 PM	484	1002	1486	0	115	115
6:00 PM	343	636	979	0	22	22
7:00 PM	0	0	0	0	0	0
8:00 PM	0	0	0	0	0	0
9:00 PM	0	0	0	0	0	0
10:00 PM	0	0	0	0	0	0
11:00 PM	0	0	0	0	0	0

Warrant 1 - Condition A:

100%	Warrant Met?	No
70%	Warrant Met?	No

Warrant 1 - Condition B:

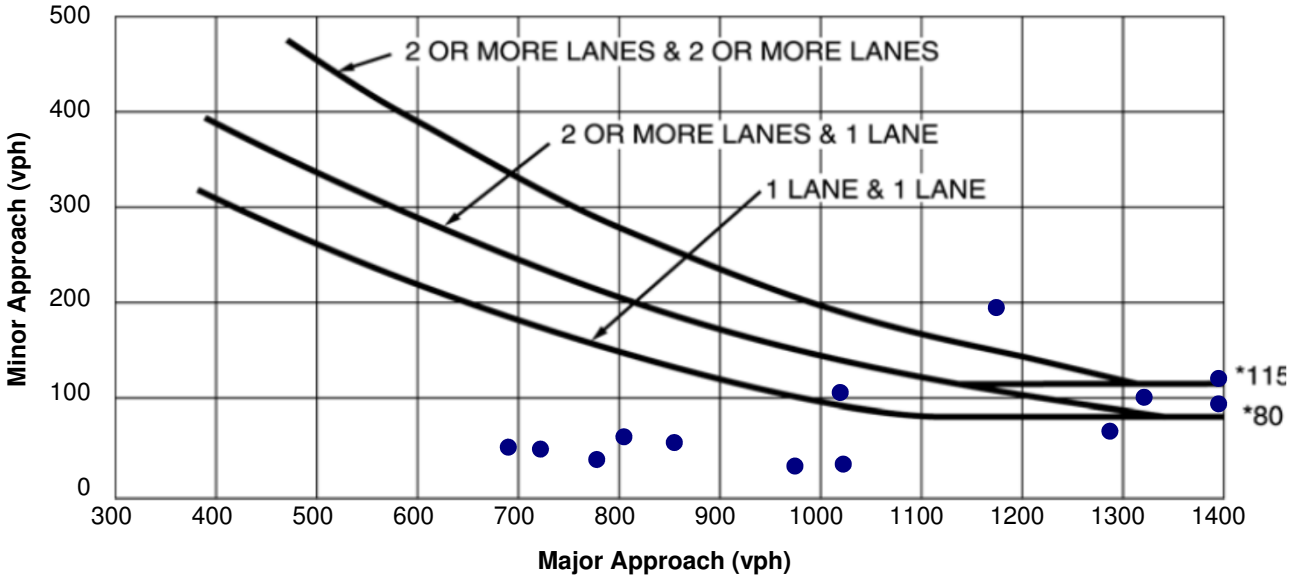
100%	Warrant Met?	No
70%	Warrant Met?	No

Combination of Warrant 1 - Conditions A & B:

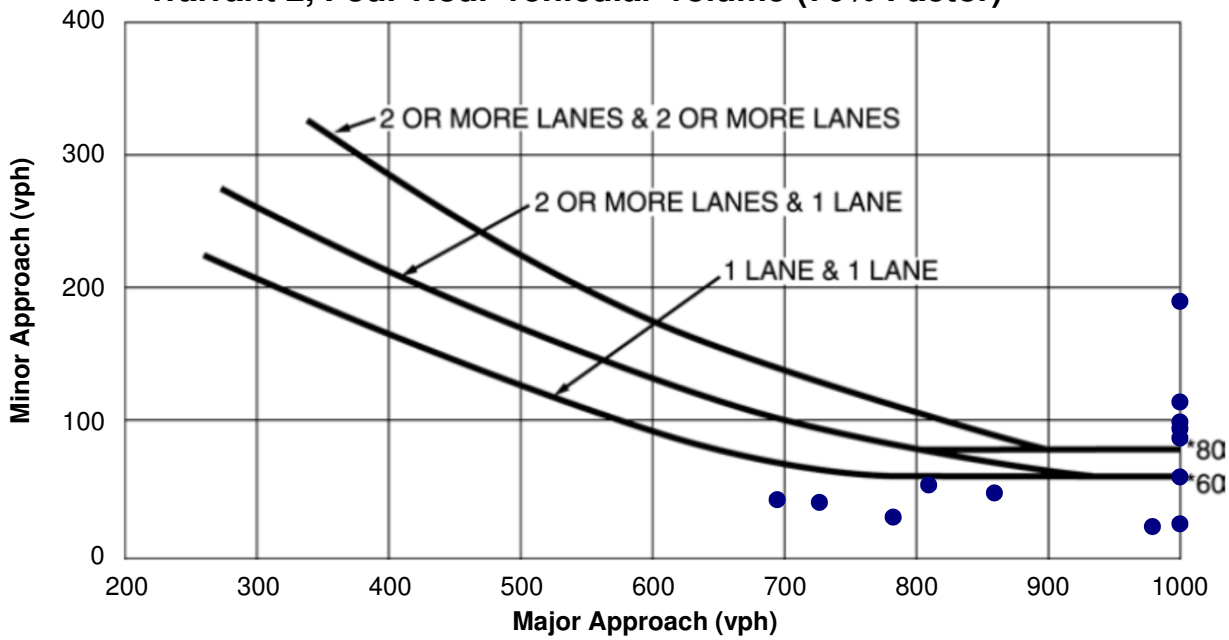
80%	Warrant Met?	No
56% (70%)	Warrant Met?	No

US 422 at Great Lakes Pkwy

Warrant 2, Four-Hour Vehicular Volume



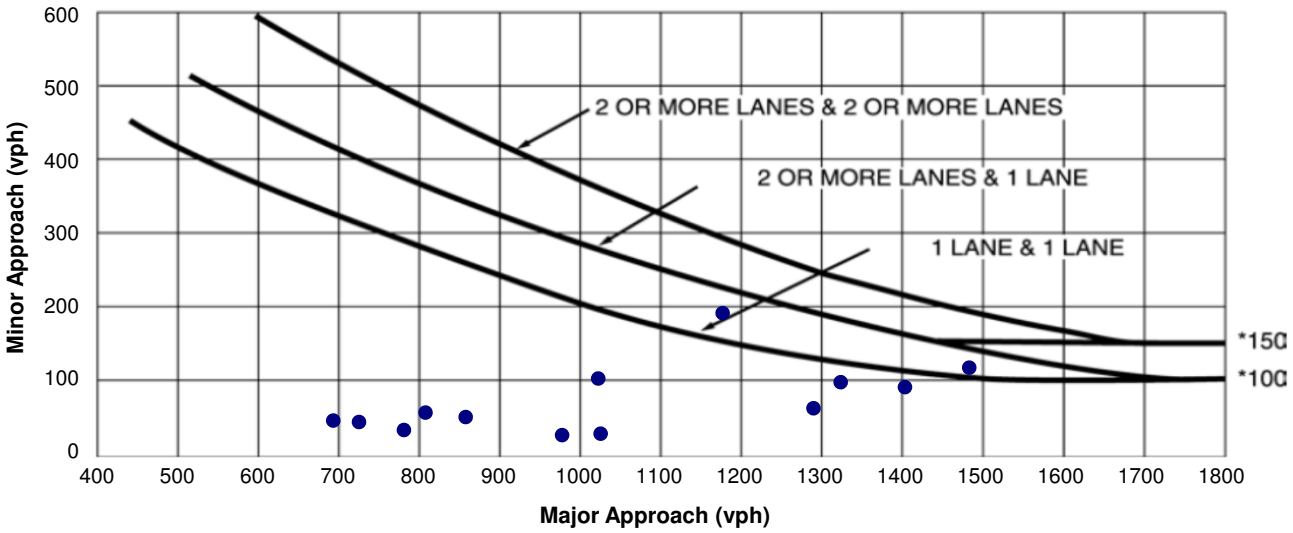
Warrant 2, Four-Hour Vehicular Volume (70% Factor)



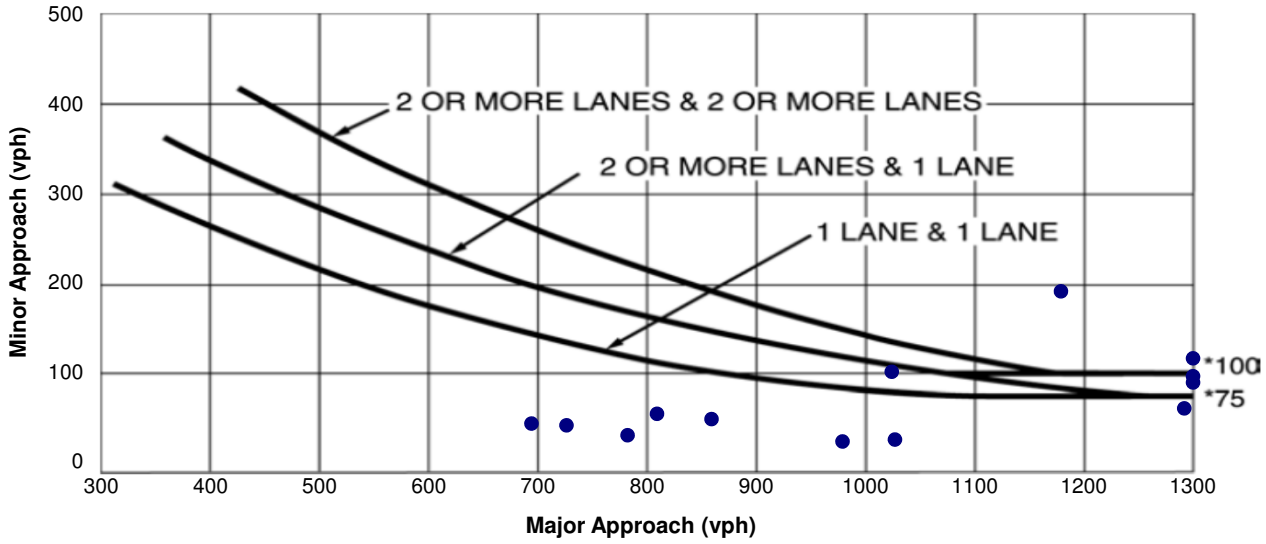
70% Warrant Apply? **Yes**

US 422 at Great Lakes Pkwy

Warrant 3, Peak-Hour Vehicular Volume



Warrant 3, Peak-Hour Vehicular Volume (70% Factor)



70% Warrant Apply? **Yes**

Date: Tuesday, September 09, 2014
Jurisdiction: Geauga County, OHIO
Intersection: US 422 at Rapids Road
Number of APPROACH Lanes:
Major Street = 1
Minor Street = 1
Speed Limit = 45 (mph)
Population above 10,000? Yes
70% Warrant Apply? Yes

Traffic Signal Warrant (OMUTCD - 2012)

	Warrant 1 - Condition A				Warrant 1 - Condition B			
	100%	80%	70%	56%	100%	80%	70%	56%
Major Approach:	500	400	350	280	750	600	525	420
Minor Approach:	150	120	105	84	75	60	53	42
Mid - 1AM								
1AM - 2AM								
2:00 AM								
3:00 AM								
4:00 AM								
5:00 AM								
6:00 AM					+	+	+	+
7:00 AM						+	+	+
8:00 AM								+
9:00 AM								
10:00 AM								
11:00 AM								
Noon - 1PM								
1PM - 2PM								
2:00 PM								+
3:00 PM							+	+
4:00 PM						+	+	+
5:00 PM							+	+
6:00 PM								
7:00 PM								
8:00 PM								
9:00 PM								
10:00 PM								
11:00 PM								
Hours Met =	0	0	0	0	1	3	5	7

Data:	Major St:		TOTAL	Minor St:		> OF TWO
Mid - 1AM	0	0	0	0	0	0
1AM - 2AM	0	0	0	0	0	0
2:00 AM	0	0	0	0	0	0
3:00 AM	0	0	0	0	0	0
4:00 AM	0	0	0	0	0	0
5:00 AM	0	0	0	0	0	0
6:00 AM	937	308	1245	75	37	75
7:00 AM	812	452	1264	73	46	73
8:00 AM	574	350	924	49	29	49
9:00 AM	384	334	718	32	20	32
10:00 AM	339	364	703	25	12	25
11:00 AM	313	363	676	27	13	27
Noon - 1PM	367	414	781	36	21	36
1PM - 2PM	409	425	834	35	15	35
2:00 PM	457	583	1040	47	21	47
3:00 PM	351	912	1263	56	15	56
4:00 PM	415	1009	1424	65	18	65
5:00 PM	462	982	1444	57	16	57
6:00 PM	302	620	922	37	18	37
7:00 PM	0	0	0	0	0	0
8:00 PM	0	0	0	0	0	0
9:00 PM	0	0	0	0	0	0
10:00 PM	0	0	0	0	0	0
11:00 PM	0	0	0	0	0	0

Warrant 1 - Condition A:

100%	Warrant Met?	No
70%	Warrant Met?	No

Warrant 1 - Condition B:

100%	Warrant Met?	No
70%	Warrant Met?	No

Combination of Warrant 1 - Conditions A & B:

80%	Warrant Met?	No
56% (70%)	Warrant Met?	No

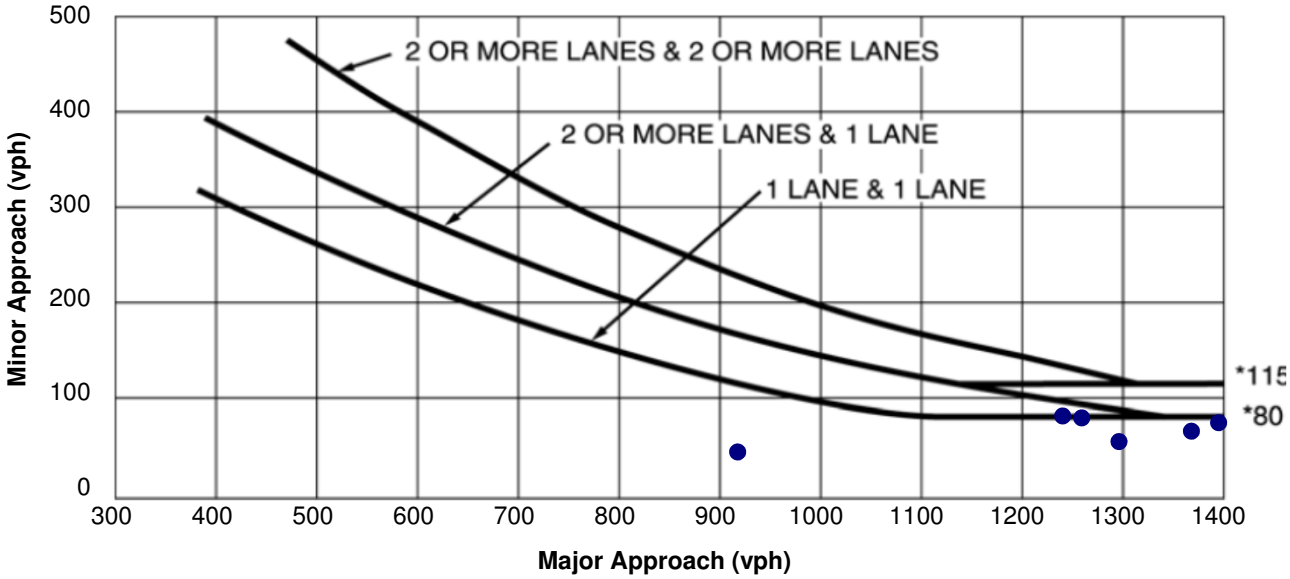
Date: Tuesday, September 09, 2014
Jurisdiction: Geauga County, OHIO
Intersection: US 422 at Rapids Road
Number of APPROACH Lanes:
Major Street = 1
Minor Street = 1
Speed Limit = 45 (mph)
Population above 10,000? Yes
70% Warrant Apply? Yes

Traffic Signal Warrant (OMUTCD - 2012)

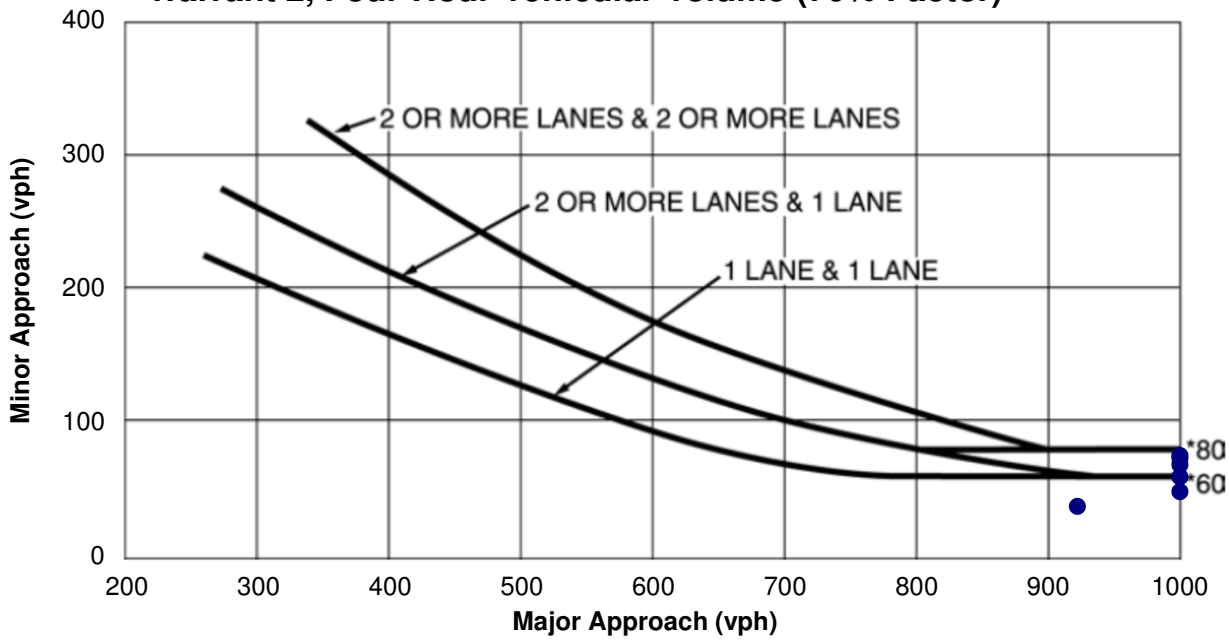
Data:	Major St:		TOTAL	Minor St:		> OF TWO
6:00 AM	*937*	*308*	**1245**	*75*	*37*	**75**
7:00 AM	*812*	*452*	**1264**	*73*	*46*	**73**
3:30 PM	*392*	*981*	**1373**	*59*	*20*	**59**
4:30 PM	*430*	*1009*	**1439**	*68*	*16*	**68**
5:30 PM	*461*	*840*	**1301**	*48*	*12*	**48**
	0	*0*	**0**	*0*	*0*	**0**
	0	*0*	**0**	*0*	*0*	**0**
	0	*0*	**0**	*0*	*0*	**0**
	0	*0*	**0**	*0*	*0*	**0**
	0	*0*	**0**	*0*	*0*	**0**
	0	*0*	**0**	*0*	*0*	**0**

US 422 at Rapids Road

Warrant 2, Four-Hour Vehicular Volume



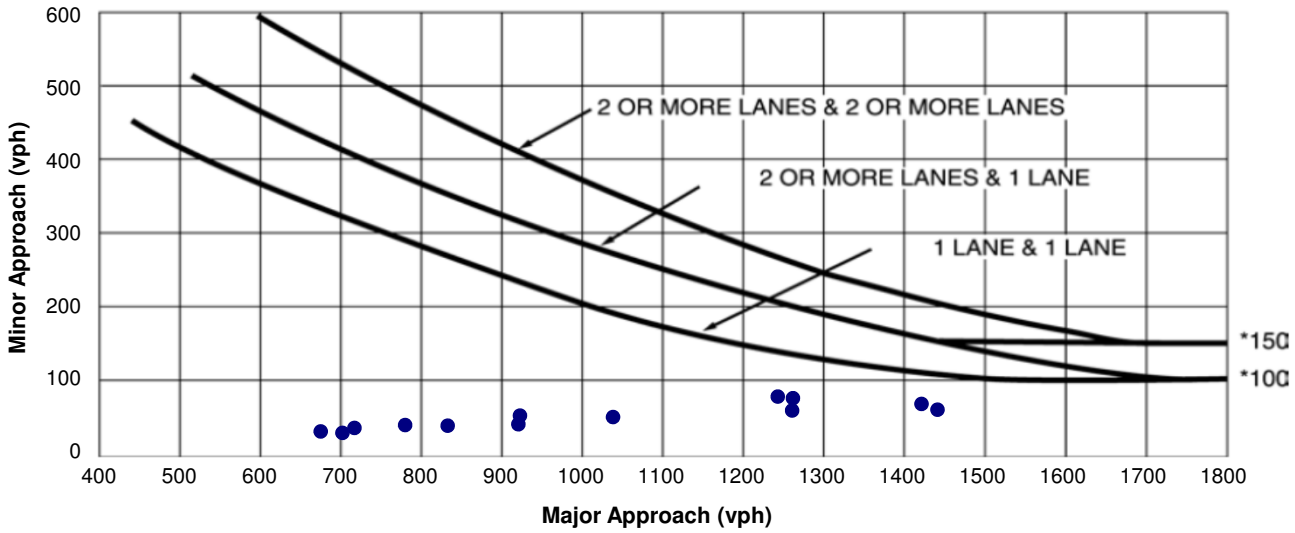
Warrant 2, Four-Hour Vehicular Volume (70% Factor)



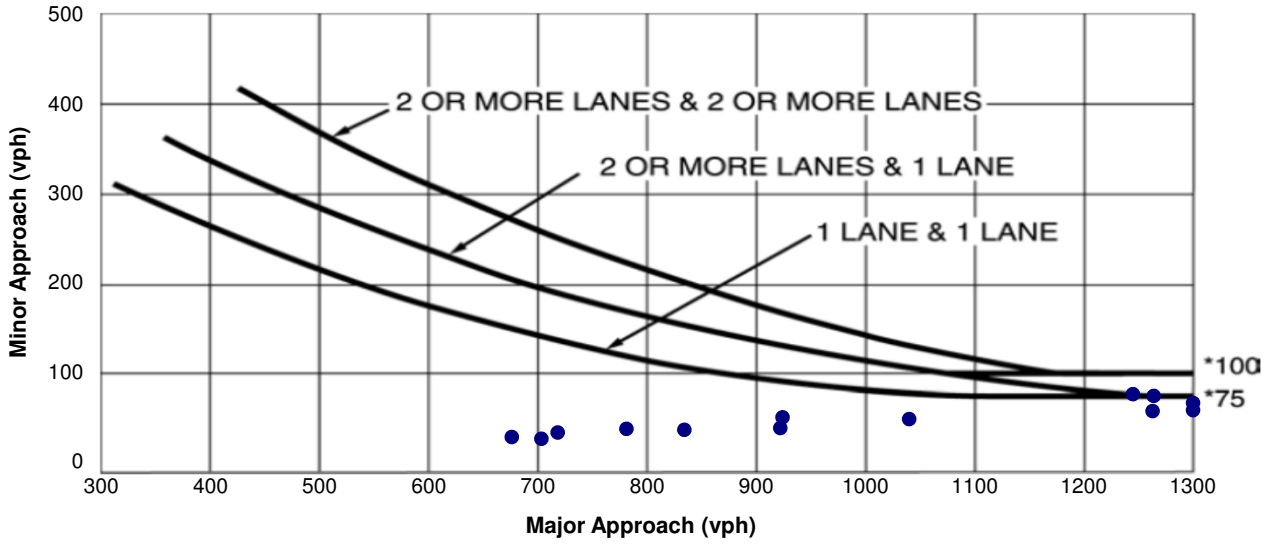
70% Warrant Apply? **Yes**

US 422 at Rapids Road

Warrant 3, Peak-Hour Vehicular Volume



Warrant 3, Peak-Hour Vehicular Volume (70% Factor)



70% Warrant Apply? **Yes**

Date: Tuesday, September 09, 2014
Jurisdiction: Geauga County, OHIO
Intersection: US 422 at SR 700
Number of APPROACH Lanes:
Major Street = 1
Minor Street = 1
Speed Limit = 45 (mph)
Population above 10,000? Yes
70% Warrant Apply? Yes

Traffic Signal Warrant (OMUTCD - 2012)

	Warrant 1 - Condition A				Warrant 1 - Condition B			
	100%	80%	70%	56%	100%	80%	70%	56%
Major Approach:	500	400	350	280	750	600	525	420
Minor Approach:	150	120	105	84	75	60	53	42
Mid - 1AM								
1AM - 2AM								
2:00 AM								
3:00 AM								
4:00 AM								
5:00 AM								
6:00 AM	+	+	+	+	+	+	+	+
7:00 AM	+	+	+	+	+	+	+	+
8:00 AM	+	+	+	+	+	+	+	+
9:00 AM				+		+	+	+
10:00 AM				+			+	+
11:00 AM				+		+	+	+
Noon - 1PM				+		+	+	+
1PM - 2PM				+		+	+	+
2:00 PM		+	+	+	+	+	+	+
3:00 PM		+	+	+	+	+	+	+
4:00 PM	+	+	+	+	+	+	+	+
5:00 PM	+	+	+	+	+	+	+	+
6:00 PM				+	+	+	+	+
7:00 PM								
8:00 PM								
9:00 PM								
10:00 PM								
11:00 PM								
Hours Met =	5	7	7	13	8	12	13	13

Data:	Major St:		TOTAL	Minor St:		> OF TWO
Mid - 1AM	0	0	0	0	0	0
1AM - 2AM	0	0	0	0	0	0
2:00 AM	0	0	0	0	0	0
3:00 AM	0	0	0	0	0	0
4:00 AM	0	0	0	0	0	0
5:00 AM	0	0	0	0	0	0
6:00 AM	767	280	1047	130	171	171
7:00 AM	658	401	1059	143	214	214
8:00 AM	473	308	781	110	175	175
9:00 AM	353	319	672	73	88	88
10:00 AM	276	313	589	96	78	96
11:00 AM	284	325	609	87	90	90
Noon - 1PM	311	359	670	92	94	94
1PM - 2PM	346	350	696	103	98	103
2:00 PM	373	508	881	121	93	121
3:00 PM	289	754	1043	143	138	143
4:00 PM	334	791	1125	161	130	161
5:00 PM	345	834	1179	188	108	188
6:00 PM	260	565	825	99	98	99
7:00 PM	0	0	0	0	0	0
8:00 PM	0	0	0	0	0	0
9:00 PM	0	0	0	0	0	0
10:00 PM	0	0	0	0	0	0
11:00 PM	0	0	0	0	0	0

Warrant 1 - Condition A:

100%	Warrant Met?	No
70%	Warrant Met?	No

Warrant 1 - Condition B:

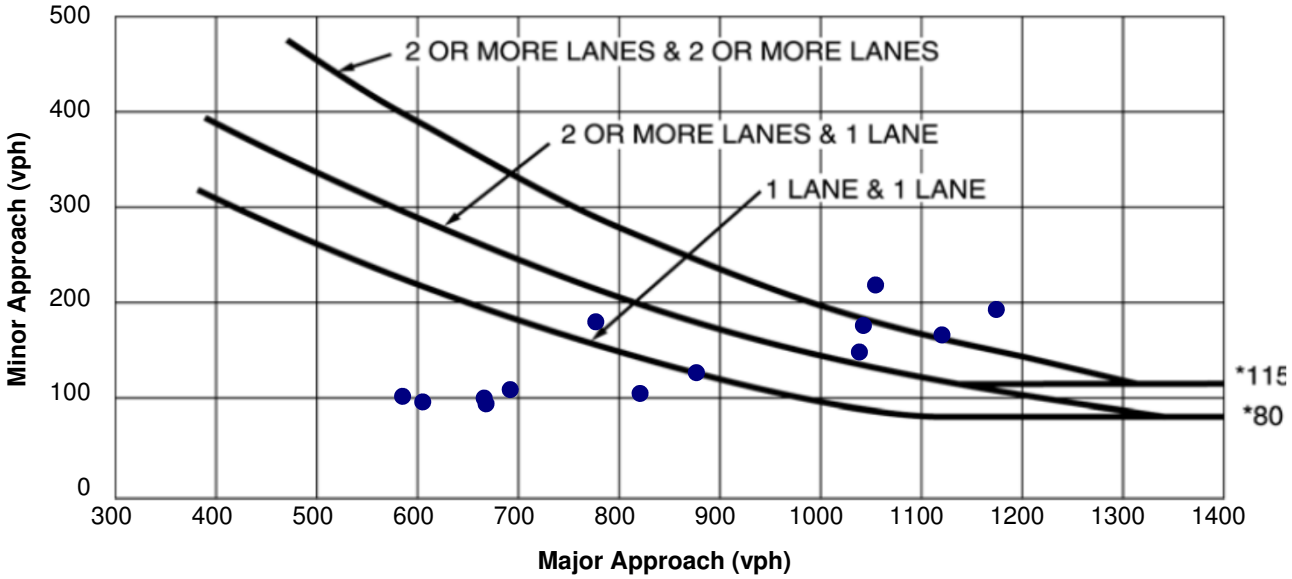
100%	Warrant Met?	Yes
70%	Warrant Met?	Yes

Combination of Warrant 1 - Conditions A & B:

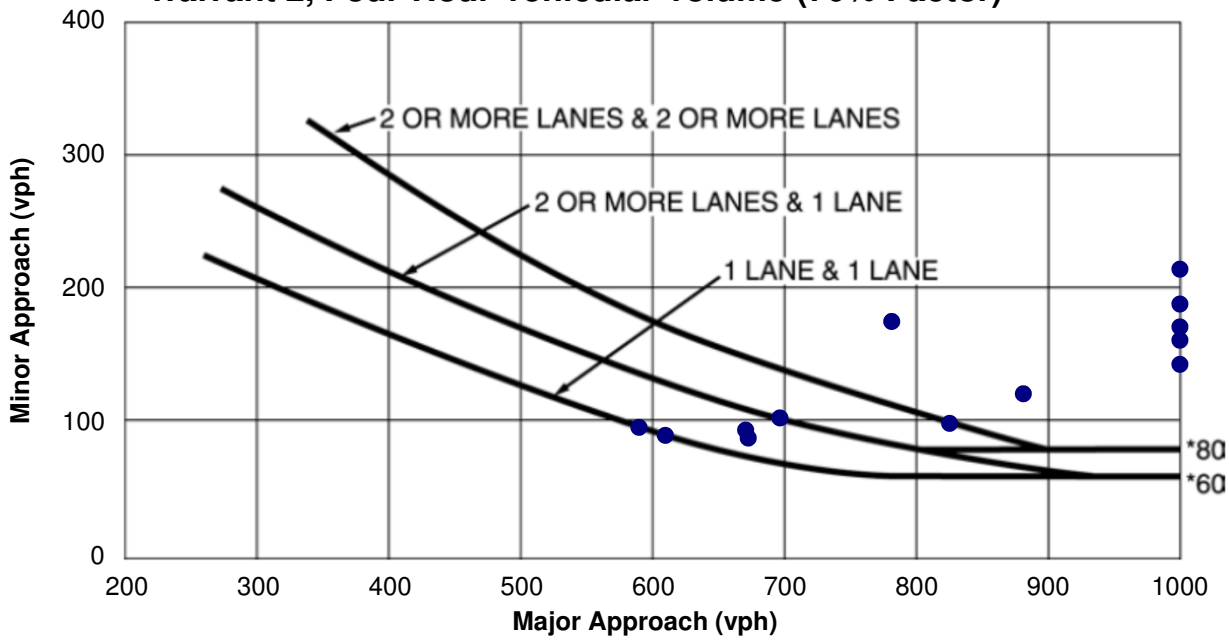
80%	Warrant Met?	No
56% (70%)	Warrant Met?	Yes

US 422 at SR 700

Warrant 2, Four-Hour Vehicular Volume



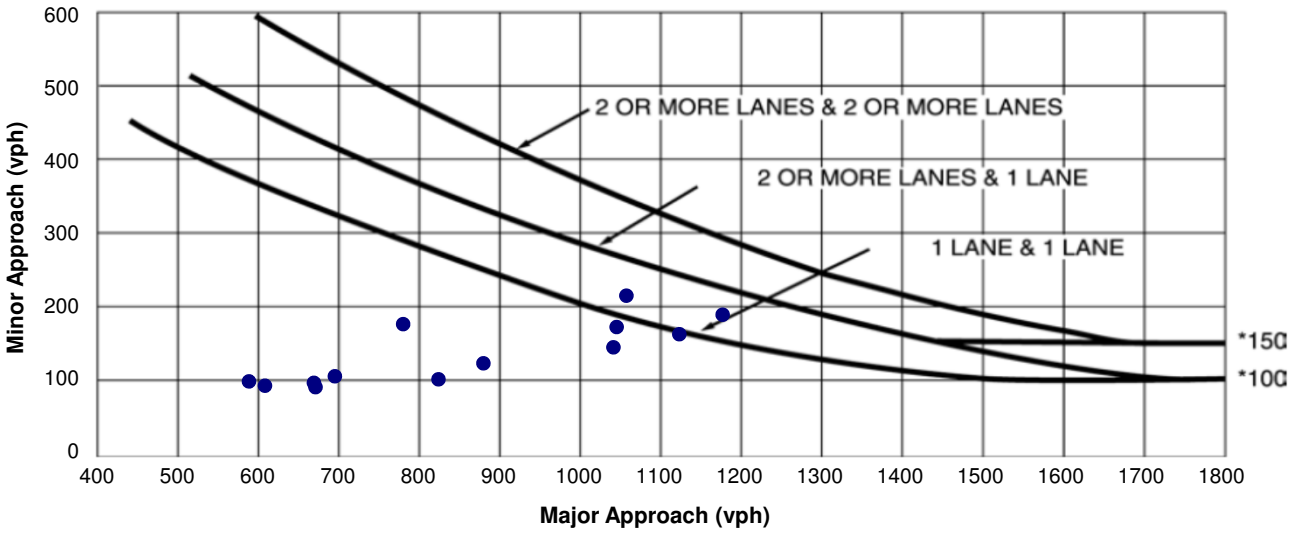
Warrant 2, Four-Hour Vehicular Volume (70% Factor)



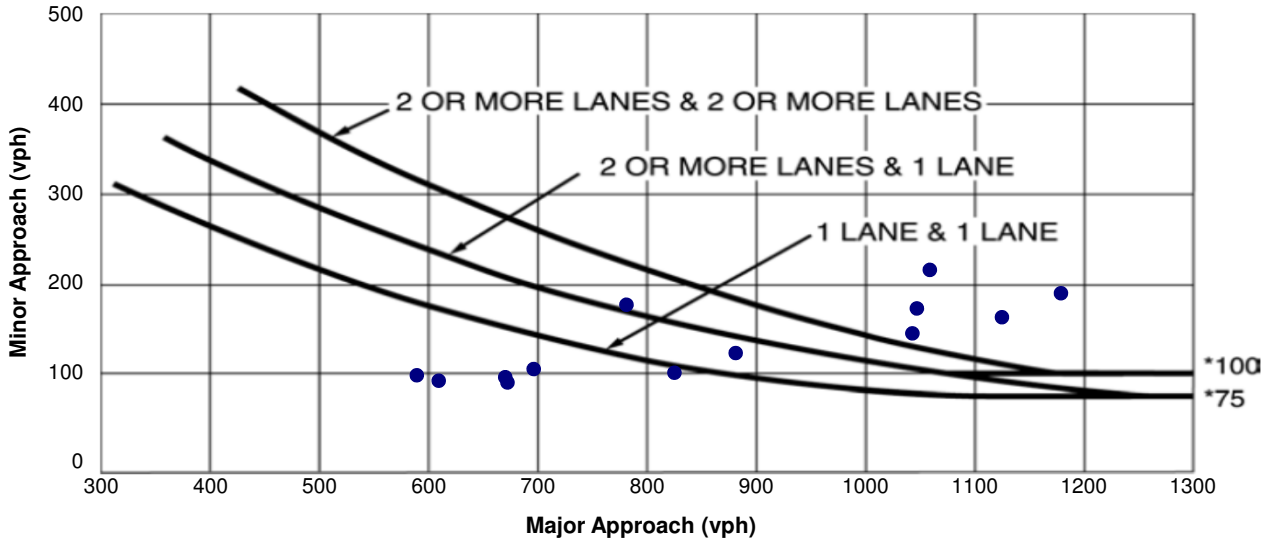
70% Warrant Apply? **Yes**

US 422 at SR 700

Warrant 3, Peak-Hour Vehicular Volume



Warrant 3, Peak-Hour Vehicular Volume (70% Factor)



70% Warrant Apply? **Yes**

APPENDIX G
STORAGE LENGTH CALCULATIONS

STORAGE LANE LENGTHS

Turn lane lengths were calculated for proposed turn lanes at the U.S. Hwy 422 and Rapids Road intersection and the U.S. Hwy 422 and S.R. 700 intersection. Lane lengths were calculated using guidelines specified in the Location and Design Manual Section 401 (Ohio Department of Transportation). Lane lengths based on ODOT standard criteria assume posted speed limits and include vehicle storage and a 125 foot diverging taper. The calculated lengths were compared to the 95th percentile queue lengths generated by SimTraffic modeling software. A recommended length is provided based on the above calculations and engineering judgment. A summary of the lane sizing comparison is shown in **Table G1** with lane sizing calculations appended to this section**.**

Turn lane lengths were calculated using the following parameters:

- 2014 AM & PM peak hour traffic volumes
- 45 MPH design speed for U.S. Hwy 422
- 100 second cycle length

TABLE G1: STORAGE LENGTH SUMMARY –U.S. Hwy 422 Intersections

Movement	Existing Storage Length (with taper)	Turn Lane Sizing (feet)			
		ODOT Calculated*	No Block Turn Lane Length	Synchro 95th Percentile Queue	Recommended Length*
U.S. Hwy 422/Rapids Road					
EB Left Turn	0	300	800	205	300
WB Left Turn	0	175	460	235	175
U.S. Hwy 422/S.R. 700					
EB Left Turn	0	275	830	260	275
WB Left Turn	0	175	360	65	175

* Length includes decceleration, rounded to nearest 5 ft.

GEA-422 -10.93_13.31 Corridor Study

Turn Lane Length Calculations

US 422 & Rapids Road

MOVEMENT:EB Left Turn PM Unsignalized Through		
Movement	EBLT	
Design Speed	45	mph
Cycle Length	60	seconds
Control (Stop or Signal)	Stop	
Through Volume	863	vph
Number of Through Lanes	1	
Turning Volume	145	vph
Number of Turning Lanes	1	
Design Condition	C	A, B, or C
Turning Percentage	14%	
Vehicles Per Cycle	2.4	
Storage Length	120	feet
Deceleration/Taper	125	feet
Calculated Turn Lane Length	245	feet
No Block Distance	N.A.	feet
No Block Turn Lane Length	N.A.	feet

MOVEMENT:WB Left Turn PM Unsignalized Through		
Movement	WBLT	
Design Speed	45	mph
Cycle Length	60	seconds
Control (Stop or Signal)	Stop	
Through Volume	447	vph
Number of Through Lanes	1	
Turning Volume	14	vph
Number of Turning Lanes	1	
Design Condition	B	A, B, or C
Turning Percentage	3%	
Vehicles Per Cycle	0.2	
Storage Length	50	feet
Deceleration/Taper	175	feet
Calculated Turn Lane Length	175	feet
No Block Distance	N.A.	feet
No Block Turn Lane Length	N.A.	feet

MOVEMENT:EB Left Turn PM Signalized		
Movement	EBLT	
Design Speed	45	mph
Cycle Length	100	seconds
Control (Stop or Signal)	Signal	
Through Volume	863	vph
Number of Through Lanes	1	
Turning Volume	145	vph
Number of Turning Lanes	1	
Design Condition	C	A, B, or C
Turning Percentage	14%	
Vehicles Per Cycle	4.0	
Storage Length	175	feet
Deceleration/Taper	125	feet
Calculated Turn Lane Length	300	feet
No Block Distance	798	feet
No Block Turn Lane Length	798	feet

MOVEMENT:WB Left Turn PM Signalized		
Movement	WBLT	
Design Speed	45	mph
Cycle Length	100	seconds
Control (Stop or Signal)	Signal	
Through Volume	447	vph
Number of Through Lanes	1	
Turning Volume	14	vph
Number of Turning Lanes	1	
Design Condition	B	A, B, or C
Turning Percentage	3%	
Vehicles Per Cycle	0.4	
Storage Length	50	feet
Deceleration/Taper	175	feet
Calculated Turn Lane Length	175	feet
No Block Distance	460	feet
No Block Turn Lane Length	460	feet

GEA-422 -10.93_13.31 Corridor Study

Turn Lane Length Calculations

US 422 & SR 700 Intersection

MOVEMENT:EB Left Turn PM Peak hour volumes		
Movement	EBLT	
Design Speed	45	mph
Cycle Length	100	seconds
Control (Stop or Signal)	Signal	
Through Volume	904	vph
Number of Through Lanes	1	
Turning Volume	108	vph
Number of Turning Lanes	1	
Design Condition	C	A, B, or C
Turning Percentage	11%	
Vehicles Per Cycle	3.0	
Storage Length	150	feet
Deceleration/Taper	125	feet
Calculated Turn Lane Length	275	feet
No Block Distance	828	feet
No Block Turn Lane Length	828	feet

MOVEMENT:WB Left Turn PM Peak hour volumes		
Movement	WBLT	
Design Speed	45	mph
Cycle Length	100	seconds
Control (Stop or Signal)	Signal	
Through Volume	337	vph
Number of Through Lanes	1	
Turning Volume	20	vph
Number of Turning Lanes	1	
Design Condition	C	A, B, or C
Turning Percentage	6%	
Vehicles Per Cycle	0.6	
Storage Length	50	feet
Deceleration/Taper	125	feet
Calculated Turn Lane Length	175	feet
No Block Distance	358	feet
No Block Turn Lane Length	358	feet

APPENDIX H
COST ESTIMATE

GEA-422-10.93-13.31
MAIN MARKET ROAD (US 422) AT CLARIDON ROAD (SR 700)
PRELIMINARY CONSTRUCTION ESTIMATE - OCTOBER 14, 2014

ITEM	DESCRIPTION	QUANTITY	UNIT COST	TOTAL COST
201	CLEARING AND GRUBBING	1 LS	$ 10,000.00	$ 10,000.00
202	PAVEMENT REMOVED, ASPHALT	180 SY	$ 12.00	$ 2,160.00
202	WALK REMOVED	SF	$ 1.50	$ -
202	MEDIAN REMOVED	SY	$ 5.00	$ -
202	CURB REMOVED	900 LF	$ 5.00	$ 4,500.00
202	CATCH BASIN OR INLET REMOVED	3 EA	$ 500.00	$ 1,500.00
203	EXCAVATION	850 CY	$ 15.00	$ 12,750.00
203	EMBANKMENT	50 CY	$ 12.00	$ 600.00
204	SUBGRADE COMPACTION	1700 SY	$ 2.00	$ 3,400.00
206	CEMENT STABILIZED SUBGRADE, 16" DEEP	SY	$ 5.50	$ -
252	PAVEMENT SAWING	1550 LF	$ 3.00	$ 4,650.00
254	PAVEMENT PLANING, ASPHALT CONCRETE	4000 SY	$ 3.00	$ 12,000.00
301	ASPHALT CONCRETE BASE 6"	300 CY	$ 125.00	$ 37,500.00
304	AGGREGATE BASE 10"	500 CY	$ 60.00	$ 30,000.00
407	TACK COAT	800 GAL	$ 3.00	$ 2,400.00
448	ASPHALT CONCRETE INTERMEDIATE COURSE 1.5"	100 CY	$ 150.00	$ 15,000.00
448	ASPHALT CONCRETE SURFACE COURSE 1.5"	270 CY	$ 175.00	$ 47,250.00
451	CONCRETE PAVEMENT	SY	$ 75.00	$ -
603	15" CONDUIT	100 LF	$ 75.00	$ 7,500.00
604	CATCH BASIN	3 EA	$ 2,500.00	$ 7,500.00
604	MANHOLE, NO. 3	1 EA	$ 3,000.00	$ 3,000.00
605	6" BASE PIPE UNDERDRAIN	1600 LF	$ 8.00	$ 12,800.00
606	GUARD RAIL	200 LF	$ 20.00	$ 4,000.00
608	4" CONCRETE WALK	SF	$ 5.00	$ -
608	CURB RAMPS	EA	$ 450.00	$ -
609	CURB	900 LF	$ 18.00	$ 16,200.00
609	CONCRETE DRIVE APPROACH	200 SY	$ 75.00	$ 15,000.00
609	6" CONCRETE TRAFFIC ISLAND	SY	$ 50.00	$ -
625	RED LIGHT CAMERAS RELOCATED	EA	$ 7,500.00	$ -
630	SIGNAGE	1 LS	$ 3,500.00	$ 3,500.00
SPECIAL	LANDSCAPING MOUND	LS	$ 15,000.00	$ -
632	TRAFFIC SIGNAL INSTALLATION	1 EA	$ 150,000.00	$ 150,000.00
644	PAVEMENT MARKINGS	1 LS	$ 7,500.00	$ 7,500.00
659	TOPSOIL	100 CY	$ 25.00	$ 2,500.00
659	SEEDING AND MULCHING	2000 SY	$ 3.00	$ 6,000.00
832	SWPPP	1 LS	$ 10,000.00	$ 10,000.00
832	EROSION CONTROL	3500 EA	$ 1.00	$ 3,500.00
			Subtotal	$ 433,000.00
614	MAINTAINING TRAFFIC	1 LS	$ 20,000.00	$ 20,000.00
619	FIELD OFFICE, TYPE B	6 MN	$ 2,000.00	$ 12,000.00
623	CONSTRUCTION LAYOUT STAKES	1 LS	$ 6,500.00	$ 6,500.00
624	MOBILIZATION	1 LS	$ 20,000.00	$ 20,000.00
			Subtotal	$ 492,000.00
			Design Risk (35%)	$ 173,000.00
			Subtotal	$ 665,000.00
			Inflation Cost (10%)	$ 67,000.00
			Total	**$ 732,000.00**

1 Right of way is estimated separately
2 Existing pavement is assumed to be full depth asphalt
3 Pavement widening is assumed to be full depth asphalt
4 Utility relocation not included
5 Construction estimated to occur in mid 2017

GEA-422-10.93-13.31
MAIN MARKET ROAD AT CLARIDON ROAD
PRELIMINARY RIGHT OF WAY ESTIMATE - OCTOBER 14, 2014

Parcel ID	Land Use	Land Value	Structure Value	Total	TOTAL ACREAGE (ACRES)	Structure Impact	Area of Take (SF)	Area: Fee Simple	Area: Temporary	Labor costs	Cost: Fee Simple	Cost: Temporary	Relocation	Sub-Total Cost	Cost to Cure	Comments
067100		$44,200	$0	$44,200	1.910	NO	3000	0.069		$8,950	$10,544	$0		$10,544		TEMPORARY R/W & COST TO CURE NOT CONSIDERED
070400		$74,900	$0	$74,900	8.990	NO	2500	0.057		$8,950	$9,428	$0		$9,428		
043100		$8,900	$0	$8,900	0.260	NO	1700	0.039		$8,950	$10,286	$0		$10,286		
043200		$14,500	$0	$14,500	0.750	NO	1800	0.041		$8,950	$9,749	$0		$9,749		
064000		$9,200	$0	$9,200	0.330	NO	900	0.021		$8,950	$9,526	$0		$9,526		
054000		$8,600	$0	$8,600	0.300	NO	500	0.011		$8,950	$9,279	$0		$9,279		
702578		$14,000	$0	$14,000	4.230	NO	500	0.011		$8,950	$8,988	$0		$8,988		
063900		$38,600	$0	$38,600	2.840	NO	1000	0.023		$8,950	$9,262	$0		$9,262		
									Sub-Totals		**$77,062**	**$0**	**$0**	**$77,062**	**$0**	
Administrative Costs	[(sub-total)x0.15]x1.20													$13,871		
Jury trial Costs	[(sub-total)x0.10]x1.50													$11,559		
Incidental transfer Costs	[(sub-total)x0.90]x0.025													$1,734		
All areas are in acres.														**$104,226**		
											Contingency (50%)			**$52,113**		
											TOTAL COST			**$156,339**		

* Labor Cost Includes the following:
(per ODOT Cost Estimating Procedures For Acquiring Rights of Way)

Titles		Detailed Appraisal		Detailed Appraisal Review	Negotiation	Closings	Project Management
$400		$4,500		$2,000	$1,100	$400	$550

Notes:
1 Existing R/W estimated using GIS parcel lines, where available
2 Where R/W cannot be easily estimated from GIS parcels, existing R/W is assumed to be 1' behind walk
3 Property value based upon auditor's records