TRAFFIC OPERATIONS ANALYSIS

ACKMAN ROAD
Haligus Road to Randall Road

February 2020

Prepared For:

McHenry County Division of Transportation

Prepared By:

TranSystems
EXPERIENCE | Transportation

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Introduction

McHenry County Division of Transportation (MCDOT) has contracted TranSystems to analyze traffic operations for a 3.2-mile segment of Ackman Road, from Haligus Road at the west limit to Randall Road at the east limit. This study evaluates traffic operations for existing conditions and a range of potential design alternatives, to identify the capacity needs of this corridor and its critical intersections.

The objective of this study is to assist MCDOT in identifying the capacity improvements required along this corridor to accommodate the projected traffic growth. The results of this traffic analysis are expected to serve as a component of the decision making process that assists in the identification of proposed design alternatives, along with other considerations such safety, cost, land acquisition, environmental impacts, pedestrian/bike accommodations, and stakeholder feedback.

Study Area

The study corridor extends along Ackman Road for over 3 miles, from Haligus Road to Randall Road. **Exhibit 1** shows this study corridor and the surrounding street network. The study corridor travels through the Villages of Lakewood, Lake in the Hills, and the City of Crystal Lake. Roadway jurisdictions and classifications are shown on Exhibit 1.

Within these study limits, the corridor characteristics vary considerably in terms of geometrics, traffic control, and vehicular volumes. The roadway varies from a three to two-lane cross section, with most of the corridor providing gravel or paved shoulders with painted median, but a section with barrier median and curbs is also present. Traffic control at intersections includes signals, all-way stop-control, two-way stop-control, and Rectangular Rapid Flashing Beacons (RRFB).

Under peak hour conditions, traffic operations for Ackman Road also vary significantly from free flow to congested, depending on the location. In general, the eastern portion of the corridor, from Golf Course Road to Randall Road, experiences higher congestion. West of this section, Ackman Road traffic operates under capacity, except in the area between Redtail Road and Huntley Road. These existing traffic operations are discussed in greater detail in the subsequent sections of this report.

Ackman Road is classified as an arterial from Haligus Road to Randall Road (Illinois Department of Transportation classifies Ackman Road as a major collector from Haligus Road to Lakewood Road, and a minor arterial from Lakewood Road to Randall Road). It carries an Average Daily Traffic (ADT) ranging from approximately 4,000 vehicles per day (vpd) at the west project limits at Haligus Road to 18,000 vpd at its east terminus at Randall Road.

The study corridor is primarily a three-lane roadway, with one travel lane in each direction and a painted median or left turn lane. Right turn lanes are present at Ronan Drive (EB), Albrecht Road (EB), Huntley Road (WB), Amberwood Drive (WB), Manchester Drive (WB), Westport Ridge (EB/WB), and Crimson Drive (WB). This three-lane roadway narrows down to a two-lane cross section from east of Albrecht Road to west of Huntley Road. The segment between Haligus Road and Lakewood Road is also a two-lane roadway as it does not contain any access driveways that would require turn lanes.

There are 14 intersections along the study corridor, including both Randall Road and Haligus Road at the termini. Of the 14 intersections, two are signalized (Randall Road and Golf Course Road), one is an all-way stop (Lakewood Road), and the remaining are stop controlled along the minor side street (Skyridge Drive, Crimson Drive, Westport Ridge, Manchester Drive, Amberwood Drive, Huntley Road, Swanson Road, Redtail Drive, Albrecht Road, Ronan Drive, and Haligus Road). All intersections are full access except for Skyridge Drive which is right in/right out.

Between the stop control at Lakewood Road and traffic signal at Golf Course Road, Ackman Road traffic has open roadway conditions (no stop signs or signal control) with a rolling terrain. The posted speed limit on Ackman Road is 50 mph west of Lakewood Road, and 40 mph east of it. The corridor provides a rural cross section with shoulders and ditches except for the far-east end of the project near Randall Road which is an urban cross section with curb, gutter and raised median.

Existing facilities for pedestrians and bicyclists include a sidewalk on the north side of Ackman Road between Randall Road and Amberwood Drive, and a multi-use path along the south side of Ackman Road between Skyridge Drive and Golf Course Road. West of these limits, these paths deviate away from the Ackman Road Alignment. Marked crosswalks across Ackman Road are provided at Amberwood Drive, Golf Course Road, and Westport Ridge. Dedicated bike lanes are provided on Golf Course Road, and also on Lakewood Road north of Ackman Road.

The land use within the study limits is primarily residential. Multiple schools are located in the vicinity with Crystal Lake South High School and Woods Creek Elementary being the closest. Hope Church is located at the east end of the corridor, in the southwest quadrant of Ackman Road and Randall Road intersection. The corridor is also adjacent to recreational land uses, including Redtail Golf Club, Willows Edge Park, Woodscreek Park, and Fetzner Park. There are also two commercial complexes, Lakewood Commons and Prairie Shops, between Redtail Drive and Lakewood Road.

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CADD FILE NAME
NOTE BOOK
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PROFILE | SURVEYED | BY | DATE
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BM. NOTED
STRUCTURE NOTATNS CHKD
NOTE BOOK
NO.

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McHENRY COUNTY
DIVISION OF TRANSPORTATION

EXHIBIT 1
ACKMAN ROAD TRAFFIC OPERATIONS ANALYSIS
STUDY AREA MAP

SCALE: 1"=50' | SHEET OF SHEETS | STA. | TO STA.

F.A.U. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
3873	18-00492-00-ES	MCHENRY		
		CONTRACT NO.		
	ILLINOIS FED. AID PROJECT			

Methodology

The purpose of this study is to evaluate existing traffic operations, identify current operational deficiencies, and evaluate roadway lane configurations which provide acceptable vehicular capacity for current and future traffic volumes. This analysis was conducted in three main stages:

1. Existing Conditions

The first stage of the study evaluated the existing traffic conditions along the study corridor. This included an inventory of roadway lane configurations, traffic controls, and collection of peak hour traffic volumes. Data collection was supplemented by general observations of traffic operations within the study limits during field visits. This data was used to model the existing traffic conditions using Synchro (version 10.2) traffic simulation software and evaluate existing traffic performance.

2. Projected Traffic under Existing Roadway Conditions (No-Build Conditions)

The second stage consisted of estimating 2050 design year traffic volumes using projections provided by the Chicago Metropolitan Agency for Planning (CMAP). Traffic operations under this stage were analyzed for a hypothetical case, using projected 2050 traffic volumes under the existing traffic control and roadway geometrics (without any infrastructure improvements).

3. Evaluation of Potential Design Options (2050 Build Conditions)

Under the final stage of the analysis, any operational problems identified in the first two stages were used to develop a range of potential design options consisting of geometric and traffic control modifications. These design options were analyzed under 2050 traffic volumes to compare their traffic performance against each other, as well as the existing and No-Build conditions.

Data Collection

Traffic Volumes

Traffic data for this study was obtained by MCDOT through a separate contract with Gewalt Hamilton Associates (GHA). Intersection turning movement counts with vehicle classification were conducted in 15-minute increments for a 24-hour period on Tuesday, December 4, 2018 using Miovision's video-based data collection platform at the following nine intersections along the Ackman Road corridor:

- Haligus Road & Ackman Road
- Lakewood Road & Ackman Road
- Redtail Drive & Ackman Road
- Swanson Road & Ackman Road
- Huntley Road & Ackman Road
- Amberwood Drive & Ackman Road
- Golf Course Road & Ackman Road
- Westport Ridge & Ackman Road
- Randall Road & Ackman Road

The weekday AM and PM peak hours were identified from this data and form the basis for the Synchro models of the existing peak period traffic conditions.

The AM peak period for almost all intersections within the study limits occurs from 6:45 am to 7:45 am; with the exception of the intersections at Lakewood Road (7:00 to 8:00 am) and Haligus Road (7:15 to 8:15 am).

The PM peak period was found to vary within the study limits between the hours of 4:30 to 5:30 pm and 5:15 to 6:15 pm. However, for most of the intersections, the PM peak occurred from 5:00 to 6:00 pm (Lakewood Road to Huntley Road) or 5:15 to 6:15 pm (Amberwood Drive to Westport Ridge).

The highest AM and PM volumes at each intersection was used to model the existing peak traffic conditions for a conservative analysis, rather than normalizing the volumes for the entire study area.

These traffic counts were also used to estimate existing Average Daily Traffic (ADT) volumes. These existing ADTs were used by CMAP to develop 2050 ADTs, as discussed in the next section.

The existing peak hour volumes and ADT are summarized in **Exhibit 2**. Detailed traffic count information is included in **Appendix A**.

Design Year Traffic Projections

The design year for the study corridor is 2050, consistent with the CMAP *ON TO 2050* comprehensive regional plan. The study corridor was divided into three distinct segments for evaluation. The segments are described in the following section. The 2050 traffic projections for the three roadway segments along the corridor were obtained from CMAP under two future scenarios:

- Scenario 1: Existing roadway network with Ackman Road terminating at Haligus Road.
- Scenario 2: Extension of Ackman Road to IL Route 47, approximately 1.25 miles to the west.

The extension of Ackman Road will provide direct access between two principal arterials, IL Route 47 and Randall Road. This creates a new east-west connection that can provide an alternate route to Algonquin Road, located two miles to the south. Under Scenario 2, the new extension of Ackman Road is expected to be classified as a minor arterial.

Exhibit 3 lists the existing ADT, as well as the 2050 ADT volumes with and without the extension of Ackman Road to IL Route 47. Due to the new connectivity provided by extending Ackman Road, Scenario 2 projects higher traffic volumes in the study limits for year 2050. For a conservative analysis, modeling of future traffic conditions are based on these higher projections.

2050 ADT were used to develop DHV's based on the CMAP recommended growth rates. This resulted in some imbalance due to different growth rates on the cross streets. However, the imbalance was adjusted using the method of iterative proportional fitting based on the process discussed in *NCHRP Report 765: Analytical Travel Forecasting Approaches for Project-Level Planning and Design*.

Projected 2050 Design Hourly Volumes (DHV) and ADT are shown in **Exhibit 4**.

For two of the proposed design options, the existing roadway network and traffic routing is modified by means of roadway re-alignment or access control. One of the options re-aligns Swanson Road to create a four-legged intersection at Redtail Drive (Segment 2 - Options 4 & 5). Another option converts the Swanson Road intersection to a Right-In/Right-Out intersection and reroutes all left turns at this intersection via u-turn movements at Redtail Drive and Huntley Road (Segment 2 - Option 6). The redistributed DHV and ADT volumes for these design alternatives are shown in **Exhibits 5 and 6**, respectively.

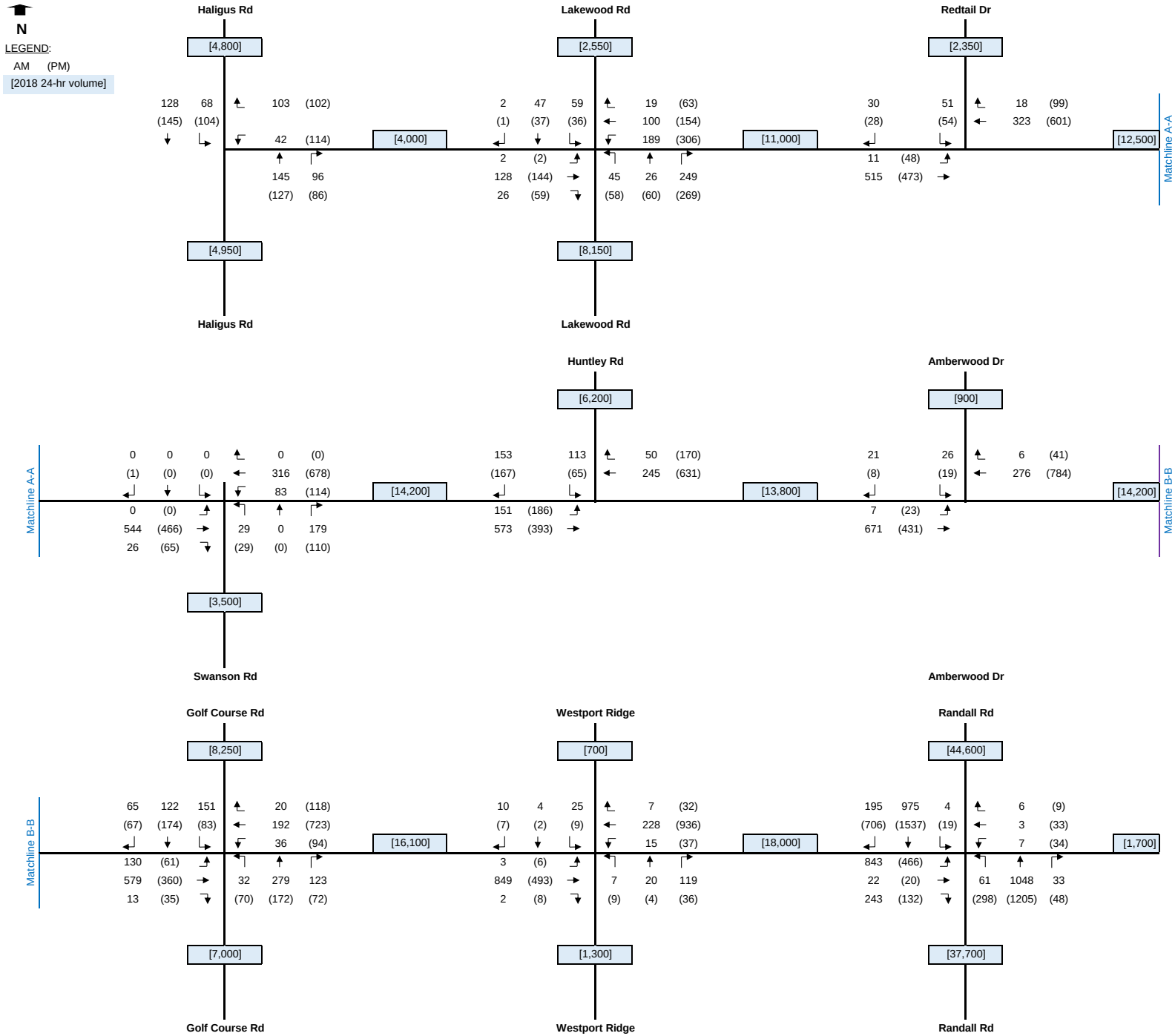


EXHIBIT 2
EXISTING (2018) TRAFFIC VOLUMES
AM (PM) Peak Hour and 24-Hour Counts

Roadway Segment	Current (2018) Traffic	2050 Traffic (w/o extension to IL-47)			2050 Traffic (w/ extension to IL-47)		
	ADT	ADT	% Growth	Annual % Growth	ADT	% Growth	Annual % Growth
IL-47 - N of Ackman	17,900	26,300	47%	1.21%	28,100	57%	1.42%
IL-47 - S of Ackman	17,900	26,300	47%	1.21%	29,100	63%	1.53%
Haligus Rd - N of Ackman	4,800	6,600	38%	1.00%	7,100	48%	1.23%
Haligus Rd - S of Ackman	4,950	7,900	60%	1.47%	5,600	13%	0.39%
Lakewood Rd - N of Ackman	2,550	6,100	139%	2.76%	6,200	143%	2.82%
Lakewood Rd - S of Ackman	8,150	9,300	14%	0.41%	10,200	25%	0.70%
Redtail Dr - N of Ackman	2,350	3,000	28%	0.77%	3,000	28%	0.77%
Swanson Rd - S of Ackman	3,500	5,500	57%	1.42%	5,800	66%	1.59%
Huntley Rd - N of Ackman	6,200	8,800	42%	1.10%	9,200	48%	1.24%
Amberwood Dr - N of Ackman	900	1,200	33%	0.90%	1,200	33%	0.90%
Golf Course Rd - N of Ackman	8,250	11,300	37%	0.99%	11,400	38%	1.02%
Golf Course Rd - S of Ackman	7,000	11,200	60%	1.48%	11,400	63%	1.54%
Westport Ridge - N of Ackman	700	1,000	43%	1.12%	1,000	43%	1.12%
Westport Ridge - S of Ackman	1,300	1,700	31%	0.84%	1,700	31%	0.84%
Randall Rd - N of Ackman	44,600	53,400	20%	0.56%	53,500	20%	0.57%
Randall Rd - S of Ackman	37,700	44,100	17%	0.49%	44,100	17%	0.49%
Ackman Rd - IL-47 to Haligus Rd	-	-	-	-	4,600	-	-
Ackman Rd - Haligus Rd to Lakewood Rd	4,000	5,700	43%	1.11%	7,500	88%	1.98%
Ackman Rd - Lakewood Rd to Redtail Rd	11,000	15,100	37%	0.99%	16,100	46%	1.20%
Ackman Rd - Redtail Rd to Swanson Rd	12,500	16,800	34%	0.93%	17,800	42%	1.11%
Ackman Rd - Swanson Rd to Huntley Rd	14,200	17,400	23%	0.64%	18,100	27%	0.76%
Ackman Rd - Huntley Rd to Amberwood Dr	13,800	17,200	25%	0.69%	17,500	27%	0.75%
Ackman Rd - Amberwood Dr to Golf Course Rd	14,200	17,800	25%	0.71%	18,100	27%	0.76%
Ackman Rd - Golf Course Rd to Westport Ridge	16,100	18,900	17%	0.50%	19,000	18%	0.52%
Ackman Rd - Westport Ridge to Randall Rd	18,000	20,900	16%	0.47%	21,000	17%	0.48%
Ackman Rd - E of Randall Rd	1,700	2,200	29%	0.81%	2,200	29%	0.81%

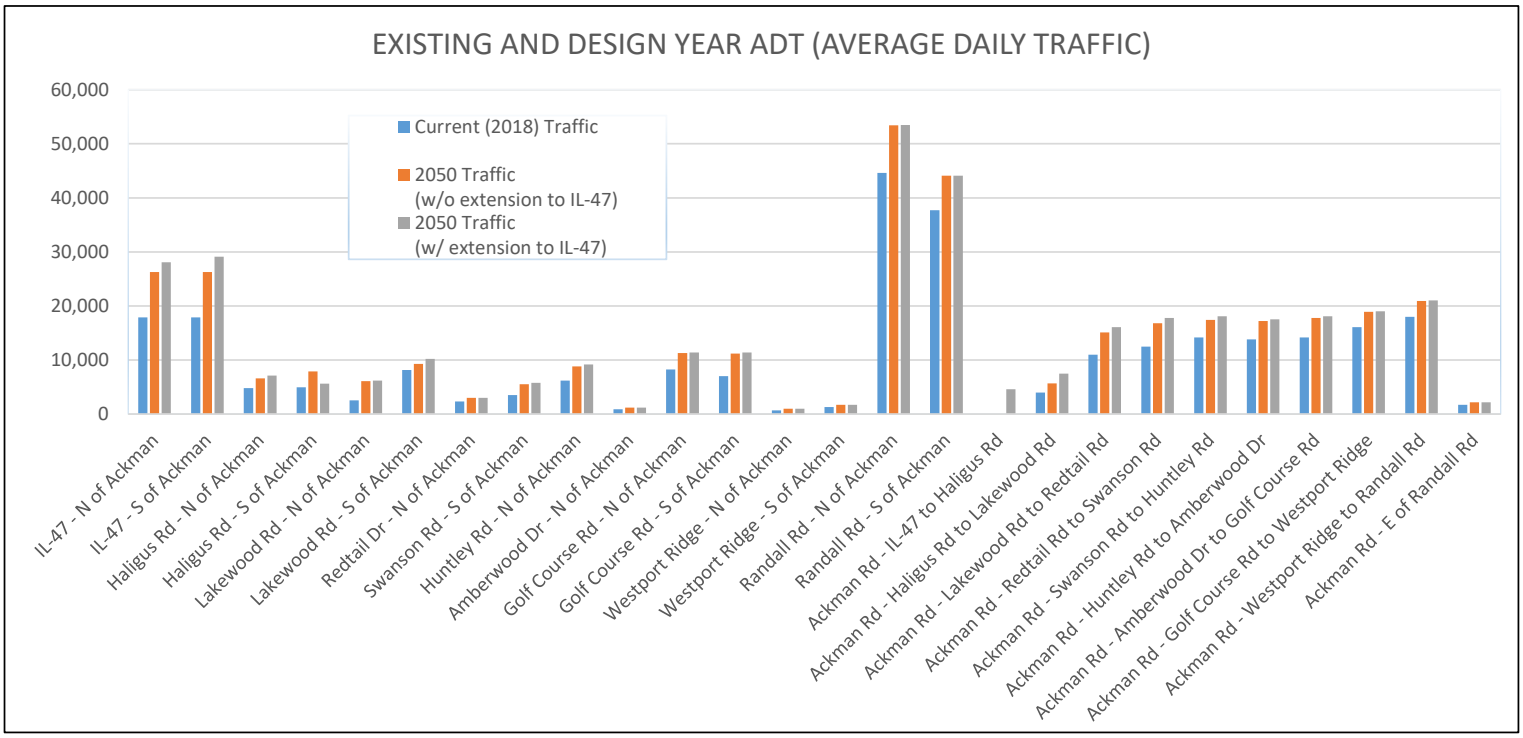


EXHIBIT 3
EXISTING AND DESIGN YEAR ADT (AVERAGE DAILY TRAFFIC)

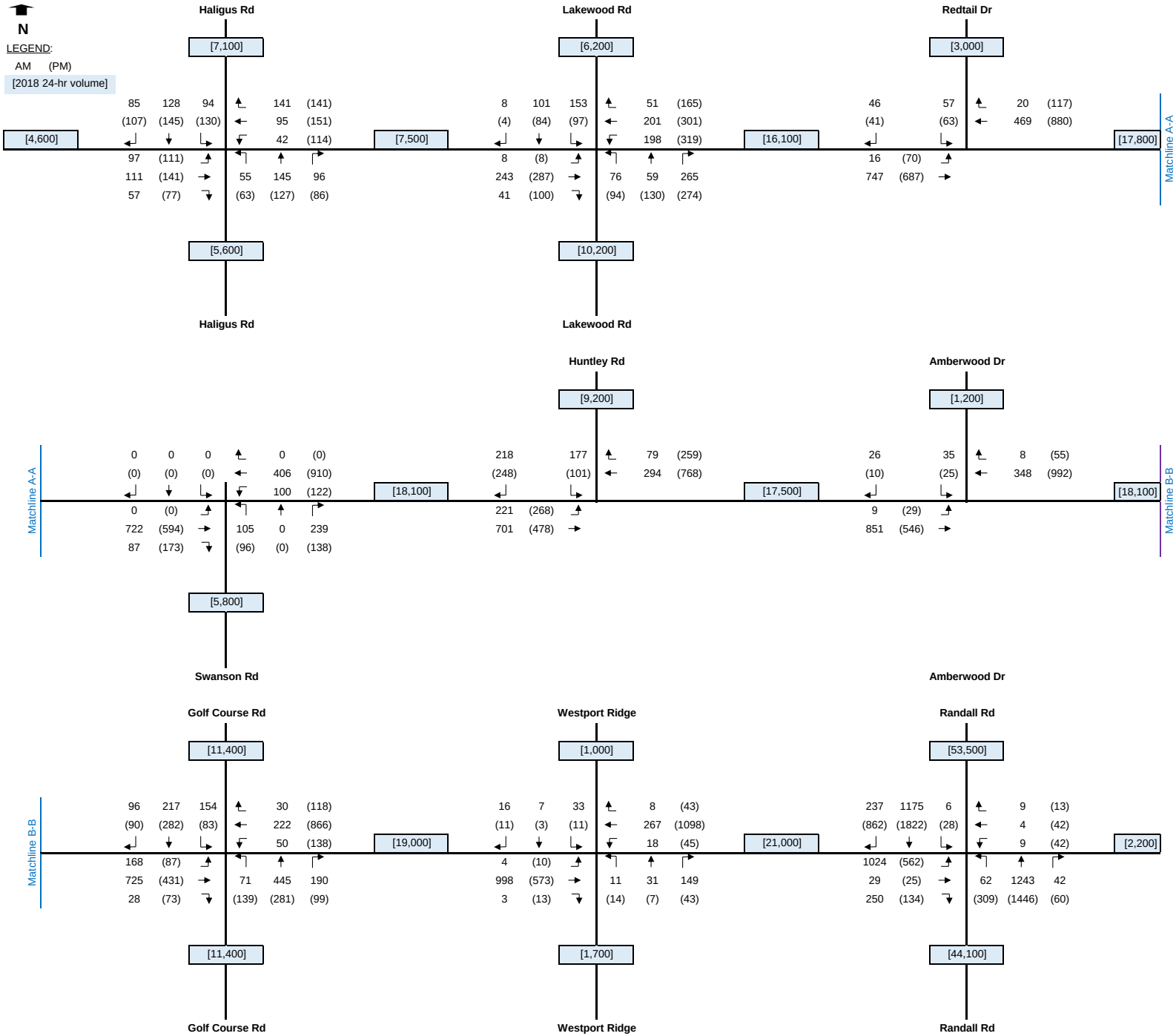


EXHIBIT 4
2050 (DESIGN YEAR) TRAFFIC VOLUMES
(With IL-47 Extension)
AM (PM) Peak Hour and 24-Hour Counts

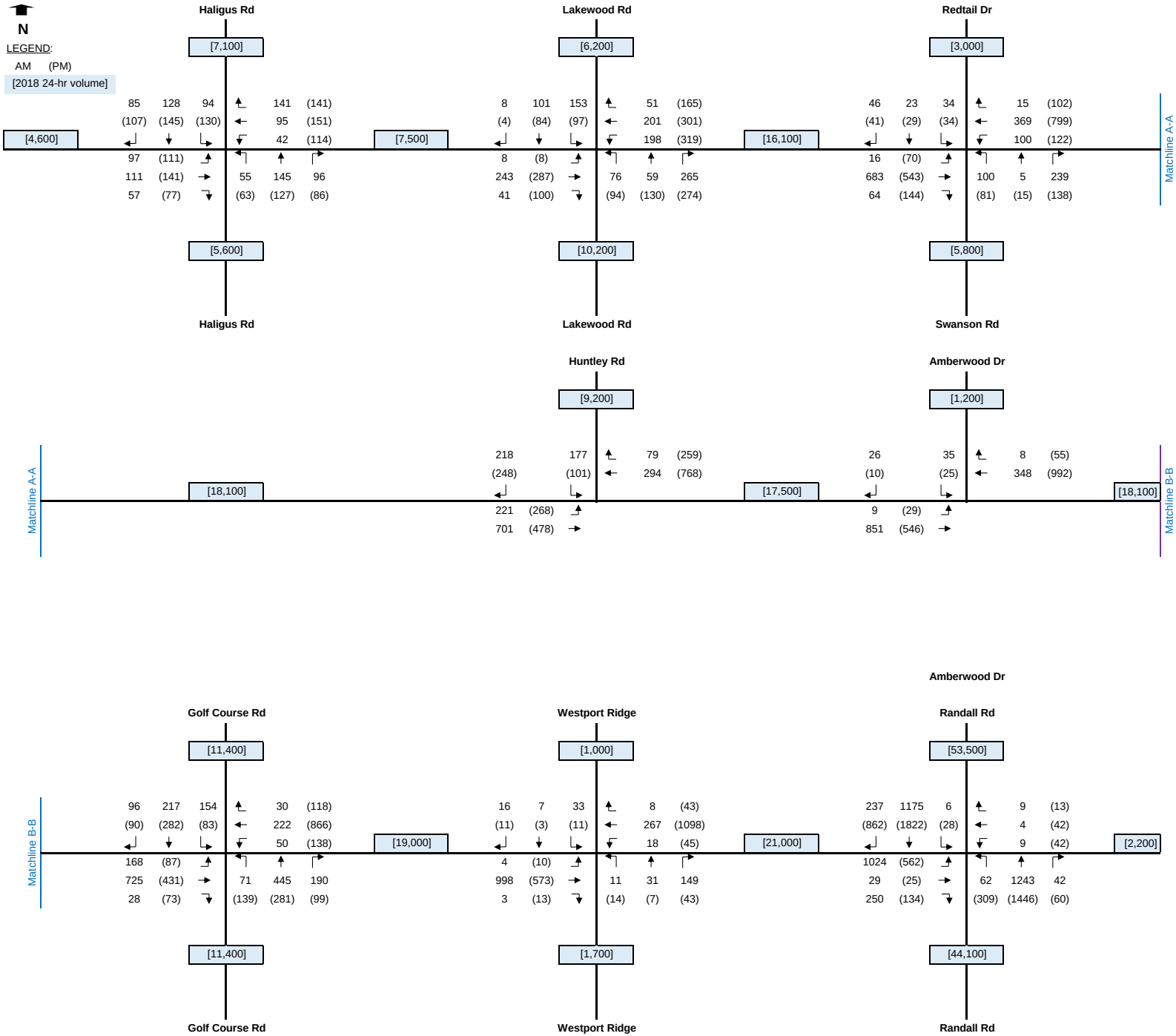


EXHIBIT 5

2050 (DESIGN YEAR) TRAFFIC VOLUMES - FOR SWANSON ROAD RE-ALIGNMENT TO REDTAIL DRIVE

(SEGMENT 2 - OPTIONS 4 & 5)

AM (PM) Peak Hour and 24-Hour Counts

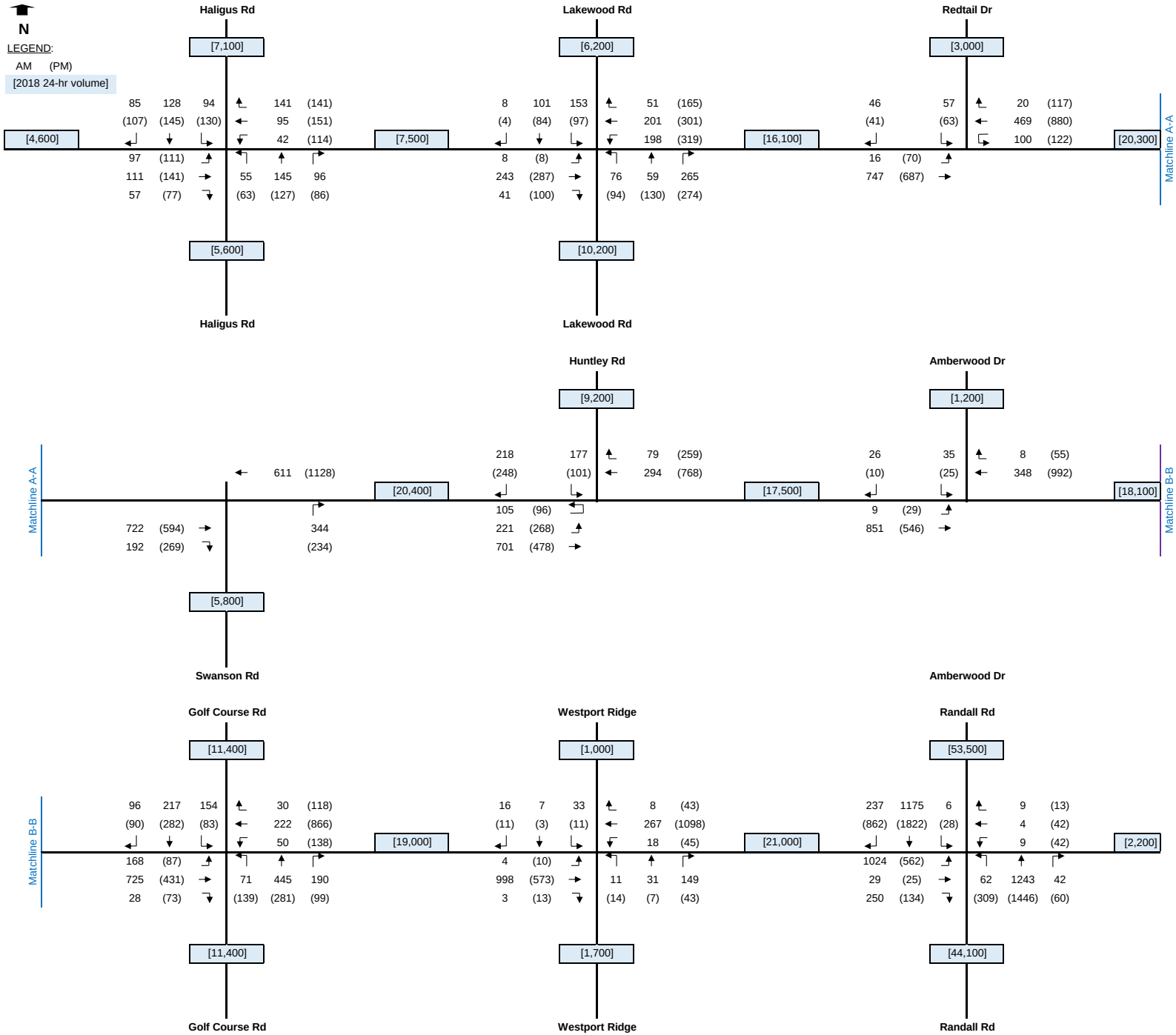


EXHIBIT 6

2050 (DESIGN YEAR) TRAFFIC VOLUMES - FOR SWANSON ROAD RIGHT-IN/RIGHT-OUT CONFIGURATION

(SEGMENT 2 - OPTION 6)

AM (PM) Peak Hour and 24-Hour Counts

Proposed Design Options

A range of design options were developed for the Ackman Road corridor with the aim of alleviating existing and potential issues related to traffic safety, capacity and access. Note that this technical document details the evaluations of these viable options solely from a traffic operations perspective and identifies the capacity improvement needs.

The corridor was divided in to three distinct segments so that solutions for each segment can be explored independently. This demarcation is based on the areas within which traffic operations or geometrics are interdependent between intersections. The segment limits include the operational/influence area of the outlying intersections.

Segment 1 extends from Haligus Road to Lakewood Road. Traffic operations within this segment can be considered independent of the operations within Segment 2, which extends from Redtail Drive to Amberwood Drive.

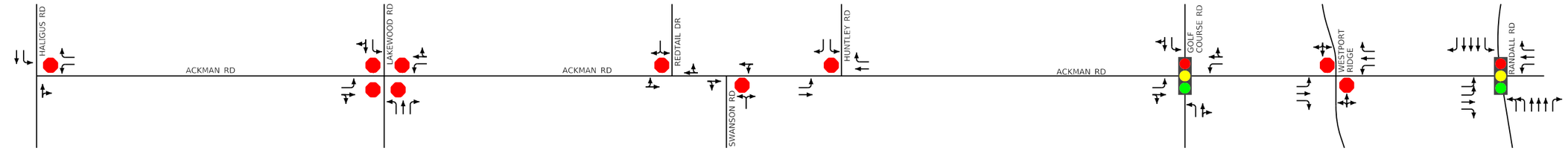
Segment 2 extends from Redtail Drive to Huntley Road, and include the three intersections at Redtail Drive, Swanson Road and Huntley Road. These intersections are spaced close enough that peak hour traffic operations at each location can potentially interact with the adjacent intersections within the segment. Additionally, modifications to the east or west legs of these intersections will influence the design at the adjacent intersection. Therefore, any proposed design options within Segment 2 must consider the roadway geometrics and traffic operations for this segment as a whole.

Segment 3, extends from Golf Course Road to Randall Road and considers the primary intersections of Golf Course Road, West Port Ridge, and Randall Road. Similar to Segment 2, the traffic operations within Segment 3 are interdependent between intersections as peak period queues have been observed to extend to the next upstream intersection.

Ten proposed design options are explored under this study: two for Segment 1, six for Segment 2, and two for Segment 3. Different combinations of alternatives from each segment can result in 24 variations for the study corridor. Corridor segmentation simplifies the decision-making process by allowing us to consider the proposed options for each segment independently.

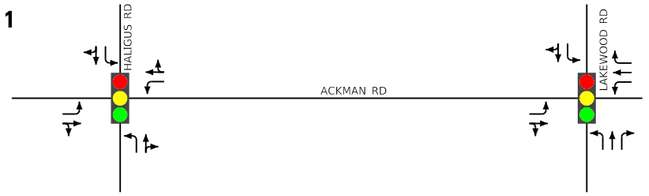
As such, this traffic operations analysis will evaluate multiple design options for each of the three Ackman Road segments. These design options are described below and summarized in **Exhibit 7**.

EXISTING CONDITIONS

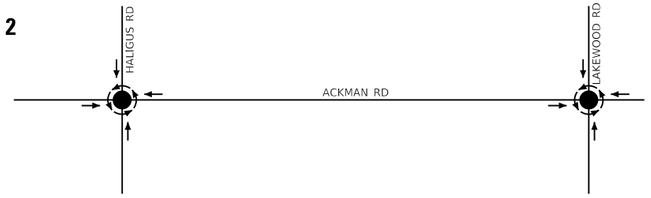


SEGMENT 1

OPTION 1

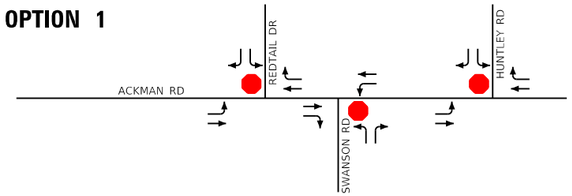


OPTION 2



SEGMENT 2

OPTION 1



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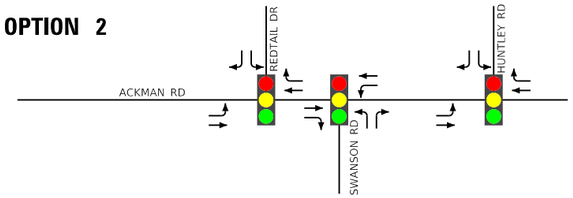
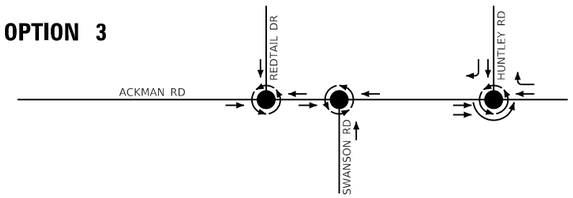


OPTION 3



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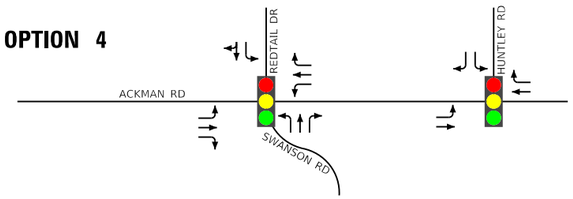

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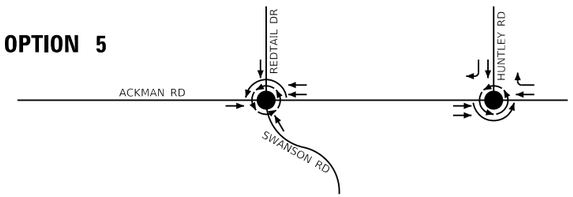

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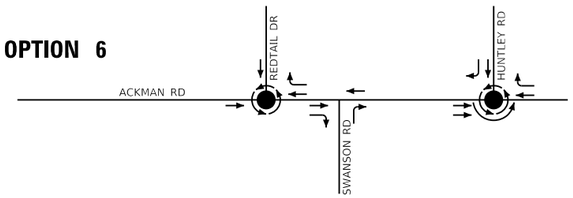
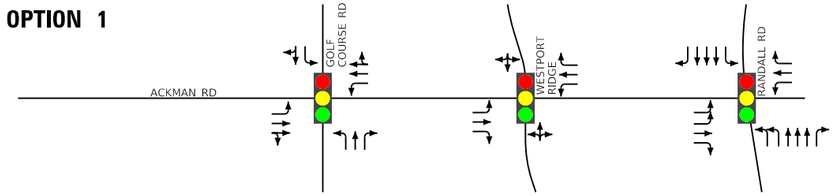
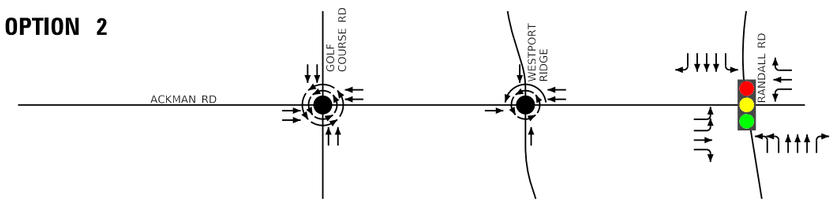


SEGMENT 3

OPTION 1



OPTION 2



LEGEND

- STOP CONTROLLED INTERSECTION
- SIGNALIZED INTERSECTION
- ROUNDABOUT
- LANE CONFIGURATION

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PROFILE: SURVEYED ___ PLOTTED ___ CROSS CHECKED ___ BM. NOTED ___ STRUCTURE NO(S)/NS CHKD ___ NOTE BOOK ___ NO. ___ | BY | DATE

Tran Systems
1475 EAST WOODFIELD ROAD, SUITE 600
SCHAUMBURG, ILLINOIS 60173
(847) 605-9600

FILE NAME = Alternatives	USER NAME = bmsetzke	DESIGNED -	REVISED -
		DRAWN -	REVISED -
	PLOT SCALE = 50 SCALE	CHECKED -	REVISED -
	PLOT DATE = 1/24/2020	DATE -	REVISED -

STATE OF ILLINOIS
DEPARTMENT OF TRANSPORTATION

EXHIBIT 7
ACKMAN ROAD FEASIBILITY STUDY
SUMMARY OF DESIGN ALTERNATIVES

SCALE: N/A | SHEET 1 OF 1 SHEETS | STA. | TO STA.

F.A.U. RTE.	SECTION	COUNTY	TOTAL SHEETS	SHEET NO.
3873	18-00492-00-ES	MCHENRY	1	1
		CONTRACT NO.		
		ILLINOIS FED. AID PROJECT		

Segment 1: Haligus Road to Lakewood Road

Option 1: Install traffic signals at Haligus Road and Lakewood Road. Add left turn lanes to all approaches of both intersections, and right turn lanes for the northbound and westbound approaches of the intersection with Lakewood Road.

The intersection of Ackman Road and Lakewood Road did not meet traffic signal warrants for existing or projected 2050 conditions. However, traffic signal operations were analyzed at this intersection for the purpose of this feasibility study to evaluate potential capacity improvements under this option.

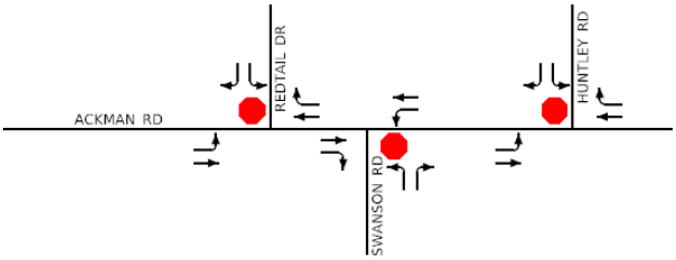
Segment 1, Option 1

Option 2: Construct roundabouts at Haligus Road and Lakewood Road. Both roundabouts are proposed to have single circulatory lanes and single lane approaches in all directions.

Segment 1, Option 2

Segment 2: Redtail Drive to Huntley Road

Option 1: Add left turn lanes on the eastbound and southbound approaches of the Redtail Drive intersection. Add left turn lanes on the northbound and westbound approaches of the Swanson Road intersection. Add new right turn lanes on the approaches that lie between the Redtail and Swanson intersections. Extend the auxiliary lanes at Huntley Road intersection to meet design criteria. Maintain the existing traffic control (stop control on minor street) at Redtail, Swanson and Huntley intersections.

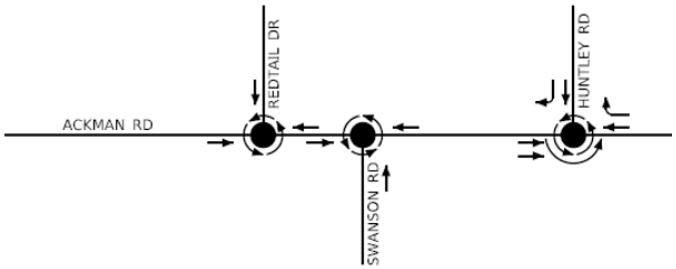


Segment 2, Option 1

Option 2: Install traffic signals at Redtail Drive, Swanson Road, and Huntley Road; incorporating the left and right turn lanes proposed under Option 1. All three signals will be interconnected under this option.

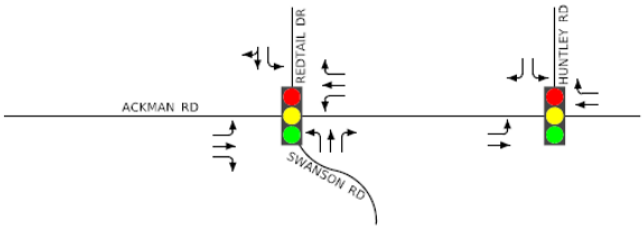
Segment 2, Option 2

Option 3: Construct roundabouts at Redtail Drive, Swanson Road, and Huntley Road intersections. The roundabouts at Redtail Drive and Swanson Road are proposed to have a single circulatory lane and single lane approaches in all three directions. The roundabout at Huntley Road is proposed to have a single circulatory lane on the north half. Two circulatory lanes are proposed on the south half of this intersection for the eastbound through movement. As such, two eastbound lanes will be provided on approach (west) and departure (east) legs of the roundabout. Single lane approach with a right turn bypass lane is proposed for both the southbound and westbound approaches.



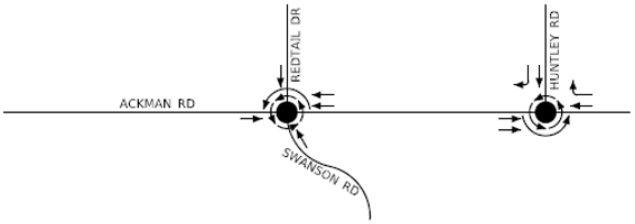
Segment 2, Option 3

Option 4: Realign Swanson Road to the west to form the south leg of the Redtail Drive intersection. Eliminate the current intersection of Swanson and Ackman, terminating Swanson Road in a cul-de-sac south of Ackman Road. Install traffic signals at the new Swanson/Redtail intersection and the Huntley intersection, incorporating appropriate turn lane channelization. All signals in this segment will be interconnected under this option.



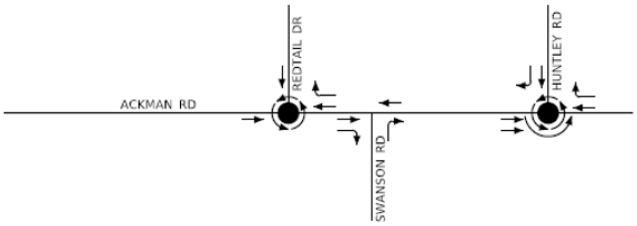
Segment 2, Option 4

Option 5: Realign Swanson Road to the west to form the south leg of the Redtail Drive intersection. Eliminate the current intersection of Swanson and Ackman, terminating Swanson Road in a cul-de-sac south of Ackman Road. Construct roundabouts at the new Redtail/Swanson intersection and the Huntley intersection. The roundabout at Redtail/Swanson is proposed to have a single circulatory lane on the south half. Two circulatory lanes are proposed on the north half of this intersection for the westbound through movement. As such, two westbound lanes will be provided on approach (east) and departure (west) legs of the roundabout. A single lane is proposed for each of the southbound, northbound, and eastbound approaches. The roundabout at Huntley Road is proposed to have the same lane configurations as those described for this intersection under Option 3.



Segment 2, Option 5

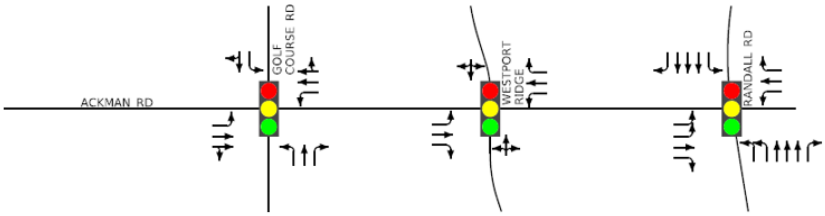
Option 6: Implement access-control between the intersections of Redtail Drive and Huntley Road, eliminating all left-turn movements in this section and converting the Swanson Road intersection to a Right-In/Right-Out access. This roadway section (between Redtail and Huntley) will provide one westbound lane and two eastbound lanes, with the right eastbound lane proposed to serve as a lane-add and lane-drop at Swanson Road. Roundabouts will be provided at Redtail and Huntley under this option. This will provide full access at Swanson and local driveways via “u-turn” movements at the roundabouts. The roundabout at Redtail Drive is proposed to have a single circulatory lane and a single lane in all three directions, with a right turn bypass lane on the westbound approach. The roundabout at Huntley Road is proposed to have the same lane configurations as those described for this intersection under Option 3.



Segment 2, Option 6

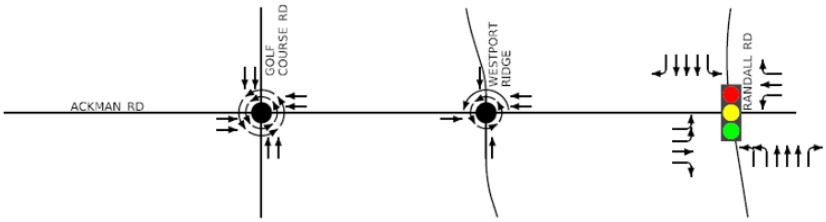
Segment 3: Golf Course Road to Randall Road

Option 1: Add auxiliary through lanes and northbound right-turn lane at the signalized intersection of Golf Course Road. Install traffic signal at Westport Ridge. Under this option, it is also recommended that the signals at Golf Course Road and Westport Ridge be interconnected with the system at Randall Road.



Segment 3, Option 1

Option 2: Construct roundabouts at Golf Course Road and Westport Ridge intersections. The roundabout at Golf Course Road is proposed to have two circulatory lanes throughout the roundabout, with dual lane approaches in all directions. Prepared traffic models and associated results indicated that three circulatory lanes could be considered for the roundabout at Golf Course Road. However, three circulatory lane roundabout configurations are relatively uncommon and generally more difficult to navigate for motorists, therefore was left out of this analysis. The roundabout at Westport Ridge is proposed to have a single circulatory lane, except for on the north side of the intersection where two circulatory lanes are proposed for westbound movements. As such, a dual lane approach is proposed for the east leg of the roundabout. Single lane approaches are proposed for the north, south, and west legs of the intersection.



Segment 3, Option 2

Signal Warrant Analyses

Signal warrant analyses were performed for the seven unsignalized intersections in the study limits under current and 2050 traffic volumes by Gewalt Hamilton Associates. None of these intersections met signal warrants under existing traffic demand. Under 2050 traffic projections, the intersections at Haligus, Redtail, Swanson, Huntley and Westport Ridge met one or more signal warrants for vehicular volumes. A summary of the signal warrant results is provided in **Exhibit 8**. For the purpose of this feasibility study, traffic signal installations were considered viable proposed design options at all intersections within this study limits, irrespective of the results of the signal warrant analysis.

EXHIBIT 8
SUMMARY OF SIGNAL WARRANT ANALYSIS

	Existing Traffic				Design Year (2050) Traffic			
Intersection	Warrant 1 (8 hr traffic)	Warrant 2 (4 hr traffic)	Warrant 3 (Peak hr traffic)	Signal Warrants Met?	Warrant 1 (8 hr traffic)	Warrant 2 (4 hr traffic)	Warrant 3 (Peak hr traffic)	Signal Warrants Met?
Haligus Rd & Ackman Rd	No	No	No	No	No	No	Yes	Yes
Lakewood Rd & Ackman Rd	No	No	No	No	No	No	No	No
Redtail Dr & Ackman Rd	No	No	No	No	Yes	Yes	Yes	Yes
Swanson Rd & Ackman Rd	No	No	No	No	Yes	Yes	Yes	Yes
Huntley Rd & Ackman Rd	No	No	No	No	Yes	Yes	Yes	Yes
Amberwood Dr & Ackman Rd	No	No	No	No	No	No	No	No
Westport Ridge & Ackman Rd	No	No	No	No	No	No	Yes	Yes

Note: Signal warrant analyses conducted by Gewalt Hamilton Associates (GHA).

Traffic Operations and Analysis

Under the procedures set in the *Highway Capacity Manual*, traffic performance at intersections is measured as a function of delay (in seconds) caused by the intersection operations. On the basis of this delay, operational performance of a traffic movement or intersection is summarized by Level of Service (LOS) criteria ranging from A (best) to F (worst). Additional metrics, such as estimates of 95th percentile queues and volume-to-capacity ratios (v/c), also provide a useful indicator of intersection performance.

In some cases, queues observed in the field may exceed the estimates provided by Synchro. This is because Synchro's model for 50th and 95th percentile queue lengths does not provide a reliable estimate when the v/c ratio is greater than 1. Under these conditions queueing can theoretically be much longer than the values indicated by the model. These conditions are indicated by footnotes ~ and # in the Synchro output. [1]

[1] The ~ and # footnotes indicate that the volume modeled exceeds capacity. The ~ footnote indicates that the approach is above capacity and the queue could be much longer. The queue length is theoretically infinite and blocking problems may occur. The value shown for the 50th percentile queue is sufficient to hold one cycle of traffic. This will prevent capacity problem from being compounded by insufficient storage space.

Traffic operations within the study limits were analyzed using Synchro traffic simulation software for AM and PM peaks under the following scenarios:

- Existing traffic volume under current traffic control and roadway conditions
- Projected 2050 traffic under current traffic control and roadway conditions (No-Build Conditions)
- Projected 2050 traffic under various proposed design options:
    - Segment 1: Haligus Road to Lakewood Road
        - Option 1: Traffic Signals at both intersections
        - Option 2: Roundabouts at both intersections
    - Segment 2: Redtail Road to Huntley Road
        - Option 1: Lane Channelization at Redtail and Swanson
        - Option 2: Traffic Signals at Redtail, Swanson and Huntley
        - Option 3: Roundabouts at Redtail, Swanson and Huntley
        - Option 4: Swanson Re-alignment to Redtail, with traffic signals at Redtail/Swanson and Huntley
        - Option 5: Swanson Re-alignment to Redtail, with roundabouts at Redtail/Swanson and Huntley
        - Option 6: Roundabouts at Redtail and Huntley, Right-In/Right-Out at Swanson
    - Segment 3: Golf Course Road to Randall Road
        - Option 1: Traffic Signals at Golf Course Rd and Westport Ridge
        - Option 2: Roundabouts at Golf Course Rd and Westport Ridge

Details for these lane configurations and traffic control alternatives are discussed under the previous section on ”Proposed Design Options” and summarized under **Exhibit 7**.

A summary of traffic operations under these scenarios is provided in Tables 1, 2 and 3 (for Segments 1, 2, and 3, respectively). Areas with potential capacity issues are highlighted in blue (LOS E) or red (LOS F). These results are discussed below for critical locations under each segment.

In general, due to the primarily residential land use adjacent to the study corridor, the traffic flow along the corridor is highly directional; with heavy eastbound travel in the AM peak and larger westbound flow in the PM peak.

Note that the No-Build conditions are analyzed as a hypothetical scenario. The 2050 traffic projections may not be attained under the existing roadway or traffic control due to the capacity constraints.

The # footnote indicates that the volume for the 95th percentile cycle exceeds capacity. This traffic was simulated for two complete cycles of 95th percentile traffic to account for the effects of spillover between cycles. If the reported v/c <1 for this movement, the methods used represent a valid method for estimating the 95th percentile queue. (Source: Synchro Studio (version 10) User Guide)

Segment 1: Haligus Road to Lakewood Road

- **Existing Traffic and Roadway Conditions:** Existing operations at Haligus and Lakewood are under capacity, with most traffic movements operating at LOS C or better under the AM and PM peaks. The critical traffic movement in this segment is the westbound left turn at Lakewood intersection, which carries more than 300 vph and operates at LOS D in the PM peak.

- **Projected Traffic under Existing (No-Build) Roadway Conditions:** Operations under projected 2050 volumes are expected to be significantly worse in this segment if no improvements are made to roadway capacity or traffic control. Both intersections at Haligus and Lakewood fail in the PM peak (LOS F) under these No-Build conditions. The existing stop-control at both intersection will not provide adequate capacity for the projected 2050 PM peak traffic on eastbound and westbound Ackman Road.

- **Projected 2050 Traffic Operations under Proposed Design Options:** Roadway and traffic control improvements proposed under either option for Segment 1 are expected to provide adequate capacity and operational efficiency for the design year traffic. With both Option 1 (traffic signals) and Option 2 (roundabouts), all intersection movements are expected to operate at LOS C or better, with v/c < 1, and queues shorter than proposed storage lengths.

Segment 2: Redtail Drive to Huntley Road

- **Existing Traffic and Roadway Conditions:** Areas of existing capacity concerns in Segment 2 occur on minor street approaches caused by the limited number of acceptable gaps in the heavy east-west freeflow traffic along Ackman Road.

    - Redtail Drive Intersection: PM peak is the critical period at this intersection, with the southbound traffic operating at LOS F. Single lane southbound approach creates additional queues for right-turn movements that are often blocked by left turning traffic.

      The traffic model reports a LOS B for the eastbound left turn movement at this intersection. However, this metric, which is based on the weighted average delay, under represents the impacts of the left turning vehicles that block the eastbound through movement.

    - Swanson Road Intersection: The northbound traffic operates at LOS E under AM peak and LOS F under PM peak. The volume in the PM peak is nearly at capacity for northbound Swanson Road under current stop control conditions (v/c = 0.96). As such, queues on this approach are likely to be much higher than that indicated by the model results.

      Similar to the Redtail intersection, the traffic model reports a LOS A for the westbound left turn movement at this intersection. However, this metric, which is based on the weighted average delay, under represents the impacts of the left turning vehicles that block the westbound through movements.

    - Huntley Road Intersection: Current operations at this intersection are generally under capacity with the highest delays occurring at southbound left turn movement, which operates at LOS D under AM and PM peaks.

- **Projected 2050 Traffic under Existing (No-Build) Roadway Conditions:** Without improvements in lane configuration or traffic control, all three intersections in Segment 2 will fail in one manner or another under 2050 traffic volumes. Acceptable gaps in Ackman Road traffic are expected to be infrequent under the projected volumes, particularly for left turns from a stop-controlled approach. Redtail Drive traffic will exceed its current capacity in the PM peak (v/c = 1.63). Swanson Road traffic will exceed its current capacity by a large margin in both AM (v/c = 2.05) and PM (v/c = 4.94) peaks. Huntley Road left turn movement will operate at LOS F under both peaks, with volumes exceeding capacity in the AM peak (v/c = 1.1).

- **Projected 2050 Traffic Operations under Proposed Design Options:**

  - Option 1 (auxiliary turn lanes with existing stop-control), is the only design alternative to not meet the capacity requirements of the design year traffic. This option is expected to improve the performance of minor street right turns and Ackman Road traffic at Redtail Drive and Swanson Road intersections. However, it provides no improvements for the minor cross street left turn traffic (Redtail southbound left and Swanson northbound left) and those movements will continue to operate at LOS F and v/c >1, similar to the No-Build Option.

    - Redtail Drive Intersection: With implementation of the roadway improvements associated with Option 1, the southbound left turn movement at the intersection is expected to operate at LOS E under design year AM peak traffic, and at LOS F under design year PM peak traffic. In the instance of the PM peak traffic, the volume for the southbound left turn movement exceeds its capacity (v/c = 1.18).

    - Swanson Road Intersection: With implementation of the roadway improvements associated with Option 1, the northbound left turn movement at the intersection is expected to operate at LOS F under both the design year AM peak traffic and PM peak traffic. The northbound left turn volume will exceeds capacity under the AM (v/c = 1.18) and PM (v/c = 3.30) peaks. The significant delay expected for this movement under PM peak traffic causes the overall intersection to operate at LOS F.

  - The roadway and traffic control improvements proposed for Segment 2 under Options 2 through 5 are expected to provide adequate capacity and operational efficiency for the design year traffic.

    - Almost all intersection movements within the corridor are expected to operate within the acceptable LOS thresholds, with v/c < 1, and queues shorter than proposed storage.

    - Some of the minor cross street left turn movements will operate at LOS D under the design alternatives with traffic signal installations (Options 2 and 4) , as noted in Table 2.

Segment 3: Golf Course Road to Randall Road

- **Existing Traffic and Roadway Conditions:**
  - Golf Course Road Intersection: Under current AM peak traffic, the northbound through/right turn movement operates at LOS F, with volumes that exceed capacity (v/c = 1.25). Due to a v/c > 1, the queues on this approach are likely to be longer than that indicated by the model results. The queue on this approach extends beyond the upstream intersections, blocking access to/from Loch Lomond Drive, and potentially Willow Tree Drive as well.

    In the PM peak, the westbound approach is the critical movement with volume exceeding capacity. Consequently, queues on this approach are likely to be longer than the 1,150 feet predicted by the model, and could potentially extend beyond the upstream intersection at Westport Ridge.

  - Westport Ridge Intersection: The northbound and southbound movements at this intersection operates at LOS F under both current AM peak and PM peak traffic. Indicating that it is difficult for traffic to exit from Westport Ridge under the current two-way stop control, due to the heavy traffic and insufficient gaps on Ackman Road. The operations for Westport Ridge traffic is particularly bad in the AM peak, where volume has reached capacity. This condition can be exacerbated by queues from upstream intersections that can potentially block this intersection (eastbound queues from Randall Road in the AM peak and westbound queues from Golf Course Road in the PM peak).

  - Randall Road Intersection: Improvements at this intersection are outside the scope of this study, but it is included in the traffic analysis as operations at this location can influence other intersections in this segment. The eastbound left turn is the critical movement in terms of its impacts on Ackman Road, and currently operates at LOS E under the PM peak.

- **Projected Traffic under Existing (No-Build) Roadway Conditions:** Without improvements in lane configuration or traffic control, existing operational issues at Golf Course Road and Westport Ridge highlighted above will become notably worse under 2050 projected traffic. At Golf Course Road, eastbound traffic will also exceed capacity in the AM peak, in addition to the northbound through/right. The overall intersection will operate at LOS F under both AM and PM peaks. Operations at Westport Ridge intersection will further deteriorate under the No-Build conditions, with queues extending beyond 400 feet on the northbound approach in the AM peak.

- **Projected 2050 Traffic Operations under Proposed Design Options:** Both recommended roadway and traffic control improvement options discussed for Segment 3 in the above section are expected to provide adequate capacity and operational efficiency for the design year traffic. Almost all intersection movements within the corridor are expected to operate within the applicable level of service thresholds, with v/c < 1, and queues shorter than proposed storage, with the following noted exceptions:

  - Option 1
    - Golf Course Road Intersection: With implementation of the roadway improvements associated with Option 1, the southbound through/right turn movement at the intersection is expected to operate at LOS E under design year PM peak traffic. Under AM

peak traffic, the northbound through/right turn movement is expected to operate with delays slightly lower than thresholds associated with LOS E.

- Westport Ridge Intersection: With implementation of the roadway improvements associated with Option 1, both the northbound and southbound movements at the intersection are expected to operate at LOS E under both design year AM peak and PM peak traffic. The delay on the minor street here is a function of a larger portion of the signal cycle being dedicated to the major street; the demand on the minor street does not exceed the capacity provided by the signal operations.

- Option 2
  - Golf Course Road Intersection: With implementation of roundabouts proposed under Option 2, the northbound left turn and through movements at the intersection are expected to operate at LOS E under design year AM peak traffic.

Conclusions

Most proposed design options provide adequate traffic capacity and operational efficiency under 2050 design year traffic, with the exception of Segment 2 Option 1. Under this option, the provision of auxiliary turn lanes at the Redtail and Swanson intersections, without upgrading the one-way stop control conditions will not provide adequate capacity. It is suggested that this option be removed from further considerations on basis of its poor traffic performance.

This study does not recommend any single proposed design option over the others based on the findings of this traffic analysis. The information provided here is intended to inform the feasibility review for each design option. The identification and recommendation on the final preferred design option, is made under the *Alternatives Analyses Report* (under separate cover). The *Alternatives Analysis Report* will incorporate findings from this document, additional reports such as the *Road Safety Study* and will consider for other factors such as cost, land acquisition, environmental impacts, pedestrian/bike accommodations, and stakeholder feedback.

APPENDICES

A. Intersection Turning Movement Counts
B. Synchro Output – Traffic Signals and Stop-Control Intersections
C. Sidra Output – Roundabouts
D. Signal Warrant Analyses

Ackman Road Traffic Impact Study
Table 1: Summary of Traffic Operations
Segment 1: Haligus Road to Lakewood Road

AM PEAK

Intersection	Movement	Existing Conditions				No-Build Conditions				Proposed Design Options							
										Option 1				Option 2			
		Delay	LOS	95th %ile Q	v/c	Delay	LOS	95th %ile Q	v/c	Delay	LOS	95th %ile Q	v/c	Delay	LOS	95th %ile Q	v/c
Haligus Rd & Ackman Rd		**OWSC (E)**				**TWSC (E-W)**				**Traffic Signal w/ channelization**				**Roundabout Intersection**			
	Overall	3.7 s	(A)			14.2 s	(B)			17.4 s	(B)			6.6 s	(A)		
	EB LT					56.9 s	(F)	[95 ft]	0.62	11.0 s	(B)	[51 ft]	0.19	6.3 s	(A)	[35 ft]	0.28
	EB Thru					22.0 s	(C)	[64 ft]	0.46	15.2 s	(B)	[95 ft]	0.27				
	EB RT																
	WB LT	14.2 s	(B)	[11 ft]	0.12	30.5 s	(D)	[25 ft]	0.24	10.6 s	(B)	[27 ft]	0.08	6.7 s	(A)	[38 ft]	0.30
	WB Thru					19.6 s	(C)	[78 ft]	0.51	16.1 s	(B)	[122 ft]	0.43				
	WB RT	10.4 s	(B)	[17 ft]	0.16												
	NB LT					7.8 s	(A)	[3 ft]	0.04	12.8 s	(B)	[36 ft]	0.13	7.1 s	(A)	[41 ft]	0.32
	NB Thru									24.0 s	(C)	[151 ft]	0.57				
	NB RT																
	SB LT	8.1 s	(A)	[6 ft]	0.07	8.0 s	(A)	[5 ft]	0.08	13.9 s	(B)	[56 ft]	0.24	6.1 s	(A)	[39 ft]	0.30
	SB Thru									20.2 s	(C)	[132 ft]	0.45				
	SB RT																
Lakewood Rd & Ackman Rd		**AWSC**				**AWSC**				**Traffic Signal w/ channelization**				**Roundabout Intersection**			
	Overall	14.6 s	(B)			24.4 s	(C)			15.3 s	(B)			8.8 s	(A)		
	EB LT	10.8 s	(B)	[ft]	0.01	12.6 s	(B)	[3 ft]	0.02	8.6 s	(A)	[6 ft]	0.03	8.8 s	(A)	[47 ft]	0.37
	EB Thru	15.0 s	(B)	[53 ft]	0.40	34.8 s	(D)	[171 ft]	0.75	22.0 s	(C)	[186 ft]	0.47				
	EB RT																
	WB LT	17.1 s	(C)	[70 ft]	0.48	22.4 s	(C)	[87 ft]	0.54	9.6 s	(A)	[80 ft]	0.31	7.4 s	(A)	[64 ft]	0.41
	WB Thru	12.5 s	(B)	[34 ft]	0.29	25.5 s	(D)	[120 ft]	0.64	11.5 s	(B)	[108 ft]	0.20				
	WB RT									0.7 s	(A)	[6 ft]	0.04				
	NB LT	11.7 s	(B)	[14 ft]	0.14	14.9 s	(B)	[22 ft]	0.21	20.2 s	(C)	[59 ft]	0.23	10.3 s	(B)	[85 ft]	0.48
	NB Thru	10.5 s	(B)	[6 ft]	0.07	13.5 s	(B)	[14 ft]	0.16	31.9 s	(C)	[66 ft]	0.21				
	NB RT	15.6 s	(C)	[78 ft]	0.50	25.0 s	(C)	[123 ft]	0.65	5.0 s	(A)	[49 ft]	0.44				
	SB LT	13.1 s	(B)	[20 ft]	0.20	20.7 s	(C)	[62 ft]	0.45	19.7 s	(B)	[109 ft]	0.35	8.8 s	(A)	[42 ft]	0.35
	SB Thru	11.8 s	(B)	[14 ft]	0.15	16.2 s	(C)	[34 ft]	0.30	29.0 s	(C)	[103 ft]	0.36				
	SB RT																

PM PEAK

Intersection	Movement	Existing Conditions				No-Build Conditions				Proposed Design Options							
										Option 1				Option 2			
		Delay	LOS	95th %ile Q	v/c	Delay	LOS	95th %ile Q	v/c	Delay	LOS	95th %ile Q	v/c	Delay	LOS	95th %ile Q	v/c
Haligus Rd & Ackman Rd		**OWSC (E)**				**TWSC (E-W)**				**Traffic Signal w/ channelization**				**Roundabout Intersection**			
	Overall	5.6 s	(A)			52.4 s	(F)			19.4 s	(B)			8.3 s	(A)		
	EB LT					285.7 s	(F)	[241 ft]	1.31	11.7 s	(B)	[61 ft]	0.23	8.5 s	(A)	[51 ft]	0.39
	EB Thru					35.0 s	(D)	[132 ft]	0.68	18.4 s	(B)	[134 ft]	0.37				
	EB RT																
	WB LT	17.3 s	(C)	[34 ft]	0.29	171.3 s	(F)	[199 ft]	1.05	11.6 s	(B)	[62 ft]	0.21	8.6 s	(A)	[63 ft]	0.43
	WB Thru					42.9 s	(E)	[196 ft]	0.80	20.1 s	(C)	[180 ft]	0.51				
	WB RT	9.8 s	(A)	[11 ft]	0.13												
	NB LT					7.9 s	(A)	[6 ft]	0.05	14.7 s	(B)	[45 ft]	0.15	7.4 s	(A)	[40 ft]	0.32
	NB Thru									25.4 s	(C)	[151 ft]	0.52				
	NB RT																
	SB LT	8.0 s	(A)	[8 ft]	0.10	8.0 s	(A)	[8 ft]	0.10	16.1 s	(B)	[83 ft]	0.30	8.5 s	(A)	[59 ft]	0.42
	SB Thru									23.8 s	(C)	[176 ft]	0.53				
	SB RT																
Lakewood Rd & Ackman Rd		**AWSC**				**AWSC**				**Traffic Signal w/ channelization**				**Roundabout Intersection**			
	Overall	21.6 s	(C)			81.2 s	(F)			16.7 s	(B)			14.2 s	(B)		
	EB LT	11.7 s	(B)	[ft]	0.01	13.9 s	(B)	[3 ft]	0.02	9.0 s	(A)	[6 ft]	0.03	11.8 s	(B)	[97 ft]	0.51
	EB Thru	19.6 s	(C)	[84 ft]	0.53	113.5 s	(F)	[412 ft]	1.14	27.5 s	(C)	[287 ft]	0.66				
	EB RT																
	WB LT	32.3 s	(D)	[182 ft]	0.76	60.4 s	(F)	[258 ft]	0.94	12.9 s	(B)	[136 ft]	0.59	17.5 s	(C)	[431 ft]	0.77
	WB Thru	17.6 s	(C)	[84 ft]	0.52	150.8 s	(F)	[552 ft]	1.27	11.5 s	(B)	[163 ft]	0.31				
	WB RT									1.3 s	(A)	[22 ft]	0.14				
	NB LT	13.0 s	(B)	[17 ft]	0.18	18.0 s	(C)	[31 ft]	0.30	21.7 s	(C)	[74 ft]	0.27	12.7 s	(B)	[144 ft]	0.59
	NB Thru	12.1 s	(B)	[14 ft]	0.15	19.4 s	(C)	[48 ft]	0.40	34.7 s	(C)	[120 ft]	0.43				
	NB RT	21.3 s	(C)	[118 ft]	0.62	35.6 s	(E)	[160 ft]	0.78	3.6 s	(A)	[41 ft]	0.39				
	SB LT	13.8 s	(B)	[11 ft]	0.13	20.8 s	(C)	[39 ft]	0.35	22.3 s	(C)	[76 ft]	0.30	9.8 s	(A)	[34 ft]	0.31
	SB Thru	13.0 s	(B)	[11 ft]	0.12	18.9 s	(C)	[31 ft]	0.30	31.2 s	(C)	[91 ft]	0.35				
	SB RT																

OWSC One-Way Stop Control (on indicated approach)
TWSC Two-Way Stop Control (on indicated approach)
AWSC All-Way Stop Control

Ackman Road Traffic Impact Study
Table 2: Summary of Traffic Operations
Segment 2: Redtail Drive to Huntley Road

AM PEAK

Intersection	Movement		Existing Conditions				No-Build Conditions				Proposed Design Options																							
											Option 1				Option 2				Option 3				Option 4				Option 5				Option 6			
			Delay	LOS	95th %ile Q	v/c	Delay	LOS	95th %ile Q	v/c	Delay	LOS	95th %ile Q	v/c	Delay	LOS	95th %ile Q	v/c	Delay	LOS	95th %ile Q	v/c	Delay	LOS	95th %ile Q	v/c	Delay	LOS	95th %ile Q	v/c	Delay	LOS	95th %ile Q	v/c
Redtail Dr & Ackman Rd			**OWSC (N)**				**OWSC (N)**				**OWSC (N) w/ channelization**				**Traffic Signal w/ channelization**				**Roundabout**				**Traffic Signal w/ south leg**				**Roundabout w/ south leg**				**Roundabout**			
	Overall		2.1 s	(A)			3.9 s	(A)			2.8 s	(A)			9.2 s	(A)			9.0 s	(A)			17.5 s	(B)			12.2 s	(B)			10.8 s	(B)		
	EB	LT	8.7 s	(A)	[3 ft]	0.02	9.2 s	(A)	[3 ft]	0.04	9.2 s	(A)	[3 ft]	0.04	2.9 s	(A)	[6 ft]	0.07	10.9 s	(B)	[158 ft]	0.64	5.9 s	(A)	[8 ft]	0.07	14.5 s	(B)	[273 ft]	0.72	14.3 s	(B)	[263 ft]	0.71
		Thru													6.2 s	(A)	[272 ft]	0.53					22.3 s	(C)	[482 ft]	0.72								
		RT																					1.0 s	(A)	[2 ft]	0.09								
	WB	LT																					8.3 s	(A)	[23 ft]	0.36	5.3 s	(A)	[32 ft]	0.26	7.0 s	(A)	[74 ft]	0.45
		Thru													10.6 s	(B)	[316 ft]	0.38	6.6 s	(A)	[66 ft]	0.40	7.2 s	(A)	[90 ft]	0.35	4.9 s	(A)	[32 ft]	0.26				
		RT													1.4 s	(A)	[7 ft]	0.02					0.1 s	(A)	[0 ft]	0.02	4.6 s	(A)	[18 ft]	0.17	3.0 s	(A)	[2 ft]	0.02
	NB	LT																					48.6 s	(D)	[87 ft]	0.63	19.3 s	(C)	[123 ft]	0.63				
		Thru																					35.0 s	(C)	[12 ft]	0.03								
		RT																					11.2 s	(B)	[75 ft]	0.49								
	SB	LT									44.7 s	(E)	[56 ft]	0.44	41.5 s	(D)	[68 ft]	0.36	6.0 s	(A)	[14 ft]	0.14	27.6 s	(C)	[40 ft]	0.14	5.9 s	(A)	[12 ft]	0.14	6.9 s	(A)	[16 ft]	0.15
		Thru	19.8 s	(C)	[36 ft]	0.30	39.8 s	(E)	[92 ft]	0.58													21.7 s	(C)	[40 ft]	0.44								
		RT									12.0 s	(B)	[11 ft]	0.12	8.2 s	(A)	[16 ft]	0.18	6.0 s	(A)	[14 ft]	0.14									6.6 s	(A)	[16 ft]	0.15
Swanson Rd & Ackman Rd			**TWSC (N-S)**				**TWSC (N-S)**				**OWSC (N) w/ channelization**				**Traffic Signal w/ channelization**				**Roundabout**				**N/A (Realigned to Redtail Dr)**				**N/A (Realigned to Redtail Dr)**				**RIRO**			
	Overall		12.0 s	(B)			107.4 s	(F)			18.7 s	(C)			16.5 s	(B)			12.5 s	(B)											3.2 s	(A)		
	EB	LT																	13.3 s	(B)	[190 ft]	0.71												
		Thru													18.0 s	(B)	[273 ft]	0.75																
		RT													0.4 s	(A)	[1 ft]	0.10																
	WB	LT									10.6 s	(B)	[17 ft]	0.16	12.5 s	(B)	[71 ft]	0.38	7.8 s	(A)	[76 ft]	0.45												
		Thru	9.2 s	(A)	[11 ft]	0.11	10.6 s	(B)	[17 ft]	0.16					12.0 s	(B)	[277 ft]	0.37																
		RT																																
	NB	LT									230.6 s	(F)	[213 ft]	1.18	35.8 s	(D)	[97 ft]	0.46	17.8 s	(C)	[113 ft]	0.61												
		Thru	49.6 s	(E)	[221 ft]	0.85	532.8 s	(F)	[784 ft]	2.05	27.5 s	(D)	[115 ft]	0.62	17.7 s	(B)	[90 ft]	0.60																
		RT																													18.7 s	(C)	[106 ft]	0.59
Huntley Rd & Ackman Rd			**OWSC (N)**				**OWSC (N)**				**OWSC (N)**				**Traffic Signal w/ channelization**				**Roundabout**				**Traffic Signal w/ channelization**				**Roundabout**				**Roundabout**			
	Overall		5.3 s	(A)			19.3 s	(C)			10.7 s	(B)			11.6 s	(B)			6.7 s	(A)			11.7 s	(B)			6.7 s	(A)			7.6 s	(A)		
	EB	LT	8.6 s	(A)	[14 ft]	0.14	9.3 s	(A)	[25 ft]	0.22	8.9 s	(A)	[22 ft]	0.20	4.7 s	(A)	[52 ft]	0.36	8.8 s	(A)	[82 ft]	0.51	3.8 s	(A)	[59 ft]	0.36	8.8 s	(A)	[82 ft]	0.51	10.1 s	(B)	[100 ft]	0.57
		Thru													6.6 s	(A)	[154 ft]	0.58	7.3 s	(A)	[82 ft]	0.51	7.4 s	(A)	[476 ft]	0.58	7.3 s	(A)	[82 ft]	0.51	7.9 s	(A)	[100 ft]	0.57
	WB	Thru													15.5 s	(B)	[181 ft]	0.38	6.0 s	(A)	[34 ft]	0.28	15.5 s	(B)	[181 ft]	0.38	6.0 s	(A)	[34 ft]	0.28	7.0 s	(A)	[37 ft]	0.32
		RT													0.7 s	(A)	[7 ft]	0.08	3.9 s	(A)	[8 ft]	0.08	0.7 s	(A)	[7 ft]	0.08	3.9 s	(A)	[8 ft]	0.08	3.9 s	(A)	[8 ft]	0.08
	SB	LT	32.4 s	(D)	[81 ft]	0.53	139.2 s	(F)	[297 ft]	1.10	75.9 s	(F)	[188 ft]	0.86	41.8 s	(D)	[155 ft]	0.65	5.0 s	(A)	[19 ft]	0.18	41.8 s	(D)	[155 ft]	0.65	5.0 s	(A)	[19 ft]	0.18	5.7 s	(A)	[21 ft]	0.20
		Thru																																
		RT	11.5 s	(B)	[28 ft]	0.25	13.5 s	(B)	[50 ft]	0.38	12.1 s	(B)	[36 ft]	0.31	3.9 s	(A)	[36 ft]	0.36	5.5 s	(A)	[24 ft]	0.22	3.9 s	(A)	[36 ft]	0.36	5.5 s	(A)	[24 ft]	0.22	6.3 s	(A)	[27 ft]	0.24

PM PEAK

Intersection	Movement		Existing Conditions				No-Build Conditions				Proposed Design Options																							
											Option 1				Option 2				Option 3				Option 4				Option 5				Option 6			
			Delay	LOS	95th %ile Q	v/c	Delay	LOS	95th %ile Q	v/c	Delay	LOS	95th %ile Q	v/c	Delay	LOS	95th %ile Q	v/c	Delay	LOS	95th %ile Q	v/c	Delay	LOS	95th %ile Q	v/c	Delay	LOS	95th %ile Q	v/c	Delay	LOS	95th %ile Q	v/c
Redtail Dr & Ackman Rd			**OWSC (N)**				**OWSC (N)**				**OWSC (N) w/ channelization**				**Traffic Signal w/ channelization**				**Roundabout**				**Traffic Signal w/ south leg**				**Roundabout w/ south leg**				**Roundabout**			
	Overall		4.5 s	(A)			28.8 s	(D)			12.2 s	(B)			9.1 s	(A)			15.1 s	(C)			14.6 s	(B)			12.7 s	(B)			15.1 s	(C)		
	EB	LT	10.1 s	(B)	[8 ft]	0.08	11.4 s	(B)	[14 ft]	0.14	11.4 s	(B)	[14 ft]	0.14	4.4 s	(A)	[20 ft]	0.26	10.6 s	(B)	[154 ft]	0.63	8.6 s	(A)	[26 ft]	0.34	16.3 s	(C)	[387 ft]	0.75	14.7 s	(B)	[311 ft]	0.72
		Thru													6.1 s	(A)	[244 ft]	0.50					16.4 s	(B)	[331 ft]	0.55								
		RT																					1.4 s	(A)	[20 ft]	0.13								
	WB	LT																					4.1 s	(A)	[22 ft]	0.26	11.2 s	(B)	[153 ft]	0.60	17.2 s	(C)	[303 ft]	0.81
		Thru													9.6 s	(A)	[393 ft]	0.72	19.1 s	(C)	[359 ft]	0.83	13.0 s	(B)	[311 ft]	0.75	9.7 s	(A)	[153 ft]	0.60				
		RT													0.2 s	(A)	[1 ft]	0.09					0.6 s	(A)	[2 ft]	0.08	7.2 s	(A)	[50 ft]	0.38	3.5 s	(A)	[10 ft]	0.10
	NB	LT																					49.0 s	(D)	[71 ft]	0.65	14.8 s	(B)	[96 ft]	0.55				
		Thru																					36.5 s	(D)	[23 ft]	0.13								
		RT																					6.4 s	(A)	[24 ft]	0.40								
	SB	LT									266.3 s	(F)	[182 ft]	1.18	47.4 s	(D)	[78 ft]	0.43	9.7 s	(A)	[21 ft]	0.21	28.7 s	(C)	[39 ft]	0.17	10.3 s	(B)	[23 ft]	0.26	11.6 s	(B)	[23 ft]	0.24
		Thru	58.5 s	(F)	[101 ft]	0.64	414.9 s	(F)	[314 ft]	1.63													25.1 s	(C)	[45 ft]	0.42								
		RT									18.0 s	(C)	[17 ft]	0.16	9.4 s	(A)	[22 ft]	0.14	9.7 s	(A)	[21 ft]	0.21									11.4 s	(B)	[23 ft]	0.24
Swanson Rd & Ackman Rd			**TWSC (N-S)**				**TWSC (N-S)**				**OWSC (N) w/ channelization**				**Traffic Signal w/ channelization**				**Roundabout**				**N/A (Realigned to Redtail Dr)**				**N/A (Realigned to Redtail Dr)**				**RIRO**			
	Overall		12.9 s	(B)			298.8 s	(F)			93.3 s	(F)			11.0 s	(B)			18.2 s	(C)											1.3 s	(A)		
	EB	LT																	12.7 s	(B)	[169 ft]	0.68												
		Thru	-	(-)	-	-	-	(-)	-	-					12.3 s	(B)	[333 ft]	0.55																
		RT													0.4 s	(A)	[1 ft]	0.14																
	WB	LT									10.2 s	(B)	[17 ft]	0.16	4.3 s	(A)	[27 ft]	0.31	24.4 s	(C)	[524 ft]	0.89												
		Thru	9.1 s	(A)	[14 ft]	0.14	10.2 s	(B)	[17 ft]	0.16					8.7 s	(A)	[195 ft]	0.77																
		RT																																
	NB	LT									1199 s	(F)	[515 ft]	3.30	43.8 s	(D)	[97 ft]	0.54	9.3 s	(A)	[41 ft]	0.34												
		Thru	101.7 s	(F)	[230 ft]	0.96	1887 s	(F)	[1089 ft]	4.94	16.8 s	(C)	[48 ft]	0.38	5.7 s	(A)	[26 ft]	0.31																
		RT																													13.2 s	(B)	[45 ft]	0.36
Huntley Rd & Ackman Rd			**OWSC (N)**				**OWSC (N)**				**OWSC (N)**				**Traffic Signal w/ channelization**				**Roundabout**				**Traffic Signal w/ channelization**				**Roundabout**				**Roundabout**			
	Overall		4.8 s	(A)			12.6 s	(B)			9.1 s	(A)			15.8 s	(B)			10.2 s	(B)			14.5 s	(B)			10.2 s	(B)			12.4 s	(B)		
	EB	LT	11.1 s	(B)	[28 ft]	0.26	15.1 s	(C)	[67 ft]	0.45	14.7 s	(B)	[62 ft]	0.44	20.8 s	(C)	[182 ft]	0.67	6.4 s	(A)	[54 ft]	0.38	13.6 s	(B)	[63 ft]	0.69	6.4 s	(A)	[54 ft]	0.38	7.0 s	(A)	[66 ft]	0.43
		Thru													7.4 s	(A)	[232 ft]	0.35	5.5 s	(A)	[54 ft]	0.38	4.2 s	(A)	[38 ft]	0.36	5.5 s	(A)	[54 ft]	0.38	5.8 s	(A)	[66 ft]	0.43
	WB	Thru													18.8 s	(B)	[540 ft]	0.70	16.0 s	(C)	[353 ft]	0.75	20.8 s	(C)	[528 ft]	0.74	16.0 s	(C)	[353 ft]	0.75	21.9 s	(C)	[445 ft]	0.82
		RT													0.8 s	(A)	[17 ft]	0.21	5.7 s	(A)	[29 ft]	0.25	1.0 s	(A)	[20 ft]	0.21	5.7 s	(A)	[29 ft]	0.25	5.7 s	(A)	[29 ft]	0.25
	SB	LT	28.1 s	(D)	[39 ft]	0.33	91.4 s	(F)	[143 ft]	0.81	71.7 s	(F)	[115 ft]	0.70	48.7 s	(D)	[120 ft]	0.52	7.1 s	(A)	[15 ft]	0.16	43.8 s	(D)	[110 ft]	0.50	7.1 s	(A)	[15 ft]	0.16	7.9 s	(A)	[16 ft]	0.17
		Thru																																
		RT	19.1 s	(C)	[64 ft]	0.45	44.8 s	(E)	[202 ft]	0.81	32.7 s	(D)	[137 ft]	0.69	17.8 s	(B)	[118 ft]	0.57	10.9 s	(B)	[49 ft]	0.39	16.7 s	(B)	[114 ft]	0.55	10.9 s	(B)	[49 ft]	0.39	12.6 s	(B)	[55 ft]	0.43

OWSC One-Way Stop Control (on indicated approach)
TWSC Two-Way Stop Control (on indicated approach)
AWSC All-Way Stop Control

Ackman Road Traffic Impact Study
Table 3: Summary of Traffic Operations
Segment 3: Golf Course Road to Randall Road

AM PEAK

Intersection	Movement		Existing Conditions				No-Build Conditions				Proposed Design Options: Option 1				Proposed Design Options: Option 2			
			Delay	LOS	95th %ile Q	v/c	Delay	LOS	95th %ile Q	v/c	Delay	LOS	95th %ile Q	v/c	Delay	LOS	95th %ile Q	v/c
Golf Course Rd & Ackman Rd			**Traffic Signal**				**Traffic Signal**				**Traffic Signal w/ additional lanes**				**Roundabout Intersection**			
	Overall		**72.1 s**	**(E)**			**97.4 s**	**(F)**			32.6 s	(C)			17.1 s	(C)		
	EB	LT	18.5 s	(B)	[76 ft]	0.48	15.4 s	(B)	[104 ft]	0.32	19.6 s	(B)	[130 ft]	0.31	14.5 s	(B)	[187 ft]	0.67
		Thru	53.2 s	(D)	**[680 ft]**	0.94	**68.4 s**	**(E)**	**[899 ft]**	**1.01**	33.3 s	(C)	[361 ft]	0.61	12.3 s	(B)	[187 ft]	0.67
		RT													9.2 s	(A)	[57 ft]	0.42
	WB	LT	18.1 s	(B)	[28 ft]	0.31	18.9 s	(B)	[38 ft]	0.33	22.4 s	(C)	[48 ft]	0.29	9.6 s	(A)	[33 ft]	0.32
		Thru	29.5 s	(C)	[187 ft]	0.48	26.9 s	(C)	[212 ft]	0.40	27.3 s	(C)	[104 ft]	0.24	8.8 s	(A)	[33 ft]	0.32
		RT													7.6 s	(A)	[19 ft]	0.20
	NB	LT	21.9 s	(C)	[35 ft]	0.10	23.8 s	(C)	[68 ft]	0.22	20.2 s	(C)	[58 ft]	0.20	**41.4 s**	**(E)**	[251 ft]	**0.88**
		Thru	**163.3 s**	**(F)**	**[449 ft]**	**1.25**	**238.3 s**	**(F)**	**[929 ft]**	**1.43**	54.5 s	(D)	[439 ft]	0.85	**38.3 s**	**(E)**	[251 ft]	**0.88**
		RT									12.2 s	(B)	[93 ft]	0.30	19.0 s	(C)	[75 ft]	0.55
	SB	LT	39.6 s	(D)	[155 ft]	0.71	38.6 s	(D)	[158 ft]	0.67	29.1 s	(C)	[111 ft]	0.60	7.9 s	(A)	[47 ft]	0.40
		Thru	30.4 s	(C)	[198 ft]	0.36	40.4 s	(D)	[326 ft]	0.61	30.9 s	(C)	[254 ft]	0.51	8.0 s	(A)	[47 ft]	0.40
		RT													5.0 s	(A)	[11 ft]	0.11
Westport Ridge & Ackman Rd			**TWSC (N-S)**				**TWSC (N-S)**				**Traffic Signal w/ channelization**				**Roundabout Intersection**			
	Overall		24.7 s	(C)			**92.0 s**	**(F)**			23.4 s	(C)			17.7 s	(C)		
	EB	LT	7.8 s	(A)	[ft]	0.01	7.9 s	(A)	[ft]	0.01	2.8 s	(A)	[2 ft]	0.01				
		Thru									16.5 s	(B)	[353 ft]	0.78	22.2 s	(C)	[393 ft]	0.86
		RT									0.0 s	(A)	[0 ft]	0.01				
	WB	LT	10.5 s	(B)	[3 ft]	0.05	11.2 s	(B)	[6 ft]	0.06	5.0 s	(A)	[6 ft]	0.17	4.7 s	(A)	[19 ft]	0.17
		Thru									4.8 s	(A)	[85 ft]	0.22	4.3 s	(A)	[19 ft]	0.17
		RT									0.0 s	(A)	[0 ft]	0.01	3.7 s	(A)	[11 ft]	0.11
	NB	LT																
		Thru	**95.6 s**	**(F)**	**[266 ft]**	**0.99**	**249.7 s**	**(F)**	**[417 ft]**	**1.38**	**59.9 s**	**(E)**	[63 ft]	0.83	21.6 s	(C)	[82 ft]	0.57
		RT																
	SB	LT																
		Thru	**211.5 s**	**(F)**	**[140 ft]**	**1.00**	**972.4 s**	**(F)**	**[314 ft]**	**2.65**	**70.2 s**	**(E)**	[49 ft]	0.77	4.3 s	(A)	[9 ft]	0.10
		RT																
Randall Rd & Ackman Rd			**Traffic Signal**				**Traffic Signal**				**Traffic Signal**				**Traffic Signal**			
	Overall		29.6 s	(C)			41.1 s	(D)			41.1 s	(D)			41.1 s	(D)		
	EB	LT	48.2 s	(D)	[454 ft]	0.85	**97.0 s**	**(F)**	**[663 ft]**	**1.09**	**97.0 s**	**(F)**	**[663 ft]**	**1.09**	**97.0 s**	**(F)**	**[663 ft]**	**1.09**
		Thru	30.3 s	(C)	[29 ft]	0.08	30.6 s	(C)	[43 ft]	0.05	30.6 s	(C)	[43 ft]	0.05	30.6 s	(C)	[43 ft]	0.05
		RT	27.2 s	(C)	[212 ft]	0.41	28.0 s	(C)	[225 ft]	0.41	28.0 s	(C)	[225 ft]	0.41	28.0 s	(C)	[225 ft]	0.41
	WB	LT	**56.4 s**	**(E)**	[19 ft]	0.12	**56.0 s**	**(E)**	[24 ft]	0.10	**56.0 s**	**(E)**	[24 ft]	0.10	**56.0 s**	**(E)**	[24 ft]	0.10
		Thru	53.0 s	(D)	[10 ft]	0.06	52.2 s	(D)	[15 ft]	0.03	52.2 s	(D)	[15 ft]	0.03	52.2 s	(D)	[15 ft]	0.03
		RT	44.0 s	(D)	[16 ft]	0.05	44.4 s	(D)	[21 ft]	0.05	44.4 s	(D)	[21 ft]	0.05	44.4 s	(D)	[21 ft]	0.05
	NB	LT	**57.2 s**	**(E)**	[46 ft]	0.37	**56.7 s**	**(E)**	[47 ft]	0.30	**56.7 s**	**(E)**	[47 ft]	0.30	**56.7 s**	**(E)**	[47 ft]	0.30
		Thru	21.1 s	(C)	[294 ft]	0.43	20.1 s	(C)	[327 ft]	0.48	20.1 s	(C)	[327 ft]	0.48	20.1 s	(C)	[327 ft]	0.48
		RT	19.5 s	(B)	[33 ft]	0.09	17.4 s	(B)	[43 ft]	0.05	17.4 s	(B)	[43 ft]	0.05	17.4 s	(B)	[43 ft]	0.05
	SB	LT	**55.8 s**	**(E)**	[13 ft]	0.09	**55.5 s**	**(E)**	[19 ft]	0.07	**55.5 s**	**(E)**	[19 ft]	0.07	**55.5 s**	**(E)**	[19 ft]	0.07
		Thru	26.2 s	(C)	[297 ft]	0.50	24.7 s	(C)	[324 ft]	0.53	24.7 s	(C)	[324 ft]	0.53	24.7 s	(C)	[324 ft]	0.53
		RT	4.8 s	(A)	[85 ft]	0.18	4.8 s	(A)	[98 ft]	0.21	4.8 s	(A)	[98 ft]	0.21	4.8 s	(A)	[98 ft]	0.21

PM PEAK

Intersection	Movement		Existing Conditions				No-Build Conditions				Proposed Design Options: Option 1				Proposed Design Options: Option 2			
			Delay	LOS	95th %ile Q	v/c	Delay	LOS	95th %ile Q	v/c	Delay	LOS	95th %ile Q	v/c	Delay	LOS	95th %ile Q	v/c
Golf Course Rd & Ackman Rd			**Traffic Signal**				**Traffic Signal**				**Traffic Signal w/ additional lanes**				**Roundabout Intersection**			
	Overall		62.1 s	(E)			**91.7 s**	**(F)**			33.5 s	(C)			17.7 s	(C)		
	EB	LT	16.6 s	(B)	[44 ft]	0.35	20.1 s	(C)	[61 ft]	0.43	19.1 s	(B)	[73 ft]	0.35	9.3 s	(A)	[63 ft]	0.44
		Thru	26.7 s	(C)	[348 ft]	0.54	34.6 s	(C)	[472 ft]	0.72	25.8 s	(C)	[224 ft]	0.34	8.7 s	(A)	[63 ft]	0.44
		RT													7.4 s	(A)	[29 ft]	0.28
	WB	LT	13.2 s	(B)	[63 ft]	0.25	16.4 s	(B)	[86 ft]	0.41	16.1 s	(B)	[71 ft]	0.30	25.3 s	(D)	[390 ft]	0.84
		Thru	**103.2 s**	**(F)**	**[1149 ft]**	**1.13**	**177.7 s**	**(F)**	**[1337 ft]**	**1.31**	28.0 s	(C)	[255 ft]	0.65	20.8 s	(C)	[390 ft]	0.84
		RT													11.9 s	(B)	[96 ft]	0.53
	NB	LT	25.3 s	(C)	[72 ft]	0.23	34.1 s	(C)	[124 ft]	0.59	39.9 s	(D)	[129 ft]	0.62	9.8 s	(A)	[57 ft]	0.43
		Thru	**57.4 s**	**(E)**	[272 ft]	0.83	51.4 s	(D)	[472 ft]	0.79	46.0 s	(D)	[296 ft]	0.56	9.1 s	(A)	[57 ft]	0.43
		RT									4.3 s	(A)	[33 ft]	0.16	7.9 s	(A)	[27 ft]	0.27
	SB	LT	29.2 s	(C)	[77 ft]	0.44	26.8 s	(C)	[79 ft]	0.33	29.6 s	(C)	[82 ft]	0.28	31.1 s	(D)	[149 ft]	0.77
		Thru	40.8 s	(D)	[258 ft]	0.58	**63.2 s**	**(E)**	[459 ft]	0.88	**65.4 s**	**(E)**	[430 ft]	0.85	31.1 s	(D)	[149 ft]	0.77
		RT													11.5 s	(B)	[19 ft]	0.22
Westport Ridge & Ackman Rd			**TWSC (N-S)**				**TWSC (N-S)**				**Traffic Signal w/ channelization**				**Roundabout Intersection**			
	Overall		4.3 s	(A)			20.5 s	(C)			11.7 s	(B)			8.3 s	(A)		
	EB	LT	10.7 s	(B)	[3 ft]	0.02	11.5 s	(B)	[3 ft]	0.05	2.2 s	(A)	[2 ft]	0.09				
		Thru									6.8 s	(A)	[160 ft]	0.41	8.7 s	(A)	[104 ft]	0.53
		RT									0.2 s	(A)	[1 ft]	0.02				
	WB	LT	8.7 s	(A)	[6 ft]	0.05	9.0 s	(A)	[6 ft]	0.06	2.0 s	(A)	[10 ft]	0.09	9.4 s	(A)	[126 ft]	0.59
		Thru									9.9 s	(A)	[721 ft]	0.77	8.2 s	(A)	[126 ft]	0.59
		RT									1.2 s	(A)	[7 ft]	0.05	6.1 s	(A)	[55 ft]	0.37
	NB	LT																
		Thru	**53.0 s**	**(F)**	[76 ft]	0.54	**282.5 s**	**(F)**	**[230 ft]**	**1.29**	**55.7 s**	**(E)**	[50 ft]	0.65	6.3 s	(A)	[11 ft]	0.11
		RT																
	SB	LT																
		Thru	**84.8 s**	**(F)**	[48 ft]	0.43	**239.0 s**	**(F)**	[106 ft]	0.92	**57.7 s**	**(E)**	[11 ft]	0.41	8.5 s	(A)	[7 ft]	0.09
		RT																
Randall Rd & Ackman Rd			**Traffic Signal**				**Traffic Signal**				**Traffic Signal**				**Traffic Signal**			
	Overall		34.3 s	(C)			37.4 s	(D)			37.4 s	(D)			37.4 s	(D)		
	EB	LT	**75.8 s**	**(E)**	[323 ft]	0.89	**86.7 s**	**(F)**	**[400 ft]**	**0.97**	**86.7 s**	**(F)**	[400 ft]	**0.97**	**86.7 s**	**(F)**	[400 ft]	**0.97**
		Thru	47.9 s	(D)	[39 ft]	0.09	47.2 s	(D)	[48 ft]	0.07	47.2 s	(D)	[48 ft]	0.07	47.2 s	(D)	[48 ft]	0.07
		RT	34.9 s	(C)	[147 ft]	0.28	33.5 s	(C)	[142 ft]	0.26	33.5 s	(C)	[142 ft]	0.26	33.5 s	(C)	[142 ft]	0.26
	WB	LT	**78.4 s**	**(E)**	[63 ft]	0.52	**73.9 s**	**(E)**	[80 ft]	0.41	**73.9 s**	**(E)**	[80 ft]	0.41	**73.9 s**	**(E)**	[80 ft]	0.41
		Thru	**66.7 s**	**(E)**	[65 ft]	0.32	**66.7 s**	**(E)**	[79 ft]	0.32	**66.7 s**	**(E)**	[79 ft]	0.32	**66.7 s**	**(E)**	[79 ft]	0.32
		RT	48.9 s	(D)	[20 ft]	0.08	47.8 s	(D)	[31 ft]	0.06	47.8 s	(D)	[31 ft]	0.06	47.8 s	(D)	[31 ft]	0.06
	NB	LT	**68.9 s**	**(E)**	[194 ft]	0.73	**69.0 s**	**(E)**	[198 ft]	0.74	**69.0 s**	**(E)**	[198 ft]	0.74	**69.0 s**	**(E)**	[198 ft]	0.74
		Thru	18.8 s	(B)	[307 ft]	0.42	21.2 s	(C)	[404 ft]	0.53	21.2 s	(C)	[404 ft]	0.53	21.2 s	(C)	[404 ft]	0.53
		RT	16.5 s	(B)	[46 ft]	0.07	16.9 s	(B)	[56 ft]	0.07	16.9 s	(B)	[56 ft]	0.07	16.9 s	(B)	[56 ft]	0.07
	SB	LT	**69.3 s**	**(E)**	[45 ft]	0.25	**70.2 s**	**(E)**	[60 ft]	0.29	**70.2 s**	**(E)**	[60 ft]	0.29	**70.2 s**	**(E)**	[60 ft]	0.29
		Thru	30.0 s	(C)	[523 ft]	0.65	34.2 s	(C)	[650 ft]	0.77	34.2 s	(C)	[650 ft]	0.77	34.2 s	(C)	[650 ft]	0.77
		RT	21.4 s	(C)	[665 ft]	0.75	25.5 s	(C)	**[1012 ft]**	0.82	25.5 s	(C)	**[1012 ft]**	0.82	25.5 s	(C)	**[1012 ft]**	0.82

OWSC One-Way Stop Control (on indicated approach)
TWSC Two-Way Stop Control (on indicated approach)
AWSC All-Way Stop Control

APPENDIX A

Intersection Turning Movement Counts

(by Gewalt Hamilton Associates)

Ackman Rd & Haligus Rd
4188.921 McHenry County
24 Hr
GHA Mio

Gewalt Hamilton Associates Inc.
625 Forest Edge Drive

Vernon Hills, Illinois, United States 60061
(847) 478-9700 poster@gha-engineers.com

Count Name: Ackman Rd & Haligus Rd
Site Code:
Start Date: 12/04/2018

Turning Movement Data

Start Time	Haligus Rd Southbound					Ackman Rd Westbound					Haligus Rd Northbound					
	U-Turn	Left	Thru	Peds	App. Total	U-Turn	Left	Right	Peds	App. Total	U-Turn	Thru	Right	Peds	App. Total	Int. Total
12:00 AM	0	0	0	0	0	0	0	1	0	1	0	1	0	0	1	2
12:15 AM	0	1	0	0	1	0	0	1	0	1	0	0	0	0	0	2
12:30 AM	0	0	0	0	0	0	1	0	0	1	0	1	1	0	2	3
12:45 AM	0	0	1	0	1	0	0	1	0	1	0	1	0	0	1	3
Hourly Total	0	1	1	0	2	0	1	3	0	4	0	3	1	0	4	10
1:00 AM	0	0	0	0	0	0	1	1	0	2	0	0	1	0	1	3
1:15 AM	0	0	0	0	0	0	0	1	0	1	0	1	0	0	1	2
1:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1:45 AM	0	0	1	0	1	0	1	1	0	2	0	0	0	0	0	3
Hourly Total	0	0	1	0	1	0	2	3	0	5	0	1	1	0	2	8
2:00 AM	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1
2:15 AM	0	1	1	0	2	0	1	0	0	1	0	0	0	0	0	3
2:30 AM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1
2:45 AM	0	1	1	0	2	0	1	0	0	1	0	0	0	0	0	3
Hourly Total	0	2	2	0	4	0	2	0	0	2	0	1	1	0	2	8
3:00 AM	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1
3:15 AM	0	0	0	0	0	0	0	0	0	0	0	1	1	0	2	2
3:30 AM	0	0	2	0	2	0	0	0	0	0	0	0	0	0	0	2
3:45 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hourly Total	0	0	2	0	2	0	0	0	0	0	0	2	1	0	3	5
4:00 AM	0	0	2	0	2	0	1	2	0	3	0	0	2	0	2	7
4:15 AM	0	2	2	0	4	0	0	0	0	0	0	0	1	0	1	5
4:30 AM	0	1	3	0	4	0	1	1	0	2	0	5	2	0	7	13
4:45 AM	0	0	3	0	3	0	3	0	0	3	0	2	3	0	5	11
Hourly Total	0	3	10	0	13	0	5	3	0	8	0	7	8	0	15	36
5:00 AM	0	1	3	0	4	0	3	7	0	10	0	2	6	0	8	22
5:15 AM	0	5	8	0	13	0	1	3	0	4	0	3	4	0	7	24
5:30 AM	0	5	7	0	12	0	2	6	0	8	0	7	9	0	16	36
5:45 AM	0	2	10	0	12	0	5	5	0	10	0	8	14	0	22	44
Hourly Total	0	13	28	0	41	0	11	21	0	32	0	20	33	0	53	126
6:00 AM	0	4	10	0	14	0	6	9	0	15	0	16	14	0	30	59
6:15 AM	0	7	16	0	23	0	11	10	0	21	0	26	20	0	46	90
6:30 AM	0	11	16	0	27	0	14	24	0	38	0	28	23	0	51	116
6:45 AM	0	13	33	0	46	0	20	17	0	37	0	23	20	0	43	126
Hourly Total	0	35	75	0	110	0	51	60	0	111	0	93	77	0	170	391
7:00 AM	0	9	24	0	33	0	17	18	0	35	0	29	24	0	53	121
7:15 AM	0	9	28	0	37	0	13	32	0	45	0	40	19	0	59	141
7:30 AM	0	16	36	0	52	0	13	21	0	34	0	44	33	0	77	163
7:45 AM	0	22	41	0	63	0	9	27	0	36	0	27	20	0	47	146
Hourly Total	0	56	129	0	185	0	52	98	0	150	0	140	96	0	236	571
8:00 AM	0	21	23	0	44	0	7	23	0	30	0	34	24	0	58	132

8:15 AM	0	14	15	0	29	0	6	21	0	27	0	37	18	0	55	111
8:30 AM	0	6	17	0	23	0	11	30	0	41	0	27	17	0	44	108
8:45 AM	0	7	22	0	29	0	11	23	0	34	0	24	23	0	47	110
Hourly Total	0	48	77	0	125	0	35	97	0	132	0	122	82	0	204	461
9:00 AM	0	9	15	0	24	0	12	14	0	26	0	27	29	0	56	106
9:15 AM	0	6	18	0	24	0	8	17	0	25	0	25	13	0	38	87
9:30 AM	0	14	15	0	29	0	7	16	0	23	0	37	11	0	48	100
9:45 AM	0	22	18	0	40	0	8	11	0	19	0	28	9	0	37	96
Hourly Total	0	51	66	0	117	0	35	58	0	93	0	117	62	0	179	389
10:00 AM	0	8	13	0	21	0	5	12	0	17	0	9	11	0	20	58
10:15 AM	0	6	14	0	20	0	5	11	0	16	0	11	12	0	23	59
10:30 AM	0	6	17	0	23	0	7	8	0	15	0	15	8	0	23	61
10:45 AM	0	10	22	0	32	0	8	10	0	18	0	21	15	0	36	86
Hourly Total	0	30	66	0	96	0	25	41	0	66	0	56	46	0	102	264
11:00 AM	0	11	17	0	28	0	12	12	0	24	0	26	14	0	40	92
11:15 AM	0	10	20	0	30	0	11	13	0	24	0	21	8	0	29	83
11:30 AM	0	20	21	0	41	0	10	13	0	23	0	14	16	0	30	94
11:45 AM	0	12	25	0	37	1	18	11	0	30	0	11	9	0	20	87
Hourly Total	0	53	83	0	136	1	51	49	0	101	0	72	47	0	119	356
12:00 PM	0	12	22	0	34	0	5	12	0	17	0	17	15	0	32	83
12:15 PM	0	6	14	0	20	0	12	8	0	20	0	21	16	0	37	77
12:30 PM	0	9	32	0	41	0	10	10	0	20	0	32	11	0	43	104
12:45 PM	0	12	20	0	32	0	8	20	0	28	0	17	11	0	28	88
Hourly Total	0	39	88	0	127	0	35	50	0	85	0	87	53	0	140	352
1:00 PM	0	7	30	0	37	0	14	9	0	23	0	16	11	0	27	87
1:15 PM	0	10	18	0	28	0	15	13	0	28	0	9	18	0	27	83
1:30 PM	0	11	18	0	29	0	15	11	0	26	0	16	15	0	31	86
1:45 PM	0	14	18	0	32	0	12	9	0	21	0	15	21	0	36	89
Hourly Total	0	42	84	0	126	0	56	42	0	98	0	56	65	0	121	345
2:00 PM	0	12	17	0	29	0	15	11	0	26	0	19	9	0	28	83
2:15 PM	0	13	20	0	33	0	10	16	0	26	0	18	15	0	33	92
2:30 PM	0	13	27	0	40	0	18	5	0	23	0	22	14	0	36	99
2:45 PM	0	18	25	0	43	0	19	9	0	28	0	32	17	0	49	120
Hourly Total	0	56	89	0	145	0	62	41	0	103	0	91	55	0	146	394
3:00 PM	0	11	15	0	26	0	14	12	0	26	0	26	18	0	44	96
3:15 PM	0	21	25	0	46	0	19	20	0	39	0	14	24	0	38	123
3:30 PM	0	27	32	0	59	0	18	15	0	33	0	37	30	0	67	159
3:45 PM	0	24	33	0	57	0	26	28	0	54	0	35	27	0	62	173
Hourly Total	0	83	105	0	188	0	77	75	0	152	0	112	99	0	211	551
4:00 PM	0	21	34	0	55	0	24	34	0	58	0	25	22	0	47	160
4:15 PM	0	25	28	0	53	0	22	22	0	44	0	25	24	0	49	146
4:30 PM	0	32	25	0	57	0	32	18	0	50	0	35	24	0	59	166
4:45 PM	0	22	38	0	60	0	27	27	0	54	0	30	16	0	46	160
Hourly Total	0	100	125	0	225	0	105	101	0	206	0	115	86	0	201	632
5:00 PM	0	25	38	0	63	0	28	25	0	53	0	32	23	0	55	171
5:15 PM	0	23	38	0	61	0	30	25	0	55	0	34	22	0	56	172
5:30 PM	0	34	31	0	65	0	29	25	0	54	0	31	25	0	56	175
5:45 PM	0	24	25	0	49	1	31	18	0	50	0	30	25	0	55	154
Hourly Total	0	106	132	0	238	1	118	93	0	212	0	127	95	0	222	672
6:00 PM	0	12	24	0	36	0	33	24	0	57	0	25	10	0	35	128
6:15 PM	0	16	28	0	44	0	32	26	0	58	0	27	18	0	45	147
6:30 PM	0	12	18	0	30	0	25	15	0	40	0	25	26	0	51	121

6:45 PM	0	8	11	0	19	0	18	14	0	32	0	19	18	0	37	88
Hourly Total	0	48	81	0	129	0	108	79	0	187	0	96	72	0	168	484
7:00 PM	0	13	10	0	23	0	10	10	0	20	0	14	13	0	27	70
7:15 PM	0	11	18	0	29	0	15	8	0	23	0	6	12	0	18	70
7:30 PM	0	4	19	0	23	0	9	17	0	26	0	10	5	0	15	64
7:45 PM	0	14	15	0	29	0	18	12	0	30	0	8	9	0	17	76
Hourly Total	0	42	62	0	104	0	52	47	0	99	0	38	39	0	77	280
8:00 PM	0	11	15	0	26	0	14	15	0	29	0	15	10	0	25	80
8:15 PM	0	8	13	0	21	0	21	10	0	31	0	14	10	0	24	76
8:30 PM	0	21	17	0	38	0	9	4	0	13	0	1	10	0	11	62
8:45 PM	0	10	28	0	38	0	11	7	0	18	0	4	6	0	10	66
Hourly Total	0	50	73	0	123	0	55	36	0	91	0	34	36	0	70	284
9:00 PM	0	5	7	0	12	0	7	6	0	13	0	6	7	0	13	38
9:15 PM	0	5	7	0	12	0	15	9	0	24	0	3	6	0	9	45
9:30 PM	0	3	8	0	11	0	10	11	0	21	0	6	3	0	9	41
9:45 PM	0	5	5	0	10	0	7	3	0	10	0	3	2	0	5	25
Hourly Total	0	18	27	0	45	0	39	29	0	68	0	18	18	0	36	149
10:00 PM	0	6	6	0	12	0	6	5	0	11	0	2	4	0	6	29
10:15 PM	0	4	6	0	10	0	5	3	0	8	0	4	2	0	6	24
10:30 PM	0	2	2	0	4	0	4	3	0	7	0	2	3	0	5	16
10:45 PM	0	3	9	0	12	0	2	2	0	4	0	0	1	0	1	17
Hourly Total	0	15	23	0	38	0	17	13	0	30	0	8	10	0	18	86
11:00 PM	0	4	2	0	6	0	3	1	0	4	0	0	2	0	2	12
11:15 PM	0	1	3	0	4	0	2	1	0	3	0	1	1	0	2	9
11:30 PM	0	0	1	0	1	0	2	2	0	4	0	3	0	0	3	8
11:45 PM	0	1	1	0	2	0	1	2	0	3	0	1	1	0	2	7
Hourly Total	0	6	7	0	13	0	8	6	0	14	0	5	4	0	9	36
Grand Total	0	897	1436	0	2333	2	1002	1045	0	2049	0	1421	1087	0	2508	6890
Approach %	0.0	38.4	61.6	-	-	0.1	48.9	51.0	-	-	0.0	56.7	43.3	-	-	-
Total %	0.0	13.0	20.8	-	33.9	0.0	14.5	15.2	-	29.7	0.0	20.6	15.8	-	36.4	-
Lights	0	884	1423	-	2307	2	994	1028	-	2024	0	1405	1075	-	2480	6811
% Lights	-	98.6	99.1	-	98.9	100.0	99.2	98.4	-	98.8	-	98.9	98.9	-	98.9	98.9
Mediums	0	13	13	-	26	0	7	12	-	19	0	15	11	-	26	71
% Mediums	-	1.4	0.9	-	1.1	0.0	0.7	1.1	-	0.9	-	1.1	1.0	-	1.0	1.0
Articulated Trucks	0	0	0	-	0	0	1	5	-	6	0	0	1	-	1	7
% Articulated Trucks	-	0.0	0.0	-	0.0	0.0	0.1	0.5	-	0.3	-	0.0	0.1	-	0.0	0.1
Bicycles on Road	0	0	0	-	0	0	0	0	-	0	0	1	0	-	1	1
% Bicycles on Road	-	0.0	0.0	-	0.0	0.0	0.0	0.0	-	0.0	-	0.1	0.0	-	0.0	0.0
Bicycles on Crosswalk	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pedestrians	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

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Vernon Hills, Illinois, United States 60061
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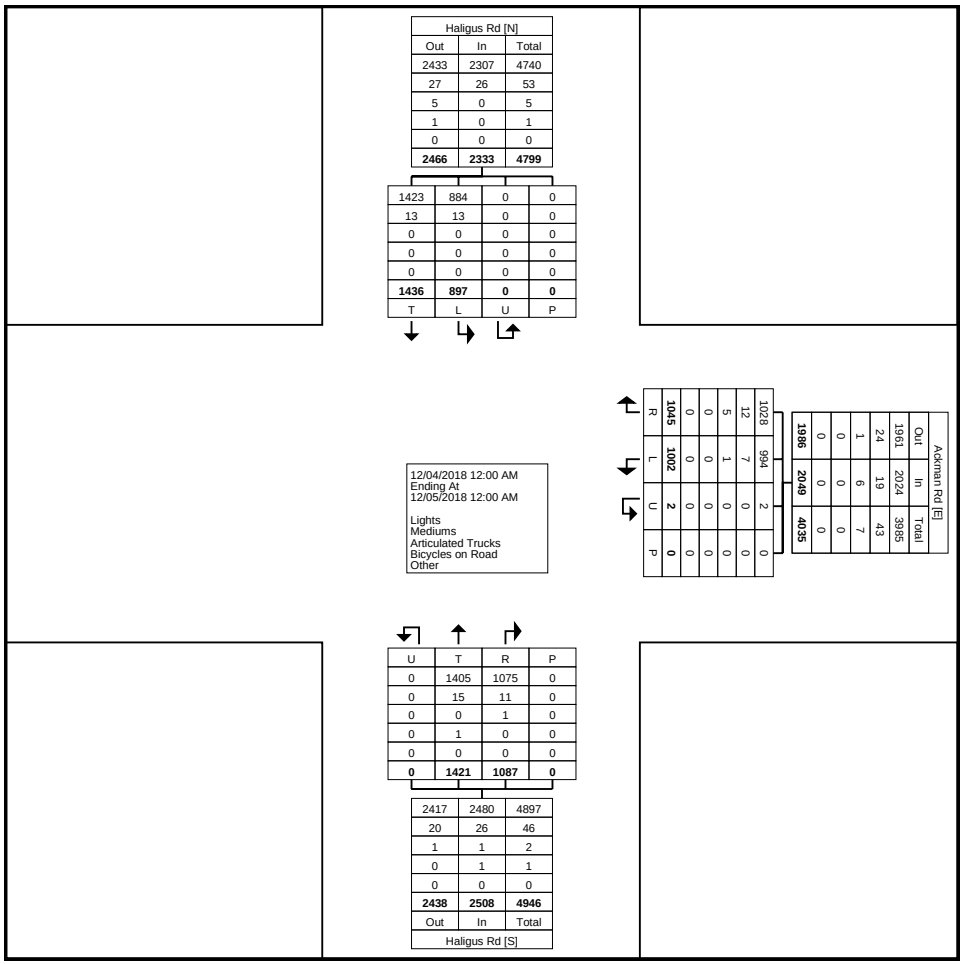

Turning Movement Data Plot

Ackman Rd & Haligus Rd
4188.921 McHenry County
24 Hr
GHA Mio

Gewalt Hamilton Associates Inc.
625 Forest Edge Drive

Vernon Hills, Illinois, United States 60061
(847) 478-9700 poster@gha-engineers.com

Count Name: Ackman Rd & Haligus Rd
Site Code:
Start Date: 12/04/2018

Turning Movement Peak Hour Data (7:15 AM)

Start Time	Haligus Rd Southbound					Ackman Rd Westbound					Haligus Rd Northbound					
	U-Turn	Left	Thru	Peds	App. Total	U-Turn	Left	Right	Peds	App. Total	U-Turn	Thru	Right	Peds	App. Total	Int. Total
7:15 AM	0	9	28	0	37	0	13	32	0	45	0	40	19	0	59	141
7:30 AM	0	16	36	0	52	0	13	21	0	34	0	44	33	0	77	163
7:45 AM	0	22	41	0	63	0	9	27	0	36	0	27	20	0	47	146
8:00 AM	0	21	23	0	44	0	7	23	0	30	0	34	24	0	58	132
Total	0	68	128	0	196	0	42	103	0	145	0	145	96	0	241	582
Approach %	0.0	34.7	65.3	-	-	0.0	29.0	71.0	-	-	0.0	60.2	39.8	-	-	-
Total %	0.0	11.7	22.0	-	33.7	0.0	7.2	17.7	-	24.9	0.0	24.9	16.5	-	41.4	-
PHF	0.000	0.773	0.780	-	0.778	0.000	0.808	0.805	-	0.806	0.000	0.824	0.727	-	0.782	0.893
Lights	0	66	125	-	191	0	41	101	-	142	0	142	94	-	236	569
% Lights	-	97.1	97.7	-	97.4	-	97.6	98.1	-	97.9	-	97.9	97.9	-	97.9	97.8
Mediums	0	2	3	-	5	0	1	2	-	3	0	3	2	-	5	13
% Mediums	-	2.9	2.3	-	2.6	-	2.4	1.9	-	2.1	-	2.1	2.1	-	2.1	2.2
Articulated Trucks	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
% Articulated Trucks	-	0.0	0.0	-	0.0	-	0.0	0.0	-	0.0	-	0.0	0.0	-	0.0	0.0
Bicycles on Road	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
% Bicycles on Road	-	0.0	0.0	-	0.0	-	0.0	0.0	-	0.0	-	0.0	0.0	-	0.0	0.0
Bicycles on Crosswalk	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pedestrians	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

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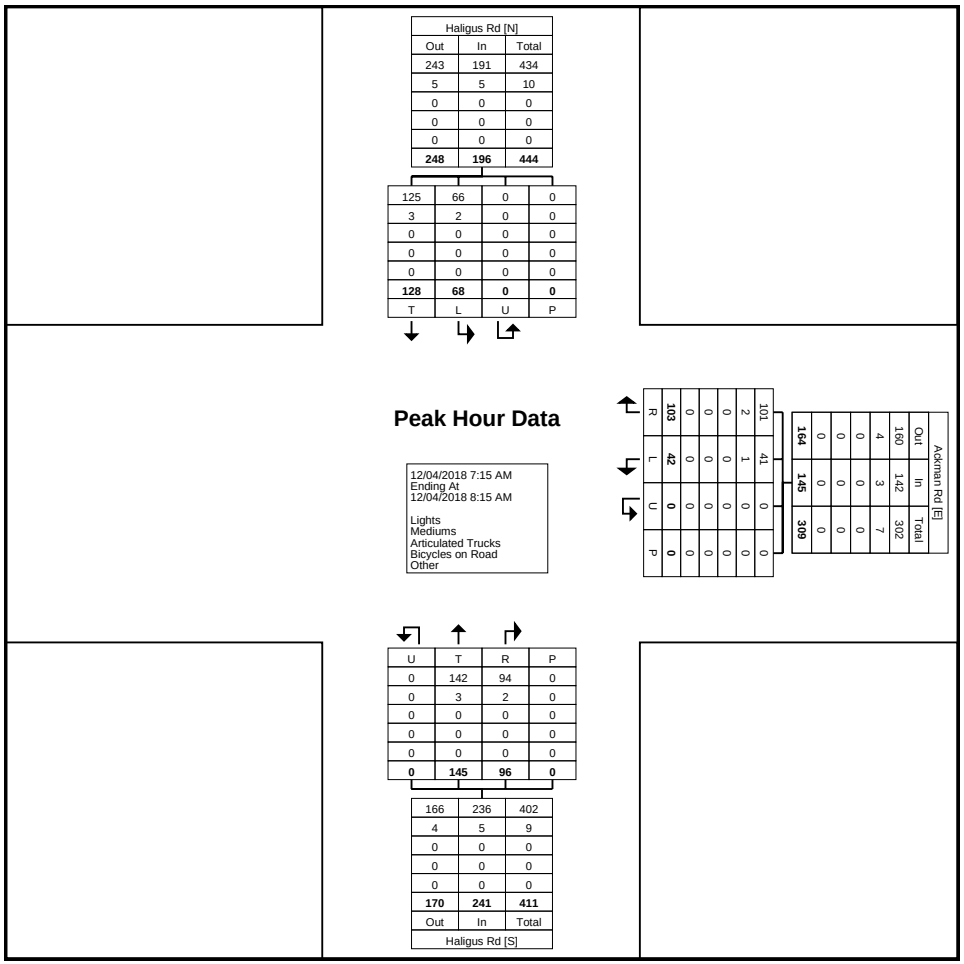

Turning Movement Peak Hour Data Plot (7:15 AM)

Ackman Rd & Haligus Rd
4188.921 McHenry County
24 Hr
GHA Mio

Gewalt Hamilton Associates Inc.
625 Forest Edge Drive

Vernon Hills, Illinois, United States 60061
(847) 478-9700 poster@gha-engineers.com

Count Name: Ackman Rd & Haligus Rd
Site Code:
Start Date: 12/04/2018

Turning Movement Peak Hour Data (4:45 PM)

Start Time	Haligus Rd Southbound					Ackman Rd Westbound					Haligus Rd Northbound					
	U-Turn	Left	Thru	Peds	App. Total	U-Turn	Left	Right	Peds	App. Total	U-Turn	Thru	Right	Peds	App. Total	Int. Total
4:45 PM	0	22	38	0	60	0	27	27	0	54	0	30	16	0	46	160
5:00 PM	0	25	38	0	63	0	28	25	0	53	0	32	23	0	55	171
5:15 PM	0	23	38	0	61	0	30	25	0	55	0	34	22	0	56	172
5:30 PM	0	34	31	0	65	0	29	25	0	54	0	31	25	0	56	175
Total	0	104	145	0	249	0	114	102	0	216	0	127	86	0	213	678
Approach %	0.0	41.8	58.2	-	-	0.0	52.8	47.2	-	-	0.0	59.6	40.4	-	-	-
Total %	0.0	15.3	21.4	-	36.7	0.0	16.8	15.0	-	31.9	0.0	18.7	12.7	-	31.4	-
PHF	0.000	0.765	0.954	-	0.958	0.000	0.950	0.944	-	0.982	0.000	0.934	0.860	-	0.951	0.969
Lights	0	104	145	-	249	0	114	101	-	215	0	127	86	-	213	677
% Lights	-	100.0	100.0	-	100.0	-	100.0	99.0	-	99.5	-	100.0	100.0	-	100.0	99.9
Mediums	0	0	0	-	0	0	0	1	-	1	0	0	0	-	0	1
% Mediums	-	0.0	0.0	-	0.0	-	0.0	1.0	-	0.5	-	0.0	0.0	-	0.0	0.1
Articulated Trucks	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
% Articulated Trucks	-	0.0	0.0	-	0.0	-	0.0	0.0	-	0.0	-	0.0	0.0	-	0.0	0.0
Bicycles on Road	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
% Bicycles on Road	-	0.0	0.0	-	0.0	-	0.0	0.0	-	0.0	-	0.0	0.0	-	0.0	0.0
Bicycles on Crosswalk	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pedestrians	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Ackman Rd & Haligus Rd
4188.921 McHenry County
24 Hr
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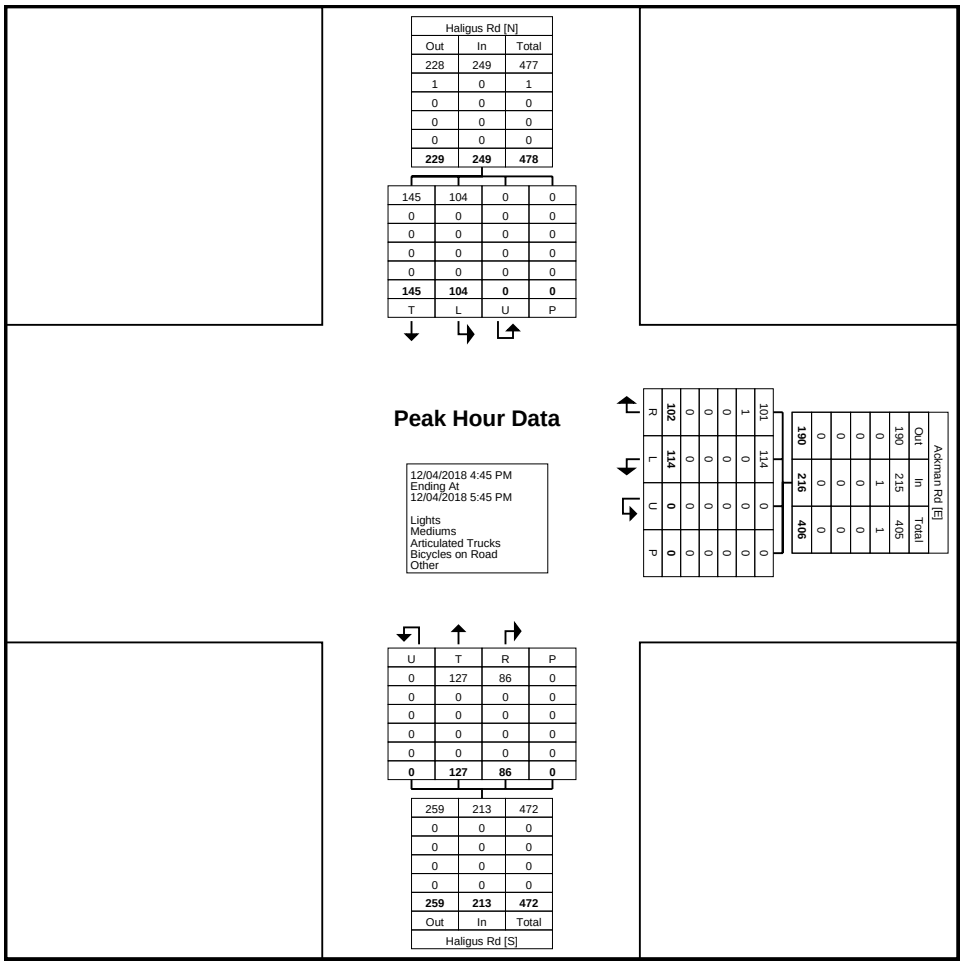


Turning Movement Peak Hour Data Plot (4:45 PM)

Ackman Rd & N Lakewood Rd
4188.921 McHenry County
24 Hr
GHA Mio

Gewalt Hamilton Associates Inc.
625 Forest Edge Drive

Vernon Hills, Illinois, United States 60061
(847) 478-9700 poster@gha-engineers.com

Count Name: Ackman Rd & N Lakewood Rd
Site Code:
Start Date: 12/04/2018

Turning Movement Data

Start Time	N Lakewood Rd Southbound						Ackman Rd Westbound						N Lakewood Rd Northbound						Ackman Rd Eastbound						Int. Total
	U-Turn	Left	Thru	Right	Peds	App. Total	U-Turn	Left	Thru	Right	Peds	App. Total	U-Turn	Left	Thru	Right	Peds	App. Total	U-Turn	Left	Thru	Right	Peds	App. Total	
12:00 AM	0	0	0	0	0	0	0	6	0	0	0	6	0	0	0	4	0	4	0	0	0	0	0	0	10
12:15 AM	0	0	0	0	0	0	0	5	0	0	0	5	0	1	0	2	0	3	0	0	0	1	0	1	9
12:30 AM	0	0	0	0	0	0	0	1	1	1	0	3	0	0	1	2	0	3	0	0	1	0	0	1	7
12:45 AM	0	0	0	0	0	0	0	4	2	1	0	7	0	0	1	2	0	3	0	0	0	0	0	0	10
Hourly Total	0	0	0	0	0	0	0	16	3	2	0	21	0	1	2	10	0	13	0	0	1	1	0	2	36
1:00 AM	0	0	0	0	0	0	0	2	0	1	0	3	0	1	0	1	0	2	0	0	1	0	0	1	6
1:15 AM	0	0	0	0	0	0	0	2	1	1	0	4	0	0	0	1	0	1	0	0	0	0	0	0	5
1:30 AM	0	0	0	0	0	0	0	2	0	0	0	2	0	1	1	1	0	3	0	0	0	0	0	0	5
1:45 AM	0	0	1	0	0	1	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	2
Hourly Total	0	0	1	0	0	1	0	6	2	2	0	10	0	2	1	3	0	6	0	0	1	0	0	1	18
2:00 AM	0	0	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	0	0	0	1	0	0	1	2
2:15 AM	0	0	0	0	0	0	0	1	1	0	0	2	0	0	0	1	0	1	0	0	0	1	0	1	4
2:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	1
2:45 AM	0	0	0	0	0	0	0	1	1	0	0	2	0	0	0	0	0	0	0	0	1	0	0	1	3
Hourly Total	0	0	0	0	0	0	0	3	2	0	0	5	0	0	0	2	0	2	0	0	2	1	0	3	10
3:00 AM	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
3:15 AM	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1	2
3:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	1
3:45 AM	0	1	0	0	0	1	0	1	0	0	0	1	0	0	0	1	0	1	0	0	1	0	0	1	4
Hourly Total	0	1	1	0	0	2	0	1	0	0	0	1	0	0	0	2	0	2	0	0	2	0	0	2	7
4:00 AM	0	1	0	0	0	1	0	2	3	0	0	5	0	0	0	4	0	4	0	0	2	0	0	2	12
4:15 AM	0	1	1	0	0	2	0	0	0	0	0	0	0	0	1	2	0	3	0	0	1	1	0	2	7
4:30 AM	0	0	2	0	0	2	0	3	2	0	0	5	0	0	0	8	0	8	0	0	3	1	0	4	19
4:45 AM	0	0	4	0	0	4	0	7	3	0	0	10	0	0	0	10	0	10	0	0	3	0	0	3	27
Hourly Total	0	2	7	0	0	9	0	12	8	0	0	20	0	0	1	24	0	25	0	0	9	2	0	11	65
5:00 AM	0	1	2	0	0	3	0	5	8	0	0	13	0	2	1	11	0	14	0	0	5	1	0	6	36
5:15 AM	0	1	2	0	0	3	0	19	1	0	0	20	0	3	1	14	0	18	0	0	7	2	0	9	50
5:30 AM	0	5	5	0	0	10	0	17	10	2	0	29	0	1	0	33	0	34	0	0	11	2	0	13	86
5:45 AM	0	5	8	1	0	14	0	26	6	0	0	32	0	2	2	33	0	37	0	0	14	1	0	15	98
Hourly Total	0	12	17	1	0	30	0	67	25	2	0	94	0	8	4	91	0	103	0	0	37	6	0	43	270
6:00 AM	0	3	6	1	0	10	0	18	11	1	0	30	0	5	2	32	0	39	0	0	16	2	0	18	97
6:15 AM	0	6	6	1	0	13	0	25	14	4	0	43	0	3	0	38	0	41	0	0	21	3	0	24	121
6:30 AM	0	17	10	1	0	28	0	23	34	2	0	59	0	5	4	53	0	62	0	1	30	2	0	33	182
6:45 AM	0	16	8	1	0	25	0	59	27	0	0	86	0	9	4	62	0	75	0	0	27	3	0	30	216
Hourly Total	0	42	30	4	0	76	0	125	86	7	0	218	0	22	10	185	0	217	0	1	94	10	0	105	616
7:00 AM	0	21	11	0	0	32	0	28	29	4	0	61	0	6	5	52	0	63	0	0	28	6	0	34	190
7:15 AM	1	19	10	1	0	31	0	57	27	8	0	92	0	16	7	65	0	88	0	1	24	4	0	29	240
7:30 AM	0	9	10	1	0	20	0	51	23	4	0	78	0	11	5	70	0	86	0	1	39	7	0	47	231
7:45 AM	0	9	16	0	0	25	0	53	21	3	0	77	0	12	9	62	0	83	0	0	37	9	0	46	231
Hourly Total	1	58	47	2	0	108	0	189	100	19	0	308	0	45	26	249	0	320	0	2	128	26	0	156	892

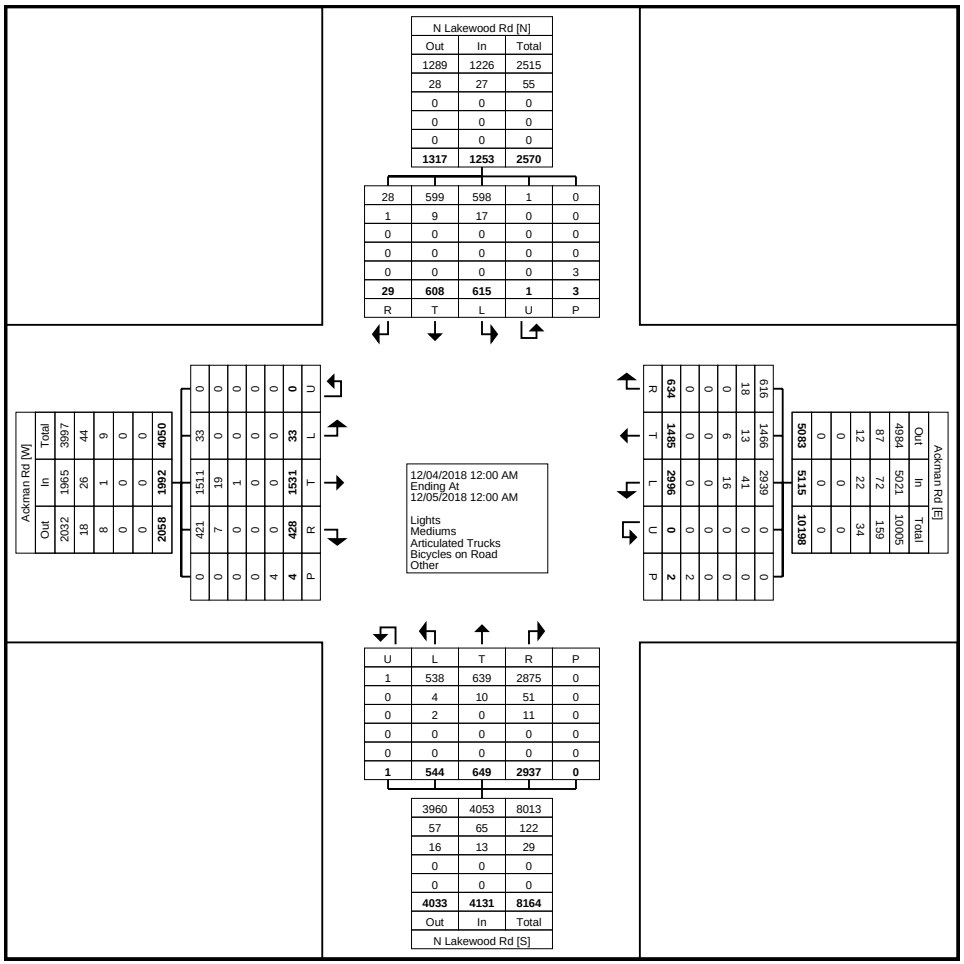
8:00 AM	0	12	7	1	0	20	0	28	20	4	0	52	0	11	3	55	0	69	0	1	37	5	0	43	184
8:15 AM	0	16	16	0	0	32	0	27	16	5	0	48	0	12	11	46	0	69	0	0	30	6	0	36	185
8:30 AM	0	14	19	0	0	33	0	32	30	3	0	65	0	15	3	57	0	75	0	1	21	3	1	25	198
8:45 AM	0	16	14	1	0	31	0	37	21	7	0	65	0	10	7	40	0	57	0	0	27	2	0	29	182
Hourly Total	0	58	56	2	0	116	0	124	87	19	0	230	0	48	24	198	0	270	0	2	115	16	1	133	749
9:00 AM	0	10	17	2	0	29	0	35	17	4	0	56	0	4	9	33	0	46	0	0	33	5	0	38	169
9:15 AM	0	7	8	0	0	15	0	34	17	8	0	59	0	9	3	28	0	40	0	3	15	1	1	19	133
9:30 AM	0	8	14	0	0	22	0	29	12	11	0	52	0	9	7	48	0	64	0	1	13	10	0	24	162
9:45 AM	0	7	8	1	0	16	0	31	15	5	0	51	0	7	9	37	0	53	0	0	24	10	0	34	154
Hourly Total	0	32	47	3	0	82	0	129	61	28	0	218	0	29	28	146	0	203	0	4	85	26	1	115	618
10:00 AM	0	8	11	1	0	20	0	42	10	6	0	58	0	3	3	27	0	33	0	0	16	3	0	19	130
10:15 AM	0	13	16	0	0	29	0	32	8	10	0	50	1	6	19	39	0	65	0	0	13	5	0	18	162
10:30 AM	0	12	11	0	0	23	0	18	13	3	0	34	0	4	7	41	0	52	0	1	9	2	0	12	121
10:45 AM	0	9	6	0	0	15	0	29	15	6	0	50	0	4	14	38	0	56	0	0	22	2	0	24	145
Hourly Total	0	42	44	1	0	87	0	121	46	25	0	192	1	17	43	145	0	206	0	1	60	12	0	73	558
11:00 AM	0	12	13	0	0	25	0	36	23	6	0	65	0	5	7	31	0	43	0	0	24	5	0	29	162
11:15 AM	0	16	11	1	0	28	0	33	14	10	0	57	0	7	10	48	0	65	0	0	12	4	0	16	166
11:30 AM	0	7	11	0	0	18	0	30	12	8	0	50	0	11	6	31	0	48	0	1	21	12	0	34	150
11:45 AM	0	12	12	1	0	25	0	44	20	5	0	69	0	7	10	39	0	56	0	2	18	6	0	26	176
Hourly Total	0	47	47	2	0	96	0	143	69	29	0	241	0	30	33	149	0	212	0	3	75	27	0	105	654
12:00 PM	0	5	11	0	0	16	0	32	11	4	0	47	0	7	5	40	0	52	0	0	22	6	0	28	143
12:15 PM	0	9	6	0	0	15	0	35	12	5	0	52	0	7	11	34	0	52	0	0	19	2	0	21	140
12:30 PM	0	12	7	0	0	19	0	43	16	8	0	67	0	4	16	29	0	49	0	1	15	5	0	21	156
12:45 PM	0	6	15	1	0	22	0	34	14	9	0	57	0	13	8	42	0	63	0	0	16	9	0	25	167
Hourly Total	0	32	39	1	0	72	0	144	53	26	0	223	0	31	40	145	0	216	0	1	72	22	0	95	606
1:00 PM	0	4	7	1	0	12	0	35	21	11	0	67	0	4	11	38	0	53	0	1	13	4	0	18	150
1:15 PM	0	6	8	1	0	15	0	46	19	13	0	78	0	7	6	29	0	42	0	1	20	5	0	26	161
1:30 PM	0	10	11	1	0	22	0	43	18	14	0	75	0	9	15	29	0	53	0	1	21	4	0	26	176
1:45 PM	0	8	4	1	1	13	0	36	14	6	1	56	0	5	6	35	0	46	0	1	28	6	1	35	150
Hourly Total	0	28	30	4	1	62	0	160	72	44	1	276	0	25	38	131	0	194	0	4	82	19	1	105	637
2:00 PM	0	5	12	0	2	17	0	31	16	13	1	60	0	8	9	32	0	49	0	0	16	6	1	22	148
2:15 PM	0	5	13	1	0	19	0	45	16	15	0	76	0	10	10	28	0	48	0	0	21	6	0	27	170
2:30 PM	0	10	9	1	0	20	0	48	19	10	0	77	0	3	9	39	0	51	0	1	17	7	0	25	173
2:45 PM	0	14	4	0	0	18	0	50	20	9	0	79	0	7	15	39	0	61	0	1	22	14	0	37	195
Hourly Total	0	34	38	2	2	74	0	174	71	47	1	292	0	28	43	138	0	209	0	2	76	33	1	111	686
3:00 PM	0	14	13	1	0	28	0	62	21	17	0	100	0	6	18	35	0	59	0	0	24	5	0	29	216
3:15 PM	0	15	5	0	0	20	0	66	27	13	0	106	0	12	16	50	0	78	0	1	34	11	0	46	250
3:30 PM	0	9	11	0	0	20	0	51	28	16	0	95	0	8	18	68	0	94	0	1	50	7	0	58	267
3:45 PM	0	10	17	0	0	27	0	55	41	15	0	111	0	11	17	61	0	89	0	1	35	9	0	45	272
Hourly Total	0	48	46	1	0	95	0	234	117	61	0	412	0	37	69	214	0	320	0	3	143	32	0	178	1005
4:00 PM	0	10	8	1	0	19	0	71	34	17	0	122	0	23	20	60	0	103	0	0	38	11	0	49	293
4:15 PM	0	18	9	0	0	27	0	79	34	21	0	134	0	11	17	65	0	93	0	0	36	11	0	47	301
4:30 PM	0	12	11	1	0	24	0	61	44	14	0	119	0	3	12	74	0	89	0	0	35	17	0	52	284
4:45 PM	0	5	10	1	0	16	0	80	38	12	0	130	0	17	11	45	0	73	0	0	32	10	0	42	261
Hourly Total	0	45	38	3	0	86	0	291	150	64	0	505	0	54	60	244	0	358	0	0	141	49	0	190	1139
5:00 PM	0	12	11	1	0	24	0	70	36	16	0	122	0	13	17	59	0	89	0	1	35	13	0	49	284
5:15 PM	0	10	9	0	0	19	0	87	47	18	0	152	0	14	14	77	0	105	0	1	30	13	0	44	320
5:30 PM	0	9	9	0	0	18	0	68	34	16	0	118	0	19	14	72	0	105	0	0	37	16	0	53	294
5:45 PM	0	5	8	0	0	13	0	81	37	13	0	131	0	12	15	61	0	88	0	0	42	17	0	59	291
Hourly Total	0	36	37	1	0	74	0	306	154	63	0	523	0	58	60	269	0	387	0	2	144	59	0	205	1189
6:00 PM	0	13	11	0	0	24	0	75	43	11	0	129	0	12	13	70	0	95	0	2	14	6	0	22	270
6:15 PM	0	10	2	0	0	12	0	90	48	14	0	152	0	16	19	45	0	80	0	2	25	6	0	33	277

6:30 PM	0	16	9	0	0	25	0	63	23	15	0	101	0	11	11	55	0	77	0	1	33	5	0	39	242
6:45 PM	0	6	7	0	0	13	0	45	23	17	0	85	0	9	13	47	0	69	0	1	21	5	0	27	194
Hourly Total	0	45	29	0	0	74	0	273	137	57	0	467	0	48	56	217	0	321	0	6	93	22	0	121	983
7:00 PM	0	4	10	0	0	14	0	56	16	17	0	89	0	9	7	57	0	73	0	0	15	10	0	25	201
7:15 PM	0	5	8	0	0	13	0	53	16	13	0	82	0	3	14	34	0	51	0	0	17	5	0	22	168
7:30 PM	0	4	2	0	0	6	0	41	18	9	0	68	0	10	11	31	0	52	0	0	8	2	0	10	136
7:45 PM	0	9	3	0	0	12	0	41	25	14	0	80	0	5	5	20	0	30	0	0	19	5	0	24	146
Hourly Total	0	22	23	0	0	45	0	191	75	53	0	319	0	27	37	142	0	206	0	0	59	22	0	81	651
8:00 PM	0	7	0	0	0	7	0	35	23	11	0	69	0	6	8	30	0	44	0	0	13	6	0	19	139
8:15 PM	0	6	6	1	0	13	0	36	26	7	0	69	0	3	11	32	0	46	0	0	12	6	0	18	146
8:30 PM	0	3	1	0	0	4	0	29	12	8	0	49	0	1	6	19	0	26	0	2	16	12	0	30	109
8:45 PM	0	4	11	0	0	15	0	28	18	7	0	53	0	0	5	21	0	26	0	0	14	5	0	19	113
Hourly Total	0	20	18	1	0	39	0	128	79	33	0	240	0	10	30	102	0	142	0	2	55	29	0	86	507
9:00 PM	0	1	4	0	0	5	0	23	14	11	0	48	0	2	7	21	0	30	0	0	8	2	0	10	93
9:15 PM	0	3	2	0	0	5	0	30	21	15	0	66	0	4	9	13	0	26	0	0	12	1	0	13	110
9:30 PM	0	0	2	1	0	3	0	17	10	4	0	31	0	7	4	13	0	24	0	0	5	1	0	6	64
9:45 PM	0	1	0	0	0	1	0	21	8	4	0	33	0	2	2	6	0	10	0	0	4	3	0	7	51
Hourly Total	0	5	8	1	0	14	0	91	53	34	0	178	0	15	22	53	0	90	0	0	29	7	0	36	318
10:00 PM	0	0	2	0	0	2	0	10	8	2	0	20	0	3	7	18	0	28	0	0	7	1	0	8	58
10:15 PM	0	1	0	0	0	1	0	12	7	4	0	23	0	2	5	15	0	22	0	0	4	3	0	7	53
10:30 PM	0	1	1	0	0	2	0	11	5	6	0	22	0	1	4	8	0	13	0	0	6	0	0	6	43
10:45 PM	0	0	0	0	0	0	0	9	5	1	0	15	0	1	2	12	0	15	0	0	2	2	0	4	34
Hourly Total	0	2	3	0	0	5	0	42	25	13	0	80	0	7	18	53	0	78	0	0	19	6	0	25	188
11:00 PM	0	1	0	0	0	1	0	7	2	3	0	12	0	0	2	4	0	6	0	0	6	0	0	6	25
11:15 PM	0	2	1	0	0	3	0	8	3	0	0	11	0	0	1	7	0	8	0	0	1	0	0	1	23
11:30 PM	0	1	1	0	0	2	0	7	4	1	0	12	0	1	1	11	0	13	0	0	0	1	0	1	28
11:45 PM	0	0	0	0	0	0	0	4	1	2	0	7	0	1	0	3	0	4	0	0	2	0	0	2	13
Hourly Total	0	4	2	0	0	6	0	26	10	6	0	42	0	2	4	25	0	31	0	0	9	1	0	10	89
Grand Total	1	615	608	29	3	1253	0	2996	1485	634	2	5115	1	544	649	2937	0	4131	0	33	1531	428	4	1992	12491
Approach %	0.1	49.1	48.5	2.3	-	-	0.0	58.6	29.0	12.4	-	-	0.0	13.2	15.7	71.1	-	-	0.0	1.7	76.9	21.5	-	-	-
Total %	0.0	4.9	4.9	0.2	-	10.0	0.0	24.0	11.9	5.1	-	40.9	0.0	4.4	5.2	23.5	-	33.1	0.0	0.3	12.3	3.4	-	15.9	-
Lights	1	598	599	28	-	1226	0	2939	1466	616	-	5021	1	538	639	2875	-	4053	0	33	1511	421	-	1965	12265
% Lights	100.0	97.2	98.5	96.6	-	97.8	-	98.1	98.7	97.2	-	98.2	100.0	98.9	98.5	97.9	-	98.1	-	100.0	98.7	98.4	-	98.6	98.2
Mediums	0	17	9	1	-	27	0	41	13	18	-	72	0	4	10	51	-	65	0	0	19	7	-	26	190
% Mediums	0.0	2.8	1.5	3.4	-	2.2	-	1.4	0.9	2.8	-	1.4	0.0	0.7	1.5	1.7	-	1.6	-	0.0	1.2	1.6	-	1.3	1.5
Articulated Trucks	0	0	0	0	-	0	0	16	6	0	-	22	0	2	0	11	-	13	0	0	1	0	-	1	36
% Articulated Trucks	0.0	0.0	0.0	0.0	-	0.0	-	0.5	0.4	0.0	-	0.4	0.0	0.4	0.0	0.4	-	0.3	-	0.0	0.1	0.0	-	0.1	0.3
Bicycles on Road	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Bicycles on Road	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	0.0
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	0.0	-	-	-	-	-	0.0	-	-	-	-	-	-	-	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	-	3	-	-	-	-	-	2	-	-	-	-	-	0	-	-	-	-	-	4	-	-
% Pedestrians	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-	-	-	-	-	-	-	-	-	-	100.0	-	-

Ackman Rd & N Lakewood Rd
4188.921 McHenry County
24 Hr
GHA Mio

Gewalt Hamilton Associates Inc.
625 Forest Edge Drive

Vernon Hills, Illinois, United States 60061
(847) 478-9700 poster@gha-engineers.com



Turning Movement Data Plot

Ackman Rd & N Lakewood Rd
4188.921 McHenry County
24 Hr
GHA Mio

Gewalt Hamilton Associates Inc.
625 Forest Edge Drive

Vernon Hills, Illinois, United States 60061
(847) 478-9700 poster@gha-engineers.com

Count Name: Ackman Rd & N Lakewood Rd
Site Code:
Start Date: 12/04/2018

Turning Movement Peak Hour Data (7:00 AM)

Start Time	N Lakewood Rd Southbound						Ackman Rd Westbound						N Lakewood Rd Northbound						Ackman Rd Eastbound						Int. Total
	U-Turn	Left	Thru	Right	Peds	App. Total	U-Turn	Left	Thru	Right	Peds	App. Total	U-Turn	Left	Thru	Right	Peds	App. Total	U-Turn	Left	Thru	Right	Peds	App. Total	
7:00 AM	0	21	11	0	0	32	0	28	29	4	0	61	0	6	5	52	0	63	0	0	28	6	0	34	190
7:15 AM	1	19	10	1	0	31	0	57	27	8	0	92	0	16	7	65	0	88	0	1	24	4	0	29	240
7:30 AM	0	9	10	1	0	20	0	51	23	4	0	78	0	11	5	70	0	86	0	1	39	7	0	47	231
7:45 AM	0	9	16	0	0	25	0	53	21	3	0	77	0	12	9	62	0	83	0	0	37	9	0	46	231
Total	1	58	47	2	0	108	0	189	100	19	0	308	0	45	26	249	0	320	0	2	128	26	0	156	892
Approach %	0.9	53.7	43.5	1.9	-	-	0.0	61.4	32.5	6.2	-	-	0.0	14.1	8.1	77.8	-	-	0.0	1.3	82.1	16.7	-	-	-
Total %	0.1	6.5	5.3	0.2	-	12.1	0.0	21.2	11.2	2.1	-	34.5	0.0	5.0	2.9	27.9	-	35.9	0.0	0.2	14.3	2.9	-	17.5	-
PHF	0.250	0.690	0.734	0.500	-	0.844	0.000	0.829	0.862	0.594	-	0.837	0.000	0.703	0.722	0.889	-	0.909	0.000	0.500	0.821	0.722	-	0.830	0.929
Lights	1	55	46	2	-	104	0	185	96	19	-	300	0	44	26	247	-	317	0	2	125	26	-	153	874
% Lights	100.0	94.8	97.9	100.0	-	96.3	-	97.9	96.0	100.0	-	97.4	-	97.8	100.0	99.2	-	99.1	-	100.0	97.7	100.0	-	98.1	98.0
Mediums	0	3	1	0	-	4	0	1	4	0	-	5	0	1	0	2	-	3	0	0	3	0	-	3	15
% Mediums	0.0	5.2	2.1	0.0	-	3.7	-	0.5	4.0	0.0	-	1.6	-	2.2	0.0	0.8	-	0.9	-	0.0	2.3	0.0	-	1.9	1.7
Articulated Trucks	0	0	0	0	-	0	0	3	0	0	-	3	0	0	0	0	-	0	0	0	0	0	-	0	3
% Articulated Trucks	0.0	0.0	0.0	0.0	-	0.0	-	1.6	0.0	0.0	-	1.0	-	0.0	0.0	0.0	-	0.0	-	0.0	0.0	0.0	-	0.0	0.3
Bicycles on Road	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Bicycles on Road	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
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pedestrians	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Ackman Rd & N Lakewood Rd
4188.921 McHenry County
24 Hr
GHA Mio

Gewalt Hamilton Associates Inc.
625 Forest Edge Drive

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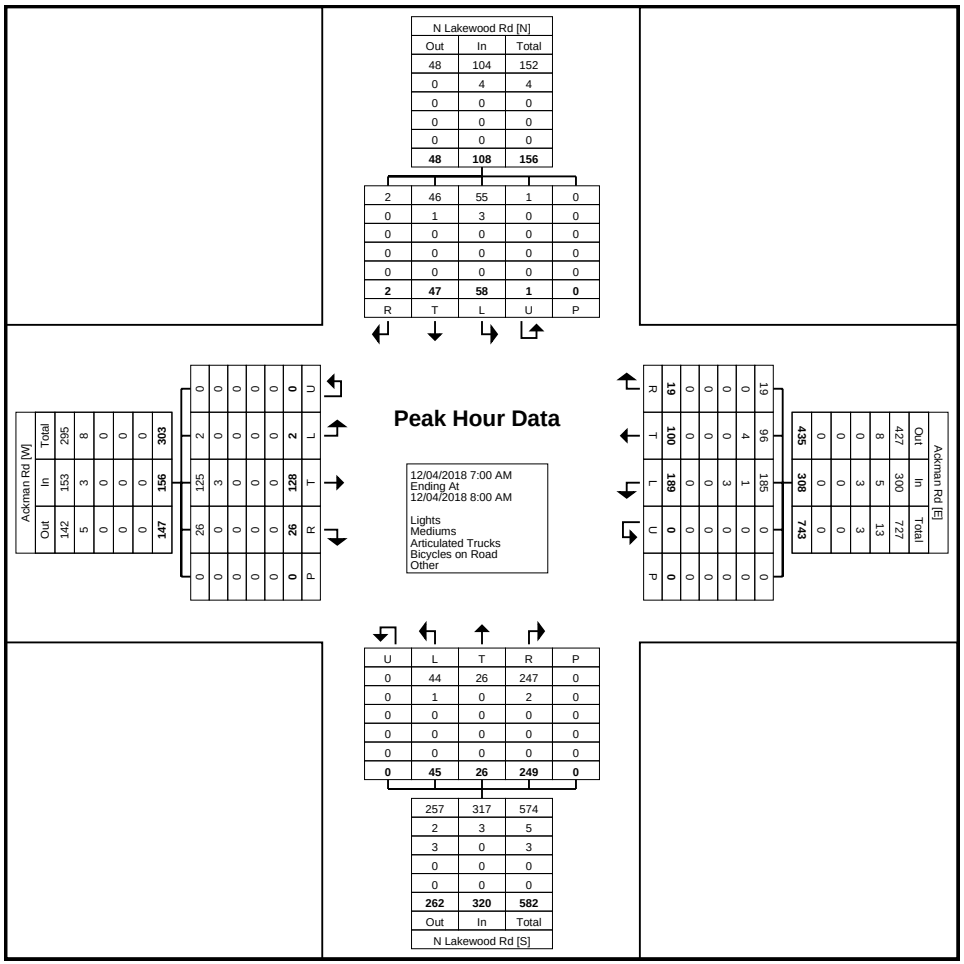
(847) 478-9700 poster@gha-engineers.com



Turning Movement Peak Hour Data Plot (7:00 AM)

Ackman Rd & N Lakewood Rd
4188.921 McHenry County
24 Hr
GHA Mio

Gewalt Hamilton Associates Inc.
625 Forest Edge Drive

Vernon Hills, Illinois, United States 60061
(847) 478-9700 poster@gha-engineers.com

Count Name: Ackman Rd & N Lakewood Rd
Site Code:
Start Date: 12/04/2018

Turning Movement Peak Hour Data (5:00 PM)

Start Time	N Lakewood Rd Southbound						Ackman Rd Westbound						N Lakewood Rd Northbound						Ackman Rd Eastbound						Int. Total
	U-Turn	Left	Thru	Right	Peds	App. Total	U-Turn	Left	Thru	Right	Peds	App. Total	U-Turn	Left	Thru	Right	Peds	App. Total	U-Turn	Left	Thru	Right	Peds	App. Total	
5:00 PM	0	12	11	1	0	24	0	70	36	16	0	122	0	13	17	59	0	89	0	1	35	13	0	49	284
5:15 PM	0	10	9	0	0	19	0	87	47	18	0	152	0	14	14	77	0	105	0	1	30	13	0	44	320
5:30 PM	0	9	9	0	0	18	0	68	34	16	0	118	0	19	14	72	0	105	0	0	37	16	0	53	294
5:45 PM	0	5	8	0	0	13	0	81	37	13	0	131	0	12	15	61	0	88	0	0	42	17	0	59	291
Total	0	36	37	1	0	74	0	306	154	63	0	523	0	58	60	269	0	387	0	2	144	59	0	205	1189
Approach %	0.0	48.6	50.0	1.4	-	-	0.0	58.5	29.4	12.0	-	-	0.0	15.0	15.5	69.5	-	-	0.0	1.0	70.2	28.8	-	-	-
Total %	0.0	3.0	3.1	0.1	-	6.2	0.0	25.7	13.0	5.3	-	44.0	0.0	4.9	5.0	22.6	-	32.5	0.0	0.2	12.1	5.0	-	17.2	-
PHF	0.000	0.750	0.841	0.250	-	0.771	0.000	0.879	0.819	0.875	-	0.860	0.000	0.763	0.882	0.873	-	0.921	0.000	0.500	0.857	0.868	-	0.869	0.929
Lights	0	35	37	1	-	73	0	304	154	63	-	521	0	58	60	265	-	383	0	2	144	59	-	205	1182
% Lights	-	97.2	100.0	100.0	-	98.6	-	99.3	100.0	100.0	-	99.6	-	100.0	100.0	98.5	-	99.0	-	100.0	100.0	100.0	-	100.0	99.4
Mediums	0	1	0	0	-	1	0	2	0	0	-	2	0	0	0	4	-	4	0	0	0	0	-	0	7
% Mediums	-	2.8	0.0	0.0	-	1.4	-	0.7	0.0	0.0	-	0.4	-	0.0	0.0	1.5	-	1.0	-	0.0	0.0	0.0	-	0.0	0.6
Articulated Trucks	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Articulated Trucks	-	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
Bicycles on Road	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Bicycles on Road	-	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
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pedestrians	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Ackman Rd & N Lakewood Rd
4188.921 McHenry County
24 Hr
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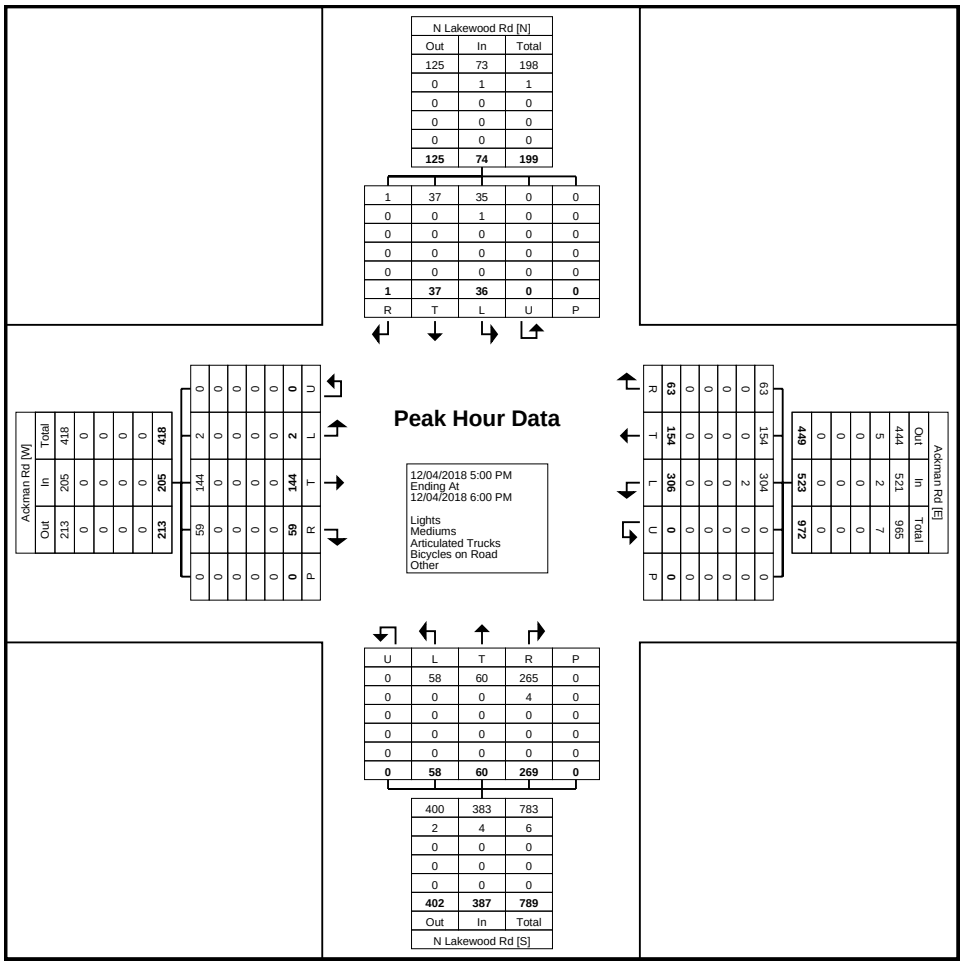


Turning Movement Peak Hour Data Plot (5:00 PM)

Ackman Rd & Redtail Dr
4188.921 McHenry County
24 Hr
GHA Mio

Gewalt Hamilton Associates Inc.
625 Forest Edge Drive

Vernon Hills, Illinois, United States 60061
(847) 478-9700 poster@gha-engineers.com

Count Name: Ackman Rd & Redtail Dr
Site Code:
Start Date: 12/04/2018

Turning Movement Data

Start Time	Redtail Dr Southbound					Ackman Rd Westbound					Ackman Rd Eastbound					
	U-Turn	Left	Right	Peds	App. Total	U-Turn	Thru	Right	Peds	App. Total	U-Turn	Left	Thru	Peds	App. Total	Int. Total
12:00 AM	0	0	0	0	0	0	6	0	0	6	0	1	3	0	4	10
12:15 AM	0	0	0	0	0	0	6	0	0	6	0	0	4	0	4	10
12:30 AM	0	0	0	0	0	0	3	0	0	3	0	0	5	0	5	8
12:45 AM	0	0	1	0	1	0	8	0	0	8	0	0	2	0	2	11
Hourly Total	0	0	1	0	1	0	23	0	0	23	0	1	14	0	15	39
1:00 AM	0	0	0	0	0	0	3	0	0	3	0	0	2	0	2	5
1:15 AM	0	0	0	0	0	0	5	1	0	6	0	0	1	0	1	7
1:30 AM	0	0	0	0	0	0	2	0	0	2	0	0	1	0	1	3
1:45 AM	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	2
Hourly Total	0	0	0	0	0	0	12	1	0	13	0	0	4	0	4	17
2:00 AM	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	1
2:15 AM	0	1	0	0	1	0	2	0	0	2	0	0	1	0	1	4
2:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2:45 AM	0	0	0	0	0	0	1	0	0	1	0	2	0	0	2	3
Hourly Total	0	1	0	0	1	0	4	0	0	4	0	2	1	0	3	8
3:00 AM	0	0	0	0	0	0	1	0	0	1	0	0	1	0	1	2
3:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2	2
3:30 AM	0	2	0	0	2	0	1	0	0	1	0	0	1	0	1	4
3:45 AM	0	3	0	0	3	0	3	1	0	4	0	0	4	0	4	11
Hourly Total	0	5	0	0	5	0	5	1	0	6	0	0	8	0	8	19
4:00 AM	0	0	1	0	1	0	5	0	0	5	0	0	10	0	10	16
4:15 AM	0	2	1	0	3	0	1	0	0	1	0	0	7	0	7	11
4:30 AM	0	4	0	0	4	0	7	0	0	7	0	0	15	0	15	26
4:45 AM	0	4	1	0	5	0	9	0	0	9	0	0	15	0	15	29
Hourly Total	0	10	3	0	13	0	22	0	0	22	0	0	47	0	47	82
5:00 AM	0	3	0	0	3	0	14	0	0	14	0	1	18	0	19	36
5:15 AM	0	2	1	0	3	0	20	0	0	20	0	0	28	0	28	51
5:30 AM	0	7	1	0	8	0	28	1	0	29	0	0	59	0	59	96
5:45 AM	0	9	2	0	11	0	31	1	0	32	0	0	65	0	65	108
Hourly Total	0	21	4	0	25	0	93	2	0	95	0	1	170	0	171	291
6:00 AM	0	11	2	0	13	0	34	2	0	36	0	2	59	0	61	110
6:15 AM	0	11	2	0	13	0	54	2	0	56	0	0	77	0	77	146
6:30 AM	0	15	7	0	22	0	65	2	0	67	0	3	117	0	120	209
6:45 AM	1	15	6	0	22	0	87	2	0	89	0	1	124	0	125	236
Hourly Total	1	52	17	0	70	0	240	8	0	248	0	6	377	0	383	701
7:00 AM	0	14	6	0	20	0	61	7	0	68	0	6	125	0	131	219
7:15 AM	0	11	11	0	22	0	91	7	0	98	0	2	123	0	125	245
7:30 AM	0	10	7	0	17	0	84	2	0	86	0	2	143	0	145	248
7:45 AM	0	13	10	0	23	0	72	0	0	72	0	6	120	0	126	221
Hourly Total	0	48	34	0	82	0	308	16	0	324	0	16	511	0	527	933
8:00 AM	0	14	3	0	17	0	54	6	0	60	0	3	112	0	115	192

8:15 AM	0	11	2	0	13	0	57	2	0	59	0	3	113	0	116	188
8:30 AM	0	13	4	0	17	0	81	8	0	89	0	3	121	0	124	230
8:45 AM	0	16	4	0	20	0	78	7	0	85	0	4	95	0	99	204
Hourly Total	0	54	13	0	67	0	270	23	0	293	0	13	441	0	454	814
9:00 AM	0	11	6	0	17	0	56	7	0	63	0	3	81	0	84	164
9:15 AM	0	9	3	0	12	0	59	7	0	66	0	0	63	0	63	141
9:30 AM	0	9	1	0	10	0	53	5	0	58	0	1	81	0	82	150
9:45 AM	0	14	6	0	20	0	47	11	0	58	0	5	66	0	71	149
Hourly Total	0	43	16	0	59	0	215	30	0	245	0	9	291	0	300	604
10:00 AM	0	9	4	0	13	0	47	10	0	57	0	4	48	0	52	122
10:15 AM	0	8	4	0	12	0	57	8	0	65	0	4	74	0	78	155
10:30 AM	0	10	5	0	15	0	40	4	0	44	0	1	66	0	67	126
10:45 AM	0	13	5	0	18	0	53	9	0	62	0	6	78	0	84	164
Hourly Total	0	40	18	0	58	0	197	31	0	228	0	15	266	0	281	567
11:00 AM	0	10	3	0	13	0	62	7	0	69	0	4	61	0	65	147
11:15 AM	0	9	4	0	13	0	66	11	0	77	0	7	74	0	81	171
11:30 AM	0	6	7	0	13	0	63	10	0	73	0	3	72	0	75	161
11:45 AM	0	10	6	0	16	0	67	12	0	79	0	8	81	0	89	184
Hourly Total	0	35	20	0	55	0	258	40	0	298	0	22	288	0	310	663
12:00 PM	0	13	6	0	19	0	44	7	0	51	0	8	59	0	67	137
12:15 PM	0	12	2	0	14	0	70	10	0	80	0	7	72	0	79	173
12:30 PM	0	13	4	0	17	0	70	8	0	78	0	3	64	0	67	162
12:45 PM	0	11	3	0	14	0	53	9	0	62	0	4	70	0	74	150
Hourly Total	0	49	15	0	64	0	237	34	0	271	0	22	265	0	287	622
1:00 PM	0	7	3	0	10	0	74	9	0	83	0	3	64	0	67	160
1:15 PM	0	10	2	0	12	0	86	14	0	100	0	4	55	0	59	171
1:30 PM	0	11	7	0	18	0	69	8	0	77	0	1	62	0	63	158
1:45 PM	0	12	3	0	15	0	55	16	0	71	0	3	73	0	76	162
Hourly Total	0	40	15	0	55	0	284	47	0	331	0	11	254	0	265	651
2:00 PM	0	7	5	0	12	0	58	9	0	67	0	1	59	0	60	139
2:15 PM	0	6	6	0	12	0	79	16	0	95	0	6	61	0	67	174
2:30 PM	0	5	7	0	12	0	78	12	0	90	0	6	58	0	64	166
2:45 PM	0	8	8	0	16	0	87	15	0	102	0	12	79	0	91	209
Hourly Total	0	26	26	0	52	0	302	52	0	354	0	25	257	0	282	688
3:00 PM	0	12	5	0	17	0	118	14	0	132	0	3	82	0	85	234
3:15 PM	0	11	10	0	21	0	109	15	0	124	0	9	106	0	115	260
3:30 PM	0	10	7	0	17	0	109	11	0	120	0	14	128	0	142	279
3:45 PM	0	15	6	0	21	0	123	20	0	143	0	10	111	0	121	285
Hourly Total	0	48	28	0	76	0	459	60	0	519	0	36	427	0	463	1058
4:00 PM	0	11	12	0	23	0	132	20	0	152	0	13	127	0	140	315
4:15 PM	0	16	15	0	31	0	146	24	0	170	0	26	113	0	139	340
4:30 PM	0	8	8	0	16	0	140	17	0	157	0	16	128	0	144	317
4:45 PM	0	10	6	0	16	0	141	15	0	156	0	14	88	0	102	274
Hourly Total	0	45	41	0	86	0	559	76	0	635	0	69	456	0	525	1246
5:00 PM	0	9	9	0	18	0	141	29	0	170	0	12	124	0	136	324
5:15 PM	0	18	7	0	25	0	183	17	0	200	0	10	121	0	131	356
5:30 PM	0	10	6	0	16	0	141	22	0	163	0	10	127	0	137	316
5:45 PM	0	17	6	0	23	0	136	31	0	167	0	16	101	0	117	307
Hourly Total	0	54	28	0	82	0	601	99	0	700	0	48	473	0	521	1303
6:00 PM	0	20	17	0	37	0	145	25	0	170	0	16	96	0	112	319
6:15 PM	0	13	11	0	24	0	137	31	0	168	0	14	84	0	98	290
6:30 PM	0	15	9	0	24	0	110	17	0	127	0	11	107	0	118	269

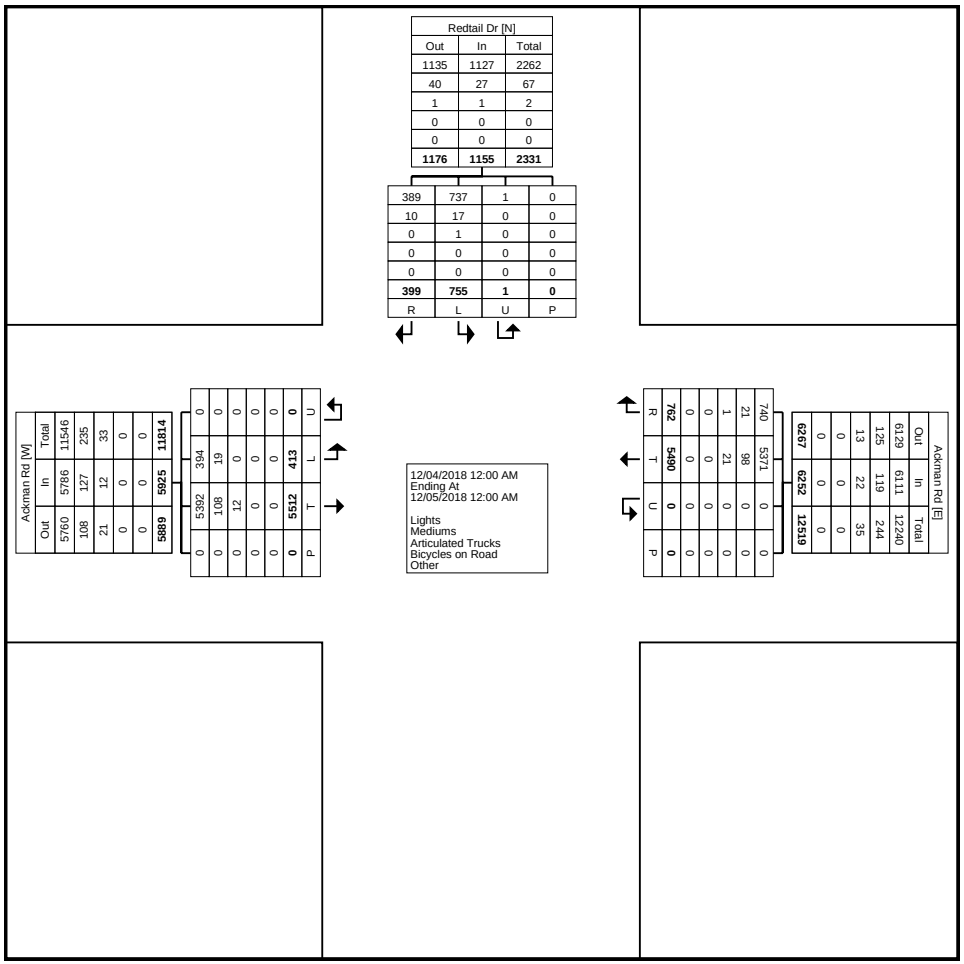
6:45 PM	0	11	9	0	20	0	94	24	0	118	0	9	82	0	91	229
Hourly Total	0	59	46	0	105	0	486	97	0	583	0	50	369	0	419	1107
7:00 PM	0	21	11	0	32	0	97	20	0	117	0	12	69	0	81	230
7:15 PM	0	13	6	0	19	0	86	17	0	103	0	6	53	0	59	181
7:30 PM	0	7	6	0	13	0	77	15	0	92	0	5	46	0	51	156
7:45 PM	0	9	5	0	14	0	89	7	0	96	0	3	49	0	52	162
Hourly Total	0	50	28	0	78	0	349	59	0	408	0	26	217	0	243	729
8:00 PM	0	4	6	0	10	0	68	10	0	78	0	8	42	0	50	138
8:15 PM	0	11	5	0	16	0	68	12	0	80	0	7	48	0	55	151
8:30 PM	0	7	4	0	11	0	58	7	0	65	0	1	42	0	43	119
8:45 PM	0	7	6	0	13	0	51	3	0	54	0	3	38	0	41	108
Hourly Total	0	29	21	0	50	0	245	32	0	277	0	19	170	0	189	516
9:00 PM	0	9	7	0	16	0	50	7	0	57	0	8	25	0	33	106
9:15 PM	0	11	6	0	17	0	72	10	0	82	0	3	31	0	34	133
9:30 PM	0	5	1	0	6	0	36	9	0	45	0	1	21	0	22	73
9:45 PM	0	8	1	0	9	0	35	5	0	40	0	1	14	0	15	64
Hourly Total	0	33	15	0	48	0	193	31	0	224	0	13	91	0	104	376
10:00 PM	0	3	1	0	4	0	20	3	0	23	0	2	26	0	28	55
10:15 PM	0	2	3	0	5	0	21	2	0	23	0	2	20	0	22	50
10:30 PM	0	4	4	0	8	0	22	2	0	24	0	2	13	0	15	47
10:45 PM	0	2	0	0	2	0	19	5	0	24	0	1	19	0	20	46
Hourly Total	0	11	8	0	19	0	82	12	0	94	0	7	78	0	85	198
11:00 PM	0	0	0	0	0	0	14	1	0	15	0	1	11	0	12	27
11:15 PM	0	1	1	0	2	0	9	6	0	15	0	1	9	0	10	27
11:30 PM	0	1	0	0	1	0	14	2	0	16	0	0	11	0	11	28
11:45 PM	0	0	1	0	1	0	9	2	0	11	0	0	6	0	6	18
Hourly Total	0	2	2	0	4	0	46	11	0	57	0	2	37	0	39	100
Grand Total	1	755	399	0	1155	0	5490	762	0	6252	0	413	5512	0	5925	13332
Approach %	0.1	65.4	34.5	-	-	0.0	87.8	12.2	-	-	0.0	7.0	93.0	-	-	-
Total %	0.0	5.7	3.0	-	8.7	0.0	41.2	5.7	-	46.9	0.0	3.1	41.3	-	44.4	-
Lights	1	737	389	-	1127	0	5371	740	-	6111	0	394	5392	-	5786	13024
% Lights	100.0	97.6	97.5	-	97.6	-	97.8	97.1	-	97.7	-	95.4	97.8	-	97.7	97.7
Mediums	0	17	10	-	27	0	98	21	-	119	0	19	108	-	127	273
% Mediums	0.0	2.3	2.5	-	2.3	-	1.8	2.8	-	1.9	-	4.6	2.0	-	2.1	2.0
Articulated Trucks	0	1	0	-	1	0	21	1	-	22	0	0	12	-	12	35
% Articulated Trucks	0.0	0.1	0.0	-	0.1	-	0.4	0.1	-	0.4	-	0.0	0.2	-	0.2	0.3
Bicycles on Road	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
% Bicycles on Road	0.0	0.0	0.0	-	0.0	-	0.0	0.0	-	0.0	-	0.0	0.0	-	0.0	0.0
Bicycles on Crosswalk	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pedestrians	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Gewalt Hamilton Associates Inc.
625 Forest Edge Drive

Vernon Hills, Illinois, United States 60061
(847) 478-9700 poster@gha-engineers.com

Ackman Rd & Redtail Dr
4188.921 McHenry County
24 Hr
GHA Mio

Count Name: Ackman Rd & Redtail Dr
Site Code:
Start Date: 12/04/2018



Turning Movement Data Plot

Ackman Rd & Redtail Dr
4188.921 McHenry County
24 Hr
GHA Mio

Gewalt Hamilton Associates Inc.
625 Forest Edge Drive

Vernon Hills, Illinois, United States 60061
(847) 478-9700 poster@gha-engineers.com

Count Name: Ackman Rd & Redtail Dr
Site Code:
Start Date: 12/04/2018

Turning Movement Peak Hour Data (6:45 AM)

Start Time	Redtail Dr Southbound					Ackman Rd Westbound					Ackman Rd Eastbound					
	U-Turn	Left	Right	Peds	App. Total	U-Turn	Thru	Right	Peds	App. Total	U-Turn	Left	Thru	Peds	App. Total	Int. Total
6:45 AM	1	15	6	0	22	0	87	2	0	89	0	1	124	0	125	236
7:00 AM	0	14	6	0	20	0	61	7	0	68	0	6	125	0	131	219
7:15 AM	0	11	11	0	22	0	91	7	0	98	0	2	123	0	125	245
7:30 AM	0	10	7	0	17	0	84	2	0	86	0	2	143	0	145	248
Total	1	50	30	0	81	0	323	18	0	341	0	11	515	0	526	948
Approach %	1.2	61.7	37.0	-	-	0.0	94.7	5.3	-	-	0.0	2.1	97.9	-	-	-
Total %	0.1	5.3	3.2	-	8.5	0.0	34.1	1.9	-	36.0	0.0	1.2	54.3	-	55.5	-
PHF	0.250	0.833	0.682	-	0.920	0.000	0.887	0.643	-	0.870	0.000	0.458	0.900	-	0.907	0.956
Lights	1	47	30	-	78	0	310	16	-	326	0	7	507	-	514	918
% Lights	100.0	94.0	100.0	-	96.3	-	96.0	88.9	-	95.6	-	63.6	98.4	-	97.7	96.8
Mediums	0	3	0	-	3	0	10	2	-	12	0	4	8	-	12	27
% Mediums	0.0	6.0	0.0	-	3.7	-	3.1	11.1	-	3.5	-	36.4	1.6	-	2.3	2.8
Articulated Trucks	0	0	0	-	0	0	3	0	-	3	0	0	0	-	0	3
% Articulated Trucks	0.0	0.0	0.0	-	0.0	-	0.9	0.0	-	0.9	-	0.0	0.0	-	0.0	0.3
Bicycles on Road	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
% Bicycles on Road	0.0	0.0	0.0	-	0.0	-	0.0	0.0	-	0.0	-	0.0	0.0	-	0.0	0.0
Bicycles on Crosswalk	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pedestrians	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Gewalt Hamilton Associates Inc.
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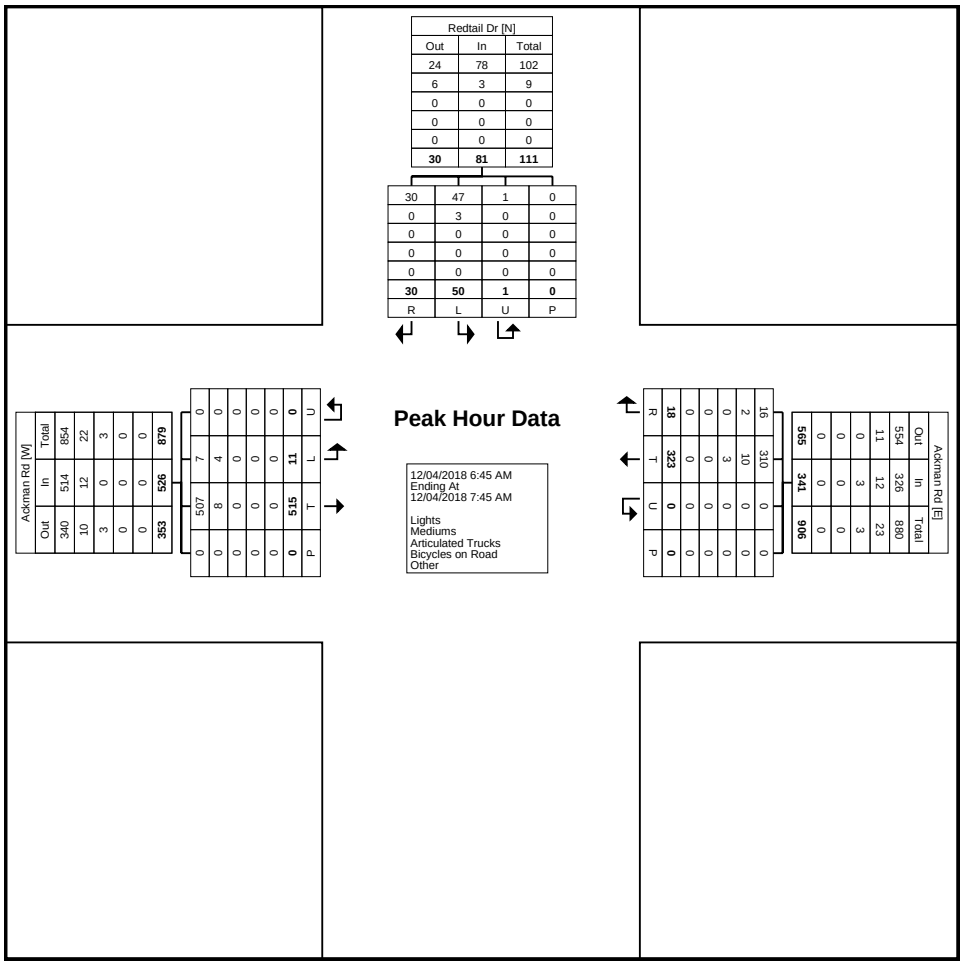

Turning Movement Peak Hour Data Plot (6:45 AM)

Ackman Rd & Redtail Dr
4188.921 McHenry County
24 Hr
GHA Mio

Gewalt Hamilton Associates Inc.
625 Forest Edge Drive

Vernon Hills, Illinois, United States 60061
(847) 478-9700 poster@gha-engineers.com

Count Name: Ackman Rd & Redtail Dr
Site Code:
Start Date: 12/04/2018

Turning Movement Peak Hour Data (5:00 PM)

Start Time	Redtail Dr Southbound					Ackman Rd Westbound					Ackman Rd Eastbound					
	U-Turn	Left	Right	Peds	App. Total	U-Turn	Thru	Right	Peds	App. Total	U-Turn	Left	Thru	Peds	App. Total	Int. Total
5:00 PM	0	9	9	0	18	0	141	29	0	170	0	12	124	0	136	324
5:15 PM	0	18	7	0	25	0	183	17	0	200	0	10	121	0	131	356
5:30 PM	0	10	6	0	16	0	141	22	0	163	0	10	127	0	137	316
5:45 PM	0	17	6	0	23	0	136	31	0	167	0	16	101	0	117	307
Total	0	54	28	0	82	0	601	99	0	700	0	48	473	0	521	1303
Approach %	0.0	65.9	34.1	-	-	0.0	85.9	14.1	-	-	0.0	9.2	90.8	-	-	-
Total %	0.0	4.1	2.1	-	6.3	0.0	46.1	7.6	-	53.7	0.0	3.7	36.3	-	40.0	-
PHF	0.000	0.750	0.778	-	0.820	0.000	0.821	0.798	-	0.875	0.000	0.750	0.931	-	0.951	0.915
Lights	0	53	28	-	81	0	597	97	-	694	0	46	467	-	513	1288
% Lights	-	98.1	100.0	-	98.8	-	99.3	98.0	-	99.1	-	95.8	98.7	-	98.5	98.8
Mediums	0	1	0	-	1	0	4	2	-	6	0	2	6	-	8	15
% Mediums	-	1.9	0.0	-	1.2	-	0.7	2.0	-	0.9	-	4.2	1.3	-	1.5	1.2
Articulated Trucks	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
% Articulated Trucks	-	0.0	0.0	-	0.0	-	0.0	0.0	-	0.0	-	0.0	0.0	-	0.0	0.0
Bicycles on Road	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
% Bicycles on Road	-	0.0	0.0	-	0.0	-	0.0	0.0	-	0.0	-	0.0	0.0	-	0.0	0.0
Bicycles on Crosswalk	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pedestrians	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

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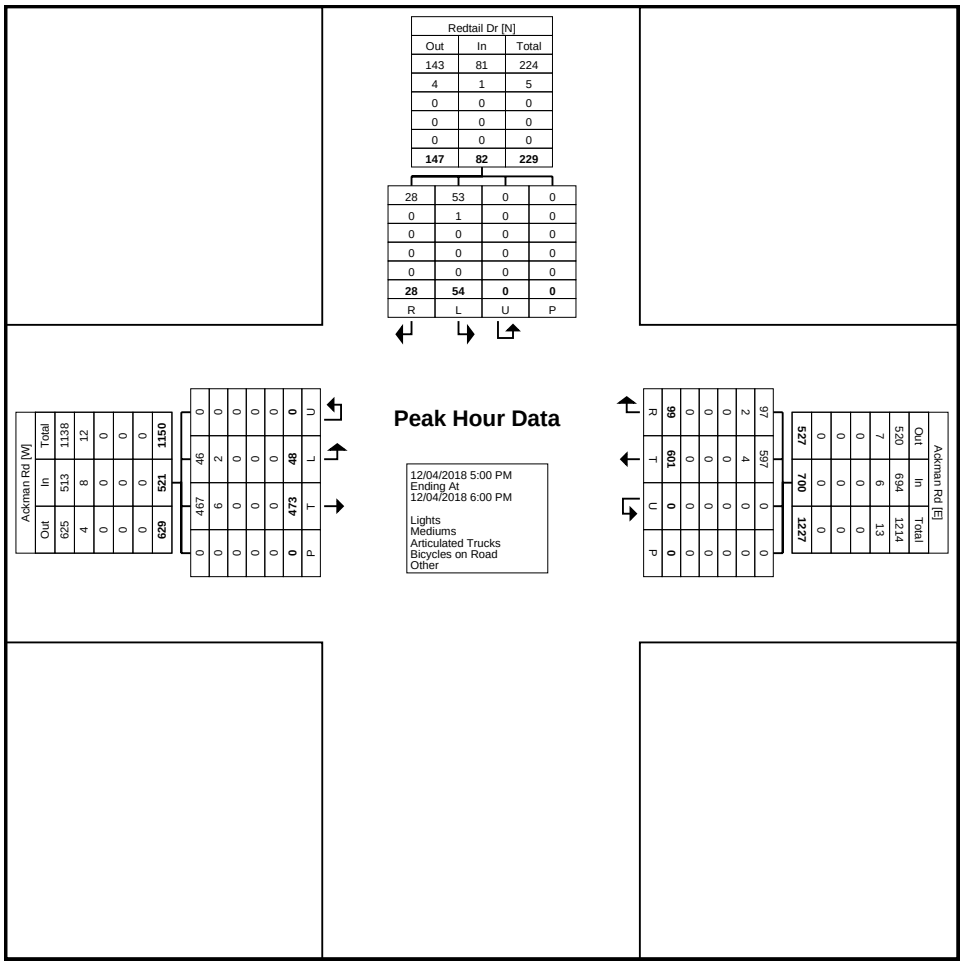


Turning Movement Peak Hour Data Plot (5:00 PM)

Ackman Rd & Swanson Rd
4188.921 McHenry County
24 Hr
GHA Mio

Gewalt Hamilton Associates Inc.
625 Forest Edge Drive

Vernon Hills, Illinois, United States 60061
(847) 478-9700 poster@gha-engineers.com

Count Name: Ackman Rd & Swanson Rd
Site Code:
Start Date: 12/04/2018

Turning Movement Data

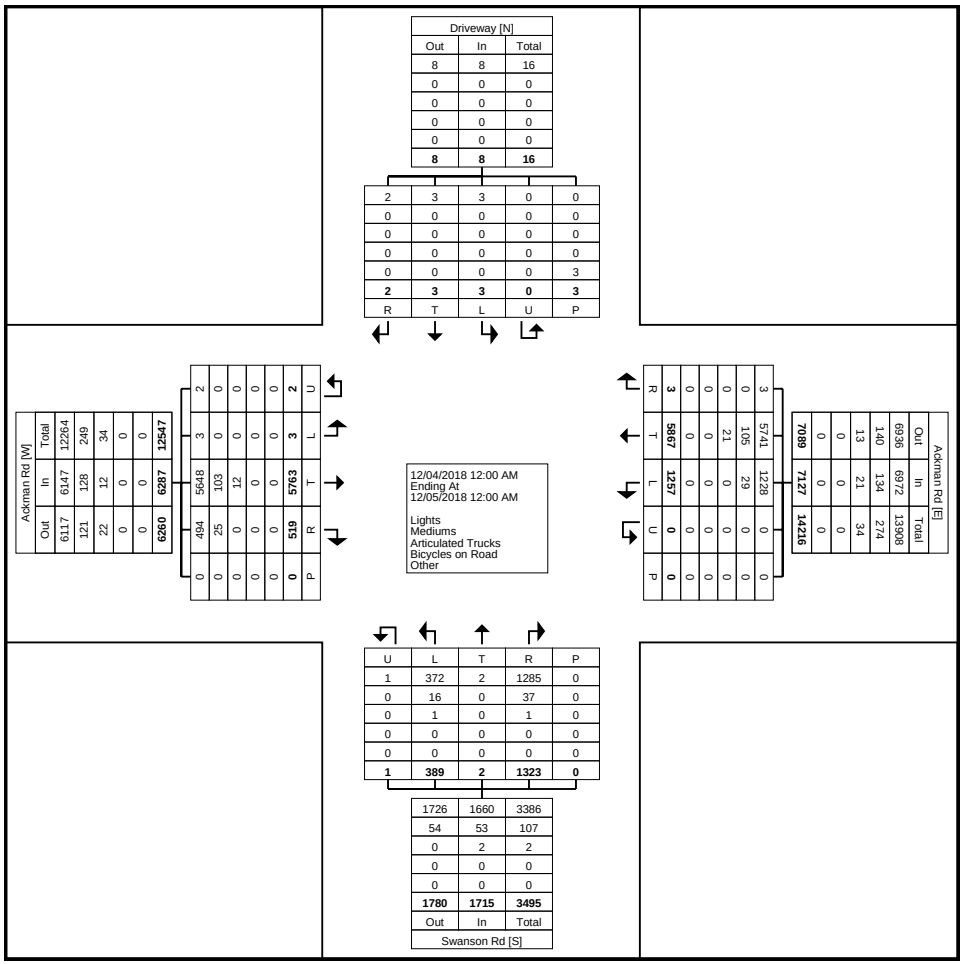
Start Time	Driveway Southbound						Ackman Rd Westbound						Swanson Rd Northbound						Ackman Rd Eastbound						Int. Total
	U-Turn	Left	Thru	Right	Peds	App. Total	U-Turn	Left	Thru	Right	Peds	App. Total	U-Turn	Left	Thru	Right	Peds	App. Total	U-Turn	Left	Thru	Right	Peds	App. Total	
12:00 AM	0	0	0	0	0	0	0	4	5	0	0	9	0	1	0	0	0	1	0	0	3	0	0	3	13
12:15 AM	0	0	0	0	0	0	0	2	6	0	0	8	0	0	0	2	0	2	0	0	3	1	0	4	14
12:30 AM	0	0	0	0	0	0	0	2	4	0	0	6	0	0	0	0	0	0	0	0	5	0	0	5	11
12:45 AM	0	0	0	0	0	0	0	0	8	0	0	8	0	0	0	1	0	1	0	0	2	0	0	2	11
Hourly Total	0	0	0	0	0	0	0	8	23	0	0	31	0	1	0	3	0	4	0	0	13	1	0	14	49
1:00 AM	0	0	0	0	0	0	0	3	3	0	0	6	0	0	0	0	0	0	0	0	2	0	0	2	8
1:15 AM	0	0	0	0	0	0	0	1	6	0	0	7	0	0	0	1	0	1	0	0	1	0	0	1	9
1:30 AM	0	0	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	0	0	0	1	0	0	1	3
1:45 AM	0	0	0	0	0	0	0	0	2	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	2
Hourly Total	0	0	0	0	0	0	0	4	13	0	0	17	0	0	0	1	0	1	0	0	4	0	0	4	22
2:00 AM	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
2:15 AM	0	0	0	0	0	0	0	1	2	0	0	3	0	0	0	0	0	0	0	0	2	0	0	2	5
2:30 AM	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
2:45 AM	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	1
Hourly Total	0	0	0	0	0	0	0	1	4	0	0	5	0	0	0	0	0	0	0	0	2	0	0	2	7
3:00 AM	0	0	0	0	0	0	0	1	1	0	0	2	0	0	0	1	0	1	0	0	1	0	0	1	4
3:15 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	0	0	2	2
3:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	2	0	0	3	0	0	3	5
3:45 AM	0	0	0	0	0	0	0	1	4	0	0	5	0	0	0	0	0	0	0	0	7	0	0	7	12
Hourly Total	0	0	0	0	0	0	0	2	5	0	0	7	0	1	0	2	0	3	0	0	13	0	0	13	23
4:00 AM	0	0	0	0	0	0	0	1	5	0	0	6	0	0	0	0	0	0	0	0	9	1	0	10	16
4:15 AM	0	0	0	0	0	0	0	1	1	0	0	2	0	0	0	3	0	3	0	0	9	0	0	9	14
4:30 AM	0	0	0	0	0	0	0	1	7	0	0	8	0	0	0	2	0	2	0	0	18	0	0	18	28
4:45 AM	0	0	0	0	0	0	0	0	10	0	0	10	0	0	0	5	0	5	0	0	20	0	0	20	35
Hourly Total	0	0	0	0	0	0	0	3	23	0	0	26	0	0	0	10	0	10	0	0	56	1	0	57	93
5:00 AM	0	0	0	0	0	0	0	1	12	0	0	13	0	1	0	7	0	8	0	0	21	0	0	21	42
5:15 AM	0	0	0	0	0	0	0	2	20	0	0	22	0	1	0	5	0	6	0	0	28	2	0	30	58
5:30 AM	0	0	0	0	0	0	0	4	25	0	0	29	0	3	0	5	0	8	0	0	65	1	0	66	103
5:45 AM	0	0	0	0	0	0	0	2	32	0	0	34	0	0	0	14	0	14	0	0	70	2	0	72	120
Hourly Total	0	0	0	0	0	0	0	9	89	0	0	98	0	5	0	31	0	36	0	0	184	5	0	189	323
6:00 AM	0	0	0	0	0	0	0	2	35	0	0	37	0	1	0	19	0	20	0	0	72	0	0	72	129
6:15 AM	0	0	0	0	0	0	0	6	48	0	0	54	0	7	0	26	0	33	0	0	87	8	0	95	182
6:30 AM	0	1	0	0	1	1	0	7	59	0	0	66	0	8	0	33	0	41	1	1	125	5	0	132	240
6:45 AM	0	0	0	0	0	0	0	18	87	0	0	105	0	3	0	35	0	38	0	0	136	5	0	141	284
Hourly Total	0	1	0	0	1	1	0	33	229	0	0	262	0	19	0	113	0	132	1	1	420	18	0	440	835
7:00 AM	0	0	0	0	0	0	0	15	62	0	0	77	0	11	0	69	0	80	0	0	134	6	0	140	297
7:15 AM	0	0	0	0	0	0	0	26	88	0	0	114	0	7	0	42	0	49	0	0	128	5	0	133	296
7:30 AM	0	0	0	0	0	0	0	24	79	0	0	103	0	8	0	33	0	41	0	0	146	10	0	156	300
7:45 AM	0	1	0	0	0	1	0	22	71	0	0	93	0	2	0	32	0	34	0	0	123	11	0	134	262
Hourly Total	0	1	0	0	0	1	0	87	300	0	0	387	0	28	0	176	0	204	0	0	531	32	0	563	1155

8:00 AM	0	0	0	0	0	0	0	20	53	0	0	73	0	6	0	21	0	27	0	0	109	14	0	123	223
8:15 AM	0	0	0	0	0	0	0	28	52	1	0	81	0	8	0	16	0	24	0	0	114	13	0	127	232
8:30 AM	0	0	1	0	0	1	0	23	72	0	0	95	0	16	0	51	0	67	0	0	109	18	0	127	290
8:45 AM	0	0	0	0	0	0	0	22	69	0	0	91	0	17	0	27	0	44	0	0	97	19	0	116	251
Hourly Total	0	0	1	0	0	1	0	93	246	1	0	340	0	47	0	115	0	162	0	0	429	64	0	493	996
9:00 AM	0	0	0	0	0	0	0	11	55	0	0	66	1	8	0	22	0	31	0	0	87	5	0	92	189
9:15 AM	0	0	0	0	0	0	0	13	55	0	0	68	0	9	0	17	0	26	0	0	69	3	0	72	166
9:30 AM	0	0	0	0	0	0	0	8	53	0	0	61	0	4	0	12	0	16	0	0	84	7	0	91	168
9:45 AM	0	0	0	0	0	0	0	8	54	0	0	62	0	5	0	15	0	20	0	0	76	4	0	80	162
Hourly Total	0	0	0	0	0	0	0	40	217	0	0	257	1	26	0	66	0	93	0	0	316	19	0	335	685
10:00 AM	0	0	0	0	0	0	0	7	51	0	0	58	0	5	0	5	0	10	0	0	52	4	0	56	124
10:15 AM	0	0	0	0	0	0	0	5	65	0	0	70	0	2	0	12	0	14	0	0	79	4	0	83	167
10:30 AM	0	0	0	0	0	0	0	11	43	0	0	54	0	1	0	11	0	12	0	0	72	3	0	75	141
10:45 AM	0	0	0	0	0	0	0	21	57	0	0	78	0	3	0	7	0	10	0	0	85	5	0	90	178
Hourly Total	0	0	0	0	0	0	0	44	216	0	0	260	0	11	0	35	0	46	0	0	288	16	0	304	610
11:00 AM	0	0	0	0	0	0	0	8	62	0	0	70	0	8	0	24	0	32	0	0	66	5	0	71	173
11:15 AM	0	0	0	0	0	0	0	16	70	0	0	86	0	6	0	30	0	36	0	0	79	6	0	85	207
11:30 AM	0	0	0	0	0	0	0	23	64	0	0	87	0	8	0	23	0	31	0	0	75	3	0	78	196
11:45 AM	0	0	0	0	0	0	0	15	76	0	0	91	0	3	0	13	0	16	1	0	82	8	0	91	198
Hourly Total	0	0	0	0	0	0	0	62	272	0	0	334	0	25	0	90	0	115	1	0	302	22	0	325	774
12:00 PM	0	0	0	0	0	0	0	19	50	0	0	69	0	0	0	13	0	13	0	0	64	8	0	72	154
12:15 PM	0	0	0	0	0	0	0	26	78	0	0	104	0	3	0	9	0	12	0	0	74	9	0	83	199
12:30 PM	0	0	0	0	0	0	0	16	71	0	0	87	0	8	0	20	0	28	0	0	74	5	0	79	194
12:45 PM	0	0	0	0	0	0	0	10	56	0	0	66	0	3	0	22	0	25	0	0	74	7	0	81	172
Hourly Total	0	0	0	0	0	0	0	71	255	0	0	326	0	14	0	64	0	78	0	0	286	29	0	315	719
1:00 PM	0	0	0	0	0	0	0	16	80	0	0	96	0	2	0	14	0	16	0	0	64	7	0	71	183
1:15 PM	0	0	0	0	0	0	0	14	96	0	0	110	0	5	0	14	0	19	0	0	61	4	0	65	194
1:30 PM	0	0	0	0	0	0	0	9	72	0	0	81	0	4	0	12	0	16	0	0	70	4	0	74	171
1:45 PM	0	0	0	1	0	1	0	6	66	0	0	72	0	5	1	7	0	13	0	0	79	4	0	83	169
Hourly Total	0	0	0	1	0	1	0	45	314	0	0	359	0	16	1	47	0	64	0	0	274	19	0	293	717
2:00 PM	0	0	0	0	0	0	0	11	62	0	0	73	0	5	0	11	0	16	0	0	64	3	0	67	156
2:15 PM	0	0	0	0	0	0	0	18	94	0	0	112	0	1	0	14	0	15	0	0	64	3	0	67	194
2:30 PM	0	0	0	0	0	0	0	16	88	0	0	104	0	2	0	16	0	18	0	0	56	7	0	63	185
2:45 PM	0	0	0	0	0	0	0	22	98	0	0	120	0	3	0	25	0	28	0	0	84	5	0	89	237
Hourly Total	0	0	0	0	0	0	0	67	342	0	0	409	0	11	0	66	0	77	0	0	268	18	0	286	772
3:00 PM	0	0	0	0	0	0	0	43	127	0	0	170	0	7	0	11	0	18	0	0	81	13	0	94	282
3:15 PM	0	0	0	0	0	0	0	36	120	0	0	156	0	3	0	32	0	35	0	0	100	18	0	118	309
3:30 PM	0	0	0	0	0	0	0	32	106	0	0	138	0	16	0	44	0	60	0	0	127	10	0	137	335
3:45 PM	0	0	0	0	0	0	0	30	131	0	0	161	0	14	0	32	0	46	0	0	114	14	0	128	335
Hourly Total	0	0	0	0	0	0	0	141	484	0	0	625	0	40	0	119	0	159	0	0	422	55	0	477	1261
4:00 PM	0	0	0	0	2	0	0	22	142	0	0	164	0	10	1	23	0	34	0	0	124	12	0	136	334
4:15 PM	0	0	0	0	0	0	0	41	158	0	0	199	0	12	0	26	0	38	0	0	119	10	0	129	366
4:30 PM	0	0	0	0	0	0	0	29	153	0	0	182	0	7	0	28	0	35	0	0	119	18	0	137	354
4:45 PM	0	0	0	0	0	0	0	24	139	0	0	163	0	13	0	26	0	39	0	1	87	9	0	97	299
Hourly Total	0	0	0	0	2	0	0	116	592	0	0	708	0	42	1	103	0	146	0	1	449	49	0	499	1353
5:00 PM	0	0	0	1	0	1	0	35	166	0	0	201	0	5	0	20	0	25	0	0	119	17	0	136	363
5:15 PM	0	0	0	0	0	0	0	23	191	0	0	214	0	8	0	29	0	37	0	0	121	15	0	136	387
5:30 PM	0	0	0	0	0	0	0	28	163	0	0	191	0	3	0	37	0	40	0	0	119	18	0	137	368
5:45 PM	0	0	0	0	0	0	0	28	158	0	0	186	0	13	0	24	0	37	0	0	107	15	0	122	345
Hourly Total	0	0	0	1	0	1	0	114	678	0	0	792	0	29	0	110	0	139	0	0	466	65	0	531	1463
6:00 PM	0	1	0	0	0	1	0	32	158	0	0	190	0	7	0	16	0	23	0	0	107	9	0	116	330
6:15 PM	0	0	0	0	0	0	0	27	158	0	0	185	0	9	0	19	0	28	0	0	87	10	0	97	310

6:30 PM	0	0	0	0	0	0	0	27	128	1	0	156	0	1	0	16	0	17	0	0	115	6	0	121	294
6:45 PM	0	0	0	0	0	0	0	19	110	0	0	129	0	7	0	15	0	22	0	0	85	8	0	93	244
Hourly Total	0	1	0	0	0	1	0	105	554	1	0	660	0	24	0	66	0	90	0	0	394	33	0	427	1178
7:00 PM	0	0	0	0	0	0	0	20	107	0	0	127	0	9	0	18	0	27	0	1	82	8	0	91	245
7:15 PM	0	0	2	0	0	2	0	12	99	0	0	111	0	5	0	6	0	11	0	0	60	7	0	67	191
7:30 PM	0	0	0	0	0	0	0	22	88	0	0	110	0	4	0	10	0	14	0	0	46	6	0	52	176
7:45 PM	0	0	0	0	0	0	0	13	90	0	0	103	0	5	0	12	0	17	0	0	53	5	0	58	178
Hourly Total	0	0	2	0	0	2	0	67	384	0	0	451	0	23	0	46	0	69	0	1	241	26	0	268	790
8:00 PM	0	0	0	0	0	0	0	18	73	0	0	91	0	5	0	10	0	15	0	0	40	6	0	46	152
8:15 PM	0	0	0	0	0	0	0	16	76	0	0	92	0	4	0	8	0	12	0	0	51	7	0	58	162
8:30 PM	0	0	0	0	0	0	0	19	67	0	0	86	0	1	0	6	0	7	0	0	44	5	0	49	142
8:45 PM	0	0	0	0	0	0	0	21	50	1	0	72	0	4	0	8	0	12	0	0	42	5	0	47	131
Hourly Total	0	0	0	0	0	0	0	74	266	1	0	341	0	14	0	32	0	46	0	0	177	23	0	200	587
9:00 PM	0	0	0	0	0	0	0	16	58	0	0	74	0	0	0	5	0	5	0	0	29	4	0	33	112
9:15 PM	0	0	0	0	0	0	0	11	76	0	0	87	0	3	0	1	0	4	0	0	38	5	0	43	134
9:30 PM	0	0	0	0	0	0	0	10	42	0	0	52	0	3	0	3	0	6	0	0	25	1	0	26	84
9:45 PM	0	0	0	0	0	0	0	6	39	0	0	45	0	1	0	5	0	6	0	0	20	2	0	22	73
Hourly Total	0	0	0	0	0	0	0	43	215	0	0	258	0	7	0	14	0	21	0	0	112	12	0	124	403
10:00 PM	0	0	0	0	0	0	0	6	22	0	0	28	0	2	0	2	0	4	0	0	25	4	0	29	61
10:15 PM	0	0	0	0	0	0	0	11	23	0	0	34	0	0	0	3	0	3	0	0	19	3	0	22	59
10:30 PM	0	0	0	0	0	0	0	5	24	0	0	29	0	1	0	2	0	3	0	0	16	1	0	17	49
10:45 PM	0	0	0	0	0	0	0	0	24	0	0	24	0	0	0	4	0	4	0	0	19	2	0	21	49
Hourly Total	0	0	0	0	0	0	0	22	93	0	0	115	0	3	0	11	0	14	0	0	79	10	0	89	218
11:00 PM	0	0	0	0	0	0	0	4	13	0	0	17	0	1	0	2	0	3	0	0	9	2	0	11	31
11:15 PM	0	0	0	0	0	0	0	0	15	0	0	15	0	0	0	0	0	0	0	0	10	0	0	10	25
11:30 PM	0	0	0	0	0	0	0	2	15	0	0	17	0	1	0	0	0	1	0	0	11	0	0	11	29
11:45 PM	0	0	0	0	0	0	0	0	10	0	0	10	0	1	0	1	0	2	0	0	7	0	0	7	19
Hourly Total	0	0	0	0	0	0	0	6	53	0	0	59	0	3	0	3	0	6	0	0	37	2	0	39	104
Grand Total	0	3	3	2	3	8	0	1257	5867	3	0	7127	1	389	2	1323	0	1715	2	3	5763	519	0	6287	15137
Approach %	0.0	37.5	37.5	25.0	-	-	0.0	17.6	82.3	0.0	-	-	0.1	22.7	0.1	77.1	-	-	0.0	0.0	91.7	8.3	-	-	-
Total %	0.0	0.0	0.0	0.0	-	0.1	0.0	8.3	38.8	0.0	-	47.1	0.0	2.6	0.0	8.7	-	11.3	0.0	0.0	38.1	3.4	-	41.5	-
Lights	0	3	3	2	-	8	0	1228	5741	3	-	6972	1	372	2	1285	-	1660	2	3	5648	494	-	6147	14787
% Lights	-	100.0	100.0	100.0	-	100.0	-	97.7	97.9	100.0	-	97.8	100.0	95.6	100.0	97.1	-	96.8	100.0	100.0	98.0	95.2	-	97.8	97.7
Mediums	0	0	0	0	-	0	0	29	105	0	-	134	0	16	0	37	-	53	0	0	103	25	-	128	315
% Mediums	-	0.0	0.0	0.0	-	0.0	-	2.3	1.8	0.0	-	1.9	0.0	4.1	0.0	2.8	-	3.1	0.0	0.0	1.8	4.8	-	2.0	2.1
Articulated Trucks	0	0	0	0	-	0	0	0	21	0	-	21	0	1	0	1	-	2	0	0	12	0	-	12	35
% Articulated Trucks	-	0.0	0.0	0.0	-	0.0	-	0.0	0.4	0.0	-	0.3	0.0	0.3	0.0	0.1	-	0.1	0.0	0.0	0.2	0.0	-	0.2	0.2
Bicycles on Road	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Bicycles on Road	-	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	0.0
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pedestrians	-	-	-	-	3	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	100.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Gewalt Hamilton Associates Inc.
625 Forest Edge Drive

Vernon Hills, Illinois, United States 60061
(847) 478-9700 poster@gha-engineers.com



Turning Movement Data Plot

Ackman Rd & Swanson Rd
4188.921 McHenry County
24 Hr
GHA Mio

Gewalt Hamilton Associates Inc.
625 Forest Edge Drive

Vernon Hills, Illinois, United States 60061
(847) 478-9700 poster@gha-engineers.com

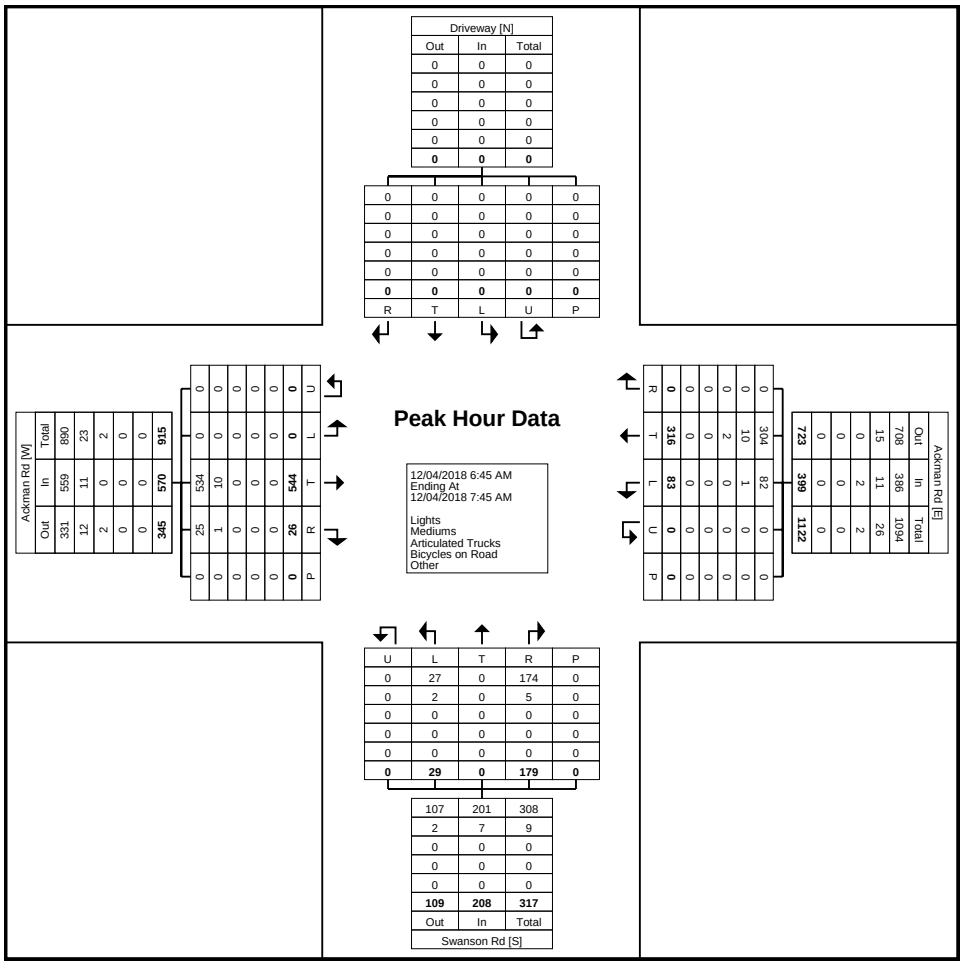
Count Name: Ackman Rd & Swanson Rd
Site Code:
Start Date: 12/04/2018

Turning Movement Peak Hour Data (6:45 AM)

Start Time	Driveway Southbound						Ackman Rd Westbound						Swanson Rd Northbound						Ackman Rd Eastbound						Int. Total
	U-Turn	Left	Thru	Right	Peds	App. Total	U-Turn	Left	Thru	Right	Peds	App. Total	U-Turn	Left	Thru	Right	Peds	App. Total	U-Turn	Left	Thru	Right	Peds	App. Total	
6:45 AM	0	0	0	0	0	0	0	18	87	0	0	105	0	3	0	35	0	38	0	0	136	5	0	141	284
7:00 AM	0	0	0	0	0	0	0	15	62	0	0	77	0	11	0	69	0	80	0	0	134	6	0	140	297
7:15 AM	0	0	0	0	0	0	0	26	88	0	0	114	0	7	0	42	0	49	0	0	128	5	0	133	296
7:30 AM	0	0	0	0	0	0	0	24	79	0	0	103	0	8	0	33	0	41	0	0	146	10	0	156	300
Total	0	0	0	0	0	0	0	83	316	0	0	399	0	29	0	179	0	208	0	0	544	26	0	570	1177
Approach %	0.0	0.0	0.0	0.0	-	-	0.0	20.8	79.2	0.0	-	-	0.0	13.9	0.0	86.1	-	-	0.0	0.0	95.4	4.6	-	-	-
Total %	0.0	0.0	0.0	0.0	-	0.0	0.0	7.1	26.8	0.0	-	33.9	0.0	2.5	0.0	15.2	-	17.7	0.0	0.0	46.2	2.2	-	48.4	-
PHF	0.000	0.000	0.000	0.000	-	0.000	0.000	0.798	0.898	0.000	-	0.875	0.000	0.659	0.000	0.649	-	0.650	0.000	0.000	0.932	0.650	-	0.913	0.981
Lights	0	0	0	0	-	0	0	82	304	0	-	386	0	27	0	174	-	201	0	0	534	25	-	559	1146
% Lights	-	-	-	-	-	-	-	98.8	96.2	-	-	96.7	-	93.1	-	97.2	-	96.6	-	-	98.2	96.2	-	98.1	97.4
Mediums	0	0	0	0	-	0	0	1	10	0	-	11	0	2	0	5	-	7	0	0	10	1	-	11	29
% Mediums	-	-	-	-	-	-	-	1.2	3.2	-	-	2.8	-	6.9	-	2.8	-	3.4	-	-	1.8	3.8	-	1.9	2.5
Articulated Trucks	0	0	0	0	-	0	0	0	2	0	-	2	0	0	0	0	-	0	0	0	0	0	-	0	2
% Articulated Trucks	-	-	-	-	-	-	-	0.0	0.6	-	-	0.5	-	0.0	-	0.0	-	0.0	-	-	0.0	0.0	-	0.0	0.2
Bicycles on Road	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Bicycles on Road	-	-	-	-	-	-	-	0.0	0.0	-	-	0.0	-	0.0	-	0.0	-	0.0	-	-	0.0	0.0	-	0.0	0.0
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pedestrians	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Gewalt Hamilton Associates Inc.
625 Forest Edge Drive

Vernon Hills, Illinois, United States 60061
(847) 478-9700 poster@gha-engineers.com



Turning Movement Peak Hour Data Plot (6:45 AM)

Ackman Rd & Swanson Rd
4188.921 McHenry County
24 Hr
GHA Mio

Gewalt Hamilton Associates Inc.
625 Forest Edge Drive

Vernon Hills, Illinois, United States 60061
(847) 478-9700 poster@gha-engineers.com

Count Name: Ackman Rd & Swanson Rd
Site Code:
Start Date: 12/04/2018

Turning Movement Peak Hour Data (5:00 PM)

Start Time	Driveway Southbound						Ackman Rd Westbound						Swanson Rd Northbound						Ackman Rd Eastbound						
	U-Turn	Left	Thru	Right	Peds	App. Total	U-Turn	Left	Thru	Right	Peds	App. Total	U-Turn	Left	Thru	Right	Peds	App. Total	U-Turn	Left	Thru	Right	Peds	App. Total	Int. Total
5:00 PM	0	0	0	1	0	1	0	35	166	0	0	201	0	5	0	20	0	25	0	0	119	17	0	136	363
5:15 PM	0	0	0	0	0	0	0	23	191	0	0	214	0	8	0	29	0	37	0	0	121	15	0	136	387
5:30 PM	0	0	0	0	0	0	0	28	163	0	0	191	0	3	0	37	0	40	0	0	119	18	0	137	368
5:45 PM	0	0	0	0	0	0	0	28	158	0	0	186	0	13	0	24	0	37	0	0	107	15	0	122	345
Total	0	0	0	1	0	1	0	114	678	0	0	792	0	29	0	110	0	139	0	0	466	65	0	531	1463
Approach %	0.0	0.0	0.0	100.0	-	-	0.0	14.4	85.6	0.0	-	-	0.0	20.9	0.0	79.1	-	-	0.0	0.0	87.8	12.2	-	-	-
Total %	0.0	0.0	0.0	0.1	-	0.1	0.0	7.8	46.3	0.0	-	54.1	0.0	2.0	0.0	7.5	-	9.5	0.0	0.0	31.9	4.4	-	36.3	-
PHF	0.000	0.000	0.000	0.250	-	0.250	0.000	0.814	0.887	0.000	-	0.925	0.000	0.558	0.000	0.743	-	0.869	0.000	0.000	0.963	0.903	-	0.969	0.945
Lights	0	0	0	1	-	1	0	112	672	0	-	784	0	29	0	110	-	139	0	0	459	65	-	524	1448
% Lights	-	-	-	100.0	-	100.0	-	98.2	99.1	-	-	99.0	-	100.0	-	100.0	-	100.0	-	-	98.5	100.0	-	98.7	99.0
Mediums	0	0	0	0	-	0	0	2	6	0	-	8	0	0	0	0	-	0	0	0	7	0	-	7	15
% Mediums	-	-	-	0.0	-	0.0	-	1.8	0.9	-	-	1.0	-	0.0	-	0.0	-	0.0	-	-	1.5	0.0	-	1.3	1.0
Articulated Trucks	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Articulated Trucks	-	-	-	0.0	-	0.0	-	0.0	0.0	-	-	0.0	-	0.0	-	0.0	-	0.0	-	-	0.0	0.0	-	0.0	0.0
Bicycles on Road	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Bicycles on Road	-	-	-	0.0	-	0.0	-	0.0	0.0	-	-	0.0	-	0.0	-	0.0	-	0.0	-	-	0.0	0.0	-	0.0	0.0
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pedestrians	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Gewalt Hamilton Associates Inc.
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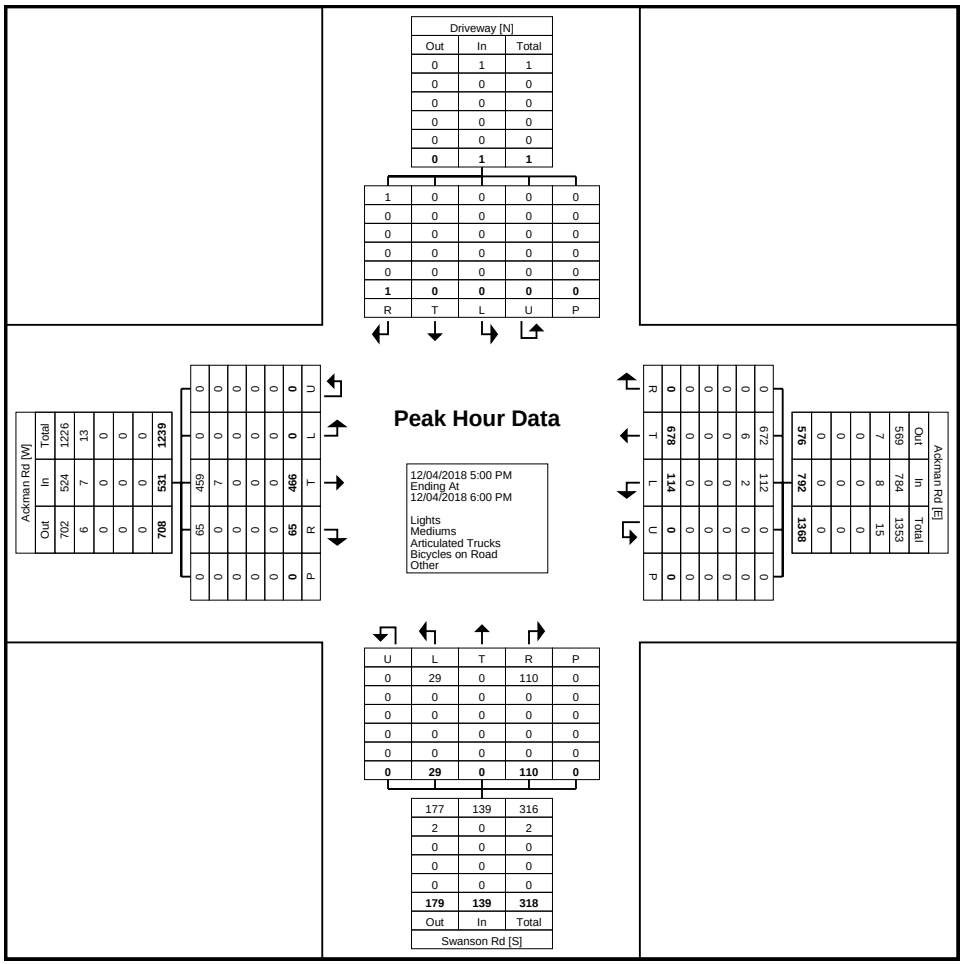

Turning Movement Peak Hour Data Plot (5:00 PM)

Huntley Rd & Ackman Rd
4188.921 McHenry County
24 Hr
GHA Mio

Gewalt Hamilton Associates Inc.
625 Forest Edge Drive

Vernon Hills, Illinois, United States 60061
(847) 478-9700 poster@gha-engineers.com

Count Name: Huntley Rd & Ackman Rd
Site Code:
Start Date: 12/04/2018

Turning Movement Data

Start Time	Huntley Rd Southbound					Ackman Rd Westbound					Ackman Rd Eastbound					
	U-Turn	Left	Right	Peds	App. Total	U-Turn	Thru	Right	Peds	App. Total	U-Turn	Left	Thru	Peds	App. Total	Int. Total
12:00 AM	0	2	4	0	6	0	5	5	0	10	0	0	3	0	3	19
12:15 AM	0	0	1	0	1	0	7	0	0	7	0	0	5	0	5	13
12:30 AM	0	0	2	0	2	0	5	1	0	6	0	0	5	0	5	13
12:45 AM	0	1	1	0	2	0	7	2	0	9	0	1	2	0	3	14
Hourly Total	0	3	8	0	11	0	24	8	0	32	0	1	15	0	16	59
1:00 AM	0	1	0	0	1	0	6	1	0	7	0	0	2	0	2	10
1:15 AM	0	0	2	0	2	0	5	5	0	10	0	0	1	0	1	13
1:30 AM	0	1	0	0	1	0	2	0	0	2	0	2	0	0	2	5
1:45 AM	0	1	0	0	1	0	2	3	0	5	0	0	0	0	0	6
Hourly Total	0	3	2	0	5	0	15	9	0	24	0	2	3	0	5	34
2:00 AM	0	0	1	0	1	0	0	1	0	1	0	0	0	0	0	2
2:15 AM	0	1	0	0	1	0	3	2	0	5	0	0	2	0	2	8
2:30 AM	0	1	0	0	1	0	0	0	0	0	0	0	0	0	0	1
2:45 AM	0	1	1	0	2	0	0	1	0	1	0	0	0	0	0	3
Hourly Total	0	3	2	0	5	0	3	4	0	7	0	0	2	0	2	14
3:00 AM	0	1	0	0	1	0	2	1	0	3	0	0	2	0	2	6
3:15 AM	0	2	0	0	2	0	0	0	0	0	0	0	2	0	2	4
3:30 AM	0	3	0	0	3	0	0	1	0	1	0	1	3	0	4	8
3:45 AM	0	5	1	0	6	0	5	0	0	5	0	0	7	0	7	18
Hourly Total	0	11	1	0	12	0	7	2	0	9	0	1	14	0	15	36
4:00 AM	0	5	1	0	6	0	5	0	0	5	0	1	8	0	9	20
4:15 AM	0	9	2	0	11	0	0	0	0	0	0	1	10	0	11	22
4:30 AM	0	20	2	0	22	0	7	3	0	10	0	1	19	0	20	52
4:45 AM	0	20	2	0	22	0	6	1	0	7	0	4	21	0	25	54
Hourly Total	0	54	7	0	61	0	18	4	0	22	0	7	58	0	65	148
5:00 AM	0	12	2	0	14	0	12	2	0	14	0	3	24	0	27	55
5:15 AM	0	24	12	0	36	0	8	1	0	9	0	1	33	0	34	79
5:30 AM	0	35	7	0	42	0	21	2	0	23	0	5	63	0	68	133
5:45 AM	0	25	14	0	39	0	21	3	0	24	0	11	73	0	84	147
Hourly Total	0	96	35	0	131	0	62	8	0	70	0	20	193	0	213	414
6:00 AM	0	33	13	0	46	0	25	2	0	27	0	13	75	0	88	161
6:15 AM	0	31	19	0	50	0	35	8	0	43	0	14	93	0	107	200
6:30 AM	0	20	11	1	31	0	55	6	0	61	0	36	125	0	161	253
6:45 AM	0	36	37	0	73	0	68	8	0	76	0	37	126	0	163	312
Hourly Total	0	120	80	1	200	0	183	24	0	207	0	100	419	0	519	926
7:00 AM	0	25	34	0	59	0	41	14	0	55	0	38	169	0	207	321
7:15 AM	0	30	37	0	67	0	77	12	0	89	0	41	130	0	171	327
7:30 AM	0	22	45	0	67	0	59	16	0	75	0	35	148	0	183	325
7:45 AM	0	23	38	0	61	0	56	19	0	75	0	34	120	0	154	290
Hourly Total	0	100	154	0	254	0	233	61	0	294	0	148	567	0	715	1263
8:00 AM	0	27	31	0	58	0	44	16	0	60	0	25	104	0	129	247

8:15 AM	0	26	32	0	58	0	49	17	0	66	0	17	113	0	130	254
8:30 AM	0	20	35	0	55	0	57	16	0	73	0	33	129	0	162	290
8:45 AM	0	40	38	0	78	0	55	13	0	68	0	29	93	0	122	268
Hourly Total	0	113	136	0	249	0	205	62	0	267	0	104	439	0	543	1059
9:00 AM	0	24	15	0	39	0	53	6	0	59	0	20	92	0	112	210
9:15 AM	0	22	19	0	41	0	45	15	0	60	0	16	66	0	82	183
9:30 AM	0	25	14	0	39	0	49	17	0	66	0	22	74	0	96	201
9:45 AM	0	15	15	0	30	0	45	12	0	57	0	14	79	0	93	180
Hourly Total	0	86	63	0	149	0	192	50	0	242	0	72	311	0	383	774
10:00 AM	0	19	16	0	35	0	45	15	0	60	0	9	50	0	59	154
10:15 AM	0	23	17	0	40	0	51	6	0	57	0	19	72	0	91	188
10:30 AM	0	15	15	0	30	0	40	11	0	51	0	16	67	0	83	164
10:45 AM	0	15	16	0	31	0	63	16	0	79	0	17	74	0	91	201
Hourly Total	0	72	64	0	136	0	199	48	0	247	0	61	263	0	324	707
11:00 AM	0	18	18	0	36	0	51	9	0	60	0	26	68	0	94	190
11:15 AM	0	18	23	0	41	0	69	16	0	85	0	17	92	0	109	235
11:30 AM	0	20	18	0	38	0	70	13	0	83	0	17	79	0	96	217
11:45 AM	0	21	23	0	44	0	61	14	0	75	0	25	71	0	96	215
Hourly Total	0	77	82	0	159	0	251	52	0	303	0	85	310	0	395	857
12:00 PM	0	20	20	0	40	0	52	18	0	70	0	19	60	0	79	189
12:15 PM	0	15	33	0	48	0	71	21	0	92	0	19	62	0	81	221
12:30 PM	0	17	24	0	41	0	62	18	0	80	0	19	77	0	96	217
12:45 PM	0	24	13	0	37	0	61	23	0	84	0	22	73	0	95	216
Hourly Total	0	76	90	0	166	0	246	80	0	326	0	79	272	0	351	843
1:00 PM	0	22	30	0	52	0	64	18	0	82	0	14	66	0	80	214
1:15 PM	0	17	24	0	41	0	81	20	0	101	0	13	60	0	73	215
1:30 PM	0	22	19	0	41	0	62	13	0	75	0	16	70	0	86	202
1:45 PM	0	16	23	0	39	0	51	17	0	68	0	17	68	0	85	192
Hourly Total	0	77	96	0	173	0	258	68	0	326	0	60	264	0	324	823
2:00 PM	0	15	17	0	32	0	58	24	0	82	0	16	61	0	77	191
2:15 PM	0	21	30	0	51	0	86	20	0	106	0	16	61	0	77	234
2:30 PM	0	16	24	0	40	0	75	19	0	94	0	14	58	0	72	206
2:45 PM	0	15	18	0	33	0	104	26	0	130	0	32	76	0	108	271
Hourly Total	0	67	89	0	156	0	323	89	0	412	0	78	256	0	334	902
3:00 PM	0	15	42	0	57	0	128	36	0	164	0	17	78	0	95	316
3:15 PM	0	23	45	0	68	0	112	34	0	146	0	41	88	0	129	343
3:30 PM	0	20	35	0	55	0	103	30	0	133	0	42	126	0	168	356
3:45 PM	0	27	43	0	70	0	117	32	0	149	0	33	118	0	151	370
Hourly Total	0	85	165	0	250	0	460	132	0	592	0	133	410	0	543	1385
4:00 PM	0	18	34	0	52	0	130	33	0	163	0	41	104	0	145	360
4:15 PM	0	17	52	0	69	0	149	45	0	194	0	41	103	0	144	407
4:30 PM	0	16	47	0	63	0	133	51	0	184	0	37	111	0	148	395
4:45 PM	0	24	38	0	62	0	128	49	0	177	0	32	81	0	113	352
Hourly Total	0	75	171	0	246	0	540	178	0	718	0	151	399	0	550	1514
5:00 PM	0	18	41	0	59	0	157	41	0	198	0	40	100	0	140	397
5:15 PM	0	14	52	0	66	0	166	45	0	211	0	49	100	0	149	426
5:30 PM	0	14	30	0	44	0	155	44	0	199	0	51	108	0	159	402
5:45 PM	0	19	44	0	63	0	153	40	0	193	0	46	85	0	131	387
Hourly Total	0	65	167	0	232	0	631	170	0	801	0	186	393	0	579	1612
6:00 PM	0	18	28	0	46	0	156	39	0	195	0	29	95	0	124	365
6:15 PM	0	17	23	0	40	0	169	42	0	211	0	25	82	0	107	358
6:30 PM	0	25	35	0	60	0	115	43	0	158	0	34	97	0	131	349

6:45 PM	0	13	21	0	34	0	102	34	0	136	0	26	74	0	100	270
Hourly Total	0	73	107	0	180	0	542	158	0	700	0	114	348	0	462	1342
7:00 PM	0	11	25	0	36	0	108	23	0	131	0	21	80	0	101	268
7:15 PM	0	16	15	0	31	0	94	37	0	131	0	21	45	0	66	228
7:30 PM	0	9	17	0	26	0	97	24	0	121	0	16	41	0	57	204
7:45 PM	0	10	11	0	21	0	90	26	0	116	0	19	48	0	67	204
Hourly Total	0	46	68	0	114	0	389	110	0	499	0	77	214	0	291	904
8:00 PM	0	9	20	0	29	0	76	21	0	97	0	16	34	0	50	176
8:15 PM	0	17	13	0	30	0	74	20	0	94	0	11	48	0	59	183
8:30 PM	0	5	19	0	24	0	68	22	0	90	0	12	40	0	52	166
8:45 PM	0	7	17	0	24	0	56	16	0	72	0	14	38	0	52	148
Hourly Total	0	38	69	0	107	0	274	79	0	353	0	53	160	0	213	673
9:00 PM	0	5	8	0	13	0	64	16	0	80	0	11	23	0	34	127
9:15 PM	0	9	15	0	24	0	73	16	0	89	0	8	30	0	38	151
9:30 PM	0	12	7	0	19	0	45	13	0	58	0	3	25	0	28	105
9:45 PM	0	4	4	0	8	0	39	9	0	48	0	6	19	0	25	81
Hourly Total	0	30	34	0	64	0	221	54	0	275	0	28	97	0	125	464
10:00 PM	0	7	6	0	13	0	22	13	0	35	0	7	21	0	28	76
10:15 PM	0	5	3	0	8	0	32	13	0	45	0	3	19	0	22	75
10:30 PM	0	1	4	0	5	0	25	11	0	36	0	4	13	0	17	58
10:45 PM	0	2	4	0	6	0	20	6	0	26	0	10	13	0	23	55
Hourly Total	0	15	17	0	32	0	99	43	0	142	0	24	66	0	90	264
11:00 PM	0	2	2	0	4	0	14	5	0	19	0	2	10	0	12	35
11:15 PM	0	5	2	0	7	0	13	13	0	26	0	4	6	0	10	43
11:30 PM	0	2	0	0	2	0	17	7	0	24	0	2	10	0	12	38
11:45 PM	0	0	3	0	3	0	8	3	0	11	0	1	7	0	8	22
Hourly Total	0	9	7	0	16	0	52	28	0	80	0	9	33	0	42	138
Grand Total	0	1394	1714	1	3108	0	5427	1521	0	6948	0	1593	5506	0	7099	17155
Approach %	0.0	44.9	55.1	-	-	0.0	78.1	21.9	-	-	0.0	22.4	77.6	-	-	-
Total %	0.0	8.1	10.0	-	18.1	0.0	31.6	8.9	-	40.5	0.0	9.3	32.1	-	41.4	-
Lights	0	1379	1666	-	3045	0	5326	1496	-	6822	0	1553	5395	-	6948	16815
% Lights	-	98.9	97.2	-	98.0	-	98.1	98.4	-	98.2	-	97.5	98.0	-	97.9	98.0
Mediums	0	14	47	-	61	0	80	24	-	104	0	37	99	-	136	301
% Mediums	-	1.0	2.7	-	2.0	-	1.5	1.6	-	1.5	-	2.3	1.8	-	1.9	1.8
Articulated Trucks	0	1	1	-	2	0	21	1	-	22	0	3	12	-	15	39
% Articulated Trucks	-	0.1	0.1	-	0.1	-	0.4	0.1	-	0.3	-	0.2	0.2	-	0.2	0.2
Bicycles on Road	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
% Bicycles on Road	-	0.0	0.0	-	0.0	-	0.0	0.0	-	0.0	-	0.0	0.0	-	0.0	0.0
Bicycles on Crosswalk	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	0.0	-	-	-	-	-	-	-	-	-	-	-	-
Pedestrians	-	-	-	1	-	-	-	-	0	-	-	-	-	0	-	-
% Pedestrians	-	-	-	100.0	-	-	-	-	-	-	-	-	-	-	-	-

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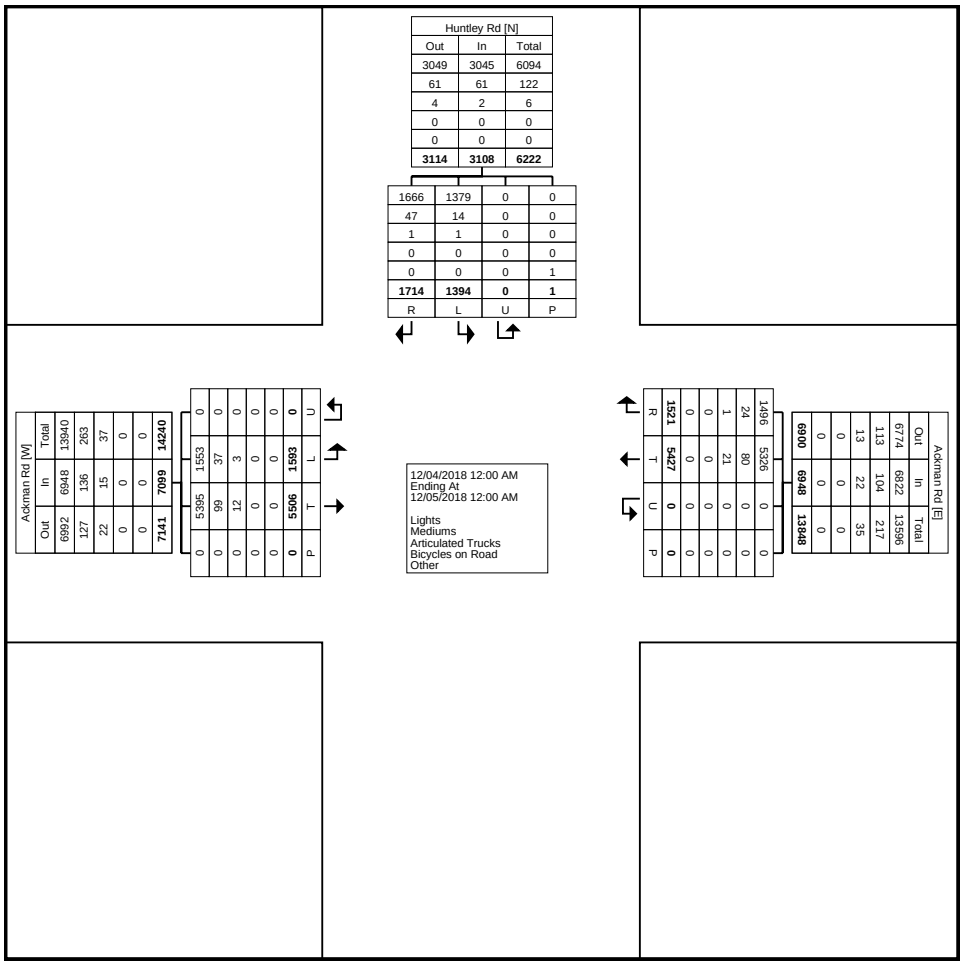

Turning Movement Data Plot

Huntley Rd & Ackman Rd
4188.921 McHenry County
24 Hr
GHA Mio

Gewalt Hamilton Associates Inc.
625 Forest Edge Drive

Vernon Hills, Illinois, United States 60061
(847) 478-9700 poster@gha-engineers.com

Count Name: Huntley Rd & Ackman Rd
Site Code:
Start Date: 12/04/2018

Turning Movement Peak Hour Data (6:45 AM)

Start Time	Huntley Rd Southbound					Ackman Rd Westbound					Ackman Rd Eastbound					
	U-Turn	Left	Right	Peds	App. Total	U-Turn	Thru	Right	Peds	App. Total	U-Turn	Left	Thru	Peds	App. Total	Int. Total
6:45 AM	0	36	37	0	73	0	68	8	0	76	0	37	126	0	163	312
7:00 AM	0	25	34	0	59	0	41	14	0	55	0	38	169	0	207	321
7:15 AM	0	30	37	0	67	0	77	12	0	89	0	41	130	0	171	327
7:30 AM	0	22	45	0	67	0	59	16	0	75	0	35	148	0	183	325
Total	0	113	153	0	266	0	245	50	0	295	0	151	573	0	724	1285
Approach %	0.0	42.5	57.5	-	-	0.0	83.1	16.9	-	-	0.0	20.9	79.1	-	-	-
Total %	0.0	8.8	11.9	-	20.7	0.0	19.1	3.9	-	23.0	0.0	11.8	44.6	-	56.3	-
PHF	0.000	0.785	0.850	-	0.911	0.000	0.795	0.781	-	0.829	0.000	0.921	0.848	-	0.874	0.982
Lights	0	113	151	-	264	0	234	48	-	282	0	143	566	-	709	1255
% Lights	-	100.0	98.7	-	99.2	-	95.5	96.0	-	95.6	-	94.7	98.8	-	97.9	97.7
Mediums	0	0	2	-	2	0	8	2	-	10	0	8	7	-	15	27
% Mediums	-	0.0	1.3	-	0.8	-	3.3	4.0	-	3.4	-	5.3	1.2	-	2.1	2.1
Articulated Trucks	0	0	0	-	0	0	3	0	-	3	0	0	0	-	0	3
% Articulated Trucks	-	0.0	0.0	-	0.0	-	1.2	0.0	-	1.0	-	0.0	0.0	-	0.0	0.2
Bicycles on Road	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
% Bicycles on Road	-	0.0	0.0	-	0.0	-	0.0	0.0	-	0.0	-	0.0	0.0	-	0.0	0.0
Bicycles on Crosswalk	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pedestrians	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Gewalt Hamilton Associates Inc.
625 Forest Edge Drive

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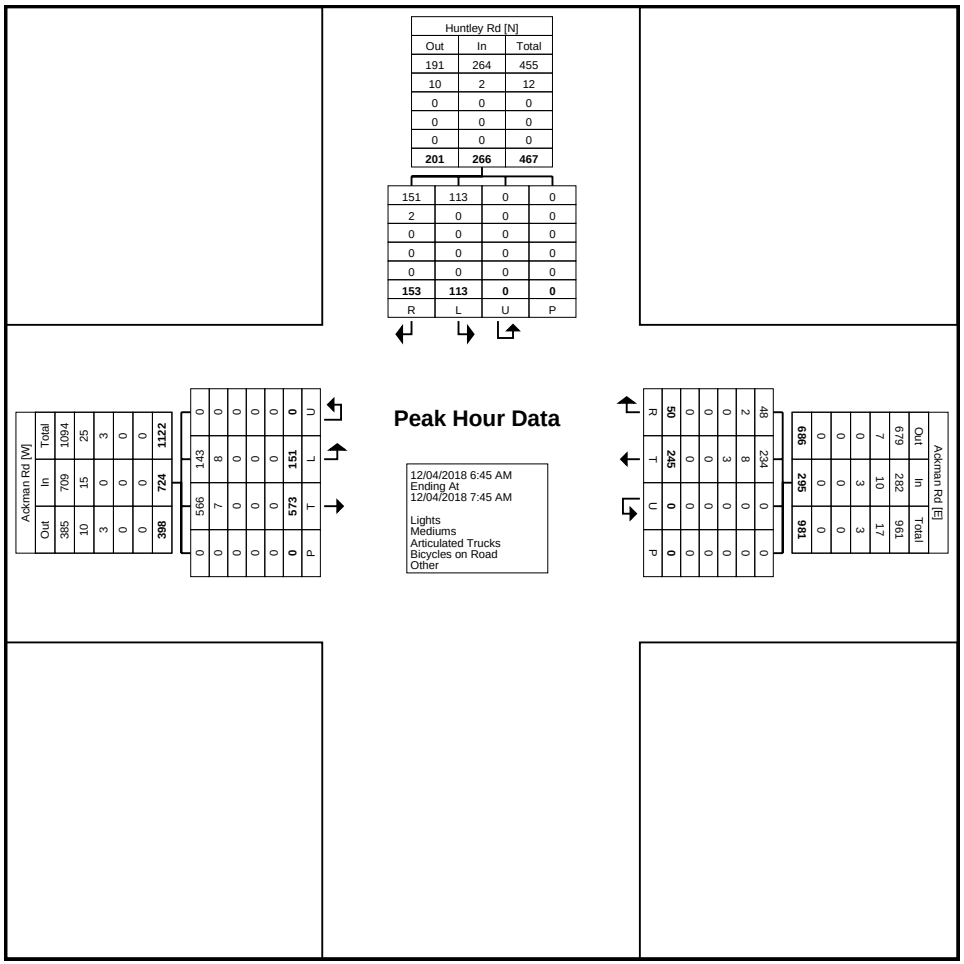

Turning Movement Peak Hour Data Plot (6:45 AM)

Huntley Rd & Ackman Rd
4188.921 McHenry County
24 Hr
GHA Mio

Gewalt Hamilton Associates Inc.
625 Forest Edge Drive

Vernon Hills, Illinois, United States 60061
(847) 478-9700 poster@gha-engineers.com

Count Name: Huntley Rd & Ackman Rd
Site Code:
Start Date: 12/04/2018

Turning Movement Peak Hour Data (5:00 PM)

Start Time	Huntley Rd Southbound					Ackman Rd Westbound					Ackman Rd Eastbound					
	U-Turn	Left	Right	Peds	App. Total	U-Turn	Thru	Right	Peds	App. Total	U-Turn	Left	Thru	Peds	App. Total	Int. Total
5:00 PM	0	18	41	0	59	0	157	41	0	198	0	40	100	0	140	397
5:15 PM	0	14	52	0	66	0	166	45	0	211	0	49	100	0	149	426
5:30 PM	0	14	30	0	44	0	155	44	0	199	0	51	108	0	159	402
5:45 PM	0	19	44	0	63	0	153	40	0	193	0	46	85	0	131	387
Total	0	65	167	0	232	0	631	170	0	801	0	186	393	0	579	1612
Approach %	0.0	28.0	72.0	-	-	0.0	78.8	21.2	-	-	0.0	32.1	67.9	-	-	-
Total %	0.0	4.0	10.4	-	14.4	0.0	39.1	10.5	-	49.7	0.0	11.5	24.4	-	35.9	-
PHF	0.000	0.855	0.803	-	0.879	0.000	0.950	0.944	-	0.949	0.000	0.912	0.910	-	0.910	0.946
Lights	0	65	164	-	229	0	629	168	-	797	0	184	389	-	573	1599
% Lights	-	100.0	98.2	-	98.7	-	99.7	98.8	-	99.5	-	98.9	99.0	-	99.0	99.2
Mediums	0	0	3	-	3	0	2	2	-	4	0	2	4	-	6	13
% Mediums	-	0.0	1.8	-	1.3	-	0.3	1.2	-	0.5	-	1.1	1.0	-	1.0	0.8
Articulated Trucks	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
% Articulated Trucks	-	0.0	0.0	-	0.0	-	0.0	0.0	-	0.0	-	0.0	0.0	-	0.0	0.0
Bicycles on Road	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
% Bicycles on Road	-	0.0	0.0	-	0.0	-	0.0	0.0	-	0.0	-	0.0	0.0	-	0.0	0.0
Bicycles on Crosswalk	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pedestrians	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

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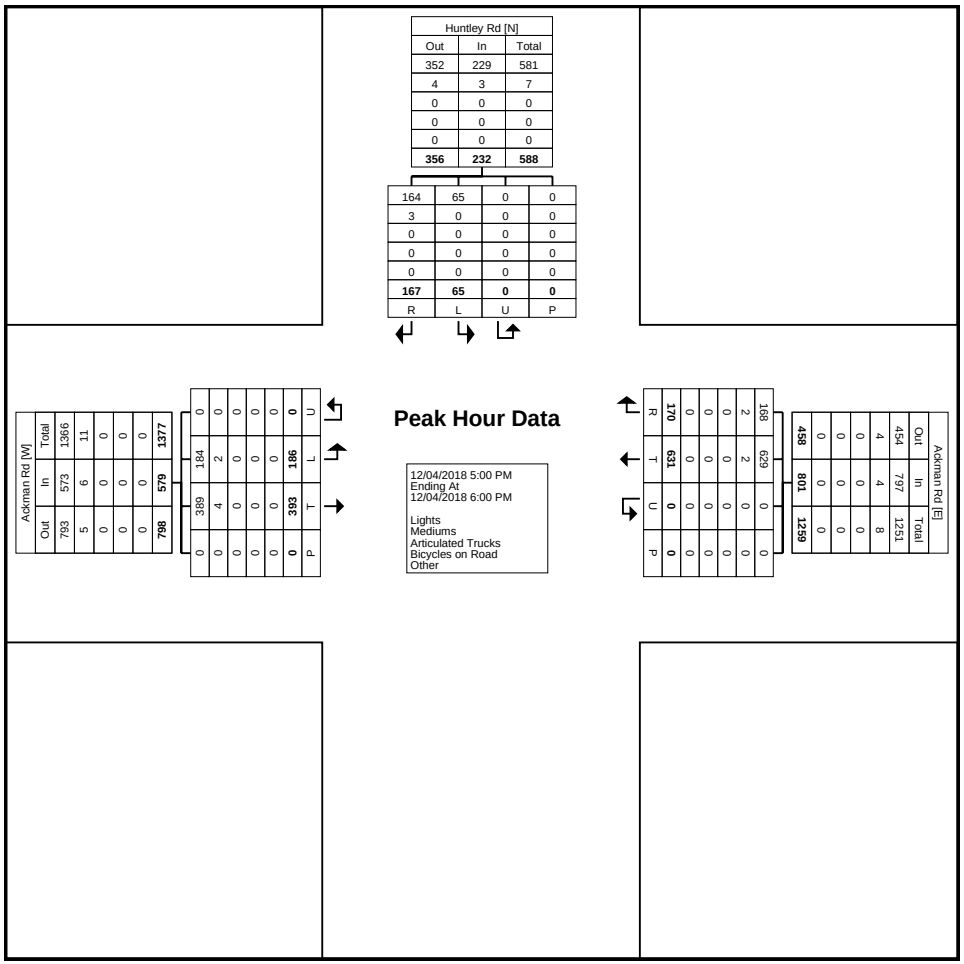


Turning Movement Peak Hour Data Plot (5:00 PM)

Amberwood Dr & Ackman Rd
4188.921 McHenry County
24 Hr
GHA Mio

Gewalt Hamilton Associates Inc.
625 Forest Edge Drive

Vernon Hills, Illinois, United States 60061
(847) 478-9700 poster@gha-engineers.com

Count Name: Amberwood Dr & Ackman Rd
Site Code:
Start Date: 12/04/2018

Turning Movement Data

Start Time	Amberwood Dr Southbound					Ackman Rd Westbound					Ackman Rd Eastbound					
	U-Turn	Left	Right	Peds	App. Total	U-Turn	Thru	Right	Peds	App. Total	U-Turn	Left	Thru	Peds	App. Total	Int. Total
12:00 AM	0	0	0	0	0	0	11	0	0	11	0	0	5	0	5	16
12:15 AM	0	0	0	0	0	0	6	1	0	7	0	1	4	0	5	12
12:30 AM	0	0	0	0	0	0	5	0	0	5	0	0	5	0	5	10
12:45 AM	0	0	0	0	0	0	9	0	0	9	0	0	3	0	3	12
Hourly Total	0	0	0	0	0	0	31	1	0	32	0	1	17	0	18	50
1:00 AM	0	0	0	0	0	0	8	1	0	9	0	0	3	0	3	12
1:15 AM	0	0	0	0	0	0	10	0	0	10	0	1	0	0	1	11
1:30 AM	0	0	0	0	0	0	1	0	0	1	0	0	1	0	1	2
1:45 AM	0	0	0	0	0	0	5	0	0	5	0	0	1	0	1	6
Hourly Total	0	0	0	0	0	0	24	1	0	25	0	1	5	0	6	31
2:00 AM	0	1	0	0	1	0	1	0	0	1	0	0	0	0	0	2
2:15 AM	0	0	0	0	0	0	5	0	0	5	0	0	3	0	3	8
2:30 AM	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	1
2:45 AM	0	0	0	0	0	0	1	0	0	1	0	0	1	0	1	2
Hourly Total	0	1	0	0	1	0	7	0	0	7	0	0	5	0	5	13
3:00 AM	0	0	0	0	0	0	3	0	0	3	0	0	3	0	3	6
3:15 AM	0	1	0	0	1	0	0	0	0	0	0	0	4	0	4	5
3:30 AM	0	0	0	0	0	0	1	0	0	1	0	0	6	0	6	7
3:45 AM	0	0	0	0	0	0	5	0	0	5	0	0	11	0	11	16
Hourly Total	0	1	0	0	1	0	9	0	0	9	0	0	24	0	24	34
4:00 AM	0	1	0	0	1	0	5	0	0	5	0	0	14	0	14	20
4:15 AM	0	0	0	0	0	0	1	0	0	1	0	0	19	0	19	20
4:30 AM	0	2	0	0	2	0	9	0	0	9	0	0	41	1	41	52
4:45 AM	0	3	1	0	4	0	6	1	0	7	0	0	43	0	43	54
Hourly Total	0	6	1	0	7	0	21	1	0	22	0	0	117	1	117	146
5:00 AM	0	3	2	0	5	0	12	0	0	12	0	0	36	0	36	53
5:15 AM	0	0	1	0	1	0	8	0	0	8	0	0	55	0	55	64
5:30 AM	0	4	2	0	6	0	20	0	0	20	0	0	97	0	97	123
5:45 AM	0	4	1	0	5	0	23	0	0	23	0	0	103	0	103	131
Hourly Total	0	11	6	0	17	0	63	0	0	63	0	0	291	0	291	371
6:00 AM	0	5	0	0	5	0	28	0	0	28	0	0	107	0	107	140
6:15 AM	0	5	2	1	7	0	45	0	0	45	0	0	123	0	123	175
6:30 AM	0	5	6	0	11	0	50	0	0	50	0	0	141	0	141	202
6:45 AM	0	5	3	0	8	0	76	1	0	77	0	3	163	1	166	251
Hourly Total	0	20	11	1	31	0	199	1	0	200	0	3	534	1	537	768
7:00 AM	0	7	4	0	11	0	52	4	0	56	0	3	191	0	194	261
7:15 AM	0	7	8	0	15	0	83	1	0	84	0	1	153	0	154	253
7:30 AM	0	7	6	0	13	0	65	0	0	65	0	0	164	0	164	242
7:45 AM	0	5	1	1	6	0	74	1	0	75	0	2	138	0	140	221
Hourly Total	0	26	19	1	45	0	274	6	0	280	0	6	646	0	652	977
8:00 AM	0	4	4	0	8	0	57	2	0	59	0	1	129	0	130	197

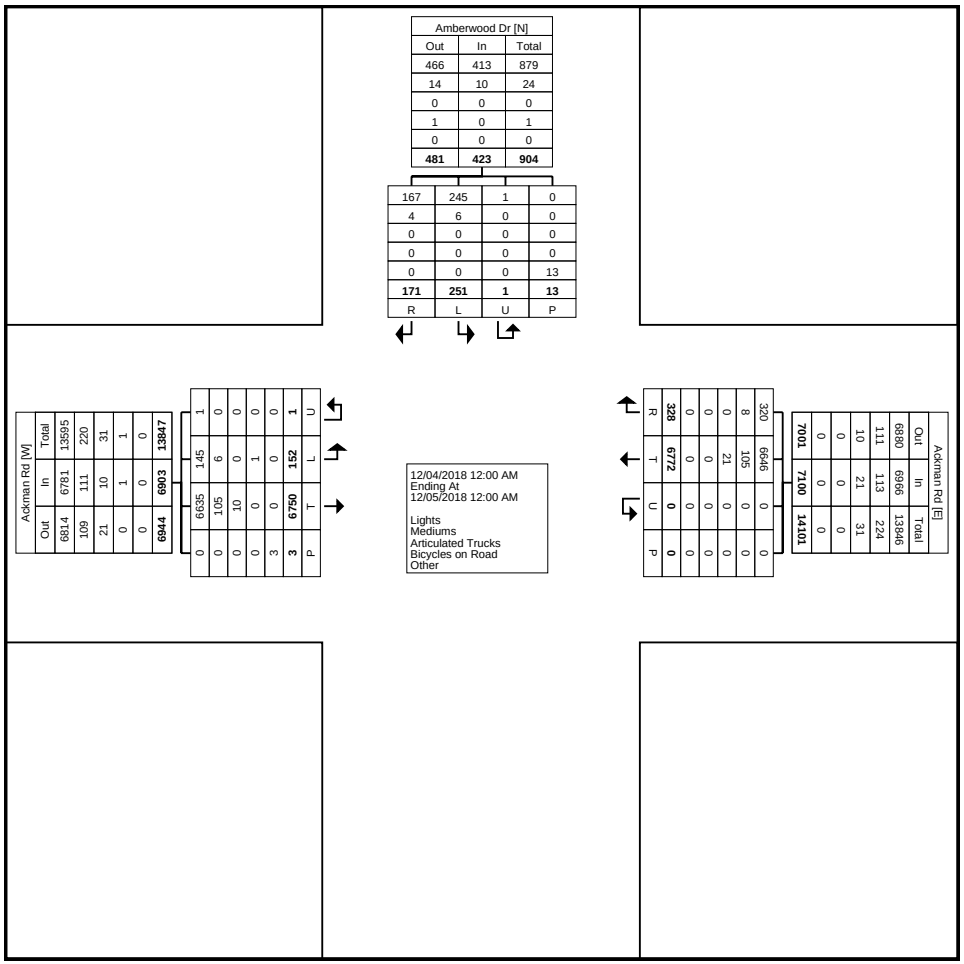
8:15 AM	0	7	10	0	17	0	61	1	0	62	0	2	139	0	141	220
8:30 AM	0	2	5	0	7	0	70	1	0	71	0	3	147	0	150	228
8:45 AM	0	3	3	1	6	0	59	2	0	61	0	5	128	0	133	200
Hourly Total	0	16	22	1	38	0	247	6	0	253	0	11	543	0	554	845
9:00 AM	0	9	2	0	11	0	56	1	0	57	0	3	111	0	114	182
9:15 AM	0	7	1	0	8	0	62	1	0	63	0	1	91	0	92	163
9:30 AM	0	3	2	0	5	0	62	1	0	63	0	1	96	0	97	165
9:45 AM	0	5	0	1	5	0	57	2	0	59	0	1	96	0	97	161
Hourly Total	0	24	5	1	29	0	237	5	0	242	0	6	394	0	400	671
10:00 AM	0	6	2	0	8	0	57	5	0	62	1	0	66	0	67	137
10:15 AM	0	4	1	0	5	0	56	1	0	57	0	0	96	0	96	158
10:30 AM	0	3	0	0	3	0	51	3	0	54	0	0	81	0	81	138
10:45 AM	0	6	0	0	6	0	80	1	0	81	0	3	87	0	90	177
Hourly Total	0	19	3	0	22	0	244	10	0	254	1	3	330	0	334	610
11:00 AM	0	5	1	0	6	0	64	2	0	66	0	1	82	0	83	155
11:15 AM	0	4	3	1	7	0	76	9	0	85	0	2	112	0	114	206
11:30 AM	0	4	3	0	7	0	84	6	0	90	0	8	91	0	99	196
11:45 AM	0	5	3	0	8	0	71	3	0	74	0	0	91	0	91	173
Hourly Total	0	18	10	1	28	0	295	20	0	315	0	11	376	0	387	730
12:00 PM	0	0	7	0	7	0	61	4	0	65	0	1	77	0	78	150
12:15 PM	0	4	1	0	5	0	93	3	0	96	0	1	76	0	77	178
12:30 PM	1	5	3	0	9	0	80	3	0	83	0	3	92	0	95	187
12:45 PM	0	2	2	1	4	0	77	6	0	83	0	0	97	0	97	184
Hourly Total	1	11	13	1	25	0	311	16	0	327	0	5	342	0	347	699
1:00 PM	0	2	4	0	6	0	76	7	0	83	0	2	84	0	86	175
1:15 PM	0	1	4	0	5	0	100	1	0	101	0	1	79	0	80	186
1:30 PM	0	7	0	0	7	0	75	3	0	78	0	1	90	0	91	176
1:45 PM	0	1	0	0	1	0	67	3	0	70	0	2	81	0	83	154
Hourly Total	0	11	8	0	19	0	318	14	0	332	0	6	334	0	340	691
2:00 PM	0	2	2	0	4	0	78	3	0	81	0	2	74	0	76	161
2:15 PM	0	2	4	0	6	0	104	2	0	106	0	0	82	0	82	194
2:30 PM	0	4	3	0	7	0	92	5	0	97	0	1	74	0	75	179
2:45 PM	0	2	3	1	5	0	124	5	0	129	0	0	88	0	88	222
Hourly Total	0	10	12	1	22	0	398	15	0	413	0	3	318	0	321	756
3:00 PM	0	4	5	0	9	0	163	9	0	172	0	2	94	0	96	277
3:15 PM	0	3	4	0	7	0	138	4	0	142	0	3	108	0	111	260
3:30 PM	0	1	1	2	2	0	137	7	0	144	0	9	136	0	145	291
3:45 PM	0	1	2	0	3	0	144	7	0	151	0	6	142	0	148	302
Hourly Total	0	9	12	2	21	0	582	27	0	609	0	20	480	0	500	1130
4:00 PM	0	7	1	0	8	0	171	10	0	181	0	4	116	0	120	309
4:15 PM	0	4	4	0	8	0	188	8	0	196	0	4	116	0	120	324
4:30 PM	0	6	2	0	8	0	176	9	0	185	0	4	123	0	127	320
4:45 PM	0	1	1	0	2	0	185	12	0	197	0	4	102	0	106	305
Hourly Total	0	18	8	0	26	0	720	39	0	759	0	16	457	0	473	1258
5:00 PM	0	1	5	0	6	0	186	7	0	193	0	6	111	0	117	316
5:15 PM	0	3	1	0	4	0	211	13	0	224	0	7	110	0	117	345
5:30 PM	0	3	5	0	8	0	196	9	0	205	0	9	109	0	118	331
5:45 PM	0	7	0	0	7	0	182	8	0	190	0	5	99	0	104	301
Hourly Total	0	14	11	0	25	0	775	37	0	812	0	27	429	0	456	1293
6:00 PM	0	6	2	0	8	0	195	11	0	206	0	2	113	0	115	329
6:15 PM	0	4	6	0	10	0	206	9	0	215	0	2	98	0	100	325
6:30 PM	0	1	3	0	4	0	158	11	0	169	0	3	113	0	116	289

6:45 PM	0	5	4	0	9	0	137	13	0	150	0	2	92	0	94	253
Hourly Total	0	16	15	0	31	0	696	44	0	740	0	9	416	0	425	1196
7:00 PM	0	0	2	0	2	0	125	10	0	135	0	1	88	0	89	226
7:15 PM	0	1	3	0	4	0	121	11	0	132	0	2	63	0	65	201
7:30 PM	0	3	0	1	3	0	118	7	0	125	0	1	51	0	52	180
7:45 PM	0	1	2	0	3	0	114	5	0	119	0	2	54	0	56	178
Hourly Total	0	5	7	1	12	0	478	33	0	511	0	6	256	0	262	785
8:00 PM	0	1	3	0	4	0	97	9	0	106	0	0	41	0	41	151
8:15 PM	0	3	0	1	3	0	97	3	0	100	0	5	62	0	67	170
8:30 PM	0	0	0	0	0	0	86	9	0	95	0	1	47	0	48	143
8:45 PM	0	3	1	0	4	0	72	3	0	75	0	4	43	0	47	126
Hourly Total	0	7	4	1	11	0	352	24	0	376	0	10	193	0	203	590
9:00 PM	0	1	2	0	3	0	75	1	0	76	0	1	27	0	28	107
9:15 PM	0	4	0	0	4	0	91	4	0	95	0	1	38	0	39	138
9:30 PM	0	1	1	0	2	0	56	5	0	61	0	0	37	0	37	100
9:45 PM	0	2	0	0	2	0	48	3	0	51	0	2	19	1	21	74
Hourly Total	0	8	3	0	11	0	270	13	0	283	0	4	121	1	125	419
10:00 PM	0	0	0	0	0	0	36	4	0	40	0	0	31	0	31	71
10:15 PM	0	0	1	1	1	0	44	3	0	47	0	1	23	0	24	72
10:30 PM	0	0	0	0	0	0	35	4	0	39	0	0	14	0	14	53
10:45 PM	0	0	0	0	0	0	26	1	0	27	0	0	15	0	15	42
Hourly Total	0	0	1	1	1	0	141	12	0	153	0	1	83	0	84	238
11:00 PM	0	0	0	1	0	0	20	0	0	20	0	1	11	0	12	32
11:15 PM	0	0	0	0	0	0	25	2	0	27	0	1	10	0	11	38
11:30 PM	0	0	0	0	0	0	24	0	0	24	0	0	12	0	12	36
11:45 PM	0	0	0	0	0	0	11	1	0	12	0	1	6	0	7	19
Hourly Total	0	0	0	1	0	0	80	3	0	83	0	3	39	0	42	125
Grand Total	1	251	171	13	423	0	6772	328	0	7100	1	152	6750	3	6903	14426
Approach %	0.2	59.3	40.4	-	-	0.0	95.4	4.6	-	-	0.0	2.2	97.8	-	-	-
Total %	0.0	1.7	1.2	-	2.9	0.0	46.9	2.3	-	49.2	0.0	1.1	46.8	-	47.9	-
Lights	1	245	167	-	413	0	6646	320	-	6966	1	145	6635	-	6781	14160
% Lights	100.0	97.6	97.7	-	97.6	-	98.1	97.6	-	98.1	100.0	95.4	98.3	-	98.2	98.2
Mediums	0	6	4	-	10	0	105	8	-	113	0	6	105	-	111	234
% Mediums	0.0	2.4	2.3	-	2.4	-	1.6	2.4	-	1.6	0.0	3.9	1.6	-	1.6	1.6
Articulated Trucks	0	0	0	-	0	0	21	0	-	21	0	0	10	-	10	31
% Articulated Trucks	0.0	0.0	0.0	-	0.0	-	0.3	0.0	-	0.3	0.0	0.0	0.1	-	0.1	0.2
Bicycles on Road	0	0	0	-	0	0	0	0	-	0	0	1	0	-	1	1
% Bicycles on Road	0.0	0.0	0.0	-	0.0	-	0.0	0.0	-	0.0	0.0	0.7	0.0	-	0.0	0.0
Bicycles on Crosswalk	-	-	-	0	-	-	-	-	0	-	-	-	-	1	-	-
% Bicycles on Crosswalk	-	-	-	0.0	-	-	-	-	-	-	-	-	-	33.3	-	-
Pedestrians	-	-	-	13	-	-	-	-	0	-	-	-	-	2	-	-
% Pedestrians	-	-	-	100.0	-	-	-	-	-	-	-	-	-	66.7	-	-

Amberwood Dr & Ackman Rd
4188.921 McHenry County
24 Hr
GHA Mio

Gewalt Hamilton Associates Inc.
625 Forest Edge Drive

Vernon Hills, Illinois, United States 60061
(847) 478-9700 poster@gha-engineers.com



Turning Movement Data Plot

Amberwood Dr & Ackman Rd
4188.921 McHenry County
24 Hr
GHA Mio

Gewalt Hamilton Associates Inc.
625 Forest Edge Drive

Vernon Hills, Illinois, United States 60061
(847) 478-9700 poster@gha-engineers.com

Count Name: Amberwood Dr & Ackman Rd
Site Code:
Start Date: 12/04/2018

Turning Movement Peak Hour Data (6:45 AM)

Start Time	Amberwood Dr Southbound					Ackman Rd Westbound					Ackman Rd Eastbound					
	U-Turn	Left	Right	Peds	App. Total	U-Turn	Thru	Right	Peds	App. Total	U-Turn	Left	Thru	Peds	App. Total	Int. Total
6:45 AM	0	5	3	0	8	0	76	1	0	77	0	3	163	1	166	251
7:00 AM	0	7	4	0	11	0	52	4	0	56	0	3	191	0	194	261
7:15 AM	0	7	8	0	15	0	83	1	0	84	0	1	153	0	154	253
7:30 AM	0	7	6	0	13	0	65	0	0	65	0	0	164	0	164	242
Total	0	26	21	0	47	0	276	6	0	282	0	7	671	1	678	1007
Approach %	0.0	55.3	44.7	-	-	0.0	97.9	2.1	-	-	0.0	1.0	99.0	-	-	-
Total %	0.0	2.6	2.1	-	4.7	0.0	27.4	0.6	-	28.0	0.0	0.7	66.6	-	67.3	-
PHF	0.000	0.929	0.656	-	0.783	0.000	0.831	0.375	-	0.839	0.000	0.583	0.878	-	0.874	0.965
Lights	0	25	21	-	46	0	263	4	-	267	0	7	664	-	671	984
% Lights	-	96.2	100.0	-	97.9	-	95.3	66.7	-	94.7	-	100.0	99.0	-	99.0	97.7
Mediums	0	1	0	-	1	0	10	2	-	12	0	0	7	-	7	20
% Mediums	-	3.8	0.0	-	2.1	-	3.6	33.3	-	4.3	-	0.0	1.0	-	1.0	2.0
Articulated Trucks	0	0	0	-	0	0	3	0	-	3	0	0	0	-	0	3
% Articulated Trucks	-	0.0	0.0	-	0.0	-	1.1	0.0	-	1.1	-	0.0	0.0	-	0.0	0.3
Bicycles on Road	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
% Bicycles on Road	-	0.0	0.0	-	0.0	-	0.0	0.0	-	0.0	-	0.0	0.0	-	0.0	0.0
Bicycles on Crosswalk	-	-	-	0	-	-	-	-	0	-	-	-	-	1	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	100.0	-	-
Pedestrians	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	-	-

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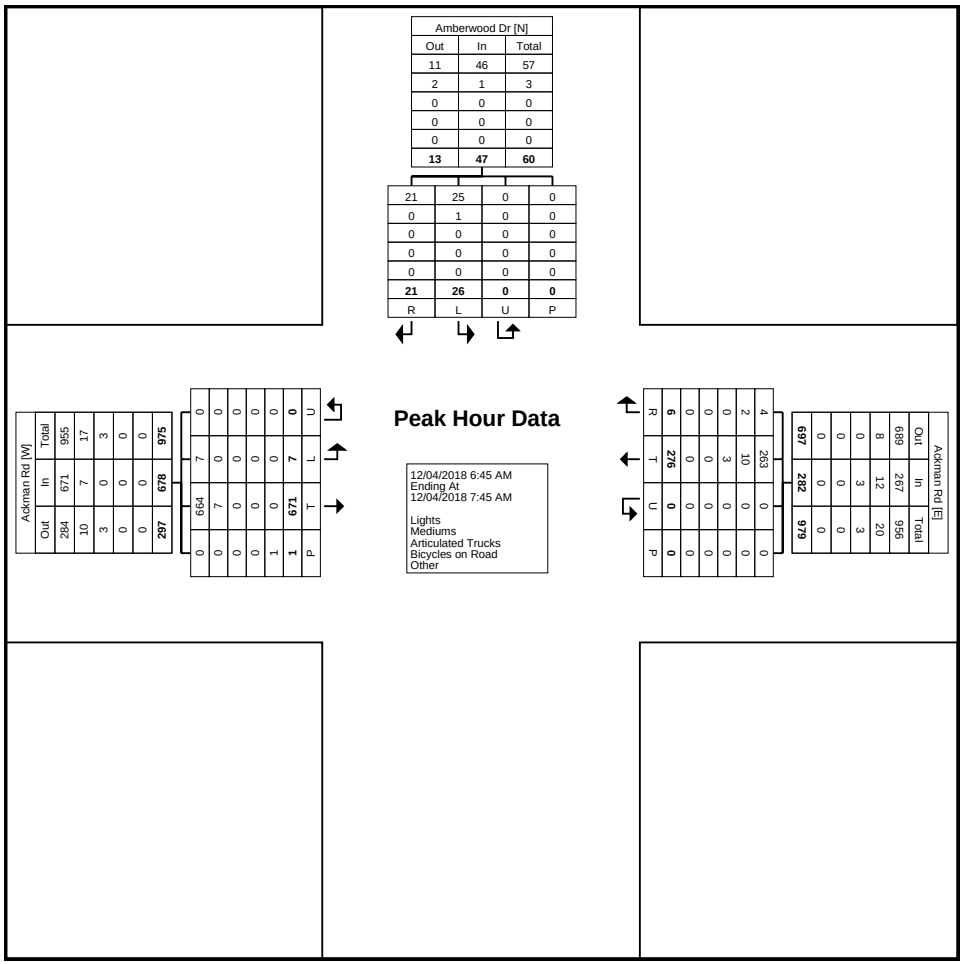

Turning Movement Peak Hour Data Plot (6:45 AM)

Amberwood Dr & Ackman Rd
4188.921 McHenry County
24 Hr
GHA Mio

Gewalt Hamilton Associates Inc.
625 Forest Edge Drive

Vernon Hills, Illinois, United States 60061
(847) 478-9700 poster@gha-engineers.com

Count Name: Amberwood Dr & Ackman Rd
Site Code:
Start Date: 12/04/2018

Turning Movement Peak Hour Data (5:15 PM)

Start Time	Amberwood Dr Southbound					Ackman Rd Westbound					Ackman Rd Eastbound					
	U-Turn	Left	Right	Peds	App. Total	U-Turn	Thru	Right	Peds	App. Total	U-Turn	Left	Thru	Peds	App. Total	Int. Total
5:15 PM	0	3	1	0	4	0	211	13	0	224	0	7	110	0	117	345
5:30 PM	0	3	5	0	8	0	196	9	0	205	0	9	109	0	118	331
5:45 PM	0	7	0	0	7	0	182	8	0	190	0	5	99	0	104	301
6:00 PM	0	6	2	0	8	0	195	11	0	206	0	2	113	0	115	329
Total	0	19	8	0	27	0	784	41	0	825	0	23	431	0	454	1306
Approach %	0.0	70.4	29.6	-	-	0.0	95.0	5.0	-	-	0.0	5.1	94.9	-	-	-
Total %	0.0	1.5	0.6	-	2.1	0.0	60.0	3.1	-	63.2	0.0	1.8	33.0	-	34.8	-
PHF	0.000	0.679	0.400	-	0.844	0.000	0.929	0.788	-	0.921	0.000	0.639	0.954	-	0.962	0.946
Lights	0	19	8	-	27	0	778	41	-	819	0	22	427	-	449	1295
% Lights	-	100.0	100.0	-	100.0	-	99.2	100.0	-	99.3	-	95.7	99.1	-	98.9	99.2
Mediums	0	0	0	-	0	0	6	0	-	6	0	0	4	-	4	10
% Mediums	-	0.0	0.0	-	0.0	-	0.8	0.0	-	0.7	-	0.0	0.9	-	0.9	0.8
Articulated Trucks	0	0	0	-	0	0	0	0	-	0	0	0	0	-	0	0
% Articulated Trucks	-	0.0	0.0	-	0.0	-	0.0	0.0	-	0.0	-	0.0	0.0	-	0.0	0.0
Bicycles on Road	0	0	0	-	0	0	0	0	-	0	0	1	0	-	1	1
% Bicycles on Road	-	0.0	0.0	-	0.0	-	0.0	0.0	-	0.0	-	4.3	0.0	-	0.2	0.1
Bicycles on Crosswalk	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pedestrians	-	-	-	0	-	-	-	-	0	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Gewalt Hamilton Associates Inc.
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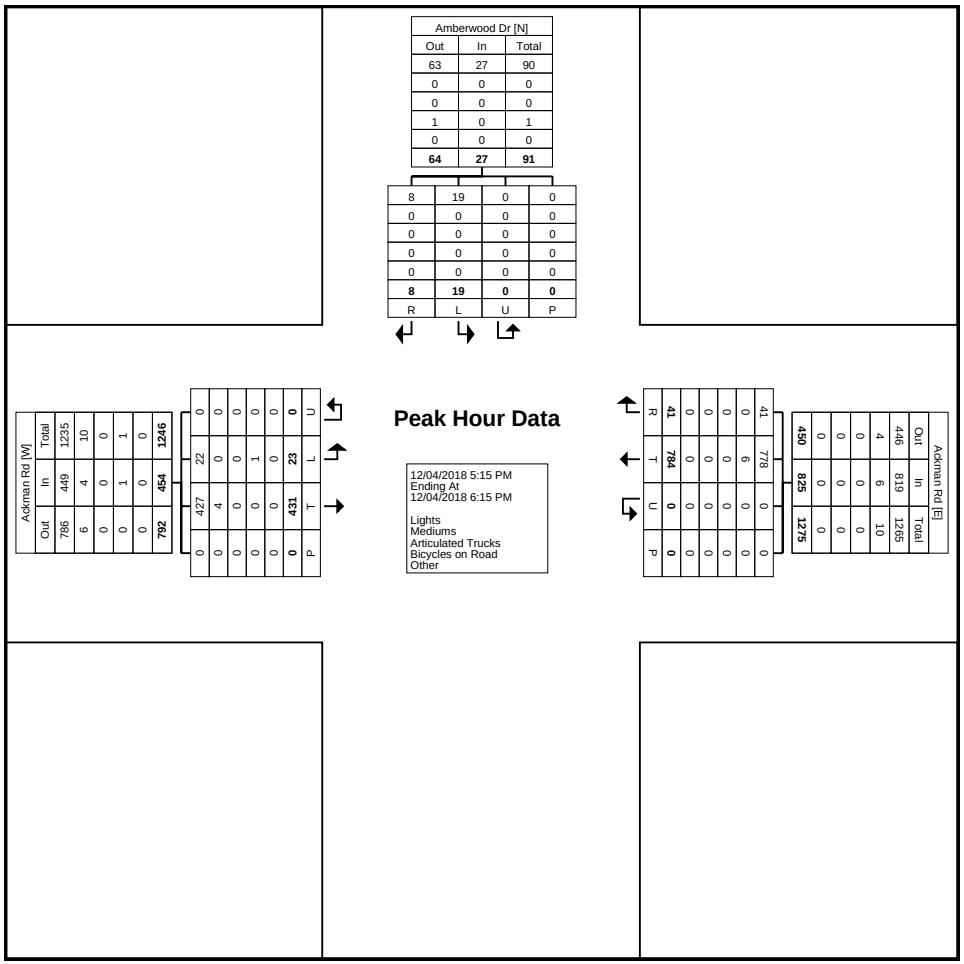


Turning Movement Peak Hour Data Plot (5:15 PM)

Ackman Rd & Golf Course Rd
4188.921 McHenry County
24 Hr
GHA Mio

Gewalt Hamilton Associates Inc.
625 Forest Edge Drive

Vernon Hills, Illinois, United States 60061
(847) 478-9700 lbeckham@gha-engineers.com

Count Name: Ackman Rd & Golf Course Rd
Site Code:
Start Date: 12/04/2018

Turning Movement Data

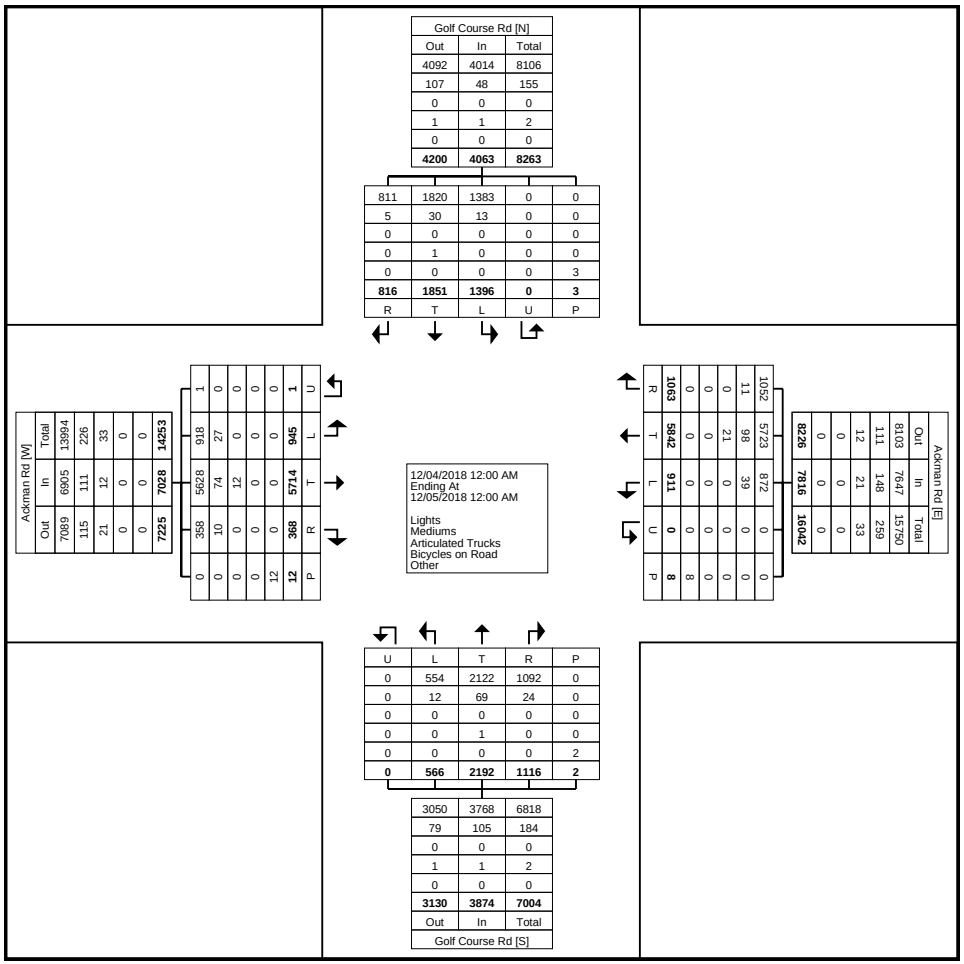
Start Time	Golf Course Rd Southbound						Ackman Rd Westbound						Golf Course Rd Northbound						Ackman Rd Eastbound						Int. Total
	U-Turn	Left	Thru	Right	Peds	App. Total	U-Turn	Left	Thru	Right	Peds	App. Total	U-Turn	Left	Thru	Right	Peds	App. Total	U-Turn	Left	Thru	Right	Peds	App. Total	
12:00 AM	0	0	1	1	0	2	0	2	8	2	0	12	0	1	1	2	0	4	0	2	1	2	0	5	23
12:15 AM	0	0	3	0	0	3	0	1	6	2	0	9	0	0	1	0	0	1	0	1	3	0	0	4	17
12:30 AM	0	2	0	1	0	3	0	0	5	0	0	5	0	0	2	1	0	3	0	0	3	2	0	5	16
12:45 AM	0	0	0	2	0	2	0	0	7	3	0	10	0	0	1	1	0	2	0	1	2	0	0	3	17
Hourly Total	0	2	4	4	0	10	0	3	26	7	0	36	0	1	5	4	0	10	0	4	9	4	0	17	73
1:00 AM	0	0	4	1	0	5	0	0	7	1	0	8	0	0	5	0	0	5	0	1	2	0	0	3	21
1:15 AM	0	1	1	1	0	3	0	0	9	2	0	11	0	0	0	0	0	0	0	0	0	0	0	0	14
1:30 AM	0	0	0	0	0	0	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	3
1:45 AM	0	0	1	1	0	2	0	0	4	0	0	4	0	0	0	0	0	0	0	0	2	0	0	2	8
Hourly Total	0	1	6	3	0	10	0	0	21	3	0	24	0	0	6	0	0	6	0	1	5	0	0	6	46
2:00 AM	0	0	0	0	0	0	0	0	1	3	0	4	0	0	0	0	0	0	0	0	1	0	0	1	5
2:15 AM	0	0	0	1	0	1	0	0	4	0	0	4	0	0	1	1	0	2	0	1	2	0	0	3	10
2:30 AM	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	1	0	0	1	2
2:45 AM	0	2	0	0	0	2	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	0	0	1	5
Hourly Total	0	2	0	1	0	3	0	0	6	4	0	10	0	0	2	1	0	3	0	1	5	0	0	6	22
3:00 AM	0	1	0	2	0	3	0	1	1	2	0	4	0	0	0	0	0	0	0	0	2	0	1	2	9
3:15 AM	0	3	0	0	0	3	0	2	0	1	0	3	0	0	1	0	0	1	0	0	6	0	0	6	13
3:30 AM	0	1	0	0	0	1	0	0	0	0	0	0	0	1	0	0	0	1	0	0	6	0	0	6	8
3:45 AM	0	5	0	2	0	7	0	0	3	1	0	4	0	0	1	1	0	2	0	0	10	0	0	10	23
Hourly Total	0	10	0	4	0	14	0	3	4	4	0	11	0	1	2	1	0	4	0	0	24	0	1	24	53
4:00 AM	0	7	1	1	0	9	0	0	3	0	0	3	0	1	2	1	0	4	0	0	17	0	0	17	33
4:15 AM	0	6	0	0	0	6	0	0	2	0	0	2	0	0	4	0	0	4	0	1	17	1	0	19	31
4:30 AM	0	7	2	2	0	11	0	0	7	0	0	7	0	0	1	2	1	3	0	1	40	0	0	41	62
4:45 AM	0	16	1	1	0	18	0	0	6	1	1	7	0	0	6	1	0	7	0	2	45	0	0	47	79
Hourly Total	0	36	4	4	0	44	0	0	18	1	1	19	0	1	13	4	1	18	0	4	119	1	0	124	205
5:00 AM	0	13	2	5	0	20	0	0	5	0	0	5	0	2	4	7	0	13	0	2	37	0	0	39	77
5:15 AM	0	12	3	1	0	16	0	0	7	0	0	7	0	1	5	6	0	12	0	1	51	2	1	54	89
5:30 AM	0	21	0	2	0	23	0	1	20	2	0	23	0	1	10	11	0	22	0	6	88	1	0	95	163
5:45 AM	0	26	4	8	0	38	0	3	12	0	0	15	0	1	10	11	0	22	0	7	102	0	0	109	184
Hourly Total	0	72	9	16	0	97	0	4	44	2	0	50	0	5	29	35	0	69	0	16	278	3	1	297	513
6:00 AM	0	29	4	5	0	38	0	4	21	3	0	28	0	4	10	18	0	32	0	4	105	3	0	112	210
6:15 AM	0	25	10	5	1	40	0	1	34	8	0	43	0	3	25	28	0	56	0	9	115	2	0	126	265
6:30 AM	0	37	24	6	0	67	0	5	34	6	0	45	0	11	52	25	0	88	0	22	114	5	0	141	341
6:45 AM	0	42	32	14	0	88	0	7	59	3	0	69	0	6	64	33	0	103	0	26	137	4	0	167	427
Hourly Total	0	133	70	30	1	233	0	17	148	20	0	185	0	24	151	104	0	279	0	61	471	14	0	546	1243
7:00 AM	0	32	27	17	0	76	0	7	38	7	0	52	0	3	117	22	0	142	0	61	136	3	1	200	470
7:15 AM	0	30	29	20	0	79	0	13	56	8	0	77	0	12	52	41	0	105	0	26	146	5	0	177	438
7:30 AM	0	47	34	14	0	95	0	9	39	2	0	50	0	11	46	27	0	84	0	17	160	1	0	178	407
7:45 AM	0	30	39	12	0	81	0	13	46	4	0	63	0	16	43	28	0	87	0	14	122	12	1	148	379
Hourly Total	0	139	129	63	0	331	0	42	179	21	0	242	0	42	258	118	0	418	0	118	564	21	2	703	1694

8:00 AM	0	30	36	9	0	75	0	13	35	10	0	58	0	12	27	24	0	63	0	22	105	4	0	131	327
8:15 AM	0	34	32	4	0	70	0	10	46	7	0	63	0	11	31	24	0	66	0	16	124	8	0	148	347
8:30 AM	0	38	40	15	0	93	0	8	43	7	0	58	0	14	44	40	0	98	0	31	112	4	0	147	396
8:45 AM	0	28	35	9	0	72	0	9	46	10	0	65	0	5	52	27	0	84	0	13	121	4	0	138	359
Hourly Total	0	130	143	37	0	310	0	40	170	34	0	244	0	42	154	115	0	311	0	82	462	20	0	564	1429
9:00 AM	0	19	16	11	0	46	0	7	39	6	0	52	0	10	29	16	0	55	0	8	111	6	0	125	278
9:15 AM	0	27	13	4	0	44	0	9	58	8	0	75	0	3	14	6	0	23	0	7	87	4	0	98	240
9:30 AM	0	24	17	8	0	49	0	8	47	9	1	64	0	6	25	18	0	49	0	15	85	3	0	103	265
9:45 AM	0	26	8	7	0	41	0	7	48	7	0	62	0	5	24	18	0	47	0	12	85	6	0	103	253
Hourly Total	0	96	54	30	0	180	0	31	192	30	1	253	0	24	92	58	0	174	0	42	368	19	0	429	1036
10:00 AM	0	16	15	7	0	38	0	6	53	12	1	71	0	3	15	13	0	31	0	8	61	2	0	71	211
10:15 AM	0	16	14	9	0	39	0	7	45	7	0	59	0	4	20	14	0	38	0	14	84	5	1	103	239
10:30 AM	0	20	15	6	0	41	0	3	45	9	0	57	0	7	22	11	0	40	0	10	71	3	0	84	222
10:45 AM	0	16	28	16	0	60	0	14	58	5	0	77	0	5	28	13	0	46	0	11	77	2	0	90	273
Hourly Total	0	68	72	38	0	178	0	30	201	33	1	264	0	19	85	51	0	155	0	43	293	12	1	348	945
11:00 AM	0	24	21	4	0	49	0	19	52	18	0	89	0	5	18	12	0	35	0	12	77	2	0	91	264
11:15 AM	0	15	22	11	0	48	0	5	71	8	0	84	0	5	61	18	0	84	0	29	79	5	0	113	329
11:30 AM	0	15	24	15	0	54	0	8	75	15	0	98	0	3	28	19	0	50	0	10	77	5	0	92	294
11:45 AM	0	15	28	8	0	51	0	9	66	12	0	87	0	4	23	8	0	35	0	8	85	8	0	101	274
Hourly Total	0	69	95	38	0	202	0	41	264	53	0	358	0	17	130	57	0	204	0	59	318	20	0	397	1161
12:00 PM	0	15	25	9	1	49	0	11	53	13	0	77	0	4	30	9	0	43	0	8	69	3	1	80	249
12:15 PM	0	21	35	12	0	68	0	25	83	17	1	125	0	2	35	14	0	51	0	6	71	4	0	81	325
12:30 PM	0	22	22	9	0	53	0	13	69	6	0	88	0	8	32	16	0	56	0	11	76	7	0	94	291
12:45 PM	0	19	23	7	0	49	0	13	72	13	0	98	0	9	34	18	0	61	0	12	84	2	0	98	306
Hourly Total	0	77	105	37	1	219	0	62	277	49	1	388	0	23	131	57	0	211	0	37	300	16	1	353	1171
1:00 PM	0	20	18	9	0	47	0	11	79	16	0	106	0	5	28	15	0	48	0	18	64	7	0	89	290
1:15 PM	0	14	23	15	0	52	0	7	80	11	0	98	0	6	24	13	0	43	0	8	66	4	0	78	271
1:30 PM	0	12	17	5	0	34	0	15	65	14	0	94	0	5	20	13	0	38	0	14	78	6	0	98	264
1:45 PM	0	11	21	11	0	43	0	13	57	11	0	81	0	5	21	16	0	42	0	10	65	5	0	80	246
Hourly Total	0	57	79	40	0	176	0	46	281	52	0	379	0	21	93	57	0	171	0	50	273	22	0	345	1071
2:00 PM	0	16	22	7	0	45	0	11	69	16	0	96	0	4	34	13	0	51	0	4	65	3	0	72	264
2:15 PM	0	15	26	11	0	52	0	16	100	16	0	132	0	3	20	5	0	28	0	6	79	6	0	91	303
2:30 PM	0	17	26	12	1	55	0	17	78	20	0	115	0	8	26	15	1	49	0	13	58	4	1	75	294
2:45 PM	0	17	47	15	0	79	0	37	110	25	0	172	0	5	29	14	0	48	0	23	61	4	0	88	387
Hourly Total	0	65	121	45	1	231	0	81	357	77	0	515	0	20	109	47	1	176	0	46	263	17	1	326	1248
3:00 PM	0	22	90	22	0	134	0	22	135	29	0	186	0	10	33	14	0	57	0	15	70	9	2	94	471
3:15 PM	0	17	42	14	0	73	0	24	111	15	1	150	0	15	32	11	0	58	0	17	78	8	0	103	384
3:30 PM	0	17	39	21	0	77	0	24	126	35	1	185	0	13	52	33	0	98	1	16	113	10	1	140	500
3:45 PM	0	26	35	22	0	83	0	23	110	15	0	148	0	15	72	30	0	117	0	23	110	10	0	143	491
Hourly Total	0	82	206	79	0	367	0	93	482	94	2	669	0	53	189	88	0	330	1	71	371	37	3	480	1846
4:00 PM	0	23	35	14	0	72	0	27	159	24	0	210	0	17	60	23	0	100	0	20	99	9	0	128	510
4:15 PM	0	25	42	15	0	82	0	18	161	24	0	203	0	16	57	29	0	102	0	20	91	11	0	122	509
4:30 PM	0	23	51	24	0	98	0	19	145	25	1	189	0	16	31	18	0	65	0	19	97	6	1	122	474
4:45 PM	0	21	51	18	0	90	0	19	162	33	0	214	0	23	52	16	0	91	0	10	87	11	0	108	503
Hourly Total	0	92	179	71	0	342	0	83	627	106	1	816	0	72	200	86	0	358	0	69	374	37	1	480	1996
5:00 PM	0	23	41	19	0	83	0	14	164	30	0	208	0	9	44	18	0	71	0	19	83	5	0	107	469
5:15 PM	0	24	46	20	0	90	0	28	183	36	0	247	0	20	42	27	0	89	0	17	88	12	0	117	543
5:30 PM	0	30	45	17	0	92	0	29	183	28	0	240	0	16	31	14	0	61	0	13	93	6	0	112	505
5:45 PM	0	14	40	15	0	69	0	14	167	13	0	194	0	16	55	17	0	88	0	19	86	8	0	113	464
Hourly Total	0	91	172	71	0	334	0	85	697	107	0	889	0	61	172	76	0	309	0	68	350	31	0	449	1981
6:00 PM	0	15	43	15	0	73	0	23	190	41	0	254	0	18	44	14	0	76	0	12	93	9	0	114	517
6:15 PM	0	15	28	17	0	60	0	17	173	29	0	219	0	17	59	26	0	102	0	14	81	7	0	102	483

6:30 PM	0	27	36	16	0	79	0	18	138	30	0	186	0	19	40	18	0	77	0	15	86	12	0	113	455
6:45 PM	0	8	21	8	0	37	0	21	136	20	0	177	0	10	37	15	0	62	0	21	80	3	0	104	380
Hourly Total	0	65	128	56	0	249	0	79	637	120	0	836	0	64	180	73	0	317	0	62	340	31	0	433	1835
7:00 PM	0	18	31	15	0	64	0	18	124	23	0	165	0	8	21	6	0	35	0	11	65	7	0	83	347
7:15 PM	0	6	23	17	0	46	0	19	106	23	0	148	0	12	21	10	0	43	0	10	49	6	0	65	302
7:30 PM	0	8	15	9	0	32	0	20	116	18	0	154	0	2	19	14	0	35	0	6	49	4	0	59	280
7:45 PM	0	9	12	8	0	29	0	18	114	24	0	156	0	5	13	3	0	21	0	8	41	2	0	51	257
Hourly Total	0	41	81	49	0	171	0	75	460	88	0	623	0	27	74	33	0	134	0	35	204	19	0	258	1186
8:00 PM	0	10	32	9	0	51	0	12	79	17	0	108	0	7	13	4	0	24	0	6	32	5	0	43	226
8:15 PM	0	5	40	12	0	57	0	11	85	18	0	114	0	7	9	4	0	20	0	11	52	2	0	65	256
8:30 PM	0	10	16	7	0	33	0	13	86	18	0	117	0	2	4	5	0	11	0	4	35	3	0	42	203
8:45 PM	0	9	14	10	0	33	0	6	70	12	0	88	0	2	13	5	0	20	0	7	37	1	0	45	186
Hourly Total	0	34	102	38	0	174	0	42	320	65	0	427	0	18	39	18	0	75	0	28	156	11	0	195	871
9:00 PM	0	4	27	16	0	47	0	10	53	10	0	73	0	4	10	11	0	25	0	5	18	5	0	28	173
9:15 PM	0	6	19	8	0	33	0	11	80	11	0	102	0	11	18	5	0	34	0	7	29	7	0	43	212
9:30 PM	0	7	10	3	0	20	0	8	51	11	0	70	0	6	10	7	0	23	0	8	25	3	1	36	149
9:45 PM	0	1	6	8	0	15	0	4	38	13	0	55	0	2	5	1	0	8	0	2	14	2	0	18	96
Hourly Total	0	18	62	35	0	115	0	33	222	45	0	300	0	23	43	24	0	90	0	22	86	17	1	125	630
10:00 PM	0	5	4	3	0	12	0	6	42	8	0	56	0	1	6	2	0	9	0	5	22	4	0	31	108
10:15 PM	0	2	7	8	0	17	0	1	42	8	0	51	0	1	8	2	0	11	0	4	12	5	0	21	100
10:30 PM	0	2	5	3	0	10	0	7	32	9	1	48	0	1	6	1	0	8	0	4	13	1	0	18	84
10:45 PM	0	1	6	3	0	10	0	2	24	10	0	36	0	0	5	0	0	5	0	5	7	3	0	15	66
Hourly Total	0	10	22	17	0	49	0	16	140	35	1	191	0	3	25	5	0	33	0	18	54	13	0	85	358
11:00 PM	0	1	4	1	0	6	0	0	16	6	0	22	0	2	3	2	0	7	0	1	9	0	0	10	45
11:15 PM	0	4	0	2	0	6	0	1	27	2	0	30	0	1	1	1	0	3	0	1	8	2	0	11	50
11:30 PM	0	1	2	2	0	5	0	3	17	1	0	21	0	1	4	0	0	5	0	5	7	0	0	12	43
11:45 PM	0	0	2	5	0	7	0	1	9	4	0	14	0	1	2	1	0	4	0	1	3	1	0	5	30
Hourly Total	0	6	8	10	0	24	0	5	69	13	0	87	0	5	10	4	0	19	0	8	27	3	0	38	168
Grand Total	0	1396	1851	816	3	4063	0	911	5842	1063	8	7816	0	566	2192	1116	2	3874	1	945	5714	368	12	7028	22781
Approach %	0.0	34.4	45.6	20.1	-	-	0.0	11.7	74.7	13.6	-	-	0.0	14.6	56.6	28.8	-	-	0.0	13.4	81.3	5.2	-	-	-
Total %	0.0	6.1	8.1	3.6	-	17.8	0.0	4.0	25.6	4.7	-	34.3	0.0	2.5	9.6	4.9	-	17.0	0.0	4.1	25.1	1.6	-	30.9	-
Lights	0	1383	1820	811	-	4014	0	872	5723	1052	-	7647	0	554	2122	1092	-	3768	1	918	5628	358	-	6905	22334
% Lights	-	99.1	98.3	99.4	-	98.8	-	95.7	98.0	99.0	-	97.8	-	97.9	96.8	97.8	-	97.3	100.0	97.1	98.5	97.3	-	98.2	98.0
Mediums	0	13	30	5	-	48	0	39	98	11	-	148	0	12	69	24	-	105	0	27	74	10	-	111	412
% Mediums	-	0.9	1.6	0.6	-	1.2	-	4.3	1.7	1.0	-	1.9	-	2.1	3.1	2.2	-	2.7	0.0	2.9	1.3	2.7	-	1.6	1.8
Articulated Trucks	0	0	0	0	-	0	0	0	21	0	-	21	0	0	0	0	-	0	0	0	12	0	-	12	33
% Articulated Trucks	-	0.0	0.0	0.0	-	0.0	-	0.0	0.4	0.0	-	0.3	-	0.0	0.0	0.0	-	0.0	0.0	0.0	0.2	0.0	-	0.2	0.1
Bicycles on Road	0	0	1	0	-	1	0	0	0	0	-	0	0	0	1	0	-	1	0	0	0	0	-	0	2
% Bicycles on Road	-	0.0	0.1	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
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	1	-	-
% Bicycles on Crosswalk	-	-	-	-	0.0	-	-	-	-	-	0.0	-	-	-	-	-	0.0	-	-	-	-	-	8.3	-	-
Pedestrians	-	-	-	-	3	-	-	-	-	-	8	-	-	-	-	-	2	-	-	-	-	-	11	-	-
% Pedestrians	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-	-	-	-	91.7	-	-

Gewalt Hamilton Associates Inc.
625 Forest Edge Drive

Vernon Hills, Illinois, United States 60061
(847) 478-9700 lbeckham@gha-engineers.com



Turning Movement Data Plot

Ackman Rd & Golf Course Rd
4188.921 McHenry County
24 Hr
GHA Mio

Gewalt Hamilton Associates Inc.
625 Forest Edge Drive

Vernon Hills, Illinois, United States 60061
(847) 478-9700 lbeckham@gha-engineers.com

Count Name: Ackman Rd & Golf Course Rd
Site Code:
Start Date: 12/04/2018

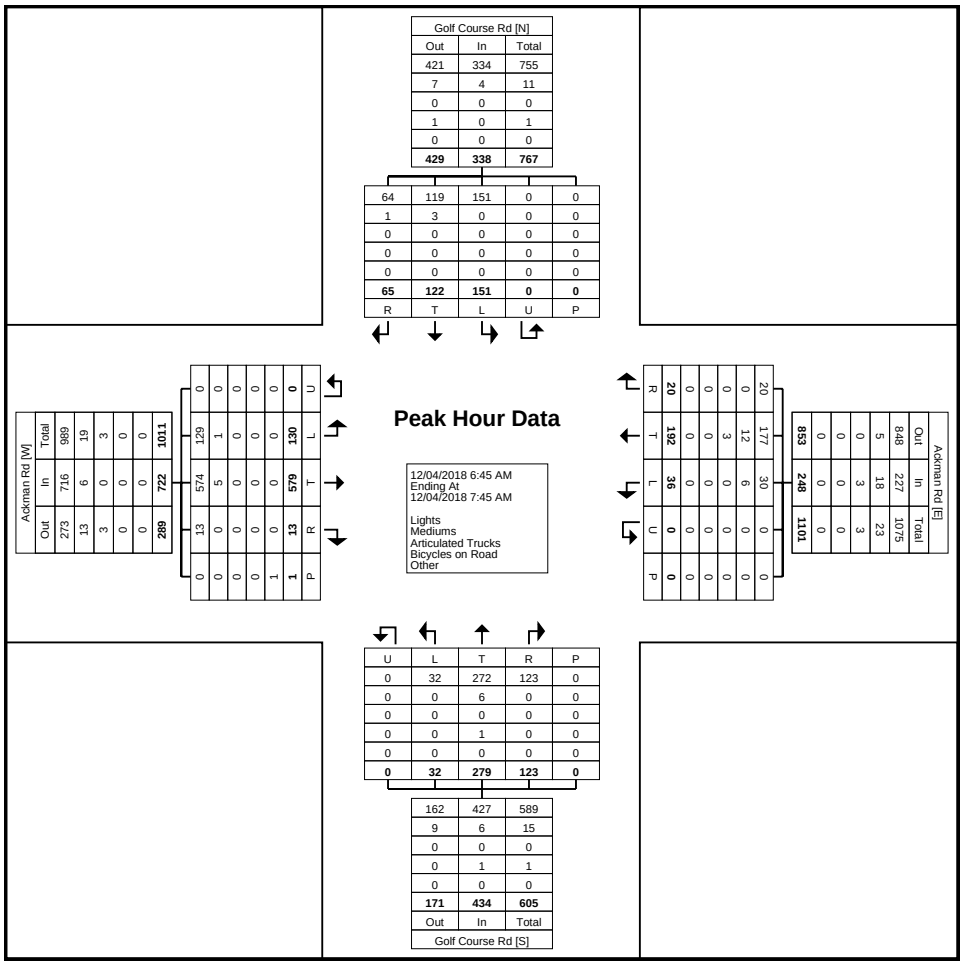
Turning Movement Peak Hour Data (6:45 AM)

Start Time	Golf Course Rd Southbound						Ackman Rd Westbound						Golf Course Rd Northbound						Ackman Rd Eastbound						Int. Total
	U-Turn	Left	Thru	Right	Peds	App. Total	U-Turn	Left	Thru	Right	Peds	App. Total	U-Turn	Left	Thru	Right	Peds	App. Total	U-Turn	Left	Thru	Right	Peds	App. Total	
6:45 AM	0	42	32	14	0	88	0	7	59	3	0	69	0	6	64	33	0	103	0	26	137	4	0	167	427
7:00 AM	0	32	27	17	0	76	0	7	38	7	0	52	0	3	117	22	0	142	0	61	136	3	1	200	470
7:15 AM	0	30	29	20	0	79	0	13	56	8	0	77	0	12	52	41	0	105	0	26	146	5	0	177	438
7:30 AM	0	47	34	14	0	95	0	9	39	2	0	50	0	11	46	27	0	84	0	17	160	1	0	178	407
Total	0	151	122	65	0	338	0	36	192	20	0	248	0	32	279	123	0	434	0	130	579	13	1	722	1742
Approach %	0.0	44.7	36.1	19.2	-	-	0.0	14.5	77.4	8.1	-	-	0.0	7.4	64.3	28.3	-	-	0.0	18.0	80.2	1.8	-	-	-
Total %	0.0	8.7	7.0	3.7	-	19.4	0.0	2.1	11.0	1.1	-	14.2	0.0	1.8	16.0	7.1	-	24.9	0.0	7.5	33.2	0.7	-	41.4	-
PHF	0.000	0.803	0.897	0.813	-	0.889	0.000	0.692	0.814	0.625	-	0.805	0.000	0.667	0.596	0.750	-	0.764	0.000	0.533	0.905	0.650	-	0.903	0.927
Lights	0	151	119	64	-	334	0	30	177	20	-	227	0	32	272	123	-	427	0	129	574	13	-	716	1704
% Lights	-	100.0	97.5	98.5	-	98.8	-	83.3	92.2	100.0	-	91.5	-	100.0	97.5	100.0	-	98.4	-	99.2	99.1	100.0	-	99.2	97.8
Mediums	0	0	3	1	-	4	0	6	12	0	-	18	0	0	6	0	-	6	0	1	5	0	-	6	34
% Mediums	-	0.0	2.5	1.5	-	1.2	-	16.7	6.3	0.0	-	7.3	-	0.0	2.2	0.0	-	1.4	-	0.8	0.9	0.0	-	0.8	2.0
Articulated Trucks	0	0	0	0	-	0	0	0	3	0	-	3	0	0	0	0	-	0	0	0	0	0	-	0	3
% Articulated Trucks	-	0.0	0.0	0.0	-	0.0	-	0.0	1.6	0.0	-	1.2	-	0.0	0.0	0.0	-	0.0	-	0.0	0.0	0.0	-	0.0	0.2
Bicycles on Road	0	0	0	0	-	0	0	0	0	0	-	0	0	0	1	0	-	1	0	0	0	0	-	0	1
% Bicycles on Road	-	0.0	0.0	0.0	-	0.0	-	0.0	0.0	0.0	-	0.0	-	0.0	0.4	0.0	-	0.2	-	0.0	0.0	0.0	-	0.0	0.1
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	1	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	100.0	-	-

Ackman Rd & Golf Course Rd
4188.921 McHenry County
24 Hr
GHA Mio

Gewalt Hamilton Associates Inc.
625 Forest Edge Drive

Vernon Hills, Illinois, United States 60061
(847) 478-9700 lbeckham@gha-engineers.com



Turning Movement Peak Hour Data Plot (6:45 AM)

Ackman Rd & Golf Course Rd
4188.921 McHenry County
24 Hr
GHA Mio

Gewalt Hamilton Associates Inc.
625 Forest Edge Drive

Vernon Hills, Illinois, United States 60061
(847) 478-9700 lbeckham@gha-engineers.com

Count Name: Ackman Rd & Golf Course Rd
Site Code:
Start Date: 12/04/2018

Turning Movement Peak Hour Data (5:15 PM)

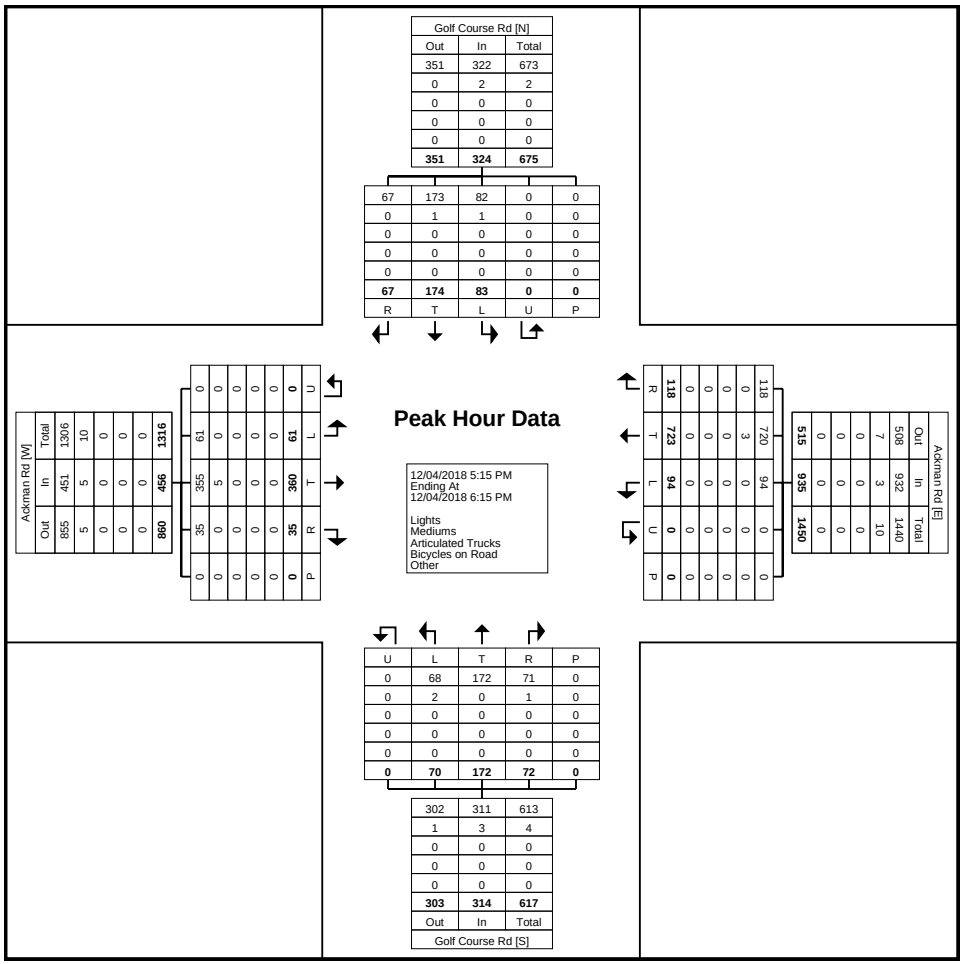
Start Time	Golf Course Rd Southbound						Ackman Rd Westbound						Golf Course Rd Northbound						Ackman Rd Eastbound						Int. Total
	U-Turn	Left	Thru	Right	Peds	App. Total	U-Turn	Left	Thru	Right	Peds	App. Total	U-Turn	Left	Thru	Right	Peds	App. Total	U-Turn	Left	Thru	Right	Peds	App. Total	
5:15 PM	0	24	46	20	0	90	0	28	183	36	0	247	0	20	42	27	0	89	0	17	88	12	0	117	543
5:30 PM	0	30	45	17	0	92	0	29	183	28	0	240	0	16	31	14	0	61	0	13	93	6	0	112	505
5:45 PM	0	14	40	15	0	69	0	14	167	13	0	194	0	16	55	17	0	88	0	19	86	8	0	113	464
6:00 PM	0	15	43	15	0	73	0	23	190	41	0	254	0	18	44	14	0	76	0	12	93	9	0	114	517
Total	0	83	174	67	0	324	0	94	723	118	0	935	0	70	172	72	0	314	0	61	360	35	0	456	2029
Approach %	0.0	25.6	53.7	20.7	-	-	0.0	10.1	77.3	12.6	-	-	0.0	22.3	54.8	22.9	-	-	0.0	13.4	78.9	7.7	-	-	-
Total %	0.0	4.1	8.6	3.3	-	16.0	0.0	4.6	35.6	5.8	-	46.1	0.0	3.4	8.5	3.5	-	15.5	0.0	3.0	17.7	1.7	-	22.5	-
PHF	0.000	0.692	0.946	0.838	-	0.880	0.000	0.810	0.951	0.720	-	0.920	0.000	0.875	0.782	0.667	-	0.882	0.000	0.803	0.968	0.729	-	0.974	0.934
Lights	0	82	173	67	-	322	0	94	720	118	-	932	0	68	172	71	-	311	0	61	355	35	-	451	2016
% Lights	-	98.8	99.4	100.0	-	99.4	-	100.0	99.6	100.0	-	99.7	-	97.1	100.0	98.6	-	99.0	-	100.0	98.6	100.0	-	98.9	99.4
Mediums	0	1	1	0	-	2	0	0	3	0	-	3	0	2	0	1	-	3	0	0	5	0	-	5	13
% Mediums	-	1.2	0.6	0.0	-	0.6	-	0.0	0.4	0.0	-	0.3	-	2.9	0.0	1.4	-	1.0	-	0.0	1.4	0.0	-	1.1	0.6
Articulated Trucks	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Articulated Trucks	-	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
Bicycles on Road	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Bicycles on Road	-	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
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pedestrians	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Ackman Rd & Golf Course Rd
4188.921 McHenry County
24 Hr
GHA Mio

Gewalt Hamilton Associates Inc.
625 Forest Edge Drive

Vernon Hills, Illinois, United States 60061
(847) 478-9700 lbeckham@gha-engineers.com

Count Name: Ackman Rd & Golf Course Rd
Site Code:
Start Date: 12/04/2018



Turning Movement Peak Hour Data Plot (5:15 PM)

Ackman Rd & Westport Ridge
4188.921 McHenry County
24 Hr
GHA Mio

Gewalt Hamilton Associates Inc.
625 Forest Edge Drive

Vernon Hills, Illinois, United States 60061
(847) 478-9700 poster@gha-engineers.com

Count Name: Ackman Rd & Westport Ridge
Site Code:
Start Date: 12/04/2018

Turning Movement Data

Start Time	Westport Ridge Southbound						Ackman Rd Westbound						Westport Ridge Northbound						Ackman Rd Eastbound						Int. Total
	U-Turn	Left	Thru	Right	Peds	App. Total	U-Turn	Left	Thru	Right	Peds	App. Total	U-Turn	Left	Thru	Right	Peds	App. Total	U-Turn	Left	Thru	Right	Peds	App. Total	
12:00 AM	0	1	0	0	0	1	0	1	13	1	0	15	0	1	0	0	0	1	0	0	1	1	0	2	19
12:15 AM	0	0	0	0	0	0	0	1	8	1	0	10	0	0	0	1	0	1	0	0	4	0	0	4	15
12:30 AM	0	0	0	0	0	0	0	0	4	0	0	4	0	2	0	0	0	2	0	0	6	0	0	6	12
12:45 AM	0	0	0	0	0	0	0	0	9	0	0	9	0	0	0	0	0	0	0	0	3	0	0	3	12
Hourly Total	0	1	0	0	0	1	0	2	34	2	0	38	0	3	0	1	0	4	0	0	14	1	0	15	58
1:00 AM	0	0	0	0	0	0	0	0	8	0	0	8	0	0	1	0	0	1	0	0	2	0	0	2	11
1:15 AM	0	0	0	0	0	0	0	0	10	2	0	12	0	1	0	1	0	2	0	0	1	0	0	1	15
1:30 AM	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	1	0	0	1	2
1:45 AM	0	0	0	0	0	0	0	0	4	2	0	6	0	0	0	0	0	0	0	0	2	0	0	2	8
Hourly Total	0	0	0	0	0	0	0	0	23	4	0	27	0	1	1	1	0	3	0	0	6	0	0	6	36
2:00 AM	0	0	0	0	0	0	0	2	3	0	0	5	0	0	0	2	0	2	0	0	1	0	0	1	8
2:15 AM	0	0	0	0	0	0	0	0	4	0	0	4	0	0	0	0	0	0	0	0	3	0	0	3	7
2:30 AM	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	1	0	1	0	0	1	0	0	1	3
2:45 AM	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	0	0	0	0	3	0	0	3	4
Hourly Total	0	0	0	0	0	0	0	2	9	0	0	11	0	0	0	3	0	3	0	0	8	0	0	8	22
3:00 AM	0	0	0	0	0	0	0	0	4	0	0	4	0	0	0	0	0	0	0	0	3	0	0	3	7
3:15 AM	0	0	0	0	0	0	0	0	2	0	0	2	0	1	0	0	0	1	0	0	8	0	0	8	11
3:30 AM	0	1	0	0	0	1	0	0	0	0	0	0	0	0	0	1	0	1	0	0	8	0	0	8	10
3:45 AM	0	0	0	0	0	0	0	0	4	0	0	4	0	0	0	0	0	0	0	0	15	0	0	15	19
Hourly Total	0	1	0	0	0	1	0	0	10	0	0	10	0	1	0	1	0	2	0	0	34	0	0	34	47
4:00 AM	0	3	0	0	0	3	0	0	3	1	0	4	0	0	0	0	0	0	0	1	25	0	0	26	33
4:15 AM	0	8	0	0	0	8	0	0	2	0	0	2	0	0	0	0	0	0	0	0	23	0	1	23	33
4:30 AM	0	1	0	0	0	1	0	0	7	2	0	9	0	0	0	1	0	1	0	0	44	0	0	44	55
4:45 AM	0	1	0	0	0	1	0	0	7	0	0	7	0	0	0	1	0	1	0	0	65	0	0	65	74
Hourly Total	0	13	0	0	0	13	0	0	19	3	0	22	0	0	0	2	0	2	0	1	157	0	1	158	195
5:00 AM	0	2	0	1	0	3	0	0	4	0	0	4	0	0	0	3	0	3	0	0	58	0	0	58	68
5:15 AM	0	5	0	1	0	6	0	1	6	1	0	8	0	0	0	2	0	2	0	0	69	0	0	69	85
5:30 AM	0	4	0	0	0	4	0	0	21	0	0	21	0	3	0	2	0	5	0	0	106	0	0	106	136
5:45 AM	0	5	0	0	0	5	0	1	15	0	0	16	0	0	0	6	0	6	0	0	151	1	0	152	179
Hourly Total	0	16	0	2	0	18	0	2	46	1	0	49	0	3	0	13	0	16	0	0	384	1	0	385	468
6:00 AM	0	4	0	1	0	5	0	1	30	3	0	34	0	0	0	13	0	13	0	0	153	2	0	155	207
6:15 AM	0	6	0	3	0	9	0	2	40	2	0	44	0	0	0	14	0	14	0	0	165	0	0	165	232
6:30 AM	0	6	0	2	0	8	0	0	47	1	2	48	0	1	0	16	0	17	0	0	168	1	0	169	242
6:45 AM	0	6	0	1	0	7	0	1	61	1	0	63	0	2	1	26	0	29	0	0	217	1	0	218	317
Hourly Total	0	22	0	7	0	29	0	4	178	7	2	189	0	3	1	69	0	73	0	0	703	4	0	707	998
7:00 AM	0	6	2	2	0	10	0	4	51	3	8	58	0	2	13	47	0	62	0	1	187	1	0	189	319
7:15 AM	0	8	2	7	0	17	0	8	64	0	1	72	0	2	6	22	0	30	0	2	211	0	0	213	332
7:30 AM	0	5	0	0	0	5	0	2	52	3	0	57	0	1	0	24	0	25	0	0	234	0	0	234	321
7:45 AM	0	9	1	1	0	11	0	1	60	1	0	62	0	2	0	26	0	28	0	0	182	2	0	184	285
Hourly Total	0	28	5	10	0	43	0	15	227	7	9	249	0	7	19	119	0	145	0	3	814	3	0	820	1257

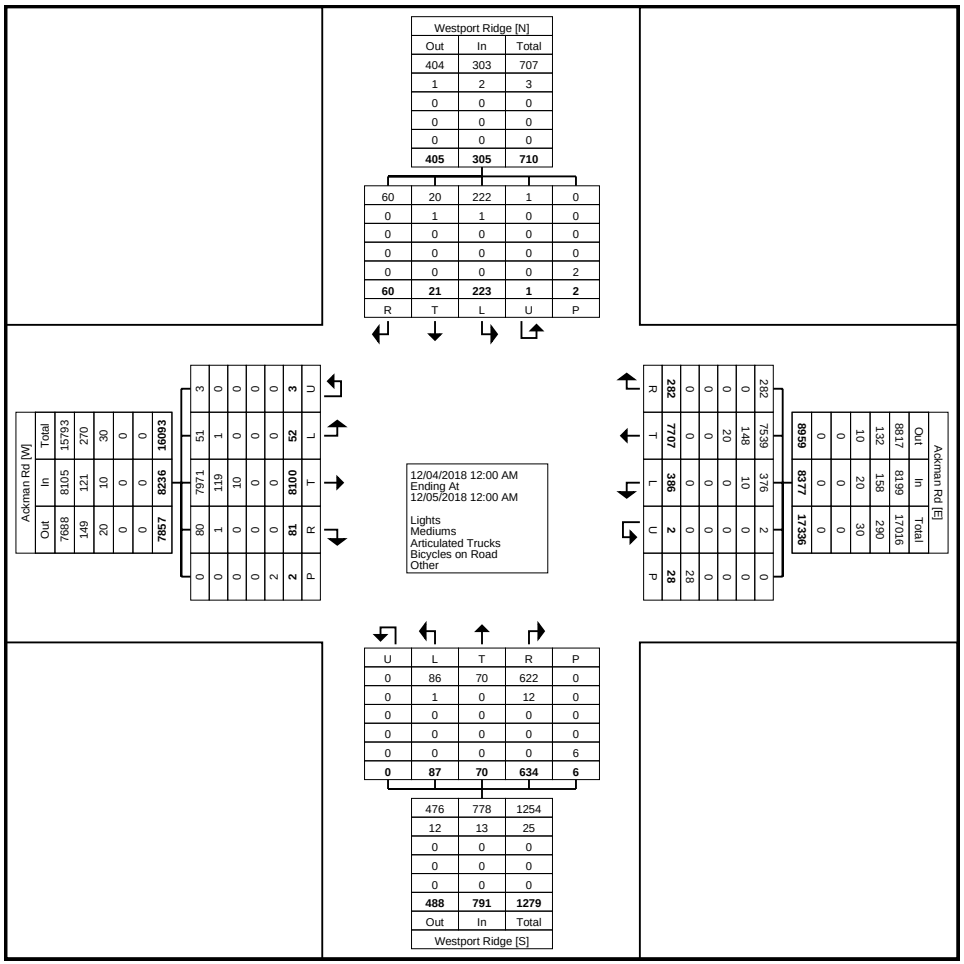
8:00 AM	0	4	1	1	0	6	0	2	56	2	0	60	0	0	0	10	0	10	0	2	159	0	0	161	237
8:15 AM	0	9	1	4	0	14	0	3	59	1	0	63	0	2	0	13	0	15	0	1	183	2	0	186	278
8:30 AM	0	5	1	0	0	6	0	1	68	0	0	69	0	0	1	16	0	17	0	1	186	1	0	188	280
8:45 AM	0	5	0	1	0	6	1	6	53	2	0	62	0	1	2	13	0	16	0	0	178	1	0	179	263
Hourly Total	0	23	3	6	0	32	1	12	236	5	0	254	0	3	3	52	0	58	0	4	706	4	0	714	1058
9:00 AM	0	5	1	0	0	6	0	1	55	3	0	59	0	0	0	10	0	10	1	1	140	1	0	143	218
9:15 AM	0	5	0	1	0	6	0	2	65	0	0	67	0	5	1	8	0	14	0	2	121	0	0	123	210
9:30 AM	0	0	0	1	0	1	0	5	61	3	0	69	0	1	0	6	0	7	0	0	120	1	0	121	198
9:45 AM	0	2	0	1	0	3	0	1	64	0	0	65	0	0	0	7	0	7	0	0	133	1	0	134	209
Hourly Total	0	12	1	3	0	16	0	9	245	6	0	260	0	6	1	31	0	38	1	3	514	3	0	521	835
10:00 AM	0	1	0	1	0	2	0	2	68	2	0	72	0	2	1	6	0	9	0	0	93	1	0	94	177
10:15 AM	0	5	1	1	0	7	0	2	55	2	0	59	0	0	0	8	1	8	0	0	109	1	0	110	184
10:30 AM	0	4	0	0	0	4	0	3	55	2	0	60	0	0	0	5	0	5	0	1	100	1	0	102	171
10:45 AM	0	4	0	0	0	4	0	6	77	4	1	87	0	0	0	6	1	6	0	1	103	2	0	106	203
Hourly Total	0	14	1	2	0	17	0	13	255	10	1	278	0	2	1	25	2	28	0	2	405	5	0	412	735
11:00 AM	0	2	0	0	0	2	0	5	86	3	0	94	0	1	0	4	0	5	0	0	111	0	0	111	212
11:15 AM	0	4	0	0	0	4	0	4	84	3	1	91	0	1	1	9	0	11	0	0	114	0	0	114	220
11:30 AM	0	2	0	0	0	2	0	10	96	4	0	110	0	1	1	2	0	4	0	0	109	0	0	109	225
11:45 AM	0	3	0	1	0	4	0	4	88	3	0	95	0	1	1	5	0	7	0	0	104	2	0	106	212
Hourly Total	0	11	0	1	0	12	0	23	354	13	1	390	0	4	3	20	0	27	0	0	438	2	0	440	869
12:00 PM	0	5	1	0	0	6	0	8	72	2	0	82	0	1	2	10	0	13	0	0	92	3	0	95	196
12:15 PM	0	7	0	0	0	7	0	8	123	0	0	131	0	1	3	5	0	9	0	0	107	1	0	108	255
12:30 PM	0	1	0	0	0	1	0	4	94	1	0	99	0	1	0	9	0	10	0	0	112	2	0	114	224
12:45 PM	1	2	0	0	0	3	0	4	98	1	0	103	0	0	1	6	0	7	0	0	123	0	0	123	236
Hourly Total	1	15	1	0	0	17	0	24	387	4	0	415	0	3	6	30	0	39	0	0	434	6	0	440	911
1:00 PM	0	1	0	1	0	2	0	4	101	5	0	110	0	1	2	13	0	16	0	1	94	0	0	95	223
1:15 PM	0	3	1	1	0	5	0	4	91	5	0	100	0	1	1	7	0	9	0	3	92	1	0	96	210
1:30 PM	0	2	0	0	0	2	0	5	92	2	0	99	0	2	0	8	0	10	0	0	101	0	0	101	212
1:45 PM	0	1	0	1	0	2	0	6	81	2	0	89	0	4	0	6	0	10	0	0	95	1	0	96	197
Hourly Total	0	7	1	3	0	11	0	19	365	14	0	398	0	8	3	34	0	45	0	4	382	2	0	388	842
2:00 PM	0	1	0	0	0	1	0	3	97	2	0	102	0	0	0	4	0	4	0	0	88	2	0	90	197
2:15 PM	0	2	0	1	0	3	0	6	129	2	0	137	0	1	0	5	0	6	0	1	97	0	0	98	244
2:30 PM	0	3	0	0	0	3	0	9	115	3	0	127	0	0	0	9	0	9	0	1	87	1	0	89	228
2:45 PM	0	6	0	1	0	7	0	9	171	5	0	185	0	1	1	9	1	11	0	2	89	3	0	94	297
Hourly Total	0	12	0	2	0	14	0	27	512	12	0	551	0	2	1	27	1	30	0	4	361	6	0	371	966
3:00 PM	0	0	2	1	0	3	0	12	192	6	13	210	0	2	2	9	2	13	0	1	106	2	1	109	335
3:15 PM	0	2	1	1	0	4	0	6	156	11	0	173	0	0	1	6	0	7	0	1	107	0	0	108	292
3:30 PM	0	1	1	2	0	4	0	6	175	3	0	184	0	0	1	13	0	14	0	4	151	1	0	156	358
3:45 PM	0	2	0	0	0	2	0	14	155	6	0	175	0	0	0	16	0	16	0	2	168	2	0	172	365
Hourly Total	0	5	4	4	0	13	0	38	678	26	13	742	0	2	4	44	2	50	0	8	532	5	1	545	1350
4:00 PM	0	2	0	1	1	3	0	9	207	6	0	222	0	1	1	7	0	9	0	1	142	1	0	144	378
4:15 PM	0	2	0	0	0	2	0	7	203	12	1	222	0	3	1	7	0	11	0	1	143	2	0	146	381
4:30 PM	0	3	0	0	0	3	0	11	203	6	0	220	0	1	2	8	0	11	1	2	131	3	0	137	371
4:45 PM	0	0	0	1	0	1	0	17	219	10	1	246	0	0	2	6	1	8	0	0	125	2	0	127	382
Hourly Total	0	7	0	2	1	9	0	44	832	34	2	910	0	5	6	28	1	39	1	4	541	8	0	554	1512
5:00 PM	0	3	0	4	0	7	0	11	211	12	0	234	0	0	1	13	0	14	0	3	118	1	0	122	377
5:15 PM	0	0	0	2	0	2	0	12	259	12	0	283	0	0	1	5	0	6	0	1	134	4	0	139	430
5:30 PM	0	3	0	2	0	5	0	8	209	11	0	228	0	2	1	14	0	17	0	4	129	2	0	135	385
5:45 PM	0	2	2	2	1	6	0	8	217	2	0	227	0	2	1	8	0	11	0	1	114	1	0	116	360
Hourly Total	0	8	2	10	1	20	0	39	896	37	0	972	0	4	4	40	0	48	0	9	495	8	0	512	1552
6:00 PM	0	4	0	1	0	5	1	8	251	7	0	267	0	5	1	9	0	15	0	0	116	1	0	117	404
6:15 PM	0	1	1	0	0	2	0	7	200	10	0	217	0	1	1	14	0	16	0	0	120	2	0	122	357

6:30 PM	0	4	0	2	0	6	0	9	179	8	0	196	0	1	4	12	0	17	0	3	126	2	0	131	350
6:45 PM	0	2	0	0	0	2	0	4	175	7	0	186	0	7	2	7	0	16	1	2	102	1	0	106	310
Hourly Total	0	11	1	3	0	15	1	28	805	32	0	866	0	14	8	42	0	64	1	5	464	6	0	476	1421
7:00 PM	0	5	0	0	0	5	0	9	155	8	0	172	0	1	3	5	0	9	0	0	84	3	0	87	273
7:15 PM	0	3	0	1	0	4	0	10	146	7	0	163	0	0	1	2	0	3	0	0	69	0	0	69	239
7:30 PM	0	0	1	0	0	1	0	6	154	4	0	164	0	1	0	6	0	7	0	0	71	0	0	71	243
7:45 PM	0	2	0	2	0	4	0	5	146	2	0	153	0	3	0	5	0	8	0	0	51	3	0	54	219
Hourly Total	0	10	1	3	0	14	0	30	601	21	0	652	0	5	4	18	0	27	0	0	275	6	0	281	974
8:00 PM	0	1	0	0	0	1	0	7	111	8	0	126	0	0	0	6	0	6	0	0	43	2	0	45	178
8:15 PM	0	3	0	0	0	3	0	6	114	3	0	123	0	2	0	4	0	6	0	0	63	1	0	64	196
8:30 PM	0	1	0	0	0	1	0	3	113	3	0	119	0	0	1	2	0	3	0	0	49	0	0	49	172
8:45 PM	0	0	0	1	0	1	0	6	85	7	0	98	0	0	1	1	0	2	0	1	56	0	0	57	158
Hourly Total	0	5	0	1	0	6	0	22	423	21	0	466	0	2	2	13	0	17	0	1	211	3	0	215	704
9:00 PM	0	0	1	0	0	1	0	4	77	2	0	83	0	2	1	4	0	7	0	0	30	2	0	32	123
9:15 PM	0	0	0	0	0	0	0	4	101	2	0	107	0	0	0	2	0	2	0	1	39	1	0	41	150
9:30 PM	0	1	0	0	0	1	0	3	72	0	0	75	0	0	0	5	0	5	0	1	36	1	0	38	119
9:45 PM	0	0	0	1	0	1	0	3	48	4	0	55	0	2	0	1	0	3	0	0	16	1	0	17	76
Hourly Total	0	1	1	1	0	3	0	14	298	8	0	320	0	4	1	12	0	17	0	2	121	5	0	128	468
10:00 PM	0	1	0	0	0	1	0	2	56	2	0	60	0	1	1	0	0	2	0	1	26	1	0	28	91
10:15 PM	0	0	0	0	0	0	0	4	50	4	0	58	0	1	1	3	0	5	0	0	17	0	0	17	80
10:30 PM	0	0	0	0	0	0	0	3	47	3	0	53	0	1	0	1	0	2	0	0	14	0	0	14	69
10:45 PM	0	0	0	0	0	0	0	3	35	1	0	39	0	0	0	1	0	1	0	0	9	1	0	10	50
Hourly Total	0	1	0	0	0	1	0	12	188	10	0	210	0	3	2	5	0	10	0	1	66	2	0	69	290
11:00 PM	0	0	0	0	0	0	0	1	24	0	0	25	0	1	0	1	0	2	0	1	10	0	0	11	38
11:15 PM	0	0	0	0	0	0	0	2	28	2	0	32	0	0	0	0	0	0	0	0	13	1	0	14	46
11:30 PM	0	0	0	0	0	0	0	3	20	2	0	25	0	1	0	1	0	2	0	0	8	0	0	8	35
11:45 PM	0	0	0	0	0	0	0	1	14	1	0	16	0	0	0	2	0	2	0	0	4	0	0	4	22
Hourly Total	0	0	0	0	0	0	0	7	86	5	0	98	0	2	0	4	0	6	0	1	35	1	0	37	141
Grand Total	1	223	21	60	2	305	2	386	7707	282	28	8377	0	87	70	634	6	791	3	52	8100	81	2	8236	17709
Approach %	0.3	73.1	6.9	19.7	-	-	0.0	4.6	92.0	3.4	-	-	0.0	11.0	8.8	80.2	-	-	0.0	0.6	98.3	1.0	-	-	-
Total %	0.0	1.3	0.1	0.3	-	1.7	0.0	2.2	43.5	1.6	-	47.3	0.0	0.5	0.4	3.6	-	4.5	0.0	0.3	45.7	0.5	-	46.5	-
Lights	1	222	20	60	-	303	2	376	7539	282	-	8199	0	86	70	622	-	778	3	51	7971	80	-	8105	17385
% Lights	100.0	99.6	95.2	100.0	-	99.3	100.0	97.4	97.8	100.0	-	97.9	-	98.9	100.0	98.1	-	98.4	100.0	98.1	98.4	98.8	-	98.4	98.2
Mediums	0	1	1	0	-	2	0	10	148	0	-	158	0	1	0	12	-	13	0	1	119	1	-	121	294
% Mediums	0.0	0.4	4.8	0.0	-	0.7	0.0	2.6	1.9	0.0	-	1.9	-	1.1	0.0	1.9	-	1.6	0.0	1.9	1.5	1.2	-	1.5	1.7
Articulated Trucks	0	0	0	0	-	0	0	0	20	0	-	20	0	0	0	0	-	0	0	0	10	0	-	10	30
% Articulated Trucks	0.0	0.0	0.0	0.0	-	0.0	0.0	0.0	0.3	0.0	-	0.2	-	0.0	0.0	0.0	-	0.0	0.0	0.0	0.1	0.0	-	0.1	0.2
Bicycles on Road	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Bicycles on Road	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	-	0.0	0.0
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	2	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	0.0	-	-	-	-	-	7.1	-	-	-	-	-	0.0	-	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	-	2	-	-	-	-	-	26	-	-	-	-	-	6	-	-	-	-	-	2	-	-
% Pedestrians	-	-	-	-	100.0	-	-	-	-	-	92.9	-	-	-	-	-	100.0	-	-	-	-	-	100.0	-	-

Ackman Rd & Westport Ridge
4188.921 McHenry County
24 Hr
GHA Mio

Gewalt Hamilton Associates Inc.
625 Forest Edge Drive

Vernon Hills, Illinois, United States 60061
(847) 478-9700 poster@gha-engineers.com



Turning Movement Data Plot

Ackman Rd & Westport Ridge
4188.921 McHenry County
24 Hr
GHA Mio

Gewalt Hamilton Associates Inc.
625 Forest Edge Drive

Vernon Hills, Illinois, United States 60061
(847) 478-9700 poster@gha-engineers.com

Count Name: Ackman Rd & Westport Ridge
Site Code:
Start Date: 12/04/2018

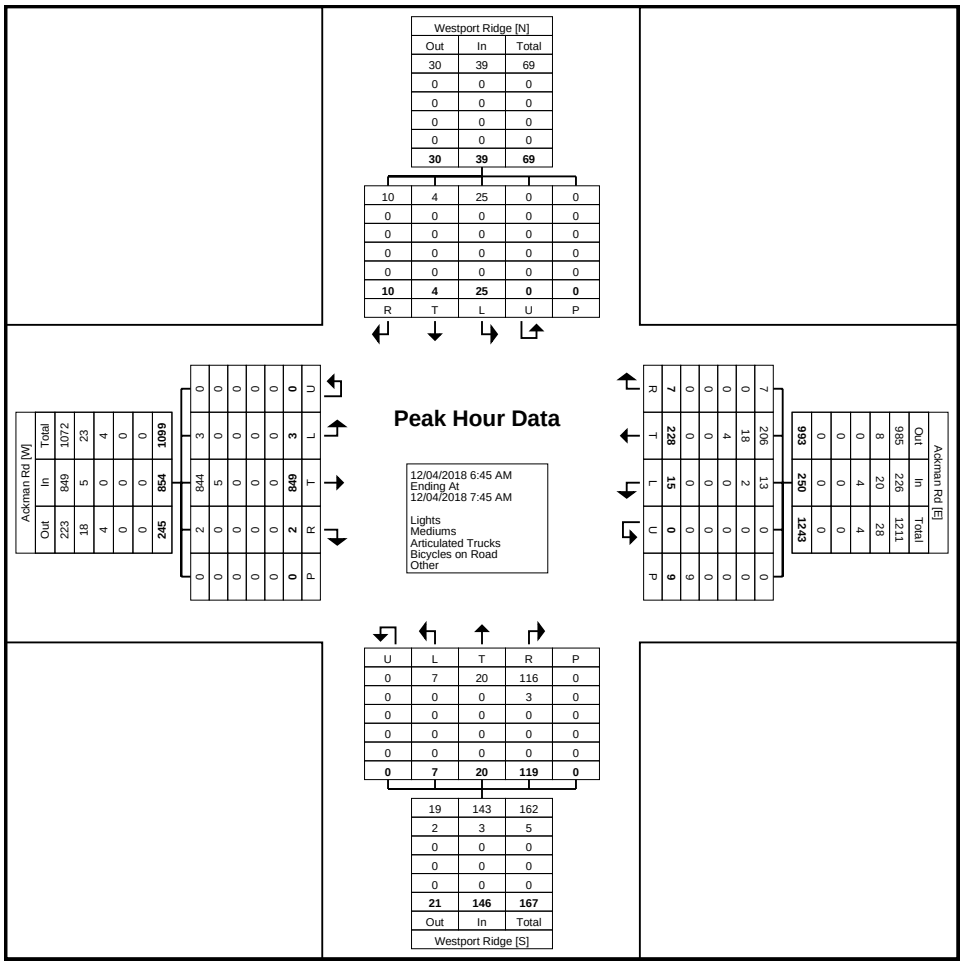
Turning Movement Peak Hour Data (6:45 AM)

Start Time	Westport Ridge Southbound						Ackman Rd Westbound						Westport Ridge Northbound						Ackman Rd Eastbound						Int. Total
	U-Turn	Left	Thru	Right	Peds	App. Total	U-Turn	Left	Thru	Right	Peds	App. Total	U-Turn	Left	Thru	Right	Peds	App. Total	U-Turn	Left	Thru	Right	Peds	App. Total	
6:45 AM	0	6	0	1	0	7	0	1	61	1	0	63	0	2	1	26	0	29	0	0	217	1	0	218	317
7:00 AM	0	6	2	2	0	10	0	4	51	3	8	58	0	2	13	47	0	62	0	1	187	1	0	189	319
7:15 AM	0	8	2	7	0	17	0	8	64	0	1	72	0	2	6	22	0	30	0	2	211	0	0	213	332
7:30 AM	0	5	0	0	0	5	0	2	52	3	0	57	0	1	0	24	0	25	0	0	234	0	0	234	321
Total	0	25	4	10	0	39	0	15	228	7	9	250	0	7	20	119	0	146	0	3	849	2	0	854	1289
Approach %	0.0	64.1	10.3	25.6	-	-	0.0	6.0	91.2	2.8	-	-	0.0	4.8	13.7	81.5	-	-	0.0	0.4	99.4	0.2	-	-	-
Total %	0.0	1.9	0.3	0.8	-	3.0	0.0	1.2	17.7	0.5	-	19.4	0.0	0.5	1.6	9.2	-	11.3	0.0	0.2	65.9	0.2	-	66.3	-
PHF	0.000	0.781	0.500	0.357	-	0.574	0.000	0.469	0.891	0.583	-	0.868	0.000	0.875	0.385	0.633	-	0.589	0.000	0.375	0.907	0.500	-	0.912	0.971
Lights	0	25	4	10	-	39	0	13	206	7	-	226	0	7	20	116	-	143	0	3	844	2	-	849	1257
% Lights	-	100.0	100.0	100.0	-	100.0	-	86.7	90.4	100.0	-	90.4	-	100.0	100.0	97.5	-	97.9	-	100.0	99.4	100.0	-	99.4	97.5
Mediums	0	0	0	0	-	0	0	2	18	0	-	20	0	0	0	3	-	3	0	0	5	0	-	5	28
% Mediums	-	0.0	0.0	0.0	-	0.0	-	13.3	7.9	0.0	-	8.0	-	0.0	0.0	2.5	-	2.1	-	0.0	0.6	0.0	-	0.6	2.2
Articulated Trucks	0	0	0	0	-	0	0	0	4	0	-	4	0	0	0	0	-	0	0	0	0	0	-	0	4
% Articulated Trucks	-	0.0	0.0	0.0	-	0.0	-	0.0	1.8	0.0	-	1.6	-	0.0	0.0	0.0	-	0.0	-	0.0	0.0	0.0	-	0.0	0.3
Bicycles on Road	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Bicycles on Road	-	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
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	1	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	11.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pedestrians	-	-	-	-	0	-	-	-	-	-	8	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	88.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Ackman Rd & Westport Ridge
4188.921 McHenry County
24 Hr
GHA Mio

Gewalt Hamilton Associates Inc.
625 Forest Edge Drive

Vernon Hills, Illinois, United States 60061
(847) 478-9700 poster@gha-engineers.com



Turning Movement Peak Hour Data Plot (6:45 AM)

Ackman Rd & Westport Ridge
4188.921 McHenry County
24 Hr
GHA Mio

Gewalt Hamilton Associates Inc.
625 Forest Edge Drive

Vernon Hills, Illinois, United States 60061
(847) 478-9700 poster@gha-engineers.com

Count Name: Ackman Rd & Westport Ridge
Site Code:
Start Date: 12/04/2018

Turning Movement Peak Hour Data (5:15 PM)

Start Time	Westport Ridge Southbound						Ackman Rd Westbound						Westport Ridge Northbound						Ackman Rd Eastbound						
	U-Turn	Left	Thru	Right	Peds	App. Total	U-Turn	Left	Thru	Right	Peds	App. Total	U-Turn	Left	Thru	Right	Peds	App. Total	U-Turn	Left	Thru	Right	Peds	App. Total	Int. Total
5:15 PM	0	0	0	2	0	2	0	12	259	12	0	283	0	0	1	5	0	6	0	1	134	4	0	139	430
5:30 PM	0	3	0	2	0	5	0	8	209	11	0	228	0	2	1	14	0	17	0	4	129	2	0	135	385
5:45 PM	0	2	2	2	1	6	0	8	217	2	0	227	0	2	1	8	0	11	0	1	114	1	0	116	360
6:00 PM	0	4	0	1	0	5	1	8	251	7	0	267	0	5	1	9	0	15	0	0	116	1	0	117	404
Total	0	9	2	7	1	18	1	36	936	32	0	1005	0	9	4	36	0	49	0	6	493	8	0	507	1579
Approach %	0.0	50.0	11.1	38.9	-	-	0.1	3.6	93.1	3.2	-	-	0.0	18.4	8.2	73.5	-	-	0.0	1.2	97.2	1.6	-	-	-
Total %	0.0	0.6	0.1	0.4	-	1.1	0.1	2.3	59.3	2.0	-	63.6	0.0	0.6	0.3	2.3	-	3.1	0.0	0.4	31.2	0.5	-	32.1	-
PHF	0.000	0.563	0.250	0.875	-	0.750	0.250	0.750	0.903	0.667	-	0.888	0.000	0.450	1.000	0.643	-	0.721	0.000	0.375	0.920	0.500	-	0.912	0.918
Lights	0	9	2	7	-	18	1	36	932	32	-	1001	0	9	4	36	-	49	0	6	486	8	-	500	1568
% Lights	-	100.0	100.0	100.0	-	100.0	100.0	100.0	99.6	100.0	-	99.6	-	100.0	100.0	100.0	-	100.0	-	100.0	98.6	100.0	-	98.6	99.3
Mediums	0	0	0	0	-	0	0	0	4	0	-	4	0	0	0	0	-	0	0	0	7	0	-	7	11
% Mediums	-	0.0	0.0	0.0	-	0.0	0.0	0.0	0.4	0.0	-	0.4	-	0.0	0.0	0.0	-	0.0	-	0.0	1.4	0.0	-	1.4	0.7
Articulated Trucks	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Articulated Trucks	-	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
Bicycles on Road	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Bicycles on Road	-	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
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	0.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pedestrians	-	-	-	-	1	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	100.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Gewalt Hamilton Associates Inc.
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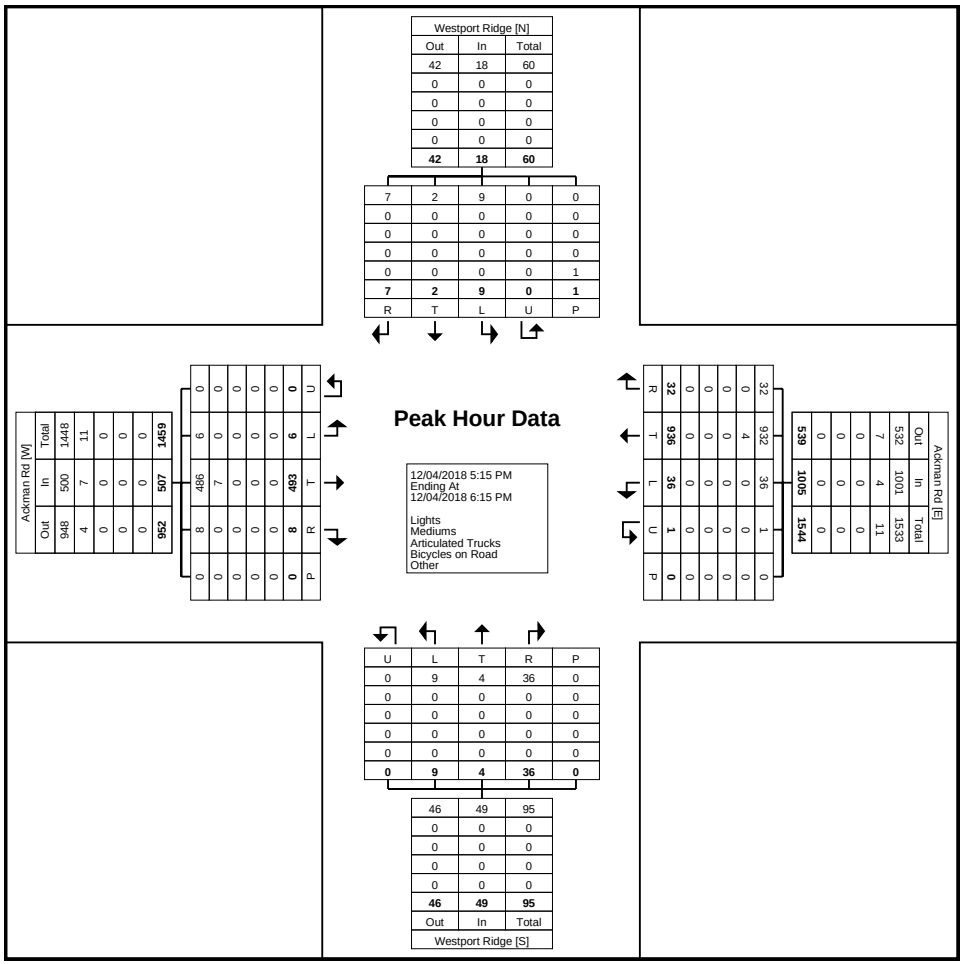


Turning Movement Peak Hour Data Plot (5:15 PM)

Randall Rd & Ackman Rd
4188.921 McHenry County
24 Hr
GHA Mio

Gewalt Hamilton Associates Inc.
625 Forest Edge Drive

Vernon Hills, Illinois, United States 60061
(847) 478-9700 poster@gha-engineers.com

Count Name: Randall Rd & Ackman Rd
Site Code:
Start Date: 12/04/2018

Turning Movement Data

Start Time	Randall Rd Southbound						Ackman Rd Westbound						Randall Rd Northbound						Ackman Rd Eastbound						Int. Total
	U-Turn	Left	Thru	Right	Peds	App. Total	U-Turn	Left	Thru	Right	Peds	App. Total	U-Turn	Left	Thru	Right	Peds	App. Total	U-Turn	Left	Thru	Right	Peds	App. Total	
12:00 AM	0	0	26	8	0	34	0	0	0	0	0	0	0	7	16	0	0	23	0	3	0	0	0	3	60
12:15 AM	0	1	16	10	0	27	0	1	1	0	0	2	0	0	23	0	0	23	0	5	0	1	0	6	58
12:30 AM	0	0	15	3	0	18	0	0	0	0	0	0	0	3	13	0	0	16	0	4	0	2	0	6	40
12:45 AM	0	0	18	7	0	25	0	0	0	0	0	0	0	2	11	0	0	13	0	0	1	2	0	3	41
Hourly Total	0	1	75	28	0	104	0	1	1	0	0	2	0	12	63	0	0	75	0	12	1	5	0	18	199
1:00 AM	0	0	13	6	0	19	0	0	0	0	0	0	0	2	13	0	0	15	0	1	0	1	0	2	36
1:15 AM	0	0	9	3	0	12	0	0	0	0	0	0	0	9	16	0	0	25	0	2	0	1	0	3	40
1:30 AM	0	0	10	1	0	11	0	0	0	0	0	0	0	0	9	0	0	9	0	2	0	1	0	3	23
1:45 AM	0	0	8	1	0	9	0	0	0	1	0	1	0	5	8	1	0	14	0	1	1	1	0	3	27
Hourly Total	0	0	40	11	0	51	0	0	0	1	0	1	0	16	46	1	0	63	0	6	1	4	0	11	126
2:00 AM	0	0	8	2	0	10	0	0	0	0	0	0	0	4	3	0	0	7	0	1	0	1	0	2	19
2:15 AM	0	0	9	2	0	11	0	0	0	0	0	0	0	3	9	1	0	13	0	4	0	1	0	5	29
2:30 AM	0	0	14	0	0	14	0	0	0	0	0	0	0	1	8	0	0	9	0	2	0	1	0	3	26
2:45 AM	0	0	5	1	0	6	0	0	0	1	0	1	0	0	7	0	0	7	0	0	0	2	0	2	16
Hourly Total	0	0	36	5	0	41	0	0	0	1	0	1	0	8	27	1	0	36	0	7	0	5	0	12	90
3:00 AM	0	0	7	2	0	9	0	0	0	0	0	0	0	2	8	0	0	10	0	0	0	3	0	3	22
3:15 AM	0	1	15	1	0	17	0	0	0	0	0	0	0	1	15	0	0	16	0	4	0	5	0	9	42
3:30 AM	0	0	19	0	0	19	0	1	0	0	0	1	0	0	9	0	0	9	0	6	0	6	0	12	41
3:45 AM	0	0	23	0	0	23	0	0	0	0	0	0	0	4	15	0	0	19	0	5	0	10	0	15	57
Hourly Total	0	1	64	3	0	68	0	1	0	0	0	1	0	7	47	0	0	54	0	15	0	24	0	39	162
4:00 AM	0	1	20	3	0	24	0	2	0	0	0	2	0	0	17	3	0	20	0	9	1	20	0	30	76
4:15 AM	0	0	30	1	0	31	0	0	0	1	0	1	0	1	16	0	0	17	0	13	0	19	0	32	81
4:30 AM	0	0	43	5	0	48	0	0	1	0	0	1	0	4	47	0	0	51	0	19	0	27	0	46	146
4:45 AM	0	0	50	5	0	55	0	0	0	0	0	0	0	1	38	0	0	39	0	28	0	40	0	68	162
Hourly Total	0	1	143	14	0	158	0	2	1	1	0	4	0	6	118	3	0	127	0	69	1	106	0	176	465
5:00 AM	0	0	57	4	0	61	0	1	0	0	0	1	0	1	49	2	0	52	0	36	1	32	0	69	183
5:15 AM	0	0	100	6	0	106	0	1	1	1	0	3	0	3	68	1	0	72	0	46	0	32	0	78	259
5:30 AM	0	0	129	18	0	147	0	0	1	0	0	1	0	3	101	0	0	104	0	59	2	53	0	114	366
5:45 AM	0	0	134	14	0	148	0	0	2	1	0	3	0	4	133	2	0	139	0	119	1	60	0	180	470
Hourly Total	0	0	420	42	0	462	0	2	4	2	0	8	0	11	351	5	0	367	0	260	4	177	0	441	1278
6:00 AM	0	1	118	25	0	144	0	0	1	0	0	1	0	7	120	1	0	128	0	110	1	60	0	171	444
6:15 AM	0	0	203	33	0	236	0	1	1	0	0	2	0	10	157	4	0	171	0	153	3	61	0	217	626
6:30 AM	0	0	229	41	0	270	0	2	0	2	0	4	0	9	204	3	0	216	1	137	1	60	0	199	689
6:45 AM	0	0	245	49	0	294	0	0	1	1	0	2	0	15	246	4	0	265	0	225	0	57	0	282	843
Hourly Total	0	1	795	148	0	944	0	3	3	3	0	9	0	41	727	12	0	780	1	625	5	238	0	869	2602
7:00 AM	0	0	209	43	0	252	0	1	0	2	0	3	0	16	248	18	0	282	0	195	4	64	0	263	800
7:15 AM	0	2	246	50	0	298	0	3	2	2	0	7	0	21	281	9	0	311	0	214	7	54	0	275	891
7:30 AM	0	2	275	53	0	330	0	3	0	1	0	4	0	9	273	2	0	284	0	209	11	59	0	279	897
7:45 AM	0	1	250	51	0	302	0	1	2	2	0	5	0	12	245	6	0	263	0	209	4	42	0	255	825
Hourly Total	0	5	980	197	0	1182	0	8	4	7	0	19	0	58	1047	35	0	1140	0	827	26	219	0	1072	3413

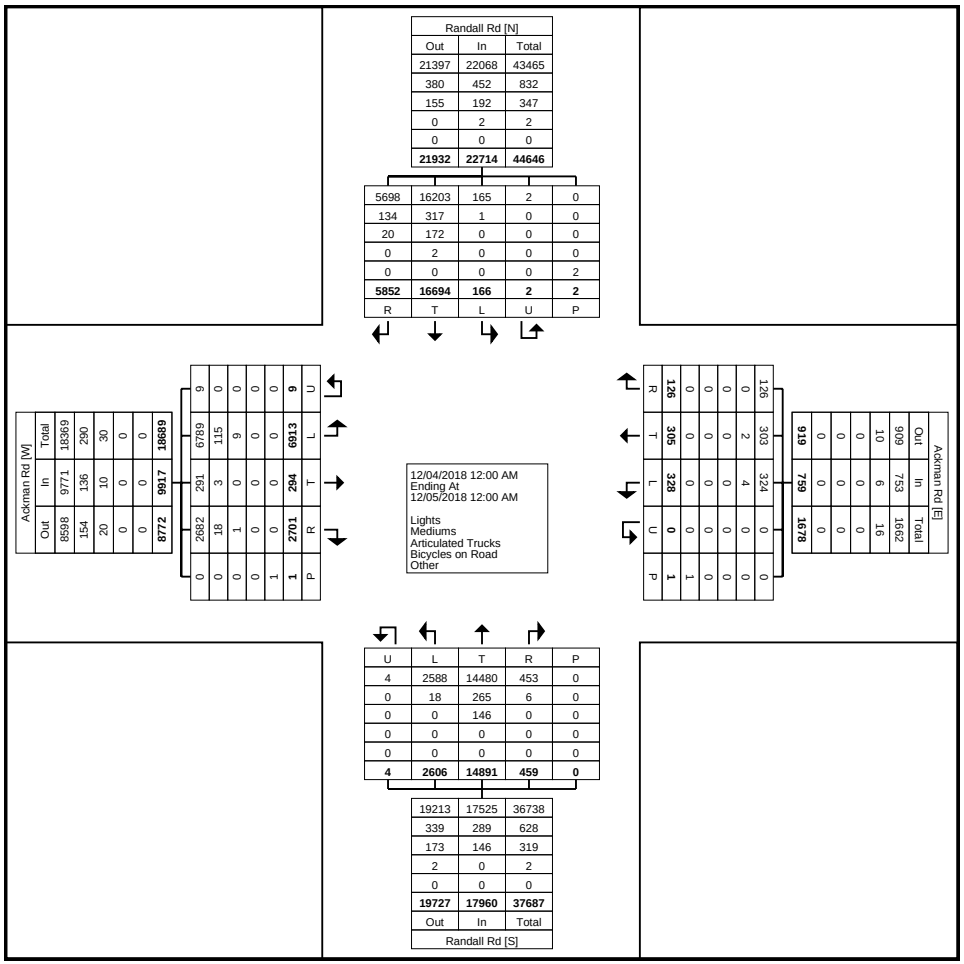
8:00 AM	0	0	210	49	0	259	0	4	2	0	0	6	0	9	216	4	0	229	0	121	5	49	0	175	669
8:15 AM	0	1	231	43	0	275	0	1	2	2	0	5	0	17	230	3	0	250	0	177	7	51	0	235	765
8:30 AM	0	0	232	47	0	279	0	4	1	3	0	8	0	20	227	6	0	253	0	163	4	64	0	231	771
8:45 AM	0	2	261	41	0	304	0	2	2	2	1	6	0	14	231	6	0	251	0	165	4	70	0	239	800
Hourly Total	0	3	934	180	0	1117	0	11	7	7	1	25	0	60	904	19	0	983	0	626	20	234	0	880	3005
9:00 AM	0	0	201	50	0	251	0	4	1	1	0	6	0	11	163	4	0	178	0	121	6	45	0	172	607
9:15 AM	0	1	184	50	0	235	0	2	1	0	0	3	0	17	200	3	0	220	0	94	4	48	0	146	604
9:30 AM	0	3	220	49	0	272	0	3	5	0	0	8	0	19	161	4	0	184	0	100	1	45	0	146	610
9:45 AM	0	2	210	42	0	254	0	3	3	1	0	7	0	18	149	8	0	175	0	95	3	53	0	151	587
Hourly Total	0	6	815	191	0	1012	0	12	10	2	0	24	0	65	673	19	0	757	0	410	14	191	0	615	2408
10:00 AM	0	2	227	44	0	273	0	3	2	0	0	5	0	25	166	4	0	195	0	82	3	32	0	117	590
10:15 AM	0	1	204	40	0	245	0	3	3	0	0	6	0	19	191	10	0	220	0	90	1	44	0	135	606
10:30 AM	0	1	211	46	0	258	0	7	2	1	0	10	0	18	204	1	0	223	0	76	3	38	0	117	608
10:45 AM	0	1	227	58	0	286	0	1	2	0	0	3	0	31	194	5	0	230	0	81	6	42	0	129	648
Hourly Total	0	5	869	188	0	1062	0	14	9	1	0	24	0	93	755	20	0	868	0	329	13	156	0	498	2452
11:00 AM	0	0	254	70	0	324	0	2	0	5	0	7	2	28	196	1	0	227	0	79	4	39	0	122	680
11:15 AM	0	2	221	56	0	279	0	7	0	1	0	8	0	38	199	13	0	250	0	97	3	30	0	130	667
11:30 AM	0	0	234	71	0	305	0	4	4	2	0	10	0	36	186	5	0	227	0	83	5	36	0	124	666
11:45 AM	0	0	286	70	0	356	0	2	4	2	0	8	0	25	185	10	0	220	0	75	4	38	0	117	701
Hourly Total	0	2	995	267	0	1264	0	15	8	10	0	33	2	127	766	29	0	924	0	334	16	143	0	493	2714
12:00 PM	0	4	250	58	0	312	0	7	4	1	0	12	0	25	197	4	0	226	0	70	4	36	0	110	660
12:15 PM	0	1	280	97	0	378	0	2	2	4	0	8	0	42	220	9	0	271	0	81	6	44	0	131	788
12:30 PM	0	2	262	69	0	333	0	6	5	3	0	14	0	28	254	8	0	290	0	77	0	38	0	115	752
12:45 PM	0	6	226	63	0	295	0	6	8	5	0	19	0	27	228	10	0	265	0	99	10	43	0	152	731
Hourly Total	0	13	1018	287	0	1318	0	21	19	13	0	53	0	122	899	31	0	1052	0	327	20	161	0	508	2931
1:00 PM	0	0	252	70	0	322	0	7	3	2	0	12	0	51	204	5	0	260	1	97	4	29	0	131	725
1:15 PM	0	4	221	64	0	289	0	2	7	2	0	11	0	30	196	4	0	230	0	84	5	29	0	118	648
1:30 PM	0	4	263	69	0	336	0	9	5	5	0	19	0	34	281	8	0	323	0	78	3	35	0	116	794
1:45 PM	1	6	240	65	0	312	0	3	5	3	0	11	0	30	245	6	0	281	0	75	5	36	0	116	720
Hourly Total	1	14	976	268	0	1259	0	21	20	12	0	53	0	145	926	23	0	1094	1	334	17	129	0	481	2887
2:00 PM	0	2	242	65	0	309	0	9	3	3	0	15	0	43	235	7	0	285	0	64	5	33	0	102	711
2:15 PM	0	4	246	98	0	348	0	6	3	1	0	10	0	42	246	6	0	294	0	95	4	35	0	134	786
2:30 PM	0	5	239	93	0	337	0	9	3	3	0	15	0	37	274	14	0	325	0	92	5	24	0	121	798
2:45 PM	0	2	251	139	0	392	0	8	9	1	0	18	0	50	256	9	0	315	1	78	4	34	0	117	842
Hourly Total	0	13	978	395	0	1386	0	32	18	8	0	58	0	172	1011	36	0	1219	1	329	18	126	0	474	3137
3:00 PM	0	5	342	149	0	496	0	4	12	1	0	17	0	45	304	14	0	363	0	77	7	24	0	108	984
3:15 PM	0	4	311	125	0	440	0	4	8	2	0	14	0	61	295	9	0	365	0	89	3	32	0	124	943
3:30 PM	0	4	327	119	0	450	0	6	8	6	0	20	0	55	306	6	0	367	0	121	7	36	0	164	1001
3:45 PM	0	4	274	125	0	403	0	6	8	6	0	20	1	57	312	6	0	376	0	166	11	39	0	216	1015
Hourly Total	0	17	1254	518	0	1789	0	20	36	15	0	71	1	218	1217	35	0	1471	0	453	28	131	0	612	3943
4:00 PM	0	4	381	170	0	555	0	6	5	1	0	12	0	59	291	9	0	359	0	119	4	42	0	165	1091
4:15 PM	0	9	323	147	0	479	0	8	12	1	0	21	0	63	281	11	0	355	0	132	3	45	0	180	1035
4:30 PM	0	6	373	160	0	539	0	8	9	3	0	20	0	75	302	9	0	386	1	112	7	33	0	153	1098
4:45 PM	0	4	363	163	0	530	0	15	11	5	0	31	0	74	304	17	0	395	0	129	6	37	0	172	1128
Hourly Total	0	23	1440	640	0	2103	0	37	37	10	0	84	0	271	1178	46	0	1495	1	492	20	157	0	670	4352
5:00 PM	0	6	388	176	0	570	0	3	5	1	0	9	0	69	311	11	0	391	0	101	2	34	0	137	1107
5:15 PM	0	3	413	207	0	623	0	8	8	0	0	16	0	80	288	11	0	379	0	123	5	28	0	156	1174
5:30 PM	0	1	314	168	0	483	0	6	6	0	0	12	0	78	297	9	0	384	0	117	6	40	0	163	1042
5:45 PM	0	6	336	178	0	520	0	10	11	0	0	21	0	55	253	6	0	314	0	95	6	33	0	134	989
Hourly Total	0	16	1451	729	0	2196	0	27	30	1	0	58	0	282	1149	37	0	1468	0	436	19	135	0	590	4312
6:00 PM	0	2	316	185	0	503	0	7	9	1	0	17	0	82	288	9	0	379	0	121	2	33	0	156	1055
6:15 PM	0	2	328	165	0	495	0	6	5	0	0	11	0	70	297	10	0	377	0	127	6	24	0	157	1040

6:30 PM	0	1	266	120	0	387	0	8	8	6	0	22	0	54	193	6	0	253	0	113	6	51	0	170	832
6:45 PM	0	5	272	124	0	401	0	5	7	3	0	15	0	74	238	7	0	319	0	81	6	32	0	119	854
Hourly Total	0	10	1182	594	0	1786	0	26	29	10	0	65	0	280	1016	32	0	1328	0	442	20	140	0	602	3781
7:00 PM	0	3	236	116	0	355	0	5	6	1	0	12	0	61	185	8	0	254	0	82	6	18	0	106	727
7:15 PM	0	7	207	98	0	312	0	7	8	4	0	19	0	63	179	9	0	251	0	63	7	20	0	90	672
7:30 PM	0	3	176	110	0	289	0	7	10	2	0	19	0	43	158	4	0	205	0	50	4	26	0	80	593
7:45 PM	0	3	159	95	0	257	0	5	3	1	0	9	0	55	154	6	0	215	0	47	7	12	0	66	547
Hourly Total	0	16	778	419	0	1213	0	24	27	8	0	59	0	222	676	27	0	925	0	242	24	76	0	342	2539
8:00 PM	0	1	209	83	0	293	0	6	7	3	0	16	1	49	144	3	0	197	0	34	2	19	0	55	561
8:15 PM	0	1	169	77	0	247	0	6	4	0	0	10	0	50	167	5	0	222	0	52	2	22	0	76	555
8:30 PM	0	4	140	84	0	228	0	6	4	0	0	10	0	40	121	6	0	167	0	30	9	14	0	53	458
8:45 PM	0	1	143	61	0	205	0	9	2	1	0	12	0	38	105	8	0	151	2	36	1	18	0	57	425
Hourly Total	0	7	661	305	0	973	0	27	17	4	0	48	1	177	537	22	0	737	2	152	14	73	0	241	1999
9:00 PM	0	3	142	55	0	200	0	4	3	3	0	10	0	26	123	4	0	153	0	24	0	12	0	36	399
9:15 PM	0	0	137	89	0	226	0	1	3	2	0	6	0	20	117	5	0	142	0	37	1	11	0	49	423
9:30 PM	0	2	81	52	0	135	0	4	3	0	0	7	0	25	77	1	0	103	0	25	4	12	0	41	286
9:45 PM	0	0	60	37	1	97	0	2	3	1	0	6	0	20	79	5	0	104	0	16	2	9	1	27	234
Hourly Total	0	5	420	233	1	658	0	11	12	6	0	29	0	91	396	15	0	502	0	102	7	44	1	153	1342
10:00 PM	0	1	80	43	1	124	0	4	1	2	0	7	0	22	60	3	0	85	0	11	1	7	0	19	235
10:15 PM	0	1	72	39	0	112	0	2	3	0	0	5	0	24	64	1	0	89	0	18	1	6	0	25	231
10:30 PM	0	3	51	27	0	81	0	1	5	0	0	6	0	15	50	2	0	67	2	16	1	3	0	22	176
10:45 PM	1	0	41	26	0	68	0	3	1	2	0	6	0	15	50	2	0	67	0	8	0	1	0	9	150
Hourly Total	1	5	244	135	1	385	0	10	10	4	0	24	0	76	224	8	0	308	2	53	3	17	0	75	792
11:00 PM	0	0	38	11	0	49	0	0	1	0	0	1	0	12	35	2	0	49	0	9	1	2	0	12	111
11:15 PM	0	0	40	16	0	56	0	2	1	0	0	3	0	19	30	0	0	49	1	9	1	4	0	15	123
11:30 PM	0	1	24	20	0	45	0	0	0	0	0	0	0	9	46	1	0	56	0	8	1	2	0	11	112
11:45 PM	0	1	24	8	0	33	0	1	1	0	0	2	0	6	27	0	0	33	0	5	0	2	0	7	75
Hourly Total	0	2	126	55	0	183	0	3	3	0	0	6	0	46	138	3	0	187	1	31	3	10	0	45	421
Grand Total	2	166	16694	5852	2	22714	0	328	305	126	1	759	4	2606	14891	459	0	17960	9	6913	294	2701	1	9917	51350
Approach %	0.0	0.7	73.5	25.8	-	-	0.0	43.2	40.2	16.6	-	-	0.0	14.5	82.9	2.6	-	-	0.1	69.7	3.0	27.2	-	-	-
Total %	0.0	0.3	32.5	11.4	-	44.2	0.0	0.6	0.6	0.2	-	1.5	0.0	5.1	29.0	0.9	-	35.0	0.0	13.5	0.6	5.3	-	19.3	-
Lights	2	165	16203	5698	-	22068	0	324	303	126	-	753	4	2588	14480	453	-	17525	9	6789	291	2682	-	9771	50117
% Lights	100.0	99.4	97.1	97.4	-	97.2	-	98.8	99.3	100.0	-	99.2	100.0	99.3	97.2	98.7	-	97.6	100.0	98.2	99.0	99.3	-	98.5	97.6
Mediums	0	1	317	134	-	452	0	4	2	0	-	6	0	18	265	6	-	289	0	115	3	18	-	136	883
% Mediums	0.0	0.6	1.9	2.3	-	2.0	-	1.2	0.7	0.0	-	0.8	0.0	0.7	1.8	1.3	-	1.6	0.0	1.7	1.0	0.7	-	1.4	1.7
Articulated Trucks	0	0	172	20	-	192	0	0	0	0	-	0	0	0	146	0	-	146	0	9	0	1	-	10	348
% Articulated Trucks	0.0	0.0	1.0	0.3	-	0.8	-	0.0	0.0	0.0	-	0.0	0.0	0.0	1.0	0.0	-	0.8	0.0	0.1	0.0	0.0	-	0.1	0.7
Bicycles on Road	0	0	2	0	-	2	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	2
% Bicycles on Road	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	-	0.0	0.0
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	1	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	0.0	-	-	-	-	-	100.0	-	-	-	-	-	-	-	-	-	-	-	0.0	-	-
Pedestrians	-	-	-	-	2	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	1	-	-
% Pedestrians	-	-	-	-	100.0	-	-	-	-	-	0.0	-	-	-	-	-	-	-	-	-	-	-	100.0	-	-

Randall Rd & Ackman Rd
4188.921 McHenry County
24 Hr
GHA Mio

Gewalt Hamilton Associates Inc.
625 Forest Edge Drive

Vernon Hills, Illinois, United States 60061
(847) 478-9700 poster@gha-engineers.com



Turning Movement Data Plot

Randall Rd & Ackman Rd
4188.921 McHenry County
24 Hr
GHA Mio

Gewalt Hamilton Associates Inc.
625 Forest Edge Drive

Vernon Hills, Illinois, United States 60061
(847) 478-9700 poster@gha-engineers.com

Count Name: Randall Rd & Ackman Rd
Site Code:
Start Date: 12/04/2018

Turning Movement Peak Hour Data (6:45 AM)

Start Time	Randall Rd Southbound						Ackman Rd Westbound						Randall Rd Northbound						Ackman Rd Eastbound						Int. Total
	U-Turn	Left	Thru	Right	Peds	App. Total	U-Turn	Left	Thru	Right	Peds	App. Total	U-Turn	Left	Thru	Right	Peds	App. Total	U-Turn	Left	Thru	Right	Peds	App. Total	
6:45 AM	0	0	245	49	0	294	0	0	1	1	0	2	0	15	246	4	0	265	0	225	0	57	0	282	843
7:00 AM	0	0	209	43	0	252	0	1	0	2	0	3	0	16	248	18	0	282	0	195	4	64	0	263	800
7:15 AM	0	2	246	50	0	298	0	3	2	2	0	7	0	21	281	9	0	311	0	214	7	54	0	275	891
7:30 AM	0	2	275	53	0	330	0	3	0	1	0	4	0	9	273	2	0	284	0	209	11	59	0	279	897
Total	0	4	975	195	0	1174	0	7	3	6	0	16	0	61	1048	33	0	1142	0	843	22	234	0	1099	3431
Approach %	0.0	0.3	83.0	16.6	-	-	0.0	43.8	18.8	37.5	-	-	0.0	5.3	91.8	2.9	-	-	0.0	76.7	2.0	21.3	-	-	-
Total %	0.0	0.1	28.4	5.7	-	34.2	0.0	0.2	0.1	0.2	-	0.5	0.0	1.8	30.5	1.0	-	33.3	0.0	24.6	0.6	6.8	-	32.0	-
PHF	0.000	0.500	0.886	0.920	-	0.889	0.000	0.583	0.375	0.750	-	0.571	0.000	0.726	0.932	0.458	-	0.918	0.000	0.937	0.500	0.914	-	0.974	0.956
Lights	0	4	926	176	-	1106	0	7	3	6	-	16	0	57	1030	32	-	1119	0	833	22	233	-	1088	3329
% Lights	-	100.0	95.0	90.3	-	94.2	-	100.0	100.0	100.0	-	100.0	-	93.4	98.3	97.0	-	98.0	-	98.8	100.0	99.6	-	99.0	97.0
Mediums	0	0	33	15	-	48	0	0	0	0	-	0	0	4	10	1	-	15	0	10	0	1	-	11	74
% Mediums	-	0.0	3.4	7.7	-	4.1	-	0.0	0.0	0.0	-	0.0	-	6.6	1.0	3.0	-	1.3	-	1.2	0.0	0.4	-	1.0	2.2
Articulated Trucks	0	0	16	4	-	20	0	0	0	0	-	0	0	0	8	0	-	8	0	0	0	0	-	0	28
% Articulated Trucks	-	0.0	1.6	2.1	-	1.7	-	0.0	0.0	0.0	-	0.0	-	0.0	0.8	0.0	-	0.7	-	0.0	0.0	0.0	-	0.0	0.8
Bicycles on Road	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Bicycles on Road	-	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
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pedestrians	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Gewalt Hamilton Associates Inc.
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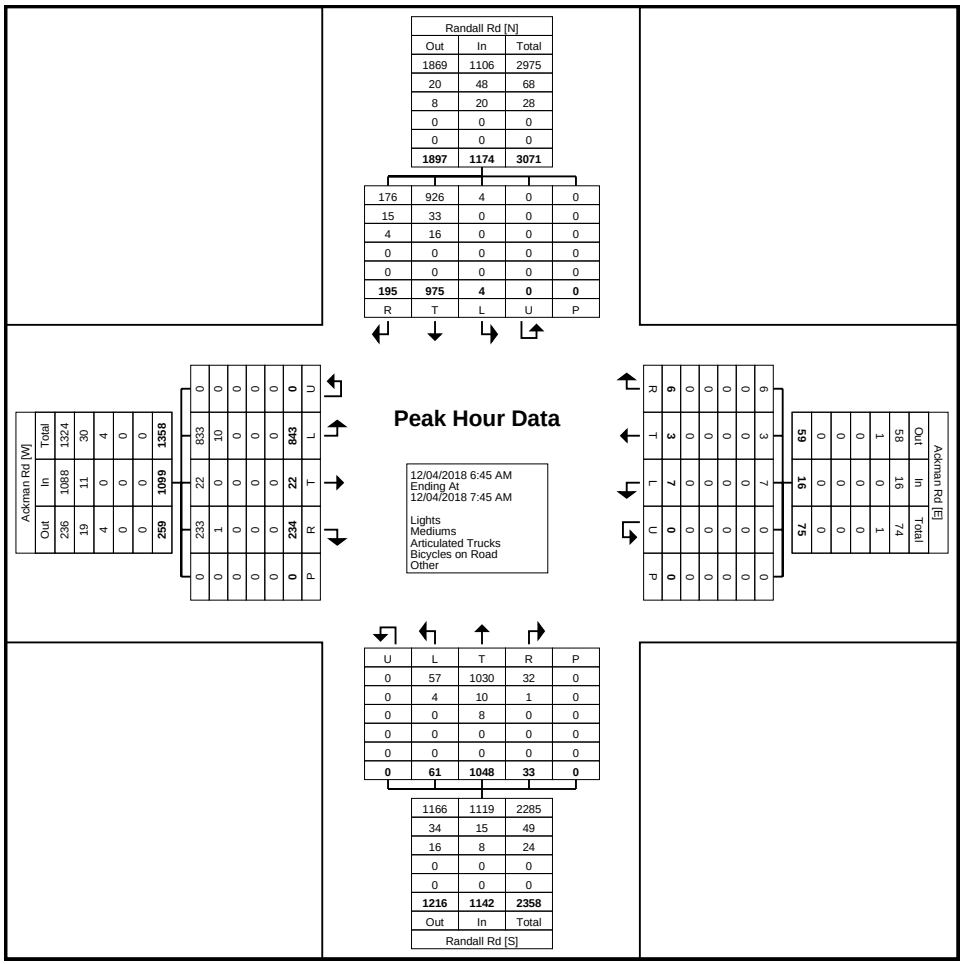

Turning Movement Peak Hour Data Plot (6:45 AM)

Randall Rd & Ackman Rd
4188.921 McHenry County
24 Hr
GHA Mio

Gewalt Hamilton Associates Inc.
625 Forest Edge Drive

Vernon Hills, Illinois, United States 60061
(847) 478-9700 poster@gha-engineers.com

Count Name: Randall Rd & Ackman Rd
Site Code:
Start Date: 12/04/2018

Turning Movement Peak Hour Data (4:30 PM)

Start Time	Randall Rd Southbound						Ackman Rd Westbound						Randall Rd Northbound						Ackman Rd Eastbound						Int. Total
	U-Turn	Left	Thru	Right	Peds	App. Total	U-Turn	Left	Thru	Right	Peds	App. Total	U-Turn	Left	Thru	Right	Peds	App. Total	U-Turn	Left	Thru	Right	Peds	App. Total	
4:30 PM	0	6	373	160	0	539	0	8	9	3	0	20	0	75	302	9	0	386	1	112	7	33	0	153	1098
4:45 PM	0	4	363	163	0	530	0	15	11	5	0	31	0	74	304	17	0	395	0	129	6	37	0	172	1128
5:00 PM	0	6	388	176	0	570	0	3	5	1	0	9	0	69	311	11	0	391	0	101	2	34	0	137	1107
5:15 PM	0	3	413	207	0	623	0	8	8	0	0	16	0	80	288	11	0	379	0	123	5	28	0	156	1174
Total	0	19	1537	706	0	2262	0	34	33	9	0	76	0	298	1205	48	0	1551	1	465	20	132	0	618	4507
Approach %	0.0	0.8	67.9	31.2	-	-	0.0	44.7	43.4	11.8	-	-	0.0	19.2	77.7	3.1	-	-	0.2	75.2	3.2	21.4	-	-	-
Total %	0.0	0.4	34.1	15.7	-	50.2	0.0	0.8	0.7	0.2	-	1.7	0.0	6.6	26.7	1.1	-	34.4	0.0	10.3	0.4	2.9	-	13.7	-
PHF	0.000	0.792	0.930	0.853	-	0.908	0.000	0.567	0.750	0.450	-	0.613	0.000	0.931	0.969	0.706	-	0.982	0.250	0.901	0.714	0.892	-	0.898	0.960
Lights	0	19	1527	701	-	2247	0	33	32	9	-	74	0	297	1182	48	-	1527	1	458	20	130	-	609	4457
% Lights	-	100.0	99.3	99.3	-	99.3	-	97.1	97.0	100.0	-	97.4	-	99.7	98.1	100.0	-	98.5	100.0	98.5	100.0	98.5	-	98.5	98.9
Mediums	0	0	5	5	-	10	0	1	1	0	-	2	0	1	12	0	-	13	0	7	0	2	-	9	34
% Mediums	-	0.0	0.3	0.7	-	0.4	-	2.9	3.0	0.0	-	2.6	-	0.3	1.0	0.0	-	0.8	0.0	1.5	0.0	1.5	-	1.5	0.8
Articulated Trucks	0	0	5	0	-	5	0	0	0	0	-	0	0	0	11	0	-	11	0	0	0	0	-	0	16
% Articulated Trucks	-	0.0	0.3	0.0	-	0.2	-	0.0	0.0	0.0	-	0.0	-	0.0	0.9	0.0	-	0.7	0.0	0.0	0.0	0.0	-	0.0	0.4
Bicycles on Road	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0	0	0	0	-	0	0
% Bicycles on Road	-	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
Bicycles on Crosswalk	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Bicycles on Crosswalk	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pedestrians	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-	-	-	-	0	-	-
% Pedestrians	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

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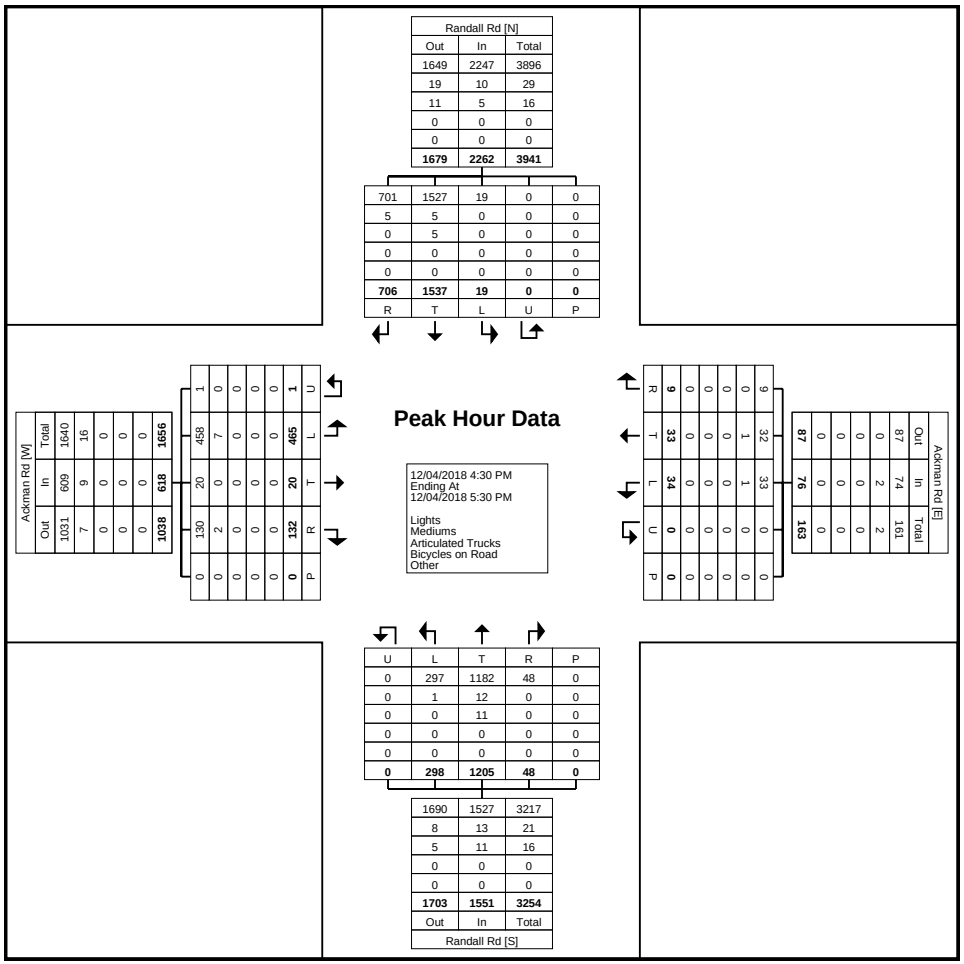


Turning Movement Peak Hour Data Plot (4:30 PM)

APPENDIX B

Synchro Output – Traffic Signals and Stop-Control Intersections

Intersection	
Int Delay, s/veh	3.7

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	42	103	145	96	68	128
Future Vol, veh/h	42	103	145	96	68	128
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	285	0	-	-	150	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	81	81	82	73	77	78
Heavy Vehicles, %	2	2	2	2	3	2
Mvmt Flow	52	127	177	132	88	164

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	583	243	0	0	309	0
Stage 1	243	-	-	-	-	-
Stage 2	340	-	-	-	-	-
Critical Hdwy	6.42	6.22	-	-	4.13	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	-	-	2.227	-
Pot Cap-1 Maneuver	475	796	-	-	1246	-
Stage 1	797	-	-	-	-	-
Stage 2	721	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	441	796	-	-	1246	-
Mov Cap-2 Maneuver	441	-	-	-	-	-
Stage 1	797	-	-	-	-	-
Stage 2	670	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	11.5	0	2.8
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	441	796	1246	-
HCM Lane V/C Ratio	-	-	0.118	0.16	0.071	-
HCM Control Delay (s)	-	-	14.2	10.4	8.1	-
HCM Lane LOS	-	-	B	B	A	-
HCM 95th %tile Q(veh)	-	-	0.4	0.6	0.2	-

Intersection	
Intersection Delay, s/veh	14.6
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	2	128	26	189	100	19	45	26	249	59	47	2
Future Vol, veh/h	2	128	26	189	100	19	45	26	249	59	47	2
Peak Hour Factor	0.50	0.82	0.72	0.83	0.86	0.59	0.70	0.72	0.89	0.69	0.73	0.50
Heavy Vehicles, %	0	2	0	2	4	0	2	0	1	5	2	0
Mvmt Flow	4	156	36	228	116	32	64	36	280	86	64	4
Number of Lanes	1	1	0	1	1	0	1	1	1	1	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	2	2	3
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	3	2	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	3	2	2	2
HCM Control Delay	14.9	15.3	14.5	12.5
HCM LOS	B	C	B	B

Lane	NBLn1	NBLn2	NBLn3	EBLn1	EBLn2	WBLn1	WBLn2	SBLn1	SBLn2
Vol Left, %	100%	0%	0%	100%	0%	100%	0%	100%	0%
Vol Thru, %	0%	100%	0%	0%	83%	0%	84%	0%	96%
Vol Right, %	0%	0%	100%	0%	17%	0%	16%	0%	4%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	45	26	249	2	154	189	119	59	49
LT Vol	45	0	0	2	0	189	0	59	0
Through Vol	0	26	0	0	128	0	100	0	47
RT Vol	0	0	249	0	26	0	19	0	2
Lane Flow Rate	64	36	280	4	192	228	148	86	68
Geometry Grp	8	8	8	8	8	8	8	8	8
Degree of Util (X)	0.138	0.072	0.503	0.009	0.396	0.479	0.288	0.197	0.147
Departure Headway (Hd)	7.712	7.168	6.471	8.009	7.415	7.567	6.981	8.309	7.714
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	465	500	557	447	484	476	515	432	464
Service Time	5.456	4.912	4.215	5.76	5.165	5.312	4.726	6.064	5.469
HCM Lane V/C Ratio	0.138	0.072	0.503	0.009	0.397	0.479	0.287	0.199	0.147
HCM Control Delay	11.7	10.5	15.6	10.8	15	17.1	12.5	13.1	11.8
HCM Lane LOS	B	B	C	B	B	C	B	B	B
HCM 95th-tile Q	0.5	0.2	2.8	0	1.9	2.5	1.2	0.7	0.5

Intersection	
Int Delay, s/veh	2.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	11	515	323	18	51	30
Future Vol, veh/h	11	515	323	18	51	30
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	46	90	89	64	83	68
Heavy Vehicles, %	36	2	4	11	6	0
Mvmt Flow	24	572	363	28	61	44

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	391	0	-	0	997	377
Stage 1	-	-	-	-	377	-
Stage 2	-	-	-	-	620	-
Critical Hdwy	4.46	-	-	-	6.46	6.2
Critical Hdwy Stg 1	-	-	-	-	5.46	-
Critical Hdwy Stg 2	-	-	-	-	5.46	-
Follow-up Hdwy	2.524	-	-	-	3.554	3.3
Pot Cap-1 Maneuver	1005	-	-	-	266	674
Stage 1	-	-	-	-	685	-
Stage 2	-	-	-	-	529	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1005	-	-	-	257	674
Mov Cap-2 Maneuver	-	-	-	-	257	-
Stage 1	-	-	-	-	661	-
Stage 2	-	-	-	-	529	-

Approach	EB	WB	SB
HCM Control Delay, s	0.3	0	19.8
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	1005	-	-	-	347
HCM Lane V/C Ratio	0.024	-	-	-	0.304
HCM Control Delay (s)	8.7	0	-	-	19.8
HCM Lane LOS	A	A	-	-	C
HCM 95th %tile Q(veh)	0.1	-	-	-	1.3

Intersection	
Int Delay, s/veh	12

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		⇕			⇕			⇕			⇕	
Traffic Vol, veh/h	0	544	26	83	316	0	29	0	179	0	0	0
Future Vol, veh/h	0	544	26	83	316	0	29	0	179	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	65	80	90	90	66	66	65	70	70	70
Heavy Vehicles, %	0	2	4	1	4	0	7	0	3	0	0	0
Mvmt Flow	0	585	40	104	351	0	44	0	275	0	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	351	0	0	625	0	0	1164	1164	605	1302	1184	351
Stage 1	-	-	-	-	-	-	605	605	-	559	559	-
Stage 2	-	-	-	-	-	-	559	559	-	743	625	-
Critical Hdwy	4.1	-	-	4.11	-	-	7.17	6.5	6.23	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.17	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.17	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.209	-	-	3.563	4	3.327	3.5	4	3.3
Pot Cap-1 Maneuver	1219	-	-	961	-	-	168	196	496	139	191	697
Stage 1	-	-	-	-	-	-	476	491	-	517	514	-
Stage 2	-	-	-	-	-	-	505	514	-	410	480	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1219	-	-	961	-	-	151	170	496	55	165	697
Mov Cap-2 Maneuver	-	-	-	-	-	-	151	170	-	55	165	-
Stage 1	-	-	-	-	-	-	476	491	-	517	445	-
Stage 2	-	-	-	-	-	-	437	445	-	182	480	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	2.1	49.6	0
HCM LOS			E	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	377	1219	-	-	961	-	-	-
HCM Lane V/C Ratio	0.847	-	-	-	0.108	-	-	-
HCM Control Delay (s)	49.6	0	-	-	9.2	0	-	0
HCM Lane LOS	E	A	-	-	A	A	-	A
HCM 95th %tile Q(veh)	7.9	0	-	-	0.4	-	-	-

Intersection	
Int Delay, s/veh	5.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	151	573	245	50	113	153
Future Vol, veh/h	151	573	245	50	113	153
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	100	-	-	120	0	105
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	85	80	78	78	85
Heavy Vehicles, %	5	1	4	4	0	1
Mvmt Flow	164	674	306	64	145	180

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	370	0	-	0	1308	306
Stage 1	-	-	-	-	306	-
Stage 2	-	-	-	-	1002	-
Critical Hdwy	4.15	-	-	-	6.4	6.21
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.245	-	-	-	3.5	3.309
Pot Cap-1 Maneuver	1172	-	-	-	178	736
Stage 1	-	-	-	-	751	-
Stage 2	-	-	-	-	358	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1172	-	-	-	153	736
Mov Cap-2 Maneuver	-	-	-	-	272	-
Stage 1	-	-	-	-	646	-
Stage 2	-	-	-	-	358	-

Approach	EB	WB	SB
HCM Control Delay, s	1.7	0	20.8
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1172	-	-	-	272	736
HCM Lane V/C Ratio	0.14	-	-	-	0.533	0.245
HCM Control Delay (s)	8.6	-	-	-	32.4	11.5
HCM Lane LOS	A	-	-	-	D	B
HCM 95th %tile Q(veh)	0.5	-	-	-	2.9	1

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	130	579	13	36	192	20	32	279	123	151	122	65
Future Volume (vph)	130	579	13	36	192	20	32	279	123	151	122	65
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	11	11	12	11	11	12	12	12	12	12	12
Storage Length (ft)	205		0	190		0	140		0	140		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	220			185			120			105		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor								0.99				
Frt		0.995			0.982			0.961			0.944	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1787	1810	0	1543	1685	0	1805	1789	0	1805	1758	0
Flt Permitted	0.443			0.110			0.623			0.118		
Satd. Flow (perm)	833	1810	0	179	1685	0	1184	1789	0	224	1758	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		2			7			14			23	
Link Speed (mph)		40			40			30			30	
Link Distance (ft)		2546			1726			1564			1951	
Travel Time (s)		43.4			29.4			35.5			44.3	
Confl. Bikes (#/hr)									1			
Peak Hour Factor	0.53	0.90	0.65	0.69	0.81	0.62	0.67	0.60	0.75	0.80	0.90	0.81
Heavy Vehicles (%)	1%	1%	0%	17%	8%	0%	0%	2%	0%	0%	2%	2%
Adj. Flow (vph)	245	643	20	52	237	32	48	465	164	189	136	80
Shared Lane Traffic (%)												
Lane Group Flow (vph)	245	663	0	52	269	0	48	629	0	189	216	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		10			10			10			10	
Two way Left Turn Lane												
Headway Factor	1.00	1.04	1.04	1.00	1.04	1.04	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2			6			8			4		
Detector Phase	5	2		1	6		3	8		7	4	
Switch Phase												
Minimum Initial (s)	3.0	15.0		3.0	15.0		3.0	8.0		3.0	8.0	
Minimum Split (s)	6.5	21.0		6.5	21.0		6.5	14.0		6.5	14.0	
Total Split (s)	15.0	55.0		15.0	55.0		15.0	35.0		15.0	35.0	
Total Split (%)	12.5%	45.8%		12.5%	45.8%		12.5%	29.2%		12.5%	29.2%	
Maximum Green (s)	11.5	49.0		11.5	49.0		11.5	29.0		11.5	29.0	
Yellow Time (s)	3.5	4.5		3.5	4.5		3.5	4.5		3.5	4.5	
All-Red Time (s)	0.0	1.5		0.0	1.5		0.0	1.5		0.0	1.5	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	3.5	6.0		3.5	6.0		3.5	6.0		3.5	6.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	Min		None	Min		None	None		None	None	
Act Effct Green (s)	52.7	41.8		45.4	35.5		39.4	29.5		46.6	35.8	
Actuated g/C Ratio	0.49	0.39		0.42	0.33		0.37	0.28		0.44	0.33	
v/c Ratio	0.48	0.94		0.31	0.48		0.10	1.25		0.71	0.36	
Control Delay	18.5	53.2		18.1	29.5		21.9	163.3		39.6	30.4	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	18.5	53.2		18.1	29.5		21.9	163.3		39.6	30.4	
LOS	B	D		B	C		C	F		D	C	
Approach Delay		43.9			27.7			153.3			34.7	
Approach LOS		D			C			F			C	
Stops (vph)	69	521		17	152		20	290		90	128	
Fuel Used(gal)	3	22		1	5		1	20		4	5	
CO Emissions (g/hr)	239	1521		50	367		45	1389		280	329	
NOx Emissions (g/hr)	46	296		10	71		9	270		55	64	
VOC Emissions (g/hr)	55	353		12	85		10	322		65	76	
Dilemma Vehicles (#)	0	17		0	4		0	0		0	0	
Queue Length 50th (ft)	94	440		18	141		21	~590		88	111	
Queue Length 95th (ft)	76	#680		28	187		35	#449		#155	198	
Internal Link Dist (ft)		2466			1646			1484			1871	
Turn Bay Length (ft)	205			190			140			140		
Base Capacity (vph)	514	843		232	788		551	503		270	603	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.48	0.79		0.22	0.34		0.09	1.25		0.70	0.36	

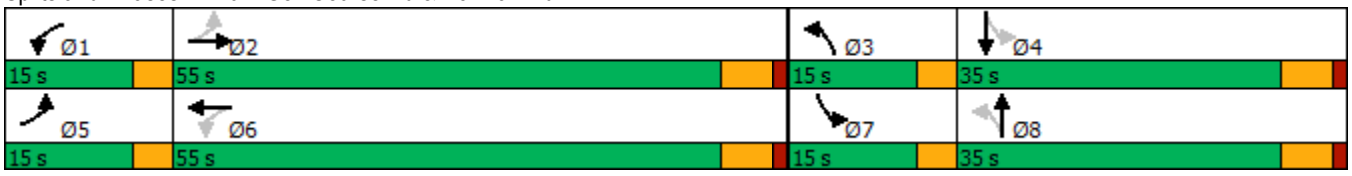
Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 107
Natural Cycle: 110
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.25
Intersection Signal Delay: 72.1 Intersection LOS: E
Intersection Capacity Utilization 81.8% ICU Level of Service D
Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

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

Splits and Phases: 107: Golf Course Rd & Ackman Rd



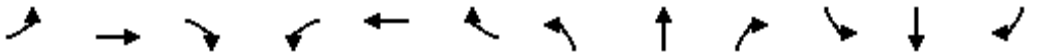
Intersection	
Int Delay, s/veh	24.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	3	849	2	15	228	7	7	20	119	25	4	10
Future Vol, veh/h	3	849	2	15	228	7	7	20	119	25	4	10
Conflicting Peds, #/hr	8	0	0	0	0	8	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	110	-	110	120	-	120	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	38	91	50	47	89	58	88	38	63	78	50	36
Heavy Vehicles, %	0	1	0	13	10	0	0	0	2	0	0	0
Mvmt Flow	8	933	4	32	256	12	8	53	189	32	8	28

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	276	0	0	937	0	0	1293	1289	933	1400	1281	264
Stage 1	-	-	-	-	-	-	949	949	-	328	328	-
Stage 2	-	-	-	-	-	-	344	340	-	1072	953	-
Critical Hdwy	4.1	-	-	4.23	-	-	7.1	6.5	6.22	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.317	-	-	3.5	4	3.318	3.5	4	3.3
Pot Cap-1 Maneuver	1299	-	-	688	-	-	141	165	323	119	167	780
Stage 1	-	-	-	-	-	-	315	342	-	689	651	-
Stage 2	-	-	-	-	-	-	676	643	-	269	340	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1289	-	-	688	-	-	125	155	323	35	157	774
Mov Cap-2 Maneuver	-	-	-	-	-	-	125	155	-	35	157	-
Stage 1	-	-	-	-	-	-	313	340	-	679	615	-
Stage 2	-	-	-	-	-	-	613	608	-	94	338	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	1.1	95.6	211.5
HCM LOS			F	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	253	1289	-	-	688	-	-	68
HCM Lane V/C Ratio	0.986	0.006	-	-	0.046	-	-	0.997
HCM Control Delay (s)	95.6	7.8	-	-	10.5	-	-	211.5
HCM Lane LOS	F	A	-	-	B	-	-	F
HCM 95th %tile Q(veh)	9.5	0	-	-	0.1	-	-	5



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	843	22	243	7	3	6	61	1048	33	4	975	195
Future Volume (vph)	843	22	243	7	3	6	61	1048	33	4	975	195
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	450		175	140		65	400		200	245		425
Storage Lanes	2		1	1		1	2		1	1		1
Taper Length (ft)	300			60			300			105		
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00	1.00	0.97	0.91	1.00	1.00	0.91	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3467	1900	1599	1805	1900	1615	3273	5085	1568	1805	4940	1468
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3467	1900	1599	1805	1900	1615	3273	5085	1568	1805	4940	1468
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		40			25			50			50	
Link Distance (ft)		984			416			1616			1479	
Travel Time (s)		16.8			11.3			22.0			20.2	
Peak Hour Factor	0.94	0.50	0.91	0.58	0.38	0.75	0.73	0.93	0.46	0.50	0.89	0.92
Heavy Vehicles (%)	1%	0%	1%	0%	0%	0%	7%	2%	3%	0%	5%	10%
Adj. Flow (vph)	897	44	267	12	8	8	84	1127	72	8	1096	212
Shared Lane Traffic (%)												
Lane Group Flow (vph)	897	44	267	12	8	8	84	1127	72	8	1096	212
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		10			10			10			10	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Prot	NA	pt+ov	Prot	NA	pt+ov	Prot	NA	Perm	Prot	NA	pt+ov
Protected Phases	7	4	4 5	3	8	8 1	5	2		1	6	6 7
Permitted Phases									2			
Detector Phase	7	4	4 5	3	8	8 1	5	2	2	1	6	6 7
Switch Phase												
Minimum Initial (s)	3.0	7.5		3.0	7.5		3.0	14.5	14.5	3.0	14.5	
Minimum Split (s)	7.5	14.0		7.5	14.0		7.5	21.0	21.0	7.5	21.0	
Total Split (s)	34.8	34.8		15.6	15.6		15.6	54.0	54.0	15.6	54.0	
Total Split (%)	29.0%	29.0%		13.0%	13.0%		13.0%	45.0%	45.0%	13.0%	45.0%	
Maximum Green (s)	30.3	28.3		11.1	9.1		11.1	47.5	47.5	11.1	47.5	
Yellow Time (s)	3.5	4.5		3.5	4.5		3.5	4.5	4.5	3.5	4.5	
All-Red Time (s)	1.0	2.0		1.0	2.0		1.0	2.0	2.0	1.0	2.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	4.5	6.5		4.5	6.5		4.5	6.5	6.5	4.5	6.5	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag	Lag	Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes	Yes	Yes	Yes	
Vehicle Extension (s)	3.0	7.0		3.0	5.0		3.0	7.0	7.0	3.0	7.0	
Minimum Gap (s)	3.0	3.0		3.0	3.0		3.0	4.0	4.0	3.0	4.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Time Before Reduce (s)	0.0	0.0		0.0	0.0		0.0	25.0	25.0	0.0	25.0	
Time To Reduce (s)	0.0	0.0		0.0	0.0		0.0	20.0	20.0	0.0	20.0	
Recall Mode	None	None		None	None		None	C-Min	C-Min	None	C-Min	
Act Effct Green (s)	36.5	35.9	48.9	6.4	8.1	12.7	8.5	61.8	61.8	6.2	53.4	94.4
Actuated g/C Ratio	0.30	0.30	0.41	0.05	0.07	0.11	0.07	0.52	0.52	0.05	0.44	0.79
v/c Ratio	0.85	0.08	0.41	0.12	0.06	0.05	0.37	0.43	0.09	0.09	0.50	0.18
Control Delay	48.2	30.3	27.2	56.4	53.0	44.0	57.2	21.1	19.5	55.8	26.2	4.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	48.2	30.3	27.2	56.4	53.0	44.0	57.2	21.1	19.5	55.8	26.2	4.8
LOS	D	C	C	E	D	D	E	C	B	E	C	A
Approach Delay		42.9			51.9			23.3			23.0	
Approach LOS		D			D			C			C	
Stops (vph)	749	15	167	8	3	7	57	646	18	5	685	51
Fuel Used(gal)	26	1	6	0	0	0	2	25	1	0	25	3
CO Emissions (g/hr)	1849	40	426	10	4	7	155	1758	52	11	1738	196
NOx Emissions (g/hr)	360	8	83	2	1	1	30	342	10	2	338	38
VOC Emissions (g/hr)	428	9	99	2	1	2	36	407	12	3	403	45
Dilemma Vehicles (#)	0	1	0	0	0	0	0	44	0	0	41	0
Queue Length 50th (ft)	343	25	152	9	6	6	32	146	21	6	189	23
Queue Length 95th (ft)	#454	29	212	19	10	16	46	294	33	13	297	85
Internal Link Dist (ft)		904			336			1536			1399	
Turn Bay Length (ft)	450		175	140		65	400		200	245		425
Base Capacity (vph)	1055	568	686	166	144	188	302	2653	818	166	2283	1148
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.85	0.08	0.39	0.07	0.06	0.04	0.28	0.42	0.09	0.05	0.48	0.18

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 105.6 (88%), Referenced to phase 2:NBT and 6:SBT, Start of Green			
Natural Cycle: 75			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.85			
Intersection Signal Delay: 29.6		Intersection LOS: C	
Intersection Capacity Utilization 67.7%		ICU Level of Service C	
Analysis Period (min) 15			

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

Splits and Phases: 109: Randall Rd & Ackman Rd

Intersection	
Int Delay, s/veh	5.6

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	114	102	127	86	104	145
Future Vol, veh/h	114	102	127	86	104	145
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	285	0	-	-	150	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	95	94	93	86	76	95
Heavy Vehicles, %	0	1	0	0	0	0
Mvmt Flow	120	109	137	100	137	153

Major/Minor	Minor1		Major1		Major2	
Conflicting Flow All	614	187	0	0	237	0
Stage 1	187	-	-	-	-	-
Stage 2	427	-	-	-	-	-
Critical Hdwy	6.4	6.21	-	-	4.1	-
Critical Hdwy Stg 1	5.4	-	-	-	-	-
Critical Hdwy Stg 2	5.4	-	-	-	-	-
Follow-up Hdwy	3.5	3.309	-	-	2.2	-
Pot Cap-1 Maneuver	459	858	-	-	1342	-
Stage 1	850	-	-	-	-	-
Stage 2	662	-	-	-	-	-
Platoon blocked, %			-	-		-
Mov Cap-1 Maneuver	412	858	-	-	1342	-
Mov Cap-2 Maneuver	412	-	-	-	-	-
Stage 1	850	-	-	-	-	-
Stage 2	594	-	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	13.7	0	3.8
HCM LOS	B		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	412	858	1342	-
HCM Lane V/C Ratio	-	-	0.291	0.126	0.102	-
HCM Control Delay (s)	-	-	17.3	9.8	8	-
HCM Lane LOS	-	-	C	A	A	-
HCM 95th %tile Q(veh)	-	-	1.2	0.4	0.3	-

Intersection	
Intersection Delay, s/veh	21.6
Intersection LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	2	144	59	306	154	63	58	60	269	36	37	1
Future Vol, veh/h	2	144	59	306	154	63	58	60	269	36	37	1
Peak Hour Factor	0.50	0.86	0.87	0.88	0.82	0.86	0.76	0.88	0.87	0.75	0.84	0.25
Heavy Vehicles, %	0	0	0	1	0	0	0	0	3	3	0	0
Mvmt Flow	4	167	68	348	188	73	76	68	309	48	44	4
Number of Lanes	1	1	0	1	1	0	1	1	1	1	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	2	2	3
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	3	2	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	3	2	2	2
HCM Control Delay	19.5	26	18.5	13.4
HCM LOS	C	D	C	B

Lane	NBLn1	NBLn2	NBLn3	EBLn1	EBLn2	WBLn1	WBLn2	SBLn1	SBLn2
Vol Left, %	100%	0%	0%	100%	0%	100%	0%	100%	0%
Vol Thru, %	0%	100%	0%	0%	71%	0%	71%	0%	97%
Vol Right, %	0%	0%	100%	0%	29%	0%	29%	0%	3%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	58	60	269	2	203	306	217	36	38
LT Vol	58	0	0	2	0	306	0	36	0
Through Vol	0	60	0	0	144	0	154	0	37
RT Vol	0	0	269	0	59	0	63	0	1
Lane Flow Rate	76	68	309	4	235	348	261	48	48
Geometry Grp	8	8	8	8	8	8	8	8	8
Degree of Util (X)	0.179	0.15	0.622	0.01	0.527	0.765	0.521	0.127	0.12
Departure Headway (Hd)	8.422	7.91	7.245	8.782	8.063	7.919	7.187	9.56	8.968
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	425	452	498	406	445	456	501	373	398
Service Time	6.191	5.678	5.013	6.564	5.844	5.687	4.955	7.356	6.764
HCM Lane V/C Ratio	0.179	0.15	0.62	0.01	0.528	0.763	0.521	0.129	0.121
HCM Control Delay	13	12.1	21.3	11.7	19.6	32.3	17.6	13.8	13
HCM Lane LOS	B	B	C	B	C	D	C	B	B
HCM 95th-tile Q	0.6	0.5	4.2	0	3	6.5	3	0.4	0.4

Intersection	
Int Delay, s/veh	4.5

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	48	473	601	99	54	28
Future Vol, veh/h	48	473	601	99	54	28
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	75	93	82	80	75	78
Heavy Vehicles, %	4	1	1	2	2	0
Mvmt Flow	64	509	733	124	72	36

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	857	0	-	0	1432	795
Stage 1	-	-	-	-	795	-
Stage 2	-	-	-	-	637	-
Critical Hdwy	4.14	-	-	-	6.42	6.2
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.236	-	-	-	3.518	3.3
Pot Cap-1 Maneuver	775	-	-	-	148	391
Stage 1	-	-	-	-	445	-
Stage 2	-	-	-	-	527	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	775	-	-	-	131	391
Mov Cap-2 Maneuver	-	-	-	-	131	-
Stage 1	-	-	-	-	394	-
Stage 2	-	-	-	-	527	-

Approach	EB	WB	SB
HCM Control Delay, s	1.1	0	58.5
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	775	-	-	-	168
HCM Lane V/C Ratio	0.083	-	-	-	0.642
HCM Control Delay (s)	10.1	0	-	-	58.5
HCM Lane LOS	B	A	-	-	F
HCM 95th %tile Q(veh)	0.3	-	-	-	3.6

Intersection	
Int Delay, s/veh	12.9

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		⇕			⇕			⇕			⇕	
Traffic Vol, veh/h	0	466	65	114	678	0	29	0	110	0	0	1
Future Vol, veh/h	0	466	65	114	678	0	29	0	110	0	0	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	96	96	90	81	89	89	56	56	75	70	70	70
Heavy Vehicles, %	0	2	0	2	1	0	0	0	0	0	0	0
Mvmt Flow	0	485	72	141	762	0	52	0	147	0	0	1

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	762	0	0	557	0	0	1566	1565	521	1639	1601	762
Stage 1	-	-	-	-	-	-	521	521	-	1044	1044	-
Stage 2	-	-	-	-	-	-	1045	1044	-	595	557	-
Critical Hdwy	4.1	-	-	4.12	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.218	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	859	-	-	1014	-	-	91	113	559	81	107	408
Stage 1	-	-	-	-	-	-	542	535	-	279	309	-
Stage 2	-	-	-	-	-	-	279	309	-	494	515	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	859	-	-	1014	-	-	74	86	559	49	81	408
Mov Cap-2 Maneuver	-	-	-	-	-	-	74	86	-	49	81	-
Stage 1	-	-	-	-	-	-	542	535	-	279	235	-
Stage 2	-	-	-	-	-	-	211	235	-	364	515	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	1.4	101.7	13.9
HCM LOS			F	B

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	206	859	-	-	1014	-	-	408
HCM Lane V/C Ratio	0.963	-	-	-	0.139	-	-	0.004
HCM Control Delay (s)	101.7	0	-	-	9.1	0	-	13.9
HCM Lane LOS	F	A	-	-	A	A	-	B
HCM 95th %tile Q(veh)	8.2	0	-	-	0.5	-	-	0

Intersection	
Int Delay, s/veh	4.8

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	186	393	631	170	65	167
Future Vol, veh/h	186	393	631	170	65	167
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	100	-	-	120	0	105
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	91	91	95	94	86	80
Heavy Vehicles, %	1	1	1	1	0	2
Mvmt Flow	204	432	664	181	76	209

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	845	0	-	0	1504	664
Stage 1	-	-	-	-	664	-
Stage 2	-	-	-	-	840	-
Critical Hdwy	4.11	-	-	-	6.4	6.22
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.209	-	-	-	3.5	3.318
Pot Cap-1 Maneuver	796	-	-	-	135	461
Stage 1	-	-	-	-	516	-
Stage 2	-	-	-	-	427	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	796	-	-	-	100	461
Mov Cap-2 Maneuver	-	-	-	-	230	-
Stage 1	-	-	-	-	384	-
Stage 2	-	-	-	-	427	-

Approach	EB	WB	SB
HCM Control Delay, s	3.6	0	21.5
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	796	-	-	-	230	461
HCM Lane V/C Ratio	0.257	-	-	-	0.329	0.453
HCM Control Delay (s)	11.1	-	-	-	28.1	19.1
HCM Lane LOS	B	-	-	-	D	C
HCM 95th %tile Q(veh)	1	-	-	-	1.4	2.3

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	61	360	35	94	723	118	70	172	72	83	174	67
Future Volume (vph)	61	360	35	94	723	118	70	172	72	83	174	67
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	11	11	12	11	11	12	12	12	12	12	12
Storage Length (ft)	205		0	190		0	140		0	140		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	220			185			120			105		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor								0.99				
Frt		0.983			0.973			0.951			0.954	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1805	1790	0	1805	1772	0	1752	1788	0	1787	1800	0
Flt Permitted	0.084			0.366			0.464			0.225		
Satd. Flow (perm)	160	1790	0	695	1772	0	856	1788	0	423	1800	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		7			11			19			17	
Link Speed (mph)		40			40			30			30	
Link Distance (ft)		2546			1726			1564			1951	
Travel Time (s)		43.4			29.4			35.5			44.3	
Confl. Bikes (#/hr)									1			
Peak Hour Factor	0.80	0.97	0.73	0.81	0.95	0.72	0.88	0.78	0.67	0.69	0.95	0.84
Heavy Vehicles (%)	0%	1%	0%	0%	1%	0%	3%	0%	1%	1%	1%	0%
Adj. Flow (vph)	76	371	48	116	761	164	80	221	107	120	183	80
Shared Lane Traffic (%)												
Lane Group Flow (vph)	76	419	0	116	925	0	80	328	0	120	263	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		10			10			10			10	
Two way Left Turn Lane												
Headway Factor	1.00	1.04	1.04	1.00	1.04	1.04	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2			6			8			4		
Detector Phase	5	2		1	6		3	8		7	4	
Switch Phase												
Minimum Initial (s)	3.0	15.0		3.0	15.0		3.0	8.0		3.0	8.0	
Minimum Split (s)	6.5	21.0		6.5	21.0		6.5	14.0		6.5	14.0	
Total Split (s)	15.0	55.0		15.0	55.0		15.0	35.0		15.0	35.0	
Total Split (%)	12.5%	45.8%		12.5%	45.8%		12.5%	29.2%		12.5%	29.2%	
Maximum Green (s)	11.5	49.0		11.5	49.0		11.5	29.0		11.5	29.0	
Yellow Time (s)	3.5	4.5		3.5	4.5		3.5	4.5		3.5	4.5	
All-Red Time (s)	0.0	1.5		0.0	1.5		0.0	1.5		0.0	1.5	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	3.5	6.0		3.5	6.0		3.5	6.0		3.5	6.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	

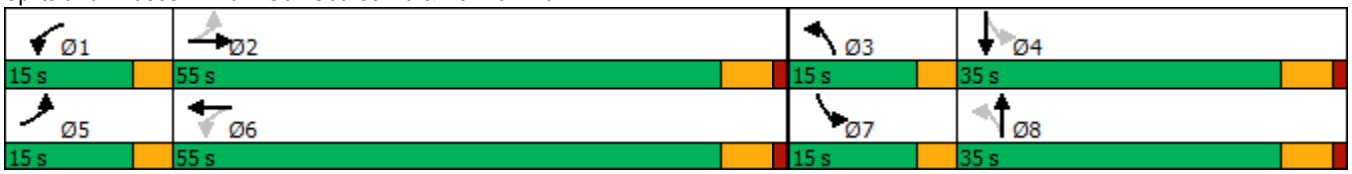
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	Min		None	Min		None	None		None	None	
Act Effct Green (s)	58.1	47.1		59.5	49.7		34.2	23.0		37.5	26.7	
Actuated g/C Ratio	0.54	0.44		0.55	0.46		0.32	0.21		0.35	0.25	
v/c Ratio	0.35	0.54		0.25	1.13		0.23	0.83		0.44	0.58	
Control Delay	16.6	26.7		13.2	103.2		25.3	57.4		29.2	40.8	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	16.6	26.7		13.2	103.2		25.3	57.4		29.2	40.8	
LOS	B	C		B	F		C	E		C	D	
Approach Delay		25.2			93.1			51.1			37.2	
Approach LOS		C			F			D			D	
Stops (vph)	26	278		41	634		46	211		53	193	
Fuel Used(gal)	2	12		2	34		1	7		2	7	
CO Emissions (g/hr)	106	818		123	2358		103	489		143	471	
NOx Emissions (g/hr)	21	159		24	459		20	95		28	92	
VOC Emissions (g/hr)	25	190		28	547		24	113		33	109	
Dilemma Vehicles (#)	0	7		0	32		0	0		0	0	
Queue Length 50th (ft)	23	213		37	~802		38	214		58	158	
Queue Length 95th (ft)	44	348		63	#1149		72	272		77	258	
Internal Link Dist (ft)		2466			1646			1484			1871	
Turn Bay Length (ft)	205			190			140			140		
Base Capacity (vph)	267	826		511	820		389	500		295	505	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.28	0.51		0.23	1.13		0.21	0.66		0.41	0.52	

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 108.2			
Natural Cycle: 90			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 1.13			
Intersection Signal Delay: 62.1		Intersection LOS: E	
Intersection Capacity Utilization 83.3%		ICU Level of Service E	
Analysis Period (min) 15			

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

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

Splits and Phases: 107: Golf Course Rd & Ackman Rd



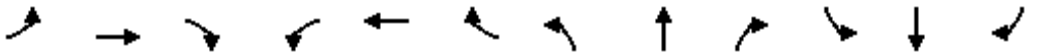
Intersection	
Int Delay, s/veh	4.3

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	6	493	8	37	936	32	9	4	36	9	2	7
Future Vol, veh/h	6	493	8	37	936	32	9	4	36	9	2	7
Conflicting Peds, #/hr	0	0	0	0	0	0	1	0	0	0	0	1
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	110	-	110	120	-	120	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	38	92	50	75	90	67	45	50	65	56	25	88
Heavy Vehicles, %	0	1	0	0	1	0	0	0	0	0	0	0
Mvmt Flow	16	536	16	49	1040	48	20	8	55	16	8	8

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	1088	0	0	552	0	0	1739	1754	536	1746	1722	1041
Stage 1	-	-	-	-	-	-	568	568	-	1138	1138	-
Stage 2	-	-	-	-	-	-	1171	1186	-	608	584	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	649	-	-	1028	-	-	69	86	549	68	90	282
Stage 1	-	-	-	-	-	-	511	510	-	247	279	-
Stage 2	-	-	-	-	-	-	237	265	-	486	501	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	649	-	-	1028	-	-	59	80	549	53	84	282
Mov Cap-2 Maneuver	-	-	-	-	-	-	59	80	-	53	84	-
Stage 1	-	-	-	-	-	-	498	497	-	241	266	-
Stage 2	-	-	-	-	-	-	213	252	-	419	488	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.3	0.4	53	84.8
HCM LOS			F	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	154	649	-	-	1028	-	-	75
HCM Lane V/C Ratio	0.541	0.024	-	-	0.048	-	-	0.427
HCM Control Delay (s)	53	10.7	-	-	8.7	-	-	84.8
HCM Lane LOS	F	B	-	-	A	-	-	F
HCM 95th %tile Q(veh)	2.7	0.1	-	-	0.2	-	-	1.7



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	466	20	132	34	33	9	298	1205	48	19	1537	706
Future Volume (vph)	466	20	132	34	33	9	298	1205	48	19	1537	706
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	450		175	140		65	400		200	245		425
Storage Lanes	2		1	1		1	2		1	1		1
Taper Length (ft)	300			60			300			105		
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00	1.00	0.97	0.91	1.00	1.00	0.91	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3433	1900	1583	1752	1845	1615	3467	5085	1615	1805	5136	1599
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3433	1900	1583	1752	1845	1615	3467	5085	1615	1805	5136	1599
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		40			25			50			50	
Link Distance (ft)		984			416			1616			1479	
Travel Time (s)		16.8			11.3			22.0			20.2	
Peak Hour Factor	0.90	0.71	0.89	0.57	0.75	0.45	0.93	0.97	0.71	0.79	0.93	0.85
Heavy Vehicles (%)	2%	0%	2%	3%	3%	0%	1%	2%	0%	0%	1%	1%
Adj. Flow (vph)	518	28	148	60	44	20	320	1242	68	24	1653	831
Shared Lane Traffic (%)												
Lane Group Flow (vph)	518	28	148	60	44	20	320	1242	68	24	1653	831
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		10			10			10			10	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Prot	NA	pt+ov	Prot	NA	pt+ov	Prot	NA	Perm	Prot	NA	pt+ov
Protected Phases	7	4	4 5	3	8	8 1	5	2		1	6	6 7
Permitted Phases									2			
Detector Phase	7	4	4 5	3	8	8 1	5	2	2	1	6	6 7
Switch Phase												
Minimum Initial (s)	3.0	7.5		3.0	7.5		3.0	14.5	14.5	3.0	14.5	
Minimum Split (s)	7.5	14.0		7.5	14.0		7.5	21.0	21.0	7.5	21.0	
Total Split (s)	29.4	33.6		15.4	19.6		25.2	75.6	75.6	15.4	65.8	
Total Split (%)	21.0%	24.0%		11.0%	14.0%		18.0%	54.0%	54.0%	11.0%	47.0%	
Maximum Green (s)	24.9	27.1		10.9	13.1		20.7	69.1	69.1	10.9	59.3	
Yellow Time (s)	3.5	4.5		3.5	4.5		3.5	4.5	4.5	3.5	4.5	
All-Red Time (s)	1.0	2.0		1.0	2.0		1.0	2.0	2.0	1.0	2.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	4.5	6.5		4.5	6.5		4.5	6.5	6.5	4.5	6.5	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag	Lag	Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes	Yes	Yes	Yes	
Vehicle Extension (s)	3.0	7.0		3.0	5.0		3.0	7.0	7.0	3.0	7.0	
Minimum Gap (s)	3.0	3.0		3.0	3.0		3.0	4.0	4.0	3.0	4.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Time Before Reduce (s)	0.0	0.0		0.0	0.0		0.0	25.0	25.0	0.0	25.0	
Time To Reduce (s)	0.0	0.0		0.0	0.0		0.0	20.0	20.0	0.0	20.0	
Recall Mode	None	None		None	None		None	C-Min	C-Min	None	C-Min	
Act Effct Green (s)	23.6	24.2	46.4	9.3	10.5	20.5	17.7	81.2	81.2	7.4	68.9	97.1
Actuated g/C Ratio	0.17	0.17	0.33	0.07	0.08	0.15	0.13	0.58	0.58	0.05	0.49	0.69
v/c Ratio	0.89	0.09	0.28	0.52	0.32	0.08	0.73	0.42	0.07	0.25	0.65	0.75
Control Delay	75.8	47.9	34.9	78.4	66.7	48.9	68.9	18.8	16.5	69.3	30.0	21.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	75.8	47.9	34.9	78.4	66.7	48.9	68.9	18.8	16.5	69.3	30.0	21.4
LOS	E	D	C	E	E	D	E	B	B	E	C	C
Approach Delay		65.9			69.5			28.5			27.5	
Approach LOS		E			E			C			C	
Stops (vph)	438	17	93	32	30	8	281	662	23	20	1139	471
Fuel Used(gal)	17	1	4	1	1	0	12	27	1	1	41	17
CO Emissions (g/hr)	1221	43	248	55	48	11	807	1896	70	53	2885	1184
NOx Emissions (g/hr)	238	8	48	11	9	2	157	369	14	10	561	230
VOC Emissions (g/hr)	283	10	57	13	11	2	187	439	16	12	669	274
Dilemma Vehicles (#)	0	1	0	0	0	0	0	43	0	0	55	0
Queue Length 50th (ft)	238	21	97	54	39	16	146	246	29	21	432	484
Queue Length 95th (ft)	#323	39	147	63	65	20	194	307	46	45	523	665
Internal Link Dist (ft)		904			336			1536			1399	
Turn Bay Length (ft)	450		175	140		65	400		200	245		425
Base Capacity (vph)	610	367	526	136	172	248	512	2950	936	140	2529	1123
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.85	0.08	0.28	0.44	0.26	0.08	0.63	0.42	0.07	0.17	0.65	0.74

Intersection Summary

Area Type: Other
Cycle Length: 140
Actuated Cycle Length: 140
Offset: 25.2 (18%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.89
Intersection Signal Delay: 34.3 Intersection LOS: C
Intersection Capacity Utilization 73.0% ICU Level of Service D
Analysis Period (min) 15
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 109: Randall Rd & Ackman Rd

Intersection	
Int Delay, s/veh	14.2

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	97	111	57	42	95	141	55	145	96	94	128	85
Future Vol, veh/h	97	111	57	42	95	141	55	145	96	94	128	85
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	150	-	-	285	-	-	150	-	-	150	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	2	2	2	2	2	2	3	2	2
Mvmt Flow	102	117	60	44	100	148	58	153	101	99	135	89

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	822	748	180	786	742	204	224	0	0	254	0	0
Stage 1	378	378	-	320	320	-	-	-	-	-	-	-
Stage 2	444	370	-	466	422	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.12	6.52	6.22	4.12	-	-	4.13	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.12	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.518	4.018	3.318	2.218	-	-	2.227	-	-
Pot Cap-1 Maneuver	293	341	863	310	344	837	1345	-	-	1305	-	-
Stage 1	644	615	-	692	652	-	-	-	-	-	-	-
Stage 2	593	620	-	577	588	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	165	301	863	185	304	837	1345	-	-	1305	-	-
Mov Cap-2 Maneuver	165	301	-	185	304	-	-	-	-	-	-	-
Stage 1	616	568	-	662	624	-	-	-	-	-	-	-
Stage 2	392	593	-	394	543	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	34.8	21.2	1.4	2.4
HCM LOS	D	C		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	1345	-	-	165	386	185	491	1305	-	-
HCM Lane V/C Ratio	0.043	-	-	0.619	0.458	0.239	0.506	0.076	-	-
HCM Control Delay (s)	7.8	-	-	56.9	22	30.5	19.6	8	-	-
HCM Lane LOS	A	-	-	F	C	D	C	A	-	-
HCM 95th %tile Q(veh)	0.1	-	-	3.4	2.3	0.9	2.8	0.2	-	-

Intersection	
Intersection Delay, s/veh	24.4
Intersection LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	8	243	41	198	201	51	76	59	265	153	101	8
Future Vol, veh/h	8	243	41	198	201	51	76	59	265	153	101	8
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles, %	0	2	0	2	4	0	2	0	1	5	2	0
Mvmt Flow	8	256	43	208	212	54	80	62	279	161	106	8
Number of Lanes	1	1	0	1	1	0	1	1	1	1	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	2	2	3
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	3	2	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	3	2	2	2
HCM Control Delay	34.2	24.1	21.4	18.8
HCM LOS	D	C	C	C

Lane	NBLn1	NBLn2	NBLn3	EBLn1	EBLn2	WBLn1	WBLn2	SBLn1	SBLn2
Vol Left, %	100%	0%	0%	100%	0%	100%	0%	100%	0%
Vol Thru, %	0%	100%	0%	0%	86%	0%	80%	0%	93%
Vol Right, %	0%	0%	100%	0%	14%	0%	20%	0%	7%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	76	59	265	8	284	198	252	153	109
LT Vol	76	0	0	8	0	198	0	153	0
Through Vol	0	59	0	0	243	0	201	0	101
RT Vol	0	0	265	0	41	0	51	0	8
Lane Flow Rate	80	62	279	8	299	208	265	161	115
Geometry Grp	8	8	8	8	8	8	8	8	8
Degree of Util (X)	0.213	0.156	0.644	0.023	0.752	0.537	0.637	0.448	0.299
Departure Headway (Hd)	9.568	9.014	8.306	9.636	9.051	9.274	8.648	10.009	9.38
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	374	397	432	371	398	388	416	359	382
Service Time	7.344	6.79	6.082	7.414	6.829	7.053	6.427	7.795	7.165
HCM Lane V/C Ratio	0.214	0.156	0.646	0.022	0.751	0.536	0.637	0.448	0.301
HCM Control Delay	14.9	13.5	25	12.6	34.8	22.4	25.5	20.7	16.2
HCM Lane LOS	B	B	C	B	D	C	D	C	C
HCM 95th-tile Q	0.8	0.5	4.4	0.1	6.1	3.1	4.3	2.2	1.2

Intersection	
Int Delay, s/veh	3.9

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	16	747	469	20	57	46
Future Vol, veh/h	16	747	469	20	57	46
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	46	95	95	64	83	68
Heavy Vehicles, %	36	2	4	11	6	0
Mvmt Flow	35	786	494	31	69	68

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	525	0	-	0	1366	510
Stage 1	-	-	-	-	510	-
Stage 2	-	-	-	-	856	-
Critical Hdwy	4.46	-	-	-	6.46	6.2
Critical Hdwy Stg 1	-	-	-	-	5.46	-
Critical Hdwy Stg 2	-	-	-	-	5.46	-
Follow-up Hdwy	2.524	-	-	-	3.554	3.3
Pot Cap-1 Maneuver	890	-	-	-	159	567
Stage 1	-	-	-	-	595	-
Stage 2	-	-	-	-	410	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	890	-	-	-	148	567
Mov Cap-2 Maneuver	-	-	-	-	148	-
Stage 1	-	-	-	-	553	-
Stage 2	-	-	-	-	410	-

Approach	EB	WB	SB
HCM Control Delay, s	0.4	0	39.8
HCM LOS			E

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	890	-	-	-	234
HCM Lane V/C Ratio	0.039	-	-	-	0.583
HCM Control Delay (s)	9.2	0	-	-	39.8
HCM Lane LOS	A	A	-	-	E
HCM 95th %tile Q(veh)	0.1	-	-	-	3.3

Intersection	
Int Delay, s/veh	107.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	0	722	87	100	406	0	105	0	239	0	0	0
Future Vol, veh/h	0	722	87	100	406	0	105	0	239	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	65	80	95	95	95	95	95	95	95	95
Heavy Vehicles, %	0	2	4	1	4	0	7	0	3	0	0	0
Mvmt Flow	0	760	134	125	427	0	111	0	252	0	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	427	0	0	894	0	0	1504	1504	827	1630	1571	427
Stage 1	-	-	-	-	-	-	827	827	-	677	677	-
Stage 2	-	-	-	-	-	-	677	677	-	953	894	-
Critical Hdwy	4.1	-	-	4.11	-	-	7.17	6.5	6.23	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.17	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.17	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.209	-	-	3.563	4	3.327	3.5	4	3.3
Pot Cap-1 Maneuver	1143	-	-	763	-	-	~ 97	123	370	82	112	632
Stage 1	-	-	-	-	-	-	359	389	-	446	455	-
Stage 2	-	-	-	-	-	-	434	455	-	314	362	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1143	-	-	763	-	-	~ 81	97	370	22	88	632
Mov Cap-2 Maneuver	-	-	-	-	-	-	~ 81	97	-	22	88	-
Stage 1	-	-	-	-	-	-	359	389	-	446	357	-
Stage 2	-	-	-	-	-	-	341	357	-	100	362	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	2.4	$ 532.8	0
HCM LOS			F	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	177	1143	-	-	763	-	-	-
HCM Lane V/C Ratio	2.046	-	-	-	0.164	-	-	-
HCM Control Delay (s)	$ 532.8	0	-	-	10.6	0	-	0
HCM Lane LOS	F	A	-	-	B	A	-	A
HCM 95th %tile Q(veh)	28	0	-	-	0.6	-	-	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Intersection	
Int Delay, s/veh	19.3

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	221	701	294	79	177	218
Future Vol, veh/h	221	701	294	79	177	218
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	100	-	-	120	0	105
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	92	95	80	78	78	85
Heavy Vehicles, %	5	1	4	4	0	1
Mvmt Flow	240	738	368	101	227	256

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	469	0	-	0	1586	368
Stage 1	-	-	-	-	368	-
Stage 2	-	-	-	-	1218	-
Critical Hdwy	4.15	-	-	-	6.4	6.21
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.245	-	-	-	3.5	3.309
Pot Cap-1 Maneuver	1077	-	-	-	~ 120	680
Stage 1	-	-	-	-	704	-
Stage 2	-	-	-	-	282	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	1077	-	-	-	~ 93	680
Mov Cap-2 Maneuver	-	-	-	-	~ 207	-
Stage 1	-	-	-	-	547	-
Stage 2	-	-	-	-	282	-

Approach	EB	WB	SB
HCM Control Delay, s	2.3	0	72.5
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1077	-	-	-	207	680
HCM Lane V/C Ratio	0.223	-	-	-	1.096	0.377
HCM Control Delay (s)	9.3	-	-	-	139.2	13.5
HCM Lane LOS	A	-	-	-	F	B
HCM 95th %tile Q(veh)	0.9	-	-	-	10.6	1.8

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

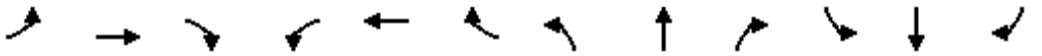
Intersection	
Int Delay, s/veh	1.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	9	851	348	8	35	26
Future Vol, veh/h	9	851	348	8	35	26
Conflicting Peds, #/hr	1	0	0	1	1	1
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	120	-	-	105	100	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	0	1	5	33	4	0
Mvmt Flow	9	896	366	8	37	27

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	375	0	-	0	1282	368
Stage 1	-	-	-	-	367	-
Stage 2	-	-	-	-	915	-
Critical Hdwy	4.1	-	-	-	6.44	6.2
Critical Hdwy Stg 1	-	-	-	-	5.44	-
Critical Hdwy Stg 2	-	-	-	-	5.44	-
Follow-up Hdwy	2.2	-	-	-	3.536	3.3
Pot Cap-1 Maneuver	1195	-	-	-	181	682
Stage 1	-	-	-	-	696	-
Stage 2	-	-	-	-	387	-
Platoon blocked, %			-	-	-	
Mov Cap-1 Maneuver	1194	-	-	-	179	681
Mov Cap-2 Maneuver	-	-	-	-	179	-
Stage 1	-	-	-	-	690	-
Stage 2	-	-	-	-	387	-

Approach	EB	WB	SB
HCM Control Delay, s	0.1	0	21.9
HCM LOS			C

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	1194	-	-	-	179	681
HCM Lane V/C Ratio	0.008	-	-	-	0.206	0.04
HCM Control Delay (s)	8	-	-	-	30.3	10.5
HCM Lane LOS	A	-	-	-	D	B
HCM 95th %tile Q(veh)	0	-	-	-	0.7	0.1



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	168	725	28	50	222	30	71	445	190	154	217	96
Future Volume (vph)	168	725	28	50	222	30	71	445	190	154	217	96
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	11	11	12	11	11	12	12	12	12	12	12
Storage Length (ft)	205		0	190		0	140		0	140		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	220			185			120			105		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor								0.99				
Frt		0.995			0.982			0.955			0.954	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1787	1810	0	1543	1685	0	1805	1778	0	1805	1777	0
Flt Permitted	0.476			0.089			0.404			0.120		
Satd. Flow (perm)	895	1810	0	145	1685	0	768	1778	0	228	1777	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		2			7			17			18	
Link Speed (mph)		40			40			30			30	
Link Distance (ft)		2546			1726			1564			1951	
Travel Time (s)		43.4			29.4			35.5			44.3	
Confl. Bikes (#/hr)									1			
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	1%	1%	0%	17%	8%	0%	0%	2%	0%	0%	2%	2%
Adj. Flow (vph)	177	763	29	53	234	32	75	468	200	162	228	101
Shared Lane Traffic (%)												
Lane Group Flow (vph)	177	792	0	53	266	0	75	668	0	162	329	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		10			10			10			10	
Two way Left Turn Lane												
Headway Factor	1.00	1.04	1.04	1.00	1.04	1.04	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2			6			8			4		
Detector Phase	5	2		1	6		3	8		7	4	
Switch Phase												
Minimum Initial (s)	3.0	15.0		3.0	15.0		3.0	8.0		3.0	8.0	
Minimum Split (s)	6.5	21.0		6.5	21.0		6.5	14.0		6.5	14.0	
Total Split (s)	15.0	55.0		15.0	55.0		15.0	35.0		15.0	35.0	
Total Split (%)	12.5%	45.8%		12.5%	45.8%		12.5%	29.2%		12.5%	29.2%	
Maximum Green (s)	11.5	49.0		11.5	49.0		11.5	29.0		11.5	29.0	
Yellow Time (s)	3.5	4.5		3.5	4.5		3.5	4.5		3.5	4.5	
All-Red Time (s)	0.0	1.5		0.0	1.5		0.0	1.5		0.0	1.5	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	3.5	6.0		3.5	6.0		3.5	6.0		3.5	6.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	Min		None	Min		None	None		None	None	
Act Effct Green (s)	60.2	49.1		53.9	44.1		40.1	29.1		45.1	33.7	
Actuated g/C Ratio	0.53	0.43		0.47	0.39		0.35	0.26		0.40	0.30	
v/c Ratio	0.32	1.01		0.33	0.40		0.22	1.43		0.67	0.61	
Control Delay	15.4	68.4		18.9	26.9		23.8	238.3		38.6	40.4	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	15.4	68.4		18.9	26.9		23.8	238.3		38.6	40.4	
LOS	B	E		B	C		C	F		D	D	
Approach Delay		58.7			25.6			216.6			39.8	
Approach LOS		E			C			F			D	
Stops (vph)	82	627		24	173		44	458		98	256	
Fuel Used(gal)	4	30		1	6		1	41		4	9	
CO Emissions (g/hr)	296	2071		71	423		102	2871		286	612	
NOx Emissions (g/hr)	58	403		14	82		20	559		56	119	
VOC Emissions (g/hr)	69	480		16	98		24	665		66	142	
Dilemma Vehicles (#)	0	30		0	4		0	0		0	0	
Queue Length 50th (ft)	65	~635		18	138		35	~678		78	206	
Queue Length 95th (ft)	104	#899		38	212		68	#929		#158	326	
Internal Link Dist (ft)		2466			1646			1484			1871	
Turn Bay Length (ft)	205			190			140			140		
Base Capacity (vph)	564	783		215	732		396	467		250	539	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.31	1.01		0.25	0.36		0.19	1.43		0.65	0.61	

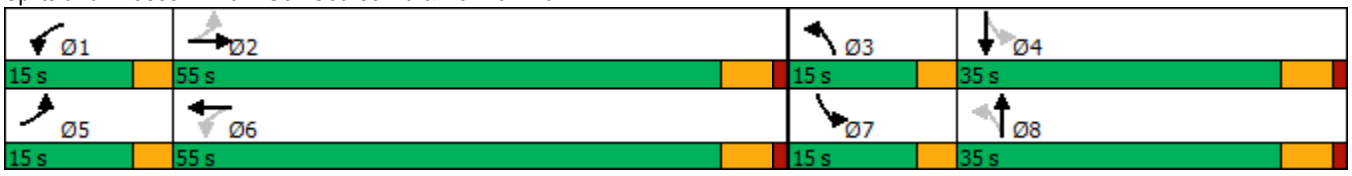
Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 113.6
Natural Cycle: 140
Control Type: Actuated-Uncoordinated
Maximum v/c Ratio: 1.43
Intersection Signal Delay: 97.4 Intersection LOS: F
Intersection Capacity Utilization 103.4% ICU Level of Service G
Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

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

Splits and Phases: 107: Golf Course Rd & Ackman Rd



Intersection	
Int Delay, s/veh	92

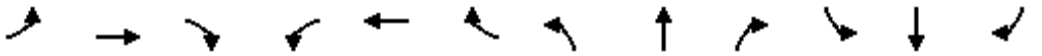
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	4	998	3	18	267	8	11	31	149	33	7	16
Future Vol, veh/h	4	998	3	18	267	8	11	31	149	33	7	16
Conflicting Peds, #/hr	8	0	0	0	0	8	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	110	-	110	120	-	120	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	38	95	50	47	95	58	88	38	95	78	50	36
Heavy Vehicles, %	0	1	0	13	10	0	0	0	2	0	0	0
Mvmt Flow	11	1051	6	38	281	14	13	82	157	42	14	44

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	303	0	0	1057	0	0	1466	1452	1051	1561	1444	289
Stage 1	-	-	-	-	-	-	1073	1073	-	365	365	-
Stage 2	-	-	-	-	-	-	393	379	-	1196	1079	-
Critical Hdwy	4.1	-	-	4.23	-	-	7.1	6.5	6.22	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.317	-	-	3.5	4	3.318	3.5	4	3.3
Pot Cap-1 Maneuver	1269	-	-	619	-	-	107	132	276	92	133	755
Stage 1	-	-	-	-	-	-	269	299	-	658	627	-
Stage 2	-	-	-	-	-	-	636	618	-	229	297	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1259	-	-	619	-	-	87	122	276	~ 17	123	749
Mov Cap-2 Maneuver	-	-	-	-	-	-	87	122	-	~ 17	123	-
Stage 1	-	-	-	-	-	-	267	296	-	647	584	-
Stage 2	-	-	-	-	-	-	548	575	-	71	294	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.1	1.3	249.7	$ 972.4
HCM LOS			F	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	182	1259	-	-	619	-	-	38
HCM Lane V/C Ratio	1.379	0.008	-	-	0.062	-	-	2.651
HCM Control Delay (s)	249.7	7.9	-	-	11.2	-	-	$ 972.4
HCM Lane LOS	F	A	-	-	B	-	-	F
HCM 95th %tile Q(veh)	14.9	0	-	-	0.2	-	-	11.2

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	1024	29	250	9	4	9	62	1243	42	6	1175	237
Future Volume (vph)	1024	29	250	9	4	9	62	1243	42	6	1175	237
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	450		175	140		65	400		200	245		425
Storage Lanes	2		1	1		1	2		1	1		1
Taper Length (ft)	300			60			300			105		
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00	1.00	0.97	0.91	1.00	1.00	0.91	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3467	1900	1599	1805	1900	1615	3273	5085	1568	1805	4940	1468
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3467	1900	1599	1805	1900	1615	3273	5085	1568	1805	4940	1468
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		40			25			50			50	
Link Distance (ft)		984			416			1616			1479	
Travel Time (s)		16.8			11.3			22.0			20.2	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	1%	0%	1%	0%	0%	0%	7%	2%	3%	0%	5%	10%
Adj. Flow (vph)	1078	31	263	9	4	9	65	1308	44	6	1237	249
Shared Lane Traffic (%)												
Lane Group Flow (vph)	1078	31	263	9	4	9	65	1308	44	6	1237	249
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		10			10			10			10	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Prot	NA	pt+ov	Prot	NA	pt+ov	Prot	NA	Perm	Prot	NA	pt+ov
Protected Phases	7	4	4 5	3	8	8 1	5	2		1	6	6 7
Permitted Phases									2			
Detector Phase	7	4	4 5	3	8	8 1	5	2	2	1	6	6 7
Switch Phase												
Minimum Initial (s)	3.0	7.5		3.0	7.5		3.0	14.5	14.5	3.0	14.5	
Minimum Split (s)	7.5	14.0		7.5	14.0		7.5	21.0	21.0	7.5	21.0	
Total Split (s)	34.8	34.8		15.6	15.6		15.6	54.0	54.0	15.6	54.0	
Total Split (%)	29.0%	29.0%		13.0%	13.0%		13.0%	45.0%	45.0%	13.0%	45.0%	
Maximum Green (s)	30.3	28.3		11.1	9.1		11.1	47.5	47.5	11.1	47.5	
Yellow Time (s)	3.5	4.5		3.5	4.5		3.5	4.5	4.5	3.5	4.5	
All-Red Time (s)	1.0	2.0		1.0	2.0		1.0	2.0	2.0	1.0	2.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	4.5	6.5		4.5	6.5		4.5	6.5	6.5	4.5	6.5	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag	Lag	Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes	Yes	Yes	Yes	
Vehicle Extension (s)	3.0	7.0		3.0	5.0		3.0	7.0	7.0	3.0	7.0	
Minimum Gap (s)	3.0	3.0		3.0	3.0		3.0	4.0	4.0	3.0	4.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Time Before Reduce (s)	0.0	0.0		0.0	0.0		0.0	25.0	25.0	0.0	25.0	
Time To Reduce (s)	0.0	0.0		0.0	0.0		0.0	20.0	20.0	0.0	20.0	
Recall Mode	None	None		None	None		None	C-Min	C-Min	None	C-Min	
Act Effct Green (s)	34.3	36.0	48.4	6.2	8.2	12.6	7.9	64.1	64.1	6.1	56.2	95.0
Actuated g/C Ratio	0.29	0.30	0.40	0.05	0.07	0.10	0.07	0.53	0.53	0.05	0.47	0.79
v/c Ratio	1.09	0.05	0.41	0.10	0.03	0.05	0.30	0.48	0.05	0.07	0.53	0.21
Control Delay	97.0	30.6	28.0	56.0	52.2	44.4	56.7	20.1	17.4	55.5	24.7	4.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	97.0	30.6	28.0	56.0	52.2	44.4	56.7	20.1	17.4	55.5	24.7	4.8
LOS	F	C	C	E	D	D	E	C	B	E	C	A
Approach Delay		82.2			50.6			21.7			21.5	
Approach LOS		F			D			C			C	
Stops (vph)	837	21	173	11	6	10	57	766	23	7	813	61
Fuel Used(gal)	42	1	6	0	0	0	2	30	1	0	29	3
CO Emissions (g/hr)	2905	53	443	12	6	11	156	2068	65	16	2056	237
NOx Emissions (g/hr)	565	10	86	2	1	2	30	402	13	3	400	46
VOC Emissions (g/hr)	673	12	103	3	1	2	36	479	15	4	476	55
Dilemma Vehicles (#)	0	1	0	0	0	0	0	52	0	0	49	0
Queue Length 50th (ft)	~511	18	157	7	3	7	25	165	12	5	206	27
Queue Length 95th (ft)	#663	43	225	24	15	21	47	327	43	19	324	98
Internal Link Dist (ft)		904			336			1536			1399	
Turn Bay Length (ft)	450		175	140		65	400		200	245		425
Base Capacity (vph)	990	570	688	166	144	188	302	2717	838	166	2333	1151
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	1.09	0.05	0.38	0.05	0.03	0.05	0.22	0.48	0.05	0.04	0.53	0.22

Intersection Summary

Area Type: Other
Cycle Length: 120
Actuated Cycle Length: 120
Offset: 105.6 (88%), Referenced to phase 2:NBT and 6:SBT, Start of Green
Natural Cycle: 90
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 1.09
Intersection Signal Delay: 41.1 Intersection LOS: D
Intersection Capacity Utilization 74.1% ICU Level of Service D
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 109: Randall Rd & Ackman Rd

Intersection	
Int Delay, s/veh	52.4

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	111	141	77	114	151	141	63	127	86	130	145	107
Future Vol, veh/h	111	141	77	114	151	141	63	127	86	130	145	107
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	150	-	-	285	-	-	150	-	-	150	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	95	95	95	95	95	95
Heavy Vehicles, %	2	2	2	0	2	1	2	0	0	0	0	2
Mvmt Flow	117	148	81	120	159	148	66	134	91	137	153	113

Major/Minor	Minor2			Minor1			Major1			Major2		
Conflicting Flow All	949	841	210	910	852	180	266	0	0	225	0	0
Stage 1	484	484	-	312	312	-	-	-	-	-	-	-
Stage 2	465	357	-	598	540	-	-	-	-	-	-	-
Critical Hdwy	7.12	6.52	6.22	7.1	6.52	6.21	4.12	-	-	4.1	-	-
Critical Hdwy Stg 1	6.12	5.52	-	6.1	5.52	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.12	5.52	-	6.1	5.52	-	-	-	-	-	-	-
Follow-up Hdwy	3.518	4.018	3.318	3.5	4.018	3.309	2.218	-	-	2.2	-	-
Pot Cap-1 Maneuver	240	301	830	258	297	865	1298	-	-	1356	-	-
Stage 1	564	552	-	703	658	-	-	-	-	-	-	-
Stage 2	578	628	-	492	521	-	-	-	-	-	-	-
Platoon blocked, %								-	-		-	-
Mov Cap-1 Maneuver	~ 89	257	830	~ 114	253	865	1298	-	-	1356	-	-
Mov Cap-2 Maneuver	~ 89	257	-	~ 114	253	-	-	-	-	-	-	-
Stage 1	535	496	-	667	624	-	-	-	-	-	-	-
Stage 2	339	596	-	280	468	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	119.6	79	1.8	2.7
HCM LOS	F	F		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	EBLn2	WBLn1	WBLn2	SBL	SBT	SBR
Capacity (veh/h)	1298	-	-	89	340	114	384	1356	-	-
HCM Lane V/C Ratio	0.051	-	-	1.313	0.675	1.053	0.8	0.101	-	-
HCM Control Delay (s)	7.9	-	-	285.7	35	171.3	42.9	8	-	-
HCM Lane LOS	A	-	-	F	E	F	E	A	-	-
HCM 95th %tile Q(veh)	0.2	-	-	8.6	4.7	7.1	7	0.3	-	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Intersection	
Intersection Delay, s/veh	81.2
Intersection LOS	F

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	8	287	100	319	301	165	94	130	274	97	84	4
Future Vol, veh/h	8	287	100	319	301	165	94	130	274	97	84	4
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles, %	0	0	0	1	0	0	0	0	3	3	0	0
Mvmt Flow	8	302	105	336	317	174	99	137	288	102	88	4
Number of Lanes	1	1	0	1	1	0	1	1	1	1	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	2	2	3
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	3	2	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	3	2	2	2
HCM Control Delay	111.5	114.1	28	19.9
HCM LOS	F	F	D	C

Lane	NBLn1	NBLn2	NBLn3	EBLn1	EBLn2	WBLn1	WBLn2	SBLn1	SBLn2
Vol Left, %	100%	0%	0%	100%	0%	100%	0%	100%	0%
Vol Thru, %	0%	100%	0%	0%	74%	0%	65%	0%	95%
Vol Right, %	0%	0%	100%	0%	26%	0%	35%	0%	5%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	94	130	274	8	387	319	466	97	88
LT Vol	94	0	0	8	0	319	0	97	0
Through Vol	0	130	0	0	287	0	301	0	84
RT Vol	0	0	274	0	100	0	165	0	4
Lane Flow Rate	99	137	288	8	407	336	491	102	93
Geometry Grp	8	8	8	8	8	8	8	8	8
Degree of Util (X)	0.284	0.374	0.737	0.025	1.11	0.91	1.225	0.325	0.28
Departure Headway (Hd)	11.032	10.509	9.83	10.966	10.26	10.206	9.412	12.311	11.691
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	328	345	369	328	358	359	388	294	309
Service Time	8.732	8.209	7.53	8.666	7.96	7.906	7.112	10.011	9.391
HCM Lane V/C Ratio	0.302	0.397	0.78	0.024	1.137	0.936	1.265	0.347	0.301
HCM Control Delay	18	19.4	35.6	13.9	113.5	60.4	150.8	20.8	18.9
HCM Lane LOS	C	C	E	B	F	F	F	C	C
HCM 95th-tile Q	1.1	1.7	5.7	0.1	14.7	9.2	19.7	1.4	1.1

Intersection	
Int Delay, s/veh	28.8

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	70	687	880	117	63	41
Future Vol, veh/h	70	687	880	117	63	41
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	75	95	95	95	75	78
Heavy Vehicles, %	4	1	1	2	2	0
Mvmt Flow	93	723	926	123	84	53

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	1049	0	-	0	1897	988
Stage 1	-	-	-	-	988	-
Stage 2	-	-	-	-	909	-
Critical Hdwy	4.14	-	-	-	6.42	6.2
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.236	-	-	-	3.518	3.3
Pot Cap-1 Maneuver	656	-	-	-	~ 76	303
Stage 1	-	-	-	-	361	-
Stage 2	-	-	-	-	393	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	656	-	-	-	~ 58	303
Mov Cap-2 Maneuver	-	-	-	-	~ 58	-
Stage 1	-	-	-	-	275	-
Stage 2	-	-	-	-	393	-

Approach	EB	WB	SB
HCM Control Delay, s	1.3	0	$ 414.9
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1
Capacity (veh/h)	656	-	-	-	84
HCM Lane V/C Ratio	0.142	-	-	-	1.626
HCM Control Delay (s)	11.4	0	-	-	-$ 414.9
HCM Lane LOS	B	A	-	-	F
HCM 95th %tile Q(veh)	0.5	-	-	-	11.2

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Intersection	
Int Delay, s/veh	298.8

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	0	594	173	122	910	0	96	0	138	0	0	0
Future Vol, veh/h	0	594	173	122	910	0	96	0	138	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	56	56	75	95	95	95
Heavy Vehicles, %	0	2	0	2	1	0	0	0	0	0	0	0
Mvmt Flow	0	625	182	128	958	0	171	0	184	0	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	958	0	0	807	0	0	1930	1930	716	2022	2021	958
Stage 1	-	-	-	-	-	-	716	716	-	1214	1214	-
Stage 2	-	-	-	-	-	-	1214	1214	-	808	807	-
Critical Hdwy	4.1	-	-	4.12	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.218	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	726	-	-	818	-	-	~ 51	67	434	44	59	315
Stage 1	-	-	-	-	-	-	424	437	-	224	257	-
Stage 2	-	-	-	-	-	-	224	257	-	378	397	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	726	-	-	818	-	-	~ 38	45	434	19	39	315
Mov Cap-2 Maneuver	-	-	-	-	-	-	~ 38	45	-	19	39	-
Stage 1	-	-	-	-	-	-	424	437	-	224	171	-
Stage 2	-	-	-	-	-	-	~ 149	171	-	218	397	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	1.2	$ 1887.1	0
HCM LOS			F	A

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	72	726	-	-	818	-	-	-
HCM Lane V/C Ratio	4.937	-	-	-	0.157	-	-	-
HCM Control Delay (s)	$ 1887.1	0	-	-	10.2	0	-	0
HCM Lane LOS	F	A	-	-	B	A	-	A
HCM 95th %tile Q(veh)	38.9	0	-	-	0.6	-	-	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Intersection	
Int Delay, s/veh	12.6

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	268	478	768	259	101	248
Future Vol, veh/h	268	478	768	259	101	248
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	100	-	-	120	0	105
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	91	95	95	95	86	80
Heavy Vehicles, %	1	1	1	1	0	2
Mvmt Flow	295	503	808	273	117	310

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	1081	0	-	0	1901	808
Stage 1	-	-	-	-	808	-
Stage 2	-	-	-	-	1093	-
Critical Hdwy	4.11	-	-	-	6.4	6.22
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.209	-	-	-	3.5	3.318
Pot Cap-1 Maneuver	649	-	-	-	~ 77	381
Stage 1	-	-	-	-	442	-
Stage 2	-	-	-	-	324	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	649	-	-	-	~ 42	381
Mov Cap-2 Maneuver	-	-	-	-	145	-
Stage 1	-	-	-	-	241	-
Stage 2	-	-	-	-	324	-

Approach	EB	WB	SB
HCM Control Delay, s	5.6	0	57.6
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	649	-	-	-	145	381
HCM Lane V/C Ratio	0.454	-	-	-	0.81	0.814
HCM Control Delay (s)	15.1	-	-	-	91.4	44.8
HCM Lane LOS	C	-	-	-	F	E
HCM 95th %tile Q(veh)	2.4	-	-	-	5.1	7.2

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

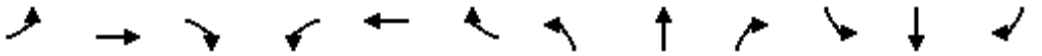
Intersection	
Int Delay, s/veh	1.1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	29	546	992	55	25	10
Future Vol, veh/h	29	546	992	55	25	10
Conflicting Peds, #/hr	1	0	0	1	1	1
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	120	-	-	105	100	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	95	95	95	95	95	95
Heavy Vehicles, %	4	1	1	0	0	0
Mvmt Flow	31	575	1044	58	26	11

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	1103	0	-	0	1683	1046
Stage 1	-	-	-	-	1045	-
Stage 2	-	-	-	-	638	-
Critical Hdwy	4.14	-	-	-	6.4	6.2
Critical Hdwy Stg 1	-	-	-	-	5.4	-
Critical Hdwy Stg 2	-	-	-	-	5.4	-
Follow-up Hdwy	2.236	-	-	-	3.5	3.3
Pot Cap-1 Maneuver	626	-	-	-	105	280
Stage 1	-	-	-	-	342	-
Stage 2	-	-	-	-	530	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	625	-	-	-	100	279
Mov Cap-2 Maneuver	-	-	-	-	100	-
Stage 1	-	-	-	-	325	-
Stage 2	-	-	-	-	529	-

Approach	EB	WB	SB
HCM Control Delay, s	0.6	0	43.4
HCM LOS			E

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	625	-	-	-	100	279
HCM Lane V/C Ratio	0.049	-	-	-	0.263	0.038
HCM Control Delay (s)	11.1	-	-	-	53.4	18.4
HCM Lane LOS	B	-	-	-	F	C
HCM 95th %tile Q(veh)	0.2	-	-	-	1	0.1



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	87	431	73	138	866	118	139	281	99	83	282	90
Future Volume (vph)	87	431	73	138	866	118	139	281	99	83	282	90
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	11	11	12	11	11	12	12	12	12	12	12
Storage Length (ft)	205		0	190		0	140		0	140		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	220			185			120			105		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor								0.99				
Frt		0.978			0.982			0.961			0.964	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1805	1781	0	1805	1788	0	1752	1811	0	1787	1818	0
Flt Permitted	0.085			0.237			0.166			0.245		
Satd. Flow (perm)	162	1781	0	450	1788	0	306	1811	0	461	1818	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		9			7			14			13	
Link Speed (mph)		40			40			30			30	
Link Distance (ft)		2546			1726			1564			1951	
Travel Time (s)		43.4			29.4			35.5			44.3	
Confl. Bikes (#/hr)									1			
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	0%	1%	0%	0%	1%	0%	3%	0%	1%	1%	1%	0%
Adj. Flow (vph)	92	454	77	145	912	124	146	296	104	87	297	95
Shared Lane Traffic (%)												
Lane Group Flow (vph)	92	531	0	145	1036	0	146	400	0	87	392	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		10			10			10			10	
Two way Left Turn Lane												
Headway Factor	1.00	1.04	1.04	1.00	1.04	1.04	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2			6			8			4		
Detector Phase	5	2		1	6		3	8		7	4	
Switch Phase												
Minimum Initial (s)	3.0	15.0		3.0	15.0		3.0	8.0		3.0	8.0	
Minimum Split (s)	6.5	21.0		6.5	21.0		6.5	14.0		6.5	14.0	
Total Split (s)	15.0	55.0		15.0	55.0		15.0	35.0		15.0	35.0	
Total Split (%)	12.5%	45.8%		12.5%	45.8%		12.5%	29.2%		12.5%	29.2%	
Maximum Green (s)	11.5	49.0		11.5	49.0		11.5	29.0		11.5	29.0	
Yellow Time (s)	3.5	4.5		3.5	4.5		3.5	4.5		3.5	4.5	
All-Red Time (s)	0.0	1.5		0.0	1.5		0.0	1.5		0.0	1.5	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	3.5	6.0		3.5	6.0		3.5	6.0		3.5	6.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	

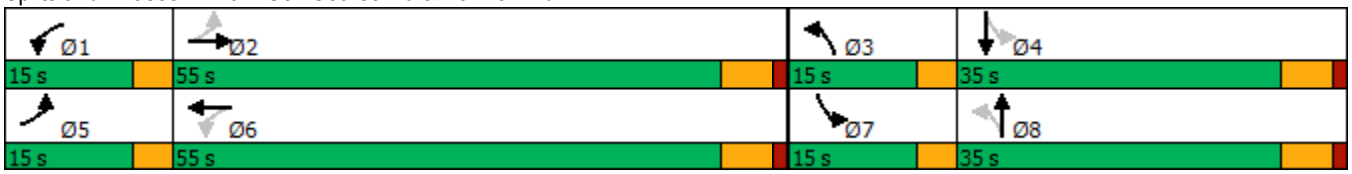
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	3.0		3.0	3.0		3.0	3.0		3.0	3.0	
Recall Mode	None	Min		None	Min		None	None		None	None	
Act Effct Green (s)	57.7	46.3		60.0	49.5		41.7	30.6		38.2	26.8	
Actuated g/C Ratio	0.51	0.41		0.53	0.44		0.37	0.27		0.34	0.24	
v/c Ratio	0.43	0.72		0.41	1.31		0.59	0.79		0.33	0.88	
Control Delay	20.1	34.6		16.4	177.7		34.1	51.4		26.8	63.2	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	20.1	34.6		16.4	177.7		34.1	51.4		26.8	63.2	
LOS	C	C		B	F		C	D		C	E	
Approach Delay		32.4			157.9			46.8			56.6	
Approach LOS		C			F			D			E	
Stops (vph)	42	405		65	718		90	317		53	321	
Fuel Used(gal)	2	16		3	54		3	10		2	12	
CO Emissions (g/hr)	159	1135		190	3786		221	725		140	854	
NOx Emissions (g/hr)	31	221		37	737		43	141		27	166	
VOC Emissions (g/hr)	37	263		44	877		51	168		33	198	
Dilemma Vehicles (#)	0	9		0	33		0	0		0	0	
Queue Length 50th (ft)	32	328		52	~1049		72	275		41	277	
Queue Length 95th (ft)	61	472		86	#1337		124	#472		79	#459	
Internal Link Dist (ft)		2466			1646			1484			1871	
Turn Bay Length (ft)	205			190			140			140		
Base Capacity (vph)	256	789		383	791		263	504		304	483	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.36	0.67		0.38	1.31		0.56	0.79		0.29	0.81	

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 112.3			
Natural Cycle: 130			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 1.31			
Intersection Signal Delay: 91.7		Intersection LOS: F	
Intersection Capacity Utilization 102.2%		ICU Level of Service G	
Analysis Period (min) 15			

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

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

Splits and Phases: 107: Golf Course Rd & Ackman Rd



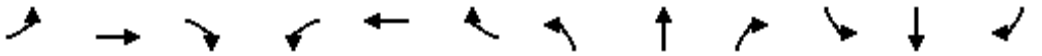
Intersection	
Int Delay, s/veh	20.5

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	10	573	13	45	1098	43	14	7	43	11	3	11
Future Vol, veh/h	10	573	13	45	1098	43	14	7	43	11	3	11
Conflicting Peds, #/hr	0	0	0	0	0	0	1	0	0	0	0	1
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	110	-	110	120	-	120	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	38	95	50	75	95	67	45	50	65	56	25	88
Heavy Vehicles, %	0	1	0	0	1	0	0	0	0	0	0	0
Mvmt Flow	26	603	26	60	1156	64	31	14	66	20	12	13

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	1220	0	0	629	0	0	1977	1995	603	1984	1957	1157
Stage 1	-	-	-	-	-	-	655	655	-	1276	1276	-
Stage 2	-	-	-	-	-	-	1322	1340	-	708	681	-
Critical Hdwy	4.1	-	-	4.1	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.2	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	579	-	-	963	-	-	47	61	503	46	64	241
Stage 1	-	-	-	-	-	-	458	466	-	207	240	-
Stage 2	-	-	-	-	-	-	195	223	-	429	453	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	579	-	-	963	-	-	34	55	503	30	57	241
Mov Cap-2 Maneuver	-	-	-	-	-	-	34	55	-	30	57	-
Stage 1	-	-	-	-	-	-	437	445	-	198	225	-
Stage 2	-	-	-	-	-	-	164	209	-	345	433	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.5	0.4	282.5	239
HCM LOS			F	F

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	86	579	-	-	963	-	-	48
HCM Lane V/C Ratio	1.294	0.045	-	-	0.062	-	-	0.92
HCM Control Delay (s)	282.5	11.5	-	-	9	-	-	239
HCM Lane LOS	F	B	-	-	A	-	-	F
HCM 95th %tile Q(veh)	8.2	0.1	-	-	0.2	-	-	3.8



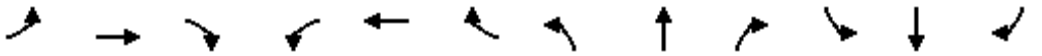
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	562	25	134	42	42	13	309	1446	60	28	1822	862
Future Volume (vph)	562	25	134	42	42	13	309	1446	60	28	1822	862
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	450		175	140		65	400		200	245		425
Storage Lanes	2		1	1		1	2		1	1		1
Taper Length (ft)	300			60			300			105		
Lane Util. Factor	0.97	1.00	1.00	1.00	1.00	1.00	0.97	0.91	1.00	1.00	0.91	1.00
Frt			0.850			0.850			0.850			0.850
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	3433	1900	1583	1752	1845	1615	3467	5085	1615	1805	5136	1599
Flt Permitted	0.950			0.950			0.950			0.950		
Satd. Flow (perm)	3433	1900	1583	1752	1845	1615	3467	5085	1615	1805	5136	1599
Right Turn on Red			No			No			No			No
Satd. Flow (RTOR)												
Link Speed (mph)		40			25			50			50	
Link Distance (ft)		984			416			1616			1479	
Travel Time (s)		16.8			11.3			22.0			20.2	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	2%	0%	2%	3%	3%	0%	1%	2%	0%	0%	1%	1%
Adj. Flow (vph)	592	26	141	44	44	14	325	1522	63	29	1918	907
Shared Lane Traffic (%)												
Lane Group Flow (vph)	592	26	141	44	44	14	325	1522	63	29	1918	907
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		24			24			24			24	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		10			10			10			10	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	Prot	NA	pt+ov	Prot	NA	pt+ov	Prot	NA	Perm	Prot	NA	pt+ov
Protected Phases	7	4	4 5	3	8	8 1	5	2		1	6	6 7
Permitted Phases									2			
Detector Phase	7	4	4 5	3	8	8 1	5	2	2	1	6	6 7
Switch Phase												
Minimum Initial (s)	3.0	7.5		3.0	7.5		3.0	14.5	14.5	3.0	14.5	
Minimum Split (s)	7.5	14.0		7.5	14.0		7.5	21.0	21.0	7.5	21.0	
Total Split (s)	29.4	33.6		15.4	19.6		25.2	75.6	75.6	15.4	65.8	
Total Split (%)	21.0%	24.0%		11.0%	14.0%		18.0%	54.0%	54.0%	11.0%	47.0%	
Maximum Green (s)	24.9	27.1		10.9	13.1		20.7	69.1	69.1	10.9	59.3	
Yellow Time (s)	3.5	4.5		3.5	4.5		3.5	4.5	4.5	3.5	4.5	
All-Red Time (s)	1.0	2.0		1.0	2.0		1.0	2.0	2.0	1.0	2.0	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	4.5	6.5		4.5	6.5		4.5	6.5	6.5	4.5	6.5	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag	Lag	Lead	Lag	
Lead-Lag Optimize?	Yes	Yes		Yes	Yes		Yes	Yes	Yes	Yes	Yes	
Vehicle Extension (s)	3.0	7.0		3.0	5.0		3.0	7.0	7.0	3.0	7.0	
Minimum Gap (s)	3.0	3.0		3.0	3.0		3.0	4.0	4.0	3.0	4.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Time Before Reduce (s)	0.0	0.0		0.0	0.0		0.0	25.0	25.0	0.0	25.0	
Time To Reduce (s)	0.0	0.0		0.0	0.0		0.0	20.0	20.0	0.0	20.0	
Recall Mode	None	None		None	None		None	C-Min	C-Min	None	C-Min	
Act Effct Green (s)	24.9	26.0	48.4	8.6	10.5	20.8	17.9	79.6	79.6	7.8	67.5	96.9
Actuated g/C Ratio	0.18	0.19	0.35	0.06	0.08	0.15	0.13	0.57	0.57	0.06	0.48	0.69
v/c Ratio	0.97	0.07	0.26	0.41	0.32	0.06	0.74	0.53	0.07	0.29	0.77	0.82
Control Delay	86.7	47.2	33.5	73.9	66.7	47.8	69.0	21.2	16.9	70.2	34.2	25.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	86.7	47.2	33.5	73.9	66.7	47.8	69.0	21.2	16.9	70.2	34.2	25.5
LOS	F	D	C	E	E	D	E	C	B	E	C	C
Approach Delay		75.4			67.2			29.1			31.8	
Approach LOS		E			E			C			C	
Stops (vph)	512	21	93	39	38	12	292	880	30	27	1480	603
Fuel Used(gal)	22	1	4	1	1	0	12	35	1	1	53	22
CO Emissions (g/hr)	1549	54	248	65	60	15	838	2416	90	75	3671	1525
NOx Emissions (g/hr)	301	10	48	13	12	3	163	470	17	15	714	297
VOC Emissions (g/hr)	359	12	57	15	14	4	194	560	21	17	851	353
Dilemma Vehicles (#)	0	1	0	0	0	0	0	51	0	0	65	0
Queue Length 50th (ft)	279	20	91	39	39	11	148	327	27	26	544	590
Queue Length 95th (ft)	#400	48	142	80	79	31	198	404	56	60	650	#1012
Internal Link Dist (ft)		904			336			1536			1399	
Turn Bay Length (ft)	450		175	140		65	400		200	245		425
Base Capacity (vph)	610	367	532	136	172	248	512	2891	918	140	2476	1106
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.97	0.07	0.27	0.32	0.26	0.06	0.63	0.53	0.07	0.21	0.77	0.82

Intersection Summary			
Area Type:	Other		
Cycle Length: 140			
Actuated Cycle Length: 140			
Offset: 25.2 (18%), Referenced to phase 2:NBT and 6:SBT, Start of Green			
Natural Cycle: 90			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.97			
Intersection Signal Delay: 37.4		Intersection LOS: D	
Intersection Capacity Utilization 83.0%		ICU Level of Service E	
Analysis Period (min) 15			

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

Splits and Phases: 109: Randall Rd & Ackman Rd

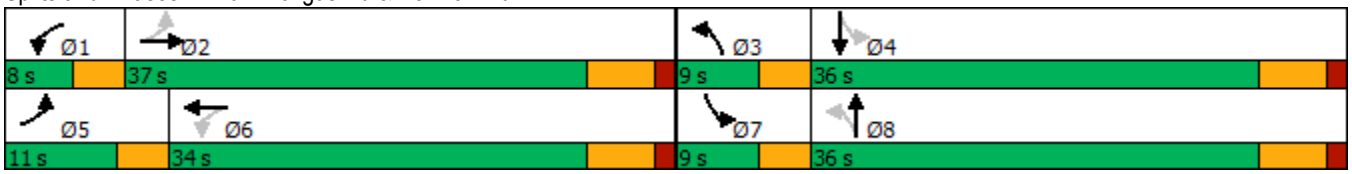


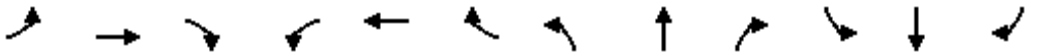
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	97	111	57	42	95	141	55	145	96	94	128	85
Future Volume (vph)	97	111	57	42	95	141	55	145	96	94	128	85
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	240		0	275		0	185		0	215		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	240			240			220			220		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.949			0.910			0.940			0.940	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1768	0	1770	1695	0	1770	1751	0	1752	1751	0
Flt Permitted	0.496			0.646			0.619			0.494		
Satd. Flow (perm)	924	1768	0	1203	1695	0	1153	1751	0	911	1751	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		31			86			40			40	
Link Speed (mph)		50			50			40			45	
Link Distance (ft)		1482			847			1463			2092	
Travel Time (s)		20.2			11.6			24.9			31.7	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	2%	2%	2%	2%	2%	2%	2%	2%	2%	3%	2%	2%
Adj. Flow (vph)	102	117	60	44	100	148	58	153	101	99	135	89
Shared Lane Traffic (%)												
Lane Group Flow (vph)	102	177	0	44	248	0	58	254	0	99	224	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		10			10			10			10	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2			6			8			4		
Detector Phase	5	2		1	6		3	8		7	4	
Switch Phase												
Minimum Initial (s)	3.0	15.0		3.0	15.0		3.0	8.0		3.0	8.0	
Minimum Split (s)	7.5	21.0		7.5	21.0		7.5	14.0		7.5	14.0	
Total Split (s)	11.0	37.0		8.0	34.0		9.0	36.0		9.0	36.0	
Total Split (%)	12.2%	41.1%		8.9%	37.8%		10.0%	40.0%		10.0%	40.0%	
Maximum Green (s)	7.5	31.0		4.5	28.0		5.5	30.0		5.5	30.0	
Yellow Time (s)	3.5	4.5		3.5	4.5		3.5	4.5		3.5	4.5	
All-Red Time (s)	0.0	1.5		0.0	1.5		0.0	1.5		0.0	1.5	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	3.5	6.0		3.5	6.0		3.5	6.0		3.5	6.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	7.0		3.0	7.0		3.0	4.0		3.0	4.0	
Recall Mode	None	Min		None	Min		None	None		None	None	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Act Effct Green (s)	28.4	21.7		23.9	18.0		20.8	14.1		21.5	15.9	
Actuated g/C Ratio	0.48	0.36		0.40	0.30		0.35	0.24		0.36	0.27	
v/c Ratio	0.19	0.27		0.08	0.43		0.13	0.57		0.24	0.45	
Control Delay	11.0	15.2		10.6	16.1		12.8	24.0		13.9	20.2	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	11.0	15.2		10.6	16.1		12.8	24.0		13.9	20.2	
LOS	B	B		B	B		B	C		B	C	
Approach Delay		13.6			15.3			21.9			18.3	
Approach LOS		B			B			C			B	
Stops (vph)	49	94		26	121		33	165		56	134	
Fuel Used(gal)	2	4		2	9		1	5		2	5	
CO Emissions (g/hr)	131	248		108	598		71	363		157	380	
NOx Emissions (g/hr)	26	48		21	116		14	71		30	74	
VOC Emissions (g/hr)	30	57		25	139		16	84		36	88	
Dilemma Vehicles (#)	0	11		0	15		0	15		0	13	
Queue Length 50th (ft)	20	41		8	50		12	70		22	59	
Queue Length 95th (ft)	51	95		27	122		36	151		56	132	
Internal Link Dist (ft)		1402			767			1383			2012	
Turn Bay Length (ft)	240			275			185			215		
Base Capacity (vph)	555	1002		530	899		463	966		412	966	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.18	0.18		0.08	0.28		0.13	0.26		0.24	0.23	

Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 59.5			
Natural Cycle: 55			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.57			
Intersection Signal Delay: 17.4		Intersection LOS: B	
Intersection Capacity Utilization 54.4%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 101: Haligus Rd & Ackman Rd



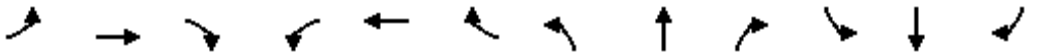


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	8	243	41	198	201	51	76	59	265	153	101	8
Future Volume (vph)	8	243	41	198	201	51	76	59	265	153	101	8
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	12	11	12	10	10
Storage Length (ft)	295		0	185		185	275		275	125		0
Storage Lanes	1		0	1		1	1		1	1		0
Taper Length (ft)	250			200			230			155		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.978				0.850			0.850		0.980	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1805	1827	0	1770	1827	1615	1770	1900	1546	1719	1708	0
Flt Permitted	0.625			0.451			0.833			0.482		
Satd. Flow (perm)	1188	1827	0	840	1827	1615	1552	1900	1546	872	1708	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		10				79			279		7	
Link Speed (mph)		50			40			45			30	
Link Distance (ft)		883			1667			965			1120	
Travel Time (s)		12.0			28.4			14.6			25.5	
Peak Hour Factor	0.50	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.50
Heavy Vehicles (%)	0%	2%	0%	2%	4%	0%	2%	0%	1%	5%	2%	0%
Adj. Flow (vph)	16	256	43	208	212	54	80	62	279	161	106	16
Shared Lane Traffic (%)												
Lane Group Flow (vph)	16	299	0	208	212	54	80	62	279	161	122	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		10			10			10			10	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.04	1.00	1.09	1.09
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	pm+pt	NA		pm+pt	NA	pm+ov	pm+pt	NA	pm+ov	pm+pt	NA	
Protected Phases	5	2		1	6	7	3	8	1	7	4	
Permitted Phases	2			6		6	8		8	4		
Detector Phase	5	2		1	6	7	3	8	1	7	4	
Switch Phase												
Minimum Initial (s)	3.0	15.0		3.0	15.0	3.0	3.0	8.0	3.0	3.0	8.0	
Minimum Split (s)	6.5	21.0		7.5	21.0	7.5	7.5	14.0	7.5	7.5	14.0	
Total Split (s)	7.0	37.0		22.0	52.0	15.0	10.0	16.0	22.0	15.0	21.0	
Total Split (%)	7.8%	41.1%		24.4%	57.8%	16.7%	11.1%	17.8%	24.4%	16.7%	23.3%	
Maximum Green (s)	3.5	31.0		18.5	46.0	11.5	6.5	10.0	18.5	11.5	15.0	
Yellow Time (s)	3.5	4.5		3.5	4.5	3.5	3.5	4.5	3.5	3.5	4.5	
All-Red Time (s)	0.0	1.5		0.0	1.5	0.0	0.0	1.5	0.0	0.0	1.5	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	3.5	6.0		3.5	6.0	3.5	3.5	6.0	3.5	3.5	6.0	
Lead/Lag	Lead	Lag		Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	7.0		3.0	7.0	3.0	3.0	4.0	3.0	3.0	4.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Recall Mode	None	Min		None	Min	None	None	None	None	None	None	
Act Effct Green (s)	28.4	21.7		38.6	37.1	52.4	13.0	9.8	18.0	20.8	12.3	
Actuated g/C Ratio	0.45	0.34		0.61	0.59	0.83	0.21	0.16	0.29	0.33	0.19	
v/c Ratio	0.03	0.47		0.31	0.20	0.04	0.23	0.21	0.44	0.35	0.36	
Control Delay	8.6	22.0		9.6	11.5	0.7	20.2	31.9	5.0	19.7	29.0	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	8.6	22.0		9.6	11.5	0.7	20.2	31.9	5.0	19.7	29.0	
LOS	A	C		A	B	A	C	C	A	B	C	
Approach Delay		21.3			9.4			11.8			23.7	
Approach LOS		C			A			B			C	
Stops (vph)	5	205		87	101	2	55	52	28	99	84	
Fuel Used(gal)	0	12		6	6	1	1	1	2	2	2	
CO Emissions (g/hr)	20	807		397	417	82	103	98	159	174	144	
NOx Emissions (g/hr)	4	157		77	81	16	20	19	31	34	28	
VOC Emissions (g/hr)	5	187		92	97	19	24	23	37	40	33	
Dilemma Vehicles (#)	0	18		0	10	0	0	4	0	0	0	
Queue Length 50th (ft)	3	100		42	47	0	21	24	0	46	42	
Queue Length 95th (ft)	6	186		80	108	6	59	66	49	109	103	
Internal Link Dist (ft)		803			1587			885			1040	
Turn Bay Length (ft)	295			185		185	275		275	125		
Base Capacity (vph)	574	1016		821	1325	1360	354	340	855	517	463	
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.03	0.29		0.25	0.16	0.04	0.23	0.18	0.33	0.31	0.26	

Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 63.1			
Natural Cycle: 50			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.47			
Intersection Signal Delay: 15.3		Intersection LOS: B	
Intersection Capacity Utilization 54.7%		ICU Level of Service A	
Analysis Period (min) 15			

Splits and Phases: 102: Lakewood Rd & Ackman Rd

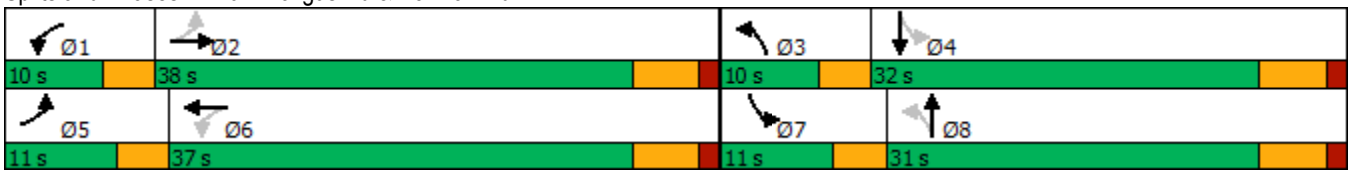


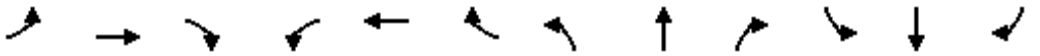
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	111	141	77	114	151	141	63	127	86	130	145	107
Future Volume (vph)	111	141	77	114	151	141	63	127	86	130	145	107
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	240		0	275		0	185		0	215		0
Storage Lanes	1		0	1		0	1		0	1		0
Taper Length (ft)	240			240			220			220		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.947			0.928			0.939			0.936	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1770	1764	0	1805	1737	0	1770	1784	0	1805	1763	0
Flt Permitted	0.470			0.616			0.580			0.498		
Satd. Flow (perm)	875	1764	0	1170	1737	0	1080	1784	0	946	1763	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		34			57			38			42	
Link Speed (mph)		50			50			40			45	
Link Distance (ft)		1497			847			1463			2092	
Travel Time (s)		20.4			11.6			24.9			31.7	
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	2%	2%	2%	0%	2%	1%	2%	0%	0%	0%	0%	2%
Adj. Flow (vph)	117	148	81	120	159	148	66	134	91	137	153	113
Shared Lane Traffic (%)												
Lane Group Flow (vph)	117	229	0	120	307	0	66	225	0	137	266	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		10			10			10			10	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA		pm+pt	NA	
Protected Phases	5	2		1	6		3	8		7	4	
Permitted Phases	2			6			8			4		
Detector Phase	5	2		1	6		3	8		7	4	
Switch Phase												
Minimum Initial (s)	3.0	15.0		3.0	15.0		3.0	8.0		3.0	8.0	
Minimum Split (s)	7.5	21.0		7.5	21.0		7.5	14.0		7.5	14.0	
Total Split (s)	11.0	38.0		10.0	37.0		10.0	31.0		11.0	32.0	
Total Split (%)	12.2%	42.2%		11.1%	41.1%		11.1%	34.4%		12.2%	35.6%	
Maximum Green (s)	7.5	32.0		6.5	31.0		6.5	25.0		7.5	26.0	
Yellow Time (s)	3.5	4.5		3.5	4.5		3.5	4.5		3.5	4.5	
All-Red Time (s)	0.0	1.5		0.0	1.5		0.0	1.5		0.0	1.5	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Lost Time (s)	3.5	6.0		3.5	6.0		3.5	6.0		3.5	6.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag		Lead	Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	7.0		3.0	7.0		3.0	4.0		3.0	4.0	
Recall Mode	None	Min		None	Min		None	None		None	None	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Act Effct Green (s)	29.8	21.7		28.5	21.0		22.0	14.6		24.0	17.4	
Actuated g/C Ratio	0.46	0.34		0.44	0.32		0.34	0.23		0.37	0.27	
v/c Ratio	0.23	0.37		0.21	0.51		0.15	0.52		0.30	0.53	
Control Delay	11.7	18.4		11.6	20.1		14.7	25.4		16.1	23.8	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0		0.0	0.0	
Total Delay	11.7	18.4		11.6	20.1		14.7	25.4		16.1	23.8	
LOS	B	B		B	C		B	C		B	C	
Approach Delay		16.1			17.7			23.0			21.2	
Approach LOS		B			B			C			C	
Stops (vph)	54	130		58	181		38	144		75	169	
Fuel Used(gal)	2	5		4	11		1	5		3	7	
CO Emissions (g/hr)	150	341		281	790		83	325		218	473	
NOx Emissions (g/hr)	29	66		55	154		16	63		42	92	
VOC Emissions (g/hr)	35	79		65	183		19	75		51	110	
Dilemma Vehicles (#)	0	13		0	18		0	11		0	15	
Queue Length 50th (ft)	25	62		25	85		16	69		35	83	
Queue Length 95th (ft)	61	134		62	180		45	151		83	176	
Internal Link Dist (ft)		1417			767			1383			2012	
Turn Bay Length (ft)	240			275			185			215		
Base Capacity (vph)	517	970		584	937		443	775		460	798	
Starvation Cap Reductn	0	0		0	0		0	0		0	0	
Spillback Cap Reductn	0	0		0	0		0	0		0	0	
Storage Cap Reductn	0	0		0	0		0	0		0	0	
Reduced v/c Ratio	0.23	0.24		0.21	0.33		0.15	0.29		0.30	0.33	

Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 64.7			
Natural Cycle: 55			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.53			
Intersection Signal Delay: 19.4		Intersection LOS: B	
Intersection Capacity Utilization 58.5%		ICU Level of Service B	
Analysis Period (min) 15			

Splits and Phases: 101: Haligus Rd & Ackman Rd





Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	8	287	100	319	301	165	94	130	274	97	84	4
Future Volume (vph)	8	287	100	319	301	165	94	130	274	97	84	4
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	12	12	12	12	12	12	12	11	12	10	10
Storage Length (ft)	295		0	185		185	275		275	125		0
Storage Lanes	1		0	1		1	1		1	1		0
Taper Length (ft)	250			200			230			155		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.961				0.850			0.850		0.977	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1805	1826	0	1787	1900	1615	1805	1900	1516	1752	1733	0
Flt Permitted	0.568			0.317			0.690			0.502		
Satd. Flow (perm)	1079	1826	0	596	1900	1615	1311	1900	1516	926	1733	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		20				174			288		9	
Link Speed (mph)		50			40			45			30	
Link Distance (ft)		883			1667			965			1120	
Travel Time (s)		12.0			28.4			14.6			25.5	
Peak Hour Factor	0.50	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.25
Heavy Vehicles (%)	0%	0%	0%	1%	0%	0%	0%	0%	3%	3%	0%	0%
Adj. Flow (vph)	16	302	105	336	317	174	99	137	288	102	88	16
Shared Lane Traffic (%)												
Lane Group Flow (vph)	16	407	0	336	317	174	99	137	288	102	104	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		10			10			10			10	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.04	1.00	1.09	1.09
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	pm+pt	NA		pm+pt	NA	pm+ov	pm+pt	NA	pm+ov	pm+pt	NA	
Protected Phases	5	2		1	6	7	3	8	1	7	4	
Permitted Phases	2			6		6	8		8	4		
Detector Phase	5	2		1	6	7	3	8	1	7	4	
Switch Phase												
Minimum Initial (s)	2.0	15.0		3.0	15.0	3.0	3.0	8.0	3.0	3.0	8.0	
Minimum Split (s)	6.5	21.0		7.5	21.0	7.5	7.5	14.0	7.5	7.5	14.0	
Total Split (s)	6.5	33.5		21.0	48.0	10.0	10.0	25.5	21.0	10.0	25.5	
Total Split (%)	7.2%	37.2%		23.3%	53.3%	11.1%	11.1%	28.3%	23.3%	11.1%	28.3%	
Maximum Green (s)	3.0	27.5		17.5	42.0	6.5	6.5	19.5	17.5	6.5	19.5	
Yellow Time (s)	3.5	4.5		3.5	4.5	3.5	3.5	4.5	3.5	3.5	4.5	
All-Red Time (s)	0.0	1.5		0.0	1.5	0.0	0.0	1.5	0.0	0.0	1.5	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	3.5	6.0		3.5	6.0	3.5	3.5	6.0	3.5	3.5	6.0	
Lead/Lag	Lead	Lag		Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	7.0		3.0	7.0	3.0	3.0	4.0	3.0	3.0	4.0	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Recall Mode	None	Min		None	Min	None	None	None	None	None	None	
Act Effct Green (s)	29.5	23.7		42.9	39.2	54.5	18.0	12.0	26.9	19.4	12.0	
Actuated g/C Ratio	0.41	0.33		0.59	0.54	0.75	0.25	0.17	0.37	0.27	0.17	
v/c Ratio	0.03	0.66		0.59	0.31	0.14	0.27	0.43	0.39	0.30	0.35	
Control Delay	9.0	27.5		12.9	11.5	1.3	21.7	34.7	3.6	22.3	31.2	
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	9.0	27.5		12.9	11.5	1.3	21.7	34.7	3.6	22.3	31.2	
LOS	A	C		B	B	A	C	C	A	C	C	
Approach Delay		26.8			9.9			15.1			26.8	
Approach LOS		C			A			B			C	
Stops (vph)	6	299		146	154	9	64	107	23	66	67	
Fuel Used(gal)	0	16		9	9	4	2	3	2	2	2	
CO Emissions (g/hr)	22	1152		659	627	268	126	214	154	116	119	
NOx Emissions (g/hr)	4	224		128	122	52	24	42	30	22	23	
VOC Emissions (g/hr)	5	267		153	145	62	29	50	36	27	28	
Dilemma Vehicles (#)	0	24		0	15	0	0	7	0	0	0	
Queue Length 50th (ft)	3	152		73	74	0	34	60	0	35	41	
Queue Length 95th (ft)	6	287		136	163	22	74	120	41	76	91	
Internal Link Dist (ft)		803			1587			885			1040	
Turn Bay Length (ft)	295			185		185	275		275	125		
Base Capacity (vph)	471	738		655	1224	1261	377	536	837	340	495	
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.03	0.55		0.51	0.26	0.14	0.26	0.26	0.34	0.30	0.21	

Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 72.2			
Natural Cycle: 60			
Control Type: Actuated-Uncoordinated			
Maximum v/c Ratio: 0.66			
Intersection Signal Delay: 16.7		Intersection LOS: B	
Intersection Capacity Utilization 67.7%		ICU Level of Service C	
Analysis Period (min) 15			

Splits and Phases: 102: Lakewood Rd & Ackman Rd

Intersection	
Int Delay, s/veh	2.8

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	16	747	469	20	57	46
Future Vol, veh/h	16	747	469	20	57	46
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	185	-	-	185	140	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	46	95	95	64	83	68
Heavy Vehicles, %	36	2	4	11	6	0
Mvmt Flow	35	786	494	31	69	68

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	525	0	-	0	1350	494
Stage 1	-	-	-	-	494	-
Stage 2	-	-	-	-	856	-
Critical Hdwy	4.46	-	-	-	6.46	6.2
Critical Hdwy Stg 1	-	-	-	-	5.46	-
Critical Hdwy Stg 2	-	-	-	-	5.46	-
Follow-up Hdwy	2.524	-	-	-	3.554	3.3
Pot Cap-1 Maneuver	890	-	-	-	163	579
Stage 1	-	-	-	-	605	-
Stage 2	-	-	-	-	410	-
Platoon blocked, %			-	-	-	
Mov Cap-1 Maneuver	890	-	-	-	157	579
Mov Cap-2 Maneuver	-	-	-	-	157	-
Stage 1	-	-	-	-	581	-
Stage 2	-	-	-	-	410	-

Approach	EB	WB	SB
HCM Control Delay, s	0.4	0	28.5
HCM LOS			D

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	890	-	-	-	157	579
HCM Lane V/C Ratio	0.039	-	-	-	0.437	0.117
HCM Control Delay (s)	9.2	-	-	-	44.7	12
HCM Lane LOS	A	-	-	-	E	B
HCM 95th %tile Q(veh)	0.1	-	-	-	2	0.4

Intersection	
Int Delay, s/veh	18.7

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	722	87	100	406	0	105	0	239	0	0	0
Future Vol, veh/h	0	722	87	100	406	0	105	0	239	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	185	-	185	185	-	-	185	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	65	80	95	95	95	95	95	95	95	95
Heavy Vehicles, %	0	2	4	1	4	0	7	0	3	0	0	0
Mvmt Flow	0	760	134	125	427	0	111	0	252	0	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	427	0	0	894	0	0	1437	1437	760	1630	1571	427
Stage 1	-	-	-	-	-	-	760	760	-	677	677	-
Stage 2	-	-	-	-	-	-	677	677	-	953	894	-
Critical Hdwy	4.1	-	-	4.11	-	-	7.17	6.5	6.23	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.17	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.17	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.209	-	-	3.563	4	3.327	3.5	4	3.3
Pot Cap-1 Maneuver	1143	-	-	763	-	-	~ 108	135	404	82	112	632
Stage 1	-	-	-	-	-	-	391	417	-	446	455	-
Stage 2	-	-	-	-	-	-	434	455	-	314	362	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1143	-	-	763	-	-	~ 94	113	404	27	94	632
Mov Cap-2 Maneuver	-	-	-	-	-	-	~ 94	113	-	27	94	-
Stage 1	-	-	-	-	-	-	391	417	-	446	380	-
Stage 2	-	-	-	-	-	-	363	380	-	118	362	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	2.4	89.5	0
HCM LOS			F	A

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	94	404	1143	-	-	763	-	-	-
HCM Lane V/C Ratio	1.176	0.623	-	-	-	0.164	-	-	-
HCM Control Delay (s)	230.6	27.5	0	-	-	10.6	-	-	0
HCM Lane LOS	F	D	A	-	-	B	-	-	A
HCM 95th %tile Q(veh)	7.6	4.1	0	-	-	0.6	-	-	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Intersection	
Int Delay, s/veh	12.2

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Vol, veh/h	70	687	880	117	63	41
Future Vol, veh/h	70	687	880	117	63	41
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	185	-	-	185	140	0
Veh in Median Storage, #	-	0	0	-	0	-
Grade, %	-	0	0	-	0	-
Peak Hour Factor	75	95	95	95	75	78
Heavy Vehicles, %	4	1	1	2	2	0
Mvmt Flow	93	723	926	123	84	53

Major/Minor	Major1		Major2		Minor2	
Conflicting Flow All	1049	0	-	0	1835	926
Stage 1	-	-	-	-	926	-
Stage 2	-	-	-	-	909	-
Critical Hdwy	4.14	-	-	-	6.42	6.2
Critical Hdwy Stg 1	-	-	-	-	5.42	-
Critical Hdwy Stg 2	-	-	-	-	5.42	-
Follow-up Hdwy	2.236	-	-	-	3.518	3.3
Pot Cap-1 Maneuver	656	-	-	-	~ 83	329
Stage 1	-	-	-	-	386	-
Stage 2	-	-	-	-	393	-
Platoon blocked, %		-	-	-		
Mov Cap-1 Maneuver	656	-	-	-	~ 71	329
Mov Cap-2 Maneuver	-	-	-	-	~ 71	-
Stage 1	-	-	-	-	331	-
Stage 2	-	-	-	-	393	-

Approach	EB	WB	SB
HCM Control Delay, s	1.3	0	170.7
HCM LOS			F

Minor Lane/Major Mvmt	EBL	EBT	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	656	-	-	-	71	329
HCM Lane V/C Ratio	0.142	-	-	-	1.183	0.16
HCM Control Delay (s)	11.4	-	-	-	266.3	18
HCM Lane LOS	B	-	-	-	F	C
HCM 95th %tile Q(veh)	0.5	-	-	-	6.5	0.6

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon

Intersection	
Int Delay, s/veh	93.3

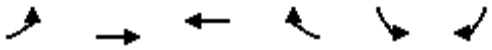
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	0	594	173	122	910	0	96	0	138	0	0	0
Future Vol, veh/h	0	594	173	122	910	0	96	0	138	0	0	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	185	-	185	185	-	-	185	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	95	95	95	95	95	95	56	56	75	95	95	95
Heavy Vehicles, %	0	2	0	2	1	0	0	0	0	0	0	0
Mvmt Flow	0	625	182	128	958	0	171	0	184	0	0	0

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	958	0	0	807	0	0	1839	1839	625	2022	2021	958
Stage 1	-	-	-	-	-	-	625	625	-	1214	1214	-
Stage 2	-	-	-	-	-	-	1214	1214	-	808	807	-
Critical Hdwy	4.1	-	-	4.12	-	-	7.1	6.5	6.2	7.1	6.5	6.2
Critical Hdwy Stg 1	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.1	5.5	-	6.1	5.5	-
Follow-up Hdwy	2.2	-	-	2.218	-	-	3.5	4	3.3	3.5	4	3.3
Pot Cap-1 Maneuver	726	-	-	818	-	-	~ 59	76	488	44	59	315
Stage 1	-	-	-	-	-	-	476	480	-	224	257	-
Stage 2	-	-	-	-	-	-	224	257	-	378	397	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	726	-	-	818	-	-	~ 52	64	488	24	50	315
Mov Cap-2 Maneuver	-	-	-	-	-	-	~ 52	64	-	24	50	-
Stage 1	-	-	-	-	-	-	476	480	-	224	217	-
Stage 2	-	-	-	-	-	-	189	217	-	235	397	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	1.2	$ 587	0
HCM LOS			F	A

Minor Lane/Major Mvmt	NBLn1	NBLn2	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	52	488	726	-	-	818	-	-	-
HCM Lane V/C Ratio	3.297	0.377	-	-	-	0.157	-	-	-
HCM Control Delay (s)	$ 1199.1	16.8	0	-	-	10.2	-	-	0
HCM Lane LOS	F	C	A	-	-	B	-	-	A
HCM 95th %tile Q(veh)	18.4	1.7	0	-	-	0.6	-	-	-

Notes			
~: Volume exceeds capacity	$: Delay exceeds 300s	+: Computation Not Defined	*: All major volume in platoon



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	16	747	469	20	57	46
Future Volume (vph)	16	747	469	20	57	46
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	185			185	140	0
Storage Lanes	1			1	1	1
Taper Length (ft)	200				45	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1327	1863	1827	1455	1703	1615
Flt Permitted	0.419				0.950	
Satd. Flow (perm)	585	1863	1827	1455	1703	1615
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				31		68
Link Speed (mph)		40	40		35	
Link Distance (ft)		1636	613		1094	
Travel Time (s)		27.9	10.4		21.3	
Peak Hour Factor	0.46	0.95	0.95	0.64	0.83	0.68
Heavy Vehicles (%)	36%	2%	4%	11%	6%	0%
Adj. Flow (vph)	35	786	494	31	69	68
Shared Lane Traffic (%)						
Lane Group Flow (vph)	35	786	494	31	69	68
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		12	12		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		10	10		10	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Turn Type	pm+pt	NA	NA	pm+ov	Prot	pt+ov
Protected Phases	5	2	6	4	4	4 5
Permitted Phases	2			6		
Detector Phase	5	2	6	4	4	4 5
Switch Phase						
Minimum Initial (s)	3.0	15.0	15.0	8.0	8.0	
Minimum Split (s)	6.5	21.0	21.0	14.0	14.0	
Total Split (s)	10.0	73.0	63.0	17.0	17.0	
Total Split (%)	11.1%	81.1%	70.0%	18.9%	18.9%	
Maximum Green (s)	6.5	67.0	57.0	11.0	11.0	
Yellow Time (s)	3.5	4.5	4.5	4.5	4.5	
All-Red Time (s)	0.0	1.5	1.5	1.5	1.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	3.5	6.0	6.0	6.0	6.0	
Lead/Lag	Lead		Lag			
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	7.0	7.0	4.0	4.0	
Recall Mode	None	C-Min	C-Min	None	None	

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Act Effct Green (s)	73.1	71.8	64.0	77.4	10.2	18.0
Actuated g/C Ratio	0.81	0.80	0.71	0.86	0.11	0.20
v/c Ratio	0.07	0.53	0.38	0.02	0.36	0.18
Control Delay	2.9	6.2	10.6	1.4	41.5	8.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	2.9	6.2	10.6	1.4	41.5	8.2
LOS	A	A	B	A	D	A
Approach Delay		6.1	10.0		25.0	
Approach LOS		A	B		C	
Stops (vph)	4	272	265	3	50	9
Fuel Used(gal)	0	20	6	0	1	1
CO Emissions (g/hr)	28	1423	389	8	91	35
NOx Emissions (g/hr)	6	277	76	2	18	7
VOC Emissions (g/hr)	7	330	90	2	21	8
Dilemma Vehicles (#)	0	36	26	0	0	0
Queue Length 50th (ft)	3	150	88	0	37	0
Queue Length 95th (ft)	6	272	316	7	68	16
Internal Link Dist (ft)		1556	533		1014	
Turn Bay Length (ft)	185			185	140	
Base Capacity (vph)	529	1496	1311	1267	218	364
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.07	0.53	0.38	0.02	0.32	0.19

Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 90			
Offset: 84 (93%), Referenced to phase 2:EBTL and 6:WBT, Start of Green			
Natural Cycle: 50			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.53			
Intersection Signal Delay: 9.2		Intersection LOS: A	
Intersection Capacity Utilization 56.0%		ICU Level of Service B	
Analysis Period (min) 15			

Splits and Phases: 103: Ackman Rd & Redtail Dr

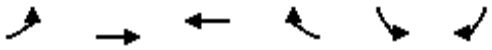
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	722	87	100	406	105	239
Future Volume (vph)	722	87	100	406	105	239
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)		185	185		185	0
Storage Lanes		1	1		1	1
Taper Length (ft)			200		200	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850				0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	1863	1553	1787	1827	1687	1568
Flt Permitted			0.177		0.950	
Satd. Flow (perm)	1863	1553	333	1827	1687	1568
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		134				174
Link Speed (mph)	40			40	40	
Link Distance (ft)	613			1319	1061	
Travel Time (s)	10.4			22.5	18.1	
Peak Hour Factor	0.93	0.65	0.80	0.90	0.66	0.65
Heavy Vehicles (%)	2%	4%	1%	4%	7%	3%
Adj. Flow (vph)	776	134	125	451	159	368
Shared Lane Traffic (%)						
Lane Group Flow (vph)	776	134	125	451	159	368
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	12			12	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	10			10	10	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Turn Type	NA	pm+ov	pm+pt	NA	Prot	pt+ov
Protected Phases	2	8	1	6	8	8 1
Permitted Phases		2	6			
Detector Phase	2	8	1	6	8	8 1
Switch Phase						
Minimum Initial (s)	15.0	8.0	3.0	15.0	8.0	
Minimum Split (s)	21.0	14.0	6.5	21.0	14.0	
Total Split (s)	56.0	25.0	9.0	65.0	25.0	
Total Split (%)	62.2%	27.8%	10.0%	72.2%	27.8%	
Maximum Green (s)	50.0	19.0	5.5	59.0	19.0	
Yellow Time (s)	4.5	4.5	3.5	4.5	4.5	
All-Red Time (s)	1.5	1.5	0.0	1.5	1.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	6.0	6.0	3.5	6.0	6.0	
Lead/Lag	Lag		Lead			
Lead-Lag Optimize?						
Vehicle Extension (s)	4.0	7.0	3.0	4.0	7.0	
Recall Mode	C-Min	None	None	C-Min	None	

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Act Effct Green (s)	49.8	74.2	62.1	59.6	18.4	28.2
Actuated g/C Ratio	0.55	0.82	0.69	0.66	0.20	0.31
v/c Ratio	0.75	0.10	0.38	0.37	0.46	0.60
Control Delay	17.9	0.4	12.5	12.0	35.8	17.7
Queue Delay	0.1	0.0	0.0	0.0	0.0	0.0
Total Delay	18.0	0.4	12.5	12.0	35.8	17.7
LOS	B	A	B	B	D	B
Approach Delay	15.4			12.1	23.2	
Approach LOS	B			B	C	
Stops (vph)	482	2	47	219	89	108
Fuel Used(gal)	10	0	2	7	2	4
CO Emissions (g/hr)	725	27	113	474	167	255
NOx Emissions (g/hr)	141	5	22	92	33	50
VOC Emissions (g/hr)	168	6	26	110	39	59
Dilemma Vehicles (#)	42	0	0	28	0	0
Queue Length 50th (ft)	389	0	25	112	74	77
Queue Length 95th (ft)	273	1	71	277	97	90
Internal Link Dist (ft)	533			1239	981	
Turn Bay Length (ft)		185	185		185	
Base Capacity (vph)	1061	1327	332	1229	373	595
Starvation Cap Reductn	11	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.74	0.10	0.38	0.37	0.43	0.62

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 59 (66%), Referenced to phase 2:EBT and 6:WBTL, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.75
Intersection Signal Delay: 16.5 Intersection LOS: B
Intersection Capacity Utilization 63.5% ICU Level of Service B
Analysis Period (min) 15

Splits and Phases: 104: Swanson Rd & Ackman Rd



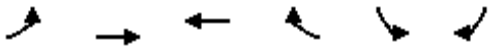
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	221	701	294	79	177	218
Future Volume (vph)	221	701	294	79	177	218
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	185			185	0	215
Storage Lanes	1			1	1	1
Taper Length (ft)	200				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1719	1881	1827	1553	1805	1599
Flt Permitted	0.452				0.950	
Satd. Flow (perm)	818	1881	1827	1553	1805	1599
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				101		256
Link Speed (mph)		40	40		45	
Link Distance (ft)		1319	1358		1117	
Travel Time (s)		22.5	23.1		16.9	
Peak Hour Factor	0.92	0.95	0.80	0.78	0.78	0.85
Heavy Vehicles (%)	5%	1%	4%	4%	0%	1%
Adj. Flow (vph)	240	738	368	101	227	256
Shared Lane Traffic (%)						
Lane Group Flow (vph)	240	738	368	101	227	256
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		12	12		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		10	10		10	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Turn Type	pm+pt	NA	NA	pm+ov	Prot	pt+ov
Protected Phases	5	2	6	4	4	4 5
Permitted Phases	2			6		
Detector Phase	5	2	6	4	4	4 5
Switch Phase						
Minimum Initial (s)	3.0	15.0	15.0	8.0	8.0	
Minimum Split (s)	6.5	21.0	21.0	14.0	14.0	
Total Split (s)	15.0	62.0	47.0	28.0	28.0	
Total Split (%)	16.7%	68.9%	52.2%	31.1%	31.1%	
Maximum Green (s)	11.5	56.0	41.0	22.0	22.0	
Yellow Time (s)	3.5	4.5	4.5	4.5	4.5	
All-Red Time (s)	0.0	1.5	1.5	1.5	1.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	3.5	6.0	6.0	6.0	6.0	
Lead/Lag	Lead		Lag			
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	7.0	7.0	4.0	4.0	
Recall Mode	None	C-Min	C-Min	None	None	

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Act Effct Green (s)	63.0	60.5	47.4	70.8	17.5	30.6
Actuated g/C Ratio	0.70	0.67	0.53	0.79	0.19	0.34
v/c Ratio	0.36	0.58	0.38	0.08	0.65	0.36
Control Delay	4.7	6.6	15.5	0.7	41.8	3.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	4.7	6.6	15.5	0.7	41.8	3.9
LOS	A	A	B	A	D	A
Approach Delay		6.2	12.3		21.7	
Approach LOS		A	B		C	
Stops (vph)	50	212	175	3	158	20
Fuel Used(gal)	3	9	5	1	5	2
CO Emissions (g/hr)	188	650	374	54	332	140
NOx Emissions (g/hr)	36	127	73	10	65	27
VOC Emissions (g/hr)	43	151	87	12	77	32
Dilemma Vehicles (#)	0	33	16	0	0	0
Queue Length 50th (ft)	34	135	120	0	119	0
Queue Length 95th (ft)	m52	154	181	7	155	36
Internal Link Dist (ft)		1239	1278		1037	
Turn Bay Length (ft)	185			185		215
Base Capacity (vph)	688	1265	961	1316	441	720
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.35	0.58	0.38	0.08	0.51	0.36

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBT, Start of Green, Master Intersection
Natural Cycle: 50
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.65
Intersection Signal Delay: 11.6 Intersection LOS: B
Intersection Capacity Utilization 56.7% ICU Level of Service B
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 105: Ackman Rd & Huntley Rd



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	70	687	880	117	63	41
Future Volume (vph)	70	687	880	117	63	41
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	185			185	140	0
Storage Lanes	1			1	1	1
Taper Length (ft)	200				45	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1736	1881	1881	1583	1770	1615
Flt Permitted	0.181				0.950	
Satd. Flow (perm)	331	1881	1881	1583	1770	1615
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				123		53
Link Speed (mph)		40	40		35	
Link Distance (ft)		1636	613		1094	
Travel Time (s)		27.9	10.4		21.3	
Peak Hour Factor	0.75	0.95	0.95	0.95	0.75	0.78
Heavy Vehicles (%)	4%	1%	1%	2%	2%	0%
Adj. Flow (vph)	93	723	926	123	84	53
Shared Lane Traffic (%)						
Lane Group Flow (vph)	93	723	926	123	84	53
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		12	12		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		10	10		10	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Turn Type	pm+pt	NA	NA	pm+ov	Prot	pt+ov
Protected Phases	5	2	6	4	4	4 5
Permitted Phases	2			6		
Detector Phase	5	2	6	4	4	4 5
Switch Phase						
Minimum Initial (s)	3.0	15.0	15.0	8.0	8.0	
Minimum Split (s)	6.5	21.0	21.0	14.0	14.0	
Total Split (s)	9.5	78.5	69.0	21.5	21.5	
Total Split (%)	9.5%	78.5%	69.0%	21.5%	21.5%	
Maximum Green (s)	6.0	72.5	63.0	15.5	15.5	
Yellow Time (s)	3.5	4.5	4.5	4.5	4.5	
All-Red Time (s)	0.0	1.5	1.5	1.5	1.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	3.5	6.0	6.0	6.0	6.0	
Lead/Lag	Lead		Lag			
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	7.0	7.0	4.0	4.0	
Recall Mode	None	C-Min	C-Min	None	None	

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Act Effct Green (s)	79.3	76.8	68.7	87.1	11.2	21.1
Actuated g/C Ratio	0.79	0.77	0.69	0.87	0.11	0.21
v/c Ratio	0.26	0.50	0.72	0.09	0.43	0.14
Control Delay	4.4	6.1	9.1	0.2	47.4	9.4
Queue Delay	0.0	0.0	0.5	0.0	0.0	0.0
Total Delay	4.4	6.1	9.6	0.2	47.4	9.4
LOS	A	A	A	A	D	A
Approach Delay		5.9	8.5		32.7	
Approach LOS		A	A		C	
Stops (vph)	14	243	431	2	57	9
Fuel Used(gal)	2	19	10	1	2	0
CO Emissions (g/hr)	124	1303	665	36	107	33
NOx Emissions (g/hr)	24	253	129	7	21	6
VOC Emissions (g/hr)	29	302	154	8	25	8
Dilemma Vehicles (#)	0	34	29	0	0	0
Queue Length 50th (ft)	10	139	178	0	51	0
Queue Length 95th (ft)	20	244	393	m1	78	22
Internal Link Dist (ft)		1556	533		1014	
Turn Bay Length (ft)	185			185	140	
Base Capacity (vph)	354	1445	1292	1435	274	352
Starvation Cap Reductn	0	0	106	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.26	0.50	0.78	0.09	0.31	0.15

Intersection Summary			
Area Type:	Other		
Cycle Length: 100			
Actuated Cycle Length: 100			
Offset: 15 (15%), Referenced to phase 2:EBTL and 6:WBT, Start of Green			
Natural Cycle: 60			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.72			
Intersection Signal Delay: 9.1		Intersection LOS: A	
Intersection Capacity Utilization 70.2%		ICU Level of Service C	
Analysis Period (min) 15			

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

Splits and Phases: 103: Ackman Rd & Redtail Dr

Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (vph)	594	173	122	910	96	138
Future Volume (vph)	594	173	122	910	96	138
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)		185	185		185	0
Storage Lanes		1	1		1	1
Taper Length (ft)			200		200	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt		0.850				0.850
Flt Protected			0.950		0.950	
Satd. Flow (prot)	1863	1615	1770	1881	1805	1615
Flt Permitted			0.304		0.950	
Satd. Flow (perm)	1863	1615	566	1881	1805	1615
Right Turn on Red		Yes				Yes
Satd. Flow (RTOR)		192				184
Link Speed (mph)	40			40	40	
Link Distance (ft)	613			1319	1061	
Travel Time (s)	10.4			22.5	18.1	
Peak Hour Factor	0.96	0.90	0.81	0.89	0.56	0.75
Heavy Vehicles (%)	2%	0%	2%	1%	0%	0%
Adj. Flow (vph)	619	192	151	1022	171	184
Shared Lane Traffic (%)						
Lane Group Flow (vph)	619	192	151	1022	171	184
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Right	Left	Left	Left	Right
Median Width(ft)	12			12	12	
Link Offset(ft)	0			0	0	
Crosswalk Width(ft)	10			10	10	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)		9	15		15	9
Turn Type	NA	pm+ov	pm+pt	NA	Prot	pt+ov
Protected Phases	2	8	1	6	8	8 1
Permitted Phases		2	6			
Detector Phase	2	8	1	6	8	8 1
Switch Phase						
Minimum Initial (s)	15.0	8.0	3.0	15.0	8.0	
Minimum Split (s)	21.0	14.0	6.5	21.0	14.0	
Total Split (s)	65.0	25.0	10.0	75.0	25.0	
Total Split (%)	65.0%	25.0%	10.0%	75.0%	25.0%	
Maximum Green (s)	59.0	19.0	6.5	69.0	19.0	
Yellow Time (s)	4.5	4.5	3.5	4.5	4.5	
All-Red Time (s)	1.5	1.5	0.0	1.5	1.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	6.0	6.0	3.5	6.0	6.0	
Lead/Lag	Lag		Lead			
Lead-Lag Optimize?						
Vehicle Extension (s)	4.0	7.0	3.0	4.0	7.0	
Recall Mode	C-Min	None	None	C-Min	None	

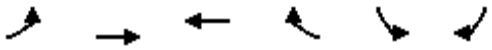
Lane Group	EBT	EBR	WBL	WBT	NBL	NBR
Act Effct Green (s)	59.9	83.6	72.8	70.3	17.7	28.1
Actuated g/C Ratio	0.60	0.84	0.73	0.70	0.18	0.28
v/c Ratio	0.55	0.14	0.31	0.77	0.54	0.31
Control Delay	12.1	0.4	4.3	8.6	43.8	5.7
Queue Delay	0.1	0.0	0.0	0.2	0.0	0.0
Total Delay	12.3	0.4	4.3	8.7	43.8	5.7
LOS	B	A	A	A	D	A
Approach Delay	9.5			8.2	24.0	
Approach LOS	A			A	C	
Stops (vph)	364	5	24	248	84	17
Fuel Used(gal)	8	1	1	12	2	1
CO Emissions (g/hr)	525	55	100	850	166	92
NOx Emissions (g/hr)	102	11	20	165	32	18
VOC Emissions (g/hr)	122	13	23	197	38	21
Dilemma Vehicles (#)	26	0	0	36	0	0
Queue Length 50th (ft)	272	1	22	194	97	0
Queue Length 95th (ft)	333	1	m27	195	97	26
Internal Link Dist (ft)	533			1239	981	
Turn Bay Length (ft)		185	185		185	
Base Capacity (vph)	1126	1403	496	1326	346	574
Starvation Cap Reductn	68	0	0	0	0	0
Spillback Cap Reductn	0	0	0	31	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.59	0.14	0.30	0.79	0.49	0.32

Intersection Summary

Area Type: Other
Cycle Length: 100
Actuated Cycle Length: 100
Offset: 18 (18%), Referenced to phase 2:EBT and 6:WBTL, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.77
Intersection Signal Delay: 11.0 Intersection LOS: B
Intersection Capacity Utilization 64.6% ICU Level of Service C
Analysis Period (min) 15

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

Splits and Phases: 104: Swanson Rd & Ackman Rd

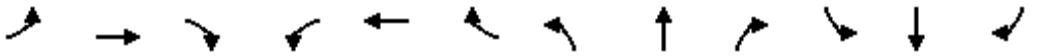


Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	268	478	768	259	101	248
Future Volume (vph)	268	478	768	259	101	248
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	185			185	0	215
Storage Lanes	1			1	1	1
Taper Length (ft)	200				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1787	1881	1881	1599	1805	1583
Flt Permitted	0.198				0.950	
Satd. Flow (perm)	372	1881	1881	1599	1805	1583
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				268		164
Link Speed (mph)		40	40		45	
Link Distance (ft)		1319	1358		1117	
Travel Time (s)		22.5	23.1		16.9	
Peak Hour Factor	0.91	0.95	0.95	0.95	0.86	0.80
Heavy Vehicles (%)	1%	1%	1%	1%	0%	2%
Adj. Flow (vph)	295	503	808	273	117	310
Shared Lane Traffic (%)						
Lane Group Flow (vph)	295	503	808	273	117	310
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		12	12		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		10	10		10	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Turn Type	pm+pt	NA	NA	pm+ov	Prot	pt+ov
Protected Phases	5	2	6	4	4	4 5
Permitted Phases	2			6		
Detector Phase	5	2	6	4	4	4 5
Switch Phase						
Minimum Initial (s)	3.0	15.0	15.0	8.0	8.0	
Minimum Split (s)	6.5	21.0	21.0	14.0	14.0	
Total Split (s)	18.0	80.0	62.0	20.0	20.0	
Total Split (%)	18.0%	80.0%	62.0%	20.0%	20.0%	
Maximum Green (s)	14.5	74.0	56.0	14.0	14.0	
Yellow Time (s)	3.5	4.5	4.5	4.5	4.5	
All-Red Time (s)	0.0	1.5	1.5	1.5	1.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	3.5	6.0	6.0	6.0	6.0	
Lead/Lag	Lead		Lag			
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	7.0	7.0	4.0	4.0	
Recall Mode	None	C-Min	C-Min	None	None	

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Act Effct Green (s)	77.9	75.4	61.0	79.7	12.6	27.0
Actuated g/C Ratio	0.78	0.75	0.61	0.80	0.13	0.27
v/c Ratio	0.67	0.35	0.70	0.21	0.52	0.57
Control Delay	20.8	7.4	18.8	0.8	48.7	17.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	20.8	7.4	18.8	0.8	48.7	17.8
LOS	C	A	B	A	D	B
Approach Delay		12.3	14.2		26.2	
Approach LOS		B	B		C	
Stops (vph)	176	185	529	8	91	100
Fuel Used(gal)	5	7	15	3	3	4
CO Emissions (g/hr)	368	476	1063	175	200	275
NOx Emissions (g/hr)	72	93	207	34	39	54
VOC Emissions (g/hr)	85	110	246	41	46	64
Dilemma Vehicles (#)	0	40	38	0	0	0
Queue Length 50th (ft)	105	97	347	1	68	73
Queue Length 95th (ft)	182	232	540	17	120	118
Internal Link Dist (ft)		1239	1278		1037	
Turn Bay Length (ft)	185			185		215
Base Capacity (vph)	494	1422	1148	1350	257	587
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.60	0.35	0.70	0.20	0.46	0.53

Intersection Summary			
Area Type:	Other		
Cycle Length: 100			
Actuated Cycle Length: 100			
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBT, Start of Green, Master Intersection			
Natural Cycle: 65			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.70			
Intersection Signal Delay: 15.8		Intersection LOS: B	
Intersection Capacity Utilization 75.3%		ICU Level of Service D	
Analysis Period (min) 15			

Splits and Phases: 105: Ackman Rd & Huntley Rd



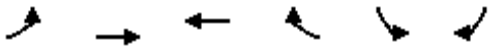
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	16	683	64	100	369	15	100	5	239	34	23	46
Future Volume (vph)	16	683	64	100	369	15	100	5	239	34	23	46
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	185		185	185		185	185		185	140		0
Storage Lanes	1		1	1		1	1		1	1		0
Taper Length (ft)	200			200			200			45		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850			0.850			0.850		0.899	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1327	1863	1583	1770	1827	1455	1770	1863	1583	1703	1697	0
Flt Permitted	0.532			0.167			0.692			0.655		
Satd. Flow (perm)	743	1863	1583	311	1827	1455	1289	1863	1583	1174	1697	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			121			79			202		68	
Link Speed (mph)		40			40			40			35	
Link Distance (ft)		1636			1932			769			1094	
Travel Time (s)		27.9			32.9			13.1			21.3	
Peak Hour Factor	0.46	0.95	0.65	0.80	0.95	0.64	0.66	0.66	0.95	0.83	0.70	0.68
Heavy Vehicles (%)	36%	2%	2%	2%	4%	11%	2%	2%	2%	6%	2%	0%
Adj. Flow (vph)	35	719	98	125	388	23	152	8	252	41	33	68
Shared Lane Traffic (%)												
Lane Group Flow (vph)	35	719	98	125	388	23	152	8	252	41	101	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		10			10			10			10	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	pm+pt	NA	pm+ov	pm+pt	NA	pm+ov	pm+pt	NA	pm+ov	pm+pt	NA	
Protected Phases	5	2	3	1	6	7	3	8	1	7	4	
Permitted Phases	2		2	6		6	8		8	4		
Detector Phase	5	2	3	1	6	7	3	8	1	7	4	
Switch Phase												
Minimum Initial (s)	3.0	15.0	3.0	3.0	15.0	3.0	3.0	8.0	3.0	3.0	8.0	
Minimum Split (s)	6.5	21.0	6.5	6.5	21.0	6.5	6.5	14.0	6.5	6.5	14.0	
Total Split (s)	7.0	50.0	10.0	13.0	56.0	7.0	10.0	20.0	13.0	7.0	17.0	
Total Split (%)	7.8%	55.6%	11.1%	14.4%	62.2%	7.8%	11.1%	22.2%	14.4%	7.8%	18.9%	
Maximum Green (s)	3.5	44.0	6.5	9.5	50.0	3.5	6.5	14.0	9.5	3.5	11.0	
Yellow Time (s)	3.5	4.5	3.5	3.5	4.5	3.5	3.5	4.5	3.5	3.5	4.5	
All-Red Time (s)	0.0	1.5	0.0	0.0	1.5	0.0	0.0	1.5	0.0	0.0	1.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	3.5	6.0	3.5	3.5	6.0	3.5	3.5	6.0	3.5	3.5	6.0	
Lead/Lag	Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	7.0	3.0	3.0	7.0	3.0	3.0	4.0	3.0	3.0	4.0	
Recall Mode	None	C-Min	None	None	C-Min	None	None	None	None	None	None	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Act Effct Green (s)	56.1	48.5	62.5	62.6	55.4	73.0	14.1	11.9	20.6	16.5	9.0	
Actuated g/C Ratio	0.62	0.54	0.69	0.70	0.62	0.81	0.16	0.13	0.23	0.18	0.10	
v/c Ratio	0.07	0.72	0.09	0.36	0.35	0.02	0.63	0.03	0.49	0.14	0.44	
Control Delay	5.9	22.3	1.0	8.3	7.2	0.1	48.6	35.0	11.2	27.6	21.7	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	5.9	22.3	1.0	8.3	7.2	0.1	48.6	35.0	11.2	27.6	21.7	
LOS	A	C	A	A	A	A	D	C	B	C	C	
Approach Delay		19.1			7.2			25.4			23.4	
Approach LOS		B			A			C			C	
Stops (vph)	6	511	3	31	146	0	79	6	55	27	27	
Fuel Used(gal)	0	23	1	2	7	0	2	0	2	1	1	
CO Emissions (g/hr)	31	1637	103	125	476	14	160	8	163	46	74	
NOx Emissions (g/hr)	6	319	20	24	93	3	31	2	32	9	14	
VOC Emissions (g/hr)	7	379	24	29	110	3	37	2	38	11	17	
Dilemma Vehicles (#)	0	38	0	0	14	0	0	0	0	0	3	
Queue Length 50th (ft)	5	294	0	8	148	0	~105	4	27	19	18	
Queue Length 95th (ft)	8	482	2	23	90	0	87	12	75	40	40	
Internal Link Dist (ft)		1556			1852			689			1014	
Turn Bay Length (ft)	185		185	185		185	185		185	140		
Base Capacity (vph)	496	1004	1135	374	1124	1195	243	319	539	283	267	
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.07	0.72	0.09	0.33	0.35	0.02	0.63	0.03	0.47	0.14	0.38	

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 28 (31%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 60
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.72
Intersection Signal Delay: 17.5 Intersection LOS: B
Intersection Capacity Utilization 67.0% ICU Level of Service C
Analysis Period (min) 15
~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.

Splits and Phases: 103: Ackman Rd & Redtail Dr



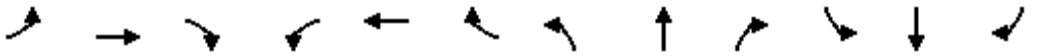
Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	221	701	294	79	177	218
Future Volume (vph)	221	701	294	79	177	218
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	195			185	0	215
Storage Lanes	1			1	1	1
Taper Length (ft)	200				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1719	1881	1827	1553	1805	1599
Flt Permitted	0.452				0.950	
Satd. Flow (perm)	818	1881	1827	1553	1805	1599
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				101		256
Link Speed (mph)		40	40		45	
Link Distance (ft)		1932	1358		1117	
Travel Time (s)		32.9	23.1		16.9	
Peak Hour Factor	0.92	0.95	0.80	0.78	0.78	0.85
Heavy Vehicles (%)	5%	1%	4%	4%	0%	1%
Adj. Flow (vph)	240	738	368	101	227	256
Shared Lane Traffic (%)						
Lane Group Flow (vph)	240	738	368	101	227	256
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		12	12		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		10	10		10	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Turn Type	pm+pt	NA	NA	pm+ov	Prot	pt+ov
Protected Phases	5	2	6	4	4	4 5
Permitted Phases	2			6		
Detector Phase	5	2	6	4	4	4 5
Switch Phase						
Minimum Initial (s)	3.0	15.0	15.0	8.0	8.0	
Minimum Split (s)	6.5	21.0	21.0	14.0	14.0	
Total Split (s)	15.0	62.0	47.0	28.0	28.0	
Total Split (%)	16.7%	68.9%	52.2%	31.1%	31.1%	
Maximum Green (s)	11.5	56.0	41.0	22.0	22.0	
Yellow Time (s)	3.5	4.5	4.5	4.5	4.5	
All-Red Time (s)	0.0	1.5	1.5	1.5	1.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	3.5	6.0	6.0	6.0	6.0	
Lead/Lag	Lead		Lag			
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	7.0	7.0	4.0	4.0	
Recall Mode	None	C-Min	C-Min	None	None	

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Act Effct Green (s)	63.0	60.5	47.4	70.8	17.5	30.6
Actuated g/C Ratio	0.70	0.67	0.53	0.79	0.19	0.34
v/c Ratio	0.36	0.58	0.38	0.08	0.65	0.36
Control Delay	3.8	7.4	15.5	0.7	41.8	3.9
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	3.8	7.4	15.5	0.7	41.8	3.9
LOS	A	A	B	A	D	A
Approach Delay		6.5	12.3		21.7	
Approach LOS		A	B		C	
Stops (vph)	52	349	175	3	158	20
Fuel Used(gal)	4	14	5	1	5	2
CO Emissions (g/hr)	250	955	374	54	332	140
NOx Emissions (g/hr)	49	186	73	10	65	27
VOC Emissions (g/hr)	58	221	87	12	77	32
Dilemma Vehicles (#)	0	14	16	0	0	0
Queue Length 50th (ft)	16	55	120	0	119	0
Queue Length 95th (ft)	m59	476	181	7	155	36
Internal Link Dist (ft)		1852	1278		1037	
Turn Bay Length (ft)	195			185		215
Base Capacity (vph)	688	1265	961	1316	441	720
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.35	0.58	0.38	0.08	0.51	0.36

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBT, Start of Green, Master Intersection
Natural Cycle: 50
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.65
Intersection Signal Delay: 11.7 Intersection LOS: B
Intersection Capacity Utilization 56.7% ICU Level of Service B
Analysis Period (min) 15
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 105: Ackman Rd & Huntley Rd



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	70	543	144	122	799	102	81	15	138	34	29	41
Future Volume (vph)	70	543	144	122	799	102	81	15	138	34	29	41
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	185		185	185		185	185		185	140		0
Storage Lanes	1		1	1		1	1		1	1		0
Taper Length (ft)	200			200			200			45		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Frt			0.850			0.850			0.850		0.915	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1736	1881	1583	1770	1881	1583	1770	1863	1583	1770	1723	0
Flt Permitted	0.156			0.295			0.696			0.514		
Satd. Flow (perm)	285	1881	1583	550	1881	1583	1296	1863	1583	957	1723	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			152			107			184		53	
Link Speed (mph)		40			40			40			35	
Link Distance (ft)		1636			1932			757			1094	
Travel Time (s)		27.9			32.9			12.9			21.3	
Peak Hour Factor	0.75	0.95	0.95	0.95	0.95	0.95	0.56	0.56	0.75	0.75	0.70	0.78
Heavy Vehicles (%)	4%	1%	2%	2%	1%	2%	2%	2%	2%	2%	2%	0%
Adj. Flow (vph)	93	572	152	128	841	107	145	27	184	45	41	53
Shared Lane Traffic (%)												
Lane Group Flow (vph)	93	572	152	128	841	107	145	27	184	45	94	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		10			10			10			10	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	pm+pt	NA	pm+ov	pm+pt	NA	pm+ov	pm+pt	NA	pm+ov	pm+pt	NA	
Protected Phases	5	2	3	1	6	7	3	8	1	7	4	
Permitted Phases	2		2	6		6	8		8	4		
Detector Phase	5	2	3	1	6	7	3	8	1	7	4	
Switch Phase												
Minimum Initial (s)	3.0	15.0	3.0	3.0	15.0	3.0	3.0	8.0	3.0	3.0	8.0	
Minimum Split (s)	6.5	21.0	6.5	6.5	21.0	6.5	6.5	14.0	6.5	6.5	14.0	
Total Split (s)	8.0	50.0	9.0	14.0	56.0	7.0	9.0	19.0	14.0	7.0	17.0	
Total Split (%)	8.9%	55.6%	10.0%	15.6%	62.2%	7.8%	10.0%	21.1%	15.6%	7.8%	18.9%	
Maximum Green (s)	4.5	44.0	5.5	10.5	50.0	3.5	5.5	13.0	10.5	3.5	11.0	
Yellow Time (s)	3.5	4.5	3.5	3.5	4.5	3.5	3.5	4.5	3.5	3.5	4.5	
All-Red Time (s)	0.0	1.5	0.0	0.0	1.5	0.0	0.0	1.5	0.0	0.0	1.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	3.5	6.0	3.5	3.5	6.0	3.5	3.5	6.0	3.5	3.5	6.0	
Lead/Lag	Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag	Lead	Lead	Lag	
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	7.0	3.0	3.0	7.0	3.0	3.0	4.0	3.0	3.0	4.0	
Recall Mode	None	C-Min	None	None	C-Min	None	None	None	None	None	None	

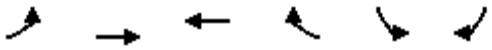
Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Act Effct Green (s)	58.3	50.0	63.0	62.5	53.8	70.6	13.0	9.8	17.9	16.1	9.2	
Actuated g/C Ratio	0.65	0.56	0.70	0.69	0.60	0.78	0.14	0.11	0.20	0.18	0.10	
v/c Ratio	0.34	0.55	0.13	0.26	0.75	0.08	0.65	0.13	0.40	0.17	0.42	
Control Delay	8.6	16.4	1.4	4.1	13.0	0.6	49.0	36.5	6.4	28.7	25.1	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Total Delay	8.6	16.4	1.4	4.1	13.0	0.6	49.0	36.5	6.4	28.7	25.1	
LOS	A	B	A	A	B	A	D	D	A	C	C	
Approach Delay		12.8			10.7			26.0			26.2	
Approach LOS		B			B			C			C	
Stops (vph)	26	347	9	22	510	4	70	14	17	29	33	
Fuel Used(gal)	2	17	3	2	18	1	2	0	1	1	1	
CO Emissions (g/hr)	136	1216	235	134	1231	97	134	23	74	48	81	
NOx Emissions (g/hr)	26	237	46	26	239	19	26	4	14	9	16	
VOC Emissions (g/hr)	32	282	54	31	285	22	31	5	17	11	19	
Dilemma Vehicles (#)	0	30	0	0	32	0	0	1	0	0	3	
Queue Length 50th (ft)	14	198	0	13	211	0	~109	14	0	21	22	
Queue Length 95th (ft)	26	331	20	m22	311	m2	71	23	24	39	45	
Internal Link Dist (ft)		1556			1852			677			1014	
Turn Bay Length (ft)	185		185	185		185	185		185	140		
Base Capacity (vph)	277	1045	1152	531	1129	1265	223	269	506	269	257	
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0	0	
Reduced v/c Ratio	0.34	0.55	0.13	0.24	0.74	0.08	0.65	0.10	0.36	0.17	0.37	

Intersection Summary

Area Type: Other
Cycle Length: 90
Actuated Cycle Length: 90
Offset: 36 (40%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green
Natural Cycle: 70
Control Type: Actuated-Coordinated
Maximum v/c Ratio: 0.75
Intersection Signal Delay: 14.6 Intersection LOS: B
Intersection Capacity Utilization 70.4% ICU Level of Service C
Analysis Period (min) 15

~ Volume exceeds capacity, queue is theoretically infinite.
Queue shown is maximum after two cycles.
m Volume for 95th percentile queue is metered by upstream signal.

Splits and Phases: 103: Ackman Rd & Redtail Dr



Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (vph)	268	478	768	259	101	248
Future Volume (vph)	268	478	768	259	101	248
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Storage Length (ft)	195			185	0	215
Storage Lanes	1			1	1	1
Taper Length (ft)	200				25	
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00
Frt				0.850		0.850
Flt Protected	0.950				0.950	
Satd. Flow (prot)	1787	1881	1881	1599	1805	1583
Flt Permitted	0.175				0.950	
Satd. Flow (perm)	329	1881	1881	1599	1805	1583
Right Turn on Red				Yes		Yes
Satd. Flow (RTOR)				249		149
Link Speed (mph)		40	40		45	
Link Distance (ft)		1932	1358		1117	
Travel Time (s)		32.9	23.1		16.9	
Peak Hour Factor	0.91	0.95	0.95	0.95	0.86	0.80
Heavy Vehicles (%)	1%	1%	1%	1%	0%	2%
Adj. Flow (vph)	295	503	808	273	117	310
Shared Lane Traffic (%)						
Lane Group Flow (vph)	295	503	808	273	117	310
Enter Blocked Intersection	No	No	No	No	No	No
Lane Alignment	Left	Left	Left	Right	Left	Right
Median Width(ft)		12	12		12	
Link Offset(ft)		0	0		0	
Crosswalk Width(ft)		10	10		10	
Two way Left Turn Lane						
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15			9	15	9
Turn Type	pm+pt	NA	NA	pm+ov	Prot	pt+ov
Protected Phases	5	2	6	4	4	4 5
Permitted Phases	2			6		
Detector Phase	5	2	6	4	4	4 5
Switch Phase						
Minimum Initial (s)	3.0	15.0	15.0	8.0	8.0	
Minimum Split (s)	6.5	21.0	21.0	14.0	14.0	
Total Split (s)	17.0	71.0	54.0	19.0	19.0	
Total Split (%)	18.9%	78.9%	60.0%	21.1%	21.1%	
Maximum Green (s)	13.5	65.0	48.0	13.0	13.0	
Yellow Time (s)	3.5	4.5	4.5	4.5	4.5	
All-Red Time (s)	0.0	1.5	1.5	1.5	1.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	3.5	6.0	6.0	6.0	6.0	
Lead/Lag	Lead		Lag			
Lead-Lag Optimize?						
Vehicle Extension (s)	3.0	7.0	7.0	4.0	4.0	
Recall Mode	None	C-Min	C-Min	None	None	

Lane Group	EBL	EBT	WBT	WBR	SBL	SBR
Act Effct Green (s)	68.8	66.3	51.9	69.6	11.7	26.1
Actuated g/C Ratio	0.76	0.74	0.58	0.77	0.13	0.29
v/c Ratio	0.69	0.36	0.74	0.21	0.50	0.55
Control Delay	13.6	4.2	20.8	1.0	43.8	16.7
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	13.6	4.2	20.8	1.0	43.8	16.7
LOS	B	A	C	A	D	B
Approach Delay		7.7	15.8		24.2	
Approach LOS		A	B		C	
Stops (vph)	119	182	562	12	92	106
Fuel Used(gal)	5	8	16	3	3	4
CO Emissions (g/hr)	379	591	1107	179	194	277
NOx Emissions (g/hr)	74	115	215	35	38	54
VOC Emissions (g/hr)	88	137	257	41	45	64
Dilemma Vehicles (#)	0	16	42	0	0	0
Queue Length 50th (ft)	43	142	334	3	62	70
Queue Length 95th (ft)	63	38	528	20	110	114
Internal Link Dist (ft)		1852	1278		1037	
Turn Bay Length (ft)	195			185		215
Base Capacity (vph)	470	1386	1085	1313	260	589
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.63	0.36	0.74	0.21	0.45	0.53

Intersection Summary			
Area Type:	Other		
Cycle Length: 90			
Actuated Cycle Length: 90			
Offset: 0 (0%), Referenced to phase 2:EBTL and 6:WBT, Start of Green, Master Intersection			
Natural Cycle: 65			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.74			
Intersection Signal Delay: 14.5		Intersection LOS: B	
Intersection Capacity Utilization 75.3%		ICU Level of Service D	
Analysis Period (min) 15			

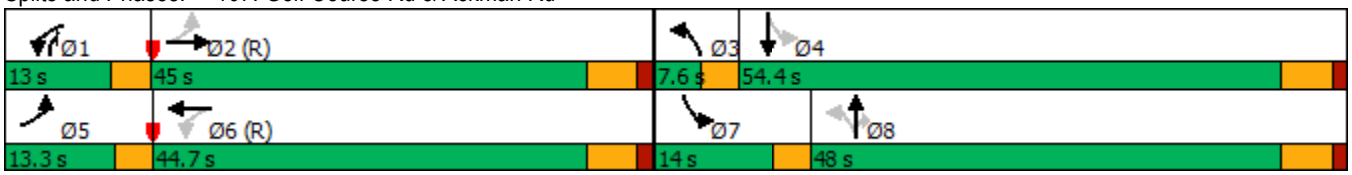
Splits and Phases: 105: Ackman Rd & Huntley Rd

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	168	725	28	50	222	30	71	445	190	154	217	96
Future Volume (vph)	168	725	28	50	222	30	71	445	190	154	217	96
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	11	11	12	11	11	12	12	12	12	12	12
Storage Length (ft)	185		0	185		0	145		145	125		0
Storage Lanes	1		0	1		0	1		1	1		0
Taper Length (ft)	200			200			105			155		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor									0.99			
Frt		0.992			0.974				0.850		0.954	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1787	3429	0	1543	3187	0	1805	1863	1615	1805	1777	0
Flt Permitted	0.537			0.230			0.486			0.159		
Satd. Flow (perm)	1010	3429	0	374	3187	0	923	1863	1595	302	1777	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		5			21				91		22	
Link Speed (mph)		40			40			35			30	
Link Distance (ft)		523			466			1564			1951	
Travel Time (s)		8.9			7.9			30.5			44.3	
Confl. Bikes (#/hr)									1			
Peak Hour Factor	0.95	0.95	0.65	0.69	0.95	0.62	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	1%	1%	0%	17%	8%	0%	0%	2%	0%	0%	2%	2%
Adj. Flow (vph)	177	763	43	72	234	48	75	468	200	162	228	101
Shared Lane Traffic (%)												
Lane Group Flow (vph)	177	806	0	72	282	0	75	468	200	162	329	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		10			10			10			10	
Two way Left Turn Lane												
Headway Factor	1.00	1.04	1.04	1.00	1.04	1.04	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA	pm+ov	pm+pt	NA	
Protected Phases	5	2		1	6		3	8	1	7	4	
Permitted Phases	2			6			8		8	4		
Detector Phase	5	2		1	6		3	8	1	7	4	
Switch Phase												
Minimum Initial (s)	3.0	15.0		3.0	15.0		3.0	8.0	3.0	3.0	8.0	
Minimum Split (s)	6.5	21.0		6.5	21.0		6.5	14.0	6.5	6.5	14.0	
Total Split (s)	13.3	45.0		13.0	44.7		7.6	48.0	13.0	14.0	54.4	
Total Split (%)	11.1%	37.5%		10.8%	37.3%		6.3%	40.0%	10.8%	11.7%	45.3%	
Maximum Green (s)	9.8	39.0		9.5	38.7		4.1	42.0	9.5	10.5	48.4	
Yellow Time (s)	3.5	4.5		3.5	4.5		3.5	4.5	3.5	3.5	4.5	
All-Red Time (s)	0.0	1.5		0.0	1.5		0.0	1.5	0.0	0.0	1.5	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	3.5	6.0		3.5	6.0		3.5	6.0	3.5	3.5	6.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag	Lead	Lead	Lag	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	7.0		3.0	7.0		3.0	4.0	3.0	3.0	4.0	
Recall Mode	None	C-Min		None	C-Min		None	None	None	None	None	
Act Effct Green (s)	59.1	46.2		54.5	43.9		44.0	35.5	46.1	52.7	42.6	
Actuated g/C Ratio	0.49	0.38		0.45	0.37		0.37	0.30	0.38	0.44	0.36	
v/c Ratio	0.31	0.61		0.29	0.24		0.20	0.85	0.30	0.60	0.51	
Control Delay	19.6	33.3		22.4	27.3		20.2	54.5	12.2	29.1	30.9	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay	19.6	33.3		22.4	27.3		20.2	54.5	12.2	29.1	30.9	
LOS	B	C		C	C		C	D	B	C	C	
Approach Delay		30.8			26.3			39.6			30.3	
Approach LOS		C			C			D			C	
Stops (vph)	97	598		28	151		44	407	64	89	223	
Fuel Used(gal)	5	24		1	6		1	13	3	4	8	
CO Emissions (g/hr)	316	1677		76	408		100	910	217	262	557	
NOx Emissions (g/hr)	62	326		15	79		19	177	42	51	108	
VOC Emissions (g/hr)	73	389		18	94		23	211	50	61	129	
Dilemma Vehicles (#)	0	31		0	8		0	18	0	0	0	
Queue Length 50th (ft)	78	273		32	72		32	337	51	72	189	
Queue Length 95th (ft)	130	361		m48	m104		58	439	93	111	254	
Internal Link Dist (ft)		443			386			1484			1871	
Turn Bay Length (ft)	185			185			145		145	125		
Base Capacity (vph)	570	1323		266	1178		382	652	687	274	729	
Starvation Cap Reductn	0	0		0	0		0	0	0	0	0	
Spillback Cap Reductn	0	0		0	0		0	0	0	0	0	
Storage Cap Reductn	0	0		0	0		0	0	0	0	0	
Reduced v/c Ratio	0.31	0.61		0.27	0.24		0.20	0.72	0.29	0.59	0.45	

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 113 (94%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green			
Natural Cycle: 60			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.85			
Intersection Signal Delay: 32.6		Intersection LOS: C	
Intersection Capacity Utilization 72.9%		ICU Level of Service C	
Analysis Period (min) 15			
m Volume for 95th percentile queue is metered by upstream signal.			

Splits and Phases: 107: Golf Course Rd & Ackman Rd

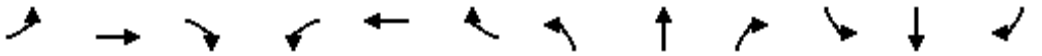


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	4	998	3	18	267	8	11	31	149	33	7	16
Future Volume (vph)	4	998	3	18	267	8	11	31	149	33	7	16
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	185		185	185		185	0		0	0		0
Storage Lanes	1		1	1		1	0		0	0		0
Taper Length (ft)	200			200			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor	1.00					0.97						
Frt			0.850			0.850		0.916			0.941	
Flt Protected	0.950			0.950				0.997			0.979	
Satd. Flow (prot)	1805	1881	1615	1597	1727	1615	0	1714	0	0	1750	0
Flt Permitted	0.587			0.136				0.981			0.395	
Satd. Flow (perm)	1111	1881	1615	229	1727	1573	0	1686	0	0	706	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			59			59		59			28	
Link Speed (mph)		40			40			30			30	
Link Distance (ft)		821			906			721			745	
Travel Time (s)		14.0			15.4			16.4			16.9	
Confl. Peds. (#/hr)	8					8						
Confl. Bikes (#/hr)						1						
Peak Hour Factor	0.38	0.95	0.50	0.47	0.95	0.58	0.88	0.38	0.95	0.78	0.50	0.36
Heavy Vehicles (%)	0%	1%	0%	13%	10%	0%	0%	0%	2%	0%	0%	0%
Adj. Flow (vph)	11	1051	6	38	281	14	13	82	157	42	14	44
Shared Lane Traffic (%)												
Lane Group Flow (vph)	11	1051	6	38	281	14	0	252	0	0	100	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		10			10			10			10	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2		2	6		6	8			4		
Detector Phase	5	2	2	1	6	6	8	8		4	4	
Switch Phase												
Minimum Initial (s)	2.0	15.0	15.0	3.0	15.0	15.0	8.0	8.0		8.0	8.0	
Minimum Split (s)	6.5	21.0	21.0	6.5	21.0	21.0	14.0	14.0		14.0	14.0	
Total Split (s)	6.5	87.4	87.4	6.6	87.5	87.5	26.0	26.0		26.0	26.0	
Total Split (%)	5.4%	72.8%	72.8%	5.5%	72.9%	72.9%	21.7%	21.7%		21.7%	21.7%	
Maximum Green (s)	3.0	81.4	81.4	3.1	81.5	81.5	20.0	20.0		20.0	20.0	
Yellow Time (s)	3.5	4.5	4.5	3.5	4.5	4.5	4.5	4.5		4.5	4.5	
All-Red Time (s)	0.0	1.5	1.5	0.0	1.5	1.5	1.5	1.5		1.5	1.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0		0.0			0.0	
Total Lost Time (s)	3.5	6.0	6.0	3.5	6.0	6.0		6.0			6.0	
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag						

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	7.0	7.0	3.0	7.0	7.0	4.0	4.0		4.0	4.0	
Recall Mode	None	C-Min	C-Min	None	C-Min	C-Min	None	None		None	None	
Act Effct Green (s)	90.2	85.9	85.9	91.7	88.6	88.6		18.1			18.1	
Actuated g/C Ratio	0.75	0.72	0.72	0.76	0.74	0.74		0.15			0.15	
v/c Ratio	0.01	0.78	0.01	0.17	0.22	0.01		0.83			0.77	
Control Delay	2.8	16.5	0.0	5.0	4.8	0.0		59.9			70.2	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0			0.0	
Total Delay	2.8	16.5	0.0	5.0	4.8	0.0		59.9			70.2	
LOS	A	B	A	A	A	A		E			E	
Approach Delay		16.2			4.6			59.9			70.2	
Approach LOS		B			A			E			E	
Stops (vph)	1	609	0	4	70	0		138			36	
Fuel Used(gal)	0	21	0	0	4	0		4			1	
CO Emissions (g/hr)	4	1469	2	20	305	7		293			93	
NOx Emissions (g/hr)	1	286	0	4	59	1		57			18	
VOC Emissions (g/hr)	1	340	1	5	71	2		68			21	
Dilemma Vehicles (#)	0	22	0	0	9	0		0			0	
Queue Length 50th (ft)	1	295	0	5	46	0		145			53	
Queue Length 95th (ft)	2	353	m0	6	85	0		63			49	
Internal Link Dist (ft)		741			826			641			665	
Turn Bay Length (ft)	185		185	185		185						
Base Capacity (vph)	858	1346	1173	222	1275	1176		330			141	
Starvation Cap Reductn	0	0	0	0	0	0		0			0	
Spillback Cap Reductn	0	0	0	0	0	0		0			0	
Storage Cap Reductn	0	0	0	0	0	0		0			0	
Reduced v/c Ratio	0.01	0.78	0.01	0.17	0.22	0.01		0.76			0.71	

Intersection Summary			
Area Type:	Other		
Cycle Length: 120			
Actuated Cycle Length: 120			
Offset: 114 (95%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green			
Natural Cycle: 80			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.83			
Intersection Signal Delay: 23.4		Intersection LOS: C	
Intersection Capacity Utilization 78.5%		ICU Level of Service D	
Analysis Period (min) 15			
m Volume for 95th percentile queue is metered by upstream signal.			

Splits and Phases: 108: Westport Ridge & Ackman Rd

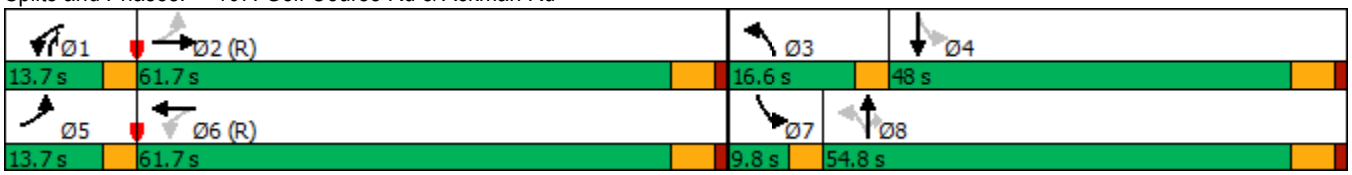


Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	87	431	73	138	866	118	139	281	99	83	282	90
Future Volume (vph)	87	431	73	138	866	118	139	281	99	83	282	90
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Lane Width (ft)	12	11	11	12	11	11	12	12	12	12	12	12
Storage Length (ft)	185		0	185		0	145		145	125		0
Storage Lanes	1		0	1		0	1		1	1		0
Taper Length (ft)	200			200			105			155		
Lane Util. Factor	1.00	0.95	0.95	1.00	0.95	0.95	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor									0.99			
Frt		0.978			0.982				0.850		0.964	
Flt Protected	0.950			0.950			0.950			0.950		
Satd. Flow (prot)	1805	3384	0	1805	3397	0	1752	1900	1599	1787	1818	0
Flt Permitted	0.169			0.390			0.161			0.423		
Satd. Flow (perm)	321	3384	0	741	3397	0	297	1900	1579	796	1818	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)		16			13				104		12	
Link Speed (mph)		40			40			35			30	
Link Distance (ft)		549			449			1564			1951	
Travel Time (s)		9.4			7.7			30.5			44.3	
Confl. Bikes (#/hr)									1			
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles (%)	0%	1%	0%	0%	1%	0%	3%	0%	1%	1%	1%	0%
Adj. Flow (vph)	92	454	77	145	912	124	146	296	104	87	297	95
Shared Lane Traffic (%)												
Lane Group Flow (vph)	92	531	0	145	1036	0	146	296	104	87	392	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			12			12	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		10			10			10			10	
Two way Left Turn Lane												
Headway Factor	1.00	1.04	1.04	1.00	1.04	1.04	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	pm+pt	NA		pm+pt	NA		pm+pt	NA	pm+ov	pm+pt	NA	
Protected Phases	5	2		1	6		3	8	1	7	4	
Permitted Phases	2			6			8		8	4		
Detector Phase	5	2		1	6		3	8	1	7	4	
Switch Phase												
Minimum Initial (s)	3.0	15.0		3.0	15.0		3.0	8.0	3.0	3.0	8.0	
Minimum Split (s)	6.5	21.0		6.5	21.0		6.5	14.0	6.5	6.5	14.0	
Total Split (s)	13.7	61.7		13.7	61.7		16.6	54.8	13.7	9.8	48.0	
Total Split (%)	9.8%	44.1%		9.8%	44.1%		11.9%	39.1%	9.8%	7.0%	34.3%	
Maximum Green (s)	10.2	55.7		10.2	55.7		13.1	48.8	10.2	6.3	42.0	
Yellow Time (s)	3.5	4.5		3.5	4.5		3.5	4.5	3.5	3.5	4.5	
All-Red Time (s)	0.0	1.5		0.0	1.5		0.0	1.5	0.0	0.0	1.5	
Lost Time Adjust (s)	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Lost Time (s)	3.5	6.0		3.5	6.0		3.5	6.0	3.5	3.5	6.0	
Lead/Lag	Lead	Lag		Lead	Lag		Lead	Lag	Lead	Lead	Lag	

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	7.0		3.0	7.0		3.0	4.0	3.0	3.0	4.0	
Recall Mode	None	C-Min		None	C-Min		None	None	None	None	None	
Act Effct Green (s)	75.2	64.1		78.1	65.6		52.4	39.3	51.8	45.0	34.9	
Actuated g/C Ratio	0.54	0.46		0.56	0.47		0.37	0.28	0.37	0.32	0.25	
v/c Ratio	0.35	0.34		0.30	0.65		0.62	0.56	0.16	0.28	0.85	
Control Delay	19.1	25.8		16.1	28.0		39.9	46.0	4.3	29.6	65.4	
Queue Delay	0.0	0.0		0.0	0.0		0.0	0.0	0.0	0.0	0.0	
Total Delay	19.1	25.8		16.1	28.0		39.9	46.0	4.3	29.6	65.4	
LOS	B	C		B	C		D	D	A	C	E	
Approach Delay		24.8			26.5			36.4			58.9	
Approach LOS		C			C			D			E	
Stops (vph)	42	312		51	783		90	231	10	56	338	
Fuel Used(gal)	2	14		3	25		3	8	1	2	12	
CO Emissions (g/hr)	158	1008		180	1735		236	527	89	145	873	
NOx Emissions (g/hr)	31	196		35	338		46	103	17	28	170	
VOC Emissions (g/hr)	37	234		42	402		55	122	21	34	202	
Dilemma Vehicles (#)	0	18		0	46		0	10	0	0	0	
Queue Length 50th (ft)	38	161		53	332		88	232	0	50	331	
Queue Length 95th (ft)	73	224		m71	255		129	296	33	82	430	
Internal Link Dist (ft)		469			369			1484			1871	
Turn Bay Length (ft)	185			185			145		145	125		
Base Capacity (vph)	284	1558		499	1597		248	662	659	309	553	
Starvation Cap Reductn	0	0		0	0		0	0	0	0	0	
Spillback Cap Reductn	0	0		0	0		0	0	0	0	0	
Storage Cap Reductn	0	0		0	0		0	0	0	0	0	
Reduced v/c Ratio	0.32	0.34		0.29	0.65		0.59	0.45	0.16	0.28	0.71	

Intersection Summary			
Area Type:	Other		
Cycle Length: 140			
Actuated Cycle Length: 140			
Offset: 24 (17%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green			
Natural Cycle: 65			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.85			
Intersection Signal Delay: 33.5		Intersection LOS: C	
Intersection Capacity Utilization 77.2%		ICU Level of Service D	
Analysis Period (min) 15			
m Volume for 95th percentile queue is metered by upstream signal.			

Splits and Phases: 107: Golf Course Rd & Ackman Rd



Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (vph)	10	573	13	45	1098	43	14	7	43	11	3	11
Future Volume (vph)	10	573	13	45	1098	43	14	7	43	11	3	11
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Storage Length (ft)	185		185	185		185	0		0	0		0
Storage Lanes	1		1	1		1	0		0	0		0
Taper Length (ft)	200			200			25			25		
Lane Util. Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Ped Bike Factor						0.98		1.00			0.99	
Frt			0.850			0.850		0.920			0.961	
Flt Protected	0.950			0.950				0.986			0.978	
Satd. Flow (prot)	1805	1881	1615	1805	1881	1615	0	1724	0	0	1773	0
Flt Permitted	0.151			0.394				0.910			0.662	
Satd. Flow (perm)	287	1881	1615	749	1881	1582	0	1589	0	0	1200	0
Right Turn on Red			Yes			Yes			Yes			Yes
Satd. Flow (RTOR)			51			51		42			12	
Link Speed (mph)		40			40			30			30	
Link Distance (ft)		819			906			721			745	
Travel Time (s)		14.0			15.4			16.4			16.9	
Confl. Peds. (#/hr)							1					1
Confl. Bikes (#/hr)						1						
Peak Hour Factor	0.38	0.95	0.50	0.75	0.95	0.67	0.45	0.50	0.65	0.56	0.25	0.88
Heavy Vehicles (%)	0%	1%	0%	0%	1%	0%	0%	0%	0%	0%	0%	0%
Adj. Flow (vph)	26	603	26	60	1156	64	31	14	66	20	12	13
Shared Lane Traffic (%)												
Lane Group Flow (vph)	26	603	26	60	1156	64	0	111	0	0	45	0
Enter Blocked Intersection	No	No	No	No	No	No	No	No	No	No	No	No
Lane Alignment	Left	Left	Right	Left	Left	Right	Left	Left	Right	Left	Left	Right
Median Width(ft)		12			12			0			0	
Link Offset(ft)		0			0			0			0	
Crosswalk Width(ft)		10			10			10			10	
Two way Left Turn Lane												
Headway Factor	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Turning Speed (mph)	15		9	15		9	15		9	15		9
Turn Type	pm+pt	NA	Perm	pm+pt	NA	Perm	Perm	NA		Perm	NA	
Protected Phases	5	2		1	6			8			4	
Permitted Phases	2		2	6		6	8			4		
Detector Phase	5	2	2	1	6	6	8	8		4	4	
Switch Phase												
Minimum Initial (s)	3.0	15.0	15.0	3.0	15.0	15.0	8.0	8.0		8.0	8.0	
Minimum Split (s)	6.5	21.0	21.0	6.5	21.0	21.0	14.0	14.0		14.0	14.0	
Total Split (s)	6.6	113.2	113.2	6.8	113.4	113.4	20.0	20.0		20.0	20.0	
Total Split (%)	4.7%	80.9%	80.9%	4.9%	81.0%	81.0%	14.3%	14.3%		14.3%	14.3%	
Maximum Green (s)	3.1	107.2	107.2	3.3	107.4	107.4	14.0	14.0		14.0	14.0	
Yellow Time (s)	3.5	4.5	4.5	3.5	4.5	4.5	4.5	4.5		4.5	4.5	
All-Red Time (s)	0.0	1.5	1.5	0.0	1.5	1.5	1.5	1.5		1.5	1.5	
Lost Time Adjust (s)	0.0	0.0	0.0	0.0	0.0	0.0		0.0			0.0	
Total Lost Time (s)	3.5	6.0	6.0	3.5	6.0	6.0		6.0			6.0	
Lead/Lag	Lead	Lag	Lag	Lead	Lag	Lag						

Lane Group	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lead-Lag Optimize?												
Vehicle Extension (s)	3.0	7.0	7.0	3.0	7.0	7.0	4.0	4.0		4.0	4.0	
Recall Mode	None	C-Min	C-Min	None	C-Min	C-Min	None	None		None	None	
Act Effct Green (s)	115.8	109.7	109.7	116.8	111.8	111.8		11.7			11.7	
Actuated g/C Ratio	0.83	0.78	0.78	0.83	0.80	0.80		0.08			0.08	
v/c Ratio	0.09	0.41	0.02	0.09	0.77	0.05		0.65			0.41	
Control Delay	2.2	6.8	0.2	2.0	9.9	1.2		55.7			57.7	
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0		0.0			0.0	
Total Delay	2.2	6.8	0.2	2.0	9.9	1.2		55.7			57.7	
LOS	A	A	A	A	A	A		E			E	
Approach Delay		6.3			9.1			55.7			57.7	
Approach LOS		A			A			E			E	
Stops (vph)	2	231	0	6	508	3		39			19	
Fuel Used(gal)	0	10	0	1	21	1		1			1	
CO Emissions (g/hr)	10	683	11	46	1487	41		91			39	
NOx Emissions (g/hr)	2	133	2	9	289	8		18			8	
VOC Emissions (g/hr)	2	158	2	11	345	10		21			9	
Dilemma Vehicles (#)	0	17	0	0	44	0		0			0	
Queue Length 50th (ft)	2	131	1	5	271	1		61			29	
Queue Length 95th (ft)	2	160	1	m10	721	m7		50			11	
Internal Link Dist (ft)		739			826			641			665	
Turn Bay Length (ft)	185		185	185		185						
Base Capacity (vph)	287	1478	1280	661	1504	1276		196			130	
Starvation Cap Reductn	0	0	0	0	0	0		0			0	
Spillback Cap Reductn	0	0	0	0	0	0		0			0	
Storage Cap Reductn	0	0	0	0	0	0		0			0	
Reduced v/c Ratio	0.09	0.41	0.02	0.09	0.77	0.05		0.57			0.35	

Intersection Summary			
Area Type:	Other		
Cycle Length: 140			
Actuated Cycle Length: 140			
Offset: 128 (91%), Referenced to phase 2:EBTL and 6:WBTL, Start of Green			
Natural Cycle: 80			
Control Type: Actuated-Coordinated			
Maximum v/c Ratio: 0.77			
Intersection Signal Delay: 11.7		Intersection LOS: B	
Intersection Capacity Utilization 74.5%		ICU Level of Service D	
Analysis Period (min) 15			
m Volume for 95th percentile queue is metered by upstream signal.			

Splits and Phases: 108: Westport Ridge & Ackman Rd

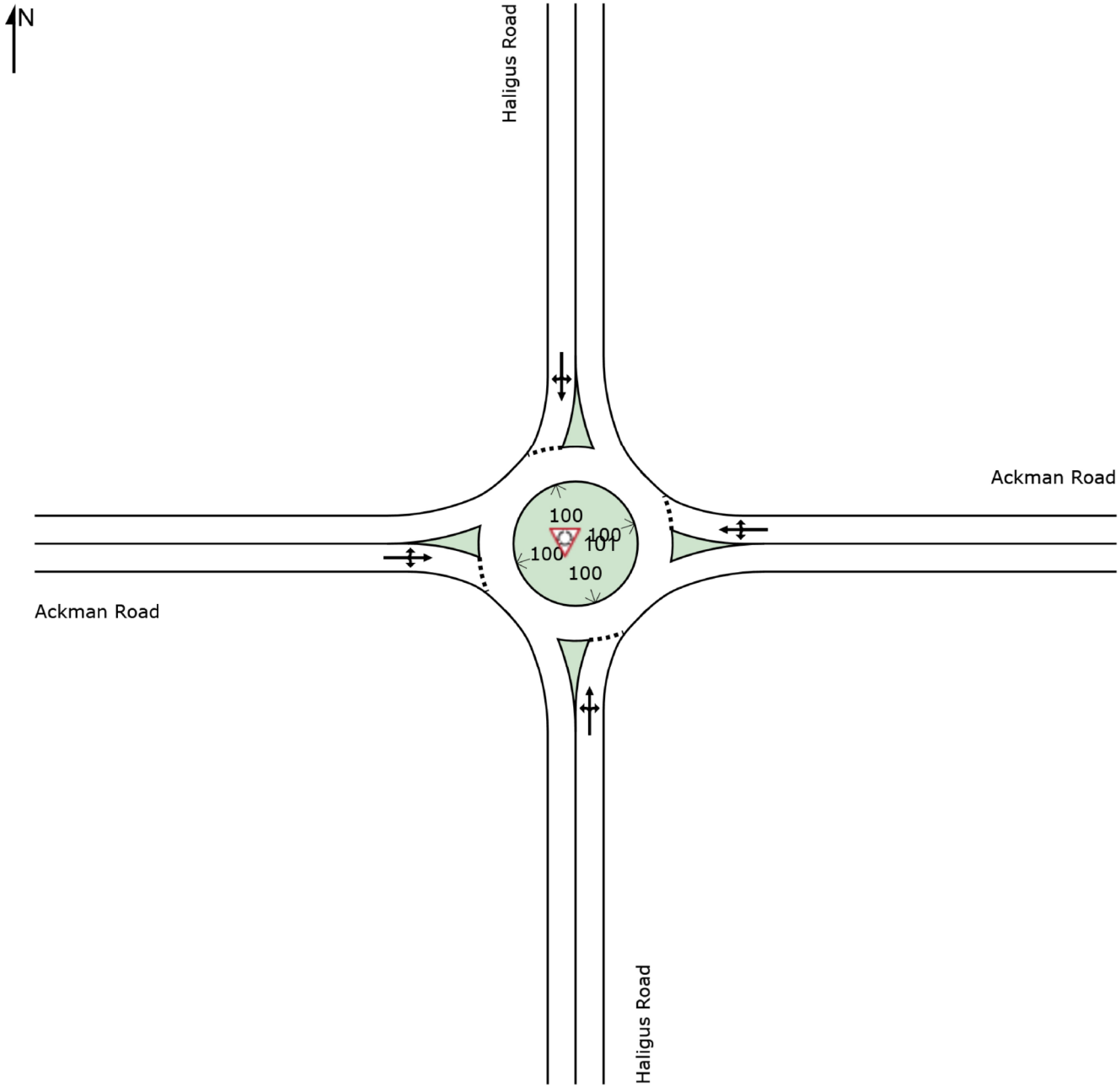
APPENDIX C

Sidra Output – Roundabouts

SITE LAYOUT

Site: 101 [Haligus AM Peak]

New Site
Site Category: (None)
Roundabout



MOVEMENT SUMMARY

Site: 101 [Haligus AM Peak]

New Site
Site Category: (None)
Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: Haligus Road												
3	L2	58	2.0	0.321	7.1	LOS A	1.6	41.2	0.53	0.44	0.53	33.7
8	T1	153	2.0	0.321	7.1	LOS A	1.6	41.2	0.53	0.44	0.53	33.6
18	R2	101	2.0	0.321	7.1	LOS A	1.6	41.2	0.53	0.44	0.53	32.7
Approach		312	2.0	0.321	7.1	LOS A	1.6	41.2	0.53	0.44	0.53	33.3
East: Ackman Road												
1	L2	44	2.0	0.299	6.7	LOS A	1.5	37.8	0.52	0.42	0.52	33.9
6	T1	100	2.0	0.299	6.7	LOS A	1.5	37.8	0.52	0.42	0.52	33.8
16	R2	148	2.0	0.299	6.7	LOS A	1.5	37.8	0.52	0.42	0.52	32.9
Approach		293	2.0	0.299	6.7	LOS A	1.5	37.8	0.52	0.42	0.52	33.3
North: Haligus Road												
7	L2	99	3.0	0.296	6.2	LOS A	1.5	39.1	0.43	0.29	0.43	33.8
4	T1	135	2.0	0.296	6.1	LOS A	1.5	39.1	0.43	0.29	0.43	33.7
14	R2	89	2.0	0.296	6.1	LOS A	1.5	39.1	0.43	0.29	0.43	32.8
Approach		323	2.3	0.296	6.1	LOS A	1.5	39.1	0.43	0.29	0.43	33.5
West: Ackman Road												
5	L2	102	2.0	0.276	6.3	LOS A	1.4	34.6	0.48	0.37	0.48	33.6
2	T1	117	2.0	0.276	6.3	LOS A	1.4	34.6	0.48	0.37	0.48	33.5
12	R2	60	2.0	0.276	6.3	LOS A	1.4	34.6	0.48	0.37	0.48	32.6
Approach		279	2.0	0.276	6.3	LOS A	1.4	34.6	0.48	0.37	0.48	33.3
All Vehicles		1206	2.1	0.321	6.6	LOS A	1.6	41.2	0.49	0.38	0.49	33.4

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [Haligus PM Peak]

New Site
Site Category: (None)
Roundabout

Movement Performance - Vehicles

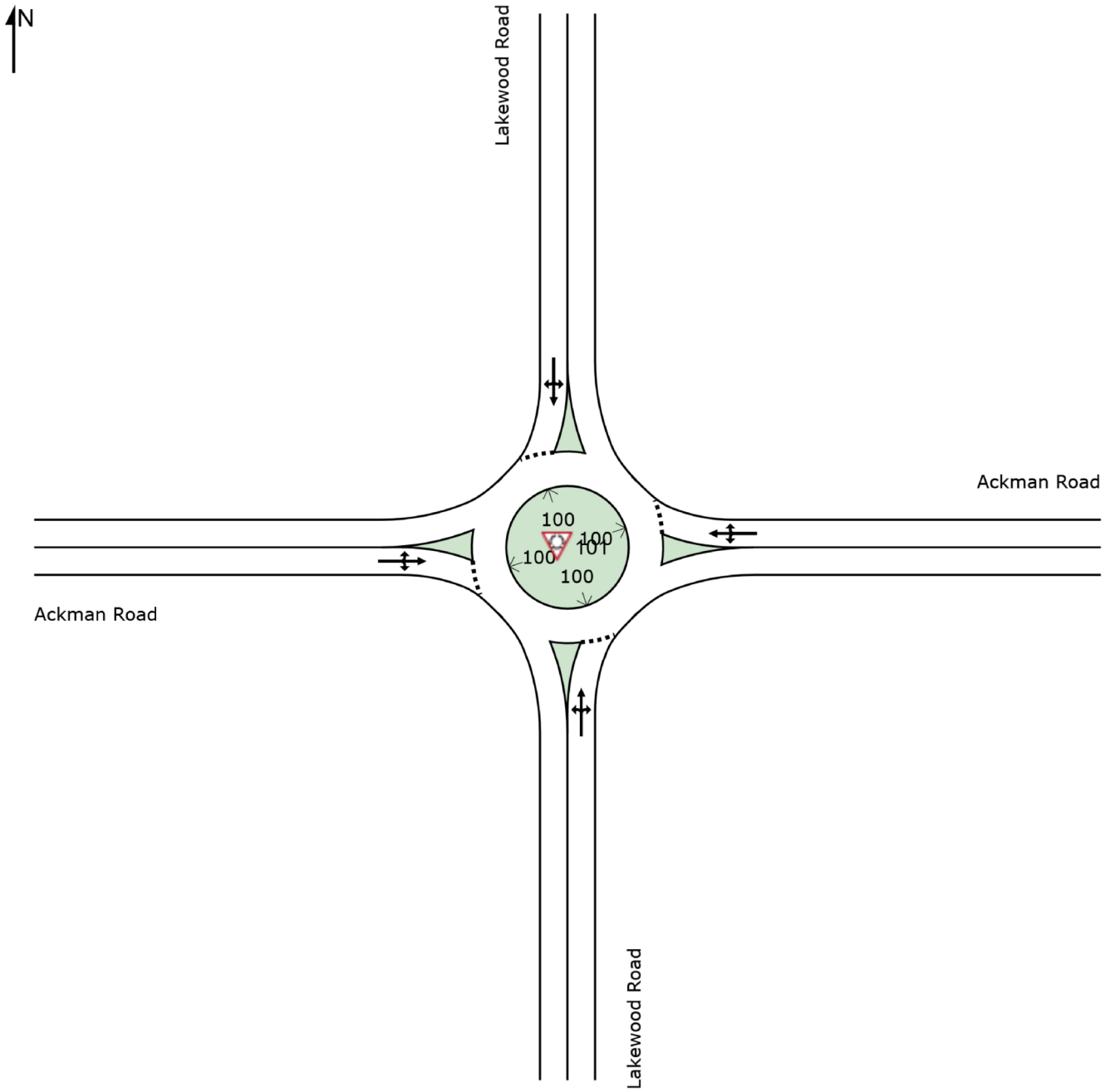
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: Haligus Road												
3	L2	66	2.0	0.320	7.5	LOS A	1.6	40.0	0.58	0.52	0.58	33.4
8	T1	134	0.0	0.320	7.4	LOS A	1.6	40.0	0.58	0.52	0.58	33.3
18	R2	91	0.0	0.320	7.4	LOS A	1.6	40.0	0.58	0.52	0.58	32.4
Approach		291	0.5	0.320	7.4	LOS A	1.6	40.0	0.58	0.52	0.58	33.1
East: Ackman Road												
1	L2	120	0.0	0.434	8.6	LOS A	2.5	62.7	0.59	0.50	0.59	32.7
6	T1	159	2.0	0.434	8.6	LOS A	2.5	62.7	0.59	0.50	0.59	32.6
16	R2	148	1.0	0.434	8.6	LOS A	2.5	62.7	0.59	0.50	0.59	31.7
Approach		427	1.1	0.434	8.6	LOS A	2.5	62.7	0.59	0.50	0.59	32.3
North: Haligus Road												
7	L2	137	0.0	0.419	8.5	LOS A	2.3	58.7	0.60	0.52	0.60	32.6
4	T1	153	0.0	0.419	8.5	LOS A	2.3	58.7	0.60	0.52	0.60	32.5
14	R2	113	2.0	0.419	8.6	LOS A	2.3	58.7	0.60	0.52	0.60	31.6
Approach		402	0.6	0.419	8.5	LOS A	2.3	58.7	0.60	0.52	0.60	32.3
West: Ackman Road												
5	L2	117	2.0	0.389	8.5	LOS A	2.0	50.9	0.61	0.56	0.61	32.6
2	T1	148	2.0	0.389	8.5	LOS A	2.0	50.9	0.61	0.56	0.61	32.5
12	R2	81	2.0	0.389	8.5	LOS A	2.0	50.9	0.61	0.56	0.61	31.6
Approach		346	2.0	0.389	8.5	LOS A	2.0	50.9	0.61	0.56	0.61	32.3
All Vehicles		1466	1.0	0.434	8.3	LOS A	2.5	62.7	0.60	0.52	0.60	32.5

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: 101 [Lakewood AM Peak]

New Site
Site Category: (None)
Roundabout



MOVEMENT SUMMARY

Site: 101 [Lakewood AM Peak]

New Site
Site Category: (None)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: Lakewood Road												
3	L2	80	2.0	0.482	10.3	LOS B	3.4	84.6	0.68	0.72	0.86	32.1
8	T1	62	0.0	0.482	10.3	LOS B	3.4	84.6	0.68	0.72	0.86	32.0
18	R2	279	1.0	0.482	10.3	LOS B	3.4	84.6	0.68	0.72	0.86	31.2
Approach		421	1.0	0.482	10.3	LOS B	3.4	84.6	0.68	0.72	0.86	31.4
East: Ackman Road												
1	L2	208	2.0	0.412	7.3	LOS A	2.5	63.9	0.42	0.27	0.42	32.9
6	T1	212	4.0	0.412	7.4	LOS A	2.5	63.9	0.42	0.27	0.42	32.8
16	R2	54	0.0	0.412	7.3	LOS A	2.5	63.9	0.42	0.27	0.42	31.9
Approach		474	2.7	0.412	7.4	LOS A	2.5	63.9	0.42	0.27	0.42	32.7
North: Lakewood Road												
7	L2	161	5.0	0.350	8.8	LOS A	1.6	42.1	0.63	0.62	0.63	31.8
4	T1	106	2.0	0.350	8.7	LOS A	1.6	42.1	0.63	0.62	0.63	31.8
14	R2	8	0.0	0.350	8.6	LOS A	1.6	42.1	0.63	0.62	0.63	31.0
Approach		276	3.7	0.350	8.8	LOS A	1.6	42.1	0.63	0.62	0.63	31.8
West: Ackman Road												
5	L2	8	0.0	0.373	8.7	LOS A	1.9	47.0	0.64	0.62	0.65	33.3
2	T1	256	2.0	0.373	8.8	LOS A	1.9	47.0	0.64	0.62	0.65	33.2
12	R2	43	0.0	0.373	8.7	LOS A	1.9	47.0	0.64	0.62	0.65	32.3
Approach		307	1.7	0.373	8.8	LOS A	1.9	47.0	0.64	0.62	0.65	33.1
All Vehicles		1478	2.2	0.482	8.8	LOS A	3.4	84.6	0.58	0.53	0.63	32.2

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [Lakewood PM Peak]

New Site
Site Category: (None)
Roundabout

Movement Performance - Vehicles

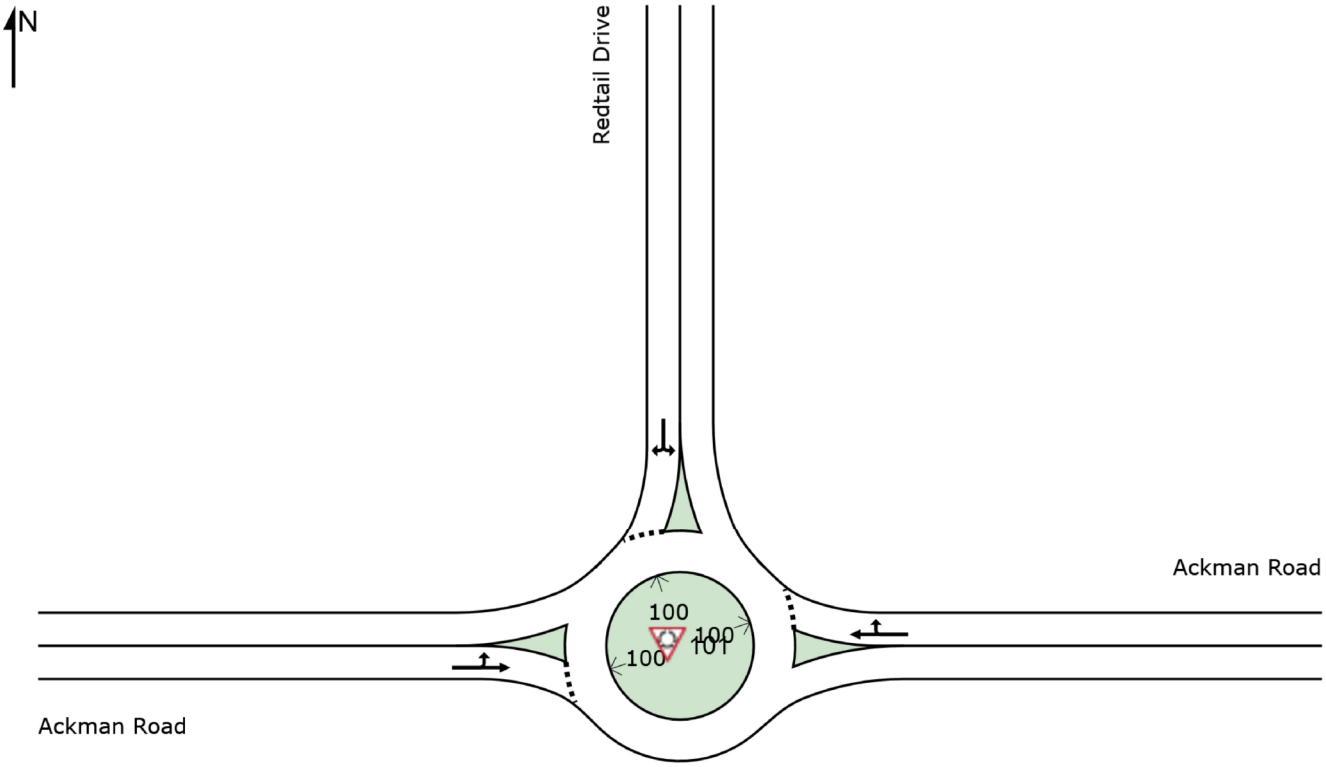
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: Lakewood Road												
3	L2	99	0.0	0.590	12.6	LOS B	5.7	143.6	0.74	0.86	1.12	31.1
8	T1	137	0.0	0.590	12.6	LOS B	5.7	143.6	0.74	0.86	1.12	31.0
18	R2	288	3.0	0.590	12.7	LOS B	5.7	143.6	0.74	0.86	1.12	30.1
Approach		524	1.7	0.590	12.7	LOS B	5.7	143.6	0.74	0.86	1.12	30.5
East: Ackman Road												
1	L2	336	1.0	0.771	17.5	LOS C	17.2	431.3	0.89	1.03	1.53	28.8
6	T1	317	0.0	0.771	17.5	LOS C	17.2	431.3	0.89	1.03	1.53	28.7
16	R2	174	0.0	0.771	17.5	LOS C	17.2	431.3	0.89	1.03	1.53	28.0
Approach		826	0.4	0.771	17.5	LOS C	17.2	431.3	0.89	1.03	1.53	28.6
North: Lakewood Road												
7	L2	102	3.0	0.310	9.9	LOS A	1.3	34.1	0.68	0.69	0.71	31.6
4	T1	88	0.0	0.310	9.7	LOS A	1.3	34.1	0.68	0.69	0.71	31.5
14	R2	4	0.0	0.310	9.7	LOS A	1.3	34.1	0.68	0.69	0.71	30.7
Approach		195	1.6	0.310	9.8	LOS A	1.3	34.1	0.68	0.69	0.71	31.5
West: Ackman Road												
5	L2	8	0.0	0.519	11.8	LOS B	3.9	97.0	0.73	0.85	1.04	31.9
2	T1	302	0.0	0.519	11.8	LOS B	3.9	97.0	0.73	0.85	1.04	31.8
12	R2	105	0.0	0.519	11.8	LOS B	3.9	97.0	0.73	0.85	1.04	31.0
Approach		416	0.0	0.519	11.8	LOS B	3.9	97.0	0.73	0.85	1.04	31.6
All Vehicles		1961	0.8	0.771	14.2	LOS B	17.2	431.3	0.80	0.91	1.24	30.0

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: 101 [Redtail AM Peak]

New Site
Site Category: (None)
Roundabout



Organisation: TRANSYSTEMS CORPORATION | Created: Friday, January 3, 2020 12:55:55 PM
Project: H:\Ackman_Segment2Option3.sip8

MOVEMENT SUMMARY

Site: 101 [Redtail AM Peak]

New Site
Site Category: (None)
Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
East: Ackman Road												
6	T1	494	4.0	0.398	6.6	LOS A	2.5	65.9	0.15	0.05	0.15	34.4
16	R2	21	11.0	0.398	6.8	LOS A	2.5	65.9	0.15	0.05	0.15	33.2
Approach		515	4.3	0.398	6.6	LOS A	2.5	65.9	0.15	0.05	0.15	34.3
North: Redtail Drive												
7	L2	60	6.0	0.137	6.1	LOS A	0.6	14.3	0.55	0.49	0.55	33.1
14	R2	48	0.0	0.137	5.8	LOS A	0.6	14.3	0.55	0.49	0.55	32.3
Approach		108	3.3	0.137	6.0	LOS A	0.6	14.3	0.55	0.49	0.55	32.7
West: Ackman Road												
5	L2	17	36.0	0.638	11.9	LOS B	6.2	157.8	0.41	0.19	0.41	31.3
2	T1	786	2.0	0.638	10.9	LOS B	6.2	157.8	0.41	0.19	0.41	32.3
Approach		803	2.7	0.638	10.9	LOS B	6.2	157.8	0.41	0.19	0.41	32.2
All Vehicles		1426	3.3	0.638	9.0	LOS A	6.2	157.8	0.32	0.16	0.32	33.0

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [Redtail PM Peak]

New Site
Site Category: (None)
Roundabout

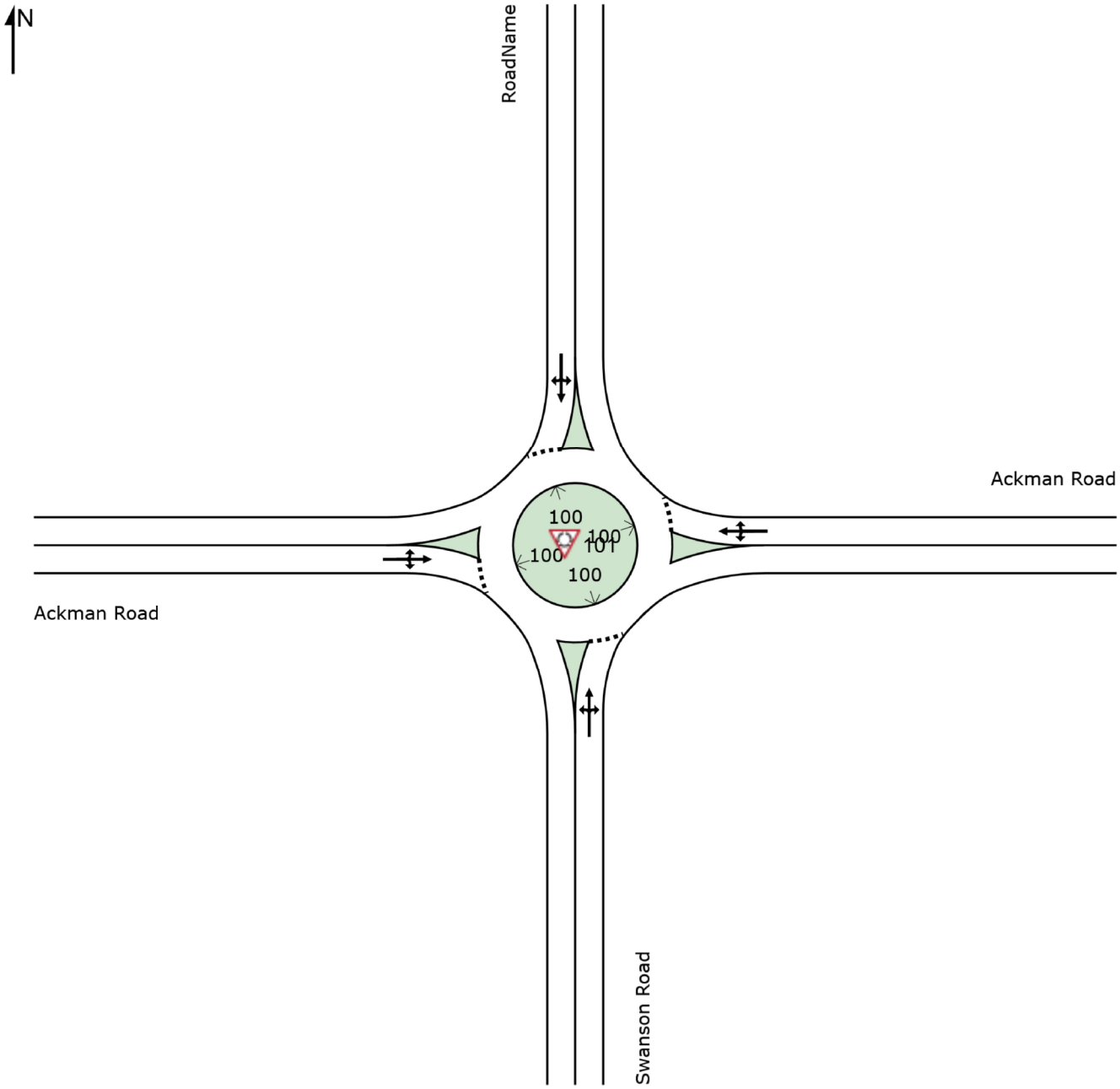
Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
East: Ackman Road												
6	T1	926	1.0	0.832	19.1	LOS C	14.2	359.4	0.79	0.41	0.79	28.9
16	R2	123	2.0	0.832	19.2	LOS C	14.2	359.4	0.79	0.41	0.79	28.2
Approach		1049	1.1	0.832	19.1	LOS C	14.2	359.4	0.79	0.41	0.79	28.8
North: Redtail Drive												
7	L2	66	2.0	0.208	9.7	LOS A	0.8	20.5	0.68	0.68	0.68	31.4
14	R2	43	0.0	0.208	9.6	LOS A	0.8	20.5	0.68	0.68	0.68	30.5
Approach		109	1.2	0.208	9.7	LOS A	0.8	20.5	0.68	0.68	0.68	31.0
West: Ackman Road												
5	L2	74	4.0	0.627	10.7	LOS B	6.1	153.7	0.42	0.20	0.42	32.2
2	T1	723	1.0	0.627	10.6	LOS B	6.1	153.7	0.42	0.20	0.42	32.2
Approach		797	1.3	0.627	10.6	LOS B	6.1	153.7	0.42	0.20	0.42	32.2
All Vehicles		1956	1.2	0.832	15.1	LOS C	14.2	359.4	0.63	0.34	0.63	30.3

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: 101 [Swanson AM Peak - single lane]

New Site
Site Category: (None)
Roundabout



MOVEMENT SUMMARY

Site: 101 [Swanson AM Peak - single lane]

New Site
Site Category: (None)
Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: Swanson Road												
3	L2	111	7.0	0.606	18.0	LOS C	4.4	112.6	0.81	1.00	1.40	28.6
8	T1	1	0.0	0.606	17.6	LOS C	4.4	112.6	0.81	1.00	1.40	28.7
18	R2	252	3.0	0.606	17.8	LOS C	4.4	112.6	0.81	1.00	1.40	28.0
Approach		363	4.2	0.606	17.8	LOS C	4.4	112.6	0.81	1.00	1.40	28.2
East: Ackman Road												
1	L2	105	1.0	0.452	7.7	LOS A	2.9	75.5	0.40	0.23	0.40	33.3
6	T1	427	4.0	0.452	7.8	LOS A	2.9	75.5	0.40	0.23	0.40	33.2
16	R2	1	0.0	0.452	7.7	LOS A	2.9	75.5	0.40	0.23	0.40	32.4
Approach		534	3.4	0.452	7.8	LOS A	2.9	75.5	0.40	0.23	0.40	33.2
North: RoadName												
7	L2	1	0.0	0.005	5.2	LOS A	0.0	0.4	0.56	0.39	0.56	34.3
4	T1	1	0.0	0.005	5.2	LOS A	0.0	0.4	0.56	0.39	0.56	34.2
14	R2	1	0.0	0.005	5.2	LOS A	0.0	0.4	0.56	0.39	0.56	33.2
Approach		3	0.0	0.005	5.2	LOS A	0.0	0.4	0.56	0.39	0.56	33.9
West: Ackman Road												
5	L2	1	0.0	0.705	13.2	LOS B	7.5	189.8	0.60	0.35	0.60	31.4
2	T1	760	2.0	0.705	13.3	LOS B	7.5	189.8	0.60	0.35	0.60	31.2
12	R2	92	4.0	0.705	13.3	LOS B	7.5	189.8	0.60	0.35	0.60	30.4
Approach		853	2.2	0.705	13.3	LOS B	7.5	189.8	0.60	0.35	0.60	31.1
All Vehicles		1753	3.0	0.705	12.5	LOS B	7.5	189.8	0.58	0.45	0.70	31.1

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [Swanson PM Peak - single lane]

New Site
Site Category: (None)
Roundabout

Movement Performance - Vehicles

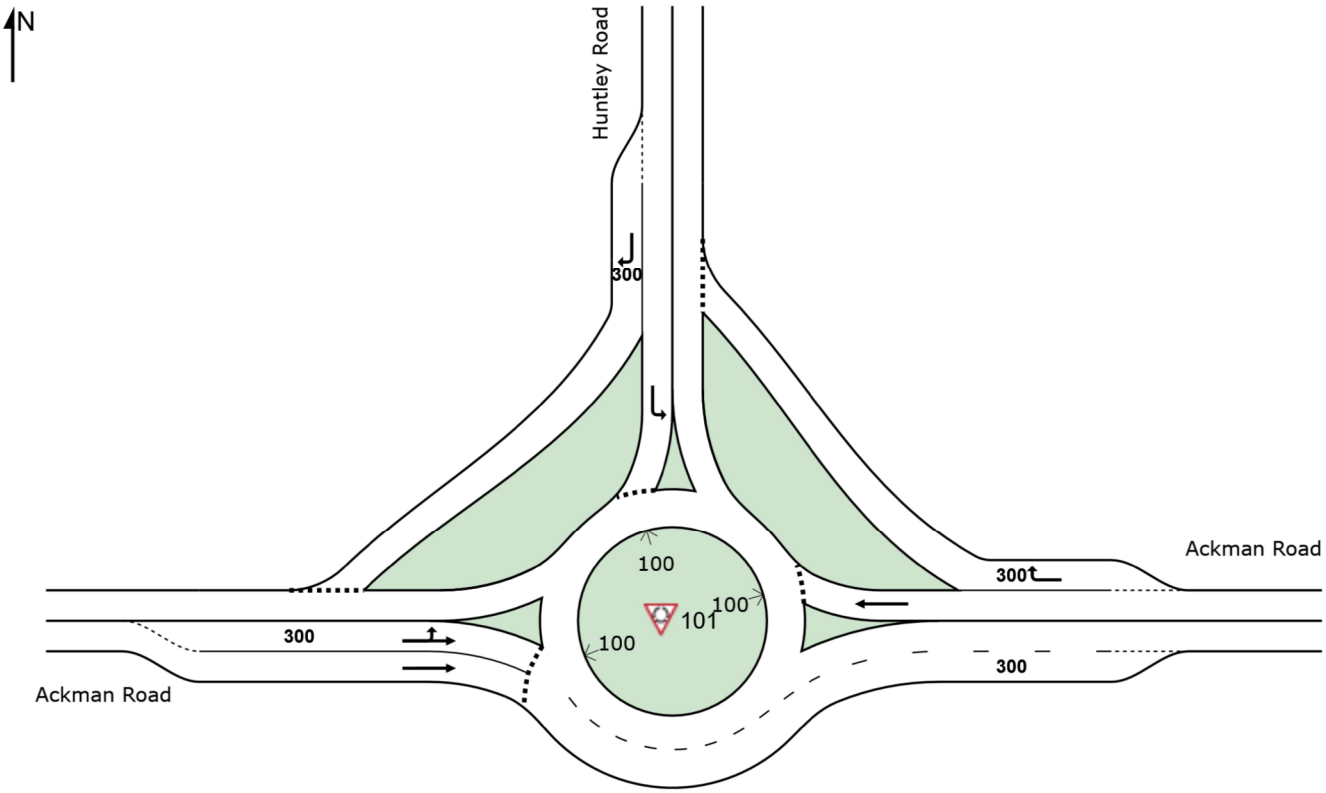
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: Swanson Road												
3	L2	101	0.0	0.344	9.3	LOS A	1.7	41.4	0.67	0.69	0.72	32.0
8	T1	1	0.0	0.344	9.3	LOS A	1.7	41.4	0.67	0.69	0.72	31.9
18	R2	145	0.0	0.344	9.3	LOS A	1.7	41.4	0.67	0.69	0.72	31.1
Approach		247	0.0	0.344	9.3	LOS A	1.7	41.4	0.67	0.69	0.72	31.5
East: Ackman Road												
1	L2	128	2.0	0.885	24.4	LOS C	20.8	524.0	1.00	0.64	1.07	27.0
6	T1	958	1.0	0.885	24.3	LOS C	20.8	524.0	1.00	0.64	1.07	26.9
16	R2	1	0.0	0.885	24.3	LOS C	20.8	524.0	1.00	0.64	1.07	26.4
Approach		1087	1.1	0.885	24.4	LOS C	20.8	524.0	1.00	0.64	1.07	26.9
North: RoadName												
7	L2	1	0.0	0.008	9.0	LOS A	0.0	0.7	0.71	0.61	0.71	32.4
4	T1	1	0.0	0.008	9.0	LOS A	0.0	0.7	0.71	0.61	0.71	32.3
14	R2	1	0.0	0.008	9.0	LOS A	0.0	0.7	0.71	0.61	0.71	31.5
Approach		3	0.0	0.008	9.0	LOS A	0.0	0.7	0.71	0.61	0.71	32.1
West: Ackman Road												
5	L2	1	0.0	0.681	12.6	LOS B	6.7	168.7	0.62	0.40	0.62	31.6
2	T1	625	2.0	0.681	12.7	LOS B	6.7	168.7	0.62	0.40	0.62	31.5
12	R2	182	0.0	0.681	12.6	LOS B	6.7	168.7	0.62	0.40	0.62	30.7
Approach		808	1.5	0.681	12.7	LOS B	6.7	168.7	0.62	0.40	0.62	31.3
All Vehicles		2146	1.1	0.885	18.2	LOS C	20.8	524.0	0.82	0.55	0.86	28.9

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: 101 [Huntley AM Peak]

New Site
Site Category: (None)
Roundabout



MOVEMENT SUMMARY

Site: 101 [Huntley AM Peak]

New Site
Site Category: (None)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
East: Ackman Road												
6	T1	309	4.0	0.283	6.0	LOS A	1.3	33.7	0.42	0.30	0.42	34.7
16	R2	83	4.0	0.076	3.9	LOS A	0.3	7.5	0.35	0.22	0.35	34.7
Approach		393	4.0	0.283	5.6	LOS A	1.3	33.7	0.40	0.28	0.40	34.7
North: Huntley Road												
7	L2	186	0.0	0.176	5.0	LOS A	0.8	18.8	0.43	0.33	0.43	32.6
14	R2	229	1.0	0.219	5.5	LOS A	1.0	24.2	0.45	0.35	0.45	33.9
Approach		416	0.6	0.219	5.3	LOS A	1.0	24.2	0.44	0.34	0.44	33.3
West: Ackman Road												
5	L2	233	5.0	0.506	8.8	LOS A	3.2	81.5	0.48	0.34	0.48	32.3
2	T1	738	1.0	0.506	7.3	LOS A	3.2	81.5	0.43	0.29	0.43	33.5
Approach		971	2.0	0.506	7.7	LOS A	3.2	81.5	0.44	0.30	0.44	33.2
All Vehicles		1779	2.1	0.506	6.7	LOS A	3.2	81.5	0.43	0.31	0.43	33.6

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [Huntley PM Peak]

New Site
Site Category: (None)
Roundabout

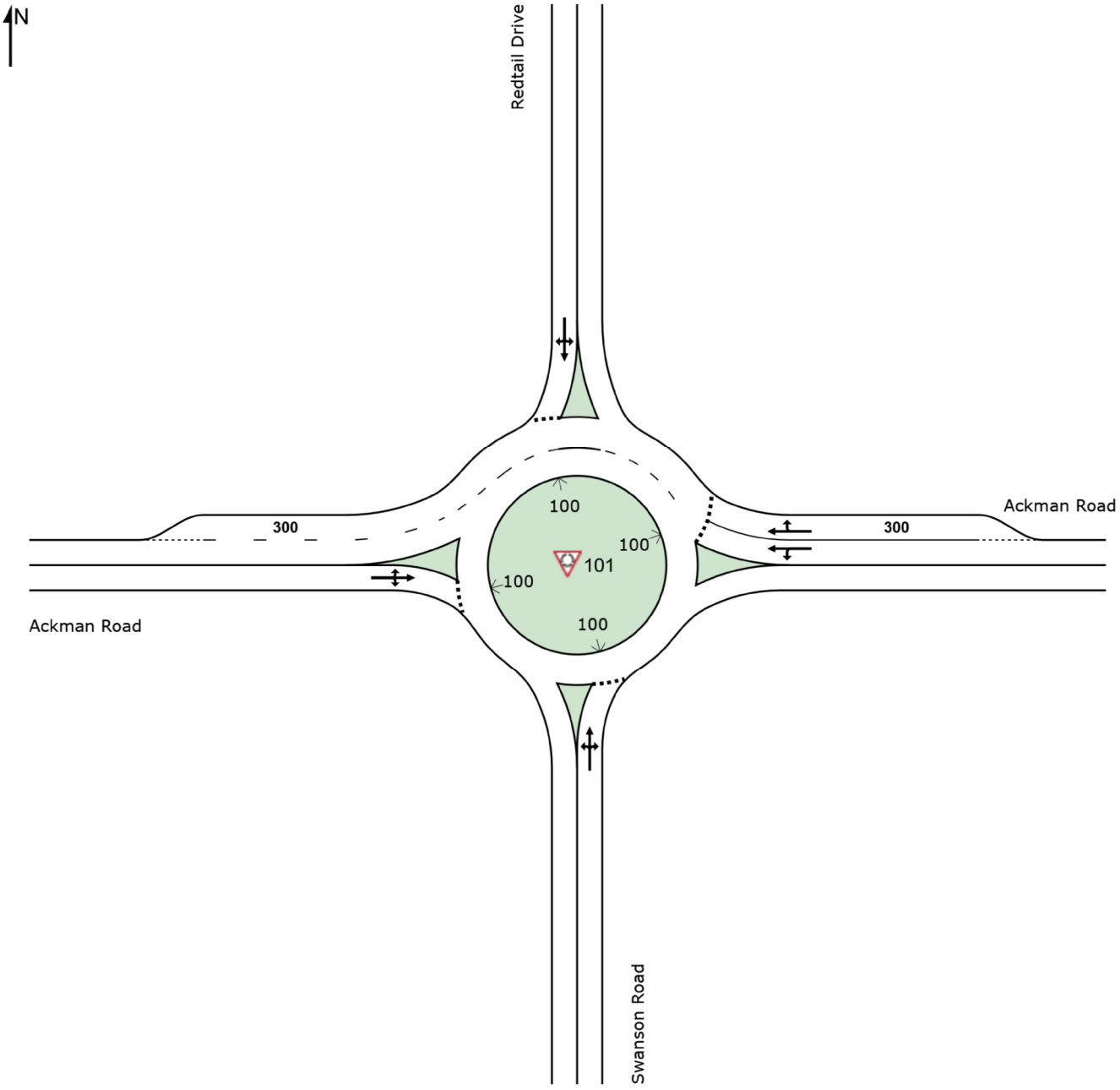
Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
East: Ackman Road												
6	T1	808	1.0	0.745	16.0	LOS C	14.0	353.0	0.82	0.98	1.45	30.1
16	R2	273	1.0	0.251	5.7	LOS A	1.2	29.0	0.44	0.33	0.44	33.8
Approach		1081	1.0	0.745	13.4	LOS B	14.0	353.0	0.72	0.82	1.19	31.0
North: Huntley Road												
7	L2	106	0.0	0.157	7.1	LOS A	0.6	14.9	0.61	0.61	0.61	31.7
14	R2	261	2.0	0.394	10.9	LOS B	1.9	48.8	0.69	0.75	0.89	31.3
Approach		367	1.4	0.394	9.8	LOS A	1.9	48.8	0.67	0.71	0.81	31.4
West: Ackman Road												
5	L2	282	1.0	0.377	6.4	LOS A	2.2	54.3	0.31	0.17	0.31	33.0
2	T1	503	1.0	0.377	5.5	LOS A	2.2	54.3	0.28	0.15	0.28	34.3
Approach		785	1.0	0.377	5.8	LOS A	2.2	54.3	0.29	0.16	0.29	33.8
All Vehicles		2234	1.1	0.745	10.2	LOS B	14.0	353.0	0.56	0.57	0.81	32.0

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: 101 [Redtail AM Peak]

New Site
Site Category: (None)
Roundabout



MOVEMENT SUMMARY

Site: 101 [Redtail AM Peak]

New Site
Site Category: (None)
Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: Swanson Road												
3	L2	109	7.0	0.634	19.4	LOS C	4.8	122.9	0.82	1.04	1.49	28.1
8	T1	5	0.0	0.634	19.0	LOS C	4.8	122.9	0.82	1.04	1.49	28.2
18	R2	260	3.0	0.634	19.2	LOS C	4.8	122.9	0.82	1.04	1.49	27.5
Approach		374	4.1	0.634	19.3	LOS C	4.8	122.9	0.82	1.04	1.49	27.7
East: Ackman Road												
1	L2	109	1.0	0.262	5.3	LOS A	1.2	31.8	0.31	0.19	0.31	34.2
6	T1	388	4.0	0.262	4.9	LOS A	1.2	31.8	0.30	0.17	0.30	34.7
16	R2	16	11.0	0.165	4.6	LOS A	0.7	18.0	0.28	0.16	0.28	34.2
Approach		513	3.6	0.262	5.0	LOS A	1.2	31.8	0.30	0.18	0.30	34.6
North: Redtail Drive												
7	L2	36	6.0	0.136	6.0	LOS A	0.5	12.4	0.53	0.49	0.53	33.8
4	T1	25	6.0	0.136	6.0	LOS A	0.5	12.4	0.53	0.49	0.53	33.7
14	R2	48	0.0	0.136	5.7	LOS A	0.5	12.4	0.53	0.49	0.53	32.9
Approach		109	3.3	0.136	5.9	LOS A	0.5	12.4	0.53	0.49	0.53	33.4
West: Ackman Road												
5	L2	17	36.0	0.717	15.5	LOS C	10.7	272.6	0.72	0.62	0.91	29.9
2	T1	719	2.0	0.717	14.4	LOS B	10.7	272.6	0.72	0.62	0.91	30.7
12	R2	70	4.0	0.717	14.5	LOS B	10.7	272.6	0.72	0.62	0.91	29.9
Approach		805	2.9	0.717	14.5	LOS B	10.7	272.6	0.72	0.62	0.91	30.6
All Vehicles		1801	3.4	0.717	12.2	LOS B	10.7	272.6	0.61	0.57	0.83	31.1

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [Redtail PM Peak]

New Site
Site Category: (None)
Roundabout

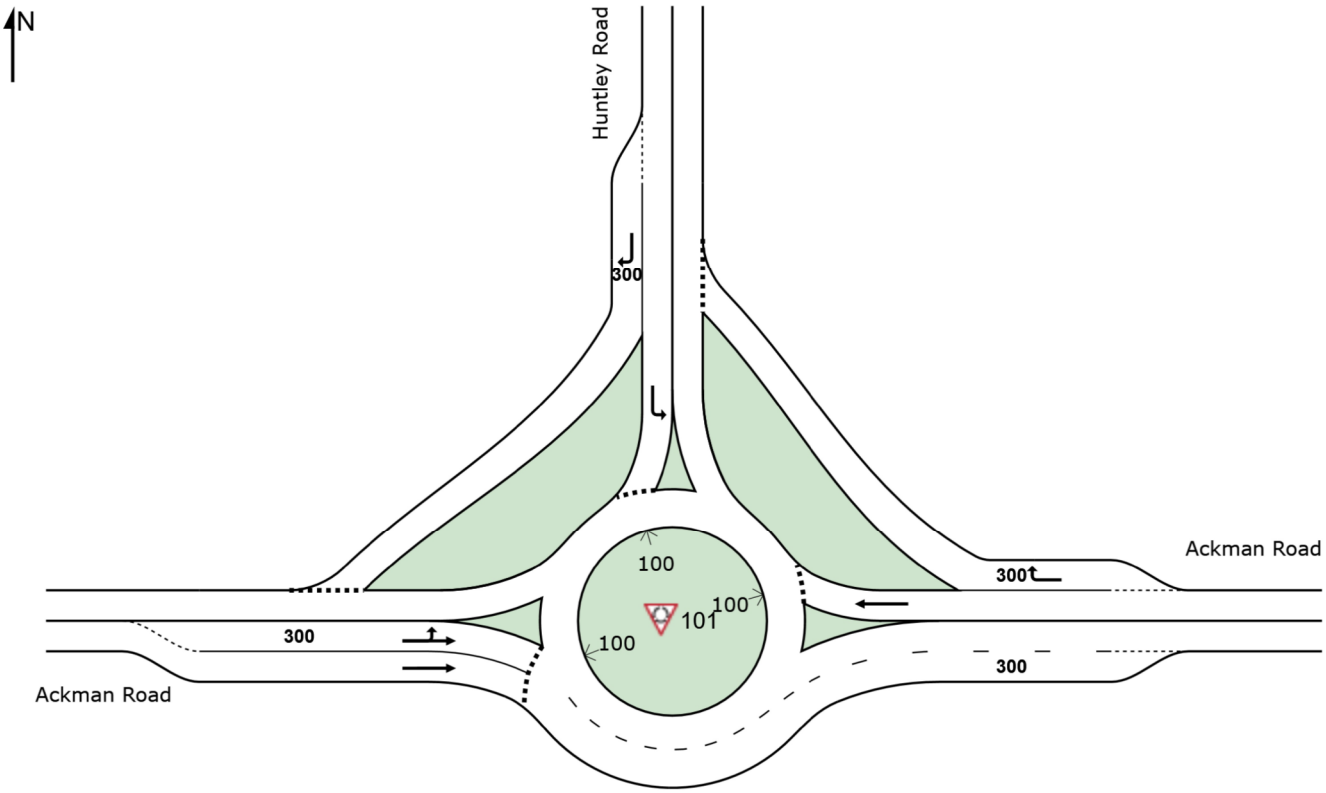
Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: Swanson Road												
3	L2	145	2.0	0.548	14.8	LOS B	3.8	95.6	0.78	0.93	1.23	29.7
8	T1	27	2.0	0.548	14.8	LOS B	3.8	95.6	0.78	0.93	1.23	29.6
18	R2	184	2.0	0.548	14.8	LOS B	3.8	95.6	0.78	0.93	1.23	28.9
Approach		355	2.0	0.548	14.8	LOS B	3.8	95.6	0.78	0.93	1.23	29.3
East: Ackman Road												
1	L2	128	2.0	0.603	11.2	LOS B	6.0	152.7	0.64	0.62	0.84	31.8
6	T1	841	1.0	0.603	9.7	LOS A	6.0	152.7	0.58	0.53	0.71	32.5
16	R2	107	2.0	0.380	7.2	LOS A	2.0	50.2	0.49	0.38	0.49	33.0
Approach		1077	1.2	0.603	9.6	LOS A	6.0	152.7	0.58	0.52	0.70	32.5
North: Redtail Drive												
7	L2	45	2.0	0.259	10.4	LOS B	0.9	23.4	0.68	0.69	0.70	31.8
4	T1	41	2.0	0.259	10.4	LOS B	0.9	23.4	0.68	0.69	0.70	31.7
14	R2	53	0.0	0.259	10.2	LOS B	0.9	23.4	0.68	0.69	0.70	30.9
Approach		139	1.2	0.259	10.3	LOS B	0.9	23.4	0.68	0.69	0.70	31.4
West: Ackman Road												
5	L2	93	4.0	0.751	16.4	LOS C	15.3	387.1	0.82	0.89	1.32	29.7
2	T1	572	1.0	0.751	16.3	LOS C	15.3	387.1	0.82	0.89	1.32	29.7
12	R2	152	2.0	0.751	16.3	LOS C	15.3	387.1	0.82	0.89	1.32	29.0
Approach		816	1.5	0.751	16.3	LOS C	15.3	387.1	0.82	0.89	1.32	29.6
All Vehicles		2388	1.4	0.751	12.7	LOS B	15.3	387.1	0.70	0.72	0.99	30.9

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: 101 [Huntley AM Peak]

New Site
Site Category: (None)
Roundabout



MOVEMENT SUMMARY

Site: 101 [Huntley AM Peak]

New Site
Site Category: (None)
Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
East: Ackman Road												
6	T1	309	4.0	0.283	6.0	LOS A	1.3	33.7	0.42	0.30	0.42	34.7
16	R2	83	4.0	0.076	3.9	LOS A	0.3	7.5	0.35	0.22	0.35	34.7
Approach		393	4.0	0.283	5.6	LOS A	1.3	33.7	0.40	0.28	0.40	34.7
North: Huntley Road												
7	L2	186	0.0	0.176	5.0	LOS A	0.8	18.8	0.43	0.33	0.43	32.6
14	R2	229	1.0	0.219	5.5	LOS A	1.0	24.2	0.45	0.35	0.45	33.9
Approach		416	0.6	0.219	5.3	LOS A	1.0	24.2	0.44	0.34	0.44	33.3
West: Ackman Road												
5	L2	233	5.0	0.506	8.8	LOS A	3.2	81.5	0.48	0.34	0.48	32.3
2	T1	738	1.0	0.506	7.3	LOS A	3.2	81.5	0.43	0.29	0.43	33.5
Approach		971	2.0	0.506	7.7	LOS A	3.2	81.5	0.44	0.30	0.44	33.2
All Vehicles		1779	2.1	0.506	6.7	LOS A	3.2	81.5	0.43	0.31	0.43	33.6

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [Huntley PM Peak]

New Site
Site Category: (None)
Roundabout

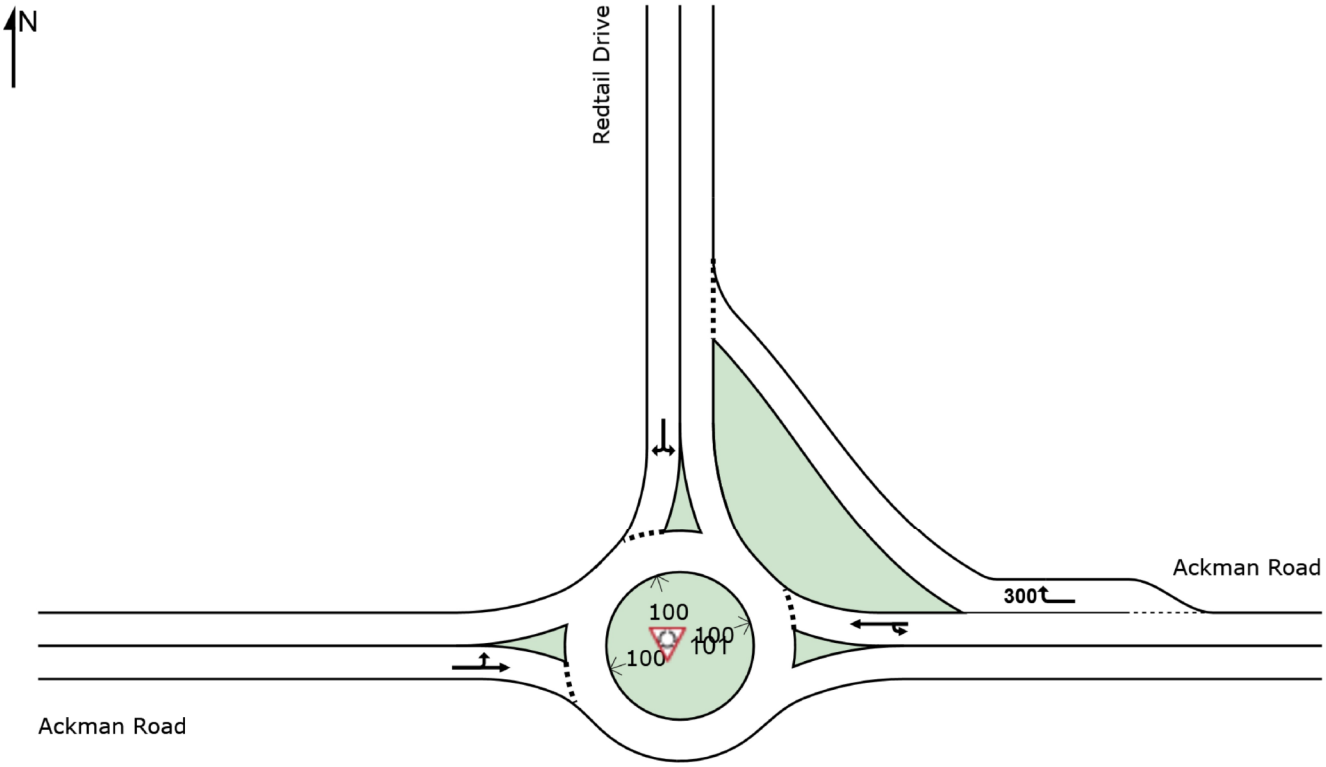
Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
East: Ackman Road												
6	T1	808	1.0	0.745	16.0	LOS C	14.0	353.0	0.82	0.98	1.45	30.1
16	R2	273	1.0	0.251	5.7	LOS A	1.2	29.0	0.44	0.33	0.44	33.8
Approach		1081	1.0	0.745	13.4	LOS B	14.0	353.0	0.72	0.82	1.19	31.0
North: Huntley Road												
7	L2	106	0.0	0.157	7.1	LOS A	0.6	14.9	0.61	0.61	0.61	31.7
14	R2	261	2.0	0.394	10.9	LOS B	1.9	48.8	0.69	0.75	0.89	31.3
Approach		367	1.4	0.394	9.8	LOS A	1.9	48.8	0.67	0.71	0.81	31.4
West: Ackman Road												
5	L2	282	1.0	0.377	6.4	LOS A	2.2	54.3	0.31	0.17	0.31	33.0
2	T1	503	1.0	0.377	5.5	LOS A	2.2	54.3	0.28	0.15	0.28	34.3
Approach		785	1.0	0.377	5.8	LOS A	2.2	54.3	0.29	0.16	0.29	33.8
All Vehicles		2234	1.1	0.745	10.2	LOS B	14.0	353.0	0.56	0.57	0.81	32.0

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: 101 [Redtail AM Peak]

New Site
Site Category: (None)
Roundabout



Organisation: TRANSYSTEMS CORPORATION | Created: Friday, January 3, 2020 1:15:52 PM
Project: H:\Ackman_Segment2Option6.sip8

MOVEMENT SUMMARY

Site: 101 [Redtail AM Peak]

New Site
Site Category: (None)
Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
East: Ackman Road												
1u	U	109	1.0	0.448	7.0	LOS A	2.9	74.3	0.15	0.04	0.15	34.3
6	T1	494	4.0	0.448	7.1	LOS A	2.9	74.3	0.15	0.04	0.15	33.4
16	R2	21	11.0	0.017	3.0	LOS A	0.1	1.6	0.09	0.02	0.09	35.0
Approach		623	3.7	0.448	6.9	LOS A	2.9	74.3	0.14	0.04	0.14	33.6
North: Redtail Drive												
7	L2	60	6.0	0.153	6.9	LOS A	0.6	15.7	0.59	0.57	0.59	32.7
14	R2	48	0.0	0.153	6.6	LOS A	0.6	15.7	0.59	0.57	0.59	31.9
Approach		108	3.3	0.153	6.8	LOS A	0.6	15.7	0.59	0.57	0.59	32.4
West: Ackman Road												
5	L2	17	36.0	0.713	15.3	LOS C	10.3	263.0	0.71	0.60	0.89	30.0
2	T1	786	2.0	0.713	14.3	LOS B	10.3	263.0	0.71	0.60	0.89	30.8
Approach		803	2.7	0.713	14.3	LOS B	10.3	263.0	0.71	0.60	0.89	30.8
All Vehicles		1535	3.2	0.713	10.8	LOS B	10.3	263.0	0.47	0.37	0.56	32.0

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [Redtail PM Peak]

New Site
Site Category: (None)
Roundabout

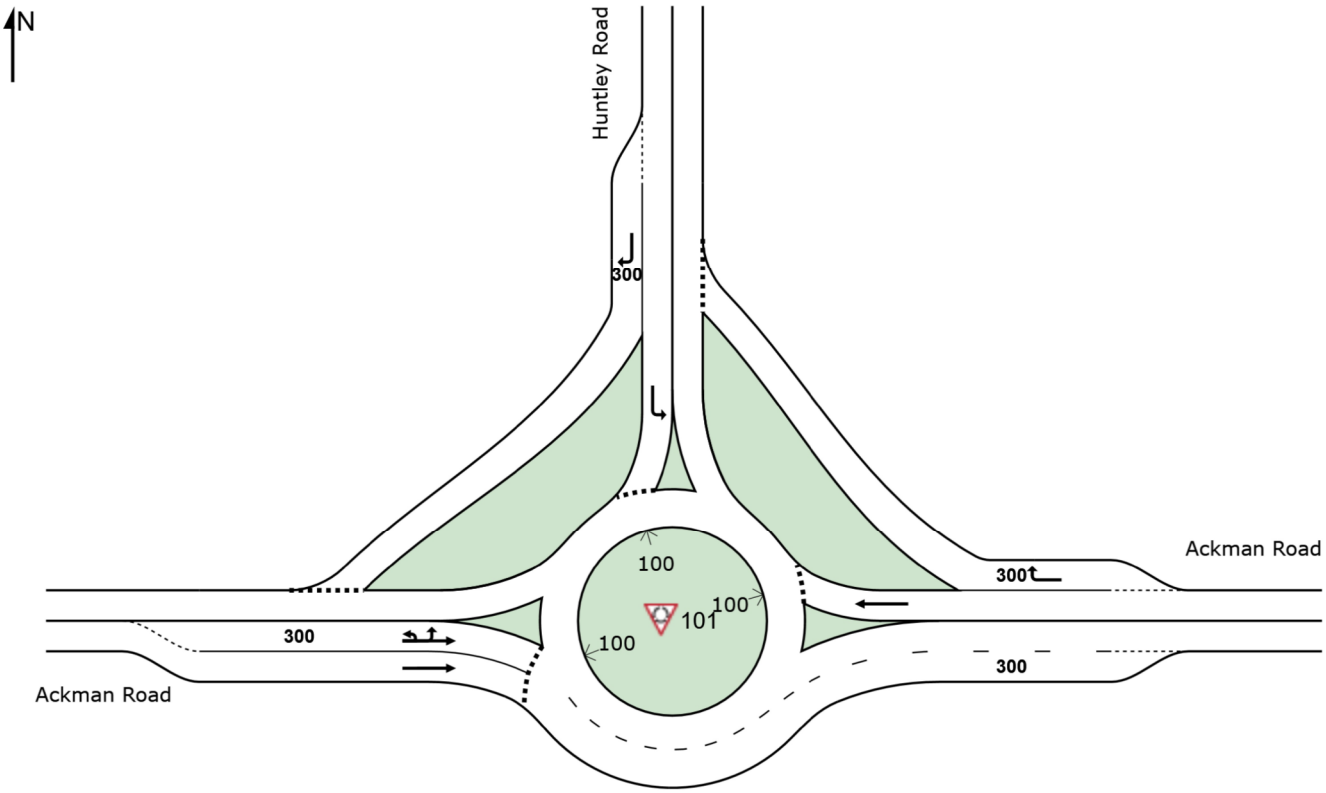
Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
East: Ackman Road												
1u	U	133	2.0	0.809	17.2	LOS C	12.0	303.2	0.67	0.35	0.67	30.0
6	T1	926	1.0	0.809	17.2	LOS C	12.0	303.2	0.67	0.35	0.67	29.3
16	R2	123	2.0	0.095	3.5	LOS A	0.4	9.9	0.19	0.08	0.19	34.9
Approach		1182	1.2	0.809	15.7	LOS C	12.0	303.2	0.62	0.32	0.62	29.9
North: Redtail Drive												
7	L2	66	2.0	0.239	11.6	LOS B	0.9	23.0	0.72	0.72	0.72	30.6
14	R2	43	0.0	0.239	11.4	LOS B	0.9	23.0	0.72	0.72	0.72	29.8
Approach		109	1.2	0.239	11.5	LOS B	0.9	23.0	0.72	0.72	0.72	30.3
West: Ackman Road												
5	L2	74	4.0	0.719	14.8	LOS B	12.3	311.1	0.76	0.75	1.09	30.5
2	T1	723	1.0	0.719	14.7	LOS B	12.3	311.1	0.76	0.75	1.09	30.5
Approach		797	1.3	0.719	14.7	LOS B	12.3	311.1	0.76	0.75	1.09	30.5
All Vehicles		2088	1.2	0.809	15.1	LOS C	12.3	311.1	0.68	0.50	0.81	30.1

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: 101 [Huntley AM Peak]

New Site
Site Category: (None)
Roundabout



MOVEMENT SUMMARY

Site: 101 [Huntley AM Peak]

New Site
Site Category: (None)
Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
East: Ackman Road												
6	T1	309	4.0	0.316	7.0	LOS A	1.4	37.1	0.51	0.43	0.51	34.2
16	R2	83	4.0	0.076	3.9	LOS A	0.3	7.5	0.35	0.22	0.35	34.7
Approach		393	4.0	0.316	6.3	LOS A	1.4	37.1	0.48	0.39	0.48	34.3
North: Huntley Road												
7	L2	186	0.0	0.197	5.7	LOS A	0.8	20.7	0.50	0.44	0.50	32.3
14	R2	229	1.0	0.244	6.3	LOS A	1.1	26.7	0.52	0.46	0.52	33.5
Approach		416	0.6	0.244	6.0	LOS A	1.1	26.7	0.51	0.45	0.51	32.9
West: Ackman Road												
5u	U	114	7.0	0.569	10.1	LOS B	3.9	99.5	0.52	0.37	0.52	31.9
5	L2	233	5.0	0.569	10.0	LOS B	3.9	99.5	0.52	0.37	0.52	31.3
2	T1	738	1.0	0.569	7.9	LOS A	3.9	99.5	0.45	0.31	0.45	33.1
Approach		1085	2.5	0.569	8.6	LOS A	3.9	99.5	0.48	0.33	0.48	32.5
All Vehicles		1893	2.4	0.569	7.6	LOS A	3.9	99.5	0.48	0.37	0.48	33.0

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [Huntley PM Peak]

New Site
Site Category: (None)
Roundabout

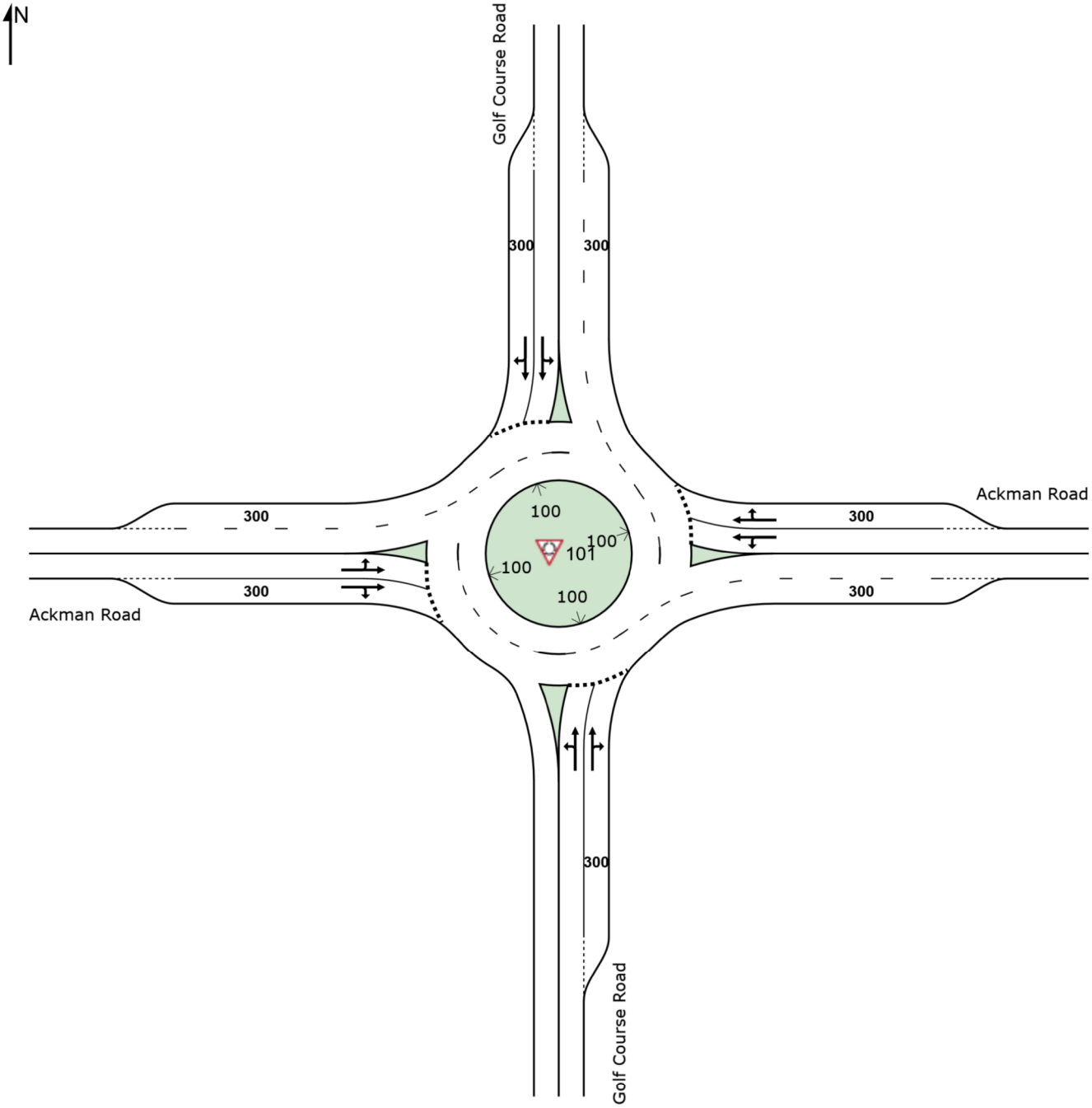
Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
East: Ackman Road												
6	T1	808	1.0	0.819	21.9	LOS C	17.7	445.0	0.95	1.38	2.10	28.0
16	R2	273	1.0	0.251	5.7	LOS A	1.2	29.0	0.44	0.33	0.44	33.8
Approach		1081	1.0	0.819	17.8	LOS C	17.7	445.0	0.82	1.12	1.68	29.2
North: Huntley Road												
7	L2	106	0.0	0.173	7.9	LOS A	0.6	16.2	0.64	0.64	0.64	31.3
14	R2	261	2.0	0.433	12.6	LOS B	2.2	55.3	0.72	0.81	1.01	30.6
Approach		367	1.4	0.433	11.3	LOS B	2.2	55.3	0.70	0.76	0.90	30.8
West: Ackman Road												
5u	U	104	0.0	0.427	7.0	LOS A	2.6	66.0	0.33	0.18	0.33	32.9
5	L2	282	1.0	0.427	7.0	LOS A	2.6	66.0	0.33	0.18	0.33	32.2
2	T1	503	1.0	0.427	5.8	LOS A	2.6	66.0	0.29	0.16	0.29	34.1
Approach		890	0.9	0.427	6.3	LOS A	2.6	66.0	0.31	0.17	0.31	33.3
All Vehicles		2338	1.0	0.819	12.4	LOS B	17.7	445.0	0.61	0.70	1.04	30.9

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: 101 [Golf Course AM]

New Site
Site Category: (None)
Roundabout



MOVEMENT SUMMARY

Site: 101 [Golf Course AM]

New Site
Site Category: (None)
Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: Golf Course Road												
3	L2	75	0.0	0.877	41.4	LOS E	9.9	250.9	0.92	1.47	2.82	22.4
8	T1	468	2.0	0.877	38.3	LOS E	9.9	250.9	0.90	1.39	2.60	23.1
18	R2	200	0.0	0.553	19.0	LOS C	3.0	75.1	0.80	0.95	1.33	28.0
Approach		743	1.3	0.877	33.4	LOS D	9.9	250.9	0.88	1.28	2.28	24.1
East: Ackman Road												
1	L2	72	17.0	0.322	9.6	LOS A	1.2	32.5	0.61	0.62	0.64	31.9
6	T1	234	8.0	0.322	8.8	LOS A	1.2	32.5	0.61	0.61	0.63	32.7
16	R2	48	0.0	0.203	7.6	LOS A	0.7	19.1	0.60	0.60	0.60	32.7
Approach		355	8.7	0.322	8.8	LOS A	1.2	32.5	0.61	0.61	0.63	32.5
North: Golf Course Road												
7	L2	162	0.0	0.395	7.9	LOS A	1.9	47.2	0.55	0.50	0.55	32.7
4	T1	228	2.0	0.395	8.0	LOS A	1.9	47.2	0.55	0.50	0.55	32.6
14	R2	101	2.0	0.112	5.0	LOS A	0.4	10.7	0.45	0.37	0.45	33.9
Approach		492	1.3	0.395	7.4	LOS A	1.9	47.2	0.53	0.47	0.53	32.9
West: Ackman Road												
5	L2	177	1.0	0.665	14.5	LOS B	7.4	186.6	0.76	0.99	1.37	30.2
2	T1	763	1.0	0.665	12.3	LOS B	7.4	186.6	0.70	0.85	1.09	31.3
12	R2	43	0.0	0.420	9.2	LOS A	2.3	57.3	0.61	0.64	0.71	32.1
Approach		983	1.0	0.665	12.6	LOS B	7.4	186.6	0.71	0.86	1.13	31.1
All Vehicles		2572	2.2	0.877	17.1	LOS C	9.9	250.9	0.71	0.87	1.28	29.2

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [Golf Course PM]

New Site
Site Category: (None)
Roundabout

Movement Performance - Vehicles

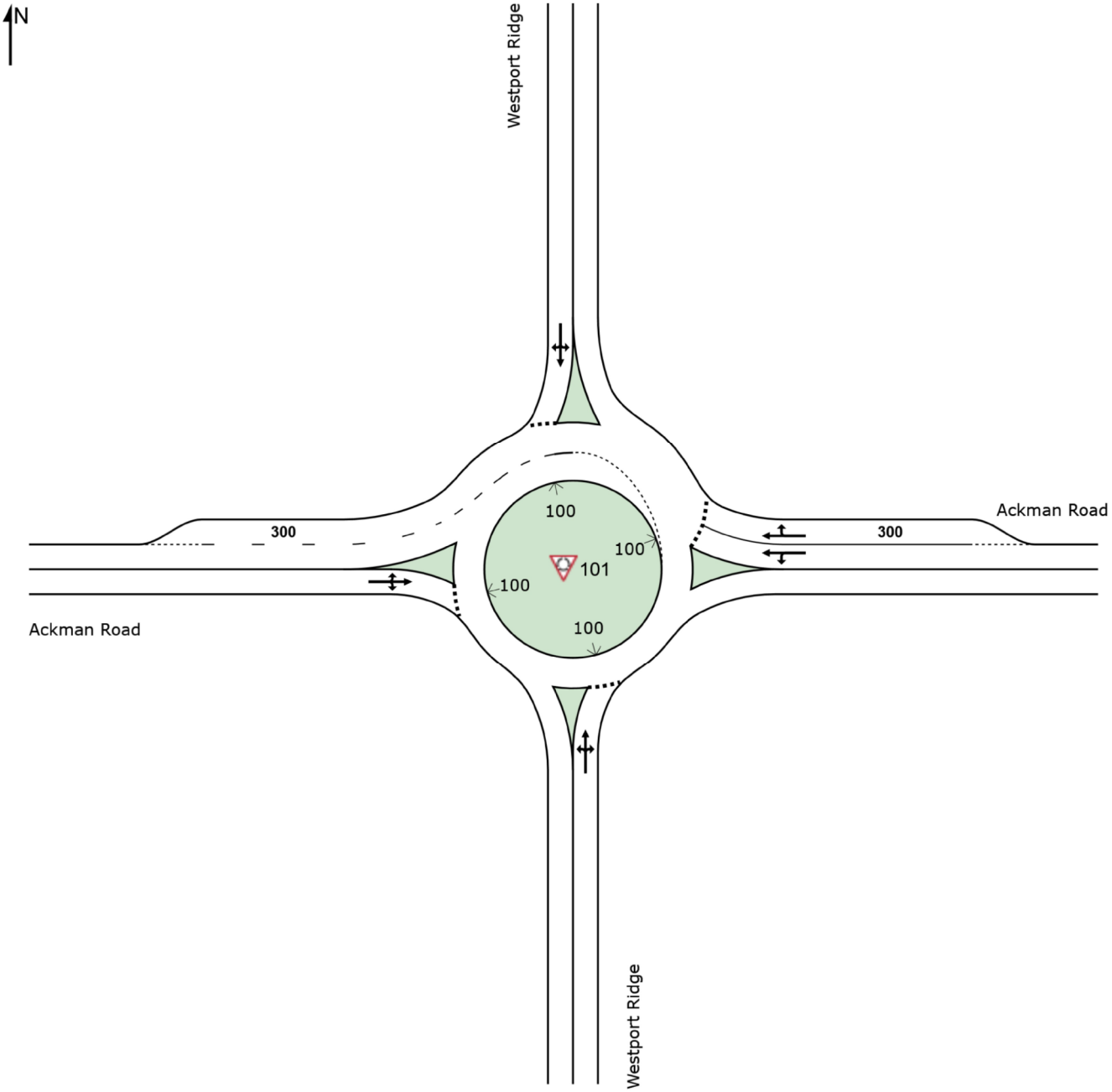
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: Golf Course Road												
3	L2	146	3.0	0.425	9.8	LOS A	2.3	57.3	0.64	0.71	0.83	31.8
8	T1	296	0.0	0.425	9.1	LOS A	2.3	57.3	0.63	0.67	0.75	32.4
18	R2	104	1.0	0.268	7.9	LOS A	1.1	27.2	0.60	0.60	0.60	32.6
Approach		546	1.0	0.425	9.1	LOS A	2.3	57.3	0.63	0.67	0.74	32.3
East: Ackman Road												
1	L2	145	0.0	0.839	25.3	LOS D	15.5	389.8	0.96	1.48	2.37	26.6
6	T1	912	1.0	0.839	20.8	LOS C	15.5	389.8	0.87	1.25	1.92	28.1
16	R2	124	0.0	0.530	11.9	LOS B	3.8	96.4	0.70	0.82	1.04	30.9
Approach		1181	0.8	0.839	20.4	LOS C	15.5	389.8	0.86	1.24	1.88	28.2
North: Golf Course Road												
7	L2	87	1.0	0.769	31.1	LOS D	5.9	148.5	0.88	1.21	2.05	24.9
4	T1	297	1.0	0.769	31.1	LOS D	5.9	148.5	0.88	1.21	2.05	24.8
14	R2	95	0.0	0.215	11.5	LOS B	0.7	18.7	0.72	0.72	0.72	30.9
Approach		479	0.8	0.769	27.2	LOS D	5.9	148.5	0.85	1.11	1.79	25.8
West: Ackman Road												
5	L2	92	0.0	0.440	9.3	LOS A	2.5	63.1	0.62	0.68	0.78	32.6
2	T1	454	1.0	0.440	8.7	LOS A	2.5	63.1	0.60	0.64	0.71	32.9
12	R2	77	0.0	0.278	7.4	LOS A	1.2	29.2	0.57	0.55	0.57	32.9
Approach		622	0.7	0.440	8.6	LOS A	2.5	63.1	0.60	0.63	0.70	32.9
All Vehicles		2828	0.8	0.839	16.8	LOS C	15.5	389.8	0.76	0.97	1.39	29.4

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

SITE LAYOUT

Site: 101 [Westport Ridge AM - Preferred]

New Site
Site Category: (None)
Roundabout



MOVEMENT SUMMARY

Site: 101 [Westport Ridge AM - Preferred]

New Site
Site Category: (None)
Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: Westport Ridge												
3	L2	13	0.0	0.573	21.5	LOS C	3.3	82.1	0.83	0.99	1.40	27.9
8	T1	82	0.0	0.573	21.5	LOS C	3.3	82.1	0.83	0.99	1.40	27.9
18	R2	157	2.0	0.573	21.6	LOS C	3.3	82.1	0.83	0.99	1.40	27.2
Approach		251	1.3	0.573	21.6	LOS C	3.3	82.1	0.83	0.99	1.40	27.4
East: Ackman Road												
1	L2	38	13.0	0.174	4.7	LOS A	0.7	19.0	0.24	0.12	0.24	34.6
6	T1	281	10.0	0.174	4.3	LOS A	0.7	19.0	0.23	0.11	0.23	35.1
16	R2	14	0.0	0.110	3.7	LOS A	0.4	11.3	0.22	0.11	0.22	34.7
Approach		333	9.9	0.174	4.4	LOS A	0.7	19.0	0.23	0.11	0.23	35.1
North: Westport Ridge												
7	L2	42	0.0	0.095	4.3	LOS A	0.4	8.9	0.40	0.30	0.40	34.4
4	T1	14	0.0	0.095	4.3	LOS A	0.4	8.9	0.40	0.30	0.40	34.3
14	R2	42	0.0	0.095	4.3	LOS A	0.4	8.9	0.40	0.30	0.40	33.4
Approach		98	0.0	0.095	4.3	LOS A	0.4	8.9	0.40	0.30	0.40	34.0
West: Ackman Road												
5	L2	11	0.0	0.864	22.1	LOS C	15.6	393.3	0.96	0.56	0.96	27.9
2	T1	1051	1.0	0.864	22.2	LOS C	15.6	393.3	0.96	0.56	0.96	27.8
12	R2	6	0.0	0.864	22.1	LOS C	15.6	393.3	0.96	0.56	0.96	27.2
Approach		1067	1.0	0.864	22.2	LOS C	15.6	393.3	0.96	0.56	0.96	27.8
All Vehicles		1750	2.7	0.864	17.7	LOS C	15.6	393.3	0.77	0.52	0.86	29.2

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

MOVEMENT SUMMARY

Site: 101 [Westport Ridge PM - Preferred]

New Site
Site Category: (None)
Roundabout

Movement Performance - Vehicles

Mov ID	Turn	Demand Flows Total veh/h	HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: Westport Ridge												
3	L2	16	0.0	0.113	6.3	LOS A	0.5	11.3	0.59	0.56	0.59	34.1
8	T1	18	0.0	0.113	6.3	LOS A	0.5	11.3	0.59	0.56	0.59	33.9
18	R2	45	0.0	0.113	6.3	LOS A	0.5	11.3	0.59	0.56	0.59	33.0
Approach		80	0.0	0.113	6.3	LOS A	0.5	11.3	0.59	0.56	0.59	33.4
East: Ackman Road												
1	L2	60	0.0	0.589	9.4	LOS A	5.0	125.9	0.33	0.15	0.33	32.9
6	T1	1156	1.0	0.589	8.2	LOS A	5.0	125.9	0.29	0.13	0.29	33.5
16	R2	64	0.0	0.372	6.1	LOS A	2.2	54.6	0.23	0.10	0.23	33.6
Approach		1280	0.9	0.589	8.2	LOS A	5.0	125.9	0.29	0.13	0.29	33.4
North: Westport Ridge												
7	L2	20	0.0	0.089	8.5	LOS A	0.3	7.4	0.67	0.67	0.67	32.4
4	T1	12	0.0	0.089	8.5	LOS A	0.3	7.4	0.67	0.67	0.67	32.3
14	R2	13	0.0	0.089	8.5	LOS A	0.3	7.4	0.67	0.67	0.67	31.4
Approach		44	0.0	0.089	8.5	LOS A	0.3	7.4	0.67	0.67	0.67	32.1
West: Ackman Road												
5	L2	26	0.0	0.526	8.7	LOS A	4.1	103.6	0.40	0.21	0.40	33.4
2	T1	603	1.0	0.526	8.7	LOS A	4.1	103.6	0.40	0.21	0.40	33.3
12	R2	26	0.0	0.526	8.7	LOS A	4.1	103.6	0.40	0.21	0.40	32.4
Approach		655	0.9	0.526	8.7	LOS A	4.1	103.6	0.40	0.21	0.40	33.2
All Vehicles		2059	0.9	0.589	8.3	LOS A	5.0	125.9	0.35	0.19	0.35	33.3

Site Level of Service (LOS) Method: Delay & v/c (HCM 6). Site LOS Method is specified in the Parameter Settings dialog (Site tab).
Roundabout LOS Method: Same as Sign Control.
Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.
LOS F will result if v/c > 1 irrespective of movement delay value (does not apply for approaches and intersection).
Intersection and Approach LOS values are based on average delay for all movements (v/c not used as specified in HCM 6).
Roundabout Capacity Model: US HCM 6.
HCM Delay Formula option is used. Control Delay does not include Geometric Delay since Exclude Geometric Delay option applies.
Gap-Acceptance Capacity: Traditional M1.
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

APPENDIX D

Signal Warrant Analyses

(by Gewalt Hamilton Associates)

TRAFFIC SIGNAL WARRANT STUDY

To: Bradley Cousin, P.E., PTOE
Traffic Engineer – McHenry County Division of Transportation

From: Daniel P. Brinkman, P.E., PTOE
Antonio Maravillas, E.I.T.

Date: October 9, 2019

Subject: Ackman Road at Amberwood Drive (2050):
Crystal Lake, IL

GHA GEWALT HAMILTON ASSOCIATES, INC.
CONSULTING ENGINEERS
625 Forest Edge Drive, Vernon Hills, IL 60061
TEL 847.478.9700 ■ FAX 847.478.9701
www.gha-engineers.com

Part I. Project Context and Summary Statement

Per your request, *Gewalt Hamilton Associates, Inc*. (GHA) has conducted the necessary analysis to determine if the above referenced intersection meets the minimum criteria as published in the FHWA's Manual on Uniform Traffic Control Devices (MUTCD) for installation of a traffic signal.

Briefly summarizing, after review of the 2050 traffic projection data, recent crash history and the MUTCD criteria, it is our finding that the Ackman Road intersection with Amberwood Drive will not meet the threshold volumes or other criteria to warrant traffic signals.

Part II. Background Information

Site Location Map and Aerial Photo

Exhibit 1 provides an aerial photo of the subject intersection and vicinity with current traffic operations. Pertinent comments include:

- Ackman Road provides one travel lane in each direction with a two-way left turn lane east and west of its intersection with Amberwood Drive
- Ackman Road also provides a separate right turn lane on the westbound approach of the intersection.
- Amberwood Drive provides one travel lane in each direction with separate left and right turn lanes at the intersection.
- A shared-use path runs parallel to Ackman Road in the intersection vicinity, with a marked crosswalk on the southbound approach of the intersection.
- The intersection currently operates as One-Way Stop Controlled.
- The posted speed limit is 40-mph on Ackman Road and no speed limit is currently posted on Amberwood Drive.

2050 Traffic Volumes

GHA conducted a 24-hour traffic count at the Ackman Road / Amberwood Drive intersection on December 4, 2018. The Chicagoland Metropolitan Agency for Planning (CMAP) provided Year 2050 traffic projections for Amberwood Drive and Ackman Road with the proposed IL 47 extension. Existing traffic volumes were multiplied

by a factor of 1.2681 for Ackman Road west of the intersection, 1.333 for Amberwood Drive, and 1.2746 for Ackman Road east of the intersection in order to obtain Year 2050 projections. Exhibit 2 tabulates the prime 14-hours of traffic count data (6:00 AM to 8:00 PM) adjusted for Year 2050.

Part III. Evaluation

Right turn on Red (RTOR) adjustments

Prior to testing the published warrant criteria, the MUTCD directs the engineer conducting a warrant study to consider the effects of future right turns on red (RTOR) and remove those traffic volumes from the observed approach volumes. Various methods exist for this reduction, but the most prevalent in our area and the approach required by the Illinois Department of Transportation (IDOT) is Pagones' Theorem. Pagones' Theorem considers reduction for future right turns based on the lane configuration of the minor street approaches and further adjusts the reduction based on the volume of traffic in the adjacent through lanes to account for available gaps that RTOR movements would be made into.

Pagones' Theorem is attached as *Exhibit 3.*

For this analysis, Amberwood Drive approach volumes were reduced in accordance with lane configuration #3 – right turn volumes were generally reduced by 40-75% based on the observed approach volumes and lane configuration. These volumes and adjusted volumes are tabulated in *Exhibit 4.*

Warrant Analyses

GHA reviewed the available signal warrants as published in the FHWA's Manual on Uniform Traffic Control Devices (MUTCD). Each of the nine available warrants and their results are discussed below.

Warrant #1 – Eight Hour Volume

The 8-hour volume requirements are based on the existing lane configuration at the Ackman Road and Amberwood Drive intersection and posted speed limits. There are two 8-hour conditions that are considered: Condition A – Minimum Vehicular Volume and Condition B – Interruption of Continuous Traffic.

Included as *Exhibit 5* is Table 4C-1 from the MUTCD. As can be seen, based on the lane configuration at the intersection the minimum major street (Ackman Road) volumes are 500 and 750 vehicles per hour respectively for Condition A and Condition B. Similarly, the minor street (Amberwood Drive) volumes are 200 and 100 vehicles per hour respectively. For either condition the volume minimums must be met simultaneously during the same hour.

Warrant #2 – Four Hour Volume

Exhibit 6 presents Figure 4C-1 from the MUTCD, which was utilized to determine if the Four Hour Warrant was met. As can be seen, there are no hours where the minimum combined volume met above the minimum threshold line on the chart. Therefore, the Four Hour volume criteria is not met.

Warrant #3 – Peak Hour Volume

Exhibit 7 presents Figure 4C-3 from the MUTCD which was utilized to determine if Warrant #3 - Peak Hour Volume was met. There were no projected hours where the combination of volumes met above the minimum threshold line on the chart. Therefore, the Peak Hour volume criteria is not met.

Warrant #4 – Pedestrian Volume

Pedestrian volume warrant criteria starts at 75 pedestrians per hour. Based on the intersection location, pedestrians are not expected to be crossing Ackman Road, and vehicle and pedestrian conflicts are not an issue on Amberwood Drive. As such – this warrant was not considered.

Warrant #5 – School Crossing

The MUTCD allows for installation of a traffic signal when the principal reason for installation is to accommodate the crossing of school aged children. There is not an elementary school in close proximity to the intersection to justify this criteria.

Warrant #6 – Coordinated Signal System

This warrant was not considered.

Warrant #7 – Crash Experience

When the frequency and severity of correctable crashes are experienced over a 12-month period, installation of a traffic signal to address these crashes is justified based on this warrant. Note that volume criteria (80% of one of the Warrant #1 8-hour conditions) must also be met.

"Correctable" crashes considered for warrant criteria are generally turning and or angle type collisions. Crashes reported with fixed objects and animals do not merit consideration for the installation of traffic signals. Only one (1) reported crash occurred at the subject intersection in the 3 year period from 2014-2016, which is not sufficient to warrant a traffic signal on the Crash Experience basis.

A crash data summary table from McHenry County DOT is included as *Appendix A.*

Warrant #8 – Roadway Network

This warrant requires the two subject roadways to both be major roadways with similar volume characteristics. This warrant is not applicable.

Warrant #9 – Intersection Near a Grade Crossing (railroad).

This warrant is only applicable when an intersection is within 150-feet of an at grade railroad crossing. This warrant is not applicable.

Part IV. Conclusions & Recommendations

Exhibit 8 provides a detailed review of the various MUTCD warrants described and discussed above. At Year 2050, the vehicular volumes at the Ackman Road intersection with Amberwood Drive will not meet any of the published warrants.

Part V. Technical Addendum

The following *Exhibits* were previously referenced. They provide technical support for our observations, findings, and recommendations discussed in the text.

Exhibits

1. Location Map
2. 2050 Traffic Volumes
3. Analysis Parameters – "Pagones' Theorem"
4. 2050 Warrant Volumes
5. Eight Hour Traffic Signal Warrant Requirements
6. Four Hour Signal Warrant Test
7. Peak Hour Signal Warrant Test
8. Signal Warrant Review Sheet

Appendices

A. Crash Summaries

4188.921 MCDOT 2019 Ackman-Amberwood Warrant 100919

Ackman Road at Amberwood Drive, Crystal Lake, IL

GHA GEWALT HAMILTON ASSOCIATES, INC.

Exhibit 1
Location Map

Exhibit 2

2050 Traffic Volumes

Ackman Road at Amberwood Drive; Crystal Lake, IL

Intersection Ackman Road at Amberwood Drive **Municipality** Crystal Lake **County** McHenry **Date** 12/4/2050

	Major Street = Ackman Road											Minor Street = Amberwood Drive											
	Approach = Eastbound					Approach = Westbound					Major Street Total	Approach = Northbound					Approach = Southbound					Minor Street Total	Intersection Total Volumes
Hour Beginning	Left	Thru	Right	U-turn	Subtotal	Left	Thru	Right	U-turn	Subtotal		Left	Thru	Right	U-turn	Subtotal	Left	Thru	Right	U-turn	Subtotal		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
6:00 AM	4	677	-	0	681	-	254	1	0	255	936	-	-	-	-	-	27	-	15	0	41	41	977
7:00 AM	8	819	-	0	827	-	349	8	0	357	1,184	-	-	-	-	-	35	-	25	0	60	60	1,244
8:00 AM	14	689	-	0	703	-	315	8	0	322	1,025	-	-	-	-	-	21	-	29	0	51	51	1,076
9:00 AM	8	500	-	0	507	-	302	6	0	308	816	-	-	-	-	-	32	-	7	0	39	39	854
10:00 AM	4	418	-	1	424	-	311	13	0	324	747	-	-	-	-	-	25	-	4	0	29	29	777
11:00 AM	14	477	-	0	491	-	376	25	0	401	892	-	-	-	-	-	24	-	13	0	37	37	930
12:00 PM	6	434	-	0	440	-	396	20	0	417	857	-	-	-	-	-	15	-	17	1	33	33	890
1:00 PM	8	424	-	0	431	-	405	18	0	423	854	-	-	-	-	-	15	-	11	0	25	25	880
2:00 PM	4	403	-	0	407	-	507	19	0	526	933	-	-	-	-	-	13	-	16	0	29	29	963
3:00 PM	25	609	-	0	634	-	742	34	0	776	1,410	-	-	-	-	-	12	-	16	0	28	28	1,438
4:00 PM	20	580	-	0	600	-	918	50	0	967	1,567	-	-	-	-	-	24	-	11	0	35	35	1,602
5:00 PM	34	544	-	0	578	-	988	47	0	1,035	1,613	-	-	-	-	-	19	-	15	0	33	33	1,647
6:00 PM	11	528	-	0	539	-	887	56	0	943	1,482	-	-	-	-	-	21	-	20	0	41	41	1,523
7:00 PM	8	325	-	0	332	-	609	42	0	651	984	-	-	-	-	-	7	-	9	0	16	16	1,000

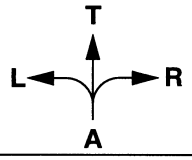
GEWALT HAMILTON ASSOCIATES, INC.

Exhibit 3

Analysis Parameters – "Pagones' Theorem"

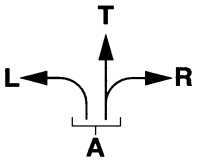
1. Lane Configurations and Right Turn Reductions

1



IF { R > 0.7A | 0.7A ≥ R > 0.35A | R ≤ 0.35A } THEN { reduce R by 60% | reduce R by 40% | reduce R by 20% }

2



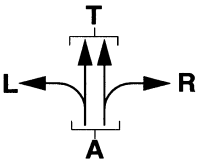
IF { R > 3T | 3T ≥ R > T/3 | R ≤ T/3 } THEN { reduce R by 60% | reduce R by 40% | reduce R by 20% }

---

3 Any configuration with an exclusive right turn lane (usually ≥ 600 ft. long)

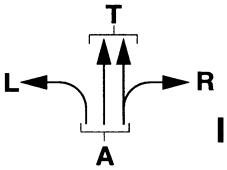
Reduce R by 75% in all cases.

4



IF { R > (T + L) | L > (T + R) | L ≈ T ≈ R (±10 veh.) | L ≈ T > 3R | R ≈ T > 3L | all other cases } THEN { reduce R by 65% | use situation 2 | reduce R by 40% | reduce R by 20% | reduce R by 50% | reduce R by 30% }

5



IF { R > T | T ≥ R > T/2 | T/2 ≥ R > T/4 | R ≤ T/4 } THEN { reduce R by 75% | reduce R by 50% | reduce R by 30% | reduce R by 15% }

LEGEND

L = number of left turning vehicles
T = number of through vehicles
R = number of right turning vehicles
A = (L+T+R)

2. Mainline Congestion Factors For Limiting Right Turn Reductions[1]

Volumes Per Lane	Reduction	Volumes Per Lane	Reduction
0 - 399	0%	1000 - 1099	35%
400 - 499	5%	1100 - 1199	40%
500 - 599	10%	1200 - 1299	45%
600 - 699	15%	1300 - 1399	50%
700 - 799	20%	1400 - 1499	55%
800 - 899	25%	1500 - 1599	60%
900 - 999	30%	etc.	etc.

(1) Mainline = Approach which right turns turn into

Exhibit 4
2050 Warrant Volumes
Ackman Road at Amberwood Drive; Crystal Lake, IL

A. Southbound Amberwood Drive

Hour	Volume From Exhibit 2				RTOR	Warrant Volumes			
Beginning	Left	Thru	Right	Subtotal	Reduction	Left	Thru	Right	Total
	1	2	3	4	5	6	7	8	9
6:00 AM	27	-	15	41	75%	27	-	4	30
7:00 AM	35	-	25	60	75%	35	-	6	41
8:00 AM	21	-	29	51	75%	21	-	7	29
9:00 AM	32	-	7	39	75%	32	-	2	34
10:00 AM	25	-	4	29	75%	25	-	1	26
11:00 AM	24	-	13	37	75%	24	-	3	27
12:00 PM	15	-	17	32	75%	15	-	4	19
1:00 PM	15	-	11	25	70%	15	-	3	18
2:00 PM	13	-	16	29	65%	13	-	6	19
3:00 PM	12	-	16	28	55%	12	-	7	19
4:00 PM	24	-	11	35	45%	24	-	6	30
5:00 PM	19	-	15	33	45%	19	-	8	27
6:00 PM	21	-	20	41	50%	21	-	10	31
7:00 PM	7	-	9	16	60%	7	-	4	10

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Exhibit 5

Eight Hour Traffic Signal Warrant Requirements

Table 4C-1. Warrant 1, Eight-Hour Vehicular Volume

Condition A—Minimum Vehicular Volume

Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher-volume minor-street approach (one direction only)			
Major Street	Minor Street	100%[a]	80%[b]	70%[c]	56%[d]	100%[a]	80%[b]	70%[c]	56%[d]
1	1	500	400	350	280	150	120	105	84
2 or more	1	600	480	420	336	150	120	105	84
2 or more	2 or more	600	480	420	336	200	160	140	112
1	2 or more	500	400	350	280	200	160	140	112

Condition B—Interruption of Continuous Traffic

Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher-volume minor-street approach (one direction only)			
Major Street	Minor Street	100%[a]	80%[b]	70%[c]	56%[d]	100%[a]	80%[b]	70%[c]	56%[d]
1	1	750	600	525	420	75	60	53	42
2 or more	1	900	720	630	504	75	60	53	42
2 or more	2 or more	900	720	630	504	100	80	70	56
1	2 or more	750	600	525	420	100	80	70	56

[a] Basic minimum hourly volume

[b] Used for combination of Conditions A and B after adequate trial of other remedial measures

[c] May be used when the major-street speed exceeds 40 mph or in an isolated community with a population of less than 10,000

[d] May be used for combination of Conditions A and B after adequate trial of other remedial measures when the major-street speed exceeds 40 mph or in an isolated community with a population of less than 10,000

Major Street - Ackman Road

- One lane for moving through traffic

Minor Street – Amberwood Drive

- Two lanes for moving traffic

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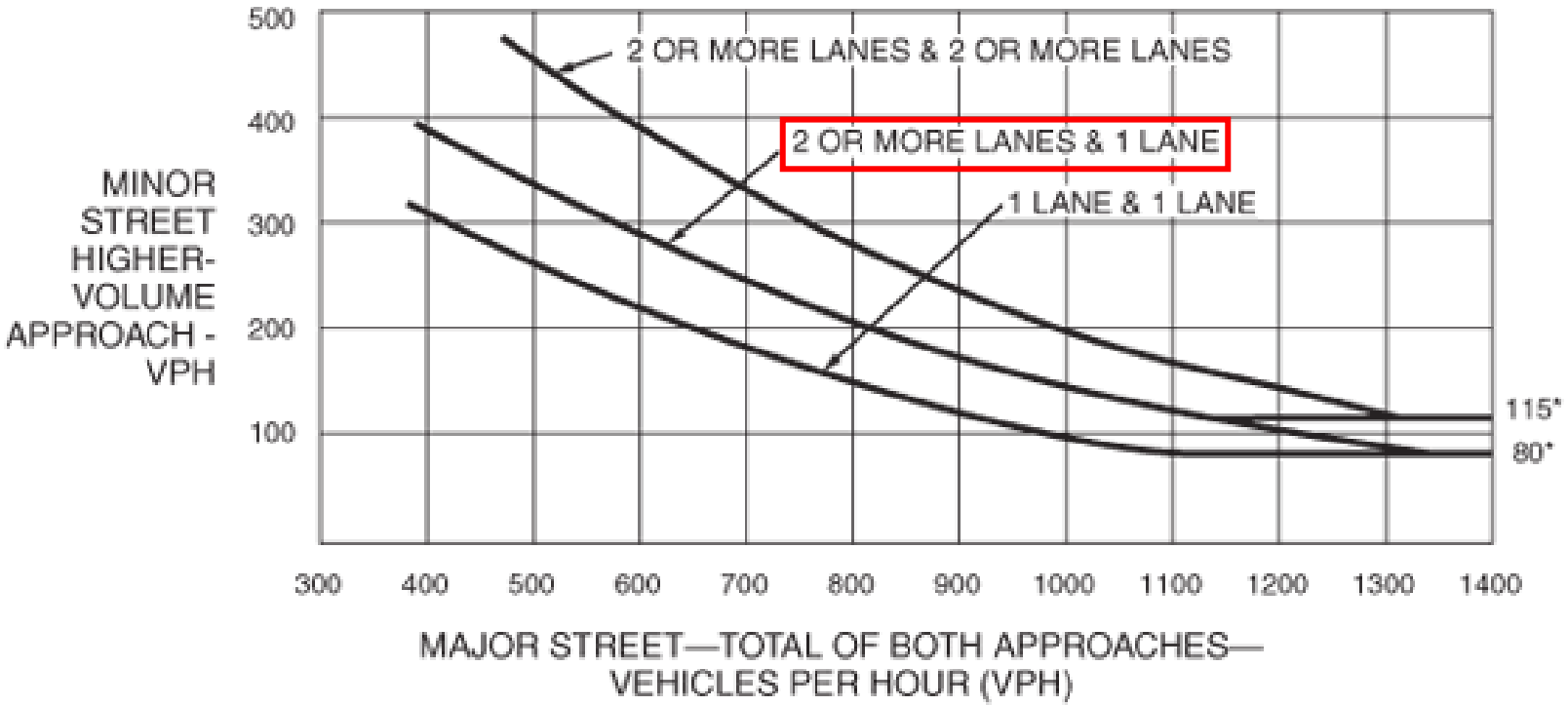
Exhibit 6

Four Hour Traffic Signal Warrant Test

Figure 4C-1. Warrant 2, Four-Hour Vehicular Volume



*Note: 115 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 80 vph applies as the lower threshold volume for a minor-street approach with one lane.

Volumes

- Major Street – Ackman Road
- Minor Street – Amberwood Drive

Result

- Intersection Volume requirements met for 0 hours.

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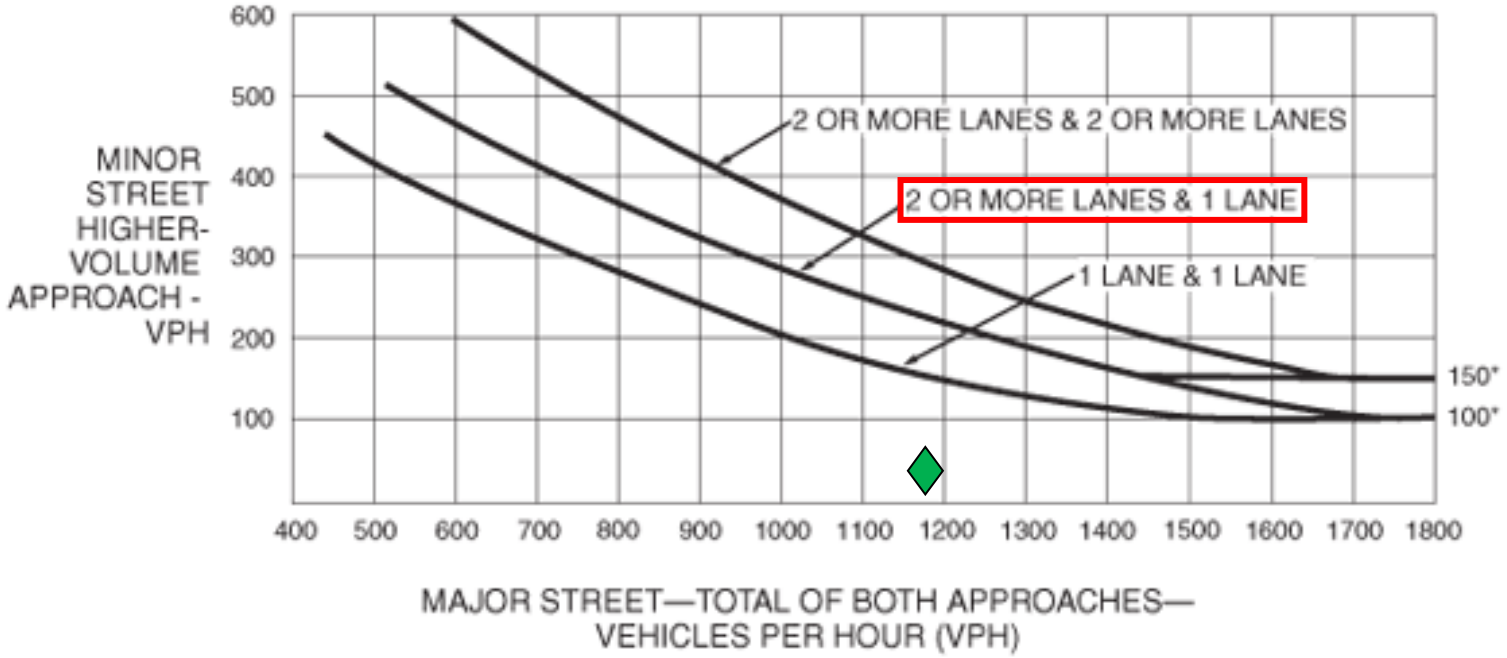
Exhibit 7

Traffic Signal Warrant Test

Figure 4C-3. Warrant 3, Peak Hour



*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Discussion

- Focus on Weekday Morning Peak Hour, because intersection minor street approach values are highest at that time.

Volumes

- Major Street – Ackman Road = 1,184 VPH
- Minor Street – Amberwood Drive = 41 VPH (7:00 AM)

Result

- Intersection volume does **not** meet Warrant #3 Peak Hour

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Exhibit 8
Signal Warrant Review Sheet

Ackman Road at Amberwood Drive (2050); Crystal Lake, IL

SRA: NO

Intersection: Ackman Road at Amberwood Drive

Municipality: Crystal Lake **County:** McHenry

Speed limit of major route: 40 **Isolated community with population <10,000?** NO

Number of lanes for major approach: 1-lane **Number of lanes for minor approach:** 2-lanes

Warrant 1 - Condition A — Need 8 Hours Major = 500 vph and Minor = 200 vph

Warrant 1 - Condition B — Need 8 Hours Major = 750 vph and Minor = 100 vph

Hour Begin	Major Street Volume (both approaches	Adj. Minor Street Volume (higher volume approach)	Check any hours which meet the following warrants: Warrant 1 A 100%	Warrant 1 B 100%	Warrant 7: 8 hrs of one of the following: Warrant 1 A/B: 8 hrs of BOTH: 80% of A	80% of B	80% of Warr #4
6:00	936	30	-	-	-	-	-
7:00	1,184	41	-	-	-	-	-
8:00	1,025	29	-	-	-	-	-
9:00	816	34	-	-	-	-	-
10:00	747	26	-	-	-	-	-
11:00	892	27	-	-	-	-	-
12:00	857	19	-	-	-	-	-
1:00	854	18	-	-	-	-	-
2:00	933	19	-	-	-	-	-
3:00	1,410	19	-	-	-	-	-
4:00	1,567	30	-	-	-	-	-
5:00	1,613	27	-	-	-	-	-
6:00	1,482	31	-	-	-	-	-
7:00	984	10	-	-	-	-	-
		Hours Met:	0	0	0	0	0

WARRANT 1 Yes / No

Warrant 1 is met if any of the following conditions are met:

Condition A Yes / No
Minimum Vehicular Volume

Condition B Yes / No
Interruption of Continuous Traffic

Condition A/B Yes / No
Combination of Warrants

WARRANT 2 Yes / No
Four-Hour Volume

WARRANT 3 Yes / No
Peak-Hour Volume

WARRANT 4 Yes / No
Pedestrian Volume

WARRANT 5 Yes / No
School Crossing

WARRANT 6 Yes / N/A / No
Coordinated Signal

WARRANT 7 Yes / No
Accident Experience

	2014	2015	2016	
Number of accidents:	1	0	0	
Correctable accidents:	1			

Less restrictive remedies tried?

Are volume requirements met? No

WARRANT 8 Yes / N/A / No
Roadway Network

WARRANT 9 Yes / N/A / No
Intersection Near a Grade Crossing

STOP OR YIELD CONTROLLED LEG WITH GRADE CROSSING

D (clear storage distance) =

	#	%	Adj. Factor
RAIL TRAFFIC PER DAY =			
HIGH OCCUPANCY BUSSES PER HOUR =			
TRUCKS PER HOUR =			

OVERALL ADJUSTMENT FACTOR =

Review Information

Counts Used: GHA 24-hour miovision data / CMAP 2050 Projections

Count Date: 4-Dec-18 (Adjusted for 2050)

Date Reviewed: 10/9/2019

Reviewed By: AM

Comments

GHA GEWALT HAMILTON ASSOCIATES, INC.

Appendix A
Crash Data for Ackman Road & Amberwood Drive from 2014-2016

INTERSECTION	YEAR	MONTH	DAY	HOUR	DAY OF WEEK	NUM VEH	INJURIES	FATALITIES	INJURY TYPE	COLLISION TYPE	WEATHER	LIGHTING	SURFACE CONDITIONS
Ackman Rd at Amberwood Dr	2014	12	15	17	Monday	2	0	0	O	Turning	Rain	Darkness/ Lighted Road	Wet
Ackman Rd at Amberwood Dr	2015	NO CRASHES											
Ackman Rd at Amberwood Dr	2016	NO CRASHES											

GREEN = CORRECTABLE
RED = NOT CORRECTABLE BY TRAFFIC SIGNAL
WHITE = NO DOCUMENTED CRASHES

Injury Severity	
K	Fatal
A	Incapacitating
B	Non-incapacitating
C	Reported/Not evident
O	No indication of injury

GHA GEWALT HAMILTON ASSOCIATES, INC.

TRAFFIC SIGNAL WARRANT STUDY

To: Bradley Cousin, P.E, PTOE
Traffic Engineer – McHenry County Division of Transportation

From: Daniel P. Brinkman, P.E., PTOE
Antonio Maravillas, E.I.T.

Date: October 9, 2019

Subject: Ackman Road at Haligus Road (2050):
Lake in the Hills, IL

GHA GEWALT HAMILTON ASSOCIATES, INC.
CONSULTING ENGINEERS
625 Forest Edge Drive, Vernon Hills, IL 60061
TEL 847.478.9700 ■ FAX 847.478.9701
www.gha-engineers.com

Part I. Project Context and Summary Statement

Per your request, *Gewalt Hamilton Associates, Inc*. (GHA) has conducted the necessary analysis to determine if the above referenced intersection meets the minimum criteria as published in the FHWA's Manual on Uniform Traffic Control Devices (MUTCD) for installation of a traffic signal.

Briefly summarizing, after review of the 2050 traffic projection data, recent crash history and the MUTCD criteria, it is our finding that the Ackman Road intersection with Haligus Road could potentially meet the peak hour threshold volumes to warrant a traffic signal by 2050, assuming the Ackman Road extension is built.

Part II. Background Information

Site Location Map and Aerial Photo

Exhibit 1 provides an aerial photo of the subject intersection and vicinity with current traffic operations. Pertinent comments include:

- Ackman Road provides one travel lane in each direction. Separate right and left turn lanes are provided at the intersection.
- Haligus Road provides a single through lane in each direction and a separate left turn lane at the southbound approach with Ackman Road.
- The intersection currently operates as One-Way Stop Controlled.
- A private driveway is located around 100 feet north of the intersection, west of Haligus Road.
- The posted speed limit on Ackman Road is 50-mph and the posted speed limit on Haligus Road is 45-mph.

Traffic Volumes

GHA conducted a 24-hour traffic count at the Ackman Road / Haligus Road intersection on December 4, 2018. The Chicagoland Metropolitan Agency for Planning (CMAP) provided Year 2050 traffic projections for Haligus Road and Ackman Road with the proposed IL 47 extension. 2050 Peak Hour projections were also provided by MCDOT and included as *Appendix A*. Existing traffic volumes along Haligus Road were multiplied by a factor of 1.4792 north of the intersection and 1.1313 south of the intersection. Existing traffic volumes along Ackman Road were multiplied by a factor of 1.8750 in order to obtain Year 2050 projections. Traffic volumes were redistributed,

and volumes were established for the new Ackman Road extension based on the travel demand shifts shown in MCDOT's projections. Exhibit 2 tabulates the prime 14- hours of traffic count data (6:00 AM to 8:00 PM) adjusted for Year 2050 and the western Ackman Road extension.

Part III. Evaluation

Right turn on Red (RTOR) adjustments

Prior to testing the published warrant criteria, the MUTCD directs the engineer conducting a warrant study to consider the effects of future right turns on red (RTOR) and remove those traffic volumes from the observed approach volumes. Various methods exist for this reduction, but the most prevalent in our area and the approach required by the Illinois Department of Transportation (IDOT) is Pagones' Theorem. Pagones' Theorem considers reduction for future right turns based on the lane configuration of the minor street approaches and further adjusts the reduction based on the volume of traffic in the adjacent through lanes to account for available gaps that RTOR movements would be made into.

Pagones' Theorem is attached as *Exhibit 3.*

For this analysis, it was assumed that all approaches would have a Left Turn Only lane in addition to a shared Thru/Right lane. Ackman Road approach volumes were reduced in accordance with lane configuration #2 – right turn volumes were generally reduced by 40% based on the observed approach volumes and lane configuration. These volumes and adjusted volumes are tabulated in *Exhibit 4.*

Warrant Analyses

GHA reviewed the available signal warrants as published in the FHWA's Manual on Uniform Traffic Control Devices (MUTCD). Each of the nine available warrants and their results are discussed below.

Warrant #1 – Eight Hour Volume

The 8-hour volume requirements are based on the existing lane configuration at the Ackman Road and Haligus Road intersection and posted speed limits. There are two 8-hour conditions that are considered: Condition A – Minimum Vehicular Volume and Condition B – Interruption of Continuous Traffic.

Included as *Exhibit 5* is Table 4C-1 from the MUTCD. As can be seen, based on the lane configuration at the intersection the minimum major street (Haligus Road) volumes are 500 and 750 vehicles per hour respectively for Condition A and Condition B. Similarly, the minor street (Ackman Road) volumes are 150 and 75 vehicles per hour respectively. For either condition the volume minimums must be met simultaneously during the same hour.

Condition A is anticipated to be met for 4 hours throughout the day. While the minimum volumes required along Haligus Road is 500 vph, there are only 5 hours where Haligus Road exceeds 400 vph. Thus, condition A is not expected to be met.

Because Condition B requires higher volumes on Haligus Road than Condition A, Condition B is also not expected to be met.

Warrant #2 – Four Hour Volume

Exhibit 6 presents Figure 4C-1 from the MUTCD, which was utilized to determine if the Four Hour Warrant was met. As can be seen, there are only 2 hours where the minimum combined volume met above the minimum threshold line on the chart with no other hours close enough. Therefore, the Four Hour volume criteria is not expected to be met.

Warrant #3 – Peak Hour Volume

Exhibit 7A and *7B* presents Figure 4C-3 from the MUTCD which was utilized to determine if Warrant #3 - Peak Hour Volume was met. Because GHA's projected peak hours volumes were lower than MCDOT's provided projections, both peak hour projections were compared. *Exhibit 7A* shows that the evening peak hour volumes from GHA's projections do not meet the required volumes to warrant a traffic signal. However, per MCDOT's projections, the peak hour volumes barely meets the minimum required volumes for a traffic signal, as shown in *Exhibit 7B*.

Warrant #4 – Pedestrian Volume

Pedestrian volume warrant criteria starts at 75 pedestrians per hour. Based on the intersection location, pedestrians are not expected to be crossing either Haligus Road or Ackman Road. As such – this warrant was not considered.

Warrant #5 – School Crossing

The MUTCD allows for installation of a traffic signal when the principal reason for installation is to accommodate the crossing of school aged children. There is not an elementary school in close proximity to the intersection to justify this criteria.

Warrant #6 – Coordinated Signal System

This warrant was not considered.

Warrant #7 – Crash Experience

When the frequency and severity of correctable crashes are experienced over a 12-month period, installation of a traffic signal to address these crashes is justified based on this warrant. Note that volume criteria (80% of one of the Warrant #1 8-hour conditions) must also be met.

"Correctable" crashes considered for warrant criteria are generally turning and or angle type collisions. Crashes reported with fixed objects and animals do not merit consideration for the installation of traffic signals. Only three (3) reported crashes occurred at the subject intersection in the 3 year period from 2014-2016, which is not sufficient to warrant a traffic signal on the Crash Experience basis.

A crash data summary table from McHenry County DOT is included as *Appendix B.*

Warrant #8 – Roadway Network

This warrant requires an intersection of two similar routes with entering volumes of at least 1,000 vehicles per hour during the peak hour. This warrant also requires 5-year traffic projections that will meet one of Warrants 1-3.

Ackman Road and Haligus Road are both classified as Major Collectors with similar traffic volumes. There are multiple hours where the total entering volumes exceed 1,000 vehicles per hour. Because the peak hour warrant may or may not be satisfied by 2050, this warrant could be applicable.

Warrant #9 – Intersection Near a Grade Crossing (railroad).

This warrant is only applicable when an intersection is within 150-feet of an at grade railroad crossing. This warrant is not applicable.

Part IV. Conclusions & Recommendations

Exhibit 8 provides a detailed review of the various MUTCD warrants described and discussed above. At Year 2050, the vehicular volumes at the Ackman Road intersection with Haligus Road may potentially satisfy the peak hour warrant. Because of the uncertainty with 30-year traffic projections, it is recommended to look into all-way stop control before installing a traffic signal.

Part V. Technical Addendum

The following *Exhibits* were previously referenced. They provide technical support for our observations, findings, and recommendations discussed in the text.

Exhibits

1. Location Map
2. 2050 Traffic Volumes
3. Analysis Parameters – "Pagones' Theorem"
4. 2050 Warrant Volumes
5. Eight Hour Traffic Signal Warrant Requirements
6. Four Hour Signal Warrant Test
7. a. Peak Hour Signal Warrant Test (GHA Projections)
   b. Peak Hour Signal Warrant Test (MCDOT Projections)
8. Signal Warrant Review Sheet

Appendices

A. Existing and 2050 Design Hourly Traffic Volumes
B. Crash Summaries

Ackman Road at Haligus Road, Lake in the Hills, IL

GHA GEWALT HAMILTON ASSOCIATES, INC.

Exhibit 1
Location Map

Exhibit 2

2050 Traffic Volumes

Ackman Road at Haligus Road; Lake in the Hills, IL

Intersection Ackman Road at Haligus Road **Municipality** Lake in the Hills **County** McHenry **Date** 12/4/2050

	Major Street = Haligus Road											Minor Street = Ackman Road											
	Approach = Northbound					Approach = Southbound					Major Street Total	Approach = Eastbound					Approach = Westbound					Minor Street Total	Intersection Total Volumes
Hour Beginning	Left	Thru	Right	U-turn	Subtotal	Left	Thru	Right	U-turn	Subtotal		Left	Thru	Right	U-turn	Subtotal	Left	Thru	Right	U-turn	Subtotal		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
6:00 AM	22	93	77	0	192	46	75	42	0	163	355	47	55	29	0	131	51	73	84	0	208	339	694
7:00 AM	31	140	96	0	267	77	129	68	0	274	541	69	80	42	0	191	52	98	131	0	281	472	1,013
8:00 AM	27	122	82	0	231	52	77	56	0	185	416	55	65	34	0	154	35	87	126	0	248	402	817
9:00 AM	24	117	62	0	203	48	66	59	0	173	376	46	54	28	0	129	35	61	78	0	174	303	679
10:00 AM	13	56	46	0	115	40	66	36	0	142	257	32	37	19	0	88	25	43	53	2	124	212	469
11:00 AM	16	72	47	0	135	56	83	62	0	201	336	43	51	26	0	120	51	66	71	1	189	310	646
12:00 PM	18	87	53	0	158	53	88	47	0	188	346	42	49	26	0	117	35	56	69	0	159	277	623
1:00 PM	16	56	65	0	137	52	84	50	0	186	323	42	49	26	0	116	56	64	63	0	184	300	623
2:00 PM	19	91	55	0	165	60	89	65	0	214	380	48	56	29	0	132	62	68	64	0	193	325	705
3:00 PM	28	112	99	0	239	78	105	95	0	278	517	67	78	41	0	185	77	100	108	0	285	470	987
4:00 PM	26	115	86	0	227	93	125	115	0	333	560	78	90	47	0	215	105	135	144	2	386	602	1,162
5:00 PM	29	127	95	0	251	99	132	121	0	352	603	82	96	50	0	228	118	139	139	1	398	626	1,229
6:00 PM	22	96	72	0	190	53	81	56	0	191	381	60	70	36	0	166	108	123	120	0	351	516	897
7:00 PM	10	38	39	0	87	43	62	49	0	154	241	35	40	21	0	96	52	65	69	0	186	282	523

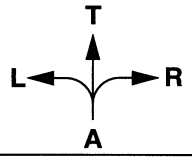
GHA GEWALT HAMILTON ASSOCIATES, INC.

Exhibit 3

Analysis Parameters – "Pagones' Theorem"

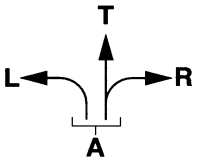
1. Lane Configurations and Right Turn Reductions

1



IF { R > 0.7A | 0.7A ≥ R > 0.35A | R ≤ 0.35A } THEN { reduce R by 60% | reduce R by 40% | reduce R by 20% }

2



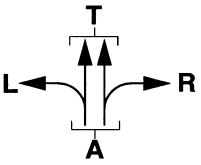
IF { R > 3T | 3T ≥ R > T/3 | R ≤ T/3 } THEN { reduce R by 60% | reduce R by 40% | reduce R by 20% }

---

3 Any configuration with an exclusive right turn lane (usually ≥ 600 ft. long)

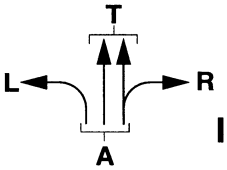
Reduce R by 75% in all cases.

4



IF { R > (T + L) | L > (T + R) | L ≈ T ≈ R (±10 veh.) | L ≈ T > 3R | R ≈ T > 3L | all other cases } THEN { reduce R by 65% | use situation 2 | reduce R by 40% | reduce R by 20% | reduce R by 50% | reduce R by 30% }

5



IF { R > T | T ≥ R > T/2 | T/2 ≥ R > T/4 | R ≤ T/4 } THEN { reduce R by 75% | reduce R by 50% | reduce R by 30% | reduce R by 15% }

LEGEND

L = number of left turning vehicles
T = number of through vehicles
R = number of right turning vehicles
A = (L+T+R)

2. Mainline Congestion Factors For Limiting Right Turn Reductions[1]

Volumes Per Lane	Reduction	Volumes Per Lane	Reduction
0 - 399	0%	1000 - 1099	35%
400 - 499	5%	1100 - 1199	40%
500 - 599	10%	1200 - 1299	45%
600 - 699	15%	1300 - 1399	50%
700 - 799	20%	1400 - 1499	55%
800 - 899	25%	1500 - 1599	60%
900 - 999	30%	etc.	etc.

(1) Mainline = Approach which right turns turn into

Exhibit 4
2050 Warrant Volumes
Ackman Road at Haligus Road; Lake in the Hills, IL

A. Westbound Ackman Road

Hour	Volume From Exhibit 2				RTOR	Warrant Volumes			
Beginning	Left	Thru	Right	Subtotal	Reduction	Left	Thru	Right	Total
	1	2	3	4	5	6	7	8	9
6:00 AM	51	55	84	190	40%	51	55	51	156
7:00 AM	52	80	131	263	40%	52	80	78	211
8:00 AM	35	65	126	226	40%	35	65	76	175
9:00 AM	35	54	78	167	40%	35	54	47	136
10:00 AM	25	37	53	115	40%	25	37	32	94
11:00 AM	51	51	71	173	40%	51	51	43	144
12:00 PM	35	49	69	153	40%	35	49	41	125
1:00 PM	56	49	63	168	40%	56	49	38	143
2:00 PM	62	56	64	181	40%	62	56	38	156
3:00 PM	77	78	108	263	40%	77	78	65	220
4:00 PM	105	90	144	339	40%	105	90	86	282
5:00 PM	118	96	139	353	40%	118	96	84	298
6:00 PM	108	70	120	298	40%	108	70	72	250
7:00 PM	52	40	69	161	40%	52	40	41	134

B. Eastbound Ackman Road

Hour	Volume From Exhibit 2				RTOR	Warrant Volumes			
Beginning	Left	Thru	Right	Subtotal	Reduction	Left	Thru	Right	Total
	1	2	3	4	5	6	7	8	9
6:00 AM	47	55	29	131	40%	47	55	17	119
7:00 AM	69	80	42	191	40%	69	80	25	174
8:00 AM	55	65	34	154	40%	55	65	20	141
9:00 AM	46	54	28	129	40%	46	54	17	118
10:00 AM	32	37	19	88	40%	32	37	12	81
11:00 AM	43	51	26	120	40%	43	51	16	110
12:00 PM	42	49	26	117	40%	42	49	16	107
1:00 PM	42	49	26	116	40%	42	49	15	106
2:00 PM	48	56	29	132	40%	48	56	17	121
3:00 PM	67	78	41	185	40%	67	78	24	169
4:00 PM	78	90	47	215	40%	78	90	28	196
5:00 PM	82	96	50	228	40%	82	96	30	208
6:00 PM	60	70	36	166	40%	60	70	22	151
7:00 PM	35	40	21	96	40%	35	40	13	88

GEWALT HAMILTON ASSOCIATES, INC.

Exhibit 5

Eight Hour Traffic Signal Warrant Requirements

Table 4C-1. Warrant 1, Eight-Hour Vehicular Volume

Condition A—Minimum Vehicular Volume

Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher-volume minor-street approach (one direction only)			
Major Street	Minor Street	100%[a]	80%[b]	70%[c]	56%[d]	100%[a]	80%[b]	70%[c]	56%[d]
1	1	500	400	350	280	150	120	105	84
2 or more	1	600	480	420	336	150	120	105	84
2 or more	2 or more	600	480	420	336	200	160	140	112
1	2 or more	500	400	350	280	200	160	140	112

Condition B—Interruption of Continuous Traffic

Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher-volume minor-street approach (one direction only)			
Major Street	Minor Street	100%[a]	80%[b]	70%[c]	56%[d]	100%[a]	80%[b]	70%[c]	56%[d]
1	1	750	600	525	420	75	60	53	42
2 or more	1	900	720	630	504	75	60	53	42
2 or more	2 or more	900	720	630	504	100	80	70	56
1	2 or more	750	600	525	420	100	80	70	56

[a] Basic minimum hourly volume

[b] Used for combination of Conditions A and B after adequate trial of other remedial measures

[c] May be used when the major-street speed exceeds 40 mph or in an isolated community with a population of less than 10,000

[d] May be used for combination of Conditions A and B after adequate trial of other remedial measures when the major-street speed exceeds 40 mph or in an isolated community with a population of less than 10,000

Major Street - Haligus Road

- Assume one lane for moving through traffic

Minor Street - Ackman Road

- Assume one lane for moving through traffic

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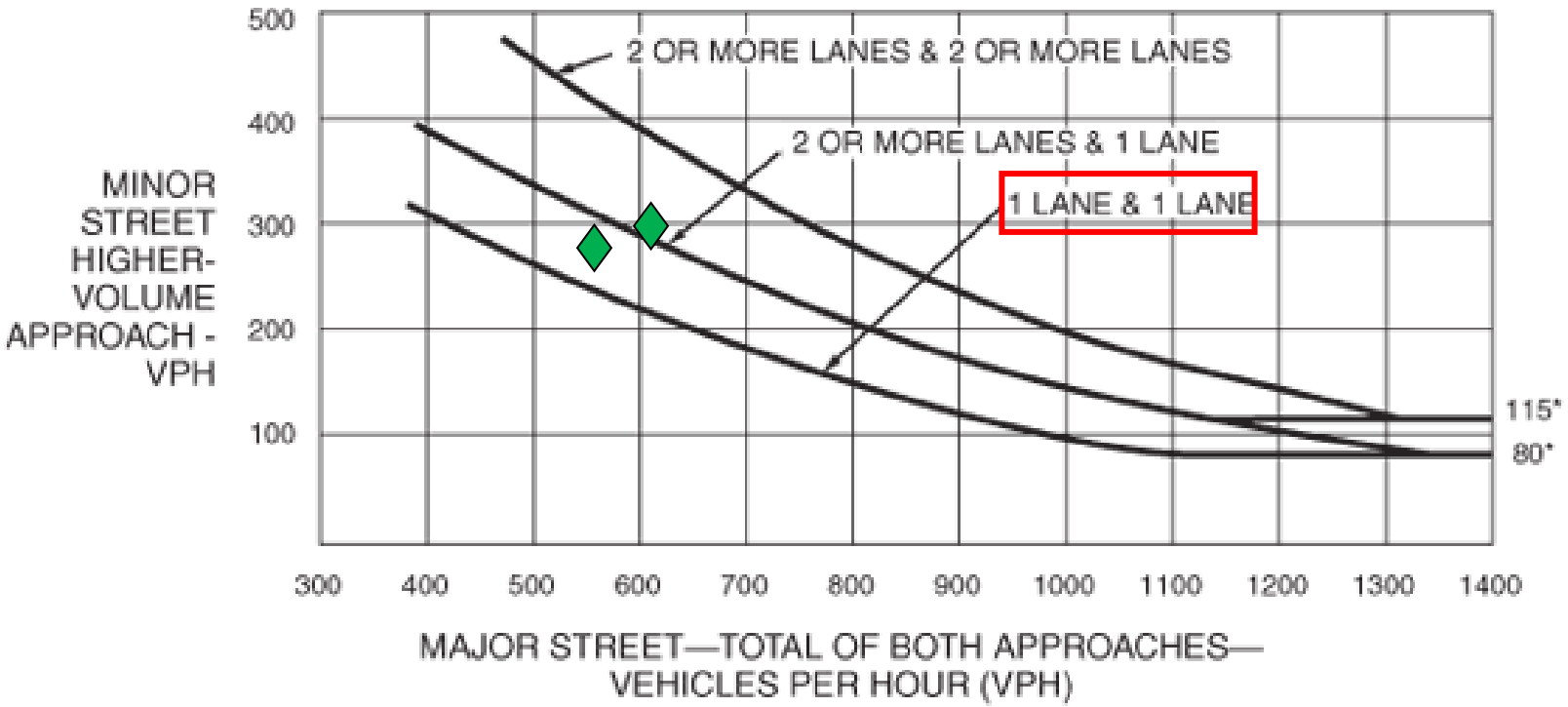
Exhibit 6

Four Hour Traffic Signal Warrant Test

Figure 4C-1. Warrant 2, Four-Hour Vehicular Volume



*Note: 115 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 80 vph applies as the lower threshold volume for a minor-street approach with one lane.

Volumes

- Major Street – Haliguis Road
- Minor Street – Ackman Road

Result

- Intersection Volume requirements only met for 2 hours.

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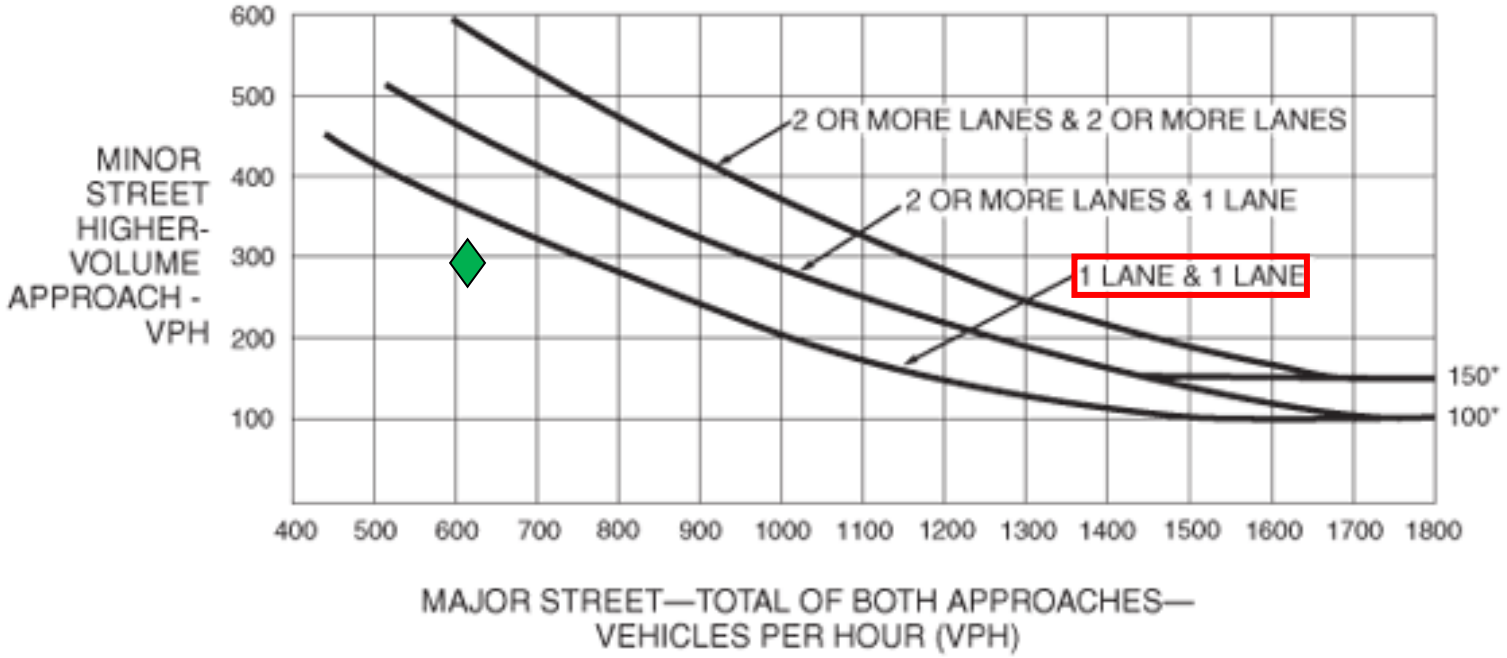
Exhibit 7A
GHA Peak Hour Projections
Traffic Signal Warrant Test

Figure 4C-3. Warrant 3, Peak Hour



*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Discussion

- Focus on Weekday Evening Peak Hour, because intersection minor street approach values are highest at that time.

Volumes

- Major Street – Haligus Road = 603 VPH
- Minor Street – Ackman Road = 298 VPH (5:00 PM)

Result

- Intersection volume does not meet Warrant #3 Peak Hour

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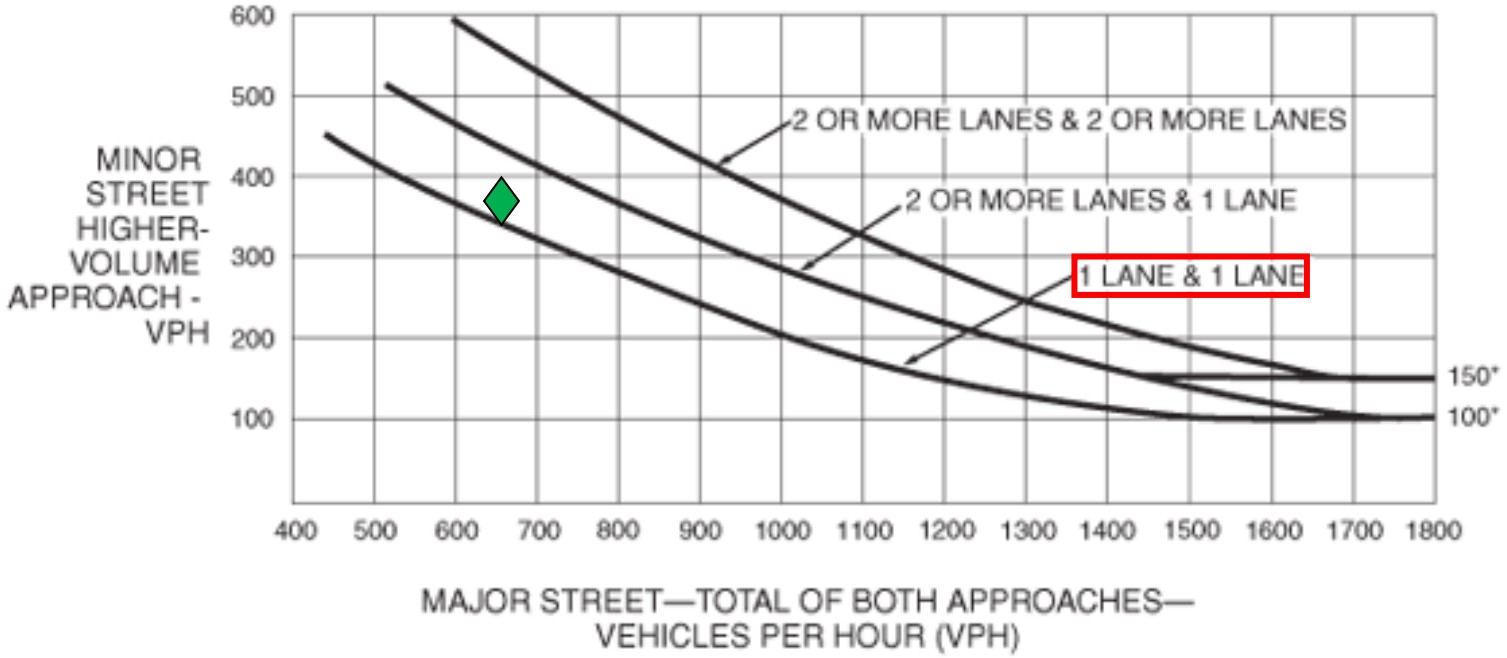
Exhibit 7B
MCDOT Peak Hour Projections
Traffic Signal Warrant Test

Figure 4C-3. Warrant 3, Peak Hour



*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Discussion

- Focus on Weekday Evening Peak Hour (4:45-5:45 PM), because intersection volumes are higher compared with Morning Peak Hour. Right turns were reduced by 40% on the minor street.

Volumes

- Major Street – Haligus Road = 659 VPH
- Minor Street – Ackman Road = 378 VPH (4:45 PM)

Result

- Intersection volume meets Warrant #3 Peak Hour

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Exhibit 8
Signal Warrant Review Sheet

Ackman Road at Haligus Road (2050); Lake in the Hills, IL

SRA: NO

Intersection: Ackman Road at Haligus Road

Municipality: Lake In the Hills **County:** McHenry

Speed limit of major route: 45 **Isolated community with population <10,000?** NO

Number of lanes for major approach: 1 **Number of lanes for minor approach:** 1

Warrant 1 - Condition A — Need 8 Hours (Major = 500 vph and Minor = 150 vph)

Warrant 1 - Condition B — Need 8 Hours (Major = 750 vph and Minor = 75 vph)

Hour Begin	Major Street Volume (both approaches	Adj. Minor Street Volume (higher volume approach)	Check any hours which meet the following warrants: Warrant 1 A 100%	Warrant 1 B 100%	Warrant 7: 8 hrs of one of the following: Warrant 1 A/B: 8 hrs of BOTH: 80% of A	80% of B	80% of Warr #4
6:00	355	156	-	-	-	-	-
7:00	541	211	X	-	X	-	-
8:00	416	175	-	-	X	-	-
9:00	376	136	-	-	-	-	-
10:00	257	94	-	-	-	-	-
11:00	336	144	-	-	-	-	-
12:00	346	125	-	-	-	-	-
1:00	323	143	-	-	-	-	-
2:00	380	156	-	-	-	-	-
3:00	517	220	X	-	X	-	-
4:00	560	282	X	-	X	-	-
5:00	603	298	X	-	X	X	-
6:00	381	250	-	-	-	-	-
7:00	241	134	-	-	-	-	-
		Hours Met:	4	0	5	1	0

WARRANT 1	Yes	No
Warrant 1 is met if any of the following conditions are met:		
Condition A Minimum Vehicular Volume	Yes	No
Condition B Interruption of Continuous Traffic	Yes	No
Condition A/B Combination of Warrants	Yes	No
WARRANT 2 Four-Hour Volume	Yes	No
WARRANT 3 Peak-Hour Volume	Yes	No
WARRANT 4 Pedestrian Volume	Yes	No
WARRANT 5 School Crossing	Yes	No
WARRANT 6 Coordinated Signal	Yes N/A	No
WARRANT 7 Accident Experience	Yes	No

	2014	2015	2016
Number of accidents:	1	0	2
Correctable accidents:	0		0

Less restrictive remedies tried?

Are volume requirements met? No

WARRANT 8 Roadway Network	Yes N/A	No
WARRANT 9 Intersection Near a Grade Crossing	Yes N/A	No

STOP OR YIELD CONTROLLED LEG WITH GRADE CROSSING

D (clear storage distance) =

	#	%	Adj. Factor
RAIL TRAFFIC PER DAY =			
HIGH OCCUPANCY BUSSES PER HOUR =			
TRUCKS PER HOUR =			

OVERALL ADJUSTMENT FACTOR =

Review Information

Counts Used: GHA 24-hour miovision data / CMAP 2050 Projections

Count Date: 4-Dec-18 (Adjusted for 2050)

Date Reviewed: 10/9/2019

Reviewed By: AM

Comments

-Assumed a Left Turn Only + Shared Thru/Right lane configuration for all approaches.

-Existing traffic volumes were adjusted based on CMAP projections. The resulting peak hour volumes were lower than the projections provided by MCDOT. Thus, both projections were evaluated for Warrant 3.

-Warrant 3 (Peak Hour) is satisfied for the projections provided by MCDOT.

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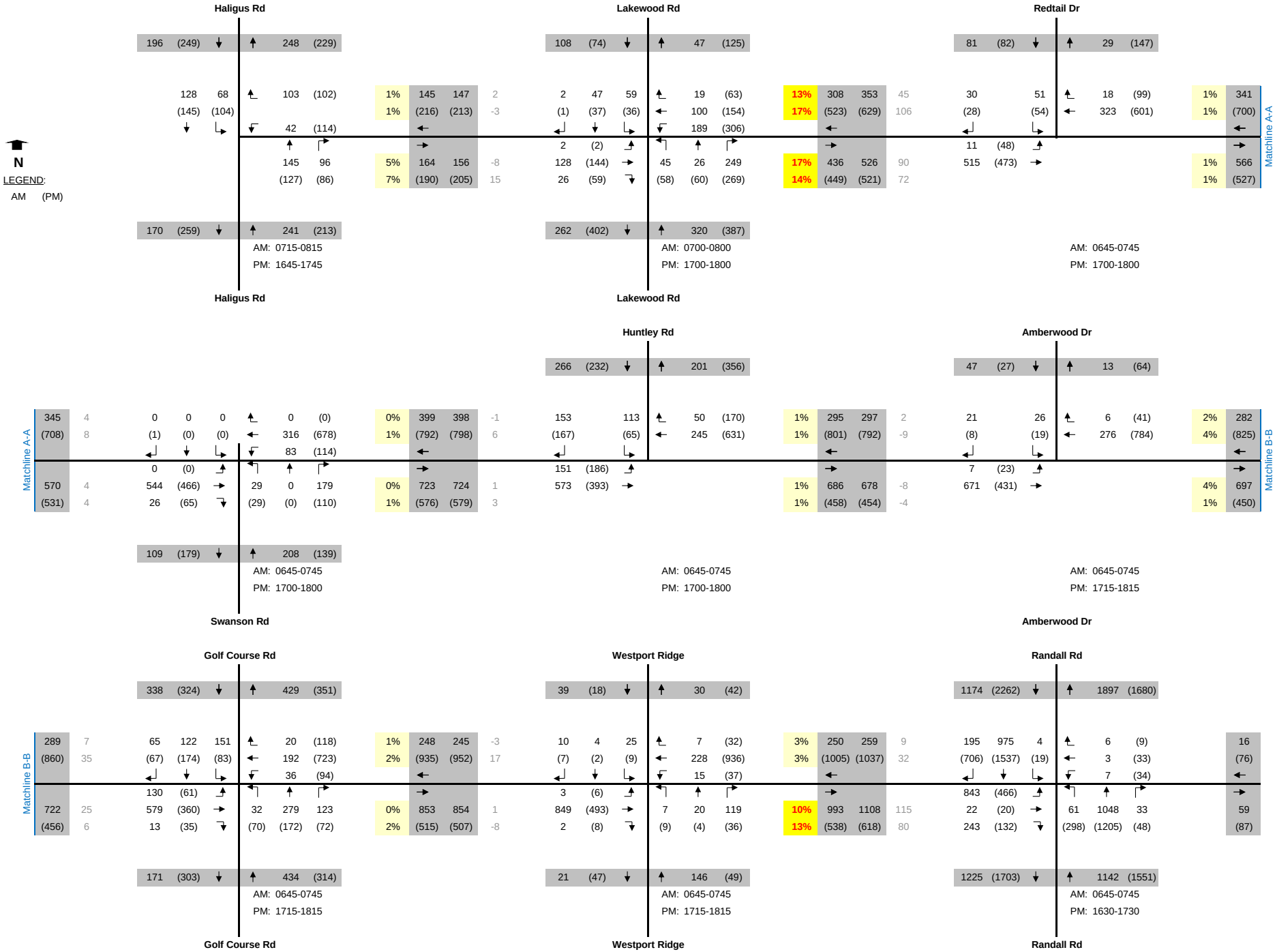
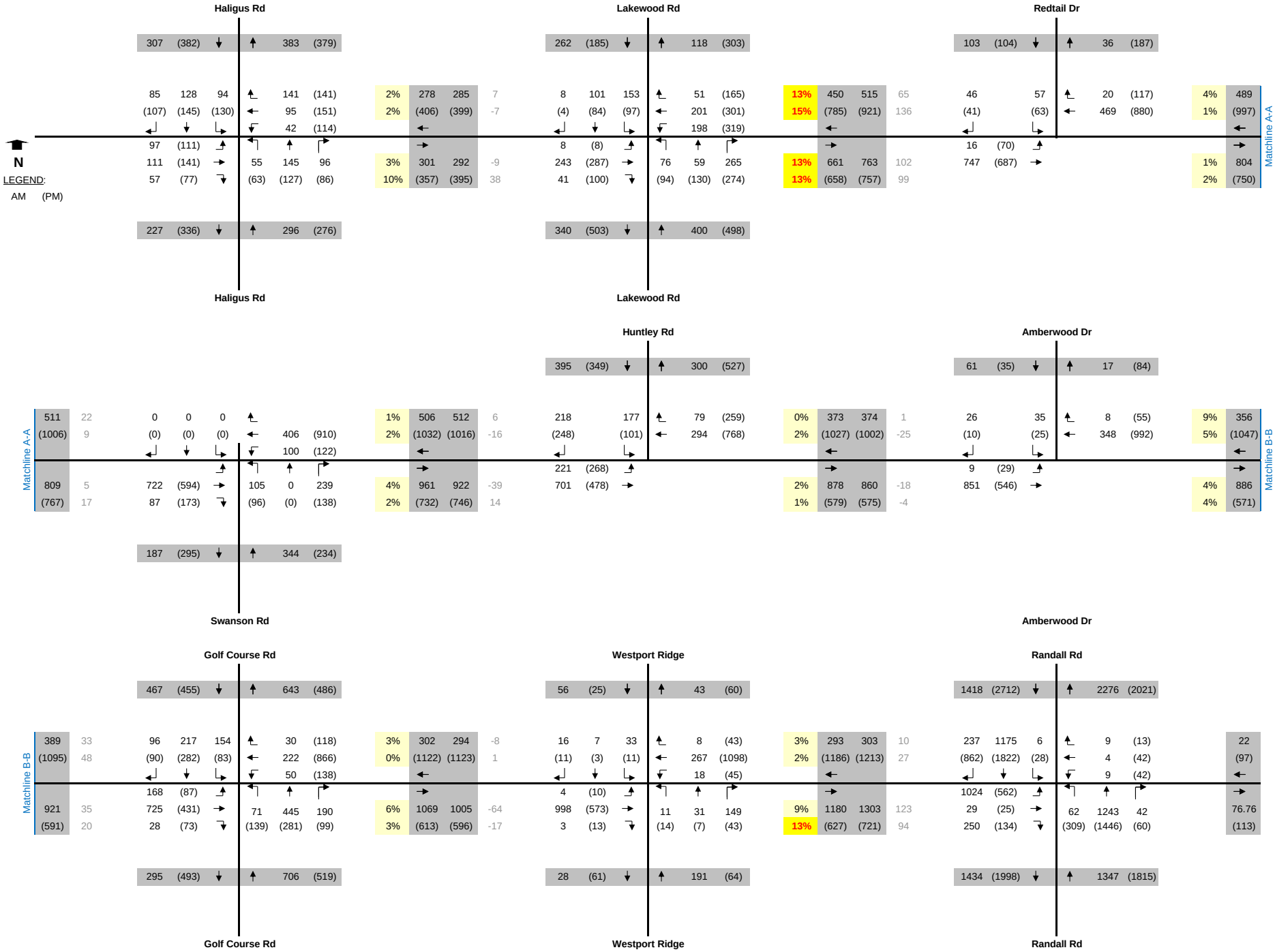


EXISTING (2018) TRAFFIC VOLUMES

AM (PM) PEAK HOUR

LOCAL (INTERSECTION) PEAK HOURS



2050 DESIGN HOURLY TRAFFIC VOLUME PROJECTIONS

AM (PM) PEAK HOUR

Appendix B
Crash Data for Ackman Road & Haligus Road from 2014-2016

INTERSECTION	YEAR	MONTH	DAY	HOUR	DAY OF WEEK	NUM VEH	INJURIES	FATALITIES	INJURY TYPE	COLLISION TYPE	WEATHER	LIGHTING	SURFACE CONDITIONS
Ackman Rd at Haligus Rd	2014	1	10	17	Friday	1	0	0	O	Overturned	Rain	Darkness	Ice
Ackman Rd at Haligus Rd	2015	NO CRASHES											
Ackman Rd at Haligus Rd	2016	1	1	1	Friday	1	0	0	O	Fixed Object	Clear	Darkness / Lighted Road	Dry
Ackman Rd at Haligus Rd	2016	7	10	1	Sunday	1	0	0	O	Fixed Object	Clear	Darkness	Dry

GREEN = CORRECTABLE
RED = NOT CORRECTABLE BY TRAFFIC SIGNAL
WHITE = NO DOCUMENTED CRASHES

Injury Severity	
K	Fatal
A	Incapacitating
B	Non-incapacitating
C	Reported/Not evident
O	No indication of injury

GHA GEWALT HAMILTON ASSOCIATES, INC.

TRAFFIC SIGNAL WARRANT STUDY

To: Bradley Cousin, P.E., PTOE
Traffic Engineer – McHenry County Division of Transportation

From: Daniel P. Brinkman, P.E., PTOE
Antonio Maravillas, E.I.T.

Date: October 9, 2019

Subject: Ackman Road at Huntley Road (2050):
Crystal Lake, IL

GHA GEWALT HAMILTON ASSOCIATES, INC.
CONSULTING ENGINEERS
625 Forest Edge Drive, Vernon Hills, IL 60061
TEL 847.478.9700 ■ FAX 847.478.9701
www.gha-engineers.com

Part I. Project Context and Summary Statement

Per your request, *Gewalt Hamilton Associates, Inc*. (GHA) has conducted the necessary analysis to determine if the above referenced intersection meets the minimum criteria as published in the FHWA's Manual on Uniform Traffic Control Devices (MUTCD) for installation of a traffic signal.

Briefly summarizing, after review of the 2050 traffic projection data, recent crash history and the MUTCD criteria, it is our finding that the Ackman Road intersection with Huntley Road will meet the threshold volumes to warrant a traffic signal by 2050.

Part II. Background Information

Site Location Map and Aerial Photo

Exhibit 1 provides an aerial photo of the subject intersection and vicinity with current traffic operations. Pertinent comments include:

- Ackman Road provides one travel lane in each direction with a two-way left turn lane east of its intersection with Huntley Road and a separate left turn lane west of the intersection.
- Ackman Road also provides a separate right turn lane on the westbound approach of the intersection.
- Huntley Road provides one travel lane in each direction with separate left and right turn lanes at the intersection.
- The intersection currently operates as One-Way Stop Controlled.
- A private driveway connects to the southern portion of the intersection.
- The posted speed limit is 40-mph on Ackman Road and 45-mph on Huntley Road.

2050 Traffic Volumes

GHA conducted a 24-hour traffic count at the Ackman Road / Huntley Road intersection on December 4, 2018. The Chicagoland Metropolitan Agency for Planning (CMAP) provided Year 2050 traffic projections for Huntley Road and Ackman Road with the proposed IL 47 extension. Existing traffic volumes were multiplied by a factor of 1.2746 for Ackman Road west of the intersection, 1.4839 for Huntley Road, and 1.2681 for Ackman Road east

of the intersection in order to obtain Year 2050 projections. Exhibit 2 tabulates the prime 14- hours of traffic count data (6:00 AM to 8:00 PM) adjusted for Year 2050.

Part III. Evaluation

Right turn on Red (RTOR) adjustments

Prior to testing the published warrant criteria, the MUTCD directs the engineer conducting a warrant study to consider the effects of future right turns on red (RTOR) and remove those traffic volumes from the observed approach volumes. Various methods exist for this reduction, but the most prevalent in our area and the approach required by the Illinois Department of Transportation (IDOT) is Pagones' Theorem. Pagones' Theorem considers reduction for future right turns based on the lane configuration of the minor street approaches and further adjusts the reduction based on the volume of traffic in the adjacent through lanes to account for available gaps that RTOR movements would be made into.

Pagones' Theorem is attached as *Exhibit 3.*

For this analysis, Huntley Road approach volumes were reduced in accordance with lane configuration #3 – right turn volumes were generally reduced by 50-75% based on the observed approach volumes and lane configuration. These volumes and adjusted volumes are tabulated in *Exhibit 4.*

Warrant Analyses

GHA reviewed the available signal warrants as published in the FHWA's Manual on Uniform Traffic Control Devices (MUTCD). Each of the nine available warrants and their results are discussed below.

Warrant #1 – Eight Hour Volume

The 8-hour volume requirements are based on the existing lane configuration at the Ackman Road and Huntley Road intersection and posted speed limits. There are two 8-hour conditions that are considered: Condition A – Minimum Vehicular Volume and Condition B – Interruption of Continuous Traffic.

Included as *Exhibit 5* is Table 4C-1 from the MUTCD. As can be seen, based on the lane configuration at the intersection the minimum major street (Ackman Road) volumes are 500 and 750 vehicles per hour respectively for Condition A and Condition B. Similarly, the minor street (Huntley Road) volumes are 200 and 100 vehicles per hour respectively. For either condition the volume minimums must be met simultaneously during the same hour.

Condition B is met for 13 hours throughout the day, far exceeding the 8-hour minimum requirement. Thus, this warrant is satisfied.

Warrant #2 – Four Hour Volume

Exhibit 6 presents Figure 4C-1 from the MUTCD, which was utilized to determine if the Four Hour Warrant was met. As can be seen, there are seven hours where the minimum combined volume met above the minimum threshold line on the chart, exceeding the minimum requirement of four hours. Thus, this warrant is satisfied.

Warrant #3 – Peak Hour Volume

Exhibit 7 presents Figure 4C-3 from the MUTCD which was utilized to determine if Warrant #3 - Peak Hour Volume was met. There were 5 projected hours where the combination of volumes met above the minimum threshold line on the chart, far exceeding the minimum requirement of one hour. Thus, this warrant is satisfied.

Warrant #4 – Pedestrian Volume

Pedestrian volume warrant criteria starts at 75 pedestrians per hour. Based on the intersection location, pedestrians are not expected to be crossing Ackman Road or Huntley Road. As such – this warrant was not considered.

Warrant #5 – School Crossing

The MUTCD allows for installation of a traffic signal when the principal reason for installation is to accommodate the crossing of school aged children. There is not an elementary school in close proximity to the intersection to justify this criteria.

Warrant #6 – Coordinated Signal System

This warrant was not considered.

Warrant #7 – Crash Experience

When the frequency and severity of correctable crashes are experienced over a 12-month period, installation of a traffic signal to address these crashes is justified based on this warrant. Note that volume criteria (80% of one of the Warrant #1 8-hour conditions) must also be met.

"Correctable" crashes considered for warrant criteria are generally turning and or angle type collisions. Crashes reported with fixed objects and animals do not merit consideration for the installation of traffic signals. Seven (7) reported crashes occurred at the subject intersection in the 3-year period of 2014-2016, of which only two could have been correctable by a traffic signal. All crashes studied involved no reported injuries. As such, the crash experience does not warrant a traffic signal.

A crash data summary table from McHenry County DOT is included as *Appendix A.*

Warrant #8 – Roadway Network

This warrant requires the two subject roadways to both be major roadways with similar volume characteristics. This warrant is not applicable.

Warrant #9 – Intersection Near a Grade Crossing (railroad).

This warrant is only applicable when an intersection is within 150-feet of an at grade railroad crossing. This warrant is not applicable.

Part IV. Conclusions & Recommendations

Exhibit 8 provides a detailed review of the various MUTCD warrants described and discussed above. At Year 2050, the vehicular volumes at the Ackman Road intersection with Huntley Road will satisfy three separate warrants. Thus, it is recommended that a traffic signal be installed at this intersection by 2050.

Part V. Technical Addendum

The following *Exhibits* were previously referenced. They provide technical support for our observations, findings, and recommendations discussed in the text.

Exhibits

1. Location Map
2. 2050 Traffic Volumes
3. Analysis Parameters – "Pagones' Theorem"
4. 2050 Warrant Volumes
5. Eight Hour Traffic Signal Warrant Requirements
6. Four Hour Signal Warrant Test
7. Peak Hour Signal Warrant Test
8. Signal Warrant Review Sheet

Appendices

A. Crash Summaries

4188.921 MCDOT 2019 Ackman-Huntley Warrant 109919

Ackman Road at Huntley Road, Crystal Lake, IL

GEWALT HAMILTON ASSOCIATES, INC.

Exhibit 1
Location Map

Exhibit 2

2050 Traffic Volumes

Ackman Road at Huntley Road; Crystal Lake, IL

Intersection Ackman Road at Huntley Road **Municipality** Crystal Lake **County** McHenry **Date** 12/4/2050

	Major Street = Ackman Road											Minor Street = Huntley Road											
	Approach = Eastbound					Approach = Westbound					Major Street Total	Approach = Northbound					Approach = Southbound					Minor Street Total	Intersection Total Volumes
Hour Beginning	Left	Thru	Right	U-turn	Subtotal	Left	Thru	Right	U-turn	Subtotal		Left	Thru	Right	U-turn	Subtotal	Left	Thru	Right	U-turn	Subtotal		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
6:00 AM	127	534	-	0	662	-	232	30	0	262	924	-	-	-	-	-	178	-	119	0	297	297	1,221
7:00 AM	189	723	-	0	911	-	295	77	0	373	1,284	-	-	-	-	-	148	-	229	0	377	377	1,661
8:00 AM	133	560	-	0	692	-	260	79	0	339	1,031	-	-	-	-	-	168	-	202	0	369	369	1,400
9:00 AM	92	396	-	0	488	-	243	63	0	307	795	-	-	-	-	-	128	-	93	0	221	221	1,016
10:00 AM	78	335	-	0	413	-	252	61	0	313	726	-	-	-	-	-	107	-	95	0	202	202	928
11:00 AM	108	395	-	0	503	-	318	66	0	384	888	-	-	-	-	-	114	-	122	0	236	236	1,124
12:00 PM	101	347	-	0	447	-	312	101	0	413	861	-	-	-	-	-	113	-	134	0	246	246	1,107
1:00 PM	76	336	-	0	413	-	327	86	0	413	826	-	-	-	-	-	114	-	142	0	257	257	1,083
2:00 PM	99	326	-	0	426	-	410	113	0	522	948	-	-	-	-	-	99	-	132	0	231	231	1,180
3:00 PM	170	523	-	0	692	-	583	167	0	751	1,443	-	-	-	-	-	126	-	245	0	371	371	1,814
4:00 PM	192	509	-	0	701	-	685	226	0	910	1,612	-	-	-	-	-	111	-	254	0	365	365	1,977
5:00 PM	237	501	-	0	738	-	800	216	0	1,016	1,754	-	-	-	-	-	96	-	248	0	344	344	2,098
6:00 PM	145	444	-	0	589	-	687	200	0	888	1,477	-	-	-	-	-	108	-	159	0	267	267	1,744
7:00 PM	98	273	-	0	371	-	493	139	0	633	1,004	-	-	-	-	-	68	-	101	0	169	169	1,173

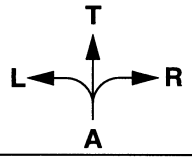
GEWALT HAMILTON ASSOCIATES, INC.

Exhibit 3

Analysis Parameters – "Pagones' Theorem"

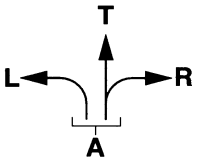
1. Lane Configurations and Right Turn Reductions

1



IF { R > 0.7A | 0.7A ≥ R > 0.35A | R ≤ 0.35A } THEN { reduce R by 60% | reduce R by 40% | reduce R by 20% }

2



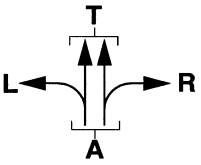
IF { R > 3T | 3T ≥ R > T/3 | R ≤ T/3 } THEN { reduce R by 60% | reduce R by 40% | reduce R by 20% }

---

3 Any configuration with an exclusive right turn lane (usually ≥ 600 ft. long)

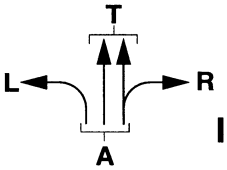
Reduce R by 75% in all cases.

4



IF { R > (T + L) | L > (T + R) | L ≈ T ≈ R (±10 veh.) | L ≈ T > 3R | R ≈ T > 3L | all other cases } THEN { reduce R by 65% | use situation 2 | reduce R by 40% | reduce R by 20% | reduce R by 50% | reduce R by 30% }

5



IF { R > T | T ≥ R > T/2 | T/2 ≥ R > T/4 | R ≤ T/4 } THEN { reduce R by 75% | reduce R by 50% | reduce R by 30% | reduce R by 15% }

LEGEND

L = number of left turning vehicles
T = number of through vehicles
R = number of right turning vehicles
A = (L+T+R)

2. Mainline Congestion Factors For Limiting Right Turn Reductions[1]

Volumes Per Lane	Reduction	Volumes Per Lane	Reduction
0 - 399	0%	1000 - 1099	35%
400 - 499	5%	1100 - 1199	40%
500 - 599	10%	1200 - 1299	45%
600 - 699	15%	1300 - 1399	50%
700 - 799	20%	1400 - 1499	55%
800 - 899	25%	1500 - 1599	60%
900 - 999	30%	etc.	etc.

(1) Mainline = Approach which right turns turn into

Exhibit 4
2050 Warrant Volumes
Ackman Road at Huntley Road; Crystal Lake, IL

A. Southbound Huntley Road

Hour	Volume From Exhibit 2				RTOR	Warrant Volumes			
Beginning	Left	Thru	Right	Subtotal	Reduction	Left	Thru	Right	Total
	1	2	3	4	5	6	7	8	9
6:00 AM	178	-	119	297	75%	178	-	30	208
7:00 AM	148	-	229	377	75%	148	-	57	206
8:00 AM	168	-	202	369	75%	168	-	50	218
9:00 AM	128	-	93	221	75%	128	-	23	151
10:00 AM	107	-	95	202	75%	107	-	24	131
11:00 AM	114	-	122	236	75%	114	-	30	145
12:00 PM	113	-	134	246	75%	113	-	33	146
1:00 PM	114	-	142	257	75%	114	-	36	150
2:00 PM	99	-	132	231	70%	99	-	40	139
3:00 PM	126	-	245	371	65%	126	-	86	212
4:00 PM	111	-	254	365	60%	111	-	101	213
5:00 PM	96	-	248	344	50%	96	-	124	220
6:00 PM	108	-	159	267	60%	108	-	64	172
7:00 PM	68	-	101	169	70%	68	-	30	99

GHA GEWALT HAMILTON ASSOCIATES, INC.

Exhibit 5

Eight Hour Traffic Signal Warrant Requirements

Table 4C-1. Warrant 1, Eight-Hour Vehicular Volume

Condition A—Minimum Vehicular Volume

Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher-volume minor-street approach (one direction only)			
Major Street	Minor Street	100%[a]	80%[b]	70%[c]	56%[d]	100%[a]	80%[b]	70%[c]	56%[d]
1	1	500	400	350	280	150	120	105	84
2 or more	1	600	480	420	336	150	120	105	84
2 or more	2 or more	600	480	420	336	200	160	140	112
1	2 or more	500	400	350	280	200	160	140	112

Condition B—Interruption of Continuous Traffic

Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher-volume minor-street approach (one direction only)			
Major Street	Minor Street	100%[a]	80%[b]	70%[c]	56%[d]	100%[a]	80%[b]	70%[c]	56%[d]
1	1	750	600	525	420	75	60	53	42
2 or more	1	900	720	630	504	75	60	53	42
2 or more	2 or more	900	720	630	504	100	80	70	56
1	2 or more	750	600	525	420	100	80	70	56

[a] Basic minimum hourly volume

[b] Used for combination of Conditions A and B after adequate trial of other remedial measures

[c] May be used when the major-street speed exceeds 40 mph or in an isolated community with a population of less than 10,000

[d] May be used for combination of Conditions A and B after adequate trial of other remedial measures when the major-street speed exceeds 40 mph or in an isolated community with a population of less than 10,000

Major Street - Ackman Road

- One lane for moving through traffic

Minor Street – Huntley Road

- Two lanes for moving traffic

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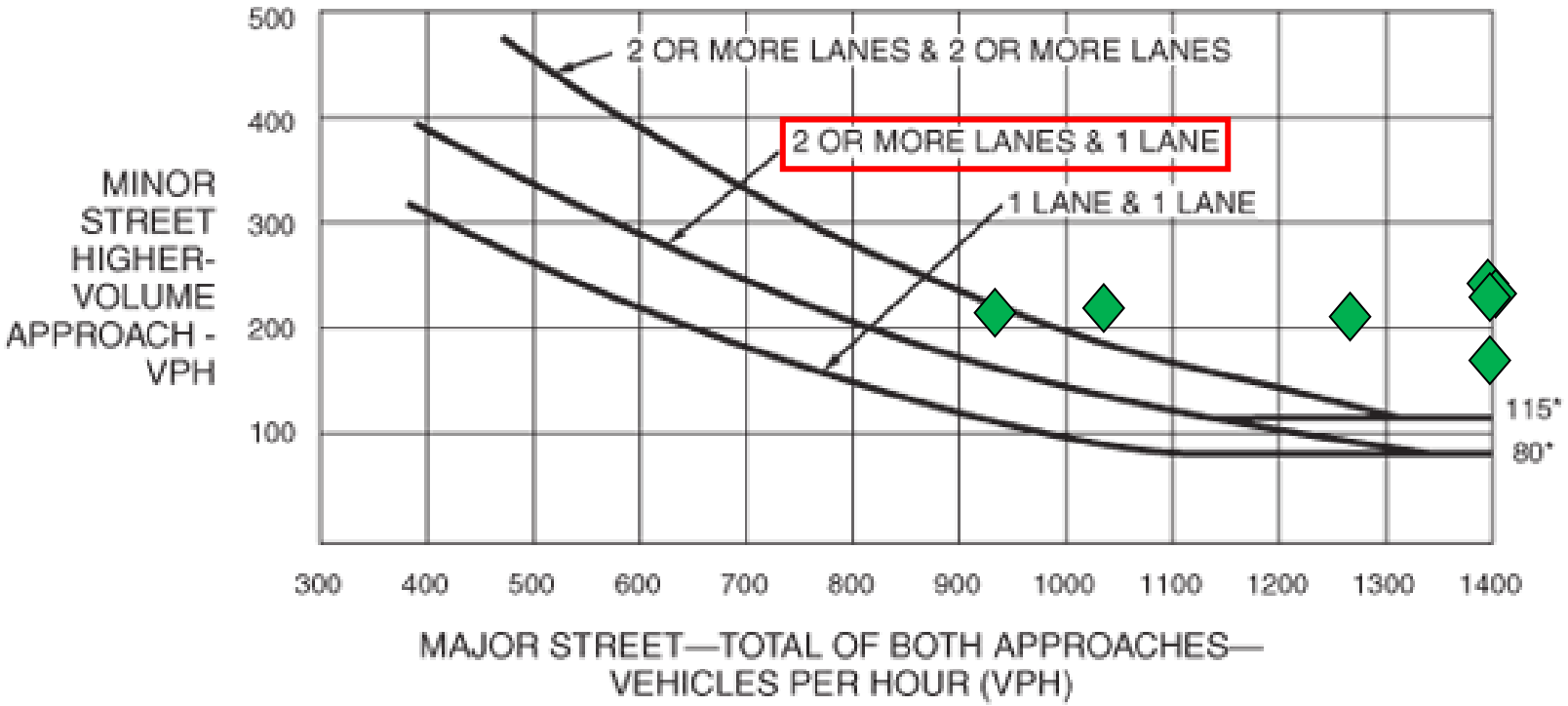
Exhibit 6

Four Hour Traffic Signal Warrant Test

Figure 4C-1. Warrant 2, Four-Hour Vehicular Volume



*Note: 115 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 80 vph applies as the lower threshold volume for a minor-street approach with one lane.

Volumes

- Major Street – Ackman Road
- Minor Street – Huntley Road

Result

- Intersection Volume requirements met for 7 hours. Warrant is met.

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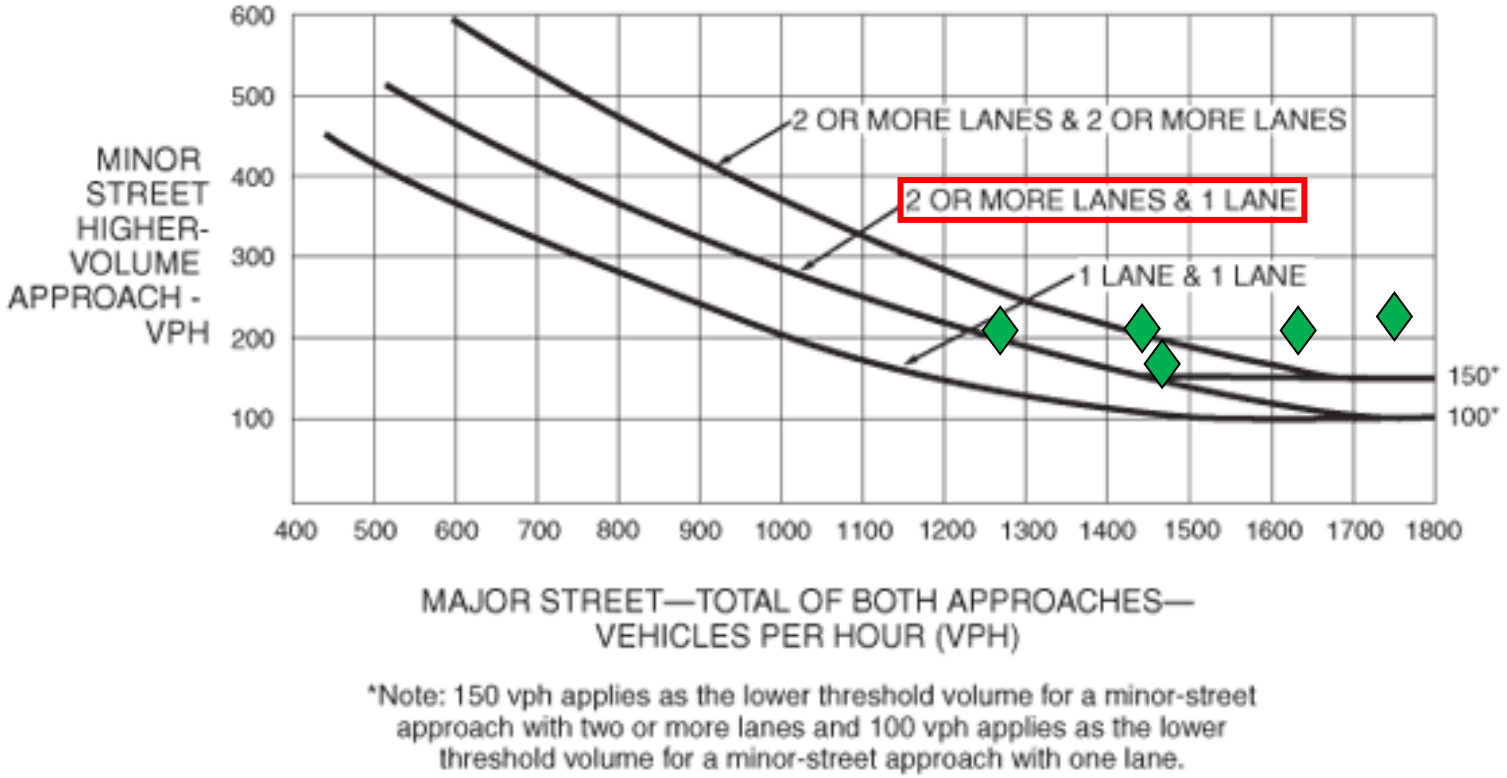
Exhibit 7

Traffic Signal Warrant Test

Figure 4C-3. Warrant 3, Peak Hour



*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Discussion

- Multiple hours with high volumes. Focus on Weekday Evening Peak Hour, because intersection total values are highest at that time.

Volumes

- Major Street – Ackman Road = 1754 VPH
- Minor Street – Huntley Road = 220 VPH (5:00 PM)

Result

- Intersection volume meets Warrant #3 Peak Hour. Condition is also met for four additional hours, but only one is required.

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Exhibit 8
Signal Warrant Review Sheet

Ackman Road at Huntley Road (2050); Crystal Lake, IL

SRA: NO

Intersection: Ackman Road at Huntley Road

Municipality: Crystal Lake **County:** McHenry

Speed limit of major route: 40 **Isolated community with population <10,000?** NO

Number of lanes for major approach: 1-lane **Number of lanes for minor approach:** 2-lanes

Warrant 1 - Condition A — Need 8 Hours Major = 500 vph and Minor = 200 vph

Warrant 1 - Condition B — Need 8 Hours Major = 750 vph and Minor = 100 vph

Hour Begin	Major Street Volume (both approaches	Adj. Minor Street Volume (higher volume approach)	Check any hours which meet the following warrants: Warrant 1 A 100%	Warrant 1 B 100%	Warrant 7: 8 hrs of one of the following: Warrant 1 A/B: 8 hrs of BOTH: 80% of A	80% of B	80% of Warr #4
6:00	924	208	X	X	X	X	-
7:00	1,284	206	X	X	X	X	-
8:00	1,031	218	X	X	X	X	-
9:00	795	151	-	X	-	X	-
10:00	726	131	-	X	-	X	-
11:00	888	145	-	X	-	X	-
12:00	861	146	-	X	-	X	-
1:00	826	150	-	X	-	X	-
2:00	948	139	-	X	-	X	-
3:00	1,443	212	X	X	X	X	-
4:00	1,612	213	X	X	X	X	-
5:00	1,754	220	X	X	X	X	-
6:00	1,477	172	-	X	X	X	-
7:00	1,004	99	-	-	-	X	-
		Hours Met:	6	13	7	14	0

WARRANT 1 Yes / No

Warrant 1 is met if any of the following conditions are met:

- **Condition A** (Minimum Vehicular Volume) — Yes / **No**
- **Condition B** (Interruption of Continuous Traffic) — **Yes** / No
- **Condition A/B** (Combination of Warrants) — Yes / **No**

WARRANT 2 (Four-Hour Volume) — **Yes** / No

WARRANT 3 (Peak-Hour Volume) — **Yes** / No

WARRANT 4 (Pedestrian Volume) — Yes / **No**

WARRANT 5 (School Crossing) — Yes / **No**

WARRANT 6 (Coordinated Signal) — Yes / **N/A** / No

WARRANT 7 (Accident Experience) — Yes / **No**

	2014	2015	2016	
Number of accidents:	2	4	1	
Correctable accidents:		2		

Less restrictive remedies tried?

Are volume requirements met? Yes

WARRANT 8 (Roadway Network) — Yes / **N/A** / No

WARRANT 9 (Intersection Near a Grade Crossing) — Yes / **N/A** / No

STOP OR YIELD CONTROLLED LEG WITH GRADE CROSSING

D (clear storage distance) =

	#	%	Adj. Factor
RAIL TRAFFIC PER DAY =			
HIGH OCCUPANCY BUSSES PER HOUR =			
TRUCKS PER HOUR =			

OVERALL ADJUSTMENT FACTOR =

Review Information

Counts Used: GHA 24-hour miovision data / CMAP 2050 Projections

Count Date: 4-Dec-18 (Adjusted for 2050)

Date Reviewed: 10/9/2019

Reviewed By: AM

Comments

-Intersection meets 3 separate Warrants. (#1-3)

-Traffic Signal will be warranted by 2050.

GHA GEWALT HAMILTON ASSOCIATES, INC.

Appendix A

Crash Data for Ackman Road & Huntley Road from 2014-2016

INTERSECTION	YEAR	MONTH	DAY	HOUR	DAY OF WEEK	NUM VEH	INJURIES	FATALITIES	INJURY TYPE	COLLISION TYPE	WEATHER	LIGHTING	SURFACE CONDITIONS
Ackman Rd at Huntley Rd	2014	1	10	16	Friday	2	0	0	O	Head On	Rain	Dusk	Ice
Ackman Rd at Huntley Rd	2014	11	15	20	Saturday	3	0	0	O	Rear End	Snow	Darkness / Lighted Road	Ice
Ackman Rd at Huntley Rd	2015	1	16	18	Friday	2	0	0	O	Turning	Clear	Darkness / Lighted Road	Dry
Ackman Rd at Huntley Rd	2015	3	7	9	Saturday	2	0	0	O	Turning	Clear	Daylight	Dry
Ackman Rd at Huntley Rd	2015	3	17	19	Tuesday	2	0	0	O	Turning	Clear	Daylight	Dry
Ackman Rd at Huntley Rd	2015	8	12	17	Wednesday	3	0	0	O	Rear End	Clear	Daylight	Dry
Ackman Rd at Huntley Rd	2016	11	12	12	Sunday	1	0	0	O	Animal	Clear	Daylight	Dry

GREEN = CORRECTABLE
RED = NOT CORRECTABLE BY TRAFFIC SIGNAL
WHITE = NO DOCUMENTED CRASHES

Injury Severity	
K	Fatal
A	Incapacitating
B	Non-incapacitating
C	Reported/Not evident
O	No indication of injury

GEWALT HAMILTON ASSOCIATES, INC.

TRAFFIC SIGNAL WARRANT STUDY

To: Bradley Cousin, P.E., PTOE
Traffic Engineer – McHenry County Division of Transportation

From: Daniel P. Brinkman, P.E., PTOE
Antonio Maravillas, E.I.T.

Date: October 9, 2019

Subject: Ackman Road at Lakewood Road (2050):
Lake in the Hills, IL

GHA GEWALT HAMILTON ASSOCIATES, INC.
CONSULTING ENGINEERS
625 Forest Edge Drive, Vernon Hills, IL 60061
TEL 847.478.9700 ■ FAX 847.478.9701
www.gha-engineers.com

Part I. Project Context and Summary Statement

Per your request, *Gewalt Hamilton Associates, Inc*. (GHA) has conducted the necessary analysis to determine if the above referenced intersection meets the minimum criteria as published in the FHWA's Manual on Uniform Traffic Control Devices (MUTCD) for installation of a traffic signal.

Briefly summarizing, after review of the 2050 traffic projection data, recent crash history and the MUTCD criteria, it is our finding that the Ackman Road intersection with Lakewood Road will not meet the threshold volumes to warrant a traffic signal by 2050.

Part II. Background Information

Site Location Map and Aerial Photo

Exhibit 1 provides an aerial photo of the subject intersection and vicinity with current traffic operations. Pertinent comments include:

- Ackman Road provides one travel lane in each direction. Separate left turn lanes are provided at both approaches of the intersection with Lakewood Road.
- Lakewood Road provides a single through lane in each direction and a separate left turn lane at the southbound approach with Ackman Road. Separate left and right turn lanes are also provided on the northbound approach.
- The intersection currently operates as All-Way Stop Controlled.
- The posted speed limit on Ackman Road is 50-mph west of Lakewood Road and 40-mph east of Lakewood Road.
- The posted speed limit on Lakewood Road is 30-mph North of Ackman Road and 45-mph south of Ackman Road.

2050 Traffic Volumes

GHA conducted a 24-hour traffic count at the Ackman Road / Lakewood Road intersection on December 4, 2018. The Chicagoland Metropolitan Agency for Planning (CMAP) provided Year 2050 traffic projections for Lakewood Road and Ackman Road with the proposed IL 47 extension. Existing traffic volumes along Ackman Road were

multiplied by a factor of 1.8750 west of the intersection, and 1.4636 east of the intersection. Existing traffic volumes along Lakewood Road were multiplied by a factor of 2.4314 north of the intersection, and 1.2515 south of the intersection in order to obtain Year 2050 projections. Exhibit 2 tabulates the prime 14- hours of traffic count data (6:00 AM to 8:00 PM) adjusted for Year 2050.

Part III. Evaluation

Right turn on Red (RTOR) adjustments

Prior to testing the published warrant criteria, the MUTCD directs the engineer conducting a warrant study to consider the effects of future right turns on red (RTOR) and remove those traffic volumes from the observed approach volumes. Various methods exist for this reduction, but the most prevalent in our area and the approach required by the Illinois Department of Transportation (IDOT) is Pagones' Theorem. Pagones' Theorem considers reduction for future right turns based on the lane configuration of the minor street approaches and further adjusts the reduction based on the volume of traffic in the adjacent through lanes to account for available gaps that RTOR movements would be made into.

Pagones' Theorem is attached as *Exhibit 3.*

For this analysis, Lakewood Road approach volumes were reduced in accordance with lane configuration #2 and #3 – right turn volumes were generally reduced by 75% on the northbound approach and 20% on the southbound approach based on the observed approach volumes and lane configuration. These volumes and adjusted volumes are tabulated in *Exhibit 4.*

Warrant Analyses

GHA reviewed the available signal warrants as published in the FHWA's Manual on Uniform Traffic Control Devices (MUTCD). Each of the nine available warrants and their results are discussed below.

Warrant #1 – Eight Hour Volume

The 8-hour volume requirements are based on the existing lane configuration at the Ackman Road and Lakewood Road intersection and posted speed limits. There are two 8-hour conditions that are considered: Condition A – Minimum Vehicular Volume and Condition B – Interruption of Continuous Traffic.

Included as *Exhibit 5* is Table 4C-1 from the MUTCD. As can be seen, based on the lane configuration at the intersection the minimum major street (Ackman Road) volumes are 600 and 900 vehicles per hour respectively for Condition A and Condition B. Similarly, the minor street (Lakewood Road) volumes are 200 and 100 vehicles per hour respectively. For either condition the volume minimums must be met simultaneously during the same hour.

Condition A is only met for 3 hours, while condition B is also only met for 3 hours. Thus, the volume criteria for this warrant is not met.

Warrant #2 – Four Hour Volume

Exhibit 6 presents Figure 4C-1 from the MUTCD, which was utilized to determine if the Four Hour Warrant was met. As can be seen, there are only two hours where the minimum combined volume met above the minimum threshold line on the chart. Therefore, the Four Hour volume criteria is not met

Warrant #3 – Peak Hour Volume

Exhibit 7 presents Figure 4C-3 from the MUTCD which was utilized to determine if Warrant #3 - Peak Hour Volume was met. There was no projected hours where the combination of volumes met above the minimum threshold line on the chart. Therefore, the Peak Hour volume criteria is not met.

Warrant #4 – Pedestrian Volume

Pedestrian volume warrant criteria starts at 75 pedestrians per hour. Based on the intersection location, pedestrians are not expected to be crossing either Ackman Road or Lakewood Road. As such – this warrant was not considered.

Warrant #5 – School Crossing

The MUTCD allows for installation of a traffic signal when the principal reason for installation is to accommodate the crossing of school aged children. There is not an elementary school in close proximity to the intersection to justify this criteria.

Warrant #6 – Coordinated Signal System

This warrant was not considered.

Warrant #7 – Crash Experience

When the frequency and severity of correctable crashes are experienced over a 12-month period, installation of a traffic signal to address these crashes is justified based on this warrant. Note that volume criteria (80% of one of the Warrant #1 8-hour conditions) must also be met.

"Correctable" crashes considered for warrant criteria are generally turning and or angle type collisions. Crashes reported with fixed objects and animals do not merit consideration for the installation of traffic signals. Nine (9) reported crashes occurred at the subject intersection in the 3-year period of 2014-2016, of which all but one could have been correctable by a traffic signal. 4 of the 8 correctable crashes involved injuries, the highest being "A", or incapacitating. Incapacitating injuries are near fatal and two have occurred in the 3-year study period. The general crash pattern is that drivers are failing to yield to the right-of-way. With high-vehicular speeds (50-mph on eastbound Ackman Road), a signal can be warranted if other protective measures have already been attempted.

A crash data summary table from McHenry County DOT is included as *Appendix A.*

Warrant #8 – Roadway Network

This warrant requires the two subject roadways to both be major roadways with similar volume characteristics. This warrant is not applicable.

Warrant #9 – Intersection Near a Grade Crossing (railroad).

This warrant is only applicable when an intersection is within 150-feet of an at grade railroad crossing. This warrant is not applicable.

Part IV. Conclusions & Recommendations

Exhibit 8 provides a detailed review of the various MUTCD warrants described and discussed above. At Year 2050, the vehicular volumes at the Ackman Road intersection with Lakewood Road will not meet any of the published warrant. Thus, a traffic signal will not be warranted by 2050.

Part V. Technical Addendum

The following *Exhibits* were previously referenced. They provide technical support for our observations, findings, and recommendations discussed in the text.

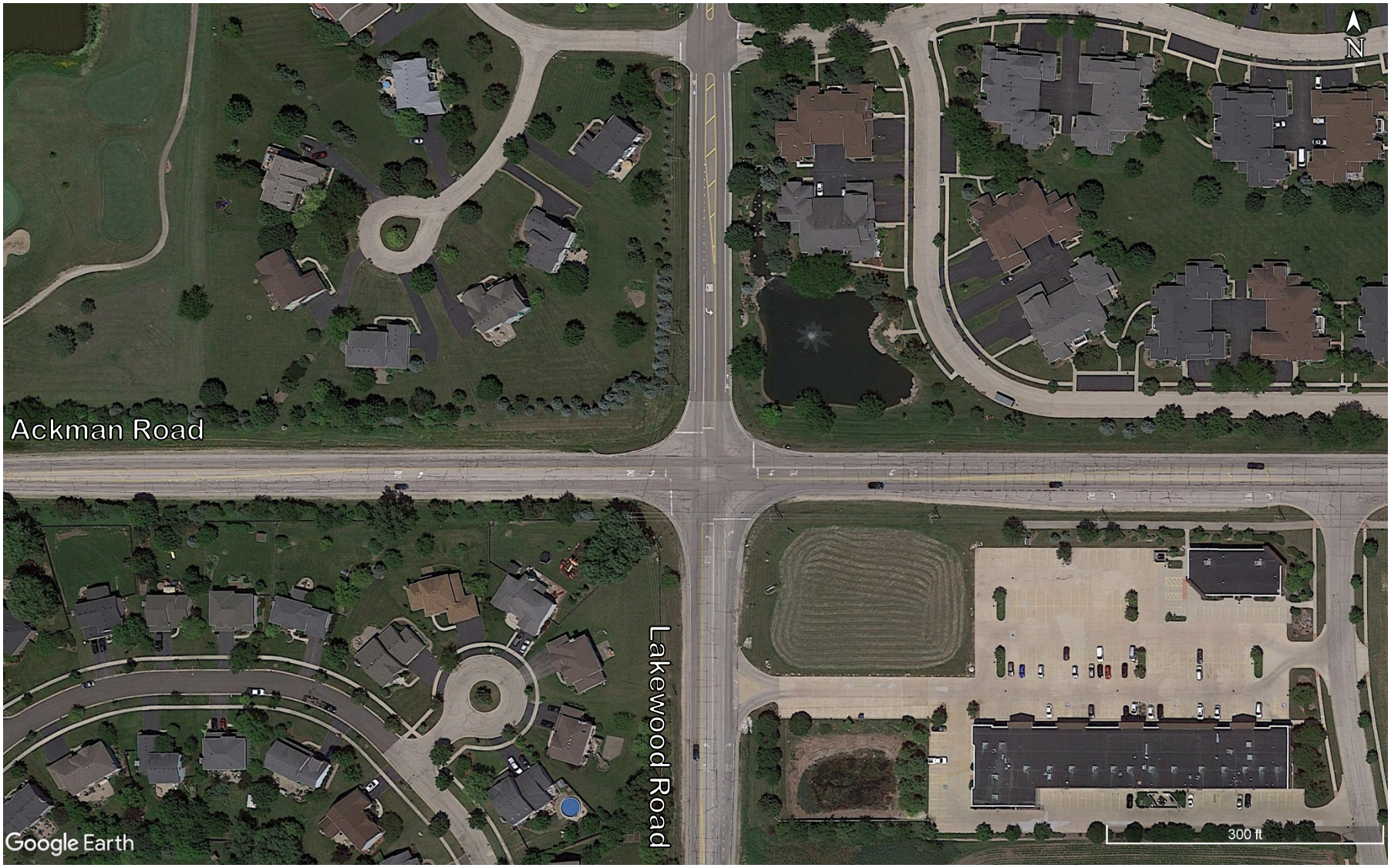
Exhibits

1. Location Map
2. 2050 Traffic Volumes
3. Analysis Parameters – "Pagones' Theorem"
4. 2050 Warrant Volumes
5. Eight Hour Traffic Signal Warrant Requirements
6. Four Hour Signal Warrant Test
7. Peak Hour Signal Warrant Test
8. Signal Warrant Review Sheet

Appendices

A. Crash Summaries

4188.921 MCDOT 2019 Ackman-Lakewood Warrant 100919



Ackman Road at Lakewood Road, Lake in the Hills, IL

GHA GEWALT HAMILTON ASSOCIATES, INC.

Exhibit 1
Location Map

Exhibit 2

2050 Traffic Volumes

Ackman Road at Lakewood Road; Lake in the Hills, IL

Intersection Ackman Road at Lakewood Road **Municipality** Lake in the Hills **County** McHenry **Date** 12/4/2050

	Major Street = Ackman Road											Minor Street = Lakewood Road											
	Approach = Eastbound					Approach = Westbound					Major Street Total	Approach = Northbound					Approach = Southbound					Minor Street Total	Intersection Total Volumes
Hour Beginning	Left	Thru	Right	U-turn	Subtotal	Left	Thru	Right	U-turn	Subtotal		Left	Thru	Right	U-turn	Subtotal	Left	Thru	Right	U-turn	Subtotal		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
6:00 AM	2	176	19	0	197	183	126	10	0	319	516	28	13	232	0	272	102	73	10	0	185	456	972
7:00 AM	4	240	49	0	293	277	146	28	0	451	743	56	33	312	0	400	141	114	5	2	262	662	1,406
8:00 AM	4	216	30	0	249	181	127	28	0	337	586	60	30	248	0	338	141	136	5	0	282	620	1,206
9:00 AM	8	159	49	0	216	189	89	41	0	319	535	36	35	183	0	254	78	114	7	0	199	453	988
10:00 AM	2	113	23	0	137	177	67	37	0	281	418	21	54	181	2	258	102	107	2	0	212	470	888
11:00 AM	6	141	51	0	197	209	101	42	0	353	550	38	41	186	0	265	114	114	5	0	233	499	1,048
12:00 PM	2	135	41	0	178	211	78	38	0	326	505	39	50	181	0	270	78	95	2	0	175	445	950
1:00 PM	8	154	36	0	197	234	105	64	0	404	601	31	48	164	0	243	68	73	10	0	151	394	994
2:00 PM	4	143	62	0	208	255	104	69	0	427	635	35	54	173	0	262	83	92	5	0	180	441	1,077
3:00 PM	6	268	60	0	334	342	171	89	0	603	937	46	86	268	0	400	117	112	2	0	231	631	1,568
4:00 PM	0	264	92	0	356	426	220	94	0	739	1,095	68	75	305	0	448	109	92	7	0	209	657	1,753
5:00 PM	4	270	111	0	384	448	225	92	0	765	1,150	73	75	337	0	484	88	90	2	0	180	664	1,814
6:00 PM	11	174	41	0	227	400	201	83	0	684	910	60	70	272	0	402	109	71	0	0	180	582	1,492
7:00 PM	0	111	41	0	152	280	110	78	0	467	619	34	46	178	0	258	53	56	0	0	109	367	986

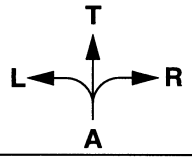
GEWALT HAMILTON ASSOCIATES, INC.

Exhibit 3

Analysis Parameters – "Pagones' Theorem"

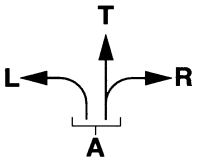
1. Lane Configurations and Right Turn Reductions

1



IF { R > 0.7A | 0.7A ≥ R > 0.35A | R ≤ 0.35A } THEN { reduce R by 60% | reduce R by 40% | reduce R by 20% }

2



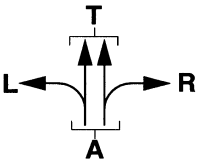
IF { R > 3T | 3T ≥ R > T/3 | R ≤ T/3 } THEN { reduce R by 60% | reduce R by 40% | reduce R by 20% }

---

3 Any configuration with an exclusive right turn lane (usually ≥ 600 ft. long)

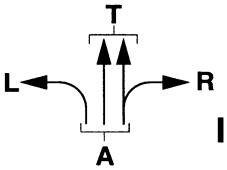
Reduce R by 75% in all cases.

4



IF { R > (T + L) | L > (T + R) | L ≈ T ≈ R (±10 veh.) | L ≈ T > 3R | R ≈ T > 3L | all other cases } THEN { reduce R by 65% | use situation 2 | reduce R by 40% | reduce R by 20% | reduce R by 50% | reduce R by 30% }

5



IF { R > T | T ≥ R > T/2 | T/2 ≥ R > T/4 | R ≤ T/4 } THEN { reduce R by 75% | reduce R by 50% | reduce R by 30% | reduce R by 15% }

LEGEND

L = number of left turning vehicles
T = number of through vehicles
R = number of right turning vehicles
A = (L+T+R)

2. Mainline Congestion Factors For Limiting Right Turn Reductions[1]

Volumes Per Lane	Reduction	Volumes Per Lane	Reduction
0 - 399	0%	1000 - 1099	35%
400 - 499	5%	1100 - 1199	40%
500 - 599	10%	1200 - 1299	45%
600 - 699	15%	1300 - 1399	50%
700 - 799	20%	1400 - 1499	55%
800 - 899	25%	1500 - 1599	60%
900 - 999	30%	etc.	etc.

(1) Mainline = Approach which right turns turn into

Exhibit 4
2050 Warrant Volumes
Ackman Road at Lakewood Road; Lake in the Hills, IL

A. Northbound Lakewood Road

Hour	Volume From Exhibit 2				RTOR	Warrant Volumes			
Beginning	Left	Thru	Right	Subtotal	Reduction	Left	Thru	Right	Total
	1	2	3	4	5	6	7	8	9
6:00 AM	28	13	232	272	75%	28	13	58	98
7:00 AM	56	33	312	400	75%	56	33	78	167
8:00 AM	60	30	248	338	75%	60	30	62	152
9:00 AM	36	35	183	254	75%	36	35	46	117
10:00 AM	21	54	181	257	75%	21	54	45	120
11:00 AM	38	41	186	265	75%	38	41	47	125
12:00 PM	39	50	181	270	75%	39	50	45	134
1:00 PM	31	48	164	243	75%	31	48	41	120
2:00 PM	35	54	173	262	75%	35	54	43	132
3:00 PM	46	86	268	400	75%	46	86	67	200
4:00 PM	68	75	305	448	75%	68	75	76	219
5:00 PM	73	75	337	484	75%	73	75	84	232
6:00 PM	60	70	272	402	75%	60	70	68	198
7:00 PM	34	46	178	258	75%	34	46	44	125

B. Southbound Lakewood Road

Hour	Volume From Exhibit 2				RTOR	Warrant Volumes			
Beginning	Left	Thru	Right	Subtotal	Reduction	Left	Thru	Right	Total
	1	2	3	4	5	6	7	8	9
6:00 AM	102	73	10	185	20%	102	73	8	183
7:00 AM	141	114	5	260	20%	141	114	4	259
8:00 AM	141	136	5	282	20%	141	136	4	281
9:00 AM	78	114	7	199	20%	78	114	6	198
10:00 AM	102	107	2	212	20%	102	107	2	211
11:00 AM	114	114	5	233	20%	114	114	4	232
12:00 PM	78	95	2	175	20%	78	95	2	175
1:00 PM	68	73	10	151	20%	68	73	8	149
2:00 PM	83	92	5	180	20%	83	92	4	179
3:00 PM	117	112	2	231	20%	117	112	2	230
4:00 PM	109	92	7	209	20%	109	92	6	208
5:00 PM	88	90	2	180	20%	88	90	2	179
6:00 PM	109	71	0	180	20%	109	71	0	180
7:00 PM	53	56	0	109	20%	53	56	0	109

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Exhibit 5

Eight Hour Traffic Signal Warrant Requirements

Table 4C-1. Warrant 1, Eight-Hour Vehicular Volume

Condition A—Minimum Vehicular Volume

Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher-volume minor-street approach (one direction only)			
Major Street	Minor Street	100%[a]	80%[b]	70%[c]	56%[d]	100%[a]	80%[b]	70%[c]	56%[d]
1	1	500	400	350	280	150	120	105	84
2 or more	1	600	480	420	336	150	120	105	84
2 or more	2 or more	600	480	420	336	200	160	140	112
1	2 or more	500	400	350	280	200	160	140	112

Condition B—Interruption of Continuous Traffic

Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher-volume minor-street approach (one direction only)			
Major Street	Minor Street	100%[a]	80%[b]	70%[c]	56%[d]	100%[a]	80%[b]	70%[c]	56%[d]
1	1	750	600	525	420	75	60	53	42
2 or more	1	900	720	630	504	75	60	53	42
2 or more	2 or more	900	720	630	504	100	80	70	56
1	2 or more	750	600	525	420	100	80	70	56

[a] Basic minimum hourly volume

[b] Used for combination of Conditions A and B after adequate trial of other remedial measures

[c] May be used when the major-street speed exceeds 40 mph or in an isolated community with a population of less than 10,000

[d] May be used for combination of Conditions A and B after adequate trial of other remedial measures when the major-street speed exceeds 40 mph or in an isolated community with a population of less than 10,000

Major Street - Ackman Road

- Two lanes for moving through traffic

Minor Street - Lakewood Road

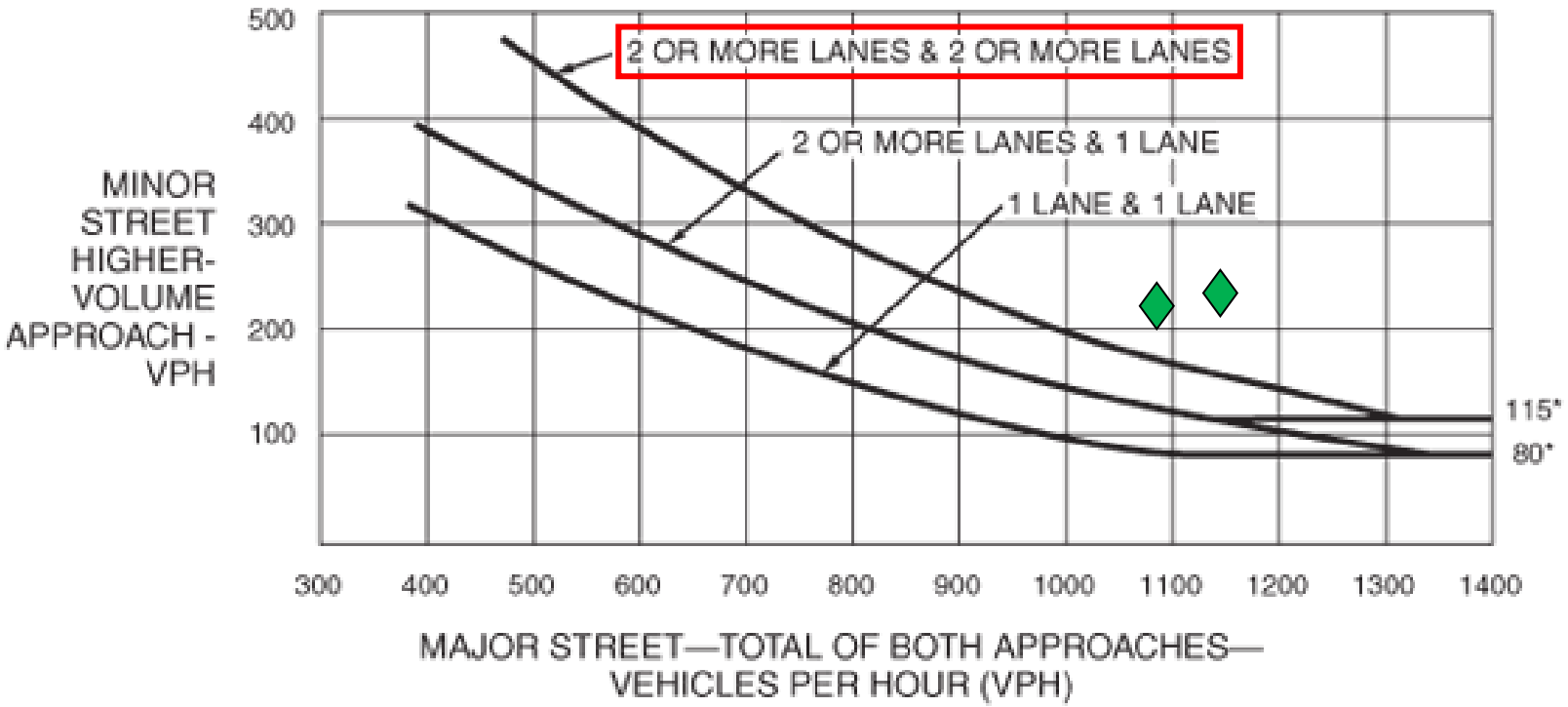
- Two lanes or more for moving through traffic

GHA GEWALT HAMILTON ASSOCIATES, INC.

Exhibit 6

Four Hour Traffic Signal Warrant Test

Figure 4C-1. Warrant 2, Four-Hour Vehicular Volume



*Note: 115 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 80 vph applies as the lower threshold volume for a minor-street approach with one lane.

Volumes

- Major Street – Ackman Road
- Minor Street – Lakewood Road

Result

- Intersection Volume requirements only met for 2 hours.

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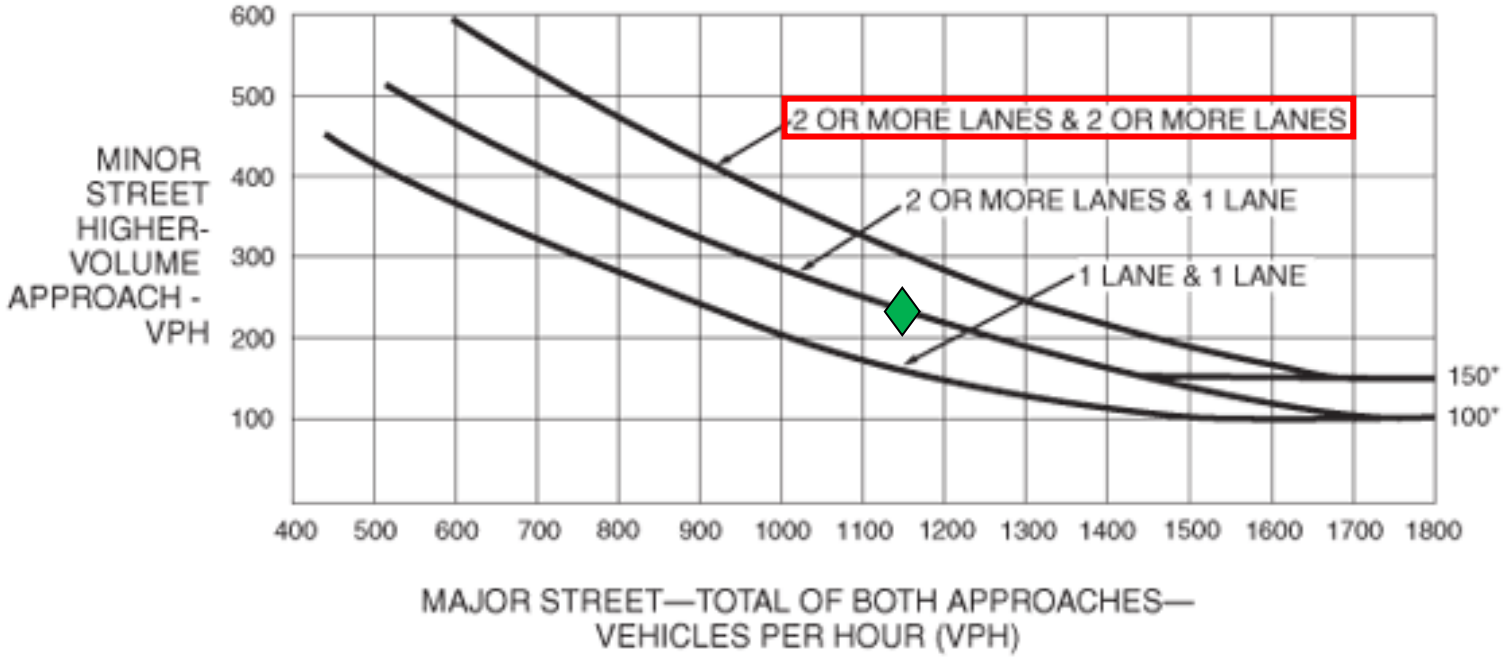
Exhibit 7

Traffic Signal Warrant Test

Figure 4C-3. Warrant 3, Peak Hour



*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Discussion

- Focus on Weekday Evening Peak Hour, because intersection minor street approach values are highest at that time.

Volumes

- Major Street – Ackman Road = 1150 VPH
- Minor Street – Lakewood Road = 232 VPH (5:00 PM)

Result

- Intersection volumes not met for Warrant #3 Peak Hour.

GEWALT HAMILTON ASSOCIATES, INC.

Exhibit 8
Signal Warrant Review Sheet

Ackman Road at Lakewood Road (2050); Lake in the Hills, IL

SRA: NO

Intersection: Ackman Road at Lakewood Road

Municipality: Lake In the Hills **County:** McHenry

Speed limit of major route: 50 **Isolated community with population <10,000?** NO

Number of lanes for major approach: 2 **Number of lanes for minor approach:** 2 or more

Warrant 1 - Condition A — Need 8 Hours (Major = 600 vph and Minor = 200 vph)

Warrant 1 - Condition B — Need 8 Hours (Major = 900 vph and Minor = 100 vph)

Hour Begin	Major Street Volume (both approaches	Adj. Minor Street Volume (higher volume approach)	Check any hours which meet the following warrants: Warrant 1 A 100%	Warrant 1 B 100%	Warrant 7: 8 hrs of one of the following: Warrant 1 A/B: 8 hrs of BOTH: 80% of A	80% of B	80% of Warr #4
6:00	516	98	-	-	-	-	-
7:00	743	167	-	-	X	X	-
8:00	586	152	-	-	-	-	-
9:00	535	117	-	-	-	-	-
10:00	418	120	-	-	-	-	-
11:00	550	125	-	-	-	-	-
12:00	505	134	-	-	-	-	-
1:00	601	120	-	-	-	-	-
2:00	635	132	-	-	-	-	-
3:00	937	200	X	X	X	X	-
4:00	1,095	219	X	X	X	X	-
5:00	1,150	232	X	X	X	X	-
6:00	910	198	-	-	X	X	-
7:00	619	125	-	-	-	-	-
		Hours Met:	3	3	5	5	0

WARRANT 1	Yes	No
Warrant 1 is met if any of the following conditions are met:		
Condition A Minimum Vehicular Volume	Yes	No
Condition B Interruption of Continuous Traffic	Yes	No
Condition A/B Combination of Warrants	Yes	No
WARRANT 2 Four-Hour Volume	Yes	No
WARRANT 3 Peak-Hour Volume	Yes	No
WARRANT 4 Pedestrian Volume	Yes	No
WARRANT 5 School Crossing	Yes	No
WARRANT 6 Coordinated Signal	Yes N/A	No
WARRANT 7 Accident Experience	Yes	No

	2014	2015	2016	
Number of accidents:	2	3	4	
Correctable accidents:	2	2	4	
Less restrictive remedies tried?				
Are volume requirements met?	No			

WARRANT 8 Roadway Network	Yes N/A	No
WARRANT 9 Intersection Near a Grade Crossing	Yes N/A	No

Review Information

Counts Used: GHA 24-hour miovision data / CMAP 2050 Projections

Count Date: 4-Dec-18 (Adjusted for 2050)

Date Reviewed: 10/9/2019

Reviewed By: AM

Comments

-Crash history indicates that 8 out of the 9 crashes that occurred in the 3-year period of 2014-2016 could have been correctable by a traffic signal.

-80% of Condition A or B is not met for at least 8 hours. Thus, a signal can not be warranted based on crash experience.

-Roundabout should be considered due to high percentage of turning movements and recent crash history.

-Traffic Signal will not be warranted by 2050.

	#	%	Adj. Factor
STOP OR YIELD CONTROLLED LEG WITH GRADE CROSSING			
D (clear storage distance) =			
RAIL TRAFFIC PER DAY =			
HIGH OCCUPANCY BUSSES PER HOUR =			
TRUCKS PER HOUR =			
OVERALL ADJUSTMENT FACTOR =			

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Appendix A

Crash Data for Ackman Road & Lakewood Road from 2014-2016

INTERSECTION	YEAR	MONTH	DAY	HOUR	DAY OF WEEK	NUM VEH	INJURIES	FATALITIES	INJURY TYPE	COLLISION TYPE	WEATHER	LIGHTING	SURFACE CONDITIONS
Ackman Rd at Lakewood Rd	2014	4	16	12	Wednesday	2	1	0	A	Angle	Clear	Daylight	Dry
Ackman Rd at Lakewood Rd	2014	9	11	10	Thursday	2	1	0	B	Angle	Clear	Daylight	Dry
Ackman Rd at Lakewood Rd	2015	1	2	18	Friday	2	0	0	O	Angle	Clear	Darkness / Lighted Road	Dry
Ackman Rd at Lakewood Rd	2015	7	9	17	Thursday	2	5	0	A	Angle	Clear	Daylight	Dry
Ackman Rd at Lakewood Rd	2015	11	20	17	Friday	2	1	0	C	Rear End	Snow	Dusk	Wet
Ackman Rd at Lakewood Rd	2016	5	7	14	Saturday	2	0	0	O	Angle	Clear	Daylight	Dry
Ackman Rd at Lakewood Rd	2016	6	26	12	Sunday	2	0	0	O	Angle	Clear	Daylight	Dry
Ackman Rd at Lakewood Dr	2016	10	30	0	Sunday	2	0	0	O	Angle	Rain	Darkness / Lighted Road	Wet
Ackman Rd at Lakewood Rd	2016	11	5	19	Saturday	2	3	0	B	Angle	Clear	Darkness	Dry

GREEN = CORRECTABLE
RED = NOT CORRECTABLE BY TRAFFIC SIGNAL
WHITE = NO DOCUMENTED CRASHES

Injury Severity	
K	Fatal
A	Incapacitating
B	Non-incapacitating
C	Reported/Not evident
O	No indication of injury

GHA GEWALT HAMILTON ASSOCIATES, INC.

TRAFFIC SIGNAL WARRANT STUDY

To: Bradley Cousin, P.E., PTOE
Traffic Engineer – McHenry County Division of Transportation

From: Daniel P. Brinkman, P.E., PTOE
Antonio Maravillas, E.I.T.

Date: October 9, 2019

Subject: Ackman Road at Redtail Drive (2050):
Lakewood, IL

GHA GEWALT HAMILTON ASSOCIATES, INC.
CONSULTING ENGINEERS
625 Forest Edge Drive, Vernon Hills, IL 60061
TEL 847.478.9700 ■ FAX 847.478.9701
www.gha-engineers.com

Part I. Project Context and Summary Statement

Per your request, *Gewalt Hamilton Associates, Inc*. (GHA) has conducted the necessary analysis to determine if the above referenced intersection meets the minimum criteria as published in the FHWA's Manual on Uniform Traffic Control Devices (MUTCD) for installation of a traffic signal.

Briefly summarizing, after review of the 2050 traffic projection data, recent crash history and the MUTCD criteria, it is our finding that the Ackman Road intersection with Redtail Drive will meet the threshold volumes to warrant a traffic signal by 2050.

Part II. Background Information

Site Location Map and Aerial Photo

Exhibit 1 provides an aerial photo of the subject intersection and vicinity with current traffic operations. Pertinent comments include:

- Ackman Road and Redtail Drive both provide one travel lane in each direction.
- The intersection currently operates as One-Way Stop Controlled.
- The posted speed limit is 40-mph on Ackman Road and 35-mph on Redtail Drive.

2050 Traffic Volumes

GHA conducted a 24-hour traffic count at the Ackman Road / Redtail Drive intersection on December 4, 2018. The Chicagoland Metropolitan Agency for Planning (CMAP) provided Year 2050 traffic projections for Redtail Drive and Ackman Road with the proposed IL 47 extension. Existing traffic volumes were multiplied by a factor of 1.4636 for Ackman Road west of the intersection, 1.4240 for Ackman Road east of the intersection, and 1.2766 for Redtail Drive in order to obtain Year 2050 projections. Exhibit 2 tabulates the prime 14- hours of traffic count data (6:00 AM to 8:00 PM) adjusted for Year 2050.

Part III. Evaluation

Right turn on Red (RTOR) adjustments

Prior to testing the published warrant criteria, the MUTCD directs the engineer conducting a warrant study to consider the effects of future right turns on red (RTOR) and remove those traffic volumes from the observed approach volumes. Various methods exist for this reduction, but the most prevalent in our area and the approach required by the Illinois Department of Transportation (IDOT) is Pagones' Theorem. Pagones' Theorem considers reduction for future right turns based on the lane configuration of the minor street approaches and further adjusts the reduction based on the volume of traffic in the adjacent through lanes to account for available gaps that RTOR movements would be made into.

Pagones' Theorem is attached as *Exhibit 3.*

For this analysis, Redtail Drive approach volumes were reduced in accordance with lane configuration #1 – right turn volumes were generally reduced by 20-40% based on the observed approach volumes and lane configuration. These volumes and adjusted volumes are tabulated in *Exhibit 4.*

Warrant Analyses

GHA reviewed the available signal warrants as published in the FHWA's Manual on Uniform Traffic Control Devices (MUTCD). Each of the nine available warrants and their results are discussed below.

Warrant #1 – Eight Hour Volume

The 8-hour volume requirements are based on the existing lane configuration at the Ackman Road and Redtail Drive intersection and posted speed limits. There are two 8-hour conditions that are considered: Condition A – Minimum Vehicular Volume and Condition B – Interruption of Continuous Traffic.

Included as *Exhibit 5* is Table 4C-1 from the MUTCD. As can be seen, based on the lane configuration at the intersection the minimum major street (Ackman Road) volumes are 500 and 750 vehicles per hour respectively for Condition A and Condition B. Similarly, the minor street (Redtail Drive) volumes are 150 and 75 vehicles per hour respectively. For either condition the volume minimums must be met simultaneously during the same hour.

Condition B is met for at least 8 hours throughout the day. Thus, this warrant is satisfied.

Warrant #2 – Four Hour Volume

Exhibit 6 presents Figure 4C-1 from the MUTCD, which was utilized to determine if the Four Hour Warrant was met. As can be seen, there are five hours where the minimum combined volume met above the minimum threshold line on the chart. Therefore, the Four Hour volume criteria is met.

Warrant #3 – Peak Hour Volume

Exhibit 7 presents Figure 4C-3 from the MUTCD which was utilized to determine if Warrant #3 - Peak Hour Volume was met. There was at least one projected hour where the combination of volumes met above the minimum threshold line on the chart. Therefore, the Peak Hour volume criteria is met.

Warrant #4 – Pedestrian Volume

Pedestrian volume warrant criteria starts at 75 pedestrians per hour. Based on the intersection location, pedestrians are not expected to be crossing either Ackman Road or Redtail Drive. As such – this warrant was not considered.

Warrant #5 – School Crossing

The MUTCD allows for installation of a traffic signal when the principal reason for installation is to accommodate the crossing of school aged children. There is not an elementary school in close proximity to the intersection to justify this criteria.

Warrant #6 – Coordinated Signal System

This warrant was not considered.

Warrant #7 – Crash Experience

When the frequency and severity of correctable crashes are experienced over a 12-month period, installation of a traffic signal to address these crashes is justified based on this warrant. Note that volume criteria (80% of one of the Warrant #1 8-hour conditions) must also be met.

"Correctable" crashes considered for warrant criteria are generally turning and or angle type collisions. Crashes reported with fixed objects and animals do not merit consideration for the installation of traffic signals. Seven (7) reported crashes occurred at the subject intersection in the 3-year period of 2014-2016. However, only two could have been correctable by a traffic signal. Both crashes involved non-injuries, which is not sufficient to warrant a traffic signal on the Crash Experience basis.

A crash data summary table from McHenry County DOT is included as *Appendix A.*

Warrant #8 – Roadway Network

This warrant requires the two subject roadways to both be major roadways with similar volume characteristics. This warrant is not applicable.

Warrant #9 – Intersection Near a Grade Crossing (railroad).

This warrant is only applicable when an intersection is within 150-feet of an at grade railroad crossing. This warrant is not applicable.

Part IV. Conclusions & Recommendations

Exhibit 8 provides a detailed review of the various MUTCD warrants described and discussed above. At Year 2050, the vehicular volumes at the Ackman Road intersection with Redtail Drive will satisfy three separate warrants. Thus, it is recommended that a traffic signal be installed at this intersection by 2050.

Part V. Technical Addendum

The following *Exhibits* were previously referenced. They provide technical support for our observations, findings, and recommendations discussed in the text.

Exhibits

1. Location Map
2. 2050 Traffic Volumes
3. Analysis Parameters – "Pagones' Theorem"
4. 2050 Warrant Volumes
5. Eight Hour Traffic Signal Warrant Requirements
6. Four Hour Signal Warrant Test
7. Peak Hour Signal Warrant Test
8. Signal Warrant Review Sheet

Appendices

A. Crash Summaries

4188.921 MCDOT 2019 Ackman-Redtail Warrant 100919

Ackman Road at Redtail Drive, Lakewood, IL

GHA GEWALT HAMILTON ASSOCIATES, INC.

Exhibit 1
Location Map

Exhibit 2

2050 Traffic Volumes

Ackman Road at Redtail Drive; Lakewood, IL

Intersection Ackman Road at Redtail Drive **Municipality** Lakewood **County** McHenry **Date** 12/4/2050

	Major Street = Ackman Road											Minor Street = Redtail Drive											
	Approach = Eastbound					Approach = Westbound					Major Street Total	Approach = Northbound					Approach = Southbound					Minor Street Total	Intersection Total Volumes
Hour Beginning	Left	Thru	Right	U-turn	Subtotal	Left	Thru	Right	U-turn	Subtotal		Left	Thru	Right	U-turn	Subtotal	Left	Thru	Right	U-turn	Subtotal		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
6:00 AM	9	552	-	0	561	-	342	11	0	353	914	-	-	-	-	-	66	-	22	1	89	89	1,003
7:00 AM	23	748	-	0	771	-	439	23	0	461	1,233	-	-	-	-	-	61	-	43	0	105	105	1,337
8:00 AM	19	645	-	0	664	-	384	33	0	417	1,082	-	-	-	-	-	69	-	17	0	86	86	1,167
9:00 AM	13	426	-	0	439	-	306	43	0	349	788	-	-	-	-	-	55	-	20	0	75	75	863
10:00 AM	22	389	-	0	411	-	281	44	0	325	736	-	-	-	-	-	51	-	23	0	74	74	810
11:00 AM	32	422	-	0	454	-	367	57	0	424	878	-	-	-	-	-	45	-	26	0	70	70	948
12:00 PM	32	388	-	0	420	-	337	48	0	386	806	-	-	-	-	-	63	-	19	0	82	82	888
1:00 PM	16	372	-	0	388	-	404	67	0	471	859	-	-	-	-	-	51	-	19	0	70	70	929
2:00 PM	37	376	-	0	413	-	430	74	0	504	917	-	-	-	-	-	33	-	33	0	66	66	983
3:00 PM	53	625	-	0	678	-	654	85	0	739	1,417	-	-	-	-	-	61	-	36	0	97	97	1,514
4:00 PM	101	667	-	0	768	-	796	108	0	904	1,673	-	-	-	-	-	57	-	52	0	110	110	1,782
5:00 PM	70	692	-	0	763	-	856	141	0	997	1,759	-	-	-	-	-	69	-	36	0	105	105	1,864
6:00 PM	73	540	-	0	613	-	692	138	0	830	1,443	-	-	-	-	-	75	-	59	0	134	134	1,577
7:00 PM	38	318	-	0	356	-	497	84	0	581	937	-	-	-	-	-	64	-	36	0	100	100	1,036

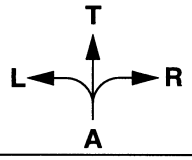
GEWALT HAMILTON ASSOCIATES, INC.

Exhibit 3

Analysis Parameters – "Pagones' Theorem"

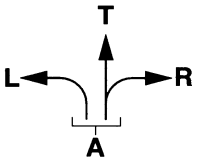
1. Lane Configurations and Right Turn Reductions

1



IF { R > 0.7A | 0.7A ≥ R > 0.35A | R ≤ 0.35A } THEN { reduce R by 60% | reduce R by 40% | reduce R by 20% }

2



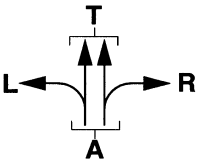
IF { R > 3T | 3T ≥ R > T/3 | R ≤ T/3 } THEN { reduce R by 60% | reduce R by 40% | reduce R by 20% }

---

3 Any configuration with an exclusive right turn lane (usually ≥ 600 ft. long)

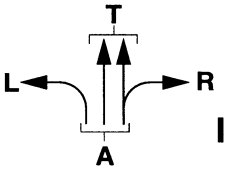
Reduce R by 75% in all cases.

4



IF { R > (T + L) | L > (T + R) | L ≈ T ≈ R (±10 veh.) | L ≈ T > 3R | R ≈ T > 3L | all other cases } THEN { reduce R by 65% | use situation 2 | reduce R by 40% | reduce R by 20% | reduce R by 50% | reduce R by 30% }

5



IF { R > T | T ≥ R > T/2 | T/2 ≥ R > T/4 | R ≤ T/4 } THEN { reduce R by 75% | reduce R by 50% | reduce R by 30% | reduce R by 15% }

LEGEND

L = number of left turning vehicles
T = number of through vehicles
R = number of right turning vehicles
A = (L+T+R)

2. Mainline Congestion Factors For Limiting Right Turn Reductions[1]

Volumes Per Lane	Reduction	Volumes Per Lane	Reduction
0 - 399	0%	1000 - 1099	35%
400 - 499	5%	1100 - 1199	40%
500 - 599	10%	1200 - 1299	45%
600 - 699	15%	1300 - 1399	50%
700 - 799	20%	1400 - 1499	55%
800 - 899	25%	1500 - 1599	60%
900 - 999	30%	etc.	etc.

(1) Mainline = Approach which right turns turn into

Exhibit 4
2050 Warrant Volumes
Ackman Road at Redtail Drive; Lakewood, IL

A. Southbound Redtail Drive

Hour	Volume From Exhibit 2				RTOR	Warrant Volumes			
Beginning	Left	Thru	Right	Subtotal	Reduction	Left	Thru	Right	Total
	1	2	3	4	5	6	7	8	9
6:00 AM	66	-	22	88	20%	66	-	17	84
7:00 AM	61	-	43	105	35%	61	-	28	89
8:00 AM	69	-	17	86	20%	69	-	13	82
9:00 AM	55	-	20	75	20%	55	-	16	71
10:00 AM	51	-	23	74	20%	51	-	18	69
11:00 AM	45	-	26	70	40%	45	-	15	60
12:00 PM	63	-	19	82	20%	63	-	15	78
1:00 PM	51	-	19	70	15%	51	-	16	67
2:00 PM	33	-	33	66	35%	33	-	22	55
3:00 PM	61	-	36	97	25%	61	-	27	88
4:00 PM	57	-	52	110	20%	57	-	42	99
5:00 PM	69	-	36	105	0%	69	-	36	105
6:00 PM	75	-	59	134	25%	75	-	44	119
7:00 PM	64	-	36	100	35%	64	-	23	87

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Exhibit 5

Eight Hour Traffic Signal Warrant Requirements

Table 4C-1. Warrant 1, Eight-Hour Vehicular Volume

Condition A—Minimum Vehicular Volume

Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher-volume minor-street approach (one direction only)			
Major Street	Minor Street	100%[a]	80%[b]	70%[c]	56%[d]	100%[a]	80%[b]	70%[c]	56%[d]
1	1	500	400	350	280	150	120	105	84
2 or more	1	600	480	420	336	150	120	105	84
2 or more	2 or more	600	480	420	336	200	160	140	112
1	2 or more	500	400	350	280	200	160	140	112

Condition B—Interruption of Continuous Traffic

Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher-volume minor-street approach (one direction only)			
Major Street	Minor Street	100%[a]	80%[b]	70%[c]	56%[d]	100%[a]	80%[b]	70%[c]	56%[d]
1	1	750	600	525	420	75	60	53	42
2 or more	1	900	720	630	504	75	60	53	42
2 or more	2 or more	900	720	630	504	100	80	70	56
1	2 or more	750	600	525	420	100	80	70	56

[a] Basic minimum hourly volume

[b] Used for combination of Conditions A and B after adequate trial of other remedial measures

[c] May be used when the major-street speed exceeds 40 mph or in an isolated community with a population of less than 10,000

[d] May be used for combination of Conditions A and B after adequate trial of other remedial measures when the major-street speed exceeds 40 mph or in an isolated community with a population of less than 10,000

Major Street - Ackman Road

- One lane for moving through traffic

Minor Street – Redtail Drive

- One lane for moving through traffic

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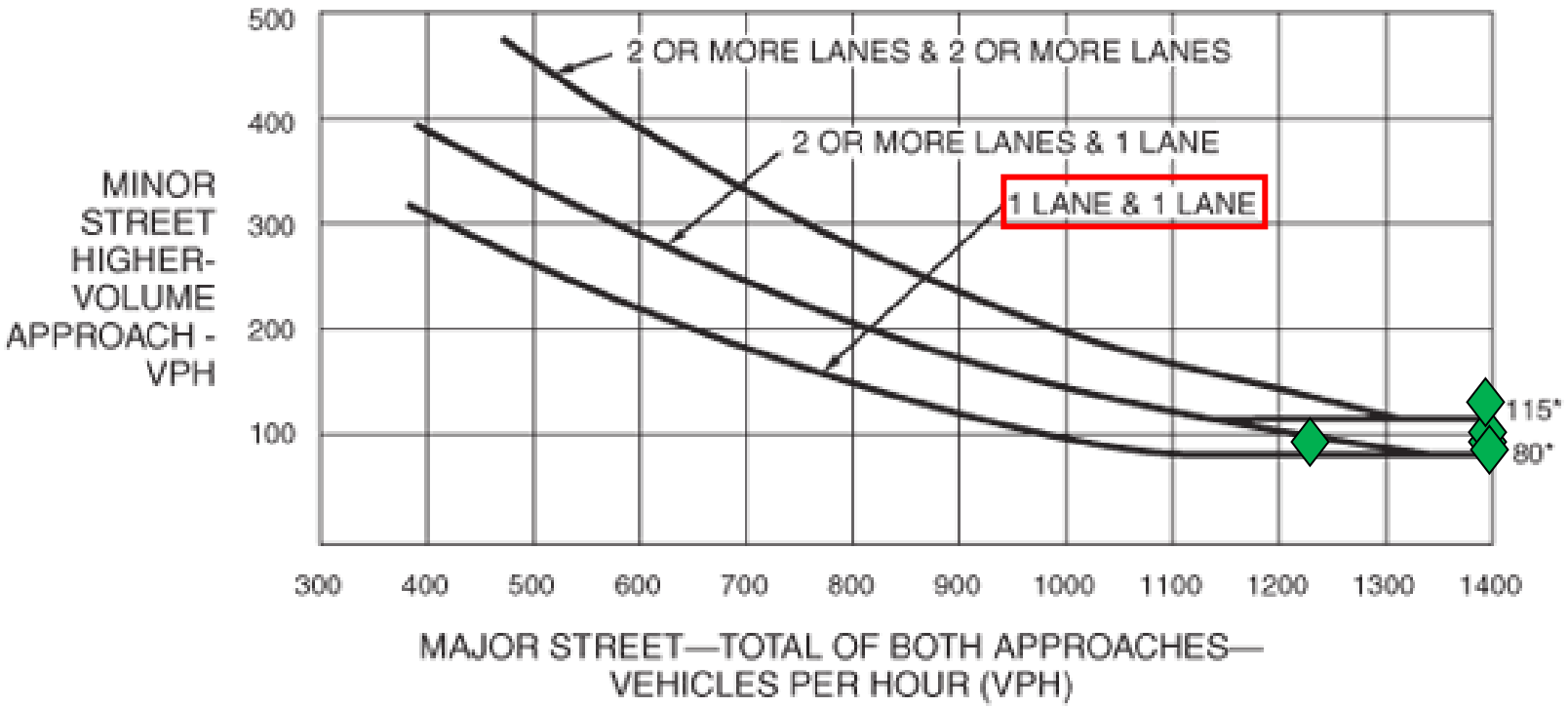
Exhibit 6

Four Hour Traffic Signal Warrant Test

Figure 4C-1. Warrant 2, Four-Hour Vehicular Volume



*Note: 115 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 80 vph applies as the lower threshold volume for a minor-street approach with one lane.

Volumes

- Major Street – Ackman Road
- Minor Street – Redtail Drive

Result

- Intersection Volume requirements met for 5 hours.

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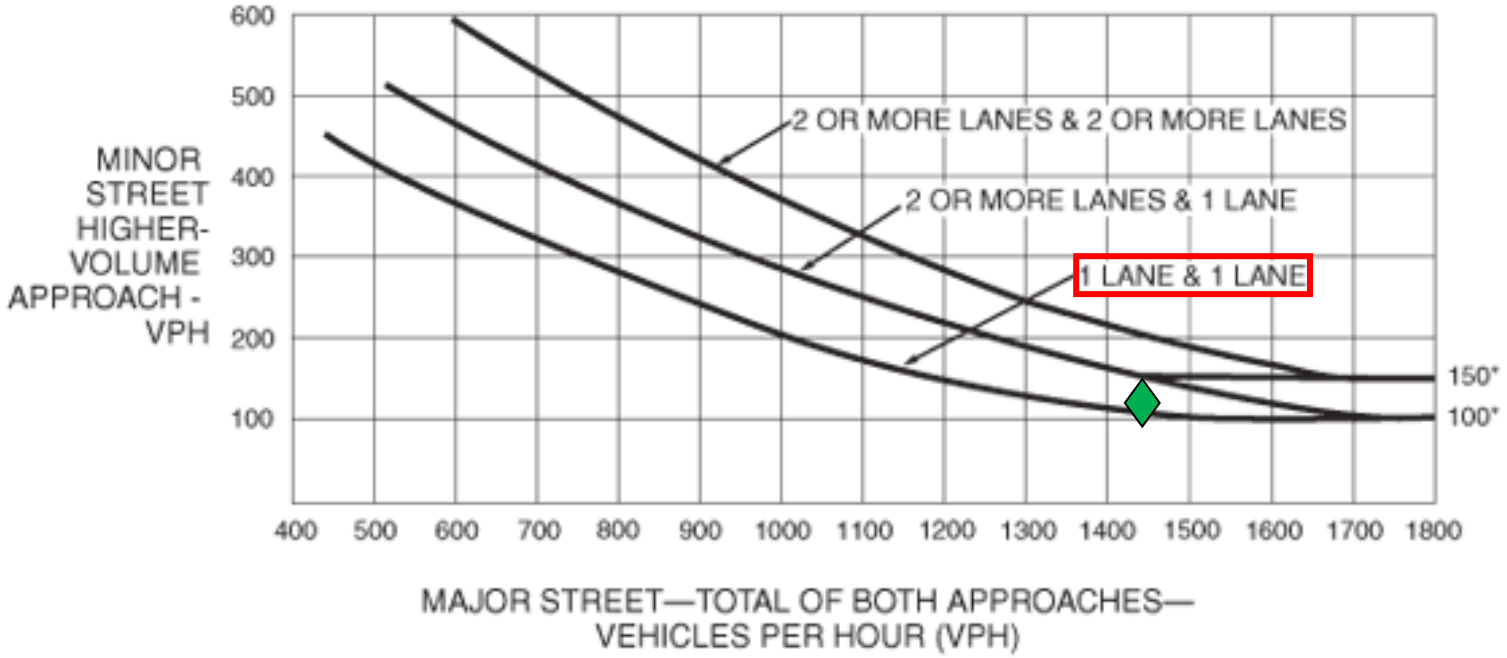
Exhibit 7

Traffic Signal Warrant Test

Figure 4C-3. Warrant 3, Peak Hour



*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Discussion

- Focus on Weekday Evening Peak Hour, because intersection minor street approach values are highest at that time.

Volumes

- Major Street – Ackman Road = 1443 VPH
- Minor Street – Redtail Drive = 119 VPH (6:00 PM)

Result

- Intersection volume meets Warrant #3 Peak Hour

GHA GEWALT HAMILTON ASSOCIATES, INC.

Exhibit 8
Signal Warrant Review Sheet

Ackman Road at Redtail Drive (2050); Lakewood, IL

SRA: NO

Intersection: Ackman Road at Redtail Drive

Municipality: Lakewood **County:** McHenry

Speed limit of major route: 40 **Isolated community with population <10,000?** NO

Number of lanes for major approach: 1-lane **Number of lanes for minor approach:** 1-lane

Warrant 1 - Condition A — Need 8 Hours Major = 500 vph and Minor = 150 vph

Warrant 1 - Condition B — Need 8 Hours Major = 750 vph and Minor = 75 vph

Hour Begin	Major Street Volume (both approaches	Adj. Minor Street Volume (higher volume approach)	Check any hours which meet the following warrants: Warrant 1 A 100%	Warrant 1 B 100%	Warrant 7: 8 hrs of one of the following: Warrant 1 A/B: 8 hrs of BOTH: 80% of A	80% of B	80% of Warr #4
6:00	914	84	-	X	-	X	-
7:00	1,233	89	-	X	-	X	-
8:00	1,082	82	-	X	-	X	-
9:00	788	71	-	-	-	X	-
10:00	736	69	-	-	-	X	-
11:00	878	60	-	-	-	X	-
12:00	806	78	-	X	-	X	-
1:00	859	67	-	-	-	X	-
2:00	917	55	-	-	-	-	-
3:00	1,417	88	-	X	-	X	-
4:00	1,673	99	-	X	-	X	-
5:00	1,759	105	-	X	-	X	-
6:00	1,443	119	-	X	-	X	-
7:00	937	87	-	X	-	X	-
		Hours Met:	**0**	**9**	**0**	**13**	**0**

WARRANT 1 Yes / No

Warrant 1 is met if any of the following conditions are met:

- **Condition A** (Minimum Vehicular Volume) — Yes / **No**
- **Condition B** (Interruption of Continuous Traffic) — **Yes** / No
- **Condition A/B** (Combination of Warrants) — Yes / **No**

WARRANT 2 (Four-Hour Volume) — **Yes** / No

WARRANT 3 (Peak-Hour Volume) — **Yes** / No

WARRANT 4 (Pedestrian Volume) — Yes / **No**

WARRANT 5 (School Crossing) — Yes / **No**

WARRANT 6 (Coordinated Signal) — Yes / **N/A** / No

WARRANT 7 (Accident Experience) — Yes / **No**

	2014	2015	2016	
Number of accidents:	3	2	2	
Correctable accidents:	1	1		

Less restrictive remedies tried?

Are volume requirements met? Yes

WARRANT 8 (Roadway Network) — Yes / **N/A** / No

WARRANT 9 (Intersection Near a Grade Crossing) — Yes / **N/A** / No

STOP OR YIELD CONTROLLED LEG WITH GRADE CROSSING

D (clear storage distance) =

	#	%	Adj. Factor
RAIL TRAFFIC PER DAY =			
HIGH OCCUPANCY BUSSES PER HOUR =			
TRUCKS PER HOUR =			

OVERALL ADJUSTMENT FACTOR =

Review Information

Counts Used: GHA 24-hour miovision data / CMAP 2050 Projections

Count Date: 4-Dec-18 (Adjusted for 2050)

Date Reviewed: 10/9/2019

Reviewed By: AM

Comments

-Intersection meets 3 separate Warrants. (#1-3)

-Traffic Signal will be warranted by 2050.

GHA GEWALT HAMILTON ASSOCIATES, INC.

Appendix A

Crash Data for Ackman Road & Redtail Drive from 2014-2016

INTERSECTION	YEAR	MONTH	DAY	HOUR	DAY OF WEEK	NUM VEH	INJURIES	FATALITIES	INJURY TYPE	COLLISION TYPE	WEATHER	LIGHTING	SURFACE CONDITIONS
Ackman Rd at Redtail Dr	2014	10	9	18	Thursday	2	0	0	O	Turning	Clear	Darkness / Lighted Road	Dry
Ackman Rd at Redtail Dr	2014	10	29	18	Wednesday	2	1	0	C	Turning	Clear	Darkness / Lighted Road	Dry
Ackman Rd at Redtail Dr	2014	11	12	7	Wednesday	1	1	0	B	Animal	Clear	Dawn	Dry
Ackman Rd at Redtail Dr	2015	6	14	12	Sunday	2	1	0	C	Rear End	Rain	Daylight	Wet
Ackman Rd at Redtail Dr	2015	12	21	18	Sunday	2	0	0	O	Turning	Fog/Haze	Darkness	Wet
Ackman Rd at Redtail Dr	2016	5	23	16	Monday	2	0	0	O	Rear End	Clear	Daylight	Unknown
Ackman Rd at Redtail Dr	2016	11	29	6	Tuesday	1	0	0	O	Animal	Clear	Darkness	Wet

GREEN = CORRECTABLE
RED = NOT CORRECTABLE BY TRAFFIC SIGNAL
WHITE = NO DOCUMENTED CRASHES

Injury Severity	
K	Fatal
A	Incapacitating
B	Non-incapacitating
C	Reported/Not evident
O	No indication of injury

GEWALT HAMILTON ASSOCIATES, INC.

TRAFFIC SIGNAL WARRANT STUDY

To: Bradley Cousin, P.E., PTOE
Traffic Engineer – McHenry County Division of Transportation

From: Daniel P. Brinkman, P.E., PTOE
Antonio Maravillas, E.I.T.

Date: October 9, 2019

Subject: Ackman Road at Swanson Road (2050):
Grafton Township, IL

GHA GEWALT HAMILTON ASSOCIATES, INC.
CONSULTING ENGINEERS
625 Forest Edge Drive, Vernon Hills, IL 60061
TEL 847.478.9700 ■ FAX 847.478.9701
www.gha-engineers.com

Part I. Project Context and Summary Statement

Per your request, *Gewalt Hamilton Associates, Inc*. (GHA) has conducted the necessary analysis to determine if the above referenced intersection meets the minimum criteria as published in the FHWA's Manual on Uniform Traffic Control Devices (MUTCD) for installation of a traffic signal.

Briefly summarizing, after review of the 2050 traffic projection data, recent crash history and the MUTCD criteria, it is our finding that the Ackman Road intersection with Swanson Road will meet the threshold volumes to warrant a traffic signal by 2050.

Part II. Background Information

Site Location Map and Aerial Photo

Exhibit 1 provides an aerial photo of the subject intersection and vicinity with current traffic operations. Pertinent comments include:

- Ackman Road and Swanson Road both provide one travel lane in each direction.
- The intersection currently operates as One-Way Stop Controlled.
- A private driveway connects to the north end of the intersection.
- A separate private driveway is located less than 100 feet east of the intersection.
- Swanson Road is located 600 feet east of Redtail Drive.
- The posted speed limit is 40-mph on Ackman Road and 40-mph on Swanson Road.

2050 Traffic Volumes

GHA conducted a 24-hour traffic count at the Ackman Road / Swanson Road intersection on December 4, 2018. The Chicagoland Metropolitan Agency for Planning (CMAP) provided Year 2050 traffic projections for Swanson Road and Ackman Road with the proposed IL 47 extension. Existing traffic volumes were multiplied by a factor of 1.4240 for Ackman Road west of the intersection, 1.2746 for Ackman Road east of the intersection, and 1.6571 for Swanson Road in order to obtain Year 2050 projections. Exhibit 2 tabulates the prime 14- hours of traffic count data (6:00 AM to 8:00 PM) adjusted for Year 2050.

Part III. Evaluation

Right turn on Red (RTOR) adjustments

Prior to testing the published warrant criteria, the MUTCD directs the engineer conducting a warrant study to consider the effects of future right turns on red (RTOR) and remove those traffic volumes from the observed approach volumes. Various methods exist for this reduction, but the most prevalent in our area and the approach required by the Illinois Department of Transportation (IDOT) is Pagones' Theorem. Pagones' Theorem considers reduction for future right turns based on the lane configuration of the minor street approaches and further adjusts the reduction based on the volume of traffic in the adjacent through lanes to account for available gaps that RTOR movements would be made into.

Pagones' Theorem is attached as *Exhibit 3.*

For this analysis, Swanson Road approach volumes were reduced in accordance with lane configuration #1 – right turn volumes were generally reduced by 40-60% based on the observed approach volumes and lane configuration. These volumes and adjusted volumes are tabulated in *Exhibit 4.*

Warrant Analyses

GHA reviewed the available signal warrants as published in the FHWA's Manual on Uniform Traffic Control Devices (MUTCD). Each of the nine available warrants and their results are discussed below.

Warrant #1 – Eight Hour Volume

The 8-hour volume requirements are based on the existing lane configuration at the Ackman Road and Swanson Road intersection and posted speed limits. There are two 8-hour conditions that are considered: Condition A – Minimum Vehicular Volume and Condition B – Interruption of Continuous Traffic.

Included as *Exhibit 5* is Table 4C-1 from the MUTCD. As can be seen, based on the lane configuration at the intersection the minimum major street (Ackman Road) volumes are 500 and 750 vehicles per hour respectively for Condition A and Condition B. Similarly, the minor street (Swanson Road) volumes are 150 and 75 vehicles per hour respectively. For either condition the volume minimums must be met simultaneously during the same hour.

Condition B is met for at least 8 hours throughout the day, satisfying this warrant.

Warrant #2 – Four Hour Volume

Exhibit 6 presents Figure 4C-1 from the MUTCD, which was utilized to determine if the Four Hour Warrant was met. As can be seen, there are seven hours where the minimum combined volume met above the minimum threshold line on the chart. Therefore, this warrant is satisfied.

Warrant #3 – Peak Hour Volume

Exhibit 7 presents Figure 4C-3 from the MUTCD which was utilized to determine if Warrant #3 - Peak Hour Volume was met. There were multiple projected hours where the combination of volumes met above the minimum threshold line on the chart, far exceeding the minimum requirement of one. Thus, the Peak Hour volume criteria is met.

Warrant #4 – Pedestrian Volume

Pedestrian volume warrant criteria starts at 75 pedestrians per hour. Based on the intersection location, pedestrians are not expected to be crossing either Ackman Road or Swanson Road. As such – this warrant was not considered.

Warrant #5 – School Crossing

The MUTCD allows for installation of a traffic signal when the principal reason for installation is to accommodate the crossing of school aged children. There is not an elementary school in close proximity to the intersection to justify this criteria.

Warrant #6 – Coordinated Signal System

This warrant was not considered.

Warrant #7 – Crash Experience

When the frequency and severity of correctable crashes are experienced over a 12-month period, installation of a traffic signal to address these crashes is justified based on this warrant. Note that volume criteria (80% of one of the Warrant #1 8-hour conditions) must also be met.

"Correctable" crashes considered for warrant criteria are generally turning and or angle type collisions. Crashes reported with fixed objects and animals do not merit consideration for the installation of traffic signals. Six (6) reported crashes occurred at the subject intersection in the 3-year period of 2014-2016. Only one could have been correctable by a traffic signal, which is not sufficient to warrant a traffic signal on the Crash Experience basis.

A crash data summary table from McHenry County DOT is included as *Appendix A.*

Warrant #8 – Roadway Network

This warrant requires the two subject roadways to both be major roadways with similar volume characteristics. This warrant is not applicable.

Warrant #9 – Intersection Near a Grade Crossing (railroad).

This warrant is only applicable when an intersection is within 150-feet of an at grade railroad crossing. This warrant is not applicable.

Part IV. Conclusions & Recommendations

Exhibit 8 provides a detailed review of the various MUTCD warrants described and discussed above. At Year 2050, the vehicular volumes at the Ackman Road intersection with Swanson Road will satisfy three separate warrants. Thus, it is recommended that a traffic signal be installed at this intersection by 2050.

Part V. Technical Addendum

The following *Exhibits* were previously referenced. They provide technical support for our observations, findings, and recommendations discussed in the text.

Exhibits

1. Location Map
2. 2050 Traffic Volumes
3. Analysis Parameters – "Pagones' Theorem"
4. 2050 Warrant Volumes
5. Eight Hour Traffic Signal Warrant Requirements
6. Four Hour Signal Warrant Test
7. Peak Hour Signal Warrant Test
8. Signal Warrant Review Sheet

Appendices

A. Crash Summaries

4188.921 MCDOT 2019 Ackman-Swanson Warrant 100919

Ackman Road at Swanson Road, Grafton Township, IL

GHA GEWALT HAMILTON ASSOCIATES, INC.

Exhibit 1
Location Map

Exhibit 2

2050 Traffic Volumes

Ackman Road at Swanson Road; Grafton Township, IL

Intersection Ackman Road at Swanson Road **Municipality** Grafton Township **County** McHenry **Date** 12/4/2050

	Major Street = Ackman Road											Minor Street = Swanson Road											
	Approach = Eastbound					Approach = Westbound					Major Street Total	Approach = Northbound					Approach = Southbound					Minor Street Total	Intersection Total Volumes
Hour Beginning	Left	Thru	Right	U-turn	Subtotal	Left	Thru	Right	U-turn	Subtotal		Left	Thru	Right	U-turn	Subtotal	Left	Thru	Right	U-turn	Subtotal		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
6:00 AM	1	598	26	1	626	42	292	0	0	334	960	31	0	187	0	219	1	0	0	0	1	220	1,180
7:00 AM	0	756	46	0	802	111	382	0	0	493	1,295	46	0	292	0	338	1	0	0	0	1	339	1,634
8:00 AM	0	611	91	0	702	119	314	1	0	433	1,135	78	0	191	0	268	0	1	0	0	1	270	1,405
9:00 AM	0	450	27	0	477	51	277	0	0	328	805	43	0	109	1	154	0	0	0	0	0	154	958
10:00 AM	0	410	23	0	433	56	275	0	0	331	764	18	0	58	0	76	0	0	0	0	0	76	841
11:00 AM	0	430	31	1	463	79	347	0	0	426	888	41	0	149	0	191	0	0	0	0	0	191	1,079
12:00 PM	0	407	41	0	449	90	325	0	0	416	864	23	0	106	0	129	0	0	0	0	0	129	993
1:00 PM	0	390	27	0	417	57	400	0	0	458	875	27	1	78	0	106	0	0	1	0	1	107	982
2:00 PM	0	382	26	0	407	85	436	0	0	521	929	18	0	109	0	128	0	0	0	0	0	128	1,056
3:00 PM	0	601	78	0	679	180	617	0	0	797	1,476	66	0	197	0	263	0	0	0	0	0	263	1,739
4:00 PM	1	639	70	0	711	148	755	0	0	902	1,613	70	1	171	0	242	0	0	0	0	0	242	1,855
5:00 PM	0	664	93	0	756	145	864	0	0	1,009	1,766	48	0	182	0	230	0	0	1	0	1	232	1,997
6:00 PM	0	561	47	0	608	134	706	1	0	841	1,449	40	0	109	0	149	1	0	0	0	1	150	1,600
7:00 PM	1	343	37	0	382	85	489	0	0	575	956	38	0	76	0	114	0	3	0	0	3	117	1,073

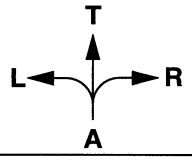
GEWALT HAMILTON ASSOCIATES, INC.

Exhibit 3

Analysis Parameters – "Pagones' Theorem"

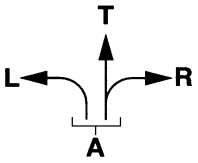
1. Lane Configurations and Right Turn Reductions

1



IF { R > 0.7A | 0.7A ≥ R > 0.35A | R ≤ 0.35A } THEN { reduce R by 60% | reduce R by 40% | reduce R by 20% }

2



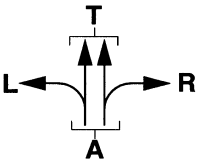
IF { R > 3T | 3T ≥ R > T/3 | R ≤ T/3 } THEN { reduce R by 60% | reduce R by 40% | reduce R by 20% }

---

3 Any configuration with an exclusive right turn lane (usually ≥ 600 ft. long)

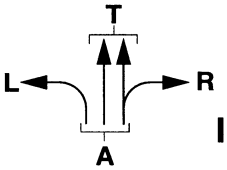
Reduce R by 75% in all cases.

4



IF { R > (T + L) | L > (T + R) | L ≈ T ≈ R (±10 veh.) | L ≈ T > 3R | R ≈ T > 3L | all other cases } THEN { reduce R by 65% | use situation 2 | reduce R by 40% | reduce R by 20% | reduce R by 50% | reduce R by 30% }

5



IF { R > T | T ≥ R > T/2 | T/2 ≥ R > T/4 | R ≤ T/4 } THEN { reduce R by 75% | reduce R by 50% | reduce R by 30% | reduce R by 15% }

LEGEND

L = number of left turning vehicles
T = number of through vehicles
R = number of right turning vehicles
A = (L+T+R)

2. Mainline Congestion Factors For Limiting Right Turn Reductions[1]

Volumes Per Lane	Reduction	Volumes Per Lane	Reduction
0 - 399	0%	1000 - 1099	35%
400 - 499	5%	1100 - 1199	40%
500 - 599	10%	1200 - 1299	45%
600 - 699	15%	1300 - 1399	50%
700 - 799	20%	1400 - 1499	55%
800 - 899	25%	1500 - 1599	60%
900 - 999	30%	etc.	etc.

(1) Mainline = Approach which right turns turn into

Exhibit 4
2050 Warrant Volumes
Ackman Road at Swanson Road; Grafton Township, IL

A. Northbound Swanson

Hour	Volume From Exhibit 2				RTOR	Warrant Volumes			
Beginning	Left	Thru	Right	Subtotal	Reduction	Left	Thru	Right	Total
	1	2	3	4	5	6	7	8	9
6:00 AM	31	0	187	219	50%	31	0	94	125
7:00 AM	46	0	292	338	40%	46	0	175	221
8:00 AM	78	0	191	268	45%	78	0	105	183
9:00 AM	43	0	109	152	55%	43	0	49	92
10:00 AM	18	0	58	76	55%	18	0	26	44
11:00 AM	41	0	149	191	55%	41	0	67	109
12:00 PM	23	0	106	129	55%	23	0	48	71
1:00 PM	27	1	78	106	60%	27	1	31	59
2:00 PM	18	0	109	128	60%	18	0	44	62
3:00 PM	66	0	197	263	45%	66	0	108	175
4:00 PM	70	1	171	242	45%	70	1	94	165
5:00 PM	48	0	182	230	45%	48	0	100	148
6:00 PM	40	0	109	149	50%	40	0	55	94
7:00 PM	38	0	76	114	40%	38	0	46	84

GHA GEWALT HAMILTON ASSOCIATES, INC.

Exhibit 5

Eight Hour Traffic Signal Warrant Requirements

Table 4C-1. Warrant 1, Eight-Hour Vehicular Volume

Condition A—Minimum Vehicular Volume

Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher-volume minor-street approach (one direction only)			
Major Street	Minor Street	100%[a]	80%[b]	70%[c]	56%[d]	100%[a]	80%[b]	70%[c]	56%[d]
1	1	500	400	350	280	150	120	105	84
2 or more	1	600	480	420	336	150	120	105	84
2 or more	2 or more	600	480	420	336	200	160	140	112
1	2 or more	500	400	350	280	200	160	140	112

Condition B—Interruption of Continuous Traffic

Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher-volume minor-street approach (one direction only)			
Major Street	Minor Street	100%[a]	80%[b]	70%[c]	56%[d]	100%[a]	80%[b]	70%[c]	56%[d]
1	1	750	600	525	420	75	60	53	42
2 or more	1	900	720	630	504	75	60	53	42
2 or more	2 or more	900	720	630	504	100	80	70	56
1	2 or more	750	600	525	420	100	80	70	56

[a] Basic minimum hourly volume

[b] Used for combination of Conditions A and B after adequate trial of other remedial measures

[c] May be used when the major-street speed exceeds 40 mph or in an isolated community with a population of less than 10,000

[d] May be used for combination of Conditions A and B after adequate trial of other remedial measures when the major-street speed exceeds 40 mph or in an isolated community with a population of less than 10,000

Major Street - Ackman Road

- One lane for moving through traffic

Minor Street – Swanson Road

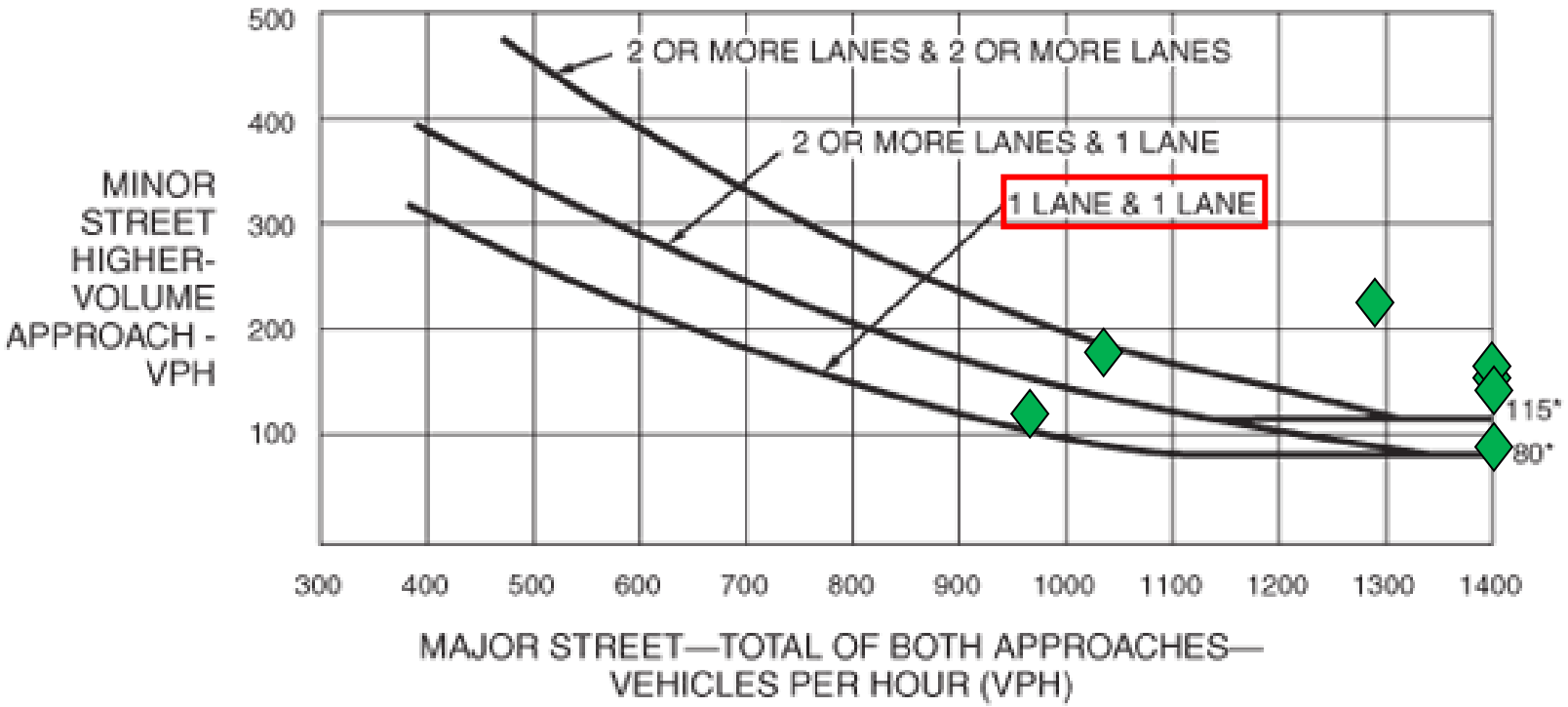
- One lane for moving through traffic

GHA GEWALT HAMILTON ASSOCIATES, INC.

Exhibit 6

Four Hour Traffic Signal Warrant Test

Figure 4C-1. Warrant 2, Four-Hour Vehicular Volume



*Note: 115 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 80 vph applies as the lower threshold volume for a minor-street approach with one lane.

Volumes

- Major Street – Ackman Road
- Minor Street – Swanson Road

Result

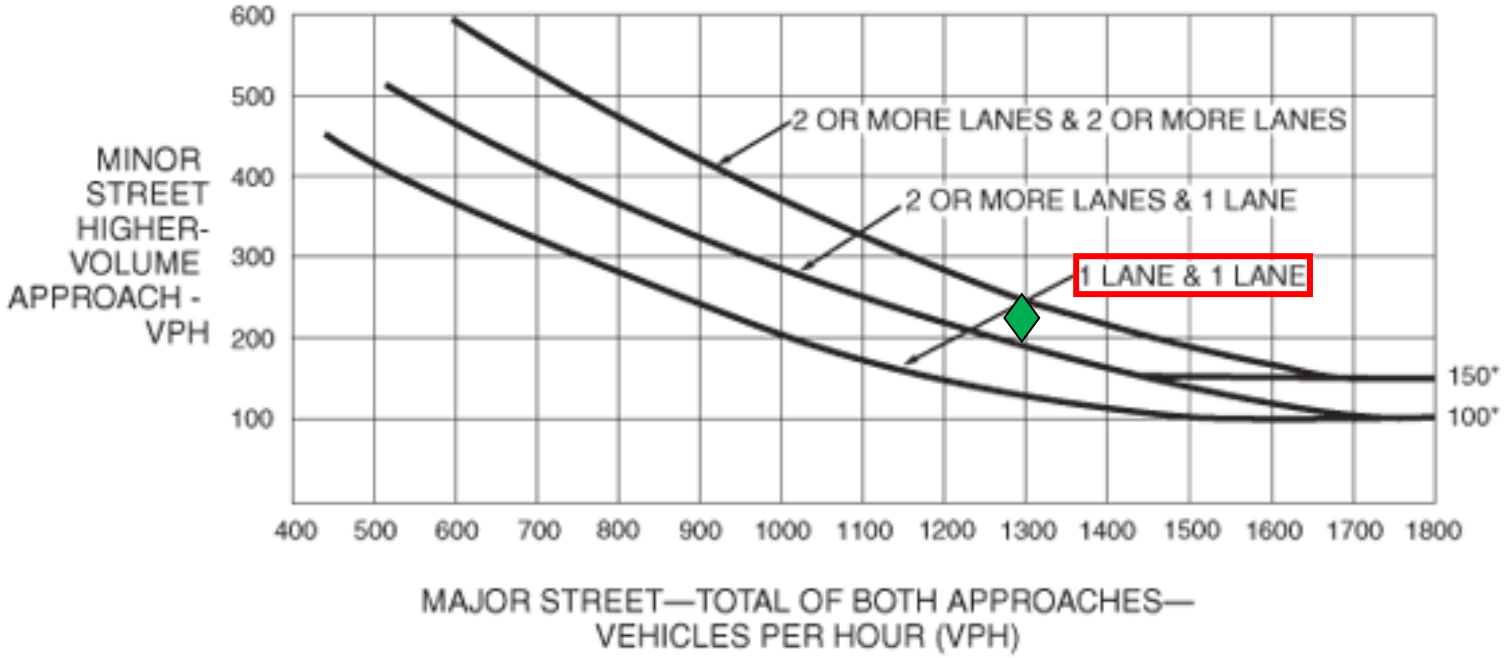
- Intersection Volume requirements met for 7 hours.

GHA GEWALT HAMILTON ASSOCIATES, INC.

Exhibit 7

Traffic Signal Warrant Test

Figure 4C-3. Warrant 3, Peak Hour



*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Discussion

- Multiple hours where intersection minor street approach values exceed 100 vph. Focus on Weekday Morning Peak Hour, because that is the highest volume.

Volumes

- Major Street – Ackman Road = 1295 VPH
- Minor Street – Swanson Road = 221 VPH (7:00 AM)

Result

- Intersection volume meets Warrant #3 Peak Hour for at least one hour.

GHA GEWALT HAMILTON ASSOCIATES, INC.

Exhibit 8
Signal Warrant Review Sheet
Ackman Road at Swanson Road (2050); Grafton Township, IL

SRA: NO

Intersection: Ackman Road at Swanson Road

Municipality: Grafton Township **County:** McHenry

Speed limit of major route: 40 **Isolated community with population <10,000?** NO

Number of lanes for major approach: 1-lane **Number of lanes for minor approach:** 1-lane

Warrant 1 - Condition A — Need 8 Hours (Major = 500 vph and Minor = 150 vph)

Warrant 1 - Condition B — Need 8 Hours (Major = 750 vph and Minor = 75 vph)

Hour Begin	Major Street Volume (both approaches	Adj. Minor Street Volume (higher volume approach)	Check any hours which meet the following warrants: Warrant 1 A 100%	Warrant 1 B 100%	Warrant 7: 8 hrs of one of the following: Warrant 1 A/B: 8 hrs of BOTH: 80% of A	80% of B	80% of Warr #4
6:00	960	125	-	X	X	X	-
7:00	1,295	221	X	X	X	X	-
8:00	1,135	183	X	X	X	X	-
9:00	805	92	-	X	-	X	-
10:00	764	44	-	-	-	-	-
11:00	888	109	-	X	-	X	-
12:00	864	71	-	-	-	X	-
1:00	875	59	-	-	-	-	-
2:00	929	62	-	-	-	X	-
3:00	1,476	175	X	X	X	X	-
4:00	1,613	165	X	X	X	X	-
5:00	1,766	148	-	X	X	X	-
6:00	1,449	94	-	X	-	X	-
7:00	956	84	-	X	-	X	-
		Hours Met:	**4**	**10**	**6**	**12**	**0**

WARRANT 1 Yes / No

Warrant 1 is met if any of the following conditions are met:

- **Condition A** (Minimum Vehicular Volume) — Yes / **No**
- **Condition B** (Interruption of Continuous Traffic) — **Yes** / No
- **Condition A/B** (Combination of Warrants) — Yes / **No**

WARRANT 2 (Four-Hour Volume) — **Yes** / No

WARRANT 3 (Peak-Hour Volume) — **Yes** / No

WARRANT 4 (Pedestrian Volume) — Yes / **No**

WARRANT 5 (School Crossing) — Yes / **No**

WARRANT 6 (Coordinated Signal) — Yes / **N/A** / No

WARRANT 7 (Accident Experience) — Yes / **No**

	2014	2015	2016	
Number of accidents:	2	2	2	
Correctable accidents:	1			

Less restrictive remedies tried?

Are volume requirements met? Yes

WARRANT 8 (Roadway Network) — Yes / **N/A** / No

WARRANT 9 (Intersection Near a Grade Crossing) — Yes / **N/A** / No

STOP OR YIELD CONTROLLED LEG WITH GRADE CROSSING

D (clear storage distance) =

	#	%	Adj. Factor
RAIL TRAFFIC PER DAY =			
HIGH OCCUPANCY BUSSES PER HOUR =			
TRUCKS PER HOUR =			

OVERALL ADJUSTMENT FACTOR =

Review Information

Counts Used: GHA 24-hour miovision data / CMAP 2050 Projections

Count Date: 4-Dec-18 (Adjusted for 2050)

Date Reviewed: 10/9/2019

Reviewed By: AM

Comments

-Intersection meets 3 separate Warrants. (#1-3)

-Traffic Signal will be warranted by 2050.

GHA GEWALT HAMILTON ASSOCIATES, INC.

Appendix A

Crash Data for Ackman Road & Swanson Road from 2014-2016

INTERSECTION	YEAR	MONTH	DAY	HOUR	DAY OF WEEK	NUM VEH	INJURIES	FATALITIES	INJURY TYPE	COLLISION TYPE	WEATHER	LIGHTING	SURFACE CONDITIONS
Ackman Rd at Swanson Rd	2014	5	20	15	Tuesday	2	0	0	O	Rear End	Clear	Daylight	Dry
Ackman Rd at Swanson Rd	2014	5	23	18	Friday	2	1	0	C	Turning	Clear	Daylight	Dry
Ackman Rd at Swanson Rd	2015	10	31	11	Saturday	2	0	0	O	SSS	Rain	Daylight	Wet
Ackman Rd at Swanson Rd	2015	12	4	15	Friday	2	0	0	O	Rear End	Clear	Daylight	Dry
Ackman Rd at Swanson Rd	2016	1	26	14	Tuesday	2	0	0	O	Rear End	Clear	Daylight	Dry
Ackman Rd at Swanson Rd	2016	7	13	19	Wednesday	2	0	0	O	Rear End	Clear	Daylight	Wet

GREEN = CORRECTABLE
RED = NOT CORRECTABLE BY TRAFFIC SIGNAL
WHITE = NO DOCUMENTED CRASHES

Injury Severity	
K	Fatal
A	Incapacitating
B	Non-incapacitating
C	Reported/Not evident
O	No indication of injury

GHA GEWALT HAMILTON ASSOCIATES, INC.

TRAFFIC SIGNAL WARRANT STUDY

To: Bradley Cousin, P.E., PTOE
Traffic Engineer – McHenry County Division of Transportation

From: Daniel P. Brinkman, P.E., PTOE
Antonio Maravillas, E.I.T.

Date: October 9, 2019

Subject: Ackman Road at Westport Ridge (2050):
Crystal Lake, IL

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Part I. Project Context and Summary Statement

Per your request, *Gewalt Hamilton Associates, Inc*. (GHA) has conducted the necessary analysis to determine if the above referenced intersection meets the minimum criteria as published in the FHWA's Manual on Uniform Traffic Control Devices (MUTCD) for installation of a traffic signal.

Briefly summarizing, after review of the 2050 traffic projection data, recent crash history and the MUTCD criteria, it is our finding that the Ackman Road intersection with Westport Ridge will meet the peak hour threshold volumes to warrant a traffic signal but will not meet the other criteria by 2050.

Part II. Background Information

Site Location Map and Aerial Photo

Exhibit 1 provides an aerial photo of the subject intersection and vicinity with current traffic operations. Pertinent comments include:

- Ackman Road provides one travel lane in each direction. Separate left and right turn lanes are provided at both approaches of the intersection with Westport Ridge.
- Westport Ridge provides a single through lane in each direction.
- The intersection currently operates as Two-Way Stop Controlled.
- The posted speed limit is 40-mph on Ackman Road and 30-mph on Westport Ridge.
- Pedestrian crosswalks are marked on the northern, eastern, and southern legs of the intersection.
- The eastern crosswalk contains flashing pedestrian signals.

2050 Traffic Volumes

GHA conducted a 24-hour traffic count at the Ackman Road / Westport Ridge intersection on December 4, 2018. The Chicagoland Metropolitan Agency for Planning (CMAP) provided Year 2050 traffic projections for Westport Ridge and Ackman Road with the proposed IL 47 extension. Existing traffic volumes along Ackman Road were multiplied by a factor of 1.1801 west of the intersection and 1.1667 east of the intersection. Existing traffic volumes along Westport Ridge were multiplied by a factor of 1.4286 north of the intersection and 1.3077 south of the

intersection in order to obtain Year 2050 projections. *Exhibit 2* tabulates the prime 14- hours of traffic count data (6:00 AM to 8:00 PM) adjusted for Year 2050.

Part III. Evaluation

Right turn on Red (RTOR) adjustments

Prior to testing the published warrant criteria, the MUTCD directs the engineer conducting a warrant study to consider the effects of future right turns on red (RTOR) and remove those traffic volumes from the observed approach volumes. Various methods exist for this reduction, but the most prevalent in our area and the approach required by the Illinois Department of Transportation (IDOT) is Pagones' Theorem. Pagones' Theorem considers reduction for future right turns based on the lane configuration of the minor street approaches and further adjusts the reduction based on the volume of traffic in the adjacent through lanes to account for available gaps that RTOR movements would be made into.

Pagones' Theorem is attached as *Exhibit 3.*

For this analysis, Westport Ridge approach volumes were reduced in accordance with lane configuration #1 – right turn volumes were generally reduced by 30-55% on the northbound approach and 0-20% on the southbound approach based on the observed approach volumes and lane configuration. These volumes and adjusted volumes are tabulated in *Exhibit 4.*

Warrant Analyses

GHA reviewed the available signal warrants as published in the FHWA's Manual on Uniform Traffic Control Devices (MUTCD). Each of the nine available warrants and their results are discussed below.

Warrant #1 – Eight Hour Volume

The 8-hour volume requirements are based on the existing lane configuration at the Ackman Road and Westport Ridge intersection and posted speed limits. There are two 8-hour conditions that are considered: Condition A – Minimum Vehicular Volume and Condition B – Interruption of Continuous Traffic.

Included as *Exhibit 5* is Table 4C-1 from the MUTCD. As can be seen, based on the lane configuration at the intersection the minimum major street (Ackman Road) volumes are 500 and 750 vehicles per hour respectively for Condition A and Condition B. Similarly, the minor street (Westport Ridge) volumes are 150 and 75 vehicles per hour respectively. For either condition the volume minimums must be met simultaneously during the same hour.

Warrant #2 – Four Hour Volume

Exhibit 6 presents Figure 4C-1 from the MUTCD, which was utilized to determine if the Four Hour Warrant was met. As can be seen, there is only one hour (7:00-8:00 AM) where the minimum combined volume met above the minimum threshold line on the chart. Therefore, the Four Hour volume criteria is not met

Warrant #3 – Peak Hour Volume

Exhibit 7 presents Figure 4C-3 from the MUTCD which was utilized to determine if Warrant #3 - Peak Hour Volume was met. There is 1 hour (7:00 AM) where the combination of volumes met above the minimum threshold line on the chart. Therefore, the Peak Hour volume criteria is met.

Warrant #4 – Pedestrian Volume

Pedestrian volume warrant criteria starts at 75 pedestrians per hour. A total of 36 pedestrians were observed over the 2018 24-hour count at the intersection. For the eastern crossing on Ackman Road, the highest observed hourly count was 13, from 3:00-4:00 PM. Pedestrian volumes are not expected to increase drastically by 2050. As such – this warrant was not considered.

Warrant #5 – School Crossing

The MUTCD allows for installation of a traffic signal when the principal reason for installation is to accommodate the crossing of school aged children. While Crystal Lake South High School is located north of this intersection, the number of students crossing this intersection is low, as indicated by the 2018 pedestrian count data.

Warrant #6 – Coordinated Signal System

This warrant was not considered.

Warrant #7 – Crash Experience

When the frequency and severity of correctable crashes are experienced over a 12-month period, installation of a traffic signal to address these crashes is justified based on this warrant. Note that volume criteria (80% of one of the Warrant #1 8-hour conditions) must also be met.

"Correctable" crashes considered for warrant criteria are generally turning and or angle type collisions. Crashes reported with fixed objects and animals do not merit consideration for the installation of traffic signals. Six (6) reported crashes occurred at the subject intersection in the 3-year period of 2014-2016. All but one were rear-end crashes, which a traffic signal would not prevent. Thus, the crash experience is not sufficient to warrant a traffic signal.

A crash data summary table from McHenry County DOT is included as *Appendix A.*

Warrant #8 – Roadway Network

This warrant requires the two subject roadways to both be major roadways with similar volume characteristics. This warrant is not applicable.

Warrant #9 – Intersection Near a Grade Crossing (railroad).

This warrant is only applicable when an intersection is within 150-feet of an at grade railroad crossing. This warrant is not applicable.

Part IV. Conclusions & Recommendations

Exhibit 8 provides a detailed review of the various MUTCD warrants described and discussed above. At Year 2050, only the peak hour volume criteria will be met for a signal warrant. Based on the recent crash history, expected pedestrian volumes, and other vehicular volume criteria, a traffic signal is not recommended at the Ackman Road intersection with Westport Ridge by 2050.

Part V. Technical Addendum

The following *Exhibits* were previously referenced. They provide technical support for our observations, findings, and recommendations discussed in the text.

Exhibits

1. Location Map
2. 2050 Traffic Volumes
3. Analysis Parameters – "Pagones' Theorem"
4. 2050 Warrant Volumes
5. Eight Hour Traffic Signal Warrant Requirements
6. Four Hour Signal Warrant Test
7. Peak Hour Signal Warrant Test
8. Signal Warrant Review Sheet

Appendices

A. Crash Summaries

4188.921 MCDOT 2019 Ackman-Westport Warrant 100919

Ackman Road at Westport Ridge, Crystal Lake, IL

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Exhibit 1
Location Map

Exhibit 2

2050 Traffic Volumes

Ackman Road at Westport Ridge; Crystal Lake, IL

Intersection Ackman Road at Westport Ridge **Municipality** Crystal Lake **County** McHenry **Date** 12/4/2050

	Major Street = Ackman Road											Minor Street = Westport Ridge											
	Approach = Eastbound					Approach = Westbound					Major Street Total	Approach = Northbound					Approach = Southbound					Minor Street Total	Intersection Total Volumes
Hour Beginning	Left	Thru	Right	U-turn	Subtotal	Left	Thru	Right	U-turn	Subtotal		Left	Thru	Right	U-turn	Subtotal	Left	Thru	Right	U-turn	Subtotal		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
6:00 AM	0	830	5	0	834	5	208	8	0	221	1,055	4	1	90	0	95	31	0	10	0	41	137	1,192
7:00 AM	4	961	4	0	968	18	265	8	0	291	1,258	9	25	156	0	190	40	7	14	0	61	251	1,509
8:00 AM	5	833	5	0	843	14	275	6	1	297	1,139	4	4	68	0	76	33	4	9	0	46	122	1,261
9:00 AM	4	607	4	1	615	11	286	7	0	303	918	8	1	41	0	50	17	1	4	0	23	73	991
10:00 AM	2	478	6	0	486	15	298	12	0	324	811	3	1	33	0	37	20	1	3	0	24	61	871
11:00 AM	0	517	2	0	519	27	413	15	0	455	974	5	4	26	0	35	16	0	1	0	17	52	1,027
12:00 PM	0	512	7	0	519	28	452	5	0	484	1,003	4	8	39	0	51	21	1	0	1	24	75	1,079
1:00 PM	5	451	2	0	458	22	426	16	0	464	922	10	4	44	0	59	10	1	4	0	16	75	997
2:00 PM	5	426	7	0	438	32	597	14	0	643	1,081	3	1	35	0	39	17	0	3	0	20	59	1,140
3:00 PM	9	628	6	0	643	44	791	30	0	866	1,509	3	5	58	0	65	7	6	6	0	19	84	1,593
4:00 PM	5	638	9	1	654	51	971	40	0	1,062	1,716	7	8	37	0	51	10	0	3	0	13	64	1,779
5:00 PM	11	584	9	0	604	46	1,045	43	0	1,134	1,738	5	5	52	0	63	11	3	14	0	29	91	1,830
6:00 PM	6	548	7	1	562	33	939	37	1	1,011	1,572	18	10	55	0	84	16	1	4	0	21	105	1,678
7:00 PM	0	325	7	0	332	35	701	25	0	761	1,092	7	5	24	0	35	14	1	4	0	20	55	1,148

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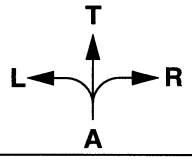
Exhibit 3

Analysis Parameters – "Pagones' Theorem"

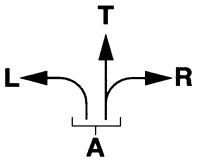
1. Lane Configurations and Right Turn Reductions

1



IF { R > 0.7A | 0.7A ≥ R > 0.35A | R ≤ 0.35A } THEN { reduce R by 60% | reduce R by 40% | reduce R by 20% }

2



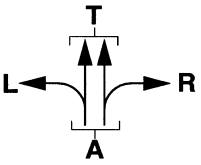
IF { R > 3T | 3T ≥ R > T/3 | R ≤ T/3 } THEN { reduce R by 60% | reduce R by 40% | reduce R by 20% }

---

3 Any configuration with an exclusive right turn lane (usually ≥ 600 ft. long)

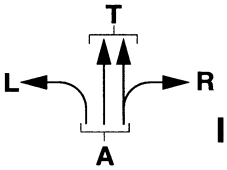
Reduce R by 75% in all cases.

4



IF { R > (T + L) | L > (T + R) | L ≈ T ≈ R (±10 veh.) | L ≈ T > 3R | R ≈ T > 3L | all other cases } THEN { reduce R by 65% | use situation 2 | reduce R by 40% | reduce R by 20% | reduce R by 50% | reduce R by 30% }

5



IF { R > T | T ≥ R > T/2 | T/2 ≥ R > T/4 | R ≤ T/4 } THEN { reduce R by 75% | reduce R by 50% | reduce R by 30% | reduce R by 15% }

LEGEND

L = number of left turning vehicles
T = number of through vehicles
R = number of right turning vehicles
A = (L+T+R)

2. Mainline Congestion Factors For Limiting Right Turn Reductions[1]

Volumes Per Lane	Reduction	Volumes Per Lane	Reduction
0 - 399	0%	1000 - 1099	35%
400 - 499	5%	1100 - 1199	40%
500 - 599	10%	1200 - 1299	45%
600 - 699	15%	1300 - 1399	50%
700 - 799	20%	1400 - 1499	55%
800 - 899	25%	1500 - 1599	60%
900 - 999	30%	etc.	etc.

(1) Mainline = Approach which right turns turn into

Exhibit 4
2050 Warrant Volumes
Ackman Road at Westport Ridge; Crystal Lake, IL

A. Northbound Westport Ridge

Hour	Volume From Exhibit 2				RTOR	Warrant Volumes			
Beginning	Left	Thru	Right	Subtotal	Reduction	Left	Thru	Right	Total
	1	2	3	4	5	6	7	8	9
6:00 AM	4	1	90	95	35%	4	1	59	64
7:00 AM	9	25	156	190	30%	9	25	109	143
8:00 AM	4	4	68	76	35%	4	4	44	52
9:00 AM	8	1	41	50	45%	8	1	22	31
10:00 AM	3	1	33	37	55%	3	1	15	19
11:00 AM	5	4	26	35	50%	5	4	13	22
12:00 PM	4	8	39	51	50%	4	8	20	31
1:00 PM	10	4	44	59	55%	10	4	20	34
2:00 PM	3	1	35	39	55%	3	1	16	20
3:00 PM	3	5	58	65	45%	3	5	32	39
4:00 PM	7	8	37	51	45%	7	8	20	35
5:00 PM	5	5	52	63	50%	5	5	26	37
6:00 PM	18	10	55	84	30%	18	10	38	67
7:00 PM	7	5	24	35	40%	7	5	14	26

B. Southbound Westport Ridge

Hour	Volume From Exhibit 2				RTOR	Warrant Volumes			
Beginning	Left	Thru	Right	Subtotal	Reduction	Left	Thru	Right	Total
	1	2	3	4	5	6	7	8	9
6:00 AM	31	0	10	41	20%	31	0	8	39
7:00 AM	40	7	14	61	20%	40	7	11	59
8:00 AM	33	4	9	46	20%	33	4	7	44
9:00 AM	17	1	4	23	20%	17	1	3	22
10:00 AM	20	1	3	24	20%	20	1	2	24
11:00 AM	16	0	1	17	15%	16	0	1	17
12:00 PM	21	1	0	23	15%	21	1	0	23
1:00 PM	10	1	4	16	15%	10	1	4	15
2:00 PM	17	0	3	20	10%	17	0	3	20
3:00 PM	7	6	6	19	0%	7	6	6	19
4:00 PM	10	0	3	13	0%	10	0	3	13
5:00 PM	11	3	14	29	5%	11	3	14	28
6:00 PM	16	1	4	21	0%	16	1	4	21
7:00 PM	14	1	4	20	0%	14	1	4	20

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Exhibit 5

Eight Hour Traffic Signal Warrant Requirements

Table 4C-1. Warrant 1, Eight-Hour Vehicular Volume

Condition A—Minimum Vehicular Volume

Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher-volume minor-street approach (one direction only)			
Major Street	Minor Street	100%[a]	80%[b]	70%[c]	56%[d]	100%[a]	80%[b]	70%[c]	56%[d]
1	1	500	400	350	280	150	120	105	84
2 or more	1	600	480	420	336	150	120	105	84
2 or more	2 or more	600	480	420	336	200	160	140	112
1	2 or more	500	400	350	280	200	160	140	112

Condition B—Interruption of Continuous Traffic

Number of lanes for moving traffic on each approach		Vehicles per hour on major street (total of both approaches)				Vehicles per hour on higher-volume minor-street approach (one direction only)			
Major Street	Minor Street	100%[a]	80%[b]	70%[c]	56%[d]	100%[a]	80%[b]	70%[c]	56%[d]
1	1	750	600	525	420	75	60	53	42
2 or more	1	900	720	630	504	75	60	53	42
2 or more	2 or more	900	720	630	504	100	80	70	56
1	2 or more	750	600	525	420	100	80	70	56

[a] Basic minimum hourly volume

[b] Used for combination of Conditions A and B after adequate trial of other remedial measures

[c] May be used when the major-street speed exceeds 40 mph or in an isolated community with a population of less than 10,000

[d] May be used for combination of Conditions A and B after adequate trial of other remedial measures when the major-street speed exceeds 40 mph or in an isolated community with a population of less than 10,000

Major Street - Ackman Road

- One lane for moving through traffic

Minor Street – Westport Ridge

- One lane for moving through traffic

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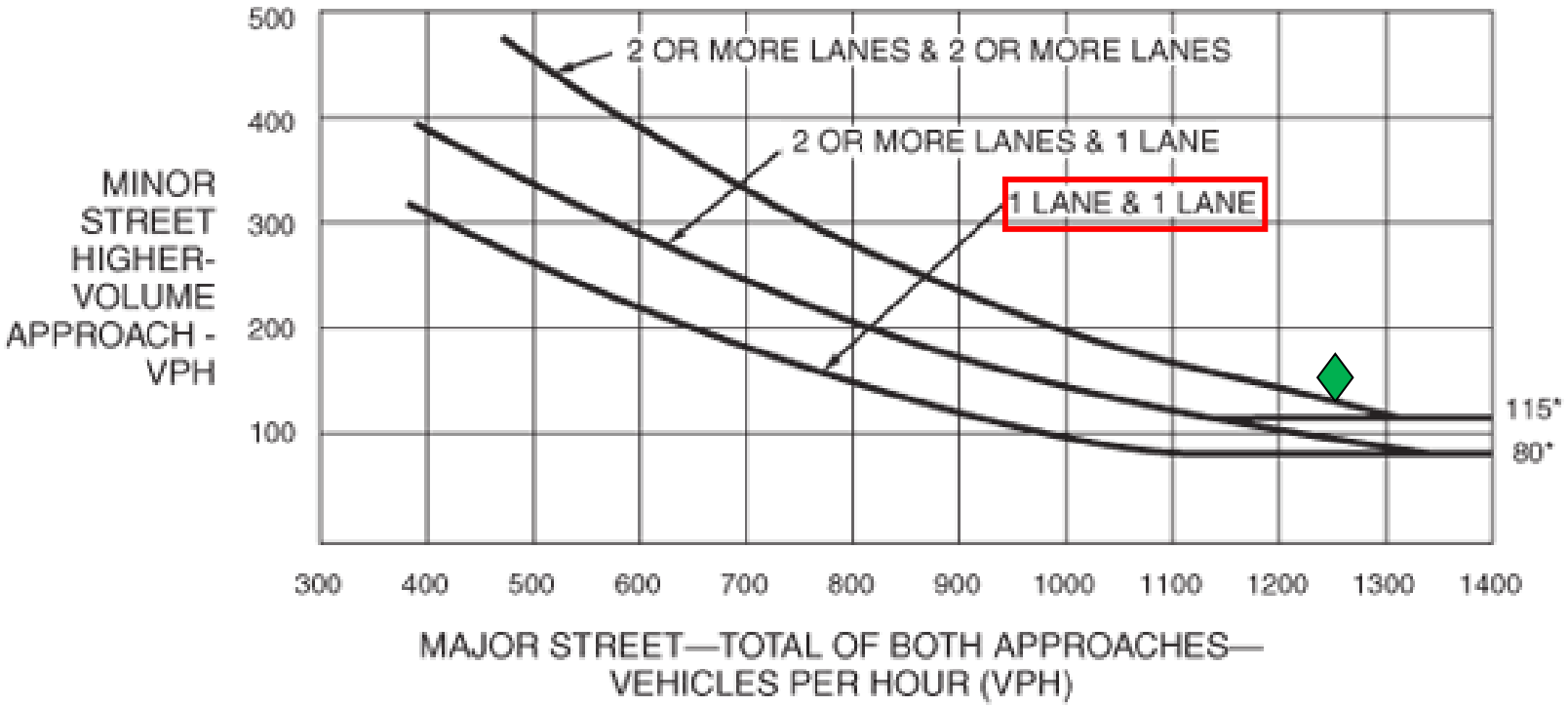
Exhibit 6

Four Hour Traffic Signal Warrant Test

Figure 4C-1. Warrant 2, Four-Hour Vehicular Volume



*Note: 115 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 80 vph applies as the lower threshold volume for a minor-street approach with one lane.

Volumes

- Major Street – Ackman Road
- Minor Street – Westport Ridge

Result

- Intersection Volume requirements only met for 1 hour.

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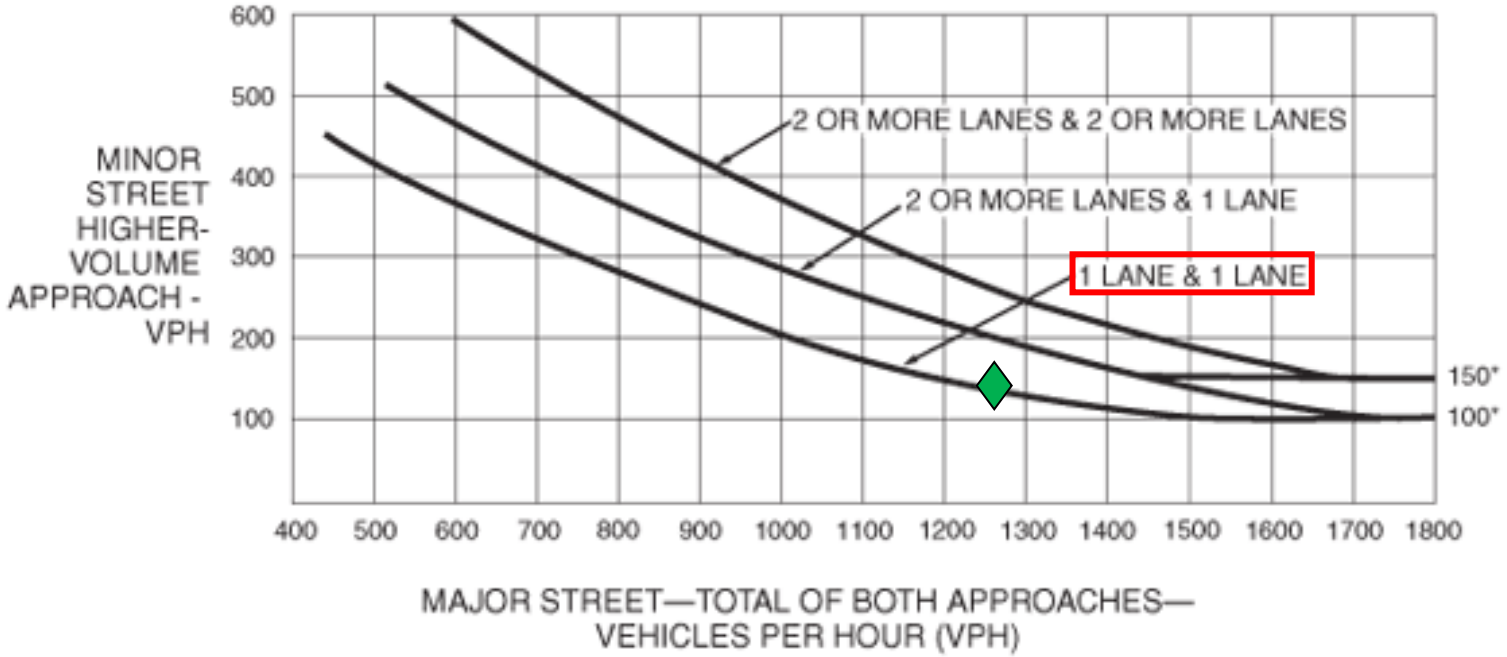
Exhibit 7

Traffic Signal Warrant Test

Figure 4C-3. Warrant 3, Peak Hour



*Note: 150 vph applies as the lower threshold volume for a minor-street approach with two or more lanes and 100 vph applies as the lower threshold volume for a minor-street approach with one lane.

Discussion

- Focus on Weekday Morning Peak Hour, because that is the only time when intersection minor street approach values exceed 100 vph.

Volumes

- Major Street – Ackman Road = 1,258 VPH
- Minor Street – Westport Ridge = 143 VPH (7:00 AM)

Result

- Intersection volume meets Warrant #3 Peak Hour

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Exhibit 8
Signal Warrant Review Sheet

Ackman Road at Westport Ridge (2050); Crystal Lake, IL

SRA: NO

Intersection: Ackman Road at Westport Ridge

Municipality: Crystal Lake **County:** McHenry

Speed limit of major route: 40 **Isolated community with population <10,000?** NO

Number of lanes for major approach: 1-lane **Number of lanes for minor approach:** 1-lane

Warrant 1 - Condition A — Need 8 Hours (Major = 500 vph and Minor = 150 vph)

Warrant 1 - Condition B — Need 8 Hours (Major = 750 vph and Minor = 75 vph)

Hour Begin	Major Street Volume (both approaches	Adj. Minor Street Volume (higher volume approach)	Check any hours which meet the following warrants: Warrant 1 A 100%	Warrant 1 B 100%	Warrant 7: 8 hrs of one of the following: Warrant 1 A/B: 8 hrs of BOTH: 80% of A	80% of B	80% of Warr #4
6:00	1,055	64	-	-	-	X	-
7:00	1,258	143	-	X	X	X	-
8:00	1,139	52	-	-	-	-	-
9:00	918	31	-	-	-	-	-
10:00	811	24	-	-	-	-	-
11:00	974	22	-	-	-	-	-
12:00	1,003	31	-	-	-	-	-
1:00	922	34	-	-	-	-	-
2:00	1,081	20	-	-	-	-	-
3:00	1,509	39	-	-	-	-	-
4:00	1,716	35	-	-	-	-	-
5:00	1,738	37	-	-	-	-	-
6:00	1,572	67	-	-	-	X	-
7:00	1,092	26	-	-	-	-	-
		Hours Met:	**0**	**1**	**1**	**3**	**0**

WARRANT 1	Yes	No
Warrant 1 is met if any of the following conditions are met:		
Condition A Minimum Vehicular Volume	Yes	No
Condition B Interruption of Continuous Traffic	Yes	No
Condition A/B Combination of Warrants	Yes	No
WARRANT 2 Four-Hour Volume	Yes	No
WARRANT 3 Peak-Hour Volume	Yes	No
WARRANT 4 Pedestrian Volume	Yes	No
WARRANT 5 School Crossing	Yes	No
WARRANT 6 Coordinated Signal	Yes N/A	No
WARRANT 7 Accident Experience	Yes	No

	2014	2015	2016	
Number of accidents:	2	2	2	
Correctable accidents:				

Less restrictive remedies tried?

Are volume requirements met? No

WARRANT 8 Roadway Network	Yes N/A	No
WARRANT 9 Intersection Near a Grade Crossing	Yes N/A	No

STOP OR YIELD CONTROLLED LEG WITH GRADE CROSSING

D (clear storage distance) =

	#	%	Adj. Factor
RAIL TRAFFIC PER DAY =			
HIGH OCCUPANCY BUSSES PER HOUR =			
TRUCKS PER HOUR =			

OVERALL ADJUSTMENT FACTOR =

Review Information

Counts Used: GHA 24-hour miovision data / CMAP 2050 Projections

Count Date: 4-Dec-18 (Adjusted for 2050)

Date Reviewed: 10/9/2019

Reviewed By: AM

Comments

-Intersection barely meets the minimum thresholds for Warrant 3 (Peak-Hour).

-Crash history shows no correcteable crashes by traffic signal in 3-year study period.

-Based on other warrant critera, a signal is not recommended for this intersection.

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Appendix A
Crash Data for Ackman Road & Westport Ridge from 2014-2016

INTERSECTION	YEAR	MONTH	DAY	HOUR	DAY OF WEEK	NUM VEH	INJURIES	FATALITIES	INJURY TYPE	COLLISION TYPE	WEATHER	LIGHTING	SURFACE CONDITIONS
Ackman Rd at Westport Ridge	2014	4	2	17	Wednesday	1	1	0	A	Pedalcyclist	Clear	Daylight	Dry
Ackman Rd at Westport Ridge	2014	4	17	17	Thursday	2	0	0	O	Rear End	Clear	Daylight	Dry
Ackman Rd at Westport Ridge	2015	5	1	17	Friday	3	0	0	O	Rear End	Clear	Daylight	Dry
Ackman Rd at Westport Ridge	2015	10	24	12	Saturday	2	0	0	O	Rear End	Clear	Daylight	Dry
Ackman Rd at Westport Ridge	2016	4	14	6	Thursday	2	0	0	O	Rear End	Clear	Daylight	Dry
Ackman Rd at Westport Ridge	2016	6	21	17	Tuesday	2	0	0	O	Rear End	Clear	Daylight	Dry

GREEN = CORRECTABLE
RED = NOT CORRECTABLE BY TRAFFIC SIGNAL
WHITE = NO DOCUMENTED CRASHES

Injury Severity	
K	Fatal
A	Incapacitating
B	Non-incapacitating
C	Reported/Not evident
O	No indication of injury

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