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CFNI PROPERTY – A PROPOSED DEVELOPMENT

NEAR CALUMET AVENUE & TREADWAY ROAD

MUNSTER, IN

TRAFFIC IMPACT STUDY

FEBRUARY 27, 2018

The CFNI property is on 37 acres owned by Community Hospital. It is a proposed commercial development on the west side of Calumet Avenue near Treadway Road. The project will consist of phased development starting with a single 30,000 SFT building for medical offices in 2018.

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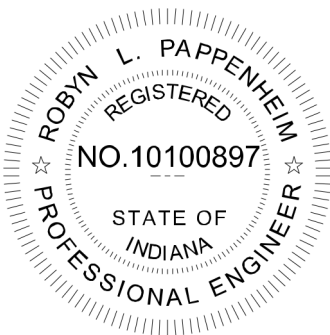
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PREPARER QUALIFICATIONS

"I certify that this TRAFFIC IMPACT STUDY has been prepared by me or under my immediate supervision and that I have experience and training in the field of traffic and transportation engineering."

***Robyn L. Pappenheim, P.E.
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A handwritten signature in black ink, appearing to read "Robyn L. Pappenheim".

02-27-18

1. Introduction and Summary

The purpose of this study is to assist Community Hospital in their efforts to evaluate the impacts of the projected traffic volumes of a traffic generator; a proposed medical office building, to be located west of Calumet Avenue near the intersection with Treadway Road in the Town of Munster, Indiana (Lake County). See Exhibit 1. Because the proposed development is part of a larger parcel owned by Community Hospital, we will analyze for a full-build scenario of the 37 acres in addition to the single 30,000 SFT building that is planned currently. We will analyze the impact on the following existing intersections:

- Calumet Avenue & Treadway Road
- Calumet Avenue & Main Street (signalized)
- Calumet Avenue & Hagburg Drive
- Calumet Avenue & Palmer C. Singleton Drive
- Calumet Avenue & Columbia Avenue/S. Centennial Drive (signalized)
- Columbia Avenue & Palmer C. Singleton Drive
- Columbia Avenue & Otis Bowen Drive
- Columbia Avenue & Hagburg Drive/McClaghry Drive
- Columbia Avenue & Main Street (signalized)

The proposed intersections of Main Street & Don Powers Drive as well as Columbia Avenue & Donna Drive/Treadway Road will also be analyzed.

Analyses of all intersections will occur during the morning and afternoon peak periods of a typical weekday with the exception of Calumet Avenue & Treadway Road which will be analyzed for a 12-hour day in order to determine if signalization is warranted.

Calumet Avenue is generally a four (4)-lane north-south principal arterial roadway. The posted speed limit in this section of Calumet Avenue is 45 MPH. Main Street is generally a two (2)-lane east-west minor arterial roadway with a posted speed limit of 35 MPH in this vicinity. Both roadways are generally flat (little to no vertical curve) and straight (little to no horizontal curve) in the vicinity of the proposed development. Columbia Avenue is generally a three (3) lane minor arterial roadway in the vicinity of this project. It has a posted speed of 35 MPH. It is generally a northeast-southwest alignment with some horizontal curvature, but little to no vertical curvature.

The Calumet Avenue corridor is mostly commercial, but many residential developments exist nearby. Main Street and Columbia Avenue are mainly residential in this area, but some commercial is present as well.

2. Proposed Development

A site of approximately 37 acres exists between Calumet Avenue and Columbia Avenue near Treadway Road in Munster, IN. Currently, about 3.56 acres is planned for development, and proposes to access Calumet Avenue across from Treadway Road, although additional roadways and entrance points are planned as well. See Exhibit 2A. Both Treadway Road to the east and Don Powers Drive to the north would extend and intersect near the proposed development. See Exhibit 2B. Don Powers Drive would then continue southerly and create a 'T' intersection at Main Street, while Treadway Road would continue westerly to create a four (4)-way intersection at Columbia Avenue across from Donna Drive.

The remaining acreage has no timeline for development. For the purposes of analyses, a full build scenario will be considered to occur within the next 10 years.

This traffic impact study will analyze the nearby affected intersections and roadways due to the expected development in Horizon Year 2027 (ten years from now) under various scenarios. It will also consider internal traffic flow.

The Northern Indiana Commuter Transportation District (NICTD) has plans to create an extension of the south shore train to be called the Westlake Corridor. Current plans would include a station near the location of this development. A TOD (Transit Oriented Development) Plan is also in the planning stages. This Westlake Corridor will certainly impact traffic in the area. While it is the responsibility of NICTD to work with towns and cities to study traffic impacts due to the train and train stations, this study will make generalized comments. Community Hospital cannot and should not be responsible, however, for traffic impacts due to the train and related development.

3. Area Conditions

3.1 EXISTING LAND USE

The existing condition of the undeveloped property for consideration is vacant land, and it is zoned C-1: Commercial.

3.2 SURROUNDING LAND USE

The 37-acre site is bordered by residential subdivisions (mostly single family) to the east, west, and south. To the north is mainly medical commercial. Many of the houses immediately to the south have been purchased by Community Hospital or another developer, Calumet Properties (on the north side of Main Street). This area of approximately 20 acres is shown as part of the Transit Oriented Development Plan, and is slated for commercial and multi-family residential. The current planned opening year for the train station is 2022.

3.3 GEOMETRIC CONDITIONS

The proposed development is planned to have three (3) access points. The first is a main entrance at the intersection of Calumet Avenue & Treadway Road. This is proposed as full-access. A secondary access point is proposed on Main Street approximately equidistant between the two (2) traffic signals with Calumet Avenue and Columbia Avenue. This is proposed as a full-access T-intersection. A tertiary access point is proposed on Columbia Avenue across from Donna Drive. This is also proposed as a full access. For all of these entrance points, stop-controlled conditions are being proposed with stop signs on the minor approaches only.

3.4 TRAFFIC VOLUME DATA

ADT (Average Daily Traffic) volumes with hourly and directional breakdowns were collected on Calumet Avenue (about 1000' north of Main Street) in October 2016 and on Main Street (about 1000' west of Calumet Avenue) in September 2017 by Garcia Consulting Engineers.

Manual traffic counts at 15-minute intervals were performed in September 2017, on one day each, from 6:30 AM to 9:00 AM and from 3:30 PM to 6:00 PM at eight (8) locations for the purpose of determining existing turn movement volumes, and for identifying a morning peak hour and an afternoon peak hour. Those locations are as follows:

- Calumet Avenue & Main Street (signalized)
- Calumet Avenue & Hagburg Drive
- Calumet Avenue & Palmer C. Singleton Drive
- Calumet Avenue & Columbia Avenue/S. Centennial Drive (signalized)
- Columbia Avenue & Palmer C. Singleton Drive
- Columbia Avenue & Otis Bowen Drive

- Columbia Avenue & Hagburg Drive/McClaghry Drive
- Columbia Avenue & Main Street (signalized)

Manual traffic counts were also collected on September 19, 2017, from 6:00 AM to 6:00 PM at the intersection of Calumet Avenue & Treadway Road for the purposes of determining the peak hours, but also for performing a traffic signal warrant analysis.

All of the traffic count data collected is shown in Exhibit 3.

4. Projected Traffic

4.1 SITE TRAFFIC

To assess the magnitude of the traffic impact due to the proposed development on the traffic flow of the surrounding streets, the future travel demand of the site was simulated.

Forecasting the site-generated trips was accomplished through trip generation, trip distribution, and traffic assignment. Trip generation is the process of providing an estimate of the number of trips that will be generated due to the proposed development. Trip distribution is the process of determining the general direction traffic is expected to travel to and from the development utilizing existing traffic patterns as a guide. And traffic assignment is the process of assigning traffic turning movements to the driveways of the development and to the surrounding roadways and intersections.

For this study, forecasting site-generated trips was performed by first generating existing traffic for the average AM and PM peak hours of the adjacent street traffic for Land Use 720: Medical-Dental Office Building using Gross Floor Area (GFA) as the independent variable. The Institute of Transportation Engineer's (ITE) Trip Generation Manual, 9th Edition was utilized in this analysis as the source for the trip generation rates.

This land use was utilized to calculate first for the 30,000 SFT building (Single Use) and then for Full Build of the 37 acres as medical offices. An assumption was made that about 360,000 total square feet of medical office could be built on the 37 acres if a mix of one and two story buildings go in.

Medical-Dental Office Building (Single Use)

Land Use 720

Average Vehicle Trip Ends vs. SFT (GFA)

30,000 GFA		Forecasted Trip Ends		
		Two Way	In	Out
Average Weekday		1012	506	506
AM Peak Hour	Adjacent Street	72	57	15
PM Peak Hour	Adjacent Street	99	28	71

Medical-Dental Office Building (Full Build)

Land Use 720

Average Vehicle Trip Ends vs. SFT (GFA)

360,000 GFA		Forecasted Trip Ends		
		Two Way	In	Out
Average Weekday		14,506	7,253	7,253
AM Peak Hour	Adjacent Street	860	679	181
PM Peak Hour	Adjacent Street	923	258	665

After the raw numbers were generated, reduction factors were considered. For Full Build it is conceivable a slight multi-use factor might exist. And for both scenarios, it is possible that some users will divert from an existing trip providing a passer-by trip reduction opportunity. However, both of these instances (multi-use and passer-by) would be small, and so to be conservative, no reduction factors were applied.

4.2 NON-SITE TRAFFIC

The site is well situated within 2 - 4 miles of two (2) state roads and one (1) interstate highway. Munster has experienced growth at an average rate of approximately 1.5% per year since 2000 according to the US Census Bureau's website. Traffic on this section of Calumet Avenue has grown at an average rate of

0.6% per year in the last 4 years. However, growth is slowing as capacity is reached due to available land shortages in the area. The Single Use site will be built before traffic growth is experienced so no growth was applied to that scenario. The Full Build scenario may not be recognized for many years. Because no reduction factors were applied and any growth in traffic rates is most likely offset by those possible reductions, a growth rate was not applied to the Full Build Scenario either.

It should be noted that because the scope of this project is large and involved many intersections counted on different days that inconsistencies were noted in the data. Most of this is believed to be due to nearby asphalt resurfacing work that was proceeding intermittently during the counting periods. Therefore, in order to be conservative the higher thru traffic numbers were carried through for all intersections.

Below are the results of the ADT counts taken by Garcia Consulting Engineers:

Non-Site 24 hr Traffic Counts	
October 2016	
Calumet Avenue	Through
Total Traffic	28,548
Northbound	13,655
Southbound	14,893

Non-Site 24 hr Traffic Counts	
September 2017	
Main Street	Through
Total Traffic	6,771
Eastbound	3,108
Westbound	3,663

5. Analysis

5.1 ANALYSIS METHODOLOGY

By adding the traffic assignments to the existing traffic volumes, turn movements for three scenarios during both peak periods were determined. These traffic assignments for the proposed development, with both the single use site and the full build condition, at nearby intersections (as well as the original counted turning movements) are included in Exhibit 4A and 4B in the form of actual traffic volumes for both the AM and PM peak hours, respectively. These expected weekday morning and afternoon peak volumes were then considered to determine what affect the additional traffic due to the addition of this facility will have on the nearby existing intersections at their peak times. This was accomplished by determining the levels of service under the various conditions and comparing them.

5.2 LEVEL OF SERVICE/QUEUING

The Level of Service (LOS) is the classification of the quality of traffic flow at a given location. A breakdown of the various LOS conditions is given below:

LOS "A" indicates a free flow conditions

LOS "B" indicated stable flow conditions

LOS "C" indicates slight interruptions in flow

LOS "D" indicates moderate interruptions in flow

LOS "E" indicates unstable flow approaching capacity

LOS "F" indicates a forced flow condition

Traffic engineering standards indicate a LOS of "D" or better is acceptable. On some occasions, a LOS of 'E' is considered acceptable.

Concurrently with LOS analyses, queuing analyses is performed. Queuing analyses determines if any turn lanes are overflowing or being blocked, or if any intersections are being blocked by traffic queues. This has a direct reflection on the resulting LOS, but also on safety, which is not as easily qualified.

The level of service was computed utilizing the recommended methodology of the Highway Capacity Manual (HCM2010, Fifth Edition, TRB, 2010). Using the Synchro software, version 8, by Trafficware, the two-way stop-controlled intersection form

was filled out for the stop-controlled intersections in which only the minor approach(es) are or would be required to stop.

The signal-controlled intersection form was filled out for the existing intersections of Calumet Avenue & Main Street, Calumet Avenue & Columbia Avenue/Centennial Drive, Columbia Avenue & Main Street, and for the proposed intersection of Calumet Avenue & Treadway Road. Existing traffic signal timings were estimated, and turn bay lengths were measured and inputted appropriately, along with the counted traffic volumes and peak hour factors. The level of service as well as queuing lengths were then calculated for each of the appropriate intersection movements to determine the impact of traffic generated from the proposed development as well as the impact future traffic will have on the existing roadways.

Results of these levels of service and queuing analyses will be discussed in more detail later in this report. The table below summarizes which exhibits are provided for further reference. The description of the scenarios and the results, however, will be discussed in more detail later in this report.

LEVEL OF SERVICE (LOS) EXHIBIT NUMBERS

<i>Intersection (FULL ACCESS UNLESS NOTED)</i>	<i>Scenario</i>		
	<i>Existing</i>	<i>Single Use Site</i>	<i>Full Build</i>
Calumet Avenue & Main Street	5	15	26
Calumet Avenue & Treadway Road	6	16	27
Calumet Avenue & Hagburg Road	7	17	28
Calumet Avenue & Palmer C. Singleton Road	8	18	29
Calumet Avenue & Columbia Avenue/ Centennial Drive	9	19	30
Columbia Avenue & Otis Bowen Drive	10	20	31
Columbia Avenue & Palmer C. Singleton Road	11	21	32
Columbia Avenue & Hagburg Road/ McClaghry Drive	12	22	33
Columbia Avenue & Donna Drive	13	23	34
Columbia Avenue & Main Street	14	24	35
Main Street & Don Powers Drive	n/a	25	36

5.3 TRAFFIC CONTROL

The Community Hospital development is proposing to have three (3) access points. All three (3) are proposed to be installed for the single use site and remain in use through full build. They are shown on Exhibit 2A. All access points are proposed as full access with stop-control on the minor approach(es) only. A right turn deceleration lane is also proposed by Community Hospital for the main entrance on Calumet Avenue. A traffic signal warrant was checked and will be discussed in the findings below.

5.4 SITE CIRCULATION

The site is a commercial development. Site circulation will be provided by internal roadways and driveways. These are depicted on Exhibit 2A. It is intended that these will be Town roads. A four (4)-way intersection within the development with all-way stop control or a roundabout will be considered.

6. Improvement Analysis

6.1 IMPROVEMENTS TO ACCOMMODATE SITE TRAFFIC

The site plan as proposed was considered under two (2) scenarios. The first was with construction of a single use, 30,000 SFT medical office building. It was assumed that because of the proximity to the proposed main entrance, that the majority of the traffic entering the site would use the main entrance. The second was with construction of the full 37 acres owned by Community Hospital as medical office building (Full Build). This full build scenario was estimated to contain 360,000 SFT of medical office building space. For this scenario, the traffic distribution utilized put greater percentages of traffic at the other two (2) entrances due to the proximity of the offices, while still leaving about half of the traffic utilizing the main entrance. Because full build is expected to utilize a traffic signal at the main entrance, nearby traffic utilizing adjacent intersections were re-distributed to the main entrance for this scenario, especially left-turners, as would be typical of what happens when a traffic signal is installed.

Traffic signal warrants under both scenarios were performed at the main entrance as well.

6.2 IMPROVEMENTS TO ACCOMMODATE NON-SITE TRAFFIC

A passing blister on Main Street for eastbound traffic as well as a right turn lane for westbound traffic entering the development on Main Street were considered. Likewise, right and left turn lanes were considered and evaluated at the other entrances under both scenarios.

7. Findings

7.1 SITE ACCESSIBILITY AND WARRANTS

A traffic signal is warranted at approximately 35% of full build of the development. It is signal warrant 1B. See Exhibit 37. The single use site represents less than 10% of full build. Opposing left turn lanes are warranted on Calumet Avenue to service both the main entrance and Treadway Road (Cobblestones subdivision entrance). These are required upon initial opening of the development.

Because Main Street has over 5,000 ADT, an eastbound passing blister is warranted at this driveway entrance point. A right turn lane is expected to be needed when the development reaches full build, but not with the single use site.

At the Columbia Avenue entrance at Donna Drive, no additional lanes are required.

7.2 TRAFFIC IMPACT

The peak hour(s) is (are) defined as the heaviest traffic period(s) of the day. Traffic engineering standards dictate that the heaviest traffic periods of an average weekday shall be studied and the needs resulting from those analyses shall be considered sufficient for the rest of the time periods not analyzed. To ensure even more conservative analyses, peak hour factors (PHF) are applied to the hourly volumes. In such, the PHF effectively cause the analyses to be for the peak 15 minutes of the peak hour(s).

The current morning (AM) peak hour of the network was determined to be 7:30 AM – 8:30 AM although the intersections varied slightly in their peak times. The current afternoon (PM) peak hour of the network was similarly determined to be approximately 4:15 PM – 5:15 PM. Generally, traffic is heaviest northbound in the morning and southbound in the afternoon on both Calumet Avenue and Columbia

Avenue in this area. On Main Street, traffic is essentially equal in the westbound and eastbound directions throughout the day.

The current signalized intersection of Calumet Avenue & Main Street operates at a LOS 'C' during the AM peak and a LOS 'D' during the PM peak hour under existing conditions and traffic volumes and under existing signal timings (see Exhibits 5A and 5B, respectively). Under the forecasted traffic volumes for the single use site in 2018, the intersection is expected to continue to operate at these same levels of service during the morning peak and the afternoon peak period (see Exhibits 15A and 15B, respectively). Under the forecasted traffic volumes for the full build scenario in year 2027, the intersection is expected to continue operate at a LOS 'C' during both the morning peak and a LOS 'D' or 'E' during the afternoon peak period (see Exhibits 26A and 26B, respectively). The LOS 'D' or 'E' is dependent upon some geometric changes which will be discussed in the conclusions section below.

The current un-signalized intersection of Calumet Avenue & Treadway Road operates at a LOS 'C' during the AM peak and a LOS 'C' during the PM peak hour under existing conditions and traffic volumes (see Exhibits 6A and 6B, respectively). Under the forecasted traffic volumes for the single use site in 2018, the intersection modified to contain a fourth approach is expected to operate at a LOS 'D/C' during the morning peak and a LOS 'F/C' during the afternoon peak period (see Exhibits 16A and 16B, respectively). Under the forecasted traffic volumes for the full build scenario in year 2027, and with a traffic signal, the intersection is expected to continue operate at a LOS 'A' during the morning peak and a LOS 'B' during the afternoon peak period (see Exhibits 27A and 27B, respectively). When two (2) LOS are listed side by side, the LOS listed first represents the west (or south) stop-controlled approach and the LOS listed second represents the east (or north) stop-controlled approach.

The current un-signalized intersection of Calumet Avenue & Hagburg Drive operates at a LOS 'C' during the AM peak and a LOS 'F' during the PM peak hour under existing conditions and traffic volumes (see Exhibits 7A and 7B, respectively). Under the forecasted traffic volumes for the single use site in 2018, the intersection is expected to operate at a LOS 'C' during the morning peak and a LOS 'F' during the afternoon peak period (see Exhibits 17A and 17B, respectively). Under the forecasted traffic volumes for the full build scenario in year 2027, the intersection is expected to operate at a LOS 'C' during the morning peak and a LOS 'F' during the afternoon peak period (see Exhibits 28A and 28B, respectively).

The current un-signalized intersection of Calumet Avenue & Palmer C. Singleton Drive operates at a LOS 'C' during the AM peak and a LOS 'F' during the PM peak hour under existing conditions and traffic volumes (see Exhibits 8A and 8B, respectively). Under the forecasted traffic volumes for the single use site in 2018,

the intersection is expected to operate at a LOS 'C' during the morning peak and a LOS 'F' during the afternoon peak period (see Exhibits 18A and 18B, respectively). Under the forecasted traffic volumes for the full build scenario in year 2027, the intersection is expected to operate at a LOS 'D' during the morning peak and a LOS 'F' during the afternoon peak period (see Exhibits 29A and 29B, respectively).

The current signalized intersection of Calumet Avenue & Columbia Avenue/Centennial Drive operates at a LOS 'B' during the AM peak and a LOS 'C' during the PM peak hour under existing conditions and traffic volumes (see Exhibits 9A and 9B, respectively). Under the forecasted traffic volumes for the single use site in 2018, the intersection is expected to operate at a LOS 'B' during the morning peak and a LOS 'C' during the afternoon peak period (see Exhibits 19A and 19B, respectively). Under the forecasted traffic volumes for the full build scenario in year 2027, the intersection is expected to operate at a LOS 'B' during the morning peak and a LOS 'D' during the afternoon peak (see Exhibits 30A and 30B, respectively).

The current un-signalized intersection of Columbia Avenue & Otis Bowen Drive operates at a LOS 'B' during the AM peak and a LOS 'C' during the PM peak hour under existing conditions and traffic volumes (see Exhibits 10A and 10B, respectively). Under the forecasted traffic volumes for the single use site in 2018, the intersection is expected to continue to operate at a LOS 'B' during the morning peak and a LOS 'C' during the afternoon peak period (see Exhibits 20A and 20B, respectively). Under the forecasted traffic volumes for the full build scenario in year 2027, the intersection is expected to still operate at a LOS 'B' during the morning peak and a LOS 'C' during the afternoon peak period (see Exhibits 31A and 31B, respectively).

The current un-signalized intersection of Columbia Avenue & Palmer C. Singleton Drive operates at a LOS 'B' during the AM peak and a LOS 'C' during the PM peak hour under existing conditions and traffic volumes (see Exhibits 11A and 11B, respectively). Under the forecasted traffic volumes for the single use site in 2018, the intersection is expected to continue to operate at a LOS 'B' during the morning peak and a LOS 'C' during the afternoon peak period (see Exhibits 21A and 21B, respectively). Under the forecasted traffic volumes for the full build scenario in year 2027, the intersection is expected to operate at a LOS 'B' during the morning peak and improve to a LOS 'B' during the afternoon peak period (see Exhibits 32A and 32B, respectively).

The current un-signalized intersection of Columbia Avenue & Hagburg Drive/McClaghry Drive operates at a LOS 'B/B' during the AM peak and a LOS 'B/C' during the PM peak hour under existing conditions and traffic volumes (see Exhibits 12A and 12B, respectively). Under the forecasted traffic volumes for the

single use site in 2018, the intersection is expected to continue to operate at a LOS 'B/B' during the morning peak and a LOS 'B/C' during the afternoon peak period (see Exhibits 22A and 22B, respectively). Under the forecasted traffic volumes for the full build scenario in year 2027, the intersection is expected to still operate at a LOS 'B/B' during the morning peak and a LOS 'B/C' during the afternoon peak period (see Exhibits 33A and 33B, respectively).

The current un-signalized intersection of Columbia Avenue & Donna Drive operates at a LOS 'A' during the AM peak and a LOS 'B' during the PM peak hour under existing conditions and traffic volumes (see Exhibits 13A and 13B, respectively). Under the forecasted traffic volumes for the single use site in 2018, the intersection modified to contain a fourth approach is expected to operate at a LOS 'B/B' during the morning peak and a LOS 'B/B' during the afternoon peak period (see Exhibits 23A and 23B, respectively). Under the forecasted traffic volumes for the full build scenario in year 2027, the intersection is expected to still operate at a LOS 'B/B' during the morning peak and a LOS 'B/B' during the afternoon peak period (see Exhibits 34A and 34B, respectively).

The current signalized intersection of Columbia Avenue & Main Street operates at a LOS 'A' during the AM peak and a LOS 'A' during the PM peak hour under existing conditions and traffic volumes (see Exhibits 14A and 14B, respectively). Under the forecasted traffic volumes for the single use site in 2018, the intersection is expected to continue to operate at a LOS 'A' during the morning peak and a LOS 'A' during the afternoon peak period (see Exhibits 24A and 24B, respectively). Under the forecasted traffic volumes for the full build scenario in year 2027, the intersection is expected to still operate at a LOS 'A' during the morning peak and a LOS 'A' during the afternoon peak (see Exhibits 35A and 35B, respectively).

Lastly, the proposed unsignalized intersection of Main Street & Don Powers Drive is expected, under the forecasted traffic volumes for the single use site in 2018, to operate at a LOS 'B' during the morning peak and a LOS 'B' during the afternoon peak period (see Exhibits 25A and 25B, respectively). Under the forecasted traffic volumes for the full build scenario in year 2027, the intersection is expected to still operate at a LOS 'B' during the morning peak and a LOS 'B' during the afternoon peak period (see Exhibits 36A and 36B, respectively). These were analyzed with no additional turn lanes or passing blisters on Main Street.

8. Recommendations

8.1 SITE ACCESS AND CIRCULATION PLAN

The roadway network inside the site is proposed to be Town roads and consist of continuations/extensions of Treadway Road west to Columbia Avenue and also of Don Powers Drive south to Main Street. These can be two (2) lanes roads, but widened at the intersections with Columbia Avenue and Main Street to contain a short left turn bay (50' in length), and should be built to Town standards. A single lane roundabout is recommended at the intersection of these two roadways in keeping with the roundabout to the north. It is far enough from the eventual signal at Calumet Avenue that queuing from that signal is not expected to be a problem. A four (4) way, all-way, stop-controlled intersection would work here, however, as well.

8.2 ROADWAY IMPROVEMENTS

The four (4) way intersection that will be created by continuing Treadway Road across Calumet Avenue will not need a traffic signal upon construction of the single use site, but the INDOT Driveway permit manual does require that opposing left turn lanes on Calumet Avenue be installed upon opening. While anticipating a future traffic signal, the left turn lanes should be approximately 200' in the NB direction and 150' in the SB direction. The addition of a traffic signal will likely spur some cut through traffic both directions and so this turn lane sizing is generous to account for that. According to the INDOT driveway permit manual, a southbound right turn lane is not required.

A traffic signal should be installed at Calumet Avenue & Treadway Road when the 37 acres reaches approximately 35% build. It is at this approximate condition that a sufficient amount of traffic to warrant a traffic signal is expected to be generated by this facility. Consideration should be given to widening the east approach to Treadway Road (the Cobblestones main entrance) when the signal is installed so that two exiting lanes can exist, and opposing left turn lanes can be utilized for eastbound and westbound traffic. The west approach should have two (2) exiting lanes including an exclusive left turn lane with 200' of storage.

A highway with at least 5,000 ADT would be required to contain a passing blister when any amount of left turning off the mainline is present. Because Main Street is just over this requirement and is expected to have very few inbound left turning vehicles at this location upon initial build, it is recommended to install a passing

blister around the time the Calumet Avenue traffic signal is installed unless an obvious need arises sooner, which would not be expected. The passing blister shall be in accordance with Town or INDOT standards. A westbound right turn lane, however, is not expected to be needed until full build of the facility unless commercial land uses are developed along Main Street prior to that occurrence. Commercial development along Main Street will need to be analyzed apart from this report as the commercial sizes and uses are unknown at this time.

Columbia Avenue should be re-striped in the vicinity of the Donna Drive/Treadway Road intersection to allow for a southbound left turn into the development. 100' of turn lane is sufficient. No other changes to Columbia Avenue are required for this development.

The speed limit on Calumet Avenue should be reduced to 35 MPH (from 45 MPH) from Main Street to Columbia Avenue/Centennial Drive prior to the improvements to Calumet Avenue at Treadway Road being installed (left turn lanes added), which should occur prior to the west approach to Treadway (main entrance) being opened to traffic.

9. Conclusions

9.1 TRAFFIC IMPACT

The existing signalized intersection of Calumet Avenue & Main Street is heavily travelled, but is functioning with slight interruptions in flow at a LOS 'C' or better throughout most of the day, and with moderate interruptions in flow at LOS 'D' during the afternoon peak period. By full build of the development the afternoon peak period is expected to drop to a LOS 'E'. The analyses show that addition of a NBRT lane at this intersection will improve northbound flow to where it requires less green time, thereby providing more green time and improving levels of service for the remaining approaches, and maintaining the overall intersection level of service at a LOS 'D'. This intersection is not currently on the coordinated system.

As described, a traffic signal will be needed at a future point in time at Calumet Avenue & Treadway Road. Until then, the addition of left turn lanes as described in this report should maintain acceptable levels of service. At the time of signalization, it should be considered to add this signal and the one at Main Street into the coordinated system, as well as any other signals to the north that are not part of the system.

The entrances on Main Street and on Columbia Avenue will require minimal improvements at various time frames, but are expected to maintain levels of service of 'B' or better throughout the day, even upon full build and during peak periods.

The intersection of Calumet Avenue & Columbia Avenue/Centennial Drive drops to a LOS 'D' during the afternoon peak period at full build. Consideration should be given at that time to allowing left turns out of both eastbound approach lanes on Columbia Avenue as very few drivers are utilizing the right lane currently (i.e. convert the right lane to a left -thru- right lane). This would require split phasing eastbound and westbound traffic, but due to the typically low volumes utilizing the east (westbound) approach, this would maintain the level of service at a LOS 'C' or better all day.

The rest of the existing intersections appear that they will be able to maintain similar traffic flows and delays to what is existing as indicated by their relatively unchanging levels of service.

9.2 FUTURE DEVELOPMENT

As mentioned previously, a NICTD train station is targeted for the area west of the intersection of Columbia & Main Street by the year 2022. Additionally, a Transit Oriented Development (TOD) is planned for the quadrants surrounding this same intersection and there is even discussion of extending Main Street into Illinois and connecting with roadways in Illinois. Addition of new roadways brings changes in traffic patterns, and undoubtedly the train station and TOD has the capacity to bring considerable amounts of traffic, but also revenue to the Town of Munster. A full study will need to be conducted by NICTD and the TOD developers to determine the full impact when more is known.

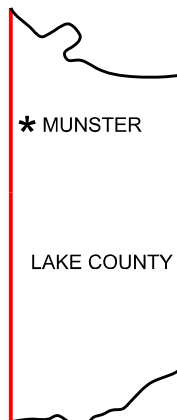
Between now and then, it is recommended to assume that the roadways of Columbia Avenue and Main Street may need widening in the future by adding lanes. Therefore, development should be restricted to whatever Town engineers feel is a proper right of way for this possible widening. In other words, setbacks of buildings as well as fences and advertising signs and even utilities should be kept away from the current right of way lines on these roadways and should be installed with possible future roadway widening in mind.



LEGEND

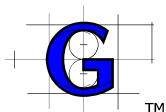
Ⓢ INTERCHANGE

— STATE LINE

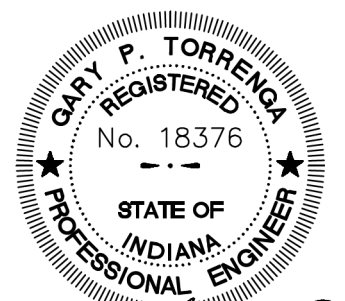


* MUNSTER

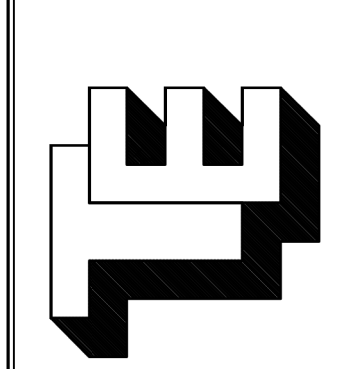
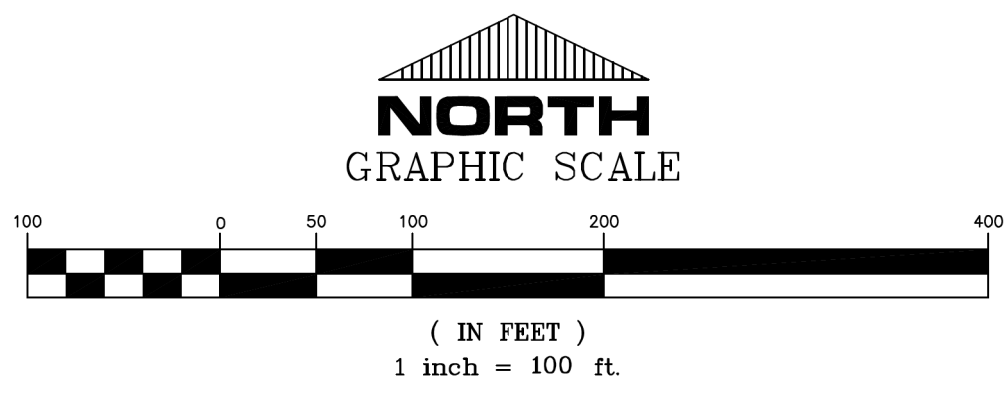
LAKE COUNTY

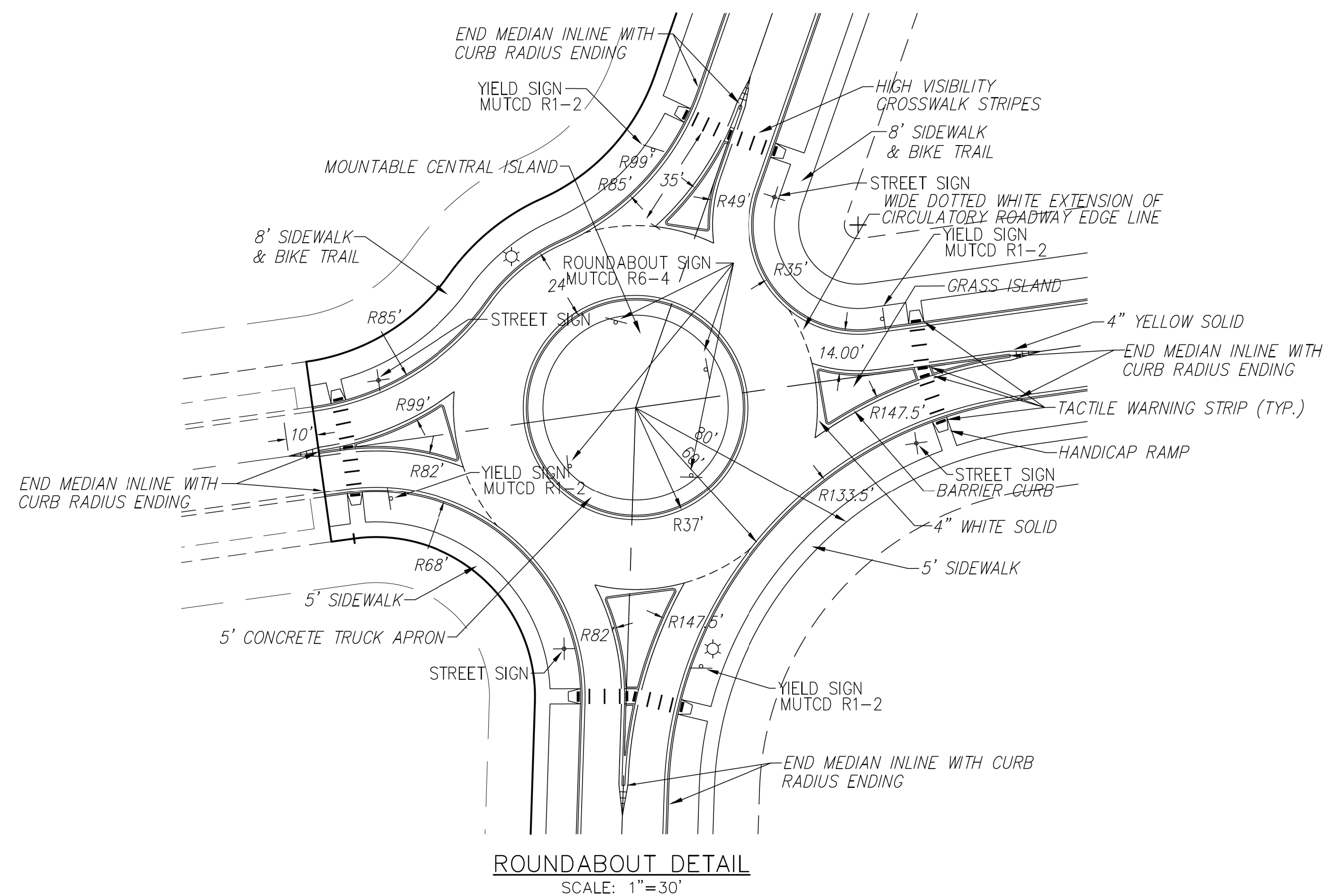


Garcia Consulting Engineers



Gary P. Torrenge





PROPOSED

- STREET LIGHT POLE
- Ⓐ NUMBER OF PARKING SPACES
- A TYPICAL PAVEMENT
- C 18" COMBINED CONCRETE HIGH BACK CURB & GUTTER (SHEET C-5.0)
- Ⓐ 24" COMBINED CONCRETE HIGH BACK CURB & GUTTER (SHEET C-5.0)
- B 6" BARRIER CURB (SHEET C-5.0)
- CC 24" CURB CUT (SHEET C-5.1)
- HC HANDICAP RAMP
- S SIDEWALK / CURB COMBINATION (SHEET C-5.0)
POUR FLUSH WITH PAVEMENT.
- ➡ TRAFFIC FLOW ARROWS
- ☼ STREET LIGHT

1. CURRENT ZONING CLASSIFICATION C-1, HIGHWAY-ORIENTED, GENERAL BUSINESS DISTRICT.

2. PROPOSED BUILDING ON LOT 4 (MEDICAL BUILDING) = 16,510 SQ.-FT.
3. PROPOSED PARKING LOT AREA = 74,742 SQ.-FT.
REQUIRED INTERNAL LANDSCAPING AREA:
10% OF ASPHALT AREA = 7,474 SQ.-FT.

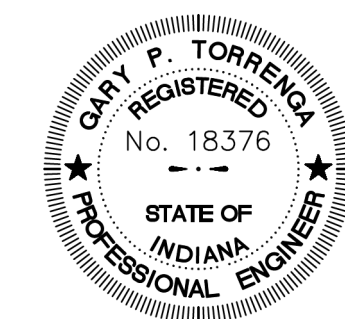
PROPOSED LANDSCAPING AREA:
INTERNAL AREA = 4,171 SQ.-FT.
EXTERNAL AREA = 3,591 SQ.-FT.
TOTAL AREA = 7,762 SQ.-FT.

4. PARKING: (9'x19' MINIMUM, TYPICAL)

REQUIRED PARKING: 5.7 SPACES PER 1000 SQ.-FT. OF FLOOR AREA

REQUIRED PARKING BY ORDINANCE:
(16,510/1000) X 5.7 X 2 = 187 SPACES

AVAILABLE PARKING SPACES:
STANDARD PARKING = 178 SPACES
HANDICAP PARKING = 9 SPACES
TOTAL AVAILABLE PARKING (INCLUDING HC) = 187
5. ALL CURB DIMENSIONS ARE MEASURED TO THE BACK OF CURB.



Gary P. Ivnerga

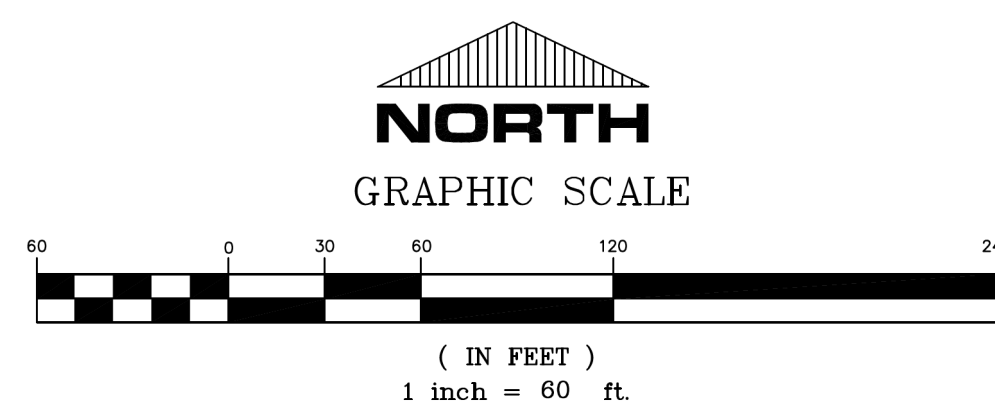


EXHIBIT 2B

TRAFFIC COUNT SUMMARY SHEET

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Clear
Dry

 Cloudy Rain Snow
Pavement:

Wet
Ice

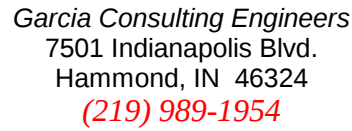
 Intersection
(Route No. and names of streets and road) Columbia Ave & Hagburg Dr.

Other Conditions _____

Counted by WL Sum by RLP City or County Munster, IN GLE No. comhs-17-0824 CFNI property TIA

Checked by MLM Day Wed Date 9/13/2017

Traffic Beginning at		Traffic Entering Intersection From																Total Traffic Entering From			Total P + T
		N on Columbia and going				E on Hagburg and going				S on Columbia and going				W on McClaghry and going							
		W	S	E	Total	N	W	S	Total	E	N	W	Total	S	E	N	Total	N+S	E+W	N+S E+W	
7:00 AM	P		25	4	29	2	1	0	3	2	56	3	61	1	0	4	5	90	8	98	101
	T		1		1				-		1		1			1	1	2	1	3	
7:15 AM	P	3	17	5	25	1	0	0	1	7	83	3	93	3	0	0	3	118	4	122	123
	T		1		1				-				-				-	1		1	
7:30 AM	P	3	31	10	44	1	0	2	3	9	85	4	98	1	0	4	5	142	8	150	150
	T				-				-				-				-			-	
7:45 AM	P	6	31	11	48	6	1	1	8	17	80	5	102	3	1	3	7	150	15	165	165
	T				-				-				-				-			-	
8:00 AM	P	2	29	2	33	1	0	1	2	7	69	3	79	0	0	4	4	112	6	118	119
	T				-				-		1		1				-	1		1	
8:15 AM	P	2	24	3	29	2	0	2	4	10	53	5	68	0	1	2	3	97	7	104	105
	T				-				-		1		1				-	1		1	
8:30 AM	P	4	24	9	37	4	0	1	5	7	65	5	77	1	0	5	6	114	11	125	128
	T				-				-		2		2			1	1	2	1	3	
8:45 AM	P	1	29	5	35	2	2	2	6	5	50	5	60	1	1	2	4	95	10	105	105
	T				-				-				-				-			-	
	P				-				-				-				-			-	-
	T				-				-				-				-			-	-
	P				-				-				-				-			-	-
	T				-				-				-				-			-	-
	P				-				-				-				-			-	-
	T				-				-				-				-			-	-
Total	P+ T	21 -	210 2	49 -	280 2	19 -	4 -	9 -	32 -	64 -	541 5	33 -	638 5	10 -	3 -	24 2	37 2	918 7	69 2	987 9	996



CFNI Calumet Avenue
Munster, IN

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Site Code : 00000222
Start Date : 9/21/2017
Page No : 1

Groups Printed- Unshifted - Bank 1

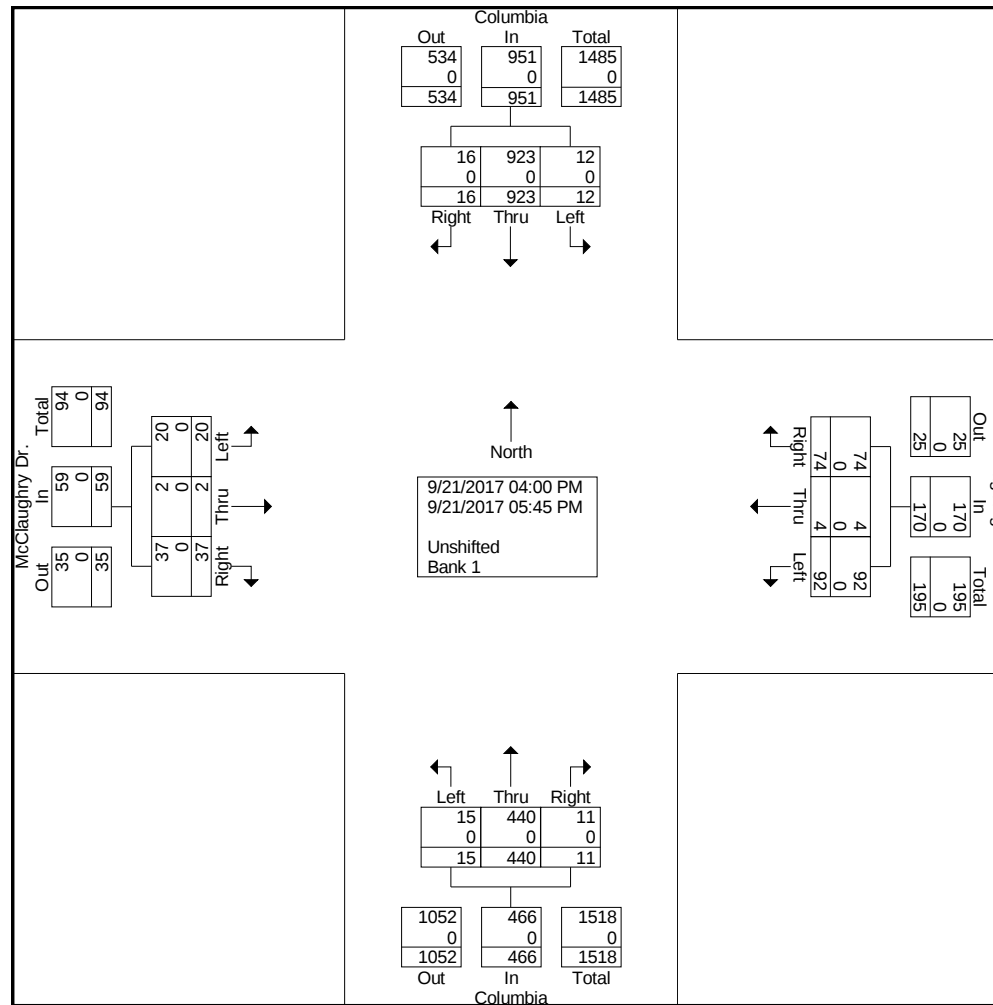
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CFNI Calumet Avenue
Munster, IN

File Name : 2017 0921 PM Columbia & Hagburg
Site Code : 00000222
Start Date : 9/21/2017
Page No : 2

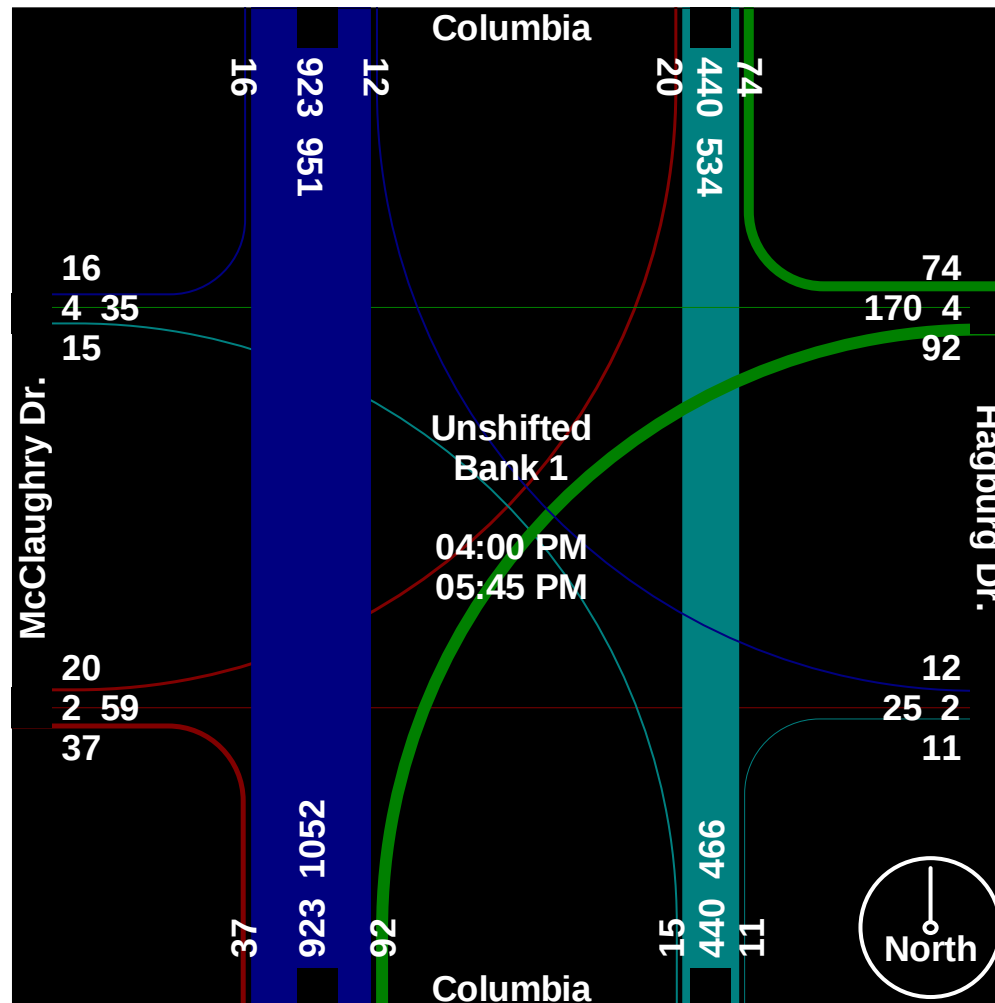




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CFNI Calumet Avenue
Munster, IN

File Name : 2017 0921 PM Columbia & Hagburg
Site Code : 00000222
Start Date : 9/21/2017
Page No : 3



TRAFFIC COUNT SUMMARY SHEET

Page Number _____ Weather:

Clear
Dry

 Cloudy Rain Snow Intersection
Pavement: Wet Ice (Route No. and names of streets and road) Columbia Ave & Palmer Singleton Dr.

Other Conditions Foggy

Counted by WL Sum by RLP City or County Munster, IN GLE No. comhs-17-0824 CFNI property TIA

Checked by MLM Day Thurs Date 9/14/2017

Traffic Beginning at		Traffic Entering Intersection From																Total Traffic Entering From			Total P + T
		N on Columbia and going				E on Palmer Singleton and going				S on Columbia and going				W on n/a and going							
		W	S	E	Total	N	W	S	Total	E	N	W	Total	S	E	N	Total	N+S	E+W	N+S E+W	
7:00 AM	P T		28	1	29	12		1	13	0	64		64				-	93	13	106	106
7:15 AM	P		23	1	24	7		2	9	0	58		58				-	82	9	91	92
	T		1		1												-	1		1	
7:30 AM	P		32	6	38	10		0	10	5	90		95				-	133	10	143	148
	T		2		2						3		3				-	5		5	
7:45 AM	P		48	5	53	8		2	10	2	85		87				-	140	10	150	151
	T			1	1												-	1		1	
8:00 AM	P		31	1	32	6		1	7	3	59		62				-	94	7	101	103
	T					1			1		1		1				-	1	1	2	
8:15 AM	P		23	4	27	3		0	3	2	64		66				-	93	3	96	96
	T																-				
8:30 AM	P		32	2	34	5		2	7	3	46		49				-	83	7	90	92
	T					1			1		1		1				-	1	1	2	
8:45 AM	P		35	7	42	5		1	6	6	60		66				-	108	6	114	116
	T			1	1	1			1								-	1	1	2	
	P T																-				-
	P T																-				-
	P T																-				-
	P T																-				-
	P T																-				-
Total	P+ T	- -	252 3	27 2	279 5	56 3	- -	9 -	65 3	21 -	526 5	- -	547 5	- -	- -	- -	- -	826 10	65 3	891 13	904

TRAFFIC COUNT SUMMARY SHEET

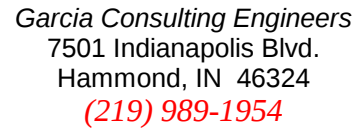
Page Number _____ Weather: Clear Cloudy Rain Snow Intersection _____
Pavement: Dry Wet Ice (Route No. and names of streets and road) Columbia Ave & Palmer Singleton

Other Conditions _____

Counted by MLM Sum by RLP City or County Munster, IN GLE No. comhs-17-0824 CFNI property TIA

Checked by MLM Day Thur Date 9/21/2017

Traffic Beginning at		Traffic Entering Intersection From																Total Traffic Entering From			Total P + T
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		and going				and going				and going				and going				N+S	E+W	N+S E+W	
W	S	E	Total	N	W	S	Total	E	N	W	Total	S	E	N	Total						
4:00 PM	P		112	4	116	11		4	15	5	60		65				-	181	15	196	196
	T				-				-				-				-	-	-	-	
4:15 PM	P		107	5	112	18		9	27	6	60		66				-	178	27	205	205
	T				-				-				-				-	-	-	-	
4:30 PM	P		104	3	107	23		6	29	7	73		80				-	187	29	216	216
	T				-				-				-				-	-	-	-	
4:45 PM	P		116	4	120	17		11	28	4	63		67				-	187	28	215	215
	T				-				-				-				-	-	-	-	
5:00 PM	P		139	4	143	16		11	27	7	61		68				-	211	27	238	238
	T				-				-				-				-	-	-	-	
5:15 PM	P		114	4	118	11		9	20	3	66		69				-	187	20	207	207
	T				-				-				-				-	-	-	-	
5:30 PM	P		101	4	105	14		16	30	4	50		54				-	159	30	189	189
	T				-				-				-				-	-	-	-	
5:45 PM	P		87	2	89	18		5	23	8	57		65				-	154	23	177	177
	T				-				-				-				-	-	-	-	
	P				-				-				-				-	-	-	-	-
	T				-				-				-				-	-	-	-	-
	P				-				-				-				-	-	-	-	-
	T				-				-				-				-	-	-	-	-
	P				-				-				-				-	-	-	-	-
	T				-				-				-				-	-	-	-	-
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CFNI Calumet Avenue
Munster, IN

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Site Code : 00000888
Start Date : 9/20/2017
Page No : 1

Groups Printed- Unshifted - Bank 1

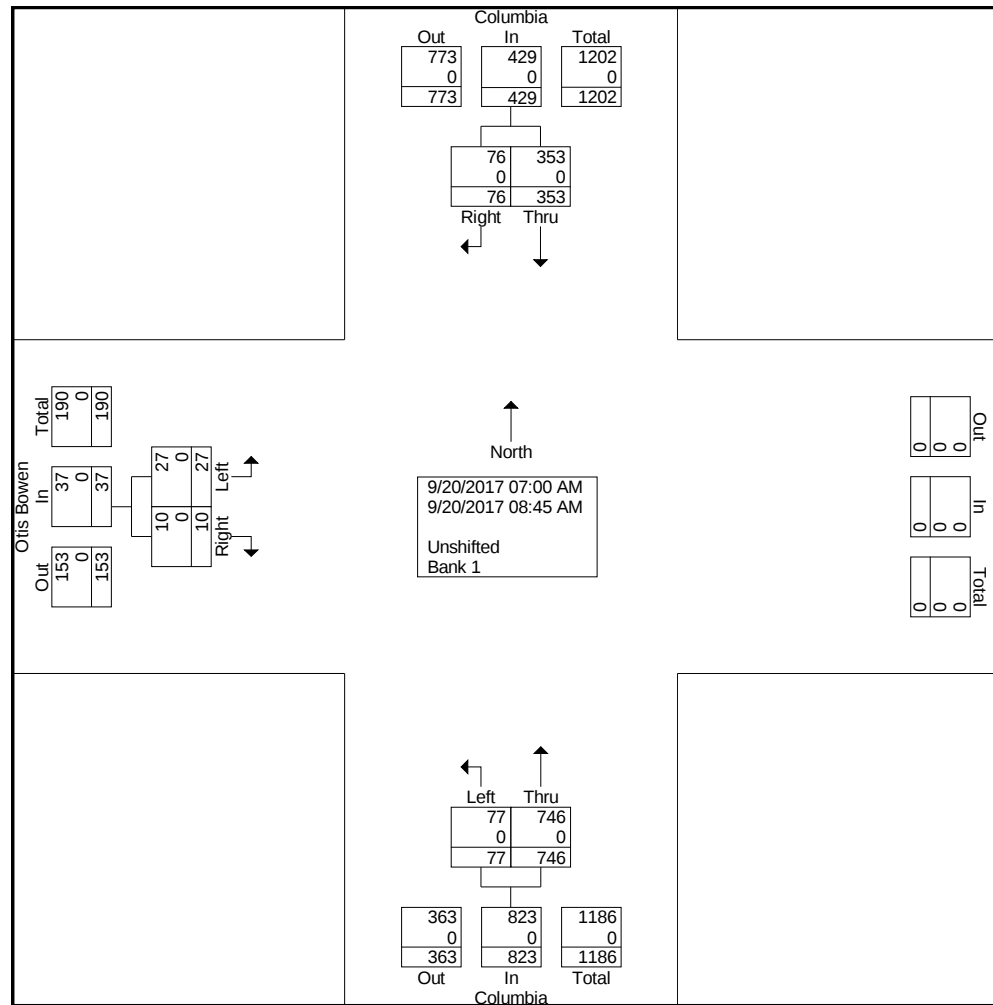
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CFNI Calumet Avenue
Munster, IN

File Name : 2017 0919 AM Columbia & Otis
Site Code : 00000888
Start Date : 9/20/2017
Page No : 2

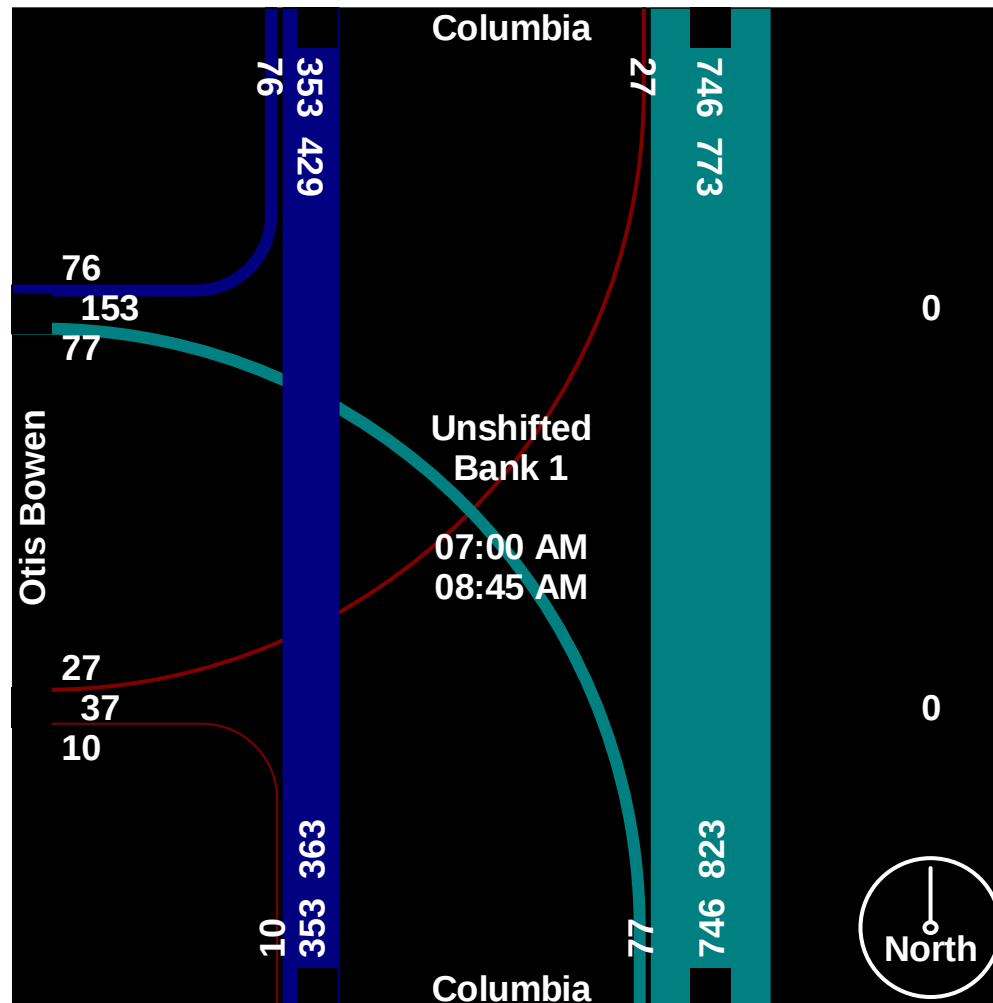




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CFNI Calumet Avenue
Munster, IN

File Name : 2017 0919 AM Columbia & Otis
Site Code : 00000888
Start Date : 9/20/2017
Page No : 3



TRAFFIC COUNT SUMMARY SHEET

Page Number _____ Weather:

Clear
Dry

 Cloudy Rain Snow
Pavement:

Wet
Ice

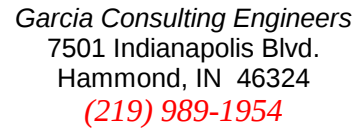
 Intersection
(Route No. and names of streets and road) Columbia Ave & Otis Bowen Dr.

Other Conditions _____

Counted by MLM Sum by RLP City or County Munster, IN GLE No. comhs-17-0824 CFNI property TIA

Checked by MLM Day Wed Date 9/20/2017

Traffic Beginning at		Traffic Entering Intersection From																Total Traffic Entering From			Total P + T
		N on Columbia				E on n/a				S on Columbia				W on Otis Bowen							
		and going				and going				and going				and going				N+S	E+W	N+S E+W	
W	S	E	Total	N	W	S	Total	E	N	W	Total	S	E	N	Total						
4:00 PM	P	3	99		102				-		67	2	69	11		19	30	171	30	201	201
	T				-				-								-				
4:15 PM	P	9	130		139				-		70	3	73	6		8	14	212	14	226	226
	T				-				-								-				
4:30 PM	P	4	117		121				-		104	1	105	18		27	45	226	45	271	271
	T				-				-								-				
4:45 PM	P	3	110		113				-		83	2	85	7		15	22	198	22	220	220
	T				-				-								-				
5:00 PM	P	4	140		144				-		76	2	78	7		15	22	222	22	244	244
	T				-				-								-				
5:15 PM	P	6	109		115				-		89	0	89	4		7	11	204	11	215	215
	T				-				-								-				
5:30 PM	P	3	94		97				-		70	2	72	5		7	12	169	12	181	181
	T				-				-								-				
5:45 PM	P	5	94		99				-		65	1	66	3		8	11	165	11	176	176
	T				-				-								-				
	P				-				-								-				
	T				-				-								-				
	P				-				-								-				
	T				-				-								-				
	P				-				-								-				
	T				-				-								-				
Total	P+ T	37 -	893 -	- -	930 -	- -	- -	- -	- -	- -	624 -	13 -	637 -	61 -	- -	106 -	167 -	1,567 -	167 -	1,734 -	1,734



CFNI Calumet Avenue
Munster, IN
comhs-17-0824 CFNI property TIA

File Name : 2017 0913 AM Columbia & Main
Site Code : 00000222
Start Date : 9/13/2017
Page No : 1

Groups Printed- Unshifted - Bank 1

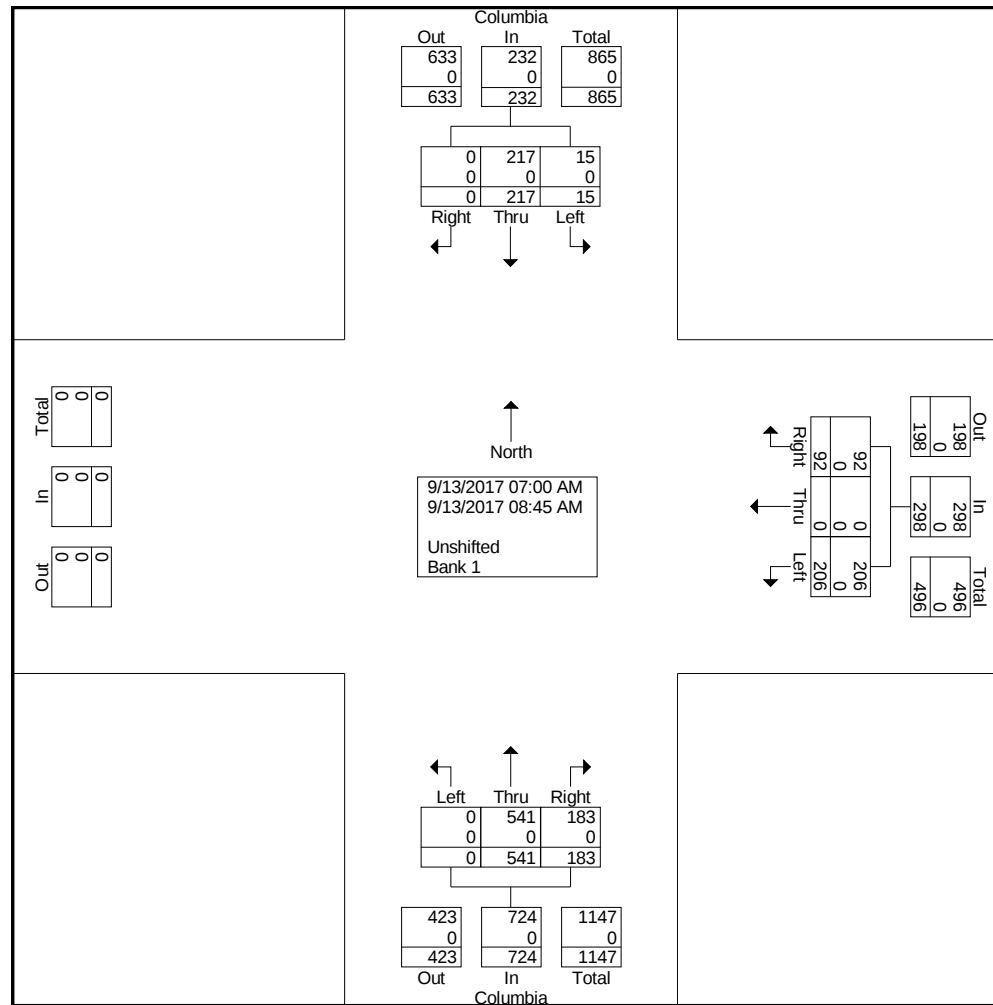
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CFNI Calumet Avenue
Munster, IN
comhs-17-0824 CFNI property TIA

File Name : 2017 0913 AM Columbia & Main
Site Code : 00000222
Start Date : 9/13/2017
Page No : 2

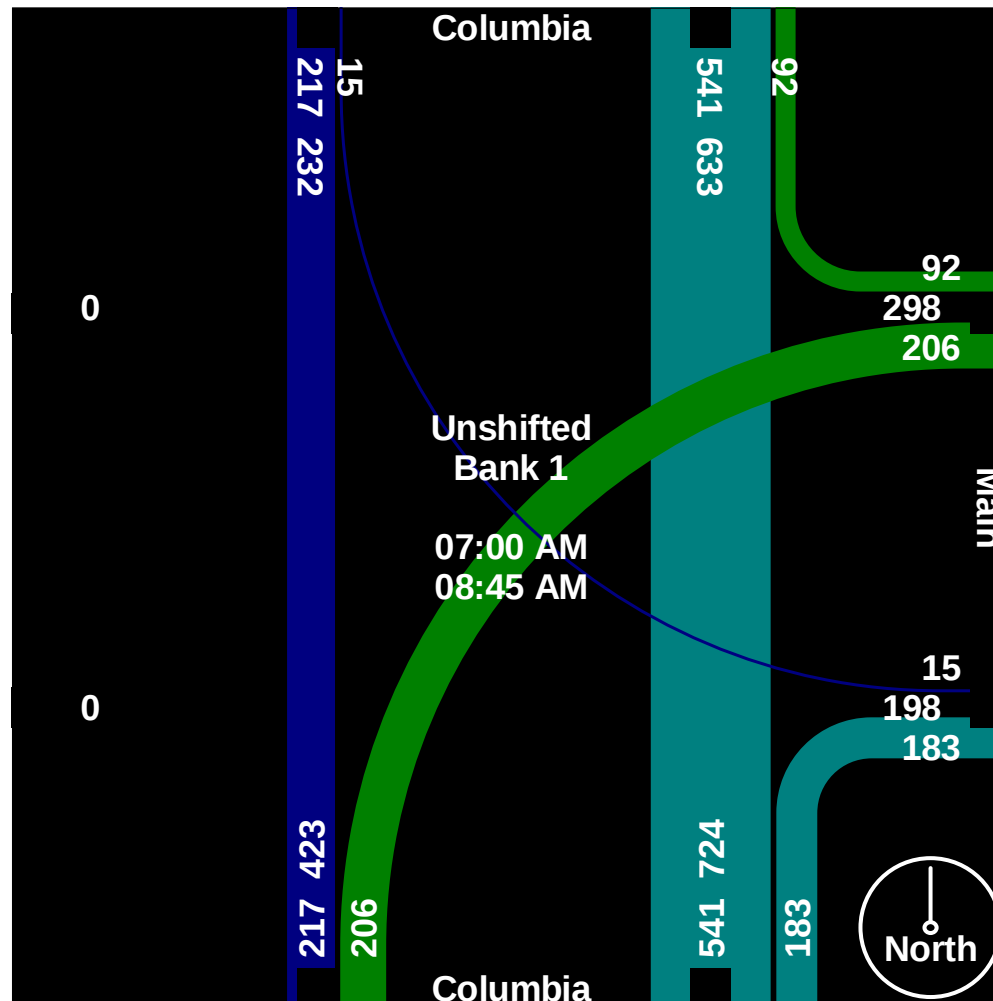


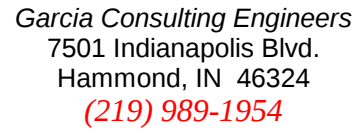


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Munster, IN
comhs-17-0824 CFNI property TIA

File Name : 2017 0913 AM Columbia & Main
Site Code : 00000222
Start Date : 9/13/2017
Page No : 3





CFNI Calumet Avenue
Munster, IN

File Name : 2017 0914 PM Columbia & Main
Site Code : 00000555
Start Date : 9/14/2017
Page No : 1

Groups Printed- Unshifted - Bank 1

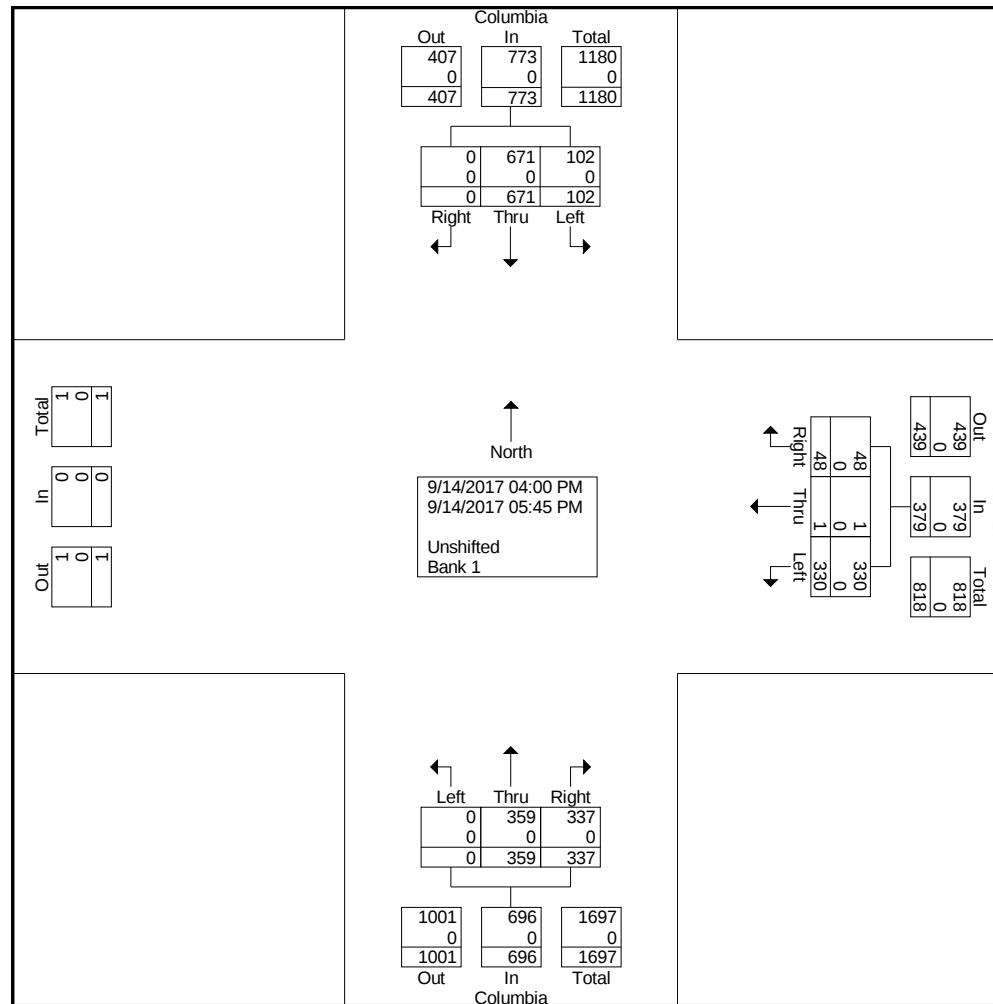
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CFNI Calumet Avenue
Munster, IN

File Name : 2017 0914 PM Columbia & Main
Site Code : 00000555
Start Date : 9/14/2017
Page No : 2

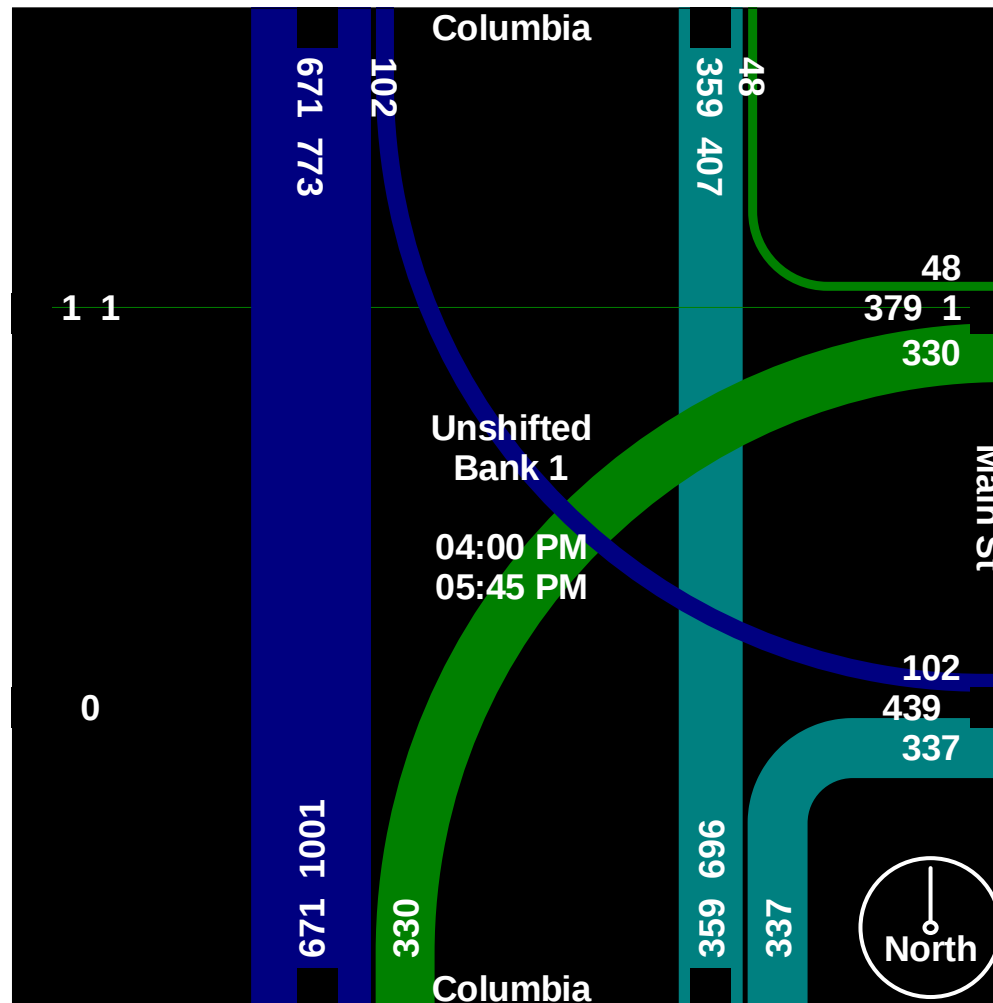


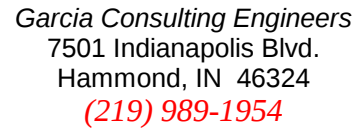


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CFNI Calumet Avenue
Munster, IN

File Name : 2017 0914 PM Columbia & Main
Site Code : 00000555
Start Date : 9/14/2017
Page No : 3





CFNI Calumet Avenue
Munster, IN

File Name : 2017 0915 am calumet & hagburg
Site Code : 00000777
Start Date : 9/15/2017
Page No : 1

Groups Printed- Unshifted - Bank 1

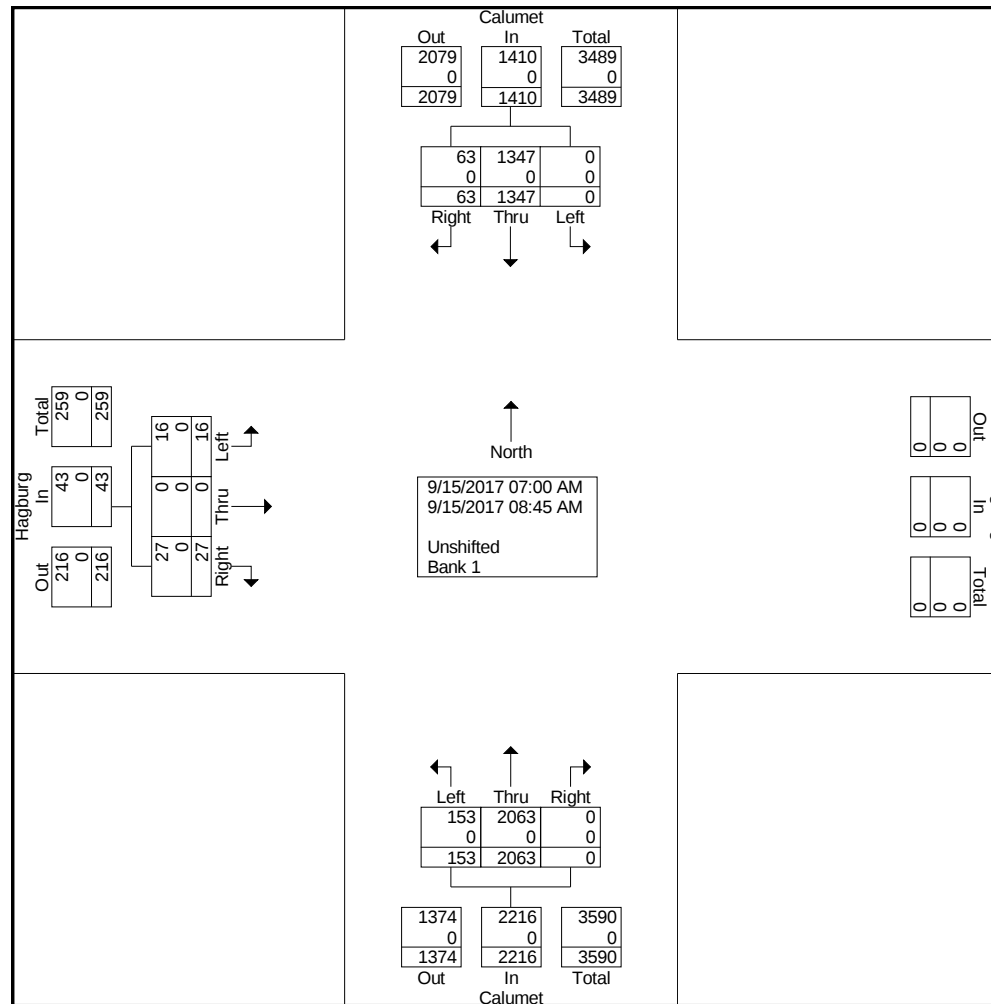
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CFNI Calumet Avenue
Munster, IN

File Name : 2017 0915 am calumet & hagburg
Site Code : 00000777
Start Date : 9/15/2017
Page No : 2

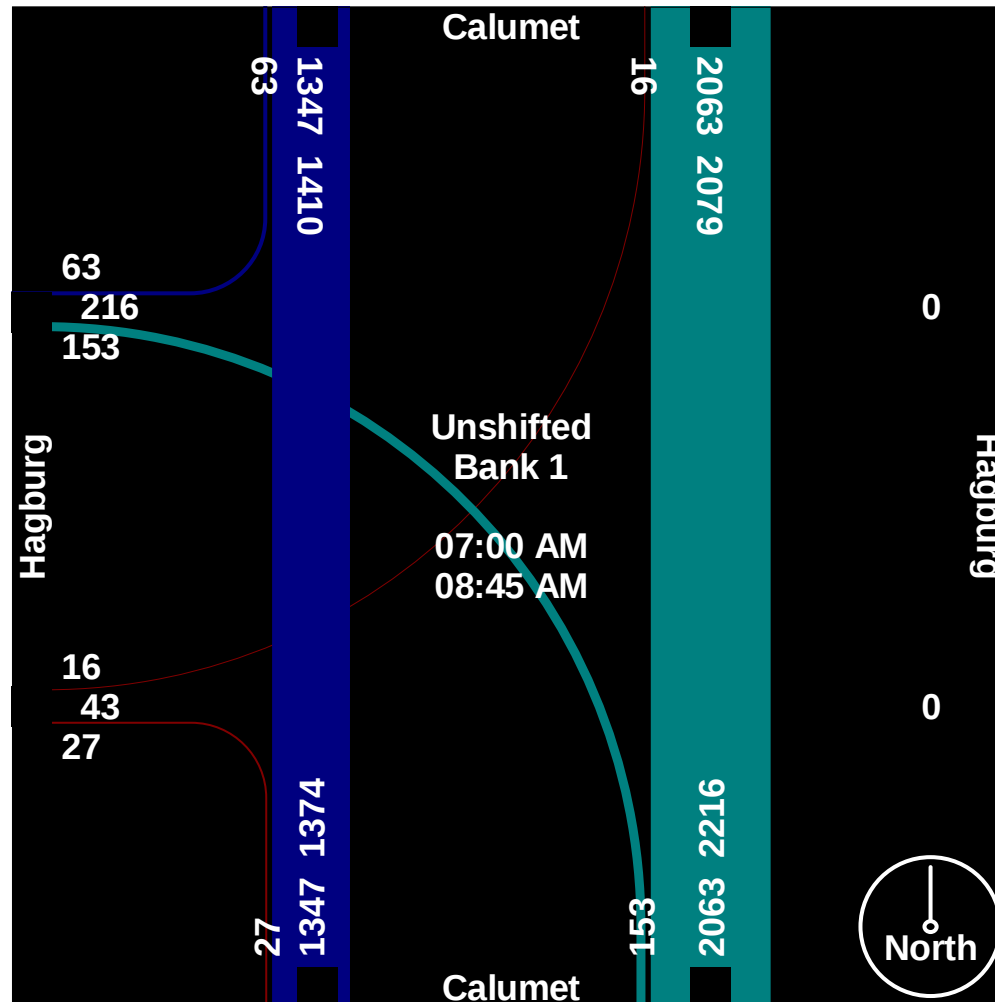


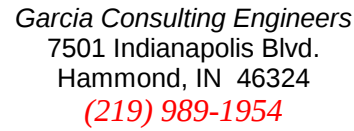


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File Name : 2017 0915 am calumet & hagburg
Site Code : 00000777
Start Date : 9/15/2017
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CFNI Calumet Avenue
Munster, IN
comhs-17-0824 TIA

File Name : 2017 0912 PM Calumet & Hagburg
Site Code : 00000111
Start Date : 9/12/2017
Page No : 1

Groups Printed- Unshifted - Bank 1

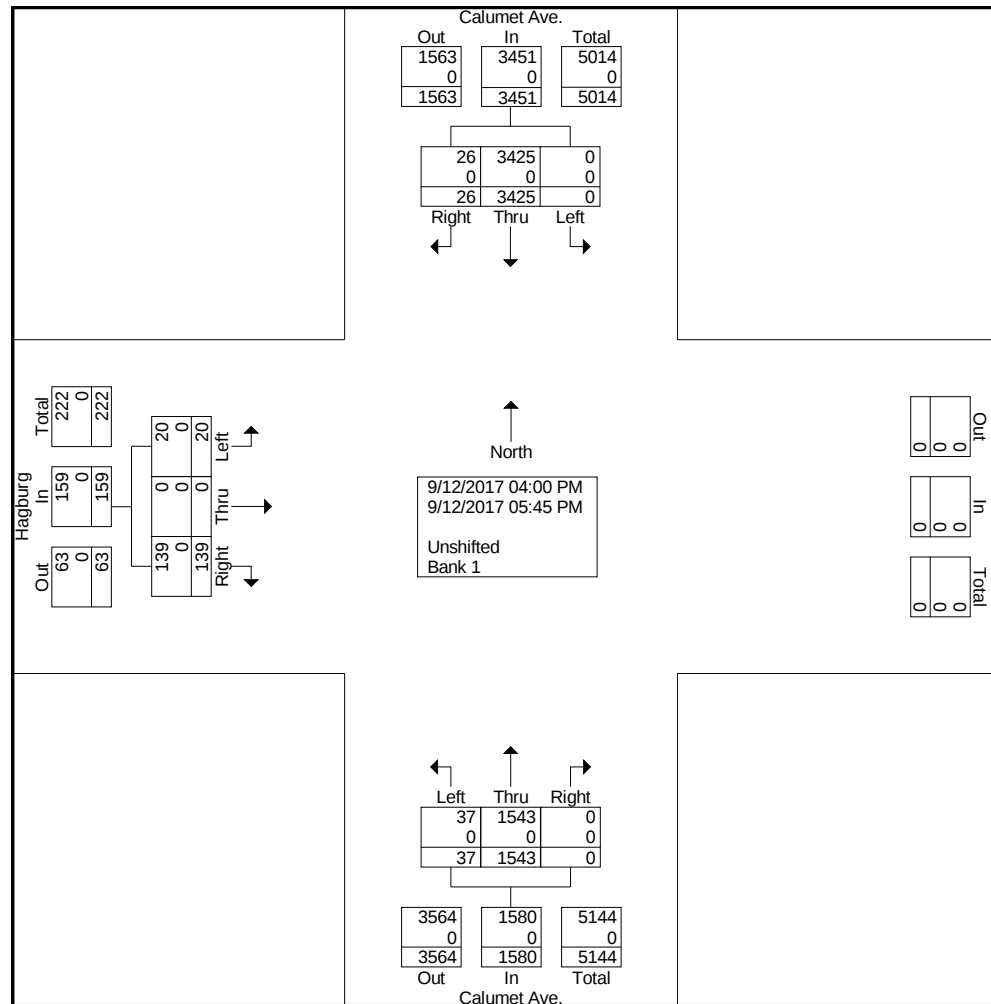
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File Name : 2017 0912 PM Calumet & Hagburg
Site Code : 00000111
Start Date : 9/12/2017
Page No : 2

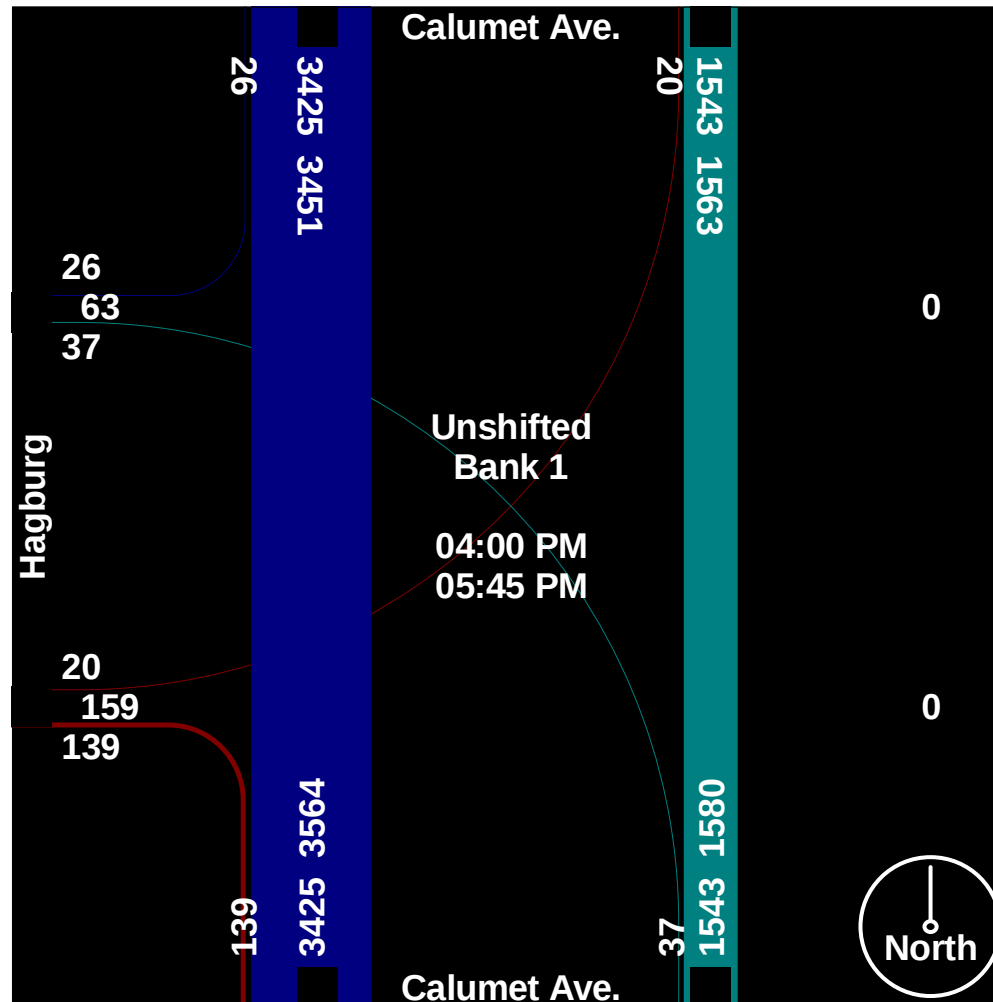


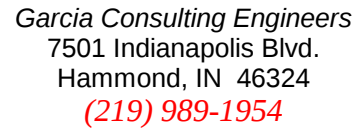


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comhs-17-0824 TIA

File Name : 2017 0912 PM Calumet & Hagburg
Site Code : 00000111
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CFNI Calumet Avenue
Munster, IN

File Name : 2017 0921 AM Calumet & Palmer
Site Code : 00001111
Start Date : 9/21/2017
Page No : 1

Groups Printed- Unshifted - Bank 1

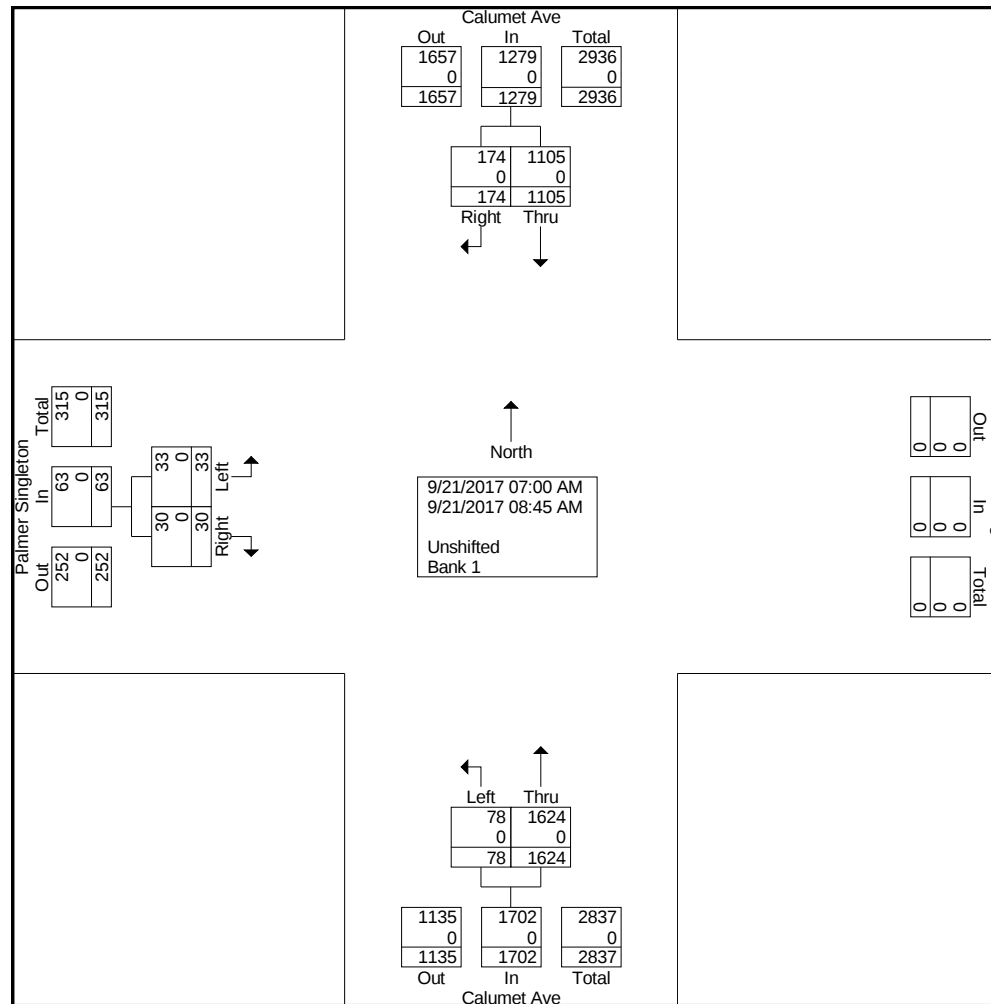
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CFNI Calumet Avenue
Munster, IN

File Name : 2017 0921 AM Calumet & Palmer
Site Code : 00001111
Start Date : 9/21/2017
Page No : 2

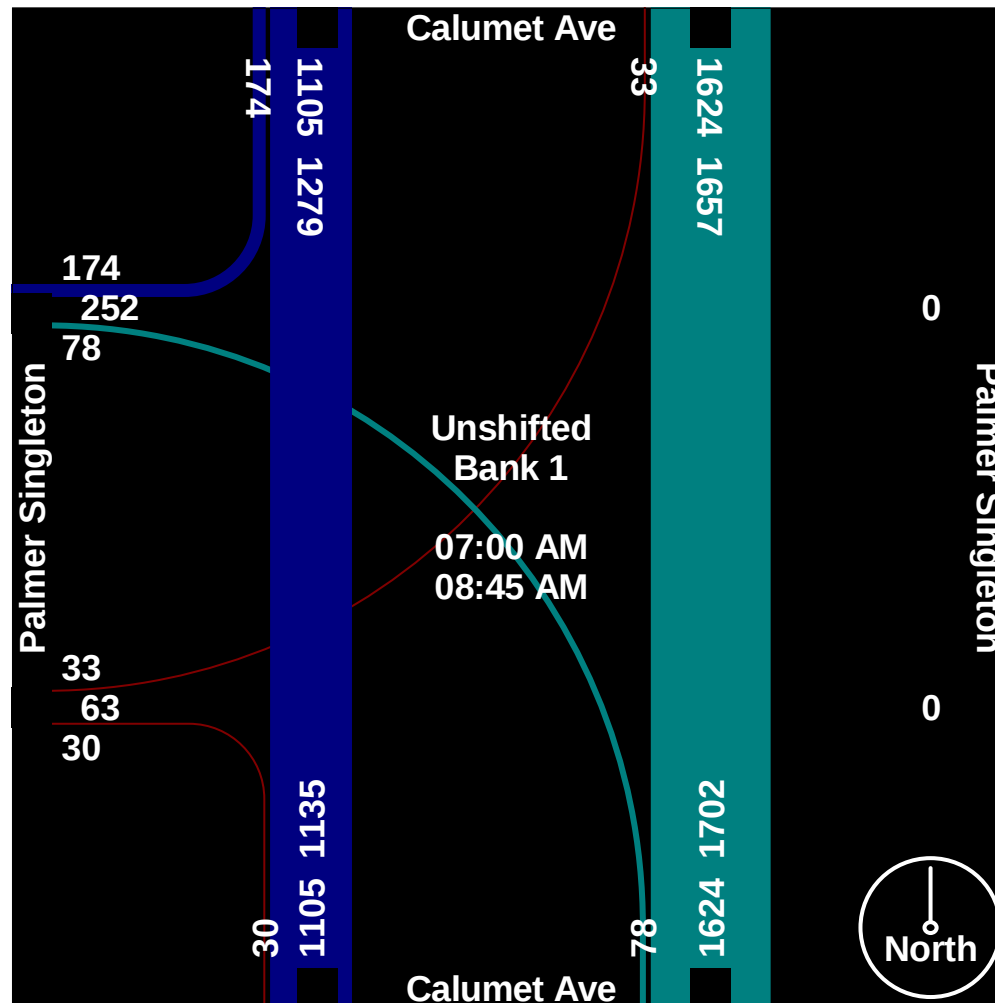


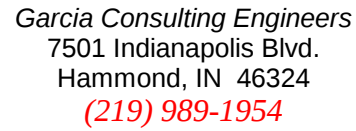


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CFNI Calumet Avenue
Munster, IN

File Name : 2017 0921 AM Calumet & Palmer
Site Code : 00001111
Start Date : 9/21/2017
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CFNI Calumet Avenue
Munster, IN

File Name : 2017 0920 PM Calumet & Palmer
Site Code : 00000999
Start Date : 9/20/2017
Page No : 1

Groups Printed- Unshifted - Bank 1

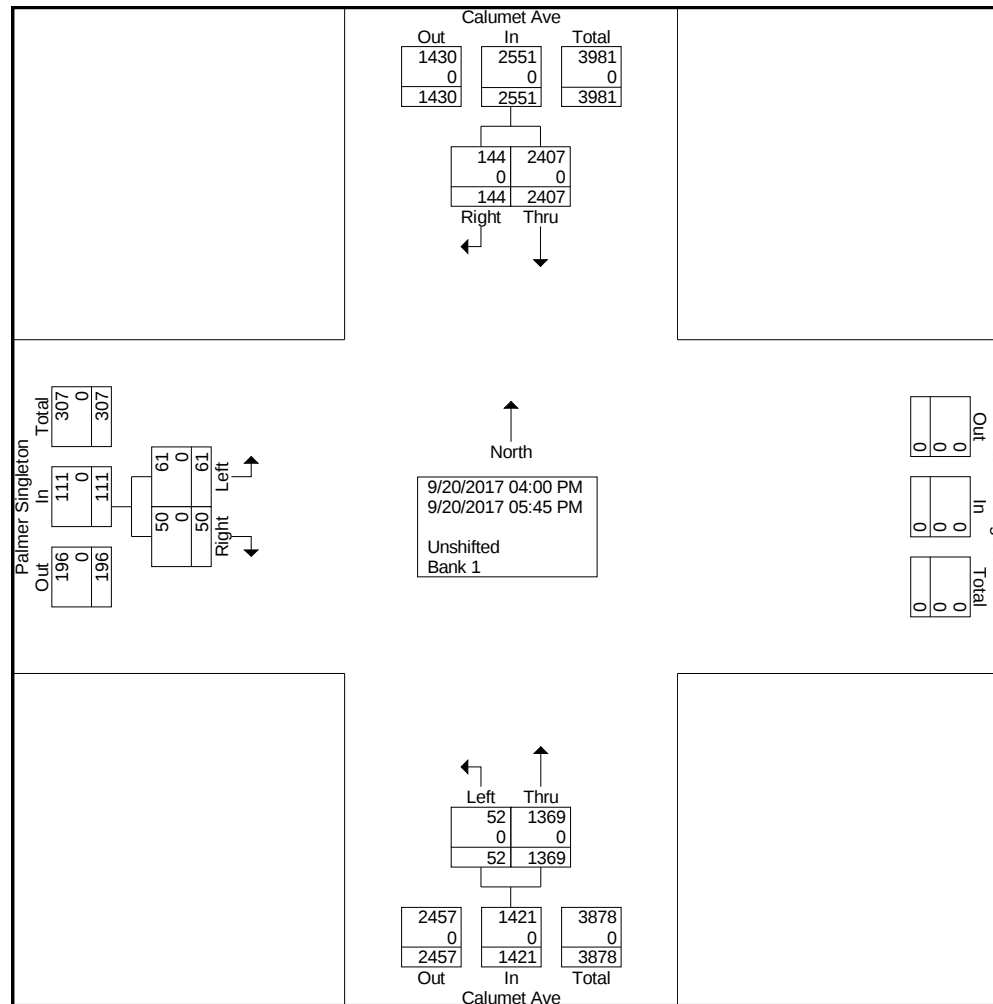
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Munster, IN

File Name : 2017 0920 PM Calumet & Palmer
Site Code : 00000999
Start Date : 9/20/2017
Page No : 2

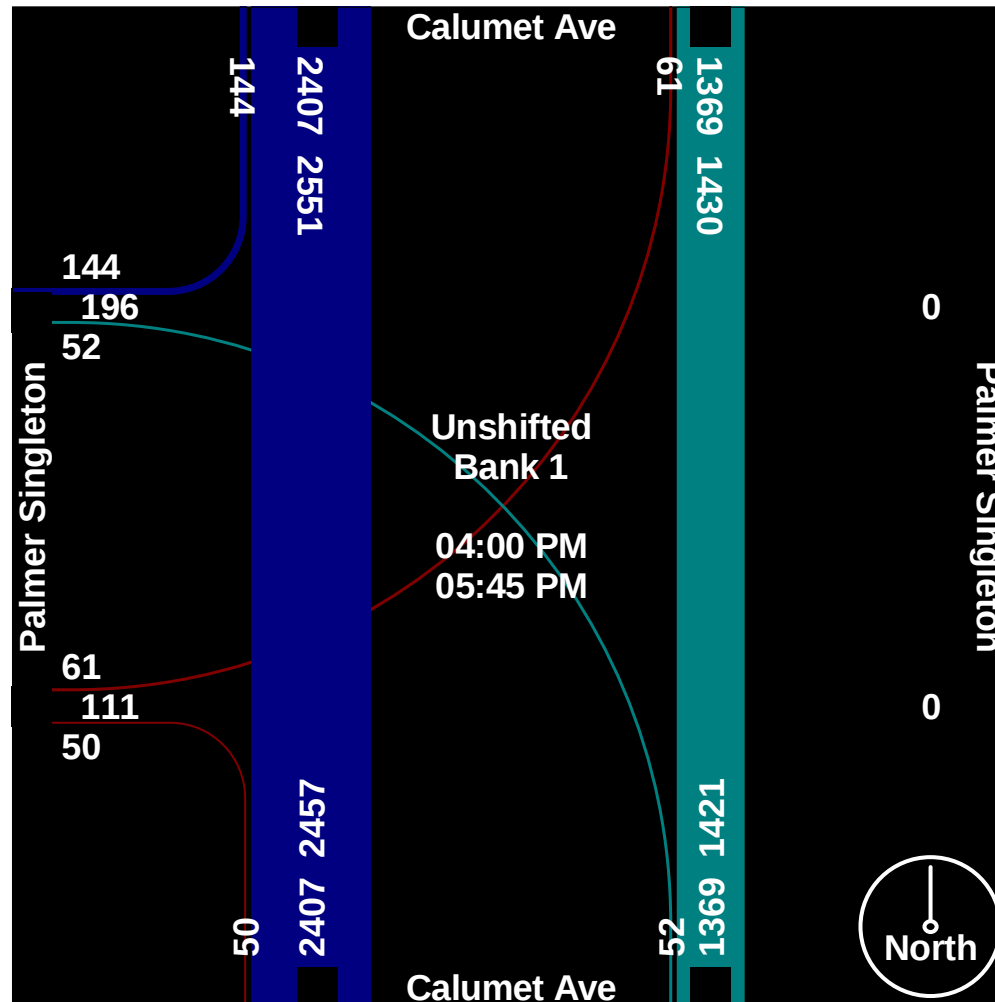


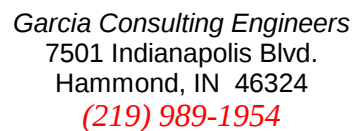


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Munster, IN

File Name : 2017 0920 PM Calumet & Palmer
Site Code : 00000999
Start Date : 9/20/2017
Page No : 3





File Name : 2016 1020 CalMain AM
Site Code : 00000222
Start Date : 10/20/2016
Page No : 1

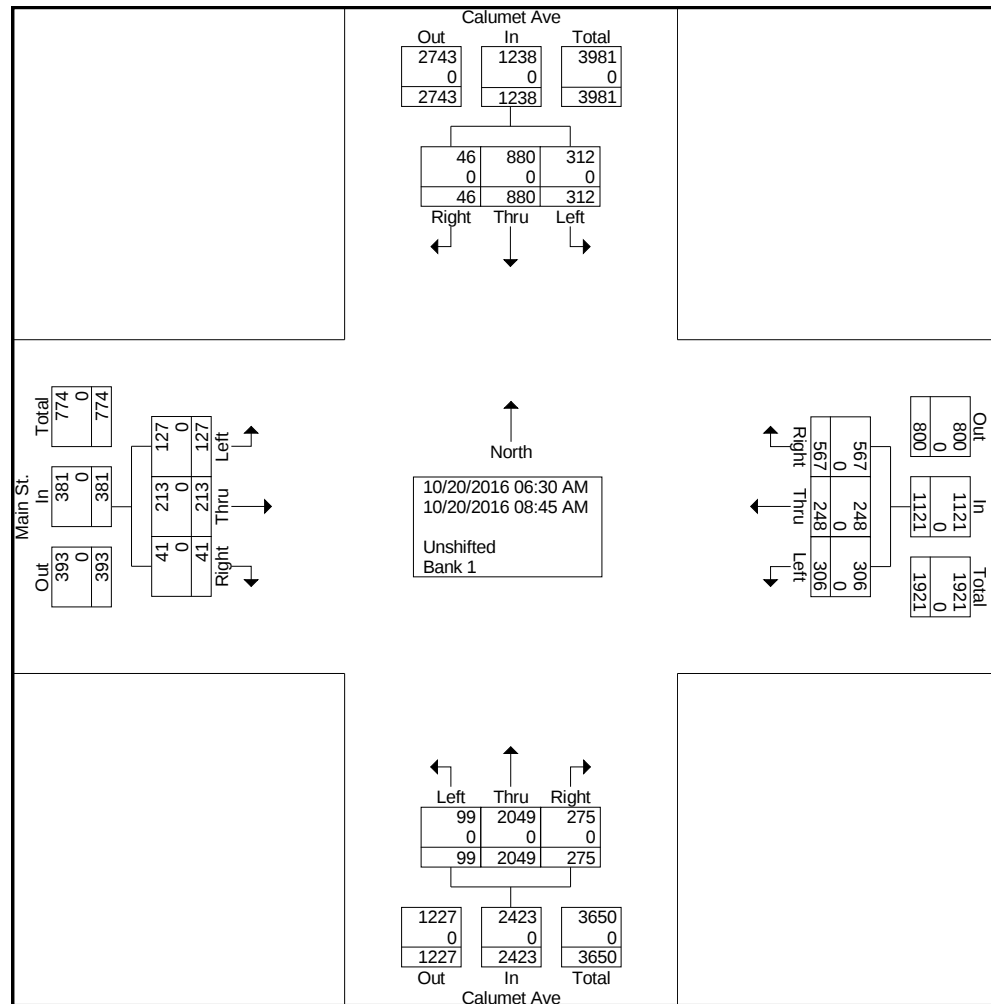
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Calumet Avenue & Main Street
Munster, IN
AM counts

File Name : 2016 1020 CalMain AM
Site Code : 00000222
Start Date : 10/20/2016
Page No : 2

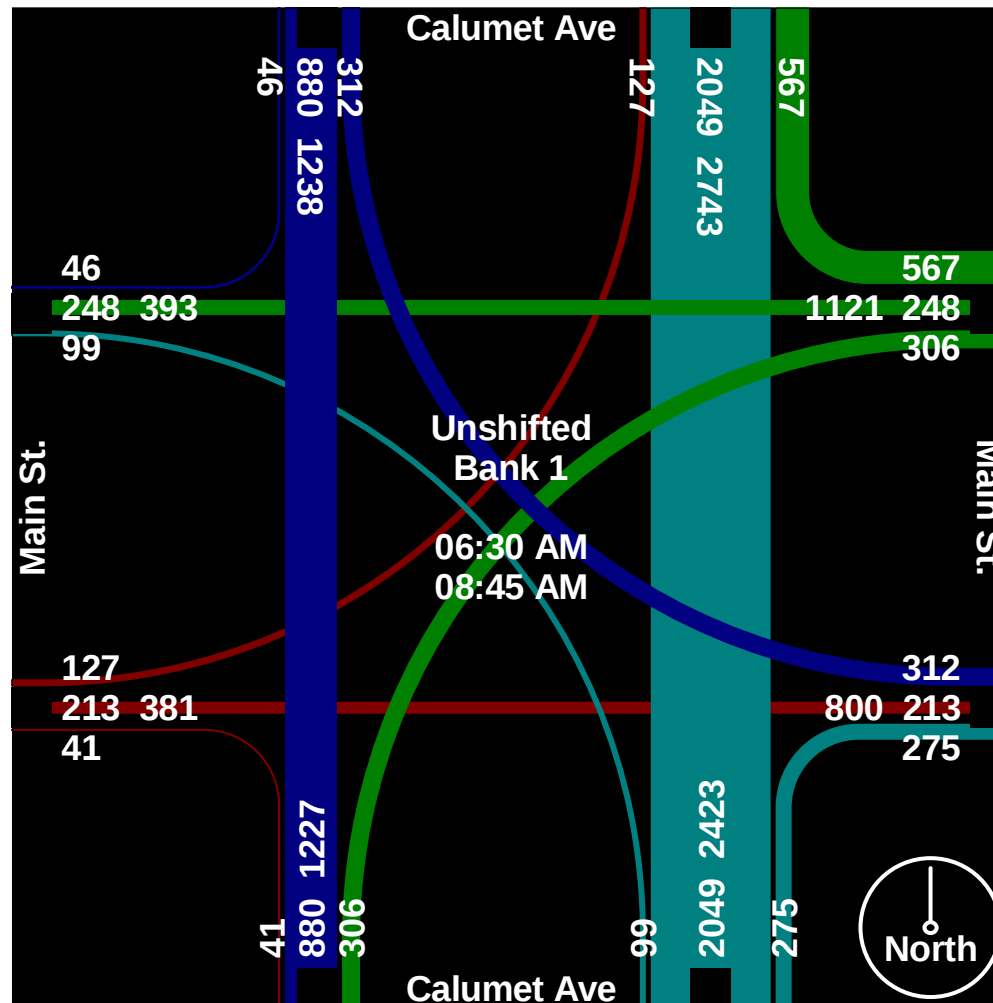




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Calumet Avenue & Main Street
Munster, IN
AM counts

File Name : 2016 1020 CalMain AM
Site Code : 00000222
Start Date : 10/20/2016
Page No : 3



Calumet Avenue & Main Street
Munster, IN
PM counts

File Name : 2016 1020 CalMain PM1
Site Code : 00000111
Start Date : 10/19/2016
Page No : 1

Groups Printed- Unshifted - Bank 1

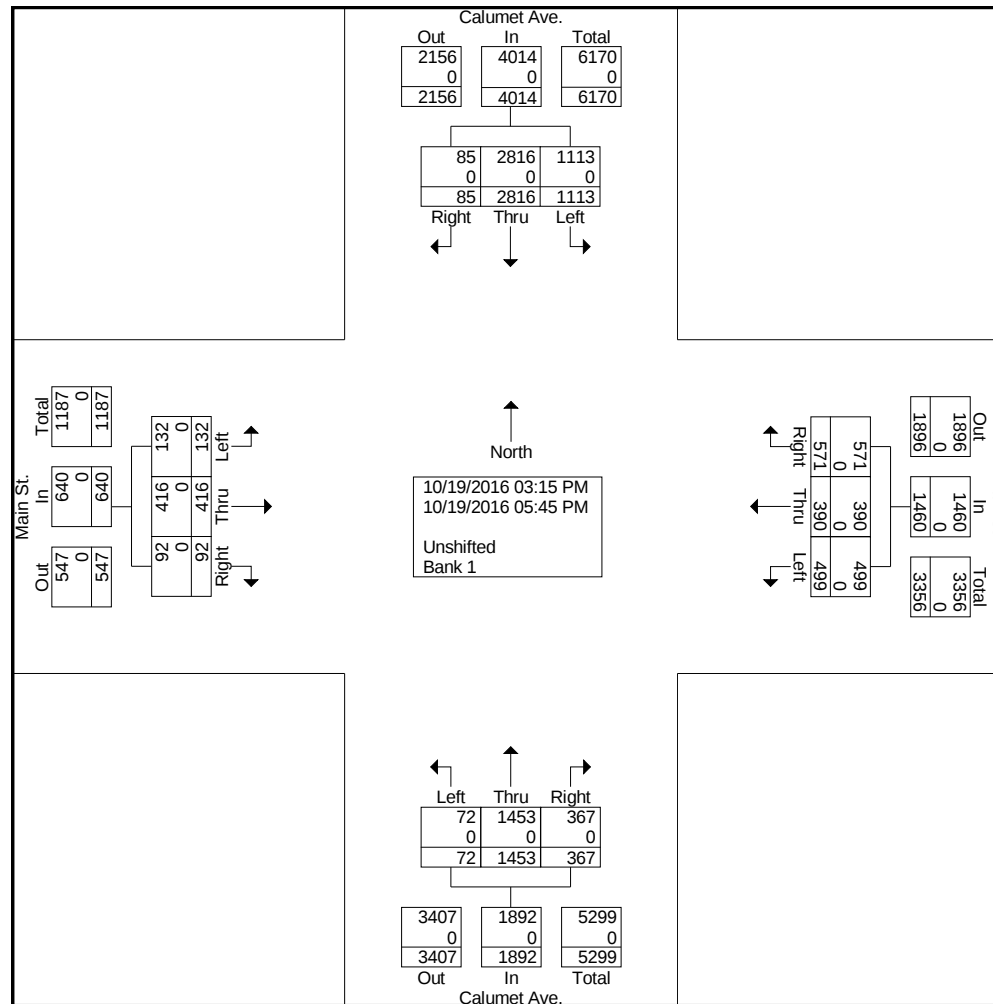
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Calumet Avenue & Main Street
Munster, IN
PM counts

File Name : 2016 1020 CalMain PM1
Site Code : 00000111
Start Date : 10/19/2016
Page No : 2

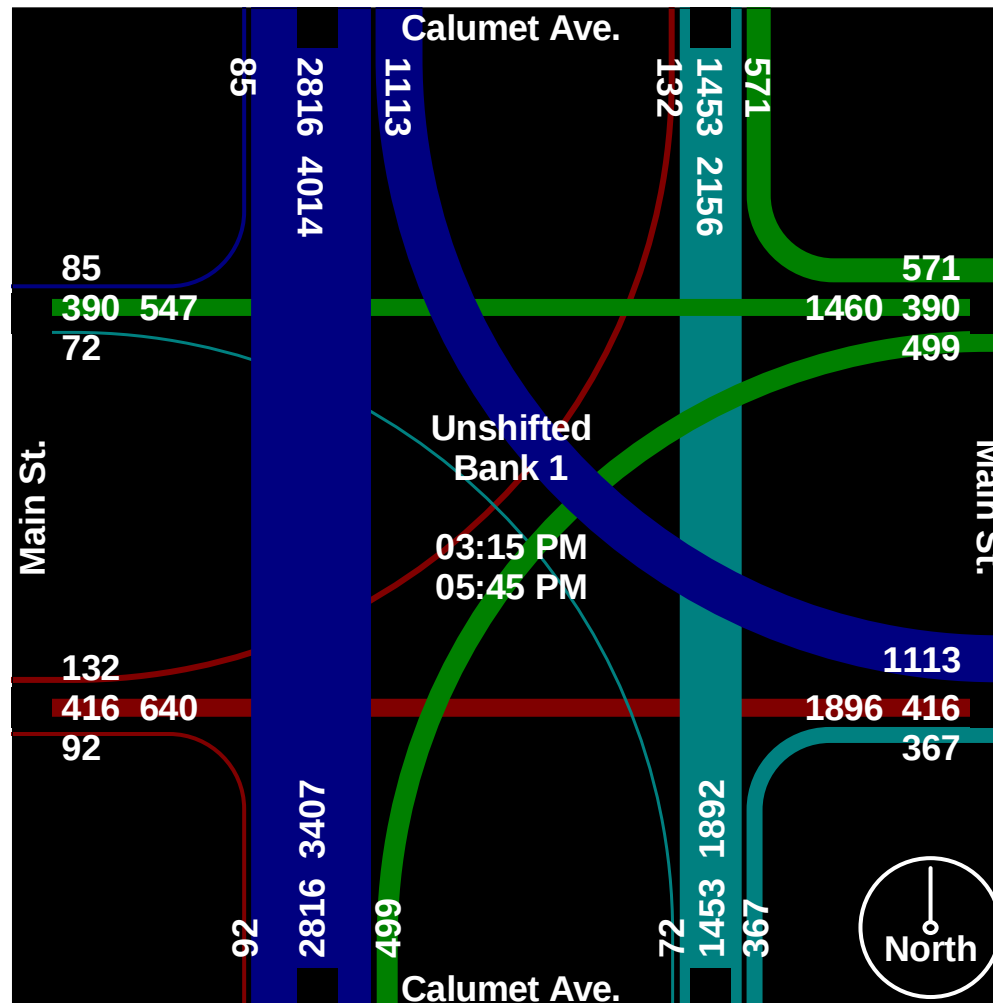


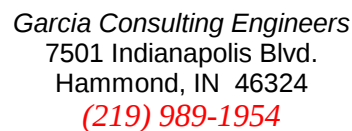


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Calumet Avenue & Main Street
Munster, IN
PM counts

File Name : 2016 1020 CalMain PM1
Site Code : 00000111
Start Date : 10/19/2016
Page No : 3





File Name : 2017 0914 AM Calumet & Columbia
Site Code : 00000444
Start Date : 9/14/2017
Page No : 1

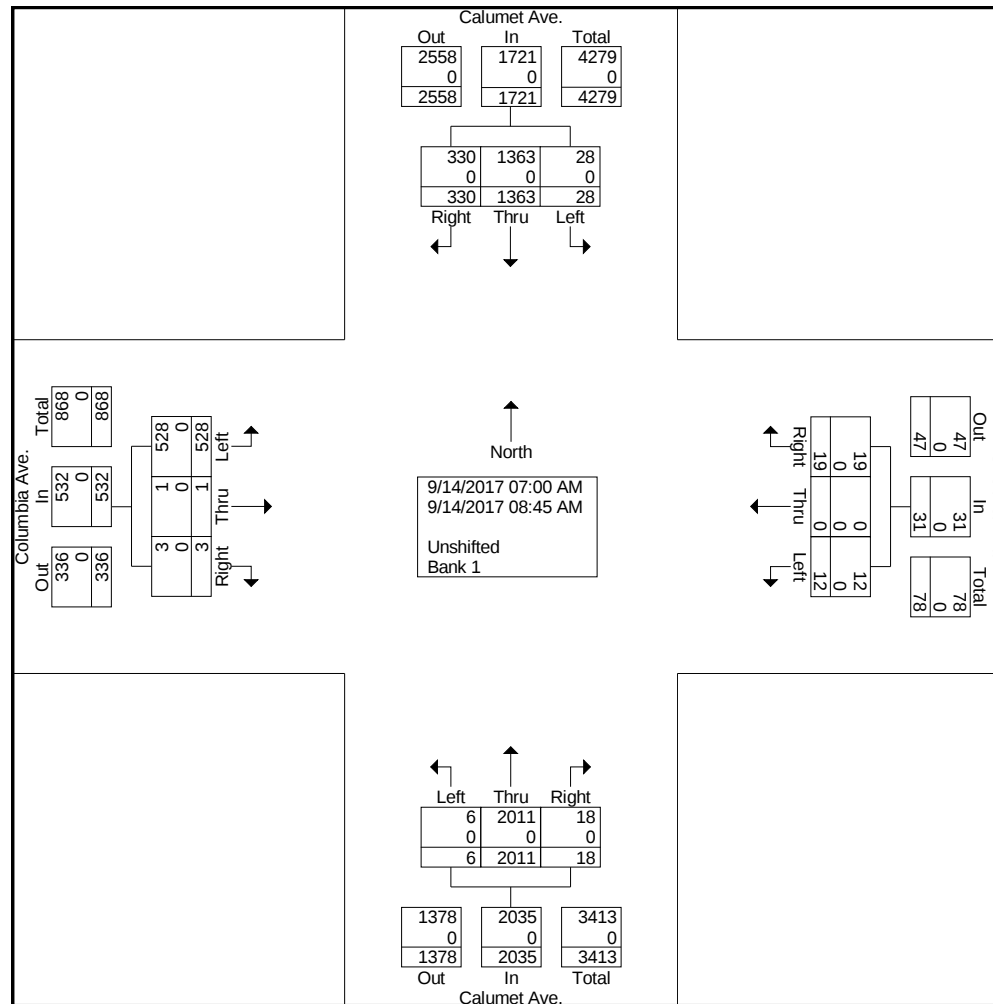
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Munster, IN
comhs-17-0824 CFNI TIA

File Name : 2017 0914 AM Calumet & Columbia
Site Code : 00000444
Start Date : 9/14/2017
Page No : 2

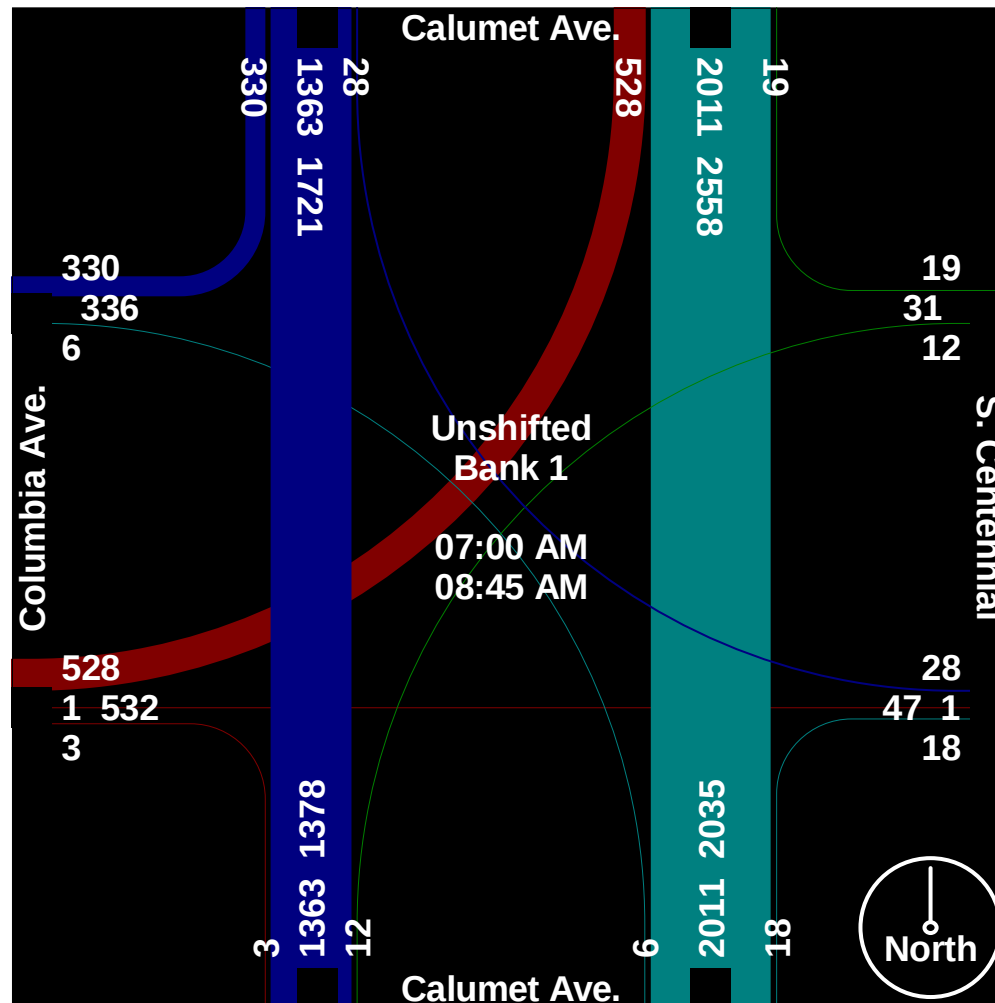


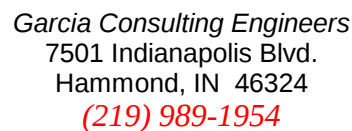


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Munster, IN
comhs-17-0824 CFNI TIA

File Name : 2017 0914 AM Calumet & Columbia
Site Code : 00000444
Start Date : 9/14/2017
Page No : 3





File Name : 2017 0913 PM Calumet & Columbia
Site Code : 00000333
Start Date : 9/13/2017
Page No : 1

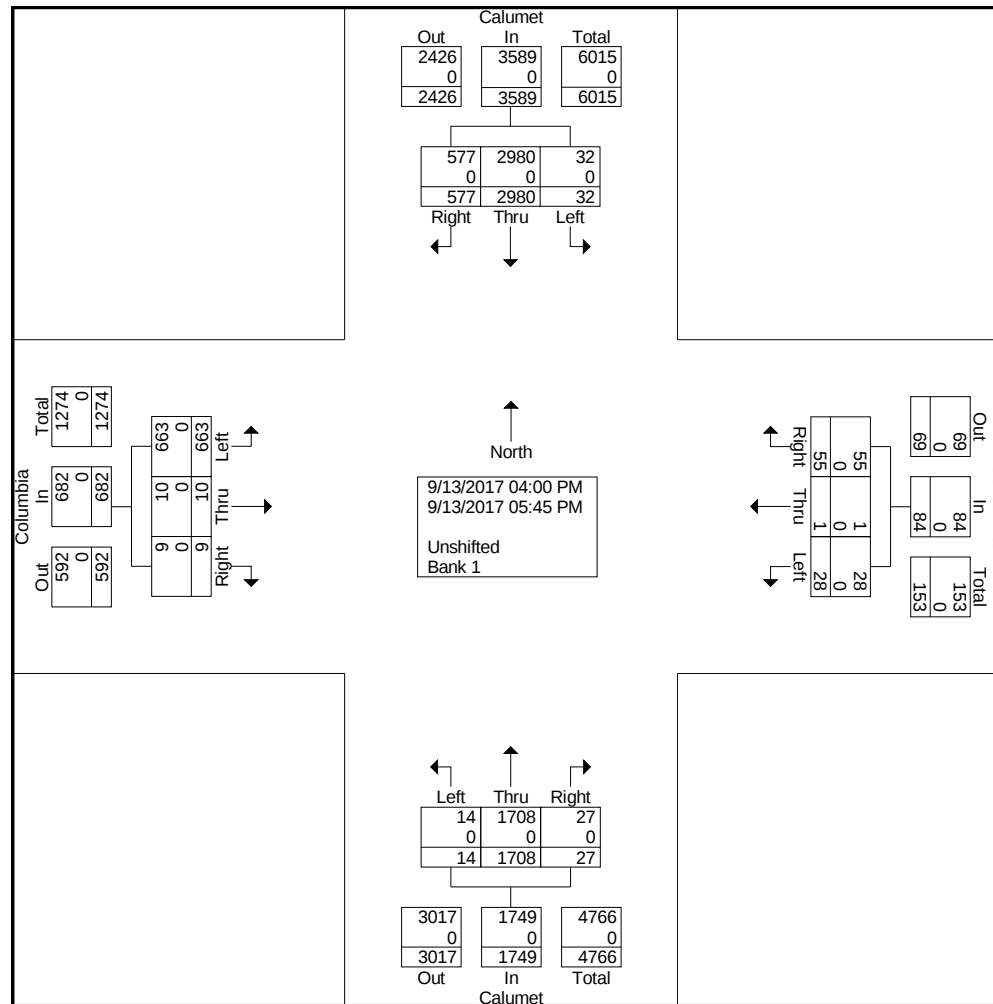
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Munster, IN

File Name : 2017 0913 PM Calumet & Columbia
Site Code : 00000333
Start Date : 9/13/2017
Page No : 2

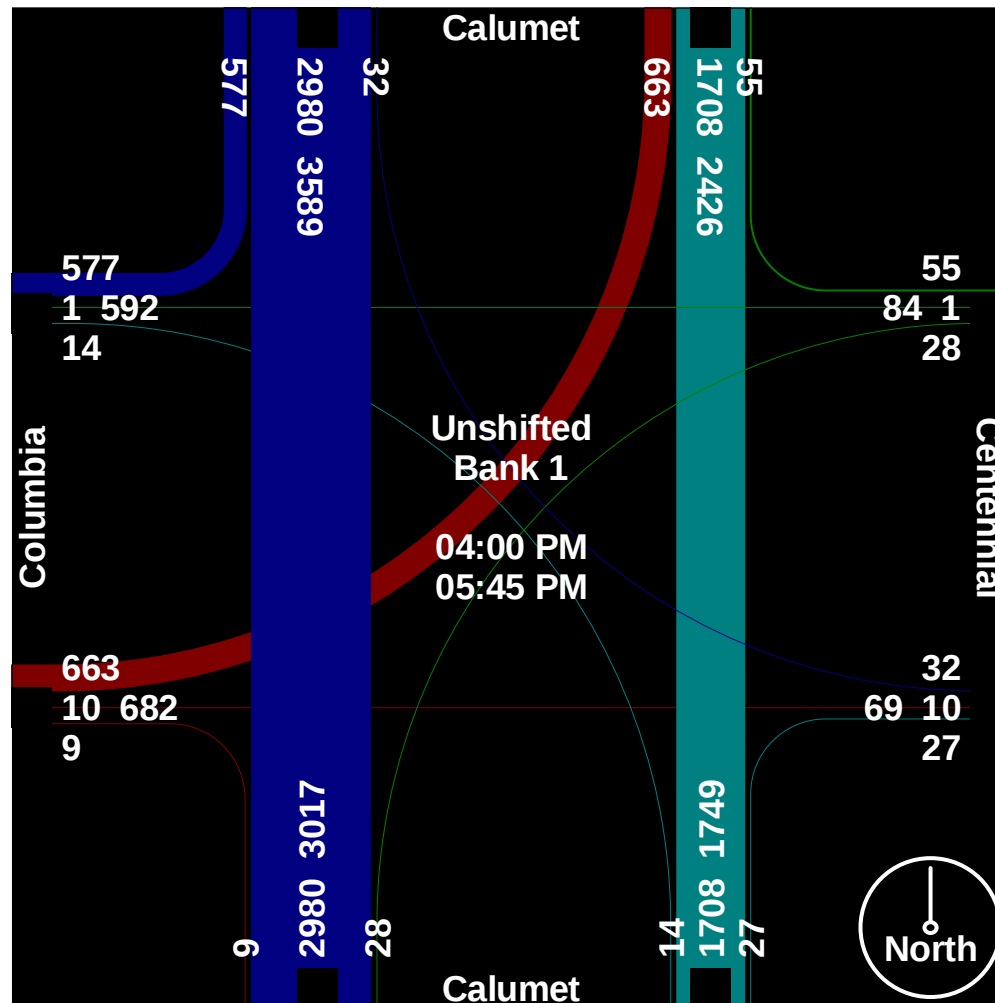




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File Name : 2017 0913 PM Calumet & Columbia
Site Code : 00000333
Start Date : 9/13/2017
Page No : 3





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CFNI Calumet Avenue
 Munster, IN

File Name : 2017 0919 Calumet & Treadway
 Site Code : 00000666
 Start Date : 9/19/2017
 Page No : 1

Groups Printed- Unshifted - Bank 1

Start Time	Calumet Ave. From North			Treadway From East			Calumet Ave. From South			Int. Total
	Thru	Left	App. Total	Right	Left	App. Total	Right	Thru	App. Total	
06:00 AM	56	1	57	10	0	10	0	195	195	262
06:15 AM	63	2	65	7	0	7	1	228	229	301
06:30 AM	83	2	85	16	1	17	1	239	240	342
06:45 AM	113	3	116	11	1	12	0	231	231	359
Total	315	8	323	44	2	46	2	893	895	1264
07:00 AM	84	3	87	23	0	23	0	252	252	362
07:15 AM	105	3	108	24	0	24	0	237	237	369
07:30 AM	140	6	146	18	0	18	0	228	228	392
07:45 AM	157	3	160	14	0	14	1	246	247	421
Total	486	15	501	79	0	79	1	963	964	1544
08:00 AM	151	6	157	10	1	11	0	195	195	363
08:15 AM	117	4	121	9	0	9	0	219	219	349
08:30 AM	143	4	147	22	0	22	1	190	191	360
08:45 AM	167	6	173	8	1	9	3	211	214	396
Total	578	20	598	49	2	51	4	815	819	1468
09:00 AM	173	1	174	8	1	9	2	166	168	351
09:15 AM	184	4	188	9	1	10	0	174	174	372
09:30 AM	170	2	172	11	1	12	2	189	191	375
09:45 AM	182	1	183	6	1	7	0	149	149	339
Total	709	8	717	34	4	38	4	678	682	1437
10:00 AM	128	2	130	6	0	6	5	152	157	293
10:15 AM	193	3	196	5	1	6	1	158	159	361
10:30 AM	184	4	188	3	4	7	5	166	171	366
10:45 AM	185	2	187	5	1	6	0	181	181	374
Total	690	11	701	19	6	25	11	657	668	1394
11:00 AM	178	5	183	5	0	5	3	161	164	352
11:15 AM	149	5	154	3	1	4	1	169	170	328



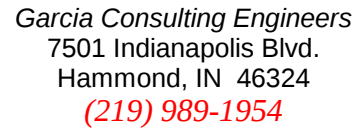
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CFNI Calumet Avenue
 Munster, IN

File Name : 2017 0919 Calumet & Treadway
 Site Code : 00000666
 Start Date : 9/19/2017
 Page No : 2

Groups Printed- Unshifted - Bank 1

Start Time	Calumet Ave. From North			Treadway From East			Calumet Ave. From South			Int. Total
	Thru	Left	App. Total	Right	Left	App. Total	Right	Thru	App. Total	
11:30 AM	202	2	204	2	0	2	2	167	169	375
11:45 AM	186	8	194	4	2	6	1	148	149	349
Total	715	20	735	14	3	17	7	645	652	1404
12:00 PM	200	3	203	7	2	9	1	136	137	349
12:15 PM	232	5	237	4	1	5	2	156	158	400
12:30 PM	209	11	220	7	0	7	1	157	158	385
12:45 PM	151	3	154	5	0	5	1	155	156	315
Total	792	22	814	23	3	26	5	604	609	1449
01:00 PM	200	5	205	8	0	8	4	179	183	396
01:15 PM	206	5	211	3	0	3	1	157	158	372
01:30 PM	188	6	194	10	0	10	1	166	167	371
01:45 PM	175	4	179	10	0	10	0	175	175	364
Total	769	20	789	31	0	31	6	677	683	1503
02:00 PM	195	10	205	5	0	5	4	168	172	382
02:15 PM	244	7	251	8	1	9	1	188	189	449
02:30 PM	266	13	279	10	0	10	3	179	182	471
02:45 PM	200	5	205	10	0	10	1	158	159	374
Total	905	35	940	33	1	34	9	693	702	1676
03:00 PM	252	11	263	5	0	5	4	172	176	444
03:15 PM	300	20	320	8	0	8	0	149	149	477
03:30 PM	298	11	309	5	0	5	3	156	159	473
03:45 PM	310	14	324	9	0	9	4	176	180	513
Total	1160	56	1216	27	0	27	11	653	664	1907
04:00 PM	320	12	332	8	0	8	3	163	166	506
04:15 PM	295	23	318	8	0	8	4	169	173	499
04:30 PM	303	34	337	6	1	7	4	157	161	505
04:45 PM	287	25	312	14	0	14	1	156	157	483
Total	1205	94	1299	36	1	37	12	645	657	1993



CFNI Calumet Avenue
Munster, IN

File Name : 2017 0919 Calumet & Treadway
Site Code : 00000666
Start Date : 9/19/2017
Page No : 3

Groups Printed- Unshifted - Bank 1

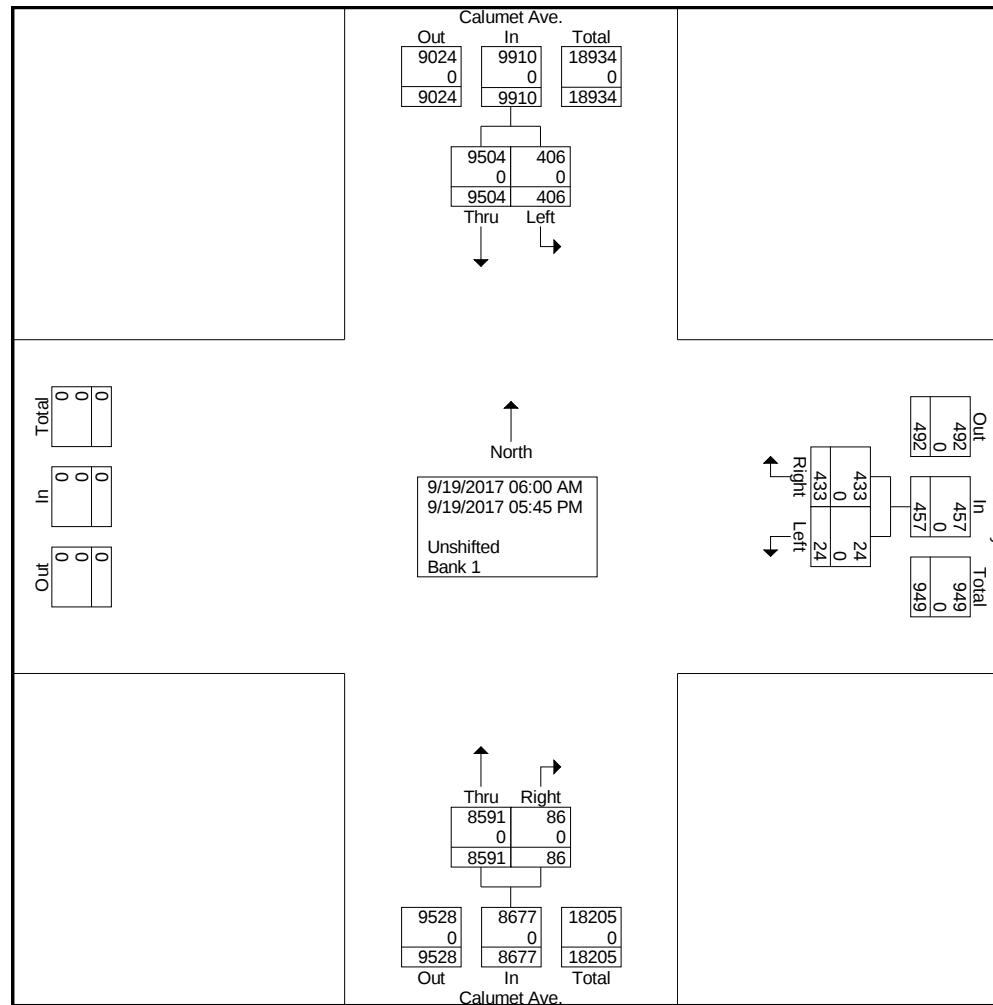
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CFNI Calumet Avenue
Munster, IN

File Name : 2017 0919 Calumet & Treadway
Site Code : 00000666
Start Date : 9/19/2017
Page No : 4

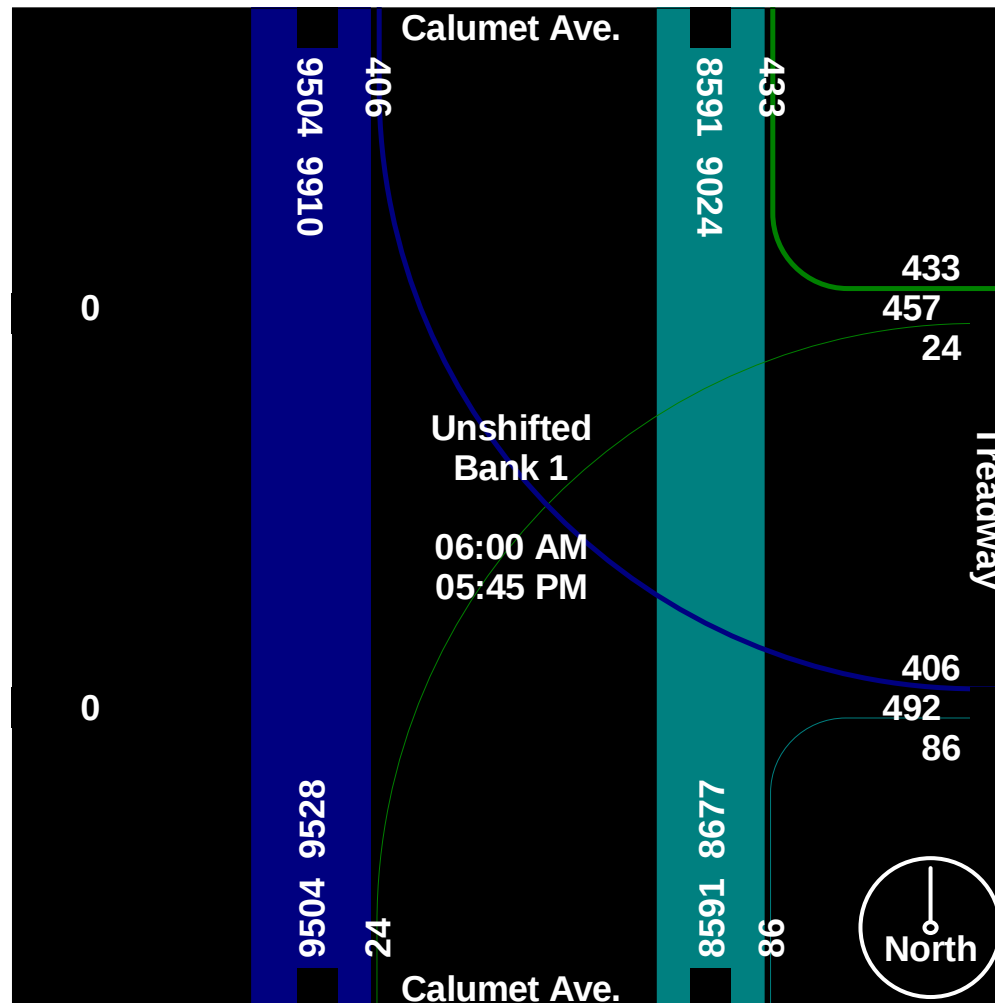




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CFNI Calumet Avenue
Munster, IN

File Name : 2017 0919 Calumet & Treadway
Site Code : 00000666
Start Date : 9/19/2017
Page No : 5



Date/Time/Volume/Average Speed/Temperature Report

HI-Star ID: 4267 Street: Main St. State: IN City: Munster County: Lake Begin: Sep/20/2017 02:00:00 PM Lane: ALL Oper: RLP Posted: 35 AADT Factor: 1 End: Sep/22/2017 02:00:00 PM Hours: 48.00 Period: 60 Raw Count: 13541 AADT Count: 7,012				
Date And Time Range	Period Volume	Average Speed	Roadway Temperature	Roadway Surface Wet/Dry
Wed, Sep/20/2017				
[14:00-15:00]	460	0 MPH	91 F	---
[15:00-16:00]	566	0 MPH	89 F	---
[16:00-17:00]	744	0 MPH	87 F	---
[17:00-18:00]	624	0 MPH	83 F	---
[18:00-19:00]	439	0 MPH	82 F	---
[19:00-20:00]	305	0 MPH	78 F	---
[20:00-21:00]	201	0 MPH	78 F	---
[21:00-22:00]	126	0 MPH	76 F	---
[22:00-23:00]	77	0 MPH	74 F	---
[23:00-00:00]	30	0 MPH	72 F	---
Wed, Sep/20/2017	3572	0 MPH	81 F	
Thu, Sep/21/2017				
[00:00-01:00]	15	0 MPH	72 F	---
[01:00-02:00]	12	0 MPH	72 F	---
[02:00-03:00]	9	0 MPH	70 F	---
[03:00-04:00]	11	0 MPH	70 F	---
[04:00-05:00]	45	0 MPH	70 F	---
[05:00-06:00]	88	0 MPH	70 F	---
[06:00-07:00]	206	0 MPH	68 F	---
[07:00-08:00]	388	0 MPH	70 F	---
[08:00-09:00]	363	0 MPH	72 F	---
[09:00-10:00]	354	0 MPH	74 F	---
[10:00-11:00]	335	0 MPH	78 F	---
[11:00-12:00]	435	0 MPH	78 F	---
[12:00-13:00]	386	0 MPH	83 F	---
[13:00-14:00]	450	0 MPH	85 F	---
[14:00-15:00]	486	0 MPH	87 F	---
[15:00-16:00]	589	0 MPH	87 F	---
[16:00-17:00]	666	0 MPH	87 F	---
[17:00-18:00]	627	0 MPH	85 F	---
[18:00-19:00]	488	0 MPH	82 F	---
[19:00-20:00]	287	0 MPH	80 F	---
[20:00-21:00]	194	0 MPH	78 F	---
[21:00-22:00]	141	0 MPH	76 F	---
[22:00-23:00]	88	0 MPH	76 F	---
[23:00-00:00]	45	0 MPH	74 F	---
Thu, Sep/21/2017	6708	0 MPH	77 F	
Fri, Sep/22/2017				
[00:00-01:00]	20	0 MPH	72 F	---
[01:00-02:00]	19	0 MPH	72 F	---
[02:00-03:00]	10	0 MPH	72 F	---
[03:00-04:00]	17	0 MPH	70 F	---

Date/Time/Volume/Average Speed/Temperature Report

HI-Star ID: 4267 Street: Main St. State: IN City: Munster County: Lake Begin: Sep/20/2017 02:00:00 PM Lane: ALL Oper: RLP Posted: 35 AADT Factor: 1 End: Sep/22/2017 02:00:00 PM Hours: 48.00 Period: 60 Raw Count: 13541 AADT Count: 7,012				
Date And Time Range	Period Volume	Average Speed	Roadway Temperature	Roadway Surface Wet/Dry
Fri, Sep/22/2017				
[04:00-05:00]	36	0 MPH	70 F	---
[05:00-06:00]	80	0 MPH	68 F	---
[06:00-07:00]	198	0 MPH	68 F	---
[07:00-08:00]	362	0 MPH	68 F	---
[08:00-09:00]	379	0 MPH	72 F	---
[09:00-10:00]	340	0 MPH	76 F	---
[10:00-11:00]	362	0 MPH	80 F	---
[11:00-12:00]	447	0 MPH	80 F	---
[12:00-13:00]	509	0 MPH	85 F	---
[13:00-14:00]	482	0 MPH	87 F	---
Fri, Sep/22/2017	3261	0 MPH	74 F	
Sep/20/2017 02:00:00 PM				
Sep/22/2017 02:00:00 PM	13541	0 MPH	77 F	

Date/Time/Volume/Average Speed/Temperature Report

HI-Star ID: 4237 Street: Columbia State: IN City: Munster County: Lake Begin: Sep/20/2017 02:00:00 PM Lane: ALL Oper: RLP Posted: 35 AADT Factor: 1 End: Sep/22/2017 02:00:00 PM Hours: 48.00 Period: 60 Raw Count: 16071 AADT Count: 8,281				
Date And Time Range	Period Volume	Average Speed	Roadway Temperature	Roadway Surface Wet/Dry
Wed, Sep/20/2017				
[14:00-15:00]	549	0 MPH	89 F	---
[15:00-16:00]	657	0 MPH	89 F	---
[16:00-17:00]	774	0 MPH	87 F	---
[17:00-18:00]	711	0 MPH	85 F	---
[18:00-19:00]	543	0 MPH	82 F	---
[19:00-20:00]	345	0 MPH	80 F	---
[20:00-21:00]	203	0 MPH	78 F	---
[21:00-22:00]	208	0 MPH	76 F	---
[22:00-23:00]	93	0 MPH	76 F	---
[23:00-00:00]	51	0 MPH	74 F	---
Wed, Sep/20/2017	4134	0 MPH	82 F	
Thu, Sep/21/2017				
[00:00-01:00]	25	0 MPH	74 F	---
[01:00-02:00]	14	0 MPH	72 F	---
[02:00-03:00]	9	0 MPH	72 F	---
[03:00-04:00]	16	0 MPH	72 F	---
[04:00-05:00]	45	0 MPH	70 F	---
[05:00-06:00]	140	0 MPH	70 F	---
[06:00-07:00]	334	0 MPH	68 F	---
[07:00-08:00]	516	0 MPH	70 F	---
[08:00-09:00]	457	0 MPH	72 F	---
[09:00-10:00]	396	0 MPH	74 F	---
[10:00-11:00]	457	0 MPH	78 F	---
[11:00-12:00]	486	0 MPH	82 F	---
[12:00-13:00]	541	0 MPH	85 F	---
[13:00-14:00]	475	0 MPH	89 F	---
[14:00-15:00]	468	0 MPH	89 F	---
[15:00-16:00]	689	0 MPH	91 F	---
[16:00-17:00]	741	0 MPH	89 F	---
[17:00-18:00]	726	0 MPH	87 F	---
[18:00-19:00]	547	0 MPH	83 F	---
[19:00-20:00]	295	0 MPH	82 F	---
[20:00-21:00]	230	0 MPH	80 F	---
[21:00-22:00]	150	0 MPH	78 F	---
[22:00-23:00]	123	0 MPH	78 F	---
[23:00-00:00]	56	0 MPH	76 F	---
Thu, Sep/21/2017	7936	0 MPH	78 F	
Fri, Sep/22/2017				
[00:00-01:00]	33	0 MPH	74 F	---
[01:00-02:00]	12	0 MPH	74 F	---
[02:00-03:00]	14	0 MPH	72 F	---
[03:00-04:00]	20	0 MPH	72 F	---

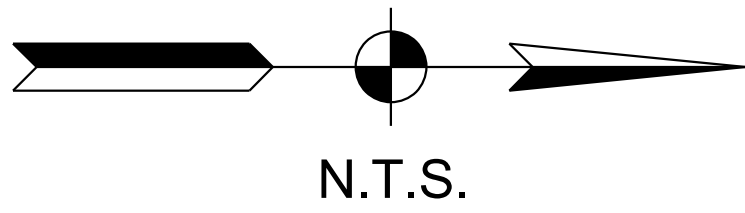
Date/Time/Volume/Average Speed/Temperature Report

HI-Star ID: 4237 Street: Columbia State: IN City: Munster County: Lake		Begin: Sep/20/2017 02:00:00 PM Lane: ALL Oper: RLP Posted: 35 AADT Factor: 1		End: Sep/22/2017 02:00:00 PM Hours: 48.00 Period: 60 Raw Count: 16071 AADT Count: 8,281	
Date And Time Range	Period Volume	Average Speed	Roadway Temperature	Roadway Surface Wet/Dry	
Fri, Sep/22/2017					
[04:00-05:00]	42	0 MPH	72 F	---	
[05:00-06:00]	138	0 MPH	70 F	---	
[06:00-07:00]	295	0 MPH	70 F	---	
[07:00-08:00]	480	0 MPH	70 F	---	
[08:00-09:00]	515	0 MPH	74 F	---	
[09:00-10:00]	425	0 MPH	78 F	---	
[10:00-11:00]	452	0 MPH	82 F	---	
[11:00-12:00]	556	0 MPH	87 F	---	
[12:00-13:00]	529	0 MPH	89 F	---	
[13:00-14:00]	490	0 MPH	93 F	---	
Fri, Sep/22/2017	4001	0 MPH	77 F		
Sep/20/2017 02:00:00 PM Sep/22/2017 02:00:00 PM	16071	0 MPH	79 F		

Date/Time/Volume/Average Speed/Temperature Report

HI-Star ID: 4267 Street: Calumet Ave State: IN City: Munster County: Lake Begin: Oct/18/2016 01:00:00 PM Lane: ALL Oper: RLP Posted: 45 AADT Factor: 1 End: Oct/19/2016 01:00:00 PM Hours: 24.00 Period: 60 Raw Count: 28548 AADT Count: 28,548				
Date And Time Range	Period Volume	Average Speed	Roadway Temperature	Roadway Surface Wet/Dry
Tue, Oct/18/2016				
[13:00-14:00]	1653	44 MPH	62 F	---
[14:00-15:00]	1818	45 MPH	76 F	---
[15:00-16:00]	2127	45 MPH	76 F	---
[16:00-17:00]	2433	44 MPH	72 F	---
[17:00-18:00]	2470	44 MPH	70 F	---
[18:00-19:00]	1935	44 MPH	68 F	---
[19:00-20:00]	1275	44 MPH	64 F	---
[20:00-21:00]	905	44 MPH	62 F	---
[21:00-22:00]	663	45 MPH	60 F	---
[22:00-23:00]	480	46 MPH	58 F	---
[23:00-00:00]	275	45 MPH	58 F	---
Tue, Oct/18/2016	16034	44 MPH	66 F	
Wed, Oct/19/2016				
[00:00-01:00]	144	45 MPH	56 F	---
[01:00-02:00]	79	45 MPH	54 F	---
[02:00-03:00]	77	45 MPH	54 F	---
[03:00-04:00]	110	44 MPH	52 F	---
[04:00-05:00]	250	45 MPH	52 F	---
[05:00-06:00]	609	46 MPH	50 F	---
[06:00-07:00]	1336	45 MPH	50 F	---
[07:00-08:00]	1856	46 MPH	50 F	---
[08:00-09:00]	1629	45 MPH	52 F	---
[09:00-10:00]	1467	45 MPH	54 F	---
[10:00-11:00]	1558	45 MPH	58 F	---
[11:00-12:00]	1661	45 MPH	62 F	---
[12:00-13:00]	1738	44 MPH	66 F	---
Wed, Oct/19/2016	12514	45 MPH	55 F	
Oct/18/2016 01:00:00 PM Oct/19/2016 01:00:00 PM				
	28548	45 MPH	60 F	

AM PEAK HOUR
TRAFFIC VOLUMES & LEVEL OF SERVICE (LOS)



YEAR	LOS	EXHIBIT
2017	14A	A
2018	24A	A
2027	35A	A

YEAR	LOS	EXHIBIT
2017	n/a	n/a
2018	25A	B
2027	36A	B

YEAR	LOS	EXHIBIT
2017	13A	A
2018	23A	B/B
2027	34A	B/B

YEAR	LOS	EXHIBIT
2017	12A	B/B
2018	22A	B/B
2027	33A	B/B

YEAR	LOS	EXHIBIT
2017	11A	B
2018	21A	B
2027	32A	B

YEAR	LOS	EXHIBIT
2017	10A	B
2018	20A	B
2027	31A	B

YEAR	LOS	EXHIBIT
2017	9A	B
2018	19A	B
2027	30A	B

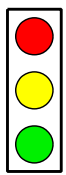
YEAR	LOS	EXHIBIT
2017	5A	C
2018	15A	C
2027	26A	C

YEAR	LOS	EXHIBIT
2017	6A	C
2018	16A	D/E
2027	27A	A (1)

YEAR	LOS	EXHIBIT
2017	7A	C
2018	17A	C
2027	28A	C

YEAR	LOS	EXHIBIT
2017	8A	C
2018	18A	C
2027	29A	D

LEGEND



EXISTING TRAFFIC SIGNAL



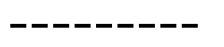
PROPOSED STOP SIGN

XX (XX) XX

EXISTING 2017 TRAFFIC VOLUME (SINGLE SITE 2018 TRAFFIC VOLUME) FULL BUILD 2027 TRAFFIC VOLUME



EXISTING ROAD



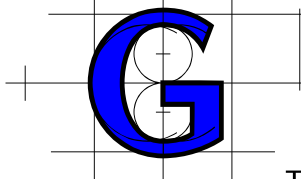
PROPOSED ROAD



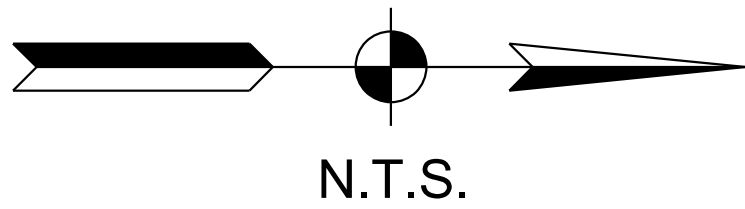
TRAFFIC SIGNAL WHEN APPROXIMATELY 35% OF FULL BUILD IS ACHIEVED

* Includes Single Use facility traffic

(1) With signalized control



PM PEAK HOUR
TRAFFIC VOLUMES & LEVEL OF SERVICE (LOS)



YEAR	LOS	EXHIBIT
2017	14B	A
2018	24B	A
2027	35B	A

YEAR	LOS	EXHIBIT
2017	n/a	n/a
2018	25B	B
2027	36B	B

YEAR	LOS	EXHIBIT
2017	13B	B
2018	23B	B/B
2027	34B	B/B

YEAR	LOS	EXHIBIT
2017	12B	B/C
2018	22B	B/C
2027	33B	B/B

YEAR	LOS	EXHIBIT
2017	11B	C
2018	21B	C
2027	32B	C

YEAR	LOS	EXHIBIT
2017	10B	C
2018	20B	C
2027	31B	C

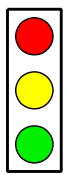
YEAR	LOS	EXHIBIT
2017	9B	C
2018	19B	C
2027	30B	D (3)

YEAR	LOS	EXHIBIT
2017	6B	C
2018	16B	F/C
2027	27B	B (1)

YEAR	LOS	EXHIBIT
2017	7B	F
2018	17B	F
2027	28B	F

YEAR	LOS	EXHIBIT
2017	8B	F
2018	18B	F
2027	29B	F

LEGEND



EXISTING TRAFFIC SIGNAL



PROPOSED STOP SIGN

XX (XX) XX

EXISTING 2017 TRAFFIC VOLUME (SINGLE SITE 2018 TRAFFIC VOLUME) FULL BUILD 2027 TRAFFIC VOLUME

EXISTING ROAD

PROPOSED ROAD



TRAFFIC SIGNAL WHEN APPROXIMATELY 35% OF FULL BUILD IS ACHIEVED

* Includes Single Use facility traffic

(1) With signalized control

(2) Can be a 'D' with addition of a NBRT lane

(3) Can be a 'C' with EB dual left turn lanes

HCM 2010 Signalized Intersection Summary

3: Calumet & Main

11/6/2017

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	49	108	16	140	125	250	49	888	141	147	401	19
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1863	1863	1863	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	64	116	20	212	144	312	64	1045	196	179	441	32
Adj No. of Lanes	1	1	1	1	1	1	1	2	0	1	2	0
Peak Hour Factor	0.77	0.93	0.80	0.66	0.87	0.80	0.77	0.85	0.72	0.82	0.91	0.59
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	306	357	303	379	394	464	506	1237	231	275	1506	109
Arrive On Green	0.05	0.19	0.19	0.07	0.21	0.21	0.05	0.42	0.42	0.08	0.45	0.45
Sat Flow, veh/h	1774	1863	1583	1774	1863	1583	1774	2977	557	1774	3348	242
Grp Volume(v), veh/h	64	116	20	212	144	312	64	620	621	179	232	241
Grp Sat Flow(s),veh/h/ln	1774	1863	1583	1774	1863	1583	1774	1770	1764	1774	1770	1820
Q Serve(g_s), s	2.3	4.4	0.8	5.5	5.4	14.2	1.7	25.9	26.0	4.6	6.8	6.9
Cycle Q Clear(g_c), s	2.3	4.4	0.8	5.5	5.4	14.2	1.7	25.9	26.0	4.6	6.8	6.9
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.32	1.00		0.13
Lane Grp Cap(c), veh/h	306	357	303	379	394	464	506	735	733	275	796	819
V/C Ratio(X)	0.21	0.33	0.07	0.56	0.37	0.67	0.13	0.84	0.85	0.65	0.29	0.29
Avail Cap(c_a), veh/h	334	461	392	379	470	528	640	735	733	348	796	819
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	24.8	28.6	27.2	27.3	27.6	25.6	12.4	21.6	21.6	17.7	14.3	14.3
Incr Delay (d2), s/veh	0.3	0.5	0.1	1.9	0.6	2.8	0.1	11.4	11.6	2.8	0.9	0.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.2	2.3	0.4	1.9	2.9	6.5	0.8	14.9	15.0	4.2	3.5	3.6
LnGrp Delay(d),s/veh	25.1	29.1	27.3	29.1	28.2	28.4	12.5	33.0	33.3	20.5	15.2	15.2
LnGrp LOS	C	C	C	C	C	C	B	C	C	C	B	B
Approach Vol, veh/h		200			668			1305			652	
Approach Delay, s/veh		27.7			28.6			32.1			16.7	
Approach LOS		C			C			C			B	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	11.7	39.4	10.0	21.0	8.8	42.2	8.3	22.7				
Change Period (Y+Rc), s	5.0	* 5.3	4.5	* 5.3	5.0	* 5.3	4.5	* 5.3				
Max Green Setting (Gmax), s	10.0	* 34	5.5	* 20	10.0	* 34	5.1	* 21				
Max Q Clear Time (g_c+I1), s	6.6	28.0	7.5	6.4	3.7	8.9	4.3	16.2				
Green Ext Time (p_c), s	0.1	4.4	0.0	2.2	0.0	12.0	0.0	1.1				
Intersection Summary												
HCM 2010 Ctrl Delay			27.4									
HCM 2010 LOS			C									
Notes												
* HCM 2010 computational engine requires equal clearance times for the phases crossing the barrier.												

HCM 2010 Signalized Intersection Summary

3: Calumet & Main

11/6/2017

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	43	175	43	250	160	213	27	559	162	441	1152	24
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1863	1863	1863	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	56	188	54	379	184	266	35	658	225	538	1266	41
Adj No. of Lanes	1	1	1	1	1	1	1	2	0	1	2	0
Peak Hour Factor	0.77	0.93	0.80	0.66	0.87	0.80	0.77	0.85	0.72	0.82	0.91	0.59
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	278	278	236	328	385	694	219	707	242	514	1649	53
Arrive On Green	0.04	0.15	0.15	0.10	0.21	0.21	0.03	0.27	0.27	0.23	0.47	0.47
Sat Flow, veh/h	1774	1863	1583	1774	1863	1583	1774	2591	885	1774	3499	113
Grp Volume(v), veh/h	56	188	54	379	184	266	35	449	434	538	640	667
Grp Sat Flow(s),veh/h/ln	1774	1863	1583	1774	1863	1583	1774	1770	1706	1774	1770	1843
Q Serve(g_s), s	2.2	7.8	2.5	8.3	7.1	9.3	1.1	20.3	20.3	19.0	24.6	24.6
Cycle Q Clear(g_c), s	2.2	7.8	2.5	8.3	7.1	9.3	1.1	20.3	20.3	19.0	24.6	24.6
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.52	1.00		0.06
Lane Grp Cap(c), veh/h	278	278	236	328	385	694	219	483	466	514	834	868
V/C Ratio(X)	0.20	0.68	0.23	1.16	0.48	0.38	0.16	0.93	0.93	1.05	0.77	0.77
Avail Cap(c_a), veh/h	310	459	390	328	531	818	376	483	466	514	834	868
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	27.6	33.0	30.7	30.6	28.7	15.6	20.6	29.1	29.1	21.8	18.0	18.0
Incr Delay (d2), s/veh	0.4	2.9	0.5	98.7	0.9	0.3	0.3	26.8	27.5	52.1	6.7	6.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.1	4.2	1.1	12.4	3.8	4.1	0.6	13.5	13.1	19.0	13.5	14.0
LnGrp Delay(d),s/veh	28.0	35.9	31.2	129.2	29.6	15.9	20.9	55.8	56.6	73.9	24.7	24.5
LnGrp LOS	C	D	C	F	C	B	C	E	E	F	C	C
Approach Vol, veh/h		298			829			918			1845	
Approach Delay, s/veh		33.6			70.8			54.9			39.0	
Approach LOS		C			E			D			D	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	24.0	27.7	12.8	17.5	7.7	44.0	8.1	22.2				
Change Period (Y+Rc), s	5.0	* 5.3	4.5	* 5.3	5.0	* 5.3	4.5	* 5.3				
Max Green Setting (Gmax), s	19.0	* 22	8.3	* 20	10.0	* 31	5.1	* 23				
Max Q Clear Time (g_c+I1), s	21.0	22.3	10.3	9.8	3.1	26.6	4.2	11.3				
Green Ext Time (p_c), s	0.0	0.1	0.0	2.4	0.0	4.1	0.0	2.6				
Intersection Summary												
HCM 2010 Ctrl Delay			49.1									
HCM 2010 LOS			D									
Notes												
* HCM 2010 computational engine requires equal clearance times for the phases crossing the barrier.												

HCM Unsignalized Intersection Capacity Analysis

29: Treadway & Calumet

11/6/2017

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	1	51	1100	1	19	598
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.25	0.71	0.90	0.25	0.80	0.90
Hourly flow rate (vph)	4	72	1222	4	24	664
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1602	611			1226	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1602	611			1226	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	96	84			96	
cM capacity (veh/h)	92	437			564	
Direction, Lane #	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	76	611	611	4	245	443
Volume Left	4	0	0	0	24	0
Volume Right	72	0	0	4	0	0
cSH	365	1700	1700	1700	564	1700
Volume to Capacity	0.21	0.36	0.36	0.00	0.04	0.26
Queue Length 95th (ft)	19	0	0	0	3	0
Control Delay (s)	17.4	0.0	0.0	0.0	1.6	0.0
Lane LOS	C				A	
Approach Delay (s)	17.4	0.0			0.6	
Approach LOS	C					
Intersection Summary						
Average Delay			0.9			
Intersection Capacity Utilization			40.4%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

29: Treadway & Calumet

11/6/2017

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	1	40	825	13	99	1615
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.25	0.71	0.95	0.81	0.73	0.95
Hourly flow rate (vph)	4	56	868	16	136	1700
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			None			None
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1990	434			884	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1990	434			884	
tC, single (s)	6.8	6.9			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	91	90			82	
cM capacity (veh/h)	44	570			761	
Direction, Lane #	WB 1	NB 1	NB 2	NB 3	SB 1	SB 2
Volume Total	60	434	434	16	702	1133
Volume Left	4	0	0	0	136	0
Volume Right	56	0	0	16	0	0
cSH	316	1700	1700	1700	761	1700
Volume to Capacity	0.19	0.26	0.26	0.01	0.18	0.67
Queue Length 95th (ft)	17	0	0	0	16	0
Control Delay (s)	19.0	0.0	0.0	0.0	4.4	0.0
Lane LOS	C				A	
Approach Delay (s)	19.0	0.0			1.7	
Approach LOS	C					
Intersection Summary						
Average Delay			1.5			
Intersection Capacity Utilization			83.7%		ICU Level of Service	E
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

24: Calumet & Hagburg

11/6/2017

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	6	12	82	1070	605	34
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.50	0.75	0.79	0.92	1.00	0.61
Hourly flow rate (vph)	12	16	104	1163	605	56
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1394	302	661			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1394	302	661			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	90	98	89			
cM capacity (veh/h)	118	694	923			
Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	28	491	775	302	302	56
Volume Left	12	104	0	0	0	0
Volume Right	16	0	0	0	0	56
cSH	224	923	1700	1700	1700	1700
Volume to Capacity	0.13	0.11	0.46	0.18	0.18	0.03
Queue Length 95th (ft)	11	9	0	0	0	0
Control Delay (s)	23.4	3.1	0.0	0.0	0.0	0.0
Lane LOS	C	A				
Approach Delay (s)	23.4	1.2		0.0		
Approach LOS	C					
Intersection Summary						
Average Delay			1.1			
Intersection Capacity Utilization			62.0%		ICU Level of Service	B
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

24: Calumet & Hagburg

11/6/2017

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	10	75	17	810	1650	11
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.50	0.62	0.71	0.88	0.95	0.46
Hourly flow rate (vph)	20	121	24	920	1737	24
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2245	868	1761			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2245	868	1761			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	40	59	93			
cM capacity (veh/h)	33	295	351			
Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	141	331	614	868	868	24
Volume Left	20	24	0	0	0	0
Volume Right	121	0	0	0	0	24
cSH	139	351	1700	1700	1700	1700
Volume to Capacity	1.01	0.07	0.36	0.51	0.51	0.01
Queue Length 95th (ft)	185	5	0	0	0	0
Control Delay (s)	142.9	2.4	0.0	0.0	0.0	0.0
Lane LOS	F	A				
Approach Delay (s)	142.9	0.8		0.0		
Approach LOS	F					
Intersection Summary						
Average Delay			7.4			
Intersection Capacity Utilization			57.5%		ICU Level of Service	B
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

19: P. Singleton

11/6/2017

							
Movement	EBL	EBR	NBL	NBT	SBT	SBR	
Lane Configurations							
Volume (veh/h)	12	14	33	1040	625	109	
Sign Control	Stop			Free	Free		
Grade	0%			0%	0%		
Peak Hour Factor	0.75	0.70	0.75	0.90	0.87	0.70	
Hourly flow rate (vph)	16	20	44	1156	718	156	
Pedestrians							
Lane Width (ft)							
Walking Speed (ft/s)							
Percent Blockage							
Right turn flare (veh)							
Median type				None	None		
Median storage (veh)							
Upstream signal (ft)					890		
pX, platoon unblocked	0.92	0.92	0.92				
vC, conflicting volume	1384	359	874				
vC1, stage 1 conf vol							
vC2, stage 2 conf vol							
vCu, unblocked vol	1237	118	680				
tC, single (s)	6.8	6.9	4.1				
tC, 2 stage (s)							
tF (s)	3.5	3.3	2.2				
p0 queue free %	89	98	95				
cM capacity (veh/h)	146	835	832				
Direction, Lane #	EB 1	EB 2	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	16	20	429	770	359	359	156
Volume Left	16	0	44	0	0	0	0
Volume Right	0	20	0	0	0	0	156
cSH	146	835	832	1700	1700	1700	1700
Volume to Capacity	0.11	0.02	0.05	0.45	0.21	0.21	0.09
Queue Length 95th (ft)	9	2	4	0	0	0	0
Control Delay (s)	32.7	9.4	1.6	0.0	0.0	0.0	0.0
Lane LOS	D	A	A				
Approach Delay (s)	19.8		0.6		0.0		
Approach LOS	C						
Intersection Summary							
Average Delay			0.7				
Intersection Capacity Utilization			60.3%		ICU Level of Service		B
Analysis Period (min)			15				

HCM Unsignalized Intersection Capacity Analysis

19: P. Singleton

11/6/2017

							
Movement	EBL	EBR	NBL	NBT	SBT	SBR	
Lane Configurations							
Volume (veh/h)	34	25	20	810	1600	69	
Sign Control	Stop			Free	Free		
Grade	0%			0%	0%		
Peak Hour Factor	0.61	0.57	0.83	0.85	0.97	0.91	
Hourly flow rate (vph)	56	44	24	953	1649	76	
Pedestrians							
Lane Width (ft)							
Walking Speed (ft/s)							
Percent Blockage							
Right turn flare (veh)							
Median type				None	None		
Median storage (veh)							
Upstream signal (ft)					890		
pX, platoon unblocked	0.54	0.54	0.54				
vC, conflicting volume	2174	825	1725				
vC1, stage 1 conf vol							
vC2, stage 2 conf vol							
vCu, unblocked vol	1477	0	650				
tC, single (s)	6.8	6.9	4.1				
tC, 2 stage (s)							
tF (s)	3.5	3.3	2.2				
p0 queue free %	8	93	95				
cM capacity (veh/h)	60	588	506				
Direction, Lane #	EB 1	EB 2	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	56	44	342	635	825	825	76
Volume Left	56	0	24	0	0	0	0
Volume Right	0	44	0	0	0	0	76
cSH	60	588	506	1700	1700	1700	1700
Volume to Capacity	0.92	0.07	0.05	0.37	0.49	0.49	0.04
Queue Length 95th (ft)	107	6	4	0	0	0	0
Control Delay (s)	206.1	11.6	1.6	0.0	0.0	0.0	0.0
Lane LOS	F	B	A				
Approach Delay (s)	120.4		0.5		0.0		
Approach LOS	F						
Intersection Summary							
Average Delay			4.5				
Intersection Capacity Utilization			54.2%		ICU Level of Service		A
Analysis Period (min)			15				

HCM 2010 Signalized Intersection Summary

11: Columbia/Centennial

11/6/2017

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	285	0	2	6	0	12	2	1065	10	10	726	189
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1900	1863	1863	1900	1863	1863	1863
Adj Flow Rate, veh/h	335	0	4	12	0	16	8	1158	12	12	834	270
Adj No. of Lanes	1	1	0	1	1	0	1	2	0	1	2	1
Peak Hour Factor	0.85	0.92	0.50	0.50	0.25	0.75	0.25	0.92	0.83	0.83	0.87	0.70
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	541	0	461	553	0	461	353	1962	20	304	1935	866
Arrive On Green	0.29	0.00	0.29	0.29	0.00	0.29	0.55	0.55	0.55	0.55	0.55	0.55
Sat Flow, veh/h	1392	0	1583	1407	0	1583	509	3589	37	478	3539	1583
Grp Volume(v), veh/h	335	0	4	12	0	16	8	571	599	12	834	270
Grp Sat Flow(s),veh/h/ln	1392	0	1583	1407	0	1583	509	1770	1856	478	1770	1583
Q Serve(g_s), s	11.2	0.0	0.1	0.3	0.0	0.4	0.5	10.7	10.7	0.9	6.9	4.6
Cycle Q Clear(g_c), s	11.6	0.0	0.1	0.4	0.0	0.4	7.4	10.7	10.7	11.5	6.9	4.6
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.02	1.00		1.00
Lane Grp Cap(c), veh/h	541	0	461	553	0	461	353	968	1015	304	1935	866
V/C Ratio(X)	0.62	0.00	0.01	0.02	0.00	0.03	0.02	0.59	0.59	0.04	0.43	0.31
Avail Cap(c_a), veh/h	840	0	802	855	0	802	353	968	1015	304	1935	866
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	16.7	0.0	12.4	12.6	0.0	12.5	8.8	7.5	7.5	11.3	6.6	6.1
Incr Delay (d2), s/veh	1.2	0.0	0.0	0.0	0.0	0.0	0.1	2.6	2.5	0.2	0.7	0.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.5	0.0	0.0	0.1	0.0	0.2	0.1	5.8	6.0	0.1	3.4	2.2
LnGrp Delay(d),s/veh	17.8	0.0	12.4	12.6	0.0	12.6	8.9	10.1	10.0	11.6	7.3	7.1
LnGrp LOS	B		B	B		B	A	B	B	B	A	A
Approach Vol, veh/h	339			28			1178			1116		
Approach Delay, s/veh	17.8			12.6			10.1			7.3		
Approach LOS	B			B			B			A		
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	2			4			6			8		
Phs Duration (G+Y+Rc), s	31.0			18.4			31.0			18.4		
Change Period (Y+Rc), s	4.0			4.0			4.0			4.0		
Max Green Setting (Gmax), s	27.0			25.0			27.0			25.0		
Max Q Clear Time (g_c+I1), s	12.7			13.6			13.5			2.4		
Green Ext Time (p_c), s	10.8			0.9			10.3			1.1		
Intersection Summary												
HCM 2010 Ctrl Delay	9.9											
HCM 2010 LOS	A											

HCM 2010 Signalized Intersection Summary

11: Columbia/Centennial

11/6/2017

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	366	3	4	10	1	19	6	826	16	22	1584	500
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1900	1863	1863	1900	1863	1863	1863
Adj Flow Rate, veh/h	482	4	12	24	4	24	8	918	24	32	1650	538
Adj No. of Lanes	1	1	0	1	1	0	1	2	0	1	2	1
Peak Hour Factor	0.76	0.75	0.33	0.42	0.25	0.79	0.75	0.90	0.67	0.69	0.96	0.93
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	586	144	432	598	81	485	137	1821	48	325	1829	818
Arrive On Green	0.35	0.35	0.35	0.35	0.35	0.35	0.52	0.52	0.52	0.52	0.52	0.52
Sat Flow, veh/h	1377	411	1234	1392	231	1387	178	3524	92	593	3539	1583
Grp Volume(v), veh/h	482	0	16	24	0	28	8	461	481	32	1650	538
Grp Sat Flow(s),veh/h/ln	1377	0	1645	1392	0	1618	178	1770	1846	593	1770	1583
Q Serve(g_s), s	20.3	0.0	0.4	0.7	0.0	0.7	2.6	10.2	10.2	2.2	25.3	14.9
Cycle Q Clear(g_c), s	21.0	0.0	0.4	1.1	0.0	0.7	27.9	10.2	10.2	12.5	25.3	14.9
Prop In Lane	1.00		0.75	1.00		0.86	1.00		0.05	1.00		1.00
Lane Grp Cap(c), veh/h	586	0	576	598	0	566	137	914	954	325	1829	818
V/C Ratio(X)	0.82	0.00	0.03	0.04	0.00	0.05	0.06	0.50	0.50	0.10	0.90	0.66
Avail Cap(c_a), veh/h	586	0	576	598	0	566	137	914	954	325	1829	818
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	20.2	0.0	12.8	13.2	0.0	12.9	25.8	9.5	9.5	13.5	13.1	10.6
Incr Delay (d2), s/veh	9.2	0.0	0.0	0.0	0.0	0.0	0.8	2.0	1.9	0.6	7.7	4.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	9.4	0.0	0.2	0.3	0.0	0.3	0.2	5.4	5.6	0.4	14.1	7.4
LnGrp Delay(d),s/veh	29.4	0.0	12.8	13.2	0.0	12.9	26.6	11.5	11.4	14.2	20.9	14.7
LnGrp LOS	C		B	B		B	C	B	B	B	C	B
Approach Vol, veh/h	498				52		950				2220	
Approach Delay, s/veh	28.9				13.0		11.5				19.3	
Approach LOS	C				B		B				B	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	2		4		6		8					
Phs Duration (G+Y+Rc), s	35.0		25.0		35.0		25.0					
Change Period (Y+Rc), s	4.0		4.0		4.0		4.0					
Max Green Setting (Gmax), s	31.0		21.0		31.0		21.0					
Max Q Clear Time (g_c+I1), s	29.9		23.0		27.3		3.1					
Green Ext Time (p_c), s	1.1		0.0		3.5		1.8					
Intersection Summary												
HCM 2010 Ctrl Delay			18.5									
HCM 2010 LOS			B									

HCM Unsignalized Intersection Capacity Analysis

27: Otis Bowen

11/6/2017



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	W		W	W	W	
Volume (veh/h)	17	5	49	280	178	48
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.61	0.62	0.53	0.82	0.86	0.46
Hourly flow rate (vph)	28	8	92	341	207	104
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				TWLT	TWLT	
Median storage (veh)				2	2	
Upstream signal (ft)					1043	
pX, platoon unblocked						
vC, conflicting volume	786	259	311			
vC1, stage 1 conf vol	259					
vC2, stage 2 conf vol	526					
vCu, unblocked vol	786	259	311			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)	5.4					
tF (s)	3.5	3.3	2.2			
p0 queue free %	95	99	93			
cM capacity (veh/h)	508	779	1249			
Direction, Lane #	EB 1	NB 1	NB 2	SB 1		
Volume Total	36	92	341	311		
Volume Left	28	92	0	0		
Volume Right	8	0	0	104		
cSH	551	1249	1700	1700		
Volume to Capacity	0.07	0.07	0.20	0.18		
Queue Length 95th (ft)	5	6	0	0		
Control Delay (s)	12.0	8.1	0.0	0.0		
Lane LOS	B	A				
Approach Delay (s)	12.0	1.7		0.0		
Approach LOS	B					
Intersection Summary						
Average Delay			1.5			
Intersection Capacity Utilization			29.0%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

27: Otis Bowen

11/6/2017

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	60	38	8	333	487	20
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.68	0.53	0.67	0.80	0.87	0.55
Hourly flow rate (vph)	88	72	12	416	560	36
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				TWLTL	TWLTL	
Median storage (veh)				2	2	
Upstream signal (ft)					1043	
pX, platoon unblocked						
vC, conflicting volume	1018	578	596			
vC1, stage 1 conf vol	578					
vC2, stage 2 conf vol	440					
vCu, unblocked vol	1018	578	596			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)	5.4					
tF (s)	3.5	3.3	2.2			
p0 queue free %	81	86	99			
cM capacity (veh/h)	472	516	980			
Direction, Lane #	EB 1	NB 1	NB 2	SB 1		
Volume Total	160	12	416	596		
Volume Left	88	12	0	0		
Volume Right	72	0	0	36		
cSH	490	980	1700	1700		
Volume to Capacity	0.33	0.01	0.24	0.35		
Queue Length 95th (ft)	35	1	0	0		
Control Delay (s)	15.9	8.7	0.0	0.0		
Lane LOS	C	A				
Approach Delay (s)	15.9	0.2		0.0		
Approach LOS	C					
Intersection Summary						
Average Delay			2.2			
Intersection Capacity Utilization			39.2%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

18: P. Singleton

11/6/2017

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	3	28	302	12	17	150
Sign Control	Stop		Free		Free	Free
Grade	0%		0%			0%
Peak Hour Factor	0.37	0.70	0.82	0.60	0.71	0.71
Hourly flow rate (vph)	8	40	368	20	24	211
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			TWLT		TWLT	
Median storage veh			2		2	
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	637	378			388	
vC1, stage 1 conf vol	378					
vC2, stage 2 conf vol	259					
vCu, unblocked vol	637	378			388	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)	5.4					
tF (s)	3.5	3.3			2.2	
p0 queue free %	99	94			98	
cM capacity (veh/h)	612	668			1170	
Direction, Lane #	WB 1	NB 1	SB 1	SB 2		
Volume Total	48	388	24	211		
Volume Left	8	0	24	0		
Volume Right	40	20	0	0		
cSH	658	1700	1170	1700		
Volume to Capacity	0.07	0.23	0.02	0.12		
Queue Length 95th (ft)	6	0	2	0		
Control Delay (s)	10.9	0.0	8.1	0.0		
Lane LOS	B		A			
Approach Delay (s)	10.9	0.0	0.8			
Approach LOS	B					
Intersection Summary						
Average Delay		1.1				
Intersection Capacity Utilization		26.6%		ICU Level of Service	A	
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

18: P. Singleton

11/6/2017

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	37	74	257	24	16	466
Sign Control	Stop		Free		Free	Free
Grade	0%		0%			0%
Peak Hour Factor	0.37	0.70	0.82	0.60	0.71	0.71
Hourly flow rate (vph)	100	106	313	40	23	656
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			TWLT		TWLT	
Median storage veh			2		2	
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1035	333			353	
vC1, stage 1 conf vol	333					
vC2, stage 2 conf vol	701					
vCu, unblocked vol	1035	333			353	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)	5.4					
tF (s)	3.5	3.3			2.2	
p0 queue free %	77	85			98	
cM capacity (veh/h)	440	708			1205	
Direction, Lane #	WB 1	NB 1	SB 1	SB 2		
Volume Total	206	353	23	656		
Volume Left	100	0	23	0		
Volume Right	106	40	0	0		
cSH	547	1700	1205	1700		
Volume to Capacity	0.38	0.21	0.02	0.39		
Queue Length 95th (ft)	43	0	1	0		
Control Delay (s)	15.5	0.0	8.0	0.0		
Lane LOS	C		A			
Approach Delay (s)	15.5	0.0	0.3			
Approach LOS	C					
Intersection Summary						
Average Delay		2.7				
Intersection Capacity Utilization		37.8%		ICU Level of Service		A
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

20: Columbia & McClaughry

11/6/2017

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Volume (veh/h)	13	2	4	6	1	10	17	288	43	26	115	13	
Sign Control	Stop			Stop			Free			Free			
Grade	0%			0%			0%			0%			
Peak Hour Factor	0.81	0.50	0.33	0.75	0.25	0.42	0.85	0.85	0.63	0.59	0.93	0.54	
Hourly flow rate (vph)	16	4	12	8	4	24	20	339	68	44	124	24	
Pedestrians													
Lane Width (ft)													
Walking Speed (ft/s)													
Percent Blockage													
Right turn flare (veh)													
Median type							TWLTL		TWLTL				
Median storage (veh)							2		2				
Upstream signal (ft)													
pX, platoon unblocked													
vC, conflicting volume	628	671	136	639	649	373	148						407
vC1, stage 1 conf vol	224	224		413	413								
vC2, stage 2 conf vol	405	447		226	236								
vCu, unblocked vol	628	671	136	639	649	373	148						407
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1						4.1
tC, 2 stage (s)	6.1	5.5		6.1	5.5								
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2						2.2
p0 queue free %	97	99	99	99	99	96	99						96
cM capacity (veh/h)	508	487	913	541	521	673	1434						1152
Direction, Lane #	EB 1	EB 2	WB 1	NB 1	NB 2	SB 1	SB 2						
Volume Total	16	16	36	20	407	44	148						
Volume Left	16	0	8	20	0	44	0						
Volume Right	0	12	24	0	68	0	24						
cSH	508	750	619	1434	1700	1152	1700						
Volume to Capacity	0.03	0.02	0.06	0.01	0.24	0.04	0.09						
Queue Length 95th (ft)	2	2	5	1	0	3	0						
Control Delay (s)	12.3	9.9	11.2	7.5	0.0	8.3	0.0						
Lane LOS	B	A	B	A	A								
Approach Delay (s)	11.1	11.2		0.4	1.9								
Approach LOS	B	B											
Intersection Summary													
Average Delay	1.9												
Intersection Capacity Utilization	34.7%			ICU Level of Service			A						
Analysis Period (min)	15												

HCM Unsignalized Intersection Capacity Analysis

20: Columbia & McClaughry

11/6/2017

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	10	2	25	58	3	52	10	228	8	6	490	5
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.62	0.25	0.62	0.54	0.75	0.59	0.83	0.97	0.67	0.75	0.83	0.62
Hourly flow rate (vph)	16	8	40	107	4	88	12	235	12	8	590	8
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								TWLTL			TWLTL	
Median storage veh								2			2	
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	960	881	594	916	880	241	598			247		
vC1, stage 1 conf vol	610	610		265	265							
vC2, stage 2 conf vol	349	271		651	614							
vCu, unblocked vol	960	881	594	916	880	241	598			247		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)	6.1	5.5		6.1	5.5							
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	96	98	92	71	99	89	99			99		
cM capacity (veh/h)	403	441	505	376	433	798	978			1319		
Direction, Lane #	EB 1	EB 2	WB 1	NB 1	NB 2	SB 1	SB 2					
Volume Total	16	48	200	12	247	8	598					
Volume Left	16	0	107	12	0	8	0					
Volume Right	0	40	88	0	12	0	8					
cSH	403	493	493	978	1700	1319	1700					
Volume to Capacity	0.04	0.10	0.41	0.01	0.15	0.01	0.35					
Queue Length 95th (ft)	3	8	49	1	0	0	0					
Control Delay (s)	14.3	13.1	17.2	8.7	0.0	7.7	0.0					
Lane LOS	B	B	C	A		A						
Approach Delay (s)	13.4		17.2	0.4		0.1						
Approach LOS	B		C									
Intersection Summary												
Average Delay			4.0									
Intersection Capacity Utilization			46.0%		ICU Level of Service					A		
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

25: Columbia & Donna

11/6/2017

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	11	8	5	337	120	5
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	12	9	5	366	130	5
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				TWLTL	TWLTL	
Median storage veh				2	2	
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	510	133	136			
vC1, stage 1 conf vol	133					
vC2, stage 2 conf vol	377					
vCu, unblocked vol	510	133	136			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)	5.4					
tF (s)	3.5	3.3	2.2			
p0 queue free %	98	99	100			
cM capacity (veh/h)	654	916	1448			
Direction, Lane #	EB 1	NB 1	NB 2	SB 1		
Volume Total	21	5	366	136		
Volume Left	12	5	0	0		
Volume Right	9	0	0	5		
cSH	743	1448	1700	1700		
Volume to Capacity	0.03	0.00	0.22	0.08		
Queue Length 95th (ft)	2	0	0	0		
Control Delay (s)	10.0	7.5	0.0	0.0		
Lane LOS	A	A				
Approach Delay (s)	10.0	0.1		0.0		
Approach LOS	A					
Intersection Summary						
Average Delay			0.5			
Intersection Capacity Utilization			27.7%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

25: Columbia & Donna

11/6/2017

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	5	3	5	240	450	30
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	3	5	261	489	33
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				TWLTL	TWLTL	
Median storage (veh)				2	2	
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	777	505	522			
vC1, stage 1 conf vol	505					
vC2, stage 2 conf vol	272					
vCu, unblocked vol	777	505	522			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)	5.4					
tF (s)	3.5	3.3	2.2			
p0 queue free %	99	99	99			
cM capacity (veh/h)	548	567	1045			
Direction, Lane #	EB 1	NB 1	NB 2	SB 1		
Volume Total	9	5	261	522		
Volume Left	5	5	0	0		
Volume Right	3	0	0	33		
cSH	555	1045	1700	1700		
Volume to Capacity	0.02	0.01	0.15	0.31		
Queue Length 95th (ft)	1	0	0	0		
Control Delay (s)	11.6	8.5	0.0	0.0		
Lane LOS	B	A				
Approach Delay (s)	11.6	0.2		0.0		
Approach LOS	B					
Intersection Summary						
Average Delay			0.2			
Intersection Capacity Utilization			35.5%	ICU Level of Service		A
Analysis Period (min)			15			

HCM 2010 Signalized Intersection Summary

5: Main & Columbia

11/6/2017

								
Movement	WBL	WBR	NBT	NBR	SBL	SBT		
Lane Configurations								
Volume (veh/h)	114	55	287	93	9	119		
Number	3	18	2	12	1	6		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln	1863	1863	1863	1900	1863	1863		
Adj Flow Rate, veh/h	124	68	359	112	12	132		
Adj No. of Lanes	1	1	1	0	1	1		
Peak Hour Factor	0.92	0.81	0.80	0.83	0.75	0.90		
Percent Heavy Veh, %	2	2	2	2	2	2		
Cap, veh/h	196	175	970	303	719	1326		
Arrive On Green	0.11	0.11	0.71	0.71	0.71	0.71		
Sat Flow, veh/h	1774	1583	1363	425	919	1863		
Grp Volume(v), veh/h	124	68	0	471	12	132		
Grp Sat Flow(s),veh/h/ln	1774	1583	0	1788	919	1863		
Q Serve(g_s), s	3.0	1.8	0.0	4.6	0.2	1.0		
Cycle Q Clear(g_c), s	3.0	1.8	0.0	4.6	4.9	1.0		
Prop In Lane	1.00	1.00		0.24	1.00			
Lane Grp Cap(c), veh/h	196	175	0	1273	719	1326		
V/C Ratio(X)	0.63	0.39	0.00	0.37	0.02	0.10		
Avail Cap(c_a), veh/h	789	704	0	1273	719	1326		
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	1.00		
Uniform Delay (d), s/veh	19.1	18.6	0.0	2.5	3.5	2.0		
Incr Delay (d2), s/veh	3.4	1.4	0.0	0.8	0.0	0.2		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	1.6	0.8	0.0	2.5	0.1	0.5		
LnGrp Delay(d),s/veh	22.5	20.0	0.0	3.4	3.5	2.2		
LnGrp LOS	C	C		A	A	A		
Approach Vol, veh/h	192		471			144		
Approach Delay, s/veh	21.6		3.4			2.3		
Approach LOS	C		A			A		
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2				6		8
Phs Duration (G+Y+Rc), s		36.0				36.0		9.0
Change Period (Y+Rc), s		4.0				4.0		4.0
Max Green Setting (Gmax), s		32.0				32.0		20.0
Max Q Clear Time (g_c+l1), s		6.6				6.9		5.0
Green Ext Time (p_c), s		4.0				4.0		0.4
Intersection Summary								
HCM 2010 Ctrl Delay			7.5					
HCM 2010 LOS			A					

HCM 2010 Signalized Intersection Summary

5: Main & Columbia

11/6/2017

								
Movement	WBL	WBR	NBT	NBR	SBL	SBT		
Lane Configurations								
Volume (veh/h)	170	28	195	177	65	362		
Number	3	18	2	12	1	6		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln	1863	1863	1863	1900	1863	1863		
Adj Flow Rate, veh/h	185	35	244	213	87	402		
Adj No. of Lanes	1	1	1	0	1	1		
Peak Hour Factor	0.92	0.81	0.80	0.83	0.75	0.90		
Percent Heavy Veh, %	2	2	2	2	2	2		
Cap, veh/h	256	228	629	549	685	1275		
Arrive On Green	0.14	0.14	0.68	0.68	0.68	0.68		
Sat Flow, veh/h	1774	1583	919	802	931	1863		
Grp Volume(v), veh/h	185	35	0	457	87	402		
Grp Sat Flow(s),veh/h/ln	1774	1583	0	1721	931	1863		
Q Serve(g_s), s	4.7	0.9	0.0	5.3	2.1	4.1		
Cycle Q Clear(g_c), s	4.7	0.9	0.0	5.3	7.4	4.1		
Prop In Lane	1.00	1.00		0.47	1.00			
Lane Grp Cap(c), veh/h	256	228	0	1178	685	1275		
V/C Ratio(X)	0.72	0.15	0.00	0.39	0.13	0.32		
Avail Cap(c_a), veh/h	759	678	0	1178	685	1275		
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	1.00		
Uniform Delay (d), s/veh	19.1	17.5	0.0	3.2	4.8	3.0		
Incr Delay (d2), s/veh	3.9	0.3	0.0	1.0	0.4	0.6		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	2.5	0.4	0.0	2.7	0.6	2.2		
LnGrp Delay(d),s/veh	23.0	17.8	0.0	4.1	5.1	3.6		
LnGrp LOS	C	B		A	A	A		
Approach Vol, veh/h	220		457			489		
Approach Delay, s/veh	22.1		4.1			3.9		
Approach LOS	C		A			A		
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2				6		8
Phs Duration (G+Y+Rc), s		36.0				36.0		10.7
Change Period (Y+Rc), s		4.0				4.0		4.0
Max Green Setting (Gmax), s		32.0				32.0		20.0
Max Q Clear Time (g_c+l1), s		7.3				9.4		6.7
Green Ext Time (p_c), s		6.4				6.2		0.5
Intersection Summary								
HCM 2010 Ctrl Delay			7.4					
HCM 2010 LOS			A					

HCM 2010 Signalized Intersection Summary

3: Calumet & Main

11/6/2017

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	49	108	16	140	130	250	59	900	141	147	401	19
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1863	1863	1863	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	64	116	20	212	149	312	77	1059	196	179	441	32
Adj No. of Lanes	1	1	1	1	1	1	1	2	0	1	2	0
Peak Hour Factor	0.77	0.93	0.80	0.66	0.87	0.80	0.77	0.85	0.72	0.82	0.91	0.59
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	303	351	298	379	393	463	509	1240	229	273	1493	108
Arrive On Green	0.05	0.19	0.19	0.07	0.21	0.21	0.05	0.42	0.42	0.08	0.45	0.45
Sat Flow, veh/h	1774	1863	1583	1774	1863	1583	1774	2984	551	1774	3348	242
Grp Volume(v), veh/h	64	116	20	212	149	312	77	627	628	179	232	241
Grp Sat Flow(s),veh/h/ln	1774	1863	1583	1774	1863	1583	1774	1770	1766	1774	1770	1820
Q Serve(g_s), s	2.3	4.4	0.9	5.7	5.6	14.2	2.0	26.2	26.4	4.6	6.9	6.9
Cycle Q Clear(g_c), s	2.3	4.4	0.9	5.7	5.6	14.2	2.0	26.2	26.4	4.6	6.9	6.9
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.31	1.00		0.13
Lane Grp Cap(c), veh/h	303	351	298	379	393	463	509	735	733	273	789	812
V/C Ratio(X)	0.21	0.33	0.07	0.56	0.38	0.67	0.15	0.85	0.86	0.66	0.29	0.30
Avail Cap(c_a), veh/h	344	460	391	379	460	519	636	735	733	345	789	812
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	24.9	28.8	27.3	27.1	27.7	25.5	12.3	21.7	21.7	17.7	14.5	14.5
Incr Delay (d2), s/veh	0.3	0.5	0.1	1.8	0.6	3.0	0.1	12.0	12.3	3.0	0.9	0.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.2	2.3	0.4	1.8	3.0	6.5	1.0	15.2	15.2	2.4	3.6	3.7
LnGrp Delay(d),s/veh	25.3	29.3	27.4	29.0	28.3	28.5	12.5	33.7	34.0	20.8	15.4	15.4
LnGrp LOS	C	C	C	C	C	C	B	C	C	C	B	B
Approach Vol, veh/h		200			673			1332			652	
Approach Delay, s/veh		27.8			28.6			32.6			16.9	
Approach LOS		C			C			C			B	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	11.6	39.3	10.2	20.7	9.1	41.8	8.3	22.6				
Change Period (Y+Rc), s	5.0	* 5.3	4.5	* 5.3	5.0	* 5.3	4.5	* 5.3				
Max Green Setting (Gmax), s	10.0	* 34	5.7	* 20	10.0	* 34	5.7	* 20				
Max Q Clear Time (g_c+I1), s	6.6	28.4	7.7	6.4	4.0	8.9	4.3	16.2				
Green Ext Time (p_c), s	0.1	4.1	0.0	2.2	0.1	12.1	0.0	1.1				
Intersection Summary												
HCM 2010 Ctrl Delay			27.7									
HCM 2010 LOS			C									
Notes												
* HCM 2010 computational engine requires equal clearance times for the phases crossing the barrier.												

HCM 2010 Signalized Intersection Summary

3: Calumet & Main

11/6/2017

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	43	180	48	250	165	215	27	562	162	441	1167	24
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1863	1863	1863	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	56	194	60	379	190	269	35	661	225	538	1282	41
Adj No. of Lanes	1	1	1	1	1	1	1	2	0	1	2	0
Peak Hour Factor	0.77	0.93	0.80	0.66	0.87	0.80	0.77	0.85	0.72	0.82	0.91	0.59
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	276	284	242	327	390	697	214	705	240	511	1642	52
Arrive On Green	0.04	0.15	0.15	0.10	0.21	0.21	0.03	0.27	0.27	0.23	0.47	0.47
Sat Flow, veh/h	1774	1863	1583	1774	1863	1583	1774	2594	883	1774	3501	112
Grp Volume(v), veh/h	56	194	60	379	190	269	35	451	435	538	648	675
Grp Sat Flow(s),veh/h/ln	1774	1863	1583	1774	1863	1583	1774	1770	1707	1774	1770	1843
Q Serve(g_s), s	2.2	8.1	2.7	8.3	7.4	9.4	1.2	20.5	20.5	19.0	25.2	25.3
Cycle Q Clear(g_c), s	2.2	8.1	2.7	8.3	7.4	9.4	1.2	20.5	20.5	19.0	25.2	25.3
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.52	1.00		0.06
Lane Grp Cap(c), veh/h	276	284	242	327	390	697	214	481	464	511	830	865
V/C Ratio(X)	0.20	0.68	0.25	1.16	0.49	0.39	0.16	0.94	0.94	1.05	0.78	0.78
Avail Cap(c_a), veh/h	308	457	388	327	529	815	370	481	464	511	830	865
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	27.5	33.0	30.7	30.5	28.7	15.5	20.8	29.3	29.3	22.0	18.3	18.3
Incr Delay (d2), s/veh	0.4	2.9	0.5	100.5	0.9	0.4	0.4	28.0	28.7	54.5	7.2	6.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.1	4.4	1.2	12.5	3.9	4.2	0.6	13.8	13.4	19.2	13.9	14.4
LnGrp Delay(d),s/veh	27.9	35.9	31.3	131.1	29.6	15.9	21.2	57.2	58.0	76.5	25.5	25.3
LnGrp LOS	C	D	C	F	C	B	C	E	E	F	C	C
Approach Vol, veh/h		310			838			921			1861	
Approach Delay, s/veh		33.6			71.1			56.2			40.1	
Approach LOS		C			E			E			D	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	24.0	27.7	12.8	17.9	7.8	43.9	8.1	22.6				
Change Period (Y+Rc), s	5.0	* 5.3	4.5	* 5.3	5.0	* 5.3	4.5	* 5.3				
Max Green Setting (Gmax), s	19.0	* 22	8.3	* 20	10.0	* 31	5.1	* 23				
Max Q Clear Time (g_c+I1), s	21.0	22.5	10.3	10.1	3.2	27.3	4.2	11.4				
Green Ext Time (p_c), s	0.0	0.0	0.0	2.5	0.0	3.6	0.0	2.7				
Intersection Summary												
HCM 2010 Ctrl Delay			50.0									
HCM 2010 LOS			D									
Notes												
* HCM 2010 computational engine requires equal clearance times for the phases crossing the barrier.												

HCM Unsignalized Intersection Capacity Analysis

29: Treadway & Calumet

12/28/2017

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	3	0	5	1	1	51	15	1100	1	19	598	11
Sign Control	Stop			Stop			Free			Free		
Grade	0%			0%			0%			0%		
Peak Hour Factor	0.92	0.92	0.92	0.25	0.92	0.71	0.92	0.90	0.25	0.80	0.90	0.92
Hourly flow rate (vph)	3	0	5	4	1	72	16	1222	4	24	664	12
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type							None			None		
Median storage veh												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1434	1977	338	1640	1979	611	676				1226	
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1434	1977	338	1640	1979	611	676				1226	
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1				4.1	
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2				2.2	
p0 queue free %	96	100	99	94	98	84	98				96	
cM capacity (veh/h)	74	58	658	63	57	437	911				564	
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	NB 3	NB 4	SB 1	SB 2	SB 3	
Volume Total	3	5	4	73	16	611	611	4	24	443	233	
Volume Left	3	0	4	0	16	0	0	0	24	0	0	
Volume Right	0	5	0	72	0	0	0	4	0	0	12	
cSH	74	658	63	398	911	1700	1700	1700	564	1700	1700	
Volume to Capacity	0.04	0.01	0.06	0.18	0.02	0.36	0.36	0.00	0.04	0.26	0.14	
Queue Length 95th (ft)	3	1	5	17	1	0	0	0	3	0	0	
Control Delay (s)	55.7	10.5	66.3	16.1	9.0	0.0	0.0	0.0	11.7	0.0	0.0	
Lane LOS	F	B	F	C	A				B			
Approach Delay (s)	27.5	18.7		0.1			0.4					
Approach LOS	D	C										
Intersection Summary												
Average Delay	1.0											
Intersection Capacity Utilization	40.4%			ICU Level of Service			A					
Analysis Period (min)	15											

HCM Unsignalized Intersection Capacity Analysis

29: Treadway & Calumet

12/28/2017

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	10	0	26	1	0	40	5	825	13	99	1615	6
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.25	0.92	0.71	0.92	0.95	0.81	0.73	0.95	0.92
Hourly flow rate (vph)	11	0	28	4	0	56	5	868	16	136	1700	7
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								None			None	
Median storage (veh)												
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	2476	2870	853	2029	2857	434	1707			884		
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	2476	2870	853	2029	2857	434	1707			884		
tC, single (s)	7.5	6.5	6.9	7.5	6.5	6.9	4.1			4.1		
tC, 2 stage (s)												
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	7	100	91	85	100	90	99			82		
cM capacity (veh/h)	12	13	302	26	13	570	368			761		
Direction, Lane #	EB 1	EB 2	WB 1	WB 2	NB 1	NB 2	NB 3	NB 4	SB 1	SB 2	SB 3	
Volume Total	11	28	4	56	5	434	434	16	136	1133	573	
Volume Left	11	0	4	0	5	0	0	0	136	0	0	
Volume Right	0	28	0	56	0	0	0	16	0	0	7	
cSH	12	302	26	570	368	1700	1700	1700	761	1700	1700	
Volume to Capacity	0.93	0.09	0.15	0.10	0.01	0.26	0.26	0.01	0.18	0.67	0.34	
Queue Length 95th (ft)	49	8	12	8	1	0	0	0	16	0	0	
Control Delay (s)	655.9	18.1	167.3	12.0	14.9	0.0	0.0	0.0	10.8	0.0	0.0	
Lane LOS	F	C	F	B	B				B			
Approach Delay (s)	195.3		22.3		0.1				0.8			
Approach LOS	F		C									
Intersection Summary												
Average Delay			3.7									
Intersection Capacity Utilization			65.4%		ICU Level of Service				C			
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

24: Calumet & Hagburg

11/6/2017

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	6	12	82	1073	615	34
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.50	0.75	0.79	0.92	1.00	0.61
Hourly flow rate (vph)	12	16	104	1166	615	56
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1406	308	671			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1406	308	671			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	90	98	89			
cM capacity (veh/h)	115	688	916			
Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	28	493	778	308	308	56
Volume Left	12	104	0	0	0	0
Volume Right	16	0	0	0	0	56
cSH	220	916	1700	1700	1700	1700
Volume to Capacity	0.13	0.11	0.46	0.18	0.18	0.03
Queue Length 95th (ft)	11	10	0	0	0	0
Control Delay (s)	23.7	3.1	0.0	0.0	0.0	0.0
Lane LOS	C	A				
Approach Delay (s)	23.7	1.2		0.0		
Approach LOS	C					
Intersection Summary						
Average Delay			1.1			
Intersection Capacity Utilization			62.4%		ICU Level of Service	B
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

24: Calumet & Hagburg

11/6/2017

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	10	75	17	820	1655	11
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.50	0.62	0.71	0.88	0.95	0.46
Hourly flow rate (vph)	20	121	24	932	1742	24
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2256	871	1766			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2256	871	1766			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	38	59	93			
cM capacity (veh/h)	32	294	349			
Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	141	335	621	871	871	24
Volume Left	20	24	0	0	0	0
Volume Right	121	0	0	0	0	24
cSH	137	349	1700	1700	1700	1700
Volume to Capacity	1.03	0.07	0.37	0.51	0.51	0.01
Queue Length 95th (ft)	188	5	0	0	0	0
Control Delay (s)	147.5	2.4	0.0	0.0	0.0	0.0
Lane LOS	F	A				
Approach Delay (s)	147.5	0.8		0.0		
Approach LOS	F					
Intersection Summary						
Average Delay			7.5			
Intersection Capacity Utilization			57.6%		ICU Level of Service	B
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

19: P. Singleton

11/6/2017

							
Movement	EBL	EBR	NBL	NBT	SBT	SBR	
Lane Configurations							
Volume (veh/h)	12	14	33	1043	630	109	
Sign Control	Stop			Free	Free		
Grade	0%			0%	0%		
Peak Hour Factor	0.75	0.70	0.75	0.90	0.87	0.70	
Hourly flow rate (vph)	16	20	44	1159	724	156	
Pedestrians							
Lane Width (ft)							
Walking Speed (ft/s)							
Percent Blockage							
Right turn flare (veh)							
Median type				None	None		
Median storage (veh)							
Upstream signal (ft)					890		
pX, platoon unblocked	0.91	0.91	0.91				
vC, conflicting volume	1392	362	880				
vC1, stage 1 conf vol							
vC2, stage 2 conf vol							
vCu, unblocked vol	1238	110	677				
tC, single (s)	6.8	6.9	4.1				
tC, 2 stage (s)							
tF (s)	3.5	3.3	2.2				
p0 queue free %	89	98	95				
cM capacity (veh/h)	145	842	831				
Direction, Lane #	EB 1	EB 2	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	16	20	430	773	362	362	156
Volume Left	16	0	44	0	0	0	0
Volume Right	0	20	0	0	0	0	156
cSH	145	842	831	1700	1700	1700	1700
Volume to Capacity	0.11	0.02	0.05	0.45	0.21	0.21	0.09
Queue Length 95th (ft)	9	2	4	0	0	0	0
Control Delay (s)	32.9	9.4	1.6	0.0	0.0	0.0	0.0
Lane LOS	D	A	A				
Approach Delay (s)	19.8		0.6		0.0		
Approach LOS	C						
Intersection Summary							
Average Delay			0.7				
Intersection Capacity Utilization			60.5%		ICU Level of Service		B
Analysis Period (min)			15				

HCM Unsignalized Intersection Capacity Analysis

19: P. Singleton

11/6/2017

							
Movement	EBL	EBR	NBL	NBT	SBT	SBR	
Lane Configurations							
Volume (veh/h)	34	25	20	820	1605	69	
Sign Control	Stop			Free	Free		
Grade	0%			0%	0%		
Peak Hour Factor	0.61	0.57	0.83	0.85	0.97	0.91	
Hourly flow rate (vph)	56	44	24	965	1655	76	
Pedestrians							
Lane Width (ft)							
Walking Speed (ft/s)							
Percent Blockage							
Right turn flare (veh)							
Median type				None	None		
Median storage (veh)							
Upstream signal (ft)					890		
pX, platoon unblocked	0.54	0.54	0.54				
vC, conflicting volume	2185	827	1730				
vC1, stage 1 conf vol							
vC2, stage 2 conf vol							
vCu, unblocked vol	1495	0	656				
tC, single (s)	6.8	6.9	4.1				
tC, 2 stage (s)							
tF (s)	3.5	3.3	2.2				
p0 queue free %	5	93	95				
cM capacity (veh/h)	59	587	502				
Direction, Lane #	EB 1	EB 2	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	56	44	346	643	827	827	76
Volume Left	56	0	24	0	0	0	0
Volume Right	0	44	0	0	0	0	76
cSH	59	587	502	1700	1700	1700	1700
Volume to Capacity	0.95	0.07	0.05	0.38	0.49	0.49	0.04
Queue Length 95th (ft)	110	6	4	0	0	0	0
Control Delay (s)	218.2	11.6	1.6	0.0	0.0	0.0	0.0
Lane LOS	F	B	A				
Approach Delay (s)	127.2		0.5		0.0		
Approach LOS	F						
Intersection Summary							
Average Delay			4.7				
Intersection Capacity Utilization			54.4%		ICU Level of Service		A
Analysis Period (min)			15				

HCM 2010 Signalized Intersection Summary

11: Columbia/Centennial

11/6/2017

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	285	0	2	6	0	12	2	1068	10	10	735	194
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1900	1863	1863	1900	1863	1863	1863
Adj Flow Rate, veh/h	335	0	4	12	0	16	8	1161	12	12	845	277
Adj No. of Lanes	1	1	0	1	1	0	1	2	0	1	2	1
Peak Hour Factor	0.85	0.92	0.50	0.50	0.25	0.75	0.25	0.92	0.83	0.83	0.87	0.70
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	541	0	461	553	0	461	348	1962	20	303	1935	866
Arrive On Green	0.29	0.00	0.29	0.29	0.00	0.29	0.55	0.55	0.55	0.55	0.55	0.55
Sat Flow, veh/h	1392	0	1583	1407	0	1583	500	3589	37	476	3539	1583
Grp Volume(v), veh/h	335	0	4	12	0	16	8	572	601	12	845	277
Grp Sat Flow(s),veh/h/ln	1392	0	1583	1407	0	1583	500	1770	1856	476	1770	1583
Q Serve(g_s), s	11.2	0.0	0.1	0.3	0.0	0.4	0.5	10.7	10.7	0.9	7.0	4.7
Cycle Q Clear(g_c), s	11.6	0.0	0.1	0.4	0.0	0.4	7.5	10.7	10.7	11.6	7.0	4.7
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.02	1.00		1.00
Lane Grp Cap(c), veh/h	541	0	461	553	0	461	348	968	1015	303	1935	866
V/C Ratio(X)	0.62	0.00	0.01	0.02	0.00	0.03	0.02	0.59	0.59	0.04	0.44	0.32
Avail Cap(c_a), veh/h	840	0	802	855	0	802	348	968	1015	303	1935	866
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	16.7	0.0	12.4	12.6	0.0	12.5	8.9	7.5	7.5	11.4	6.7	6.1
Incr Delay (d2), s/veh	1.2	0.0	0.0	0.0	0.0	0.0	0.1	2.7	2.5	0.2	0.7	1.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.5	0.0	0.0	0.1	0.0	0.2	0.1	5.8	6.1	0.1	3.6	2.2
LnGrp Delay(d),s/veh	17.8	0.0	12.4	12.6	0.0	12.6	9.0	10.2	10.0	11.6	7.4	7.1
LnGrp LOS	B		B	B		B	A	B	B	B	A	A
Approach Vol, veh/h	339			28			1181			1134		
Approach Delay, s/veh	17.8			12.6			10.1			7.4		
Approach LOS	B			B			B			A		
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	2			4			6			8		
Phs Duration (G+Y+Rc), s	31.0			18.4			31.0			18.4		
Change Period (Y+Rc), s	4.0			4.0			4.0			4.0		
Max Green Setting (Gmax), s	27.0			25.0			27.0			25.0		
Max Q Clear Time (g_c+l1), s	12.7			13.6			13.6			2.4		
Green Ext Time (p_c), s	10.9			0.9			10.3			1.1		
Intersection Summary												
HCM 2010 Ctrl Delay	9.9											
HCM 2010 LOS	A											

HCM 2010 Signalized Intersection Summary

11: Columbia/Centennial

11/6/2017

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	381	3	4	10	1	19	6	836	16	22	1590	505
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1900	1863	1863	1900	1863	1863	1863
Adj Flow Rate, veh/h	501	4	12	24	4	24	8	929	24	32	1656	543
Adj No. of Lanes	1	1	0	1	1	0	1	2	0	1	2	1
Peak Hour Factor	0.76	0.75	0.33	0.42	0.25	0.79	0.75	0.90	0.67	0.69	0.96	0.93
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	586	144	432	598	81	485	136	1821	47	322	1829	818
Arrive On Green	0.35	0.35	0.35	0.35	0.35	0.35	0.52	0.52	0.52	0.52	0.52	0.52
Sat Flow, veh/h	1377	411	1234	1392	231	1387	176	3525	91	586	3539	1583
Grp Volume(v), veh/h	501	0	16	24	0	28	8	466	487	32	1656	543
Grp Sat Flow(s),veh/h/ln	1377	0	1645	1392	0	1618	176	1770	1847	586	1770	1583
Q Serve(g_s), s	20.3	0.0	0.4	0.7	0.0	0.7	2.6	10.4	10.4	2.3	25.5	15.1
Cycle Q Clear(g_c), s	21.0	0.0	0.4	1.1	0.0	0.7	28.1	10.4	10.4	12.6	25.5	15.1
Prop In Lane	1.00		0.75	1.00		0.86	1.00		0.05	1.00		1.00
Lane Grp Cap(c), veh/h	586	0	576	598	0	566	136	914	954	322	1829	818
V/C Ratio(X)	0.85	0.00	0.03	0.04	0.00	0.05	0.06	0.51	0.51	0.10	0.91	0.66
Avail Cap(c_a), veh/h	586	0	576	598	0	566	136	914	954	322	1829	818
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	20.6	0.0	12.8	13.2	0.0	12.9	25.9	9.5	9.5	13.7	13.2	10.7
Incr Delay (d2), s/veh	11.8	0.0	0.0	0.0	0.0	0.0	0.8	2.0	1.9	0.6	8.0	4.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	10.1	0.0	0.2	0.3	0.0	0.3	0.2	5.6	5.8	0.4	14.2	7.4
LnGrp Delay(d),s/veh	32.4	0.0	12.8	13.2	0.0	12.9	26.8	11.5	11.5	14.3	21.1	14.9
LnGrp LOS	C		B	B		B	C	B	B	B	C	B
Approach Vol, veh/h		517			52			961			2231	
Approach Delay, s/veh		31.8			13.0			11.6			19.5	
Approach LOS		C			B			B			B	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		35.0		25.0		35.0		25.0				
Change Period (Y+Rc), s		4.0		4.0		4.0		4.0				
Max Green Setting (Gmax), s		31.0		21.0		31.0		21.0				
Max Q Clear Time (g_c+l1), s		30.1		23.0		27.5		3.1				
Green Ext Time (p_c), s		0.9		0.0		3.4		1.9				
Intersection Summary												
HCM 2010 Ctrl Delay			19.1									
HCM 2010 LOS			B									

HCM Unsignalized Intersection Capacity Analysis

27: Otis Bowen

11/6/2017

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	17	5	49	280	183	48
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.61	0.62	0.53	0.82	0.86	0.46
Hourly flow rate (vph)	28	8	92	341	213	104
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				TWLT	TWLT	
Median storage (veh)				2	2	
Upstream signal (ft)					1043	
pX, platoon unblocked						
vC, conflicting volume	791	265	317			
vC1, stage 1 conf vol	265					
vC2, stage 2 conf vol	526					
vCu, unblocked vol	791	265	317			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)	5.4					
tF (s)	3.5	3.3	2.2			
p0 queue free %	94	99	93			
cM capacity (veh/h)	507	774	1243			
Direction, Lane #	EB 1	NB 1	NB 2	SB 1		
Volume Total	36	92	341	317		
Volume Left	28	92	0	0		
Volume Right	8	0	0	104		
cSH	549	1243	1700	1700		
Volume to Capacity	0.07	0.07	0.20	0.19		
Queue Length 95th (ft)	5	6	0	0		
Control Delay (s)	12.0	8.1	0.0	0.0		
Lane LOS	B	A				
Approach Delay (s)	12.0	1.7		0.0		
Approach LOS	B					
Intersection Summary						
Average Delay			1.5			
Intersection Capacity Utilization			29.2%	ICU Level of Service		A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

27: Otis Bowen

11/6/2017

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	60	38	8	343	492	20
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.68	0.53	0.67	0.80	0.87	0.55
Hourly flow rate (vph)	88	72	12	429	566	36
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				TWLT	TWLT	
Median storage (veh)				2	2	
Upstream signal (ft)					1043	
pX, platoon unblocked						
vC, conflicting volume	1036	584	602			
vC1, stage 1 conf vol	584					
vC2, stage 2 conf vol	453					
vCu, unblocked vol	1036	584	602			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)	5.4					
tF (s)	3.5	3.3	2.2			
p0 queue free %	81	86	99			
cM capacity (veh/h)	466	512	976			
Direction, Lane #	EB 1	NB 1	NB 2	SB 1		
Volume Total	160	12	429	602		
Volume Left	88	12	0	0		
Volume Right	72	0	0	36		
cSH	486	976	1700	1700		
Volume to Capacity	0.33	0.01	0.25	0.35		
Queue Length 95th (ft)	36	1	0	0		
Control Delay (s)	16.0	8.7	0.0	0.0		
Lane LOS	C	A				
Approach Delay (s)	16.0	0.2		0.0		
Approach LOS	C					
Intersection Summary						
Average Delay			2.2			
Intersection Capacity Utilization			39.4%	ICU Level of Service		A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

18: P. Singleton

11/6/2017

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	3	28	302	12	17	155
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.37	0.70	0.82	0.60	0.71	0.71
Hourly flow rate (vph)	8	40	368	20	24	218
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			TWLT		TWLT	
Median storage (veh)			2		2	
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	644	378			388	
vC1, stage 1 conf vol	378					
vC2, stage 2 conf vol	266					
vCu, unblocked vol	644	378			388	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)	5.4					
tF (s)	3.5	3.3			2.2	
p0 queue free %	99	94			98	
cM capacity (veh/h)	609	668			1170	
Direction, Lane #	WB 1	NB 1	SB 1	SB 2		
Volume Total	48	388	24	218		
Volume Left	8	0	24	0		
Volume Right	40	20	0	0		
cSH	658	1700	1170	1700		
Volume to Capacity	0.07	0.23	0.02	0.13		
Queue Length 95th (ft)	6	0	2	0		
Control Delay (s)	10.9	0.0	8.1	0.0		
Lane LOS	B		A			
Approach Delay (s)	10.9	0.0	0.8			
Approach LOS	B					
Intersection Summary						
Average Delay			1.1			
Intersection Capacity Utilization			26.6%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

18: P. Singleton

11/6/2017

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	37	74	273	24	16	471
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.37	0.70	0.82	0.60	0.71	0.71
Hourly flow rate (vph)	100	106	333	40	23	663
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			TWLT		TWLT	
Median storage veh			2		2	
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1061	353			373	
vC1, stage 1 conf vol	353					
vC2, stage 2 conf vol	708					
vCu, unblocked vol	1061	353			373	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)	5.4					
tF (s)	3.5	3.3			2.2	
p0 queue free %	77	85			98	
cM capacity (veh/h)	434	691			1186	
Direction, Lane #	WB 1	NB 1	SB 1	SB 2		
Volume Total	206	373	23	663		
Volume Left	100	0	23	0		
Volume Right	106	40	0	0		
cSH	537	1700	1186	1700		
Volume to Capacity	0.38	0.22	0.02	0.39		
Queue Length 95th (ft)	45	0	1	0		
Control Delay (s)	15.8	0.0	8.1	0.0		
Lane LOS	C		A			
Approach Delay (s)	15.8	0.0	0.3			
Approach LOS	C					
Intersection Summary						
Average Delay			2.7			
Intersection Capacity Utilization			38.1%	ICU Level of Service		A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

20: Columbia & McClaughry

11/6/2017

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	13	2	4	6	1	10	17	288	43	26	120	13
Sign Control	Stop				Stop		Free				Free	
Grade	0%				0%		0%				0%	
Peak Hour Factor	0.81	0.50	0.33	0.75	0.25	0.42	0.85	0.85	0.63	0.59	0.93	0.54
Hourly flow rate (vph)	16	4	12	8	4	24	20	339	68	44	129	24
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type							TWLTL		TWLTL			
Median storage (veh)							2		2			
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	634	676	141	644	654	373	153			407		
vC1, stage 1 conf vol	229	229		413	413							
vC2, stage 2 conf vol	405	447		231	241							
vCu, unblocked vol	634	676	141	644	654	373	153			407		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)	6.1	5.5		6.1	5.5							
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	97	99	99	99	99	96	99			96		
cM capacity (veh/h)	507	486	907	539	519	673	1427			1152		
Direction, Lane #	EB 1	EB 2	WB 1	NB 1	NB 2	SB 1	SB 2					
Volume Total	16	16	36	20	407	44	153					
Volume Left	16	0	8	20	0	44	0					
Volume Right	0	12	24	0	68	0	24					
cSH	507	746	618	1427	1700	1152	1700					
Volume to Capacity	0.03	0.02	0.06	0.01	0.24	0.04	0.09					
Queue Length 95th (ft)	2	2	5	1	0	3	0					
Control Delay (s)	12.3	9.9	11.2	7.6	0.0	8.3	0.0					
Lane LOS	B	A	B	A	A							
Approach Delay (s)	11.1		11.2	0.4	1.8							
Approach LOS	B		B									
Intersection Summary												
Average Delay			1.8									
Intersection Capacity Utilization			34.7%		ICU Level of Service		A					
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

20: Columbia & McClaughry

11/6/2017

													
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR	
Lane Configurations													
Volume (veh/h)	10	2	25	58	3	52	10	240	8	6	495	5	
Sign Control		Stop			Stop			Free			Free		
Grade		0%			0%			0%			0%		
Peak Hour Factor	0.62	0.25	0.62	0.54	0.75	0.59	0.83	0.97	0.67	0.75	0.83	0.62	
Hourly flow rate (vph)	16	8	40	107	4	88	12	247	12	8	596	8	
Pedestrians													
Lane Width (ft)													
Walking Speed (ft/s)													
Percent Blockage													
Right turn flare (veh)													
Median type							TWLTL			TWLTL			
Median storage veh							2			2			
Upstream signal (ft)													
pX, platoon unblocked													
vC, conflicting volume	978	900	600	934	898	253	604				259		
vC1, stage 1 conf vol	616	616		277	277								
vC2, stage 2 conf vol	362	283		657	620								
vCu, unblocked vol	978	900	600	934	898	253	604				259		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1				4.1		
tC, 2 stage (s)	6.1	5.5		6.1	5.5								
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2				2.2		
p0 queue free %	96	98	92	71	99	89	99				99		
cM capacity (veh/h)	398	436	501	372	429	785	973				1305		
Direction, Lane #	EB 1	EB 2	WB 1	NB 1	NB 2	SB 1	SB 2						
Volume Total	16	48	200	12	259	8	604						
Volume Left	16	0	107	12	0	8	0						
Volume Right	0	40	88	0	12	0	8						
cSH	398	489	486	973	1700	1305	1700						
Volume to Capacity	0.04	0.10	0.41	0.01	0.15	0.01	0.36						
Queue Length 95th (ft)	3	8	49	1	0	0	0						
Control Delay (s)	14.4	13.2	17.5	8.7	0.0	7.8	0.0						
Lane LOS	B	B	C	A		A							
Approach Delay (s)	13.5		17.5	0.4		0.1							
Approach LOS	B		C										
Intersection Summary													
Average Delay	3.9												
Intersection Capacity Utilization	46.2%			ICU Level of Service				A					
Analysis Period (min)	15												

HCM Unsignalized Intersection Capacity Analysis

25: Columbia & Donna

11/6/2017

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	11	0	8	1	0	2	5	337	5	5	120	5
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	12	0	9	1	0	2	5	366	5	5	130	5
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								TWLT			TWLT	
Median storage veh								2			2	
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	523	527	133	530	527	369	136			372		
vC1, stage 1 conf vol	144	144		380	380							
vC2, stage 2 conf vol	379	383		150	147							
vCu, unblocked vol	523	527	133	530	527	369	136			372		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)	6.1	5.5		6.1	5.5							
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	98	100	99	100	100	100	100			100		
cM capacity (veh/h)	598	571	916	599	575	677	1448			1187		
Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2					
Volume Total	21	1	2	5	372	5	136					
Volume Left	12	1	0	5	0	5	0					
Volume Right	9	0	2	0	5	0	5					
cSH	700	599	677	1448	1700	1187	1700					
Volume to Capacity	0.03	0.00	0.00	0.00	0.22	0.00	0.08					
Queue Length 95th (ft)	2	0	0	0	0	0	0					
Control Delay (s)	10.3	11.0	10.3	7.5	0.0	8.0	0.0					
Lane LOS	B	B	B	A		A						
Approach Delay (s)	10.3	10.6		0.1		0.3						
Approach LOS	B	B										
Intersection Summary												
Average Delay			0.6									
Intersection Capacity Utilization			32.5%		ICU Level of Service					A		
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

25: Columbia & Donna

11/6/2017

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	5	0	3	5	0	15	5	240	5	5	450	30
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	0	3	5	0	16	5	261	5	5	489	33
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								TW	LT		TW	LT
Median storage veh								2			2	
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	804	793	505	778	807	264	522			266		
vC1, stage 1 conf vol	516	516		274	274							
vC2, stage 2 conf vol	288	277		503	533							
vCu, unblocked vol	804	793	505	778	807	264	522			266		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)	6.1	5.5		6.1	5.5							
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	99	100	99	99	100	98	99			100		
cM capacity (veh/h)	481	480	567	490	472	775	1045			1298		
Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2					
Volume Total	9	5	16	5	266	5	522					
Volume Left	5	5	0	5	0	5	0					
Volume Right	3	0	16	0	5	0	33					
cSH	510	490	775	1045	1700	1298	1700					
Volume to Capacity	0.02	0.01	0.02	0.01	0.16	0.00	0.31					
Queue Length 95th (ft)	1	1	2	0	0	0	0					
Control Delay (s)	12.2	12.4	9.7	8.5	0.0	7.8	0.0					
Lane LOS	B	B	A	A		A						
Approach Delay (s)	12.2	10.4		0.2		0.1						
Approach LOS	B	B										
Intersection Summary												
Average Delay			0.5									
Intersection Capacity Utilization			37.0%		ICU Level of Service					A		
Analysis Period (min)			15									

HCM 2010 Signalized Intersection Summary

5: Main & Columbia

11/6/2017

								
Movement	WBL	WBR	NBT	NBR	SBL	SBT		
Lane Configurations								
Volume (veh/h)	114	55	290	98	9	119		
Number	3	18	2	12	1	6		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln	1863	1863	1863	1900	1863	1863		
Adj Flow Rate, veh/h	124	68	362	118	12	132		
Adj No. of Lanes	1	1	1	0	1	1		
Peak Hour Factor	0.92	0.81	0.80	0.83	0.75	0.90		
Percent Heavy Veh, %	2	2	2	2	2	2		
Cap, veh/h	196	175	958	312	712	1326		
Arrive On Green	0.11	0.11	0.71	0.71	0.71	0.71		
Sat Flow, veh/h	1774	1583	1346	439	911	1863		
Grp Volume(v), veh/h	124	68	0	480	12	132		
Grp Sat Flow(s),veh/h/ln	1774	1583	0	1785	911	1863		
Q Serve(g_s), s	3.0	1.8	0.0	4.8	0.2	1.0		
Cycle Q Clear(g_c), s	3.0	1.8	0.0	4.8	5.0	1.0		
Prop In Lane	1.00	1.00		0.25	1.00			
Lane Grp Cap(c), veh/h	196	175	0	1271	712	1326		
V/C Ratio(X)	0.63	0.39	0.00	0.38	0.02	0.10		
Avail Cap(c_a), veh/h	789	704	0	1271	712	1326		
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	1.00		
Uniform Delay (d), s/veh	19.1	18.6	0.0	2.6	3.5	2.0		
Incr Delay (d2), s/veh	3.4	1.4	0.0	0.9	0.0	0.2		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	1.6	0.8	0.0	2.6	0.1	0.5		
LnGrp Delay(d),s/veh	22.5	20.0	0.0	3.4	3.6	2.2		
LnGrp LOS	C	C		A	A	A		
Approach Vol, veh/h	192		480			144		
Approach Delay, s/veh	21.6		3.4			2.3		
Approach LOS	C		A			A		
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2				6		8
Phs Duration (G+Y+Rc), s		36.0				36.0		9.0
Change Period (Y+Rc), s		4.0				4.0		4.0
Max Green Setting (Gmax), s		32.0				32.0		20.0
Max Q Clear Time (g_c+l1), s		6.8				7.0		5.0
Green Ext Time (p_c), s		4.0				4.0		0.4
Intersection Summary								
HCM 2010 Ctrl Delay			7.5					
HCM 2010 LOS			A					

HCM 2010 Signalized Intersection Summary

5: Main & Columbia

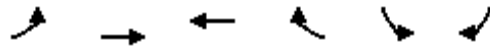
11/6/2017

								
Movement	WBL	WBR	NBT	NBR	SBL	SBT		
Lane Configurations								
Volume (veh/h)	175	28	200	179	67	365		
Number	3	18	2	12	1	6		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln	1863	1863	1863	1900	1863	1863		
Adj Flow Rate, veh/h	190	35	250	216	89	406		
Adj No. of Lanes	1	1	1	0	1	1		
Peak Hour Factor	0.92	0.81	0.80	0.83	0.75	0.90		
Percent Heavy Veh, %	2	2	2	2	2	2		
Cap, veh/h	261	233	630	544	674	1271		
Arrive On Green	0.15	0.15	0.68	0.68	0.68	0.68		
Sat Flow, veh/h	1774	1583	924	798	923	1863		
Grp Volume(v), veh/h	190	35	0	466	89	406		
Grp Sat Flow(s),veh/h/ln	1774	1583	0	1722	923	1863		
Q Serve(g_s), s	4.8	0.9	0.0	5.5	2.2	4.2		
Cycle Q Clear(g_c), s	4.8	0.9	0.0	5.5	7.7	4.2		
Prop In Lane	1.00	1.00		0.46	1.00			
Lane Grp Cap(c), veh/h	261	233	0	1174	674	1271		
V/C Ratio(X)	0.73	0.15	0.00	0.40	0.13	0.32		
Avail Cap(c_a), veh/h	756	675	0	1174	674	1271		
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	1.00		
Uniform Delay (d), s/veh	19.1	17.4	0.0	3.3	4.9	3.0		
Incr Delay (d2), s/veh	3.8	0.3	0.0	1.0	0.4	0.7		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	2.6	0.4	0.0	2.9	0.6	2.3		
LnGrp Delay(d),s/veh	22.9	17.7	0.0	4.3	5.3	3.7		
LnGrp LOS	C	B		A	A	A		
Approach Vol, veh/h	225		466			495		
Approach Delay, s/veh	22.1		4.3			4.0		
Approach LOS	C		A			A		
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2				6		8
Phs Duration (G+Y+Rc), s		36.0				36.0		10.9
Change Period (Y+Rc), s		4.0				4.0		4.0
Max Green Setting (Gmax), s		32.0				32.0		20.0
Max Q Clear Time (g_c+l1), s		7.5				9.7		6.8
Green Ext Time (p_c), s		6.5				6.3		0.5
Intersection Summary								
HCM 2010 Ctrl Delay			7.5					
HCM 2010 LOS			A					

HCM Unsignalized Intersection Capacity Analysis

7: Main

11/6/2017

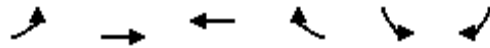


Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	5	188	212	15	2	2
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	204	230	16	2	2
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (ft)		931	899			
pX, platoon unblocked	0.97				0.97	0.97
vC, conflicting volume	247				454	239
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	208				421	199
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				100	100
cM capacity (veh/h)	1322				569	816
Direction, Lane #	EB 1	WB 1	SB 1	SB 2		
Volume Total	210	247	2	2		
Volume Left	5	0	2	0		
Volume Right	0	16	0	2		
cSH	1322	1700	569	816		
Volume to Capacity	0.00	0.15	0.00	0.00		
Queue Length 95th (ft)	0	0	0	0		
Control Delay (s)	0.2	0.0	11.4	9.4		
Lane LOS	A		B	A		
Approach Delay (s)	0.2	0.0	10.4			
Approach LOS			B			
Intersection Summary						
Average Delay			0.2			
Intersection Capacity Utilization			23.9%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

13: Main

11/6/2017



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	2	290	300	5	10	5
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	2	315	326	5	11	5
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (ft)		911	919			
pX, platoon unblocked	0.94				0.94	0.94
vC, conflicting volume	332				648	329
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	255				592	252
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				98	99
cM capacity (veh/h)	1229				439	738
Direction, Lane #	EB 1	WB 1	SB 1	SB 2		
Volume Total	317	332	11	5		
Volume Left	2	0	11	0		
Volume Right	0	5	0	5		
cSH	1229	1700	439	738		
Volume to Capacity	0.00	0.20	0.02	0.01		
Queue Length 95th (ft)	0	0	2	1		
Control Delay (s)	0.1	0.0	13.4	9.9		
Lane LOS	A		B	A		
Approach Delay (s)	0.1	0.0	12.2			
Approach LOS			B			
Intersection Summary						
Average Delay			0.3			
Intersection Capacity Utilization			26.9%		ICU Level of Service	A
Analysis Period (min)			15			

HCM 2010 Signalized Intersection Summary

3: Calumet & Main

11/6/2017

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	49	108	16	140	160	286	131	1000	141	157	430	19
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1863	1863	1863	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	64	116	20	212	184	358	170	1176	196	191	473	32
Adj No. of Lanes	1	1	1	1	1	1	1	2	0	1	2	0
Peak Hour Factor	0.77	0.93	0.80	0.66	0.87	0.80	0.77	0.85	0.72	0.82	0.91	0.59
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	291	393	334	397	428	500	502	1222	203	246	1377	93
Arrive On Green	0.05	0.21	0.21	0.06	0.23	0.23	0.08	0.40	0.40	0.09	0.41	0.41
Sat Flow, veh/h	1774	1863	1583	1774	1863	1583	1774	3039	504	1774	3365	227
Grp Volume(v), veh/h	64	116	20	212	184	358	170	682	690	191	248	257
Grp Sat Flow(s),veh/h/ln	1774	1863	1583	1774	1863	1583	1774	1770	1774	1774	1770	1823
Q Serve(g_s), s	2.4	4.5	0.9	5.5	7.2	17.0	4.7	31.9	32.3	5.3	8.2	8.2
Cycle Q Clear(g_c), s	2.4	4.5	0.9	5.5	7.2	17.0	4.7	31.9	32.3	5.3	8.2	8.2
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.28	1.00		0.12
Lane Grp Cap(c), veh/h	291	393	334	397	428	500	502	712	713	246	724	746
V/C Ratio(X)	0.22	0.29	0.06	0.53	0.43	0.72	0.34	0.96	0.97	0.78	0.34	0.34
Avail Cap(c_a), veh/h	316	442	376	397	451	519	571	712	713	302	724	746
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	24.6	28.2	26.8	27.0	28.0	25.7	13.1	24.8	24.9	19.3	17.3	17.3
Incr Delay (d2), s/veh	0.4	0.4	0.1	1.4	0.7	4.5	0.4	25.1	26.5	9.9	1.3	1.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.2	2.3	0.4	1.9	3.8	8.0	2.3	20.5	21.0	3.2	4.3	4.4
LnGrp Delay(d),s/veh	24.9	28.6	26.9	28.4	28.7	30.2	13.5	49.9	51.4	29.2	18.5	18.5
LnGrp LOS	C	C	C	C	C	C	B	D	D	C	B	B
Approach Vol, veh/h		200			754			1542			696	
Approach Delay, s/veh		27.3			29.3			46.5			21.5	
Approach LOS		C			C			D			C	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	12.3	39.5	10.0	23.3	11.7	40.1	8.4	24.9				
Change Period (Y+Rc), s	5.0	* 5.3	4.5	* 5.3	5.0	* 5.3	4.5	* 5.3				
Max Green Setting (Gmax), s	10.0	* 34	5.5	* 20	10.0	* 34	5.1	* 21				
Max Q Clear Time (g_c+I1), s	7.3	34.3	7.5	6.5	6.7	10.2	4.4	19.0				
Green Ext Time (p_c), s	0.1	0.0	0.0	2.6	0.1	13.1	0.0	0.6				
Intersection Summary												
HCM 2010 Ctrl Delay			35.8									
HCM 2010 LOS			D									
Notes												
* HCM 2010 computational engine requires equal clearance times for the phases crossing the barrier.												

HCM 2010 Signalized Intersection Summary

3: Calumet & Main

11/6/2017

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	43	208	108	250	174	220	52	606	162	500	1225	24
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1863	1863	1863	1863	1863	1863	1900	1863	1863	1900
Adj Flow Rate, veh/h	56	224	135	379	200	275	68	713	225	610	1346	41
Adj No. of Lanes	1	1	1	1	1	1	1	2	0	1	2	0
Peak Hour Factor	0.77	0.93	0.80	0.66	0.87	0.80	0.77	0.85	0.72	0.82	0.91	0.59
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	244	259	221	352	483	868	207	717	226	565	1824	55
Arrive On Green	0.04	0.14	0.14	0.16	0.26	0.26	0.04	0.27	0.27	0.29	0.52	0.52
Sat Flow, veh/h	1774	1863	1583	1774	1863	1583	1774	2649	836	1774	3507	107
Grp Volume(v), veh/h	56	224	135	379	200	275	68	476	462	610	679	708
Grp Sat Flow(s),veh/h/ln	1774	1863	1583	1774	1863	1583	1774	1770	1715	1774	1770	1844
Q Serve(g_s), s	3.7	16.3	11.1	21.7	12.3	13.2	3.8	37.2	37.2	40.0	41.4	41.5
Cycle Q Clear(g_c), s	3.7	16.3	11.1	21.7	12.3	13.2	3.8	37.2	37.2	40.0	41.4	41.5
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.49	1.00		0.06
Lane Grp Cap(c), veh/h	244	259	221	352	483	868	207	479	464	565	920	959
V/C Ratio(X)	0.23	0.86	0.61	1.08	0.41	0.32	0.33	0.99	0.99	1.08	0.74	0.74
Avail Cap(c_a), veh/h	250	278	236	352	496	878	266	479	464	565	920	959
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	48.6	58.4	56.1	43.8	42.6	17.1	34.6	50.5	50.5	41.9	25.9	25.9
Incr Delay (d2), s/veh	0.5	22.3	4.1	70.2	0.6	0.2	0.9	39.9	40.5	61.1	5.3	5.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.9	10.0	5.1	9.7	6.4	5.8	1.9	23.4	22.8	31.1	21.5	22.4
LnGrp Delay(d),s/veh	49.1	80.7	60.2	114.1	43.2	17.3	35.5	90.3	91.0	103.0	31.2	31.0
LnGrp LOS	D	F	E	F	D	B	D	F	F	F	C	C
Approach Vol, veh/h		415			854			1006			1997	
Approach Delay, s/veh		69.8			66.3			86.9			53.1	
Approach LOS		E			E			F			D	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	45.0	42.8	26.2	24.6	10.4	77.4	9.6	41.2				
Change Period (Y+Rc), s	5.0	* 5.3	4.5	* 5.3	5.0	* 5.3	4.5	* 5.3				
Max Green Setting (Gmax), s	40.0	* 38	21.7	* 21	10.0	* 68	5.5	* 37				
Max Q Clear Time (g_c+l1), s	42.0	39.2	23.7	18.3	5.8	43.5	5.7	15.2				
Green Ext Time (p_c), s	0.0	0.0	0.0	1.0	0.0	16.2	0.0	3.8				
Intersection Summary												
HCM 2010 Ctrl Delay			65.3									
HCM 2010 LOS			E									
Notes												
* HCM 2010 computational engine requires equal clearance times for the phases crossing the barrier.												

HCM 2010 Signalized Intersection Summary

29: Treadway & Calumet

12/28/2017

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	72	2	45	1	6	51	196	1100	1	19	598	204
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1900	1863	1863	1863	1863	1863	1900
Adj Flow Rate, veh/h	78	2	49	4	7	72	213	1222	4	24	664	222
Adj No. of Lanes	1	1	0	1	1	0	1	2	1	1	2	0
Peak Hour Factor	0.92	0.92	0.92	0.25	0.92	0.71	0.92	0.90	0.25	0.80	0.90	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	208	8	205	233	19	196	538	2456	1099	369	1692	565
Arrive On Green	0.13	0.13	0.13	0.13	0.13	0.13	0.07	0.69	0.69	0.02	0.65	0.65
Sat Flow, veh/h	1314	62	1530	1348	142	1462	1774	3539	1583	1774	2607	871
Grp Volume(v), veh/h	78	0	51	4	0	79	213	1222	4	24	451	435
Grp Sat Flow(s),veh/h/ln	1314	0	1593	1348	0	1605	1774	1770	1583	1774	1770	1709
Q Serve(g_s), s	4.6	0.0	2.3	0.2	0.0	3.6	2.9	12.8	0.1	0.4	9.5	9.5
Cycle Q Clear(g_c), s	8.1	0.0	2.3	2.5	0.0	3.6	2.9	12.8	0.1	0.4	9.5	9.5
Prop In Lane	1.00		0.96	1.00		0.91	1.00		1.00	1.00		0.51
Lane Grp Cap(c), veh/h	208	0	213	233	0	215	538	2456	1099	369	1148	1109
V/C Ratio(X)	0.37	0.00	0.24	0.02	0.00	0.37	0.40	0.50	0.00	0.07	0.39	0.39
Avail Cap(c_a), veh/h	347	0	382	375	0	385	757	2456	1099	422	1148	1109
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	35.0	0.0	30.7	31.8	0.0	31.3	4.4	5.7	3.7	5.0	6.6	6.6
Incr Delay (d2), s/veh	1.1	0.0	0.6	0.0	0.0	1.0	0.5	0.7	0.0	0.1	1.0	1.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.7	0.0	1.0	0.1	0.0	1.6	1.4	6.4	0.0	0.2	5.0	4.8
LnGrp Delay(d),s/veh	36.1	0.0	31.3	31.8	0.0	32.3	4.8	6.4	3.7	5.0	7.6	7.6
LnGrp LOS	D		C	C		C	A	A	A	A	A	A
Approach Vol, veh/h	129					83		1439		910		
Approach Delay, s/veh	34.2					32.3		6.2		7.5		
Approach LOS	C					C		A		A		
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	1	2	4		5	6	8					
Phs Duration (G+Y+Rc), s	5.6	59.0	14.6		9.2	55.4	14.6					
Change Period (Y+Rc), s	4.0	4.0	4.0		4.0	4.0	4.0					
Max Green Setting (Gmax), s	4.0	55.0	19.0		15.0	44.0	19.0					
Max Q Clear Time (g_c+I1), s	2.4	14.8	10.1		4.9	11.5	5.6					
Green Ext Time (p_c), s	0.0	20.5	0.6		0.4	18.3	0.8					
Intersection Summary												
HCM 2010 Ctrl Delay			8.9									
HCM 2010 LOS			A									

HCM 2010 Signalized Intersection Summary

29: Treadway & Calumet

12/28/2017

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	271	9	191	5	3	40	52	825	13	99	1615	77
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1900	1863	1863	1863	1863	1863	1900
Adj Flow Rate, veh/h	295	10	208	20	3	56	57	868	16	136	1700	84
Adj No. of Lanes	1	1	0	1	1	0	1	2	1	1	2	0
Peak Hour Factor	0.92	0.92	0.92	0.25	0.92	0.71	0.92	0.95	0.81	0.73	0.95	0.92
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	399	19	405	254	22	403	158	2282	1021	411	2214	109
Arrive On Green	0.27	0.27	0.27	0.27	0.27	0.27	0.64	0.64	0.64	0.64	0.64	0.64
Sat Flow, veh/h	1338	73	1521	1158	81	1514	265	3539	1583	626	3434	169
Grp Volume(v), veh/h	295	0	218	20	0	59	57	868	16	136	871	913
Grp Sat Flow(s),veh/h/ln	1338	0	1594	1158	0	1596	265	1770	1583	626	1770	1833
Q Serve(g_s), s	19.4	0.0	10.5	1.3	0.0	2.5	17.5	10.4	0.3	11.8	31.0	31.7
Cycle Q Clear(g_c), s	21.9	0.0	10.5	11.8	0.0	2.5	49.1	10.4	0.3	22.1	31.0	31.7
Prop In Lane	1.00		0.95	1.00		0.95	1.00		1.00	1.00		0.09
Lane Grp Cap(c), veh/h	399	0	424	254	0	425	158	2282	1021	411	1141	1182
V/C Ratio(X)	0.74	0.00	0.51	0.08	0.00	0.14	0.36	0.38	0.02	0.33	0.76	0.77
Avail Cap(c_a), veh/h	399	0	425	255	0	426	158	2282	1021	411	1141	1182
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	33.5	0.0	28.1	33.1	0.0	25.1	28.7	7.5	5.7	12.7	11.2	11.3
Incr Delay (d2), s/veh	7.1	0.0	1.1	0.1	0.0	0.1	6.3	0.5	0.0	2.1	4.9	4.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	7.9	0.0	4.7	0.4	0.0	1.1	1.5	5.2	0.2	2.2	16.6	17.3
LnGrp Delay(d),s/veh	40.6	0.0	29.1	33.2	0.0	25.3	35.0	8.0	5.8	14.9	16.0	16.2
LnGrp LOS	D		C	C		C	D	A	A	B	B	B
Approach Vol, veh/h	513				79		941				1920	
Approach Delay, s/veh	35.7				27.3		9.6				16.0	
Approach LOS	D				C		A				B	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	2		4		6		8					
Phs Duration (G+Y+Rc), s	62.0		27.9		62.0		27.9					
Change Period (Y+Rc), s	4.0		4.0		4.0		4.0					
Max Green Setting (Gmax), s	58.0		24.0		58.0		24.0					
Max Q Clear Time (g_c+l1), s	51.1		23.9		33.7		13.8					
Green Ext Time (p_c), s	6.5		0.0		20.9		2.1					
Intersection Summary												
HCM 2010 Ctrl Delay			17.5									
HCM 2010 LOS			B									

HCM Unsignalized Intersection Capacity Analysis

24: Calumet & Hagburg

11/6/2017

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	6	14	32	1140	810	102
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.50	0.75	0.79	0.92	1.00	0.61
Hourly flow rate (vph)	12	19	41	1239	810	167
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)				616		
pX, platoon unblocked	0.86					
vC, conflicting volume	1511	405	977			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1260	405	977			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	91	97	94			
cM capacity (veh/h)	131	595	702			
Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	31	454	826	405	405	167
Volume Left	12	41	0	0	0	0
Volume Right	19	0	0	0	0	167
cSH	249	702	1700	1700	1700	1700
Volume to Capacity	0.12	0.06	0.49	0.24	0.24	0.10
Queue Length 95th (ft)	10	5	0	0	0	0
Control Delay (s)	21.5	1.7	0.0	0.0	0.0	0.0
Lane LOS	C	A				
Approach Delay (s)	21.5	0.6		0.0		
Approach LOS	C					
Intersection Summary						
Average Delay			0.6			
Intersection Capacity Utilization			64.6%		ICU Level of Service	C
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

24: Calumet & Hagburg

11/6/2017

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	5	50	7	1130	1725	41
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.50	0.62	0.71	0.88	0.95	0.46
Hourly flow rate (vph)	10	81	10	1284	1816	89
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage (veh)						
Upstream signal (ft)				616		
pX, platoon unblocked	0.89					
vC, conflicting volume	2478	908	1905			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2413	908	1905			
tC, single (s)	6.8	6.9	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	57	71	97			
cM capacity (veh/h)	23	278	308			
Direction, Lane #	EB 1	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	91	438	856	908	908	89
Volume Left	10	10	0	0	0	0
Volume Right	81	0	0	0	0	89
cSH	126	308	1700	1700	1700	1700
Volume to Capacity	0.72	0.03	0.50	0.53	0.53	0.05
Queue Length 95th (ft)	100	2	0	0	0	0
Control Delay (s)	84.8	1.1	0.0	0.0	0.0	0.0
Lane LOS	F	A				
Approach Delay (s)	84.8	0.4		0.0		
Approach LOS	F					
Intersection Summary						
Average Delay		2.5				
Intersection Capacity Utilization		57.7%		ICU Level of Service		B
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

19: P. Singleton

11/6/2017

							
Movement	EBL	EBR	NBL	NBT	SBT	SBR	
Lane Configurations							
Volume (veh/h)	12	14	33	1110	902	143	
Sign Control	Stop			Free	Free		
Grade	0%			0%	0%		
Peak Hour Factor	0.75	0.70	0.75	0.90	0.87	0.70	
Hourly flow rate (vph)	16	20	44	1233	1037	204	
Pedestrians							
Lane Width (ft)							
Walking Speed (ft/s)							
Percent Blockage							
Right turn flare (veh)							
Median type				None	None		
Median storage veh							
Upstream signal (ft)					890		
pX, platoon unblocked	0.80	0.80	0.80				
vC, conflicting volume	1741	518	1241				
vC1, stage 1 conf vol							
vC2, stage 2 conf vol							
vCu, unblocked vol	1432	0	808				
tC, single (s)	6.8	6.9	4.1				
tC, 2 stage (s)							
tF (s)	3.5	3.3	2.2				
p0 queue free %	83	98	93				
cM capacity (veh/h)	94	870	652				
Direction, Lane #	EB 1	EB 2	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	16	20	455	822	518	518	204
Volume Left	16	0	44	0	0	0	0
Volume Right	0	20	0	0	0	0	204
cSH	94	870	652	1700	1700	1700	1700
Volume to Capacity	0.17	0.02	0.07	0.48	0.30	0.30	0.12
Queue Length 95th (ft)	15	2	5	0	0	0	0
Control Delay (s)	51.2	9.2	1.9	0.0	0.0	0.0	0.0
Lane LOS	F	A	A				
Approach Delay (s)	27.9		0.7		0.0		
Approach LOS	D						
Intersection Summary							
Average Delay			0.7				
Intersection Capacity Utilization			64.5%		ICU Level of Service		C
Analysis Period (min)			15				

HCM Unsignalized Intersection Capacity Analysis

19: P. Singleton

11/6/2017

							
Movement	EBL	EBR	NBL	NBT	SBT	SBR	
Lane Configurations							
Volume (veh/h)	34	25	20	1100	1690	75	
Sign Control	Stop			Free	Free		
Grade	0%			0%	0%		
Peak Hour Factor	0.61	0.57	0.83	0.85	0.97	0.91	
Hourly flow rate (vph)	56	44	24	1294	1742	82	
Pedestrians							
Lane Width (ft)							
Walking Speed (ft/s)							
Percent Blockage							
Right turn flare (veh)							
Median type				None	None		
Median storage (veh)							
Upstream signal (ft)					890		
pX, platoon unblocked	0.52	0.52	0.52				
vC, conflicting volume	2438	871	1825				
vC1, stage 1 conf vol							
vC2, stage 2 conf vol							
vCu, unblocked vol	1911	0	724				
tC, single (s)	6.8	6.9	4.1				
tC, 2 stage (s)							
tF (s)	3.5	3.3	2.2				
p0 queue free %	0	92	95				
cM capacity (veh/h)	29	560	452				
Direction, Lane #	EB 1	EB 2	NB 1	NB 2	SB 1	SB 2	SB 3
Volume Total	56	44	455	863	871	871	82
Volume Left	56	0	24	0	0	0	0
Volume Right	0	44	0	0	0	0	82
cSH	29	560	452	1700	1700	1700	1700
Volume to Capacity	1.90	0.08	0.05	0.51	0.51	0.51	0.05
Queue Length 95th (ft)	163	6	4	0	0	0	0
Control Delay (s)	714.2	12.0	1.6	0.0	0.0	0.0	0.0
Lane LOS	F	B	A				
Approach Delay (s)	405.0		0.6		0.0		
Approach LOS	F						
Intersection Summary							
Average Delay			12.7				
Intersection Capacity Utilization			56.7%		ICU Level of Service		B
Analysis Period (min)			15				

HCM 2010 Signalized Intersection Summary

11: Columbia/Centennial

11/6/2017

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	307	0	2	6	0	12	2	1110	10	10	1012	237
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1900	1863	1863	1900	1863	1863	1863
Adj Flow Rate, veh/h	361	0	4	12	0	16	8	1207	12	12	1163	339
Adj No. of Lanes	1	1	0	1	1	0	1	2	0	1	2	1
Peak Hour Factor	0.85	0.92	0.50	0.50	0.25	0.75	0.25	0.92	0.83	0.83	0.87	0.70
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	562	0	489	574	0	489	248	1915	19	278	1888	845
Arrive On Green	0.31	0.00	0.31	0.31	0.00	0.31	0.53	0.53	0.53	0.53	0.53	0.53
Sat Flow, veh/h	1392	0	1583	1407	0	1583	348	3590	36	456	3539	1583
Grp Volume(v), veh/h	361	0	4	12	0	16	8	595	624	12	1163	339
Grp Sat Flow(s),veh/h/ln	1392	0	1583	1407	0	1583	348	1770	1856	456	1770	1583
Q Serve(g_s), s	12.4	0.0	0.1	0.3	0.0	0.4	0.8	12.0	12.0	1.0	11.6	6.4
Cycle Q Clear(g_c), s	12.7	0.0	0.1	0.4	0.0	0.4	12.4	12.0	12.0	12.9	11.6	6.4
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.02	1.00		1.00
Lane Grp Cap(c), veh/h	562	0	489	574	0	489	248	944	990	278	1888	845
V/C Ratio(X)	0.64	0.00	0.01	0.02	0.00	0.03	0.03	0.63	0.63	0.04	0.62	0.40
Avail Cap(c_a), veh/h	820	0	782	835	0	782	248	944	990	278	1888	845
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	16.7	0.0	12.1	12.3	0.0	12.2	12.5	8.3	8.3	12.8	8.2	7.0
Incr Delay (d2), s/veh	1.2	0.0	0.0	0.0	0.0	0.0	0.2	3.2	3.0	0.3	1.5	1.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.9	0.0	0.0	0.1	0.0	0.2	0.1	6.6	6.9	0.1	5.9	3.1
LnGrp Delay(d),s/veh	17.9	0.0	12.1	12.3	0.0	12.3	12.8	11.5	11.3	13.1	9.7	8.4
LnGrp LOS	B		B	B		B	B	B	B	B	A	A
Approach Vol, veh/h	365				28		1227				1514	
Approach Delay, s/veh	17.8				12.3		11.4				9.5	
Approach LOS	B				B		B				A	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs	2		4		6		8					
Phs Duration (G+Y+Rc), s	31.0		19.6		31.0		19.6					
Change Period (Y+Rc), s	4.0		4.0		4.0		4.0					
Max Green Setting (Gmax), s	27.0		25.0		27.0		25.0					
Max Q Clear Time (g_c+l1), s	14.4		14.7		14.9		2.4					
Green Ext Time (p_c), s	10.9		0.9		10.5		1.2					
Intersection Summary												
HCM 2010 Ctrl Delay			11.2									
HCM 2010 LOS			B									

HCM 2010 Signalized Intersection Summary

11: Columbia/Centennial

11/6/2017

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	460	3	4	10	1	19	6	1092	16	22	1700	510
Number	7	4	14	3	8	18	5	2	12	1	6	16
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Adj Sat Flow, veh/h/ln	1863	1863	1900	1863	1863	1900	1863	1863	1900	1863	1863	1863
Adj Flow Rate, veh/h	605	4	12	24	4	24	8	1213	24	32	1771	548
Adj No. of Lanes	1	1	0	1	1	0	1	2	0	1	2	1
Peak Hour Factor	0.76	0.75	0.33	0.42	0.25	0.79	0.75	0.90	0.67	0.69	0.96	0.93
Percent Heavy Veh, %	2	2	2	2	2	2	2	2	2	2	2	2
Cap, veh/h	632	169	507	644	95	570	80	1775	35	188	1770	792
Arrive On Green	0.41	0.41	0.41	0.41	0.41	0.41	0.50	0.50	0.50	0.50	0.50	0.50
Sat Flow, veh/h	1377	411	1234	1392	231	1387	157	3550	70	448	3539	1583
Grp Volume(v), veh/h	605	0	16	24	0	28	8	605	632	32	1771	548
Grp Sat Flow(s),veh/h/ln	1377	0	1645	1392	0	1618	157	1770	1850	448	1770	1583
Q Serve(g_s), s	36.1	0.0	0.5	0.9	0.0	0.9	0.0	23.4	23.4	5.3	45.0	23.8
Cycle Q Clear(g_c), s	37.0	0.0	0.5	1.5	0.0	0.9	45.0	23.4	23.4	28.6	45.0	23.8
Prop In Lane	1.00		0.75	1.00		0.86	1.00		0.04	1.00		1.00
Lane Grp Cap(c), veh/h	632	0	676	644	0	665	80	885	925	188	1770	792
V/C Ratio(X)	0.96	0.00	0.02	0.04	0.00	0.04	0.10	0.68	0.68	0.17	1.00	0.69
Avail Cap(c_a), veh/h	632	0	676	644	0	665	80	885	925	188	1770	792
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	28.6	0.0	15.8	16.2	0.0	15.9	45.0	17.1	17.1	28.0	22.5	17.2
Incr Delay (d2), s/veh	25.7	0.0	0.0	0.0	0.0	0.0	2.5	4.3	4.1	2.0	21.6	4.9
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	19.5	0.0	0.2	0.4	0.0	0.4	0.3	12.3	12.8	0.8	27.2	11.4
LnGrp Delay(d),s/veh	54.2	0.0	15.8	16.2	0.0	15.9	47.5	21.3	21.2	29.9	44.1	22.1
LnGrp LOS	D		B	B		B	D	C	C	C	F	C
Approach Vol, veh/h		621			52			1245			2351	
Approach Delay, s/veh		53.3			16.0			21.4			38.8	
Approach LOS		D			B			C			D	
Timer	1	2	3	4	5	6	7	8				
Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		49.0		41.0		49.0		41.0				
Change Period (Y+Rc), s		4.0		4.0		4.0		4.0				
Max Green Setting (Gmax), s		45.0		37.0		45.0		37.0				
Max Q Clear Time (g_c+I1), s		47.0		39.0		47.0		3.5				
Green Ext Time (p_c), s		0.0		0.0		0.0		2.5				
Intersection Summary												
HCM 2010 Ctrl Delay	35.5											
HCM 2010 LOS	D											

HCM Unsignalized Intersection Capacity Analysis

27: Otis Bowen

11/6/2017



Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	W		W	W	W	
Volume (veh/h)	17	5	49	302	200	48
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.61	0.62	0.53	0.82	0.86	0.46
Hourly flow rate (vph)	28	8	92	368	233	104
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				TWLTL	TWLTL	
Median storage veh				2	2	
Upstream signal (ft)					1043	
pX, platoon unblocked						
vC, conflicting volume	838	285	337			
vC1, stage 1 conf vol	285					
vC2, stage 2 conf vol	553					
vCu, unblocked vol	838	285	337			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)	5.4					
tF (s)	3.5	3.3	2.2			
p0 queue free %	94	99	92			
cM capacity (veh/h)	490	754	1222			
Direction, Lane #	EB 1	NB 1	NB 2	SB 1		
Volume Total	36	92	368	337		
Volume Left	28	92	0	0		
Volume Right	8	0	0	104		
cSH	532	1222	1700	1700		
Volume to Capacity	0.07	0.08	0.22	0.20		
Queue Length 95th (ft)	5	6	0	0		
Control Delay (s)	12.3	8.2	0.0	0.0		
Lane LOS	B	A				
Approach Delay (s)	12.3	1.6		0.0		
Approach LOS	B					
Intersection Summary						
Average Delay			1.4			
Intersection Capacity Utilization			30.1%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

27: Otis Bowen

11/6/2017

						
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Volume (veh/h)	60	38	8	400	495	20
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.68	0.53	0.67	0.80	0.87	0.55
Hourly flow rate (vph)	88	72	12	500	569	36
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				TWLTL	TWLTL	
Median storage (veh)				2	2	
Upstream signal (ft)					1043	
pX, platoon unblocked						
vC, conflicting volume	1111	587	605			
vC1, stage 1 conf vol	587					
vC2, stage 2 conf vol	524					
vCu, unblocked vol	1111	587	605			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)	5.4					
tF (s)	3.5	3.3	2.2			
p0 queue free %	80	86	99			
cM capacity (veh/h)	445	509	973			
Direction, Lane #	EB 1	NB 1	NB 2	SB 1		
Volume Total	160	12	500	605		
Volume Left	88	12	0	0		
Volume Right	72	0	0	36		
cSH	472	973	1700	1700		
Volume to Capacity	0.34	0.01	0.29	0.36		
Queue Length 95th (ft)	37	1	0	0		
Control Delay (s)	16.5	8.7	0.0	0.0		
Lane LOS	C	A				
Approach Delay (s)	16.5	0.2		0.0		
Approach LOS	C					
Intersection Summary						
Average Delay			2.1			
Intersection Capacity Utilization			39.6%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

18: P. Singleton

11/6/2017

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	3	30	324	12	31	175
Sign Control	Stop		Free		Free	Free
Grade	0%		0%			0%
Peak Hour Factor	0.37	0.70	0.82	0.60	0.71	0.71
Hourly flow rate (vph)	8	43	395	20	44	246
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			TWLT		TWLT	
Median storage veh			2		2	
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	739	405			415	
vC1, stage 1 conf vol	405					
vC2, stage 2 conf vol	334					
vCu, unblocked vol	739	405			415	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)	5.4					
tF (s)	3.5	3.3			2.2	
p0 queue free %	99	93			96	
cM capacity (veh/h)	566	646			1144	
Direction, Lane #	WB 1	NB 1	SB 1	SB 2		
Volume Total	51	415	44	246		
Volume Left	8	0	44	0		
Volume Right	43	20	0	0		
cSH	632	1700	1144	1700		
Volume to Capacity	0.08	0.24	0.04	0.14		
Queue Length 95th (ft)	7	0	3	0		
Control Delay (s)	11.2	0.0	8.3	0.0		
Lane LOS	B		A			
Approach Delay (s)	11.2	0.0	1.2			
Approach LOS	B					
Intersection Summary						
Average Delay		1.2				
Intersection Capacity Utilization		34.4%		ICU Level of Service	A	
Analysis Period (min)		15				

HCM Unsignalized Intersection Capacity Analysis

18: P. Singleton

11/6/2017

						
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (veh/h)	37	87	339	24	22	479
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.37	0.70	0.82	0.60	0.71	0.71
Hourly flow rate (vph)	100	124	413	40	31	675
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type			TWLTL		TWLTL	
Median storage veh			2		2	
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1170	433			453	
vC1, stage 1 conf vol	433					
vC2, stage 2 conf vol	737					
vCu, unblocked vol	1170	433			453	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)	5.4					
tF (s)	3.5	3.3			2.2	
p0 queue free %	75	80			97	
cM capacity (veh/h)	407	622			1107	
Direction, Lane #	WB 1	NB 1	SB 1	SB 2		
Volume Total	224	453	31	675		
Volume Left	100	0	31	0		
Volume Right	124	40	0	0		
cSH	504	1700	1107	1700		
Volume to Capacity	0.45	0.27	0.03	0.40		
Queue Length 95th (ft)	57	0	2	0		
Control Delay (s)	17.8	0.0	8.3	0.0		
Lane LOS	C		A			
Approach Delay (s)	17.8	0.0	0.4			
Approach LOS	C					
Intersection Summary						
Average Delay			3.1			
Intersection Capacity Utilization			39.3%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

20: Columbia & McClaghry

11/6/2017

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	13	8	4	6	1	15	17	303	43	40	149	13
Sign Control	Stop				Stop			Free			Free	
Grade	0%				0%			0%			0%	
Peak Hour Factor	0.81	0.50	0.33	0.75	0.25	0.42	0.85	0.85	0.63	0.59	0.93	0.54
Hourly flow rate (vph)	16	16	12	8	4	36	20	356	68	68	160	24
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type							TWLTL		TWLTL			
Median storage (veh)							2		2			
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	742	773	172	747	750	391	184			425		
vC1, stage 1 conf vol	308	308		431	431							
vC2, stage 2 conf vol	434	465		316	320							
vCu, unblocked vol	742	773	172	747	750	391	184			425		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)	6.1	5.5		6.1	5.5							
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	96	96	99	98	99	95	99			94		
cM capacity (veh/h)	447	445	871	488	482	658	1390			1135		
Direction, Lane #	EB 1	EB 2	WB 1	NB 1	NB 2	SB 1	SB 2					
Volume Total	16	28	48	20	425	68	184					
Volume Left	16	0	8	20	0	68	0					
Volume Right	0	12	36	0	68	0	24					
cSH	447	564	604	1390	1700	1135	1700					
Volume to Capacity	0.04	0.05	0.08	0.01	0.25	0.06	0.11					
Queue Length 95th (ft)	3	4	6	1	0	5	0					
Control Delay (s)	13.4	11.7	11.5	7.6	0.0	8.4	0.0					
Lane LOS	B	B	B	A		A						
Approach Delay (s)	12.3		11.5	0.3		2.3						
Approach LOS	B		B									
Intersection Summary												
Average Delay			2.3									
Intersection Capacity Utilization			38.7%			ICU Level of Service				A		
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

20: Columbia & McClaughry

11/6/2017

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	10	5	25	28	3	85	10	277	8	12	503	5
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.62	0.25	0.62	0.54	0.75	0.59	0.83	0.97	0.67	0.75	0.83	0.62
Hourly flow rate (vph)	16	20	40	52	4	144	12	286	12	16	606	8
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								TWLT			TWLT	
Median storage veh)								2			2	
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	1098	964	610	1004	962	292	614			298		
vC1, stage 1 conf vol	642	642		316	316							
vC2, stage 2 conf vol	456	322		688	646							
vCu, unblocked vol	1098	964	610	1004	962	292	614			298		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)	6.1	5.5		6.1	5.5							
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	95	95	92	85	99	81	99			99		
cM capacity (veh/h)	343	416	494	343	410	748	965			1264		
Direction, Lane #	EB 1	EB 2	WB 1	NB 1	NB 2	SB 1	SB 2					
Volume Total	16	60	200	12	298	16	614					
Volume Left	16	0	52	12	0	16	0					
Volume Right	0	40	144	0	12	0	8					
cSH	343	466	566	965	1700	1264	1700					
Volume to Capacity	0.05	0.13	0.35	0.01	0.18	0.01	0.36					
Queue Length 95th (ft)	4	11	40	1	0	1	0					
Control Delay (s)	16.0	13.9	14.8	8.8	0.0	7.9	0.0					
Lane LOS	C	B	B	A		A						
Approach Delay (s)	14.3		14.8	0.3		0.2						
Approach LOS	B		B									
Intersection Summary												
Average Delay			3.5									
Intersection Capacity Utilization			47.1%		ICU Level of Service					A		
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

25: Columbia & Donna

11/6/2017

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	11	7	8	9	2	15	5	337	34	34	120	5
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	12	8	9	10	2	16	5	366	37	37	130	5
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								TWLT			TWLT	
Median storage veh								2			2	
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	602	621	133	612	605	385	136			403		
vC1, stage 1 conf vol	207	207		396	396							
vC2, stage 2 conf vol	395	414		217	210							
vCu, unblocked vol	602	621	133	612	605	385	136			403		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)	6.1	5.5		6.1	5.5							
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	98	99	99	98	100	98	100			97		
cM capacity (veh/h)	535	516	916	561	545	663	1448			1155		
Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2					
Volume Total	28	10	18	5	403	37	136					
Volume Left	12	10	0	5	0	37	0					
Volume Right	9	0	16	0	37	0	5					
cSH	607	561	646	1448	1700	1155	1700					
Volume to Capacity	0.05	0.02	0.03	0.00	0.24	0.03	0.08					
Queue Length 95th (ft)	4	1	2	0	0	2	0					
Control Delay (s)	11.2	11.5	10.7	7.5	0.0	8.2	0.0					
Lane LOS	B	B	B	A		A						
Approach Delay (s)	11.2	11.0		0.1		1.8						
Approach LOS	B	B										
Intersection Summary												
Average Delay			1.5									
Intersection Capacity Utilization			41.3%		ICU Level of Service					A		
Analysis Period (min)			15									

HCM Unsignalized Intersection Capacity Analysis

25: Columbia & Donna

11/6/2017

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Volume (veh/h)	5	3	3	63	6	33	5	240	13	13	450	30
Sign Control		Stop			Stop			Free			Free	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	5	3	3	68	7	36	5	261	14	14	489	33
Pedestrians												
Lane Width (ft)												
Walking Speed (ft/s)												
Percent Blockage												
Right turn flare (veh)												
Median type								TW	LT		TW	LT
Median storage veh								2			2	
Upstream signal (ft)												
pX, platoon unblocked												
vC, conflicting volume	845	820	505	801	829	268	522			275		
vC1, stage 1 conf vol	534	534		279	279							
vC2, stage 2 conf vol	311	286		522	550							
vCu, unblocked vol	845	820	505	801	829	268	522			275		
tC, single (s)	7.1	6.5	6.2	7.1	6.5	6.2	4.1			4.1		
tC, 2 stage (s)	6.1	5.5		6.1	5.5							
tF (s)	3.5	4.0	3.3	3.5	4.0	3.3	2.2			2.2		
p0 queue free %	99	99	99	86	99	95	99			99		
cM capacity (veh/h)	456	468	567	474	461	771	1045			1288		
Direction, Lane #	EB 1	WB 1	WB 2	NB 1	NB 2	SB 1	SB 2					
Volume Total	12	68	42	5	275	14	522					
Volume Left	5	68	0	5	0	14	0					
Volume Right	3	0	36	0	14	0	33					
cSH	485	474	698	1045	1700	1288	1700					
Volume to Capacity	0.02	0.14	0.06	0.01	0.16	0.01	0.31					
Queue Length 95th (ft)	2	13	5	0	0	1	0					
Control Delay (s)	12.6	13.9	10.5	8.5	0.0	7.8	0.0					
Lane LOS	B	B	B	A		A						
Approach Delay (s)	12.6	12.6		0.2		0.2						
Approach LOS	B	B										
Intersection Summary												
Average Delay			1.8									
Intersection Capacity Utilization			38.9%		ICU Level of Service					A		
Analysis Period (min)			15									

HCM 2010 Signalized Intersection Summary

5: Main & Columbia

11/6/2017

								
Movement	WBL	WBR	NBT	NBR	SBL	SBT		
Lane Configurations								
Volume (veh/h)	123	55	321	132	13	124		
Number	3	18	2	12	1	6		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln	1863	1863	1863	1900	1863	1863		
Adj Flow Rate, veh/h	134	68	401	159	17	138		
Adj No. of Lanes	1	1	1	0	1	1		
Peak Hour Factor	0.92	0.81	0.80	0.83	0.75	0.90		
Percent Heavy Veh, %	2	2	2	2	2	2		
Cap, veh/h	207	185	898	356	642	1316		
Arrive On Green	0.12	0.12	0.71	0.71	0.71	0.71		
Sat Flow, veh/h	1774	1583	1270	504	846	1863		
Grp Volume(v), veh/h	134	68	0	560	17	138		
Grp Sat Flow(s),veh/h/ln	1774	1583	0	1774	846	1863		
Q Serve(g_s), s	3.3	1.8	0.0	6.1	0.4	1.1		
Cycle Q Clear(g_c), s	3.3	1.8	0.0	6.1	6.5	1.1		
Prop In Lane	1.00	1.00		0.28	1.00			
Lane Grp Cap(c), veh/h	207	185	0	1253	642	1316		
V/C Ratio(X)	0.65	0.37	0.00	0.45	0.03	0.10		
Avail Cap(c_a), veh/h	783	699	0	1253	642	1316		
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	1.00		
Uniform Delay (d), s/veh	19.1	18.5	0.0	2.8	4.2	2.1		
Incr Delay (d2), s/veh	3.4	1.2	0.0	1.2	0.1	0.2		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	1.8	0.8	0.0	3.2	0.1	0.6		
LnGrp Delay(d),s/veh	22.5	19.7	0.0	4.0	4.3	2.3		
LnGrp LOS	C	B		A	A	A		
Approach Vol, veh/h	202		560			155		
Approach Delay, s/veh	21.5		4.0			2.5		
Approach LOS	C		A			A		
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2				6		8
Phs Duration (G+Y+Rc), s		36.0				36.0		9.3
Change Period (Y+Rc), s		4.0				4.0		4.0
Max Green Setting (Gmax), s		32.0				32.0		20.0
Max Q Clear Time (g_c+l1), s		8.1				8.5		5.3
Green Ext Time (p_c), s		4.8				4.8		0.5
Intersection Summary								
HCM 2010 Ctrl Delay			7.6					
HCM 2010 LOS			A					

HCM 2010 Signalized Intersection Summary

5: Main & Columbia

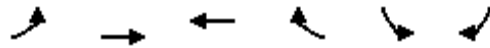
11/6/2017

								
Movement	WBL	WBR	NBT	NBR	SBL	SBT		
Lane Configurations								
Volume (veh/h)	213	28	208	190	78	382		
Number	3	18	2	12	1	6		
Initial Q (Qb), veh	0	0	0	0	0	0		
Ped-Bike Adj(A_pbT)	1.00	1.00		1.00	1.00			
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00		
Adj Sat Flow, veh/h/ln	1863	1863	1863	1900	1863	1863		
Adj Flow Rate, veh/h	232	35	260	229	104	424		
Adj No. of Lanes	1	1	1	0	1	1		
Peak Hour Factor	0.92	0.81	0.80	0.83	0.75	0.90		
Percent Heavy Veh, %	2	2	2	2	2	2		
Cap, veh/h	307	274	605	533	625	1232		
Arrive On Green	0.17	0.17	0.66	0.66	0.66	0.66		
Sat Flow, veh/h	1774	1583	915	806	904	1863		
Grp Volume(v), veh/h	232	35	0	489	104	424		
Grp Sat Flow(s),veh/h/ln	1774	1583	0	1721	904	1863		
Q Serve(g_s), s	6.0	0.9	0.0	6.5	3.0	4.8		
Cycle Q Clear(g_c), s	6.0	0.9	0.0	6.5	9.5	4.8		
Prop In Lane	1.00	1.00		0.47	1.00			
Lane Grp Cap(c), veh/h	307	274	0	1138	625	1232		
V/C Ratio(X)	0.76	0.13	0.00	0.43	0.17	0.34		
Avail Cap(c_a), veh/h	733	655	0	1138	625	1232		
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00		
Upstream Filter(I)	1.00	1.00	0.00	1.00	1.00	1.00		
Uniform Delay (d), s/veh	19.0	16.9	0.0	3.9	6.1	3.6		
Incr Delay (d2), s/veh	3.8	0.2	0.0	1.2	0.6	0.8		
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0		
%ile BackOfQ(50%),veh/ln	3.2	0.4	0.0	3.4	0.8	2.6		
LnGrp Delay(d),s/veh	22.8	17.1	0.0	5.1	6.7	4.4		
LnGrp LOS	C	B		A	A	A		
Approach Vol, veh/h	267		489			528		
Approach Delay, s/veh	22.1		5.1			4.8		
Approach LOS	C		A			A		
Timer	1	2	3	4	5	6	7	8
Assigned Phs		2				6		8
Phs Duration (G+Y+Rc), s		36.0				36.0		12.4
Change Period (Y+Rc), s		4.0				4.0		4.0
Max Green Setting (Gmax), s		32.0				32.0		20.0
Max Q Clear Time (g_c+l1), s		8.5				11.5		8.0
Green Ext Time (p_c), s		6.9				6.5		0.6
Intersection Summary								
HCM 2010 Ctrl Delay			8.5					
HCM 2010 LOS			A					

HCM Unsignalized Intersection Capacity Analysis

7: Main

11/6/2017

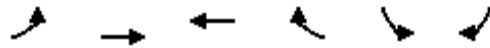


Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Volume (veh/h)	34	188	212	102	18	9
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	37	204	230	111	20	10
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh						
Upstream signal (ft)		931	899			
pX, platoon unblocked	0.96				0.96	0.96
vC, conflicting volume	341				564	286
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	290				522	232
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	97				96	99
cM capacity (veh/h)	1218				478	773
Direction, Lane #	EB 1	WB 1	SB 1	SB 2		
Volume Total	241	341	20	10		
Volume Left	37	0	20	0		
Volume Right	0	111	0	10		
cSH	1218	1700	478	773		
Volume to Capacity	0.03	0.20	0.04	0.01		
Queue Length 95th (ft)	2	0	3	1		
Control Delay (s)	1.5	0.0	12.9	9.7		
Lane LOS	A		B	A		
Approach Delay (s)	1.5	0.0	11.8			
Approach LOS			B			
Intersection Summary						
Average Delay			1.1			
Intersection Capacity Utilization			42.5%		ICU Level of Service	A
Analysis Period (min)			15			

HCM Unsignalized Intersection Capacity Analysis

13: Main

11/6/2017



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations		↕	↕		↕	↕
Volume (veh/h)	13	290	300	39	67	33
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	14	315	326	42	73	36
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)		911	919			
pX, platoon unblocked	0.92				0.92	0.92
vC, conflicting volume	368				691	347
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	268				619	245
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	99				82	95
cM capacity (veh/h)	1190				410	729
Direction, Lane #	EB 1	WB 1	SB 1	SB 2		
Volume Total	329	368	73	36		
Volume Left	14	0	73	0		
Volume Right	0	42	0	36		
cSH	1190	1700	410	729		
Volume to Capacity	0.01	0.22	0.18	0.05		
Queue Length 95th (ft)	1	0	16	4		
Control Delay (s)	0.5	0.0	15.7	10.2		
Lane LOS	A		C	B		
Approach Delay (s)	0.5	0.0	13.9			
Approach LOS			B			
Intersection Summary						
Average Delay			2.1			
Intersection Capacity Utilization			36.2%		ICU Level of Service	A
Analysis Period (min)			15			

Warrants Summary														
Information														
Analyst	Garcia Consulting					Intersection	Calumet Ave & Treadway Rd.							
Agency/Co	Lake Co.					Jurisdiction	Town of Munster							
Date Performed	9/20/2017					Units	U.S. Customary							
Project ID	comhs-17-0824 CFNI prop					Time Period Analyzed	6:00 AM - 6:00 PM							
East/West Street	Treadway Rd.					North/South Street	Calumet Avenue							
File Name	2017 1102 warrant 33% build					Major Street	North-South							
Project Description <i>comhs-17-0824 CFNI prop TIA</i>														
General							Roadway Network							
			☐ Population < 10,000				Two Major Routes			☐				
Major Street Speed (mph) 35			☐ Coordinated Signal System				Weekend Count			☐				
Nearest Signal (ft) 1700			☐ Adequate Trials of Alternatives				5-yr Growth Factor			0				
Crashes (per year) 0														
Geometry and Traffic			EB			WB			NB			SB		
			LT	TH	RT	LT	TH	RT	LT	TH	RT	LT	TH	RT
Number of lanes, N			1	1	0	1	1	0	1	2	1	1	2	1
Lane usage			L	TR		L	TR		L	T	R	L	T	R
Vehicle Volume Averages (vph)			78	0	0	2	0	36	21	715	7	33	792	21
Peds (ped/h) / Gaps (gaps/h)			--	0 / 0	--	--	0 / 0	--	--	0 / 0	--	--	0 / 0	--
Delay (s/veh) / (veh-hr)			--	0 / 0	--	--	0 / 0	--	--	0 / 0	--	--	0 / 0	--
Warrant 1: Eight-Hour Vehicular Volume													☒	
1 A. Minimum Vehicular Volumes (Both major approaches --and-- higher minor approach) --or--													☐	
1 B. Interruption of Continuous Traffic (Both major approaches --and-- higher minor approach) --or--													☒	
1 (80%) Vehicular --and-- Interruption Volumes (Both major approaches --and-- higher minor approach)													☐	
Warrant 2: Four-Hour Vehicular Volume													☐	
2 A. Four-Hour Vehicular Volumes (Both major approaches --and-- higher minor approach)													☐	
Warrant 3: Peak Hour													☐	
3 A. Peak-Hour Conditions (Minor delay --and-- minor volume --and-- total volume) --or--													☐	
3 B. Peak- Hour Vehicular Volumes (Both major approaches --and-- higher minor approach)													☐	
Warrant 4: Pedestrian Volume													☐	
4 A. Four Hour Volumes --or--													☐	
4 B. One-Hour Volumes													☐	
Warrant 5: School Crossing													☐	
5. Student Volumes --and--													☐	
5. Gaps Same Period													☐	
Warrant 6: Coordinated Signal System													☐	
6. Degree of Platooning (Predominant direction or both directions)													☐	

Warrant 7: Crash Experience		☐
7 A. Adequate trials of alternatives, observance and enforcement failed --and--		☐
7 B. Reported crashes susceptible to correction by signal (12-month period) --and--		☐
7 C. (80%) Volumes for Warrants 1A, 1B --or-- 4 are satisfied		☒
Warrant 8: Roadway Network		☐
8 A. Weekday Volume (Peak hour total --and-- projected warrants 1, 2 or 3) --or--		☐
8 B. Weekend Volume (Five hours total)		☐
Warrant 9: Grade Crossing		☐
9 A. Grade Crossing within 140 ft --and--		☐
9 B. Peak-Hour Vehicular Volumes		☐

Warrants Volume

Information

Analyst Garcia Consulting
 Agency/Co Lake Co.
 Date Performed 9/20/2017
 Project ID comhs-17-0824 CFNI prop TIA
 East/West Street Treadway Rd.
 File Name 2017 1102 warrant 33% build

Intersection Calumet Ave & Treadway Rd.
 Jurisdiction Town of Munster
 Units U.S. Customary
 Time Period Analyzed 6:00 AM - 6:00 PM
 North/South Street Calumet Avenue
 Major Street North-South

Project Description comhs-17-0824 CFNI prop TIA

Warrant 1

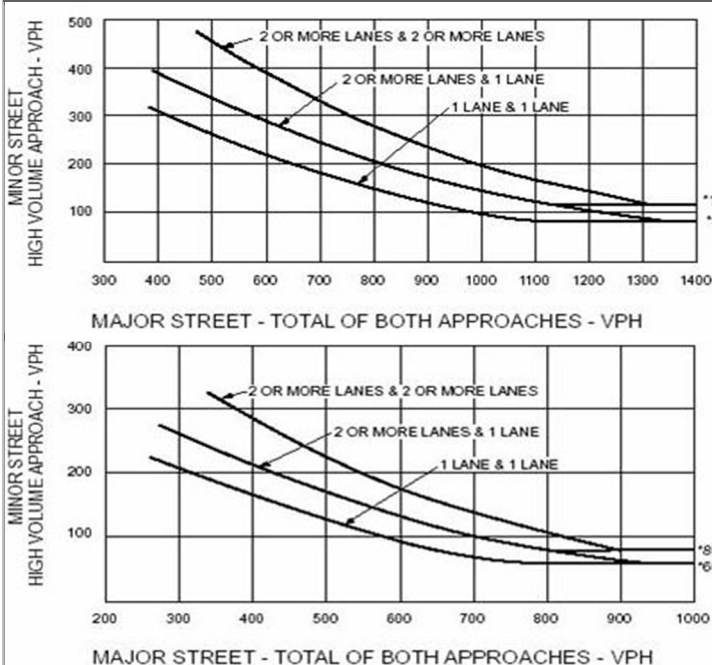
Condition A—Minimum Vehicular Volume

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%	80%	70%	56%	100%	80%	70%	56%
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

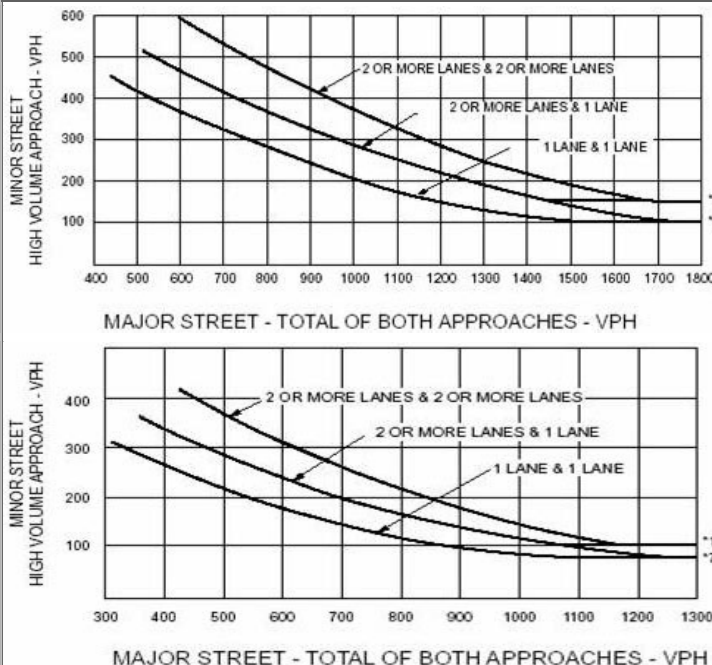
Condition B—Interruption of Continuous Traffic

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%	80%	70%	56%	100%	80%	70%	56%
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

Warrant 2



Warrant 3



Volume Summary

Major Street Lanes 2+			Minor Street Lanes 2+		Speed		35	Population		10000+
Hours	Major Volume	Minor Volume	Total Volume	1A (100%)	1A (80%)	1B (100%)	1B (80%)	2 (100%)	3A (100%)	3B (100%)
06-07	1218	46	1264	No	No	No	No	No	No	No
07-08	1465	79	1544	No	No	No	No	No	No	No
08-09	1477	51	1567	No	No	No	No	No	No	No
09-10	1470	52	1560	No	No	No	No	No	No	No
10-11	1419	101	1545	No	No	Yes	Yes	No	No	No
11-12	1436	101	1554	No	No	Yes	Yes	No	No	No
12-13	1472	101	1599	No	No	Yes	Yes	No	No	No
13-14	1521	104	1656	No	No	Yes	Yes	No	No	No
14-15	1691	105	1830	No	No	Yes	Yes	No	No	No
15-16	1929	106	2062	No	No	Yes	Yes	No	No	No
16-17	2006	124	2167	No	No	Yes	Yes	Yes	No	No
17-18	1989	119	2154	No	No	Yes	Yes	Yes	No	No
Totals	19093	1089	20502	0	0	8	8	2	0	0