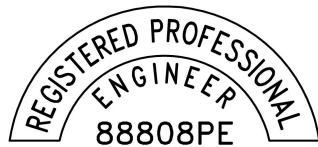




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RENEWS: 6/30/2024

## Haworth Avenue Apartments

Transportation Impact  
Study

Newberg, Oregon

Date:

October 31, 2022

Prepared for:

Grove Hunt

Grove Development, Inc.

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## Executive Summary

1. The proposed Haworth Avenue Apartments project will include the construction of a 24-to-30-unit apartment complex with access onto Haworth Avenue near west edge of the site. The site is located on a single property (tax lot R3216CB-00800) north of Portland Road (OR-99W), south of Haworth Avenue, east of N Deborah Road, and west of N Springbrook Road in Newberg, Oregon.
2. Assuming the development of 30 units, the trip generation calculations show that the proposed project is projected to generate 12 morning peak hour trips, 15 evening peak hour trips, and 202 average weekday trips.
3. No significant trends or crash patterns were identified at any of the study intersections that are indicative of safety concerns with the exception of the intersection of N Springbrook Road at Haworth Avenue which exhibits a crash rate in excess of 1.00 CMEV. Following installation of a traffic signal at the intersection once sufficient proportionate share contributions have been collected (TSP project 109), it is expected the crash rate will decrease to levels below 1.00 CMEV. Accordingly, no other safety mitigation is recommended per the crash data analysis.
4. Adequate sight distance is available to the east of the proposed site access intersection to allow safe operation along Haworth Avenue. To the west of the access intersection, sight distances are limited by trees which act as a barrier delineating the property line between the project site and the adjacent shopping center to the west. Provided this obstructing foliage is removed, adequate intersection sight distance of 240 feet or greater can be obtained to the west. No other sight distance related mitigation is necessary or recommended at the access intersection.
5. Left-turn lane warrants are not projected to be met for the site access intersection along Haworth Avenue under any analysis scenario through year 2029. Accordingly, no new turn lanes are necessary or recommended.
6. Traffic signal warrants are not projected to be met at any of the unsignalized study intersections by the 2029 planning year based on a review of traffic volumes. Specific to the intersection of N Springbrook Road at Haworth Avenue, Warrant 7 is triggered due to the number of recurring crashes at the intersection that could be mitigated by the installation of a traffic signal. Per the City of Newberg's TSP project 109, a traffic signal is planned for installation at the intersection after sufficient proportionate share contributions have been collected. No other traffic signals are necessary or warranted.
7. All study intersections are currently operating acceptably per jurisdictional standards and are projected to continue operating acceptably through the 2024 site buildout year and the future 2029 planning year, with the exception of the N Springbrook Road at Haworth Avenue intersection under existing all-way stop-controls. Once a traffic signal is installed at the intersection, City of Newberg mobility targets will be met for the intersection. No additional operational mitigation is necessary or recommended at the study intersections.

8. No queuing related mitigations are recommended at the intersections of N Springbrook Road at Haworth Avenue and N Springbrook Road at OR-99W which are projected to experience occasional 95<sup>th</sup> percentile queues which exceed available lane storages. All other study intersections and their respective turning movements are provided adequate vehicle storage space. Accordingly, no intersection queuing related mitigation is necessary or recommended as part of the proposed development project.
9. Given sufficient space between the site access and the 95<sup>th</sup> percentile eastbound queues at the N Springbrook Road at Haworth Avenue intersection are available and the potential for circulation/safety issues which could occur with a single restricted access point to the site, it is recommended that the proposed apartment complex be allowed an unrestricted full movement access onto Haworth Avenue.



# Project Description

## Introduction

The proposed Haworth Avenue Apartments project will include the construction of a 24-to-30-unit apartment complex with access onto Haworth Avenue near west edge of the site. The site is located on a single property (tax lot R3216CB-00800) north of Portland Road (OR-99W), south of Haworth Avenue, east of N Deborah Road, and west of N Springbrook Road in Newberg, Oregon.

Based on correspondence with City of Newberg and Oregon Department of Transportation (ODOT) staff, the report conducts safety and capacity/level of service analyses at the following intersections during the morning and evening peak hours:

1. N Deborah Road at Haworth Avenue
2. Site Access at Haworth Avenue
3. N Springbrook Road at Haworth Avenue
4. N Springbrook Road at OR-99W

The purpose of this study is to determine whether the transportation system within the vicinity of the site is capable of safely and efficiently supporting the existing and proposed uses, and to determine any mitigation that may be necessary to do so. Detailed information on traffic counts, trip generation calculations, safety analyses, and level of service calculations is included in the appendix to this report.

## Location Description

As described in the *Introduction*, the site is located north of OR-99W, south of Haworth Avenue, east of N Deborah Road, and west of N Springbrook Road in Newberg, Oregon. The subject site is located within a mixed-use area of the City, with residential uses to the north and commercial retail uses to the south, east and west.

The project site includes a single property (tax lot R3216CB-00800) which encompasses an approximate 0.8 acres. The project site is currently undeveloped but following buildout of the proposed development the site will take access onto Haworth Avenue near west edge of the site.

Figure 1 presents an aerial image of the nearby vicinity with the project site outlined in yellow.



Figure 1: Aerial Photo of Site Vicinity (Image from Google Earth)

**Vicinity Streets**

The proposed development is expected to impact four roadways near the site. Table 1 provides a description of each roadway within the immediate site vicinity.

**Table 1: Vicinity Roadway Descriptions**

Street Name	Jurisdiction	Functional Classification	Speed (MPH)	On-Street Parking	Curbs & Sidewalks	Bicycle Lanes
Haworth Avenue	City of Newberg	Major Collector	25	Partially Permitted	Both Sides	None
Portland Road (OR-99W)	ODOT	Major Arterial/ Statewide Hwy	35	Not Permitted	Both Sides	Both Sides
N Deborah Road	City of Newberg	Minor Collector	25	Partially Permitted	Both Sides	None
N Springbrook Road	City of Newberg	Minor Arterial	25/35	Not Permitted	Both Sides	Partial Both Sides

Table Notes: Functional Classification & Jurisdiction based on City of Newberg TSP.





## Study Intersections

Based on coordination with City of Newberg and ODOT staff, three existing intersections were identified for analysis. A summarized description of these study intersections, under their existing lane and control configurations, is provided in Table 2.

**Table 2: Study Intersection Descriptions**

Number	Intersection	Geometry	Traffic Control	Phasing/Stopped Approaches
1	N Deborah Road at Haworth Avenue	Four-Legged	Stop-Controlled	All-Way Stop-Controlled
3	N Springbrook Road at Haworth Avenue	Four-Legged	Stop-Controlled	All-Way Stop-Controlled
4	N Springbrook Road at OR-99W	Four-Legged	Signalized	Protected NB/SB/EB/WB Left-turns, Channliezed Yield-Controlled EB/WB Right-turns, Overlap NB Right-turn

### Planned Improvements at N Springbrook Road at Haworth Avenue

According to the project’s pre-application meeting notes, dated November 10, 2021, and the City of Newberg’s Transportation System Plan (TSP) project I09, a traffic signal is planned for installation at the intersection of N Springbrook Road at Haworth Avenue. Additionally, it is expected that existing eastbound travel lanes will be restriped to a dedicated left-turn lane and shared through/right-turn lane.

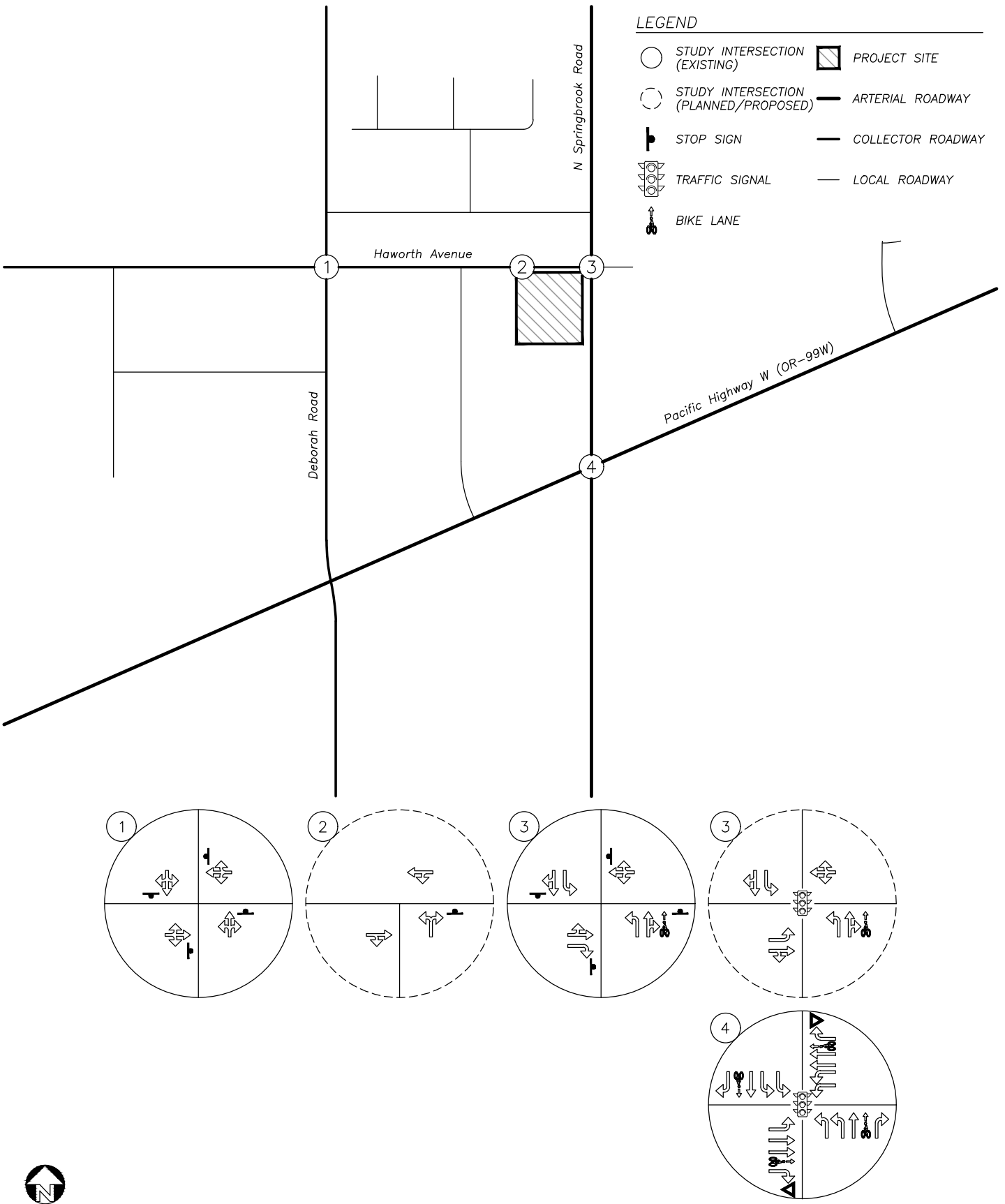
Proportionate share fees are currently being collected at the intersection for these improvements. Based on the impact fees required for the in-process Meadow Creek Apartment development, it was estimated that the proportionate share fee rate is approximately \$342.47 per morning peak hour trip impact. The proposed development is projected to add up to 10 morning peak hour site trip impacts to this intersection (see the *Site Trips* section of this report) whereby a proportionate share contribution of \$3,424.70 may be attributable to the Haworth Avenue Apartments project.

For the purposes of this analysis, the intersection was analyzed assuming operation under both all-way stop-control and with the traffic signal/westbound lane configurations installed/revised for future year 2024 and 2029 conditions.

### Transit

The project site is located near bus line 7 – *Newberg-Providence*, which has stops located within a quarter-mile walking/biking distance of the project site. The nearest transit stops to the site are located along/near OR-99W, where complete sidewalks and marked crossings at intermittent public intersections are available between the site and these transit stops. Weekday service is scheduled from approximately 7:05 AM to 6:25 PM with typical headways of approximately 65 minutes. Weekend and holiday bus service is not provided for this transit route.

A vicinity map showing the project site, vicinity streets, and study intersection configurations is shown in Figure 2.



no scale

# Site Trips

## Trip Generation

The proposed development will include the construction of between 24 to 30 apartment units on a currently undeveloped property. To estimate the number of trips that are currently and will be generated by the proposed use, trip rates from the *Trip Generation Manual*<sup>1</sup> were used. Specifically, data from land use code 220, *Multifamily Housing (Low-Rise)*, was used to estimate site trip generation based on the number of dwelling units.

Assuming the development of 30 units, the trip generation calculations show that the proposed project is projected to generate 12 morning peak hour trips, 15 evening peak hour trips, and 202 average weekday trips. The trip generation estimates associated with the proposed development are summarized in Table 3 and detailed trip generation calculations are included in the appendix.

**Table 3: Trip Generation Summary**

	ITE Code	Size	Morning Peak Hour			Evening Peak Hour			Weekday Total
			Enter	Exit	Total	Enter	Exit	Total	
Proposed Apartment	220	30 units	3	9	12	9	6	15	202

## Trip Distribution

The directional distribution of site trips to/from the project site was estimated based on the locations of likely trip destinations and locations of major transportation facilities in the site vicinity. Based on correspondence with City of Newberg staff, the following trip distribution was confirmed and utilized:

- Approximately 35 percent of site trips will travel to/from the east along OR-99W;
- Approximately 25 percent of site trips will travel to/from the west along OR-99W;
- Approximately 15 percent of site trips will travel to/from the south along N Springbrook Road;
- Approximately 10 percent of site trips will travel to/from the west along Haworth Avenue;
- Approximately 10 percent of site trips will travel to/from the north along N Springbrook Road; and
- Approximately 5 percent of site trips will travel to/from the north along Deborah Road.

The trip distribution and assignment for the site trips generated during the morning and evening peak hours is shown in the Figure 3.

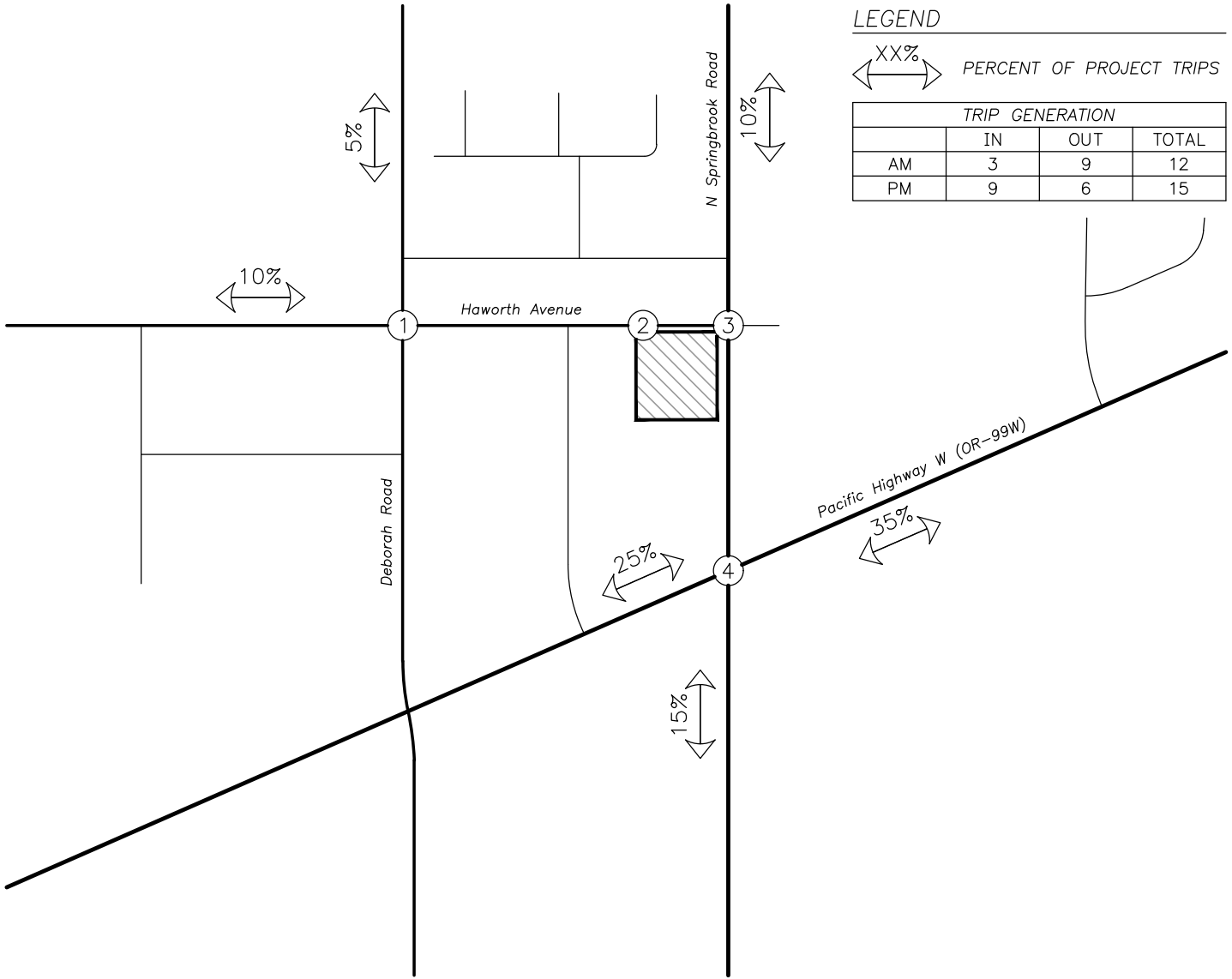
<sup>1</sup> Institute of Transportation Engineers (ITE), *Trip Generation Manual*, 11<sup>th</sup> Edition, 2021.



LEGEND

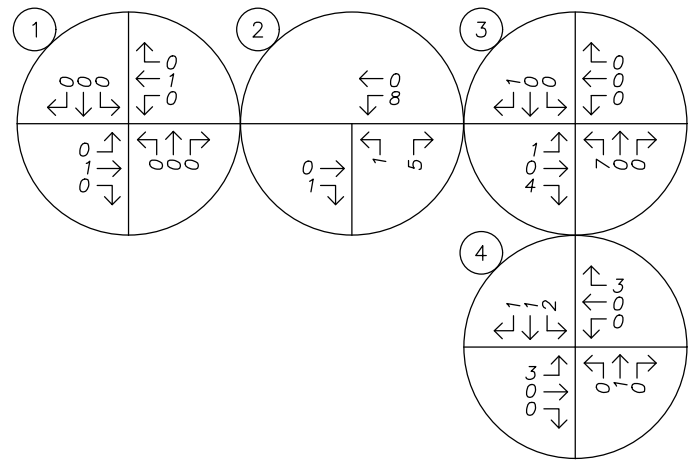
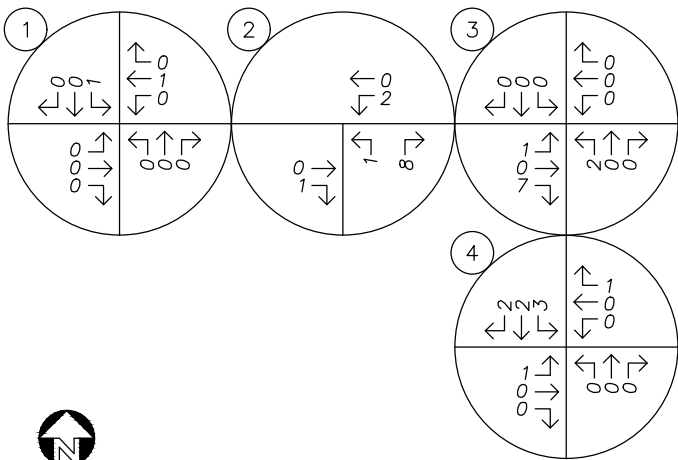
XX% PERCENT OF PROJECT TRIPS

TRIP GENERATION			
	IN	OUT	TOTAL
AM	3	9	12
PM	9	6	15



AM PEAK HOUR

PM PEAK HOUR



## Traffic Volumes

### 2022 Existing Conditions

Due to the ongoing COVID-19 viral pandemic, traffic volumes around Oregon have been depressed relative to normal conditions. However, at the time of writing schools and businesses have generally been operating at normal capacities, mask mandates have generally been lifted, and Oregon COVID-19 infection rates had decreased significantly since January 2022. Therefore, at the direction of City of Newberg staff new intersection traffic counts were collected at the study intersections and utilized for analysis.

Traffic counts were conducted at the study intersections on Tuesday, April 19, 2022, from 6:00/7:00 AM to 9:00 AM and from 3:00/4:00 PM to 6:00 PM. Data was used from each intersection's respective morning and evening peak hours.

Per the requirements established in ODOT's *Analysis Procedures Manual (APM)*, a seasonal adjustment factor of 1.0540 was calculated for the April counts, utilizing the *On-site Automatic Traffic Recorder (ATR) Method*. This method referenced average weekday traffic volumes along OR-99W at a location approximately 0.01 miles west of Brutscher Street (ATR Station 36-004) from years 2016 through 2020. Given this ATR Station is located within approximately a quarter mile of the N Springbrook Road at OR-99W intersection and there are no major intermittent intersections between the two locations, the use of the *On-site ATR Method* is appropriate to determine a seasonal adjustment factor.

Figure 4 shows the existing traffic volumes at the study intersections during the morning and evening peak hours.

### 2024 Background Conditions

To provide analysis of the impact of the proposed development on the nearby transportation facilities, an estimate of future traffic volumes is required. It is expected that the proposed development will be constructed and in operation by year 2024. In order to approximate the future year 2024 traffic volumes at the study intersections, a compounded growth rate of two percent per year for an assumed buildout condition of two years was applied to the measured 2022 existing traffic volumes. Specific to the study intersection of N Springbrook Road at OR-99W, the through movement volumes along OR-99W were grown utilizing a 0.01413 percent per year linear growth rate, derived from ODOT's 2040 Future Volumes Table. When determining this ODOT growth rate, volume/growth projections at the following two locations were compared and the higher growth rate of the two locations was used:

- 0.01 miles west of Brutscher Steet (ATR Station 36-004, Milepost 21.81).
- 0.10 miles west of Springbrook Road (Milepost 22.15).

In addition to the traffic volume growth described above, there with several in-process developments within the site vicinity that are currently approved but not yet fully constructed or occupied. The following projects were assumed to be completed and occupied prior to year 2024:

- Crestview Crossing: 260 single-family detached houses and 48 apartment units at tax lots 1100 and 13800 north of Providence Newberg Medical Center addressed at 1001 Providence Drive.
- Meadow Creek Apartments: 47 apartment units located at tax lots 100 and 200 addressed at 1306 N Springbrook Road.
- Meadow Creek Apartments (Phase 2): 74 apartment units at located at tax lots 100 and 200 addressed at 1306 N Springbrook Road.

The in-process developments are currently not fully contributing trips to the transportation system but may potentially be by the assumed 2024 buildout year of the proposed development. Additional trips corresponding to each in-process development were added to the 2022 existing year traffic volumes in addition to the two years of traffic growth at each of the applicable study intersections. To maintain a conservative analysis of operation at the study intersections, the in-process developments were assumed to be fully built-out by year 2024.

Figure 5 shows the projected year 2024 background traffic volumes at the study intersections during the morning and evening peak hours. A figure depicting in-process trips is included in the appendix to this report.

## 2024 Buildout Conditions

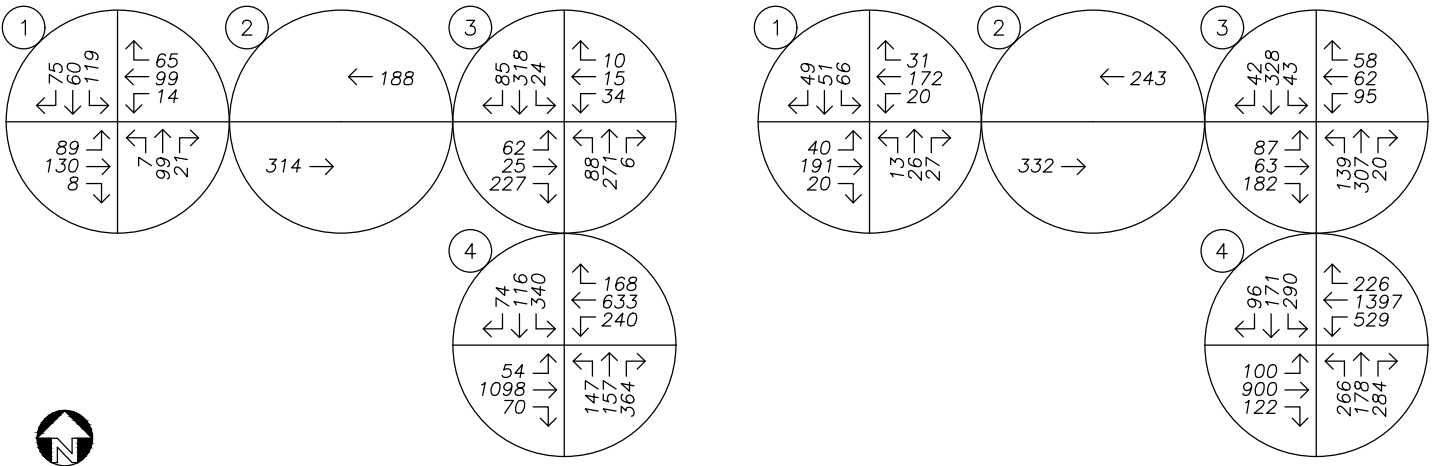
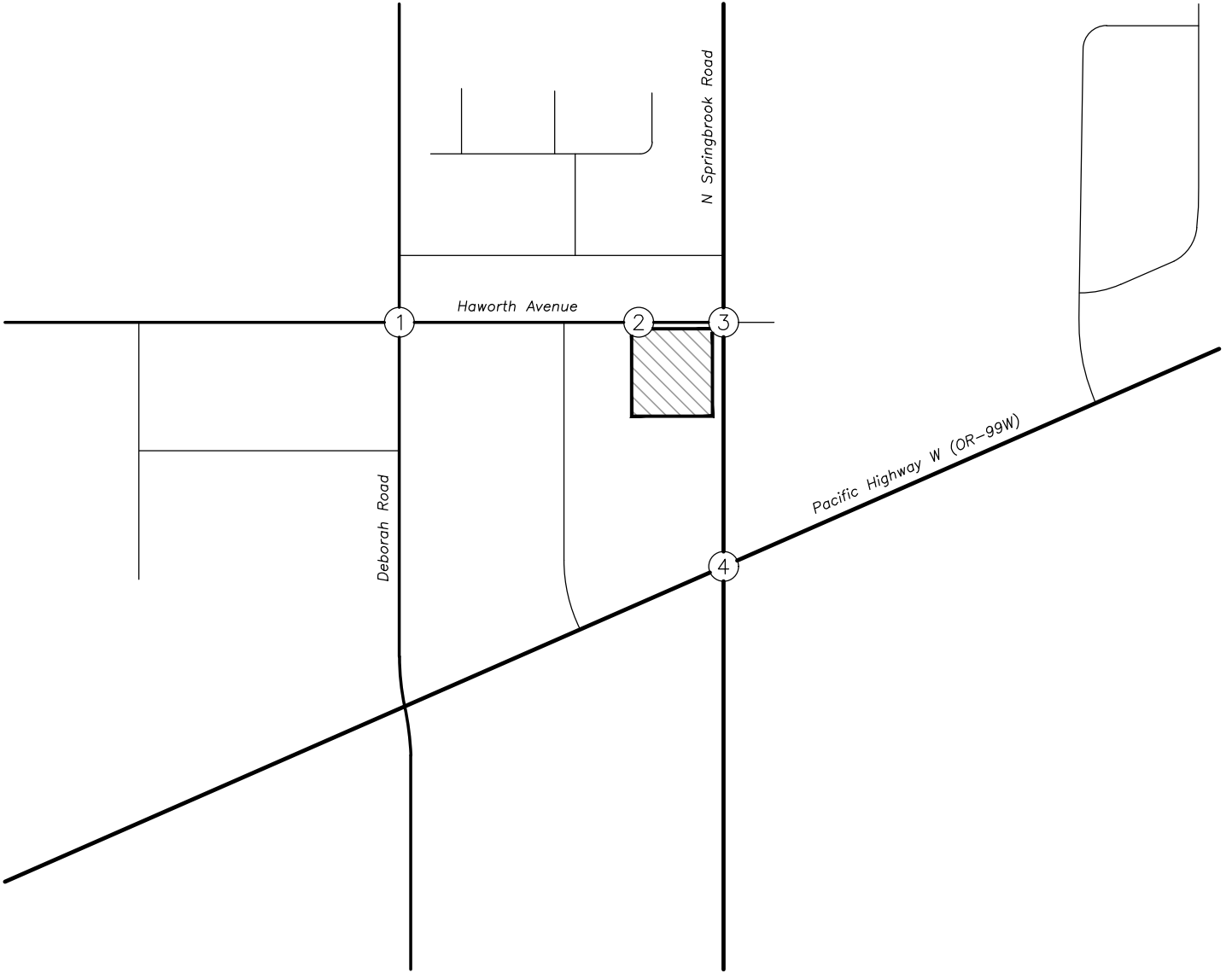
Peak hour trips calculated to be generated by the proposed development, as described earlier within the *Site Trips* section, were added to the projected year 2024 background traffic volumes to obtain the expected 2024 site buildout volumes.

Figure 6 shows year 2024 buildout traffic volumes at the study intersections during the morning and evening peak hours.

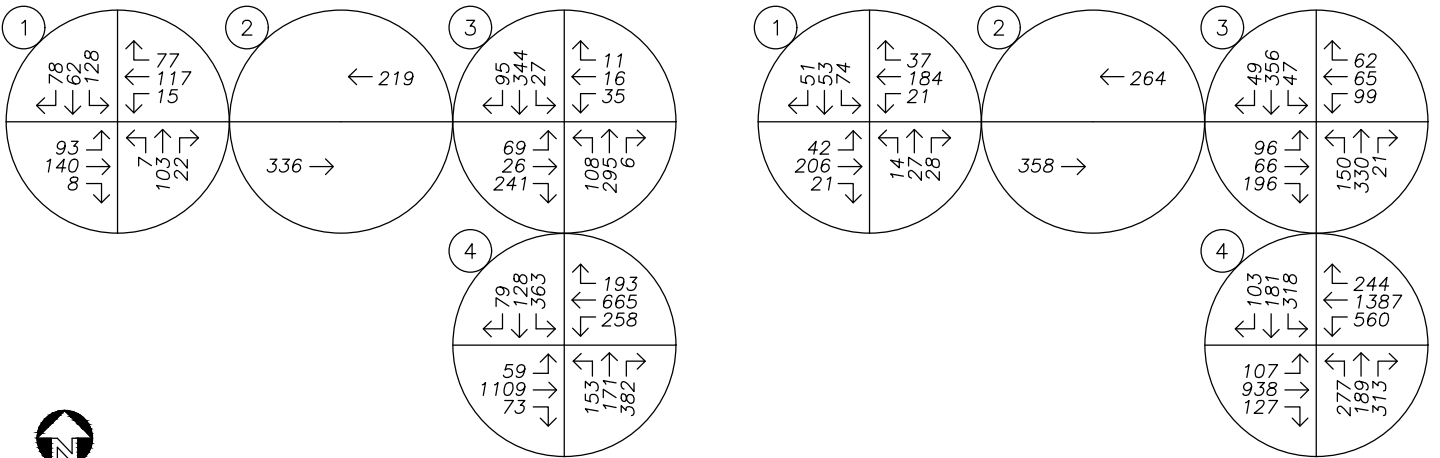
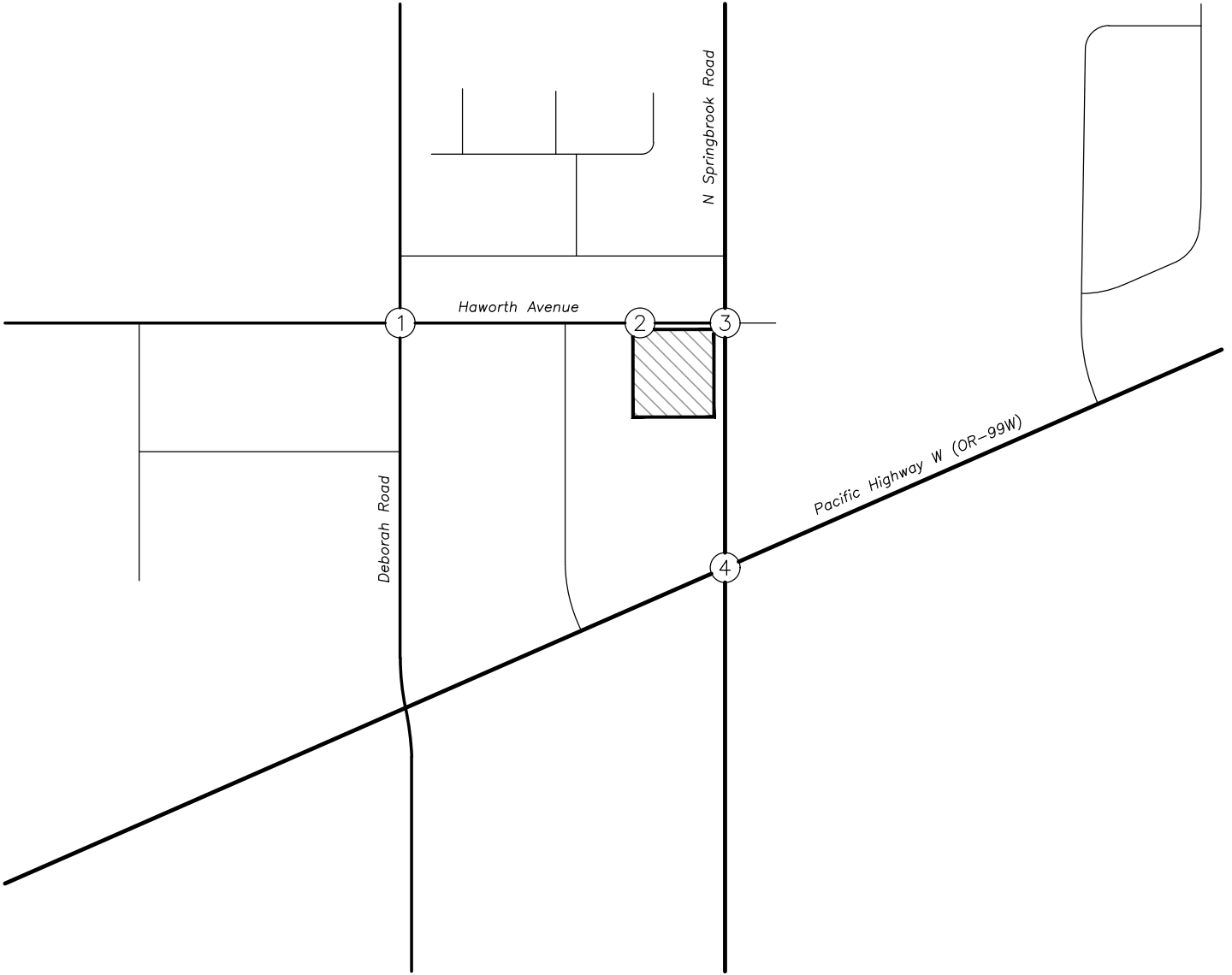
## 2029 Planning Year Conditions

At the direction of City of Newberg staff, an additional future year analysis scenario was prepared which reviews traffic conditions five years beyond the assumed 2024 buildout year of the site. The traffic volumes were estimated in a manner consistent with the methodologies discussed in the aforementioned sections, with the exception that growth rates were applied to the existing year traffic volumes over a seven-year period to estimate 2029 traffic conditions.

Figure 7 shows year 2029 planning year traffic volumes at the study intersections during the morning and evening peak hours.

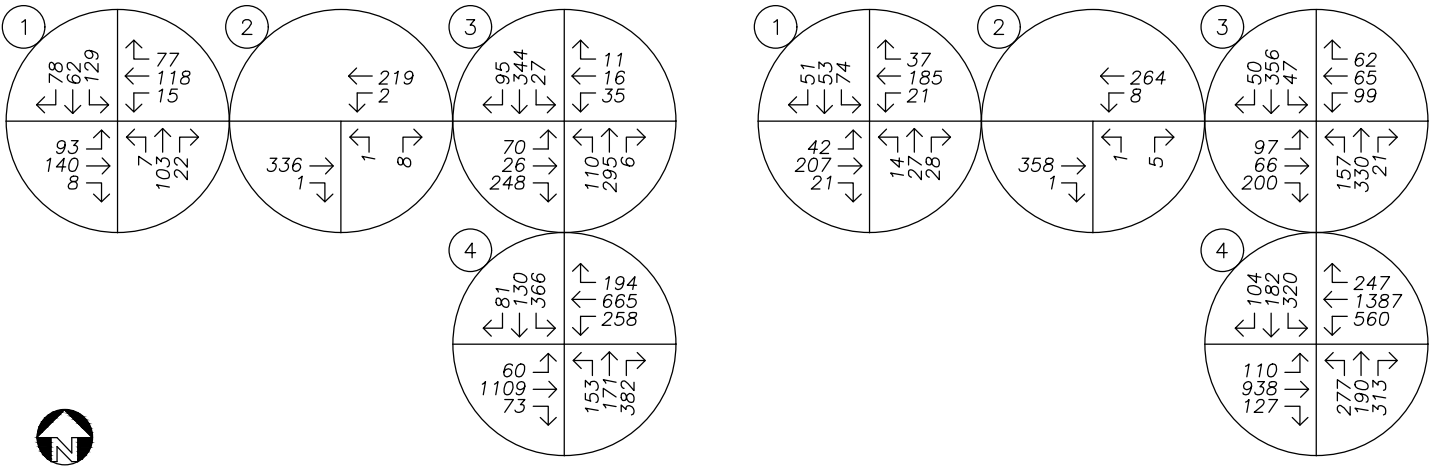
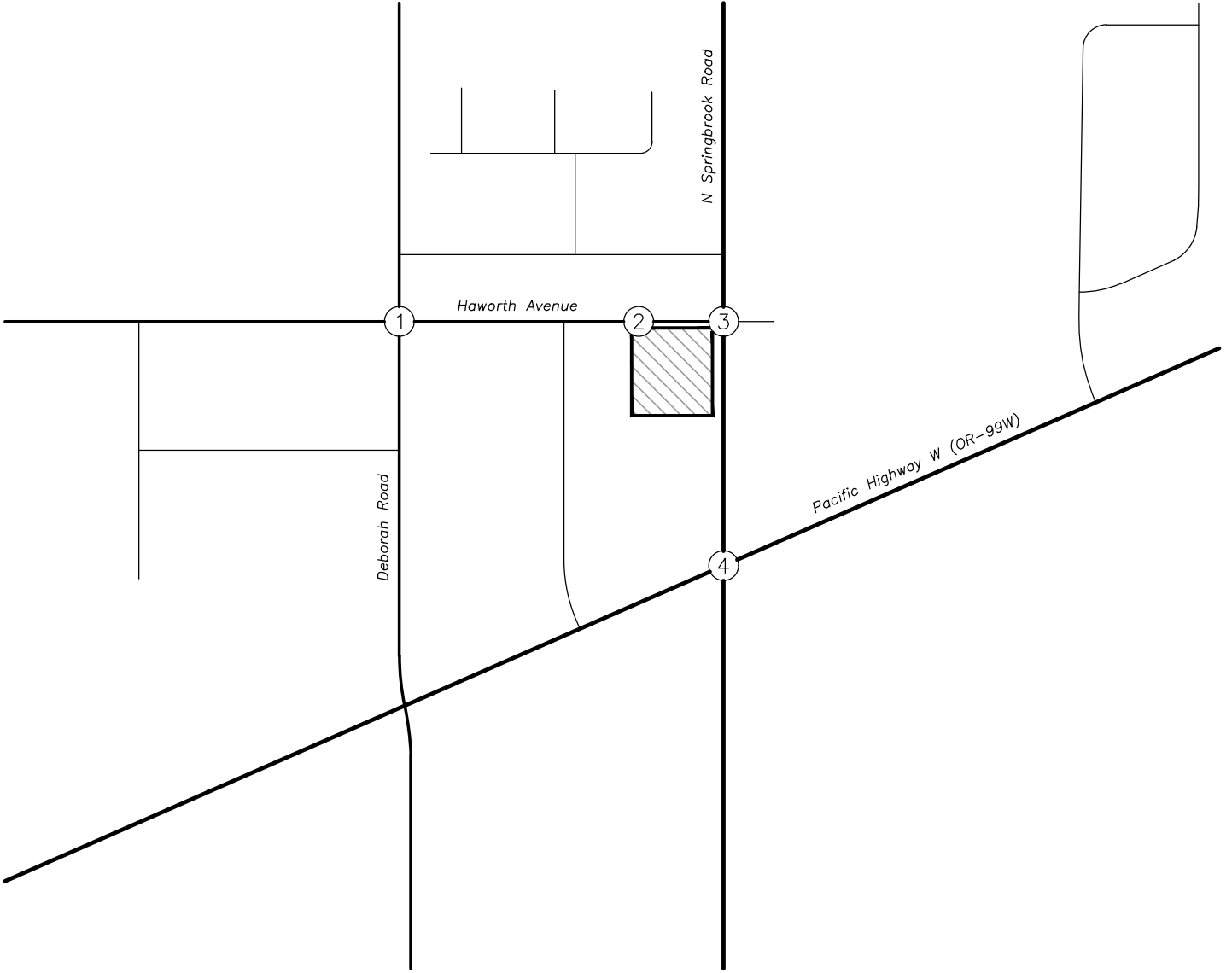


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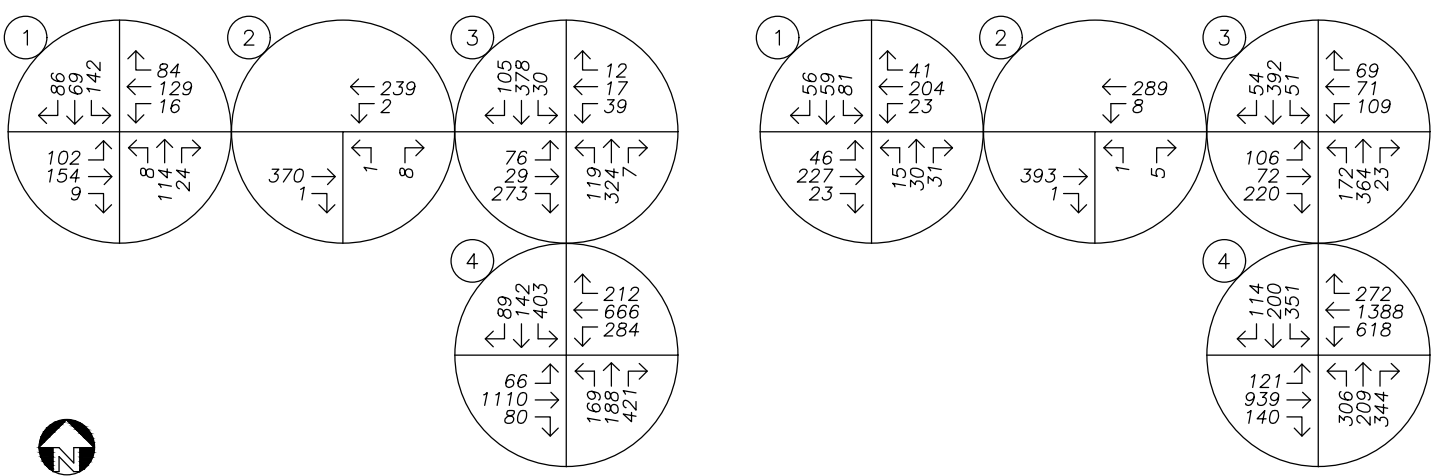
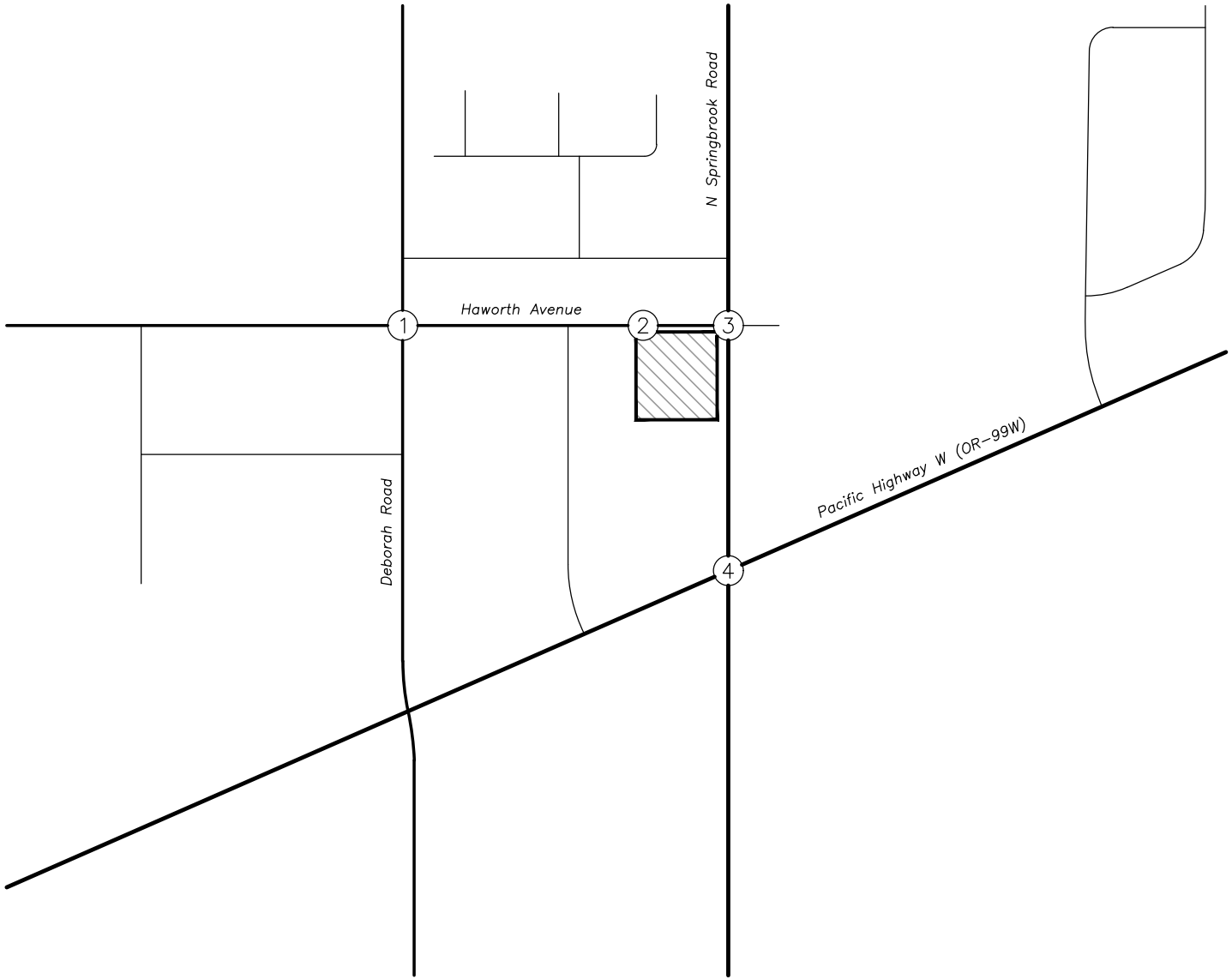


  
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# Safety Analysis

## Crash History Review

Using data obtained from ODOT's Crash Analysis and Reporting Unit, a review was performed of the most recent five years of available crash data at the study intersections (January 2016 through December 2020). The crash data was evaluated based on the number of crashes, the type of collisions, the severity of the collisions, and the resulting crash rate for each intersection. Crash rates provide the ability to compare safety risks at different intersections by accounting for both the number of crashes that have occurred during the study period and the number of vehicles that typically travel through the intersection. Crash rates were calculated under the common assumption that traffic counted during the evening peak hour represents approximately ten percent of annual average daily traffic (AADT) at each intersection. Crash rates in excess of 1.00 crashes per million entering vehicles (CMEV) may be indicative of design deficiencies and therefore require a need for further investigation and possible mitigation.

With regard to crash severity, ODOT classifies crashes in the following categories:

- Property Damage Only (PDO);
- Possible Injury – Complaint of Pain (Injury C);
- Non-Incapacitating Injury (Injury B);
- Incapacitating Injury – Bleeding, Broken Bones (Injury A); and
- Fatality or Fatal Injury.

The intersection of N Springbrook Road at OR-99W is an ODOT facility which adheres to the crash analysis methodologies in ODOT's APM. According to *Exhibit 4-1: Intersection Crash Rates per MEV by Land Type and Traffic Control* of the APM, intersections which experience crash rates in excess of their respective 90<sup>th</sup> percentile crash rates should be "flagged for further analysis". For intersections in urban settings, the following average and 90<sup>th</sup> percentile rates are applicable to the study intersection:

- Signalized, Four-Legged Intersections:
  - Average rate of 0.477 CMEV.
  - 90<sup>th</sup> percentile rate of 0.860 CMEV.

Table 4 provides a summary of crash types while Table 5 summarizes crash severities and rates for each of the study intersections. Detailed crash data is provided in the appendix to this report (note the crashes highlighted in yellow in the appendix were determined to not be related to the associated with operations or infrastructure at the intersection).

Table 4: Crash Type Summary

Number	Intersection	Crash Type						Total
		Rear End	Turn/ Angle	Fixed Object	Side swipe	Ped/ Bike	Other	
1	N Deborah Road at Haworth Avenue	0	2	0	0	1	0	3
3	N Springbrook Road at Haworth Avenue	1	23	0	1	1	1	27
4	N Springbrook Road at OR-99W	51	5	0	5	2	0	63

Table 5: Crash Severity and Rate Summary

Number	Intersection	Crash Severity						Total Crashes	AADT	Crash Rate
		PDO	C	B	A	Fatal	Unknown			
1	N Deborah Road at Haworth Avenue	1	1	1	0	0	0	3	7,060	0.233
3	N Springbrook Road at Haworth Avenue	13	9	4	1	0	0	27	14,260	<b>1.037</b>
4	N Springbrook Road at OR-99W	30	27	5	1	0	0	63	45,290	0.762

Table Notes: **BOLDED** text indicates a crash rate in excess of 1.00 CMEV or ODOT's 90th percentile rate.

Based on a review of the crash data, there were several crashes that involved either a pedestrian/bicyclist or was classified as Injury A. Additionally, the intersection of N Springbrook Road at Haworth Avenue exhibits a crash rate in excess of 1.00 CMEV. A detailed description of these crashes and intersections is provided below.

**N Deborah Road at Haworth Avenue**

The intersection of N Deborah Road at Haworth Avenue had one crash that involved a bicyclist. The crash occurred when the east/west crossing bicyclist disregarded intersection traffic controls, failed to yield right-of-way to a westbound left-turning passenger car which had initially stopped at the intersection, and collided with the motor vehicle. The bicyclist sustained injuries consistent with Injury B classification while the driver of the passenger car was uninjured.

**N Springbrook Road at Haworth Avenue**

The intersection of N Springbrook Road at Haworth Avenue had two crashes that either involved a bicyclist or was classified as Injury A.

- The bicycle-related collision occurred when an east/west crossing bicyclist failed to yield right-of-way to a southbound passenger car and collided with the motor vehicle. The bicyclist sustained injuries consistent with Injury B classification while the driver of the passenger car was uninjured.



- The crash that was classified as Injury A occurred when the driver of a northbound passenger car disregarded intersection traffic controls and collided with a westbound right-turning passenger car. A third passenger car that was stopped in the eastbound direction of travel was struck by one of the other vehicles after the initial collision. The driver of the vehicle that instigated the collision sustained injuries consistent with Injury B classification while a passenger in the same vehicle sustained injuries consistent with Injury A classification. The occupants of the two other vehicles did not sustain any reported injuries.

Additionally the intersection was identified to have a crash rate in excess of 1.00 CMEV. Upon closer inspection of the crash data, 23 of the 27 crashes reported at the intersection (i.e. approximately 85 percent of all reported crashes) were classified as angle/turning movement collisions. Per the City of Newberg’s TSP project I09, a traffic signal is planned for installation at the intersection. Following installation of the traffic signal after sufficient proportionate share contributions have been collected, it is expected that the number of recurring angle/turning movement collisions at the intersection will decrease sufficiently to levels below 1.00 CMEV. No additional mitigation is necessary or recommended at the intersection.

### **N Springbrook Road at OR-99W**

The intersection of N Springbrook Road at OR-99W had three crashes that either involved a pedestrian or was classified as Injury A.

- One of the crashes that involved a pedestrian occurred when the driver of a northbound right-turning passenger car failed to yield right-of-way to a north/south crossing pedestrian who was utilizing an intersection crosswalk. The pedestrian sustained injuries consistent with Injury B classification while the driver of the passenger car was uninjured.
- The second pedestrian-related collision occurred when the driver of a northbound left-turning passenger car was driving carelessly and failed to yield right-of-way to a north/south crossing pedestrian who was utilizing an intersection crosswalk. The pedestrian sustained injuries consistent with Injury C classification while the driver of the passenger car was uninjured.
- The crash that was classified as Injury A occurred when the driver of a southwest-bound passenger car disregarded intersection traffic controls and collided with a southbound passenger car. All occupants of the southbound vehicle sustained injuries consistent with Injury C classification. The driver of the southwest-bound vehicle sustained no injuries while the two other passengers of the vehicle sustained injuries classified as Injury C and Injury A.

### **Analysis Findings**

Based on a review of available crash data, no significant trends or crash patterns were identified at any of the study intersections that are indicative of safety concerns with the exception of the intersection of N Springbrook Road at Haworth Avenue which exhibits a crash rate in excess of 1.00 CMEV. Following installation of a traffic signal at the intersection once sufficient proportionate share contributions have been collected (TSP project I09), it is expected the crash rate will decrease to levels below 1.00 CMEV. Accordingly, no other safety mitigation is recommended per the crash data analysis.

## Sight Distance Evaluation

Intersection sight distances were measured at the proposed site access location along Haworth Avenue and evaluated in accordance with the standards established in *A Policy of Geometric Design of Highways and Streets*<sup>2</sup>.

### Methodology

According to AASHTO, the driver's eye is assumed to be approximately 15 feet from the near edge of the nearest travel lane of the intersecting street and at a height of 3.5 feet above the minor-street approach pavement. The vehicle driver's eye height along the major-street approach is assumed to be 3.5 feet above the cross-street pavement. Based on a posted speed of 25 mph along Haworth Avenue, the minimum recommended intersection sight distances include the following:

- 280 feet to the east for left-turn vehicles.
- 240 feet to the west for right-turn vehicles.

Per the AASHTO manual intersection sight distance is an operation measure intended to provide sufficient line of sight along the major-street so that a driver could turn from the minor-street approach without impeding traffic flow. Conversely, stopping sight distance is considered the minimum requirement to ensure safe operation of an intersection. This is the distance that allows an oncoming driver to see a hazard on the roadway, react, and come to a complete stop, if necessary, to avoid a collision. Based on the posted speed of 25 mph along Haworth Avenue, the minimum required stopping sight distance is 155 feet, assuming a major-street approach roadway grade of 3 percent or less.

### Field Measurements

At the proposed access intersection along Haworth Avenue, sight distance to the east was measured back to the intersection of N Springbrook Road at Haworth Avenue, approximately 170 feet away, noting that sight distances extend back into the shopping center parking lot at distances greater than 280 feet. Given the intersection currently operates under all-way stop-controls (i.e. vehicles will be approach the proposed access intersection from a stopped position) and in the future will operate with a traffic signal (i.e. vehicles may reasonably turn from N Springbrook Road onto Haworth Avenue at speeds no greater than 20 mph), there is more than sufficient stopping sight distance to safely accommodate vehicles approaching the access intersection from this direction.

Sight distance to the west of the proposed access intersection was measured to be approximately 60 feet, limited by trees which act as a barrier delineating the property line between the project site and the adjacent shopping center to the west. Provided this obstructing foliage is removed, adequate intersection sight distance of 240 feet or greater can be obtained to the west.

### Analysis Findings

Based on the above measurements, adequate sight distance is available to the east of the proposed site access intersection to allow safe operation along Haworth Avenue. To the west of the access intersection, sight distances are limited by trees which act as a barrier delineating the property line between the project site and

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<sup>2</sup> American Association of State Highway and Transportation Officials (AASHTO), *A Policy on Geometric Design of Highways and Streets*, 6<sup>th</sup> Edition, 2011.

the adjacent shopping center to the west. Provided this obstructing foliage is removed, adequate intersection sight distance of 240 feet or greater can be obtained to the west. No other sight distance related mitigation is necessary or recommended at the access intersection.

## Warrant Analysis

Left-turn lane and preliminary traffic signal warrants were examined at the study intersections where such treatments would be applicable.

### **Left-turn Lane Warrant**

A left-turn refuge lane is primarily a safety consideration for the major-street, removing left-turning vehicles from the through traffic stream at unsignalized one/two-way stop-controlled intersections. The left-turn lane warrants used were developed from the *National Cooperative Highway Research Project's (NCHRP) Report 457*. Turn lane warrants were evaluated based on the number of advancing and opposing vehicles as well as the number of turning vehicles, the travel speed, and the number of through lanes.

Left-turn lane warrants are not projected to be met for the site access intersection along Haworth Avenue under any analysis scenario through year 2029. Accordingly, no new turn lanes are necessary or recommended.

### **Preliminary Traffic Signal Warrant**

Preliminary traffic signal warrants were examined for the unsignalized study intersections along Haworth Avenue to determine whether the installation of a new traffic signal will be warranted at the intersections by the 2029 planning year with the proposed development constructed. Based on the analysis, traffic signal warrants are not projected to be met at any of the unsignalized study intersections by the 2029 planning year based on a review of traffic volumes (i.e. Warrant 1).

Specific to the intersection of N Springbrook Road at Haworth Avenue and referring to the *Crash History Review* section, Warrant 7 Crash Experience is triggered given the number of recurring crashes at the intersection over a single 12-month period that could be mitigated by the installation of a traffic signal. Per the City of Newberg's TSP project I09, a traffic signal is planned for installation at the intersection after sufficient proportionate share contributions have been collected.

## Intersection Capacity Analysis

A capacity and delay analysis were conducted for each of the study intersections per the signalized and unsignalized intersection analysis methodologies in the *Highway Capacity Manual (HCM)*<sup>3</sup>. Intersections are generally evaluated based on the average control delay experienced by vehicles and are assigned a grade according to their operation. The level of service (LOS) of an intersection can range from LOS A, which indicates very little or no delay experienced by vehicles, to LOS F, which indicates a high degree of congestion and delay. The volume-to-capacity (v/c) ratio is a measure that compares the traffic volumes (demand) against the available capacity of an intersection.

## Performance Standards

The operating standards adopted by the City of Newberg and ODOT are summarized below.

### City of Newberg

According to the City of Newberg's TSP and Public Works Design and Construction Standards, intersections under City jurisdiction are required to operate at a minimum LOS D or better with a v/c ratio no greater than 0.90.

### ODOT

Per an Oregon Highway Plan (OHP) amendment, the Oregon Transportation Commission (OTC) has adopted alternative mobility targets for OR-99W at a location from N Springbrook Road to the eastern City limits, as described in the *Alternative Mobility Targets for OR 99W and OR 219 in Newberg* memorandum, dated February 13, 2020. As part of these alternative mobility standards, the intersection of N Springbrook Road at OR-99W is required to operate with a v/c ratio no greater than 1.0.

## Delay & Capacity Analysis

According to the project's pre-application meeting notes, dated November 10, 2021, and the City of Newberg's TSP project I09, a traffic signal is planned for installation at the intersection of N Springbrook Road at Haworth Avenue. Additionally, it is expected that that existing eastbound travel lanes will be restriped to a dedicated left-turn lane and shared through/right-turn lane. For the purposes of this analysis, the intersection was analyzed assuming operation under both all-way stop-control and with the traffic signal/westbound lane configurations installed/revised for future year 2024 and 2029 conditions.

The LOS, delay, and v/c results of the capacity analysis are shown in Table 6 for the morning and evening peak hours. The TrafficWare Synchro software utilized for analysis does not report the overall v/c ratio of signalized intersections in the HCM 6<sup>th</sup> Edition capacity reports. For these intersections, the v/c ratio was calculated based on methods detailed in ODOT's *APM Section 13 Signalized Intersection Analysis*. Detailed calculations as well as tables showing the relationship between delay and LOS are included in the appendix to this report.

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<sup>3</sup> Transportation Research Board, *Highway Capacity Manual 6<sup>th</sup> Edition*, 2016.



Table 6: Capacity Analysis Summary

		AM Peak Hour			PM Peak Hour		
		LOS	Delay (s)	v/c	LOS	Delay (s)	v/c
<b>1. N Deborah Road at Haworth Avenue</b>							
	2022 Existing Conditions	B	12	0.47	B	11	0.41
	2024 Background Conditions	B	14	0.52	B	12	0.45
	2024 Buildout Conditions	B	14	0.52	B	12	0.46
	2029 Future Conditions	C	16	0.61	B	13	0.52
<b>2. Site Access at Haworth Avenue</b>							
	2024 Buildout Conditions	B	11	0.02	B	12	0.01
	2029 Future Conditions	B	11	0.02	B	12	0.01
<b>3. N Springbrook Road at Haworth Avenue</b>							
	2022 Existing Conditions	C	20	0.78	D	27	0.84
	2024 Background Conditions (AWSC)	D	26	0.89	<b>E</b>	38	<b>0.97</b>
	2024 Background Conditions (Signal)	B	10	0.50	B	12	0.59
	2024 Buildout Conditions (AWSC)	D	26	0.89	<b>E</b>	38	<b>0.98</b>
	2024 Buildout Conditions (Signal)	B	10	0.50	B	12	0.60
	2029 Future Conditions (AWSC)	<b>E</b>	40	<b>1.02</b>	<b>F</b>	58	<b>1.12</b>
	2029 Future Conditions (Signal)	B	10	0.53	B	12	0.67
<b>4. N Springbrook Road at OR-99W</b>							
	2022 Existing Conditions	D	37	0.78	D	40	0.81
	2024 Background Conditions	D	40	0.81	D	43	0.85
	2024 Buildout Conditions	D	40	0.82	D	43	0.85
	2029 Future Conditions	D	47	0.85	D	49	0.88

Table Notes: **BOLDED** text indicates intersection operation above jurisdictional standards.

Based on the results of the operational analysis, all study intersections are currently operating acceptably per jurisdictional standards and are projected to continue operating acceptably through the 2024 site buildout year and the future 2029 planning year, with the exception of the N Springbrook Road at Haworth Avenue intersection under existing all-way stop-controls. Once a traffic signal is installed at the intersection, City of Newberg mobility targets will be met for the intersection. Accordingly, no additional operational mitigation is necessary or recommended at the study intersections.



## Intersection Queuing Analysis

A queuing analysis was conducted at the study intersections to determine whether sufficient storage is available at applicable turning movements to accommodate projected queues. Additionally, the analysis was performed to demonstrate whether eastbound queues at the intersection of N Springbrook Road at Haworth Avenue will extend back to the proposed site access intersection along Haworth Avenue. Based on correspondence with City of Newberg staff, if queues from the N Springbrook Road at Haworth Avenue intersection obstruct turning movements at the site access intersection, turning movements at the site access may need to be restricted.

### Queuing Analysis

The queue lengths were projected based on the results of a Synchro/SimTraffic simulation, with the reported values representing the 95<sup>th</sup> percentile queue length. The 95<sup>th</sup> percentile queue is a statistical measurement which indicates there is a 5 percent chance, that the queue may exceed this length during the analysis period; however, given this is a probability, the 95<sup>th</sup> percentile queue length may theoretically never be met or observed in the field.

The projected 95<sup>th</sup> percentile queue lengths reported in the simulation are presented in Table 7 for the morning and evening peak hours. Note the reported queue lengths were rounded up to the nearest five feet. Detailed queuing analysis worksheets are included in the technical appendix to this report.

**Table 7: Queuing Analysis Summary**

		Available Storage (ft)	AM Peak Hour	PM Peak Hour
			95th (ft)	95th (ft)
<b>1. N Deborah Road at Haworth Avenue</b>				
2022 Existing Conditions	EB Lane	-	90	85
	WB Lane	-	75	75
	NB Lane	-	80	65
	SB Lane	-	105	85
2024 Background Conditions	EB Lane	-	95	85
	WB Lane	-	75	75
	NB Lane	-	85	65
	SB Lane	-	105	85
2024 Buildout Conditions	EB Lane	-	95	90
	WB Lane	-	75	75
	NB Lane	-	85	65
	SB Lane	-	115	85
2024 Future Conditions	EB Lane	-	105	95
	WB Lane	-	90	75
	NB Lane	-	85	65
	SB Lane	-	120	85
<b>2. Site Access at Haworth Avenue</b>				
2024 Buildout Conditions	WB Lane	150*	5	25
	NB Lane	-	30	30
2024 Future Conditions	WB Lane	150*	10	30
	NB Lane	-	30	30

Table Notes: **BOLDED** text indicates queue length exceeds available storage.

\* The distance between Haworth/Springbrook Intersection's marked crosswalk and the site access.

Table 7: Queuing Analysis Summary (Continued)

		Available Storage (ft)	AM Peak Hour	PM Peak Hour
			95th (ft)	95th (ft)
<b>3. N Springbrook Road at Haworth Avenue (AWSC)</b>				
2022 Existing Conditions	EB Th/LT Lane	150*	55	85
	EB RT Lane	150*	85	85
	WB Lane	-	55	110
	NB LT Lane	90	70	<b>95</b>
	NB Th/RT Lane	-	120	160
	SB LT Lane	95	45	<b>100</b>
	SB Th/RT Lane	-	180	220
2024 Background Conditions	EB Th/LT Lane	150*	60	85
	EB RT Lane	150*	95	85
	WB Lane	-	60	120
	NB LT Lane	90	70	<b>100</b>
	NB Th/RT Lane	-	130	200
	SB LT Lane	95	70	<b>180</b>
	SB Th/RT Lane	-	210	410
2024 Buildout Conditions	EB Th/LT Lane	150*	65	85
	EB RT Lane	150*	100	100
	WB Lane	-	60	130
	NB LT Lane	90	65	<b>120</b>
	NB Th/RT Lane	-	135	205
	SB LT Lane	95	90	<b>175</b>
	SB Th/RT Lane	-	260	390
2024 Future Conditions	EB Th/LT Lane	150*	70	110
	EB RT Lane	150*	110	115
	WB Lane	-	60	150
	NB LT Lane	90	75	<b>170</b>
	NB Th/RT Lane	-	150	290
	SB LT Lane	95	<b>145</b>	<b>285</b>
	SB Th/RT Lane	-	405	895
<b>3. N Springbrook Road at Haworth Avenue (Traffic Signal)</b>				
2024 Background Conditions	EB LT Lane	150*	70	85
	EB Th/RT Lane	150*	120	115
	WB Lane	-	70	170
	NB LT Lane	90	<b>95</b>	<b>125</b>
	NB Th/RT Lane	-	175	190
	SB LT Lane	95	70	75
	SB Th/RT Lane	-	210	195
2024 Buildout Conditions	EB LT Lane	150*	70	90
	EB Th/RT Lane	150*	115	145
	WB Lane	-	65	180
	NB LT Lane	90	<b>95</b>	<b>130</b>
	NB Th/RT Lane	-	160	200
	SB LT Lane	95	55	70
	SB Th/RT Lane	-	210	200

Table Notes: **BOLDED** text indicates queue length exceeds available storage.

\* The distance between Haworth/Springbrook Intersection's marked crosswalk and the site access.



Table 7: Queuing Analysis Summary (Continued)

		Available Storage (ft)	AM Peak Hour	PM Peak Hour
			95th (ft)	95th (ft)
<b>3. N Springbrook Road at Haworth Avenue (Traffic Signal)</b>				
2024 Future Conditions	EB LT Lane	150*	80	100
	EB Th/RT Lane	150*	140	145
	WB Lane	-	75	225
	NB LT Lane	90	<b>110</b>	<b>125</b>
	NB Th/RT Lane	-	180	195
	SB LT Lane	95	70	95
	SB Th/RT Lane	-	215	235
<b>4. N Springbrook Road at OR-99W</b>				
2022 Existing Conditions	EB LT Lane	350	105	160
	EB Th Lanes	-	405	340
	EB RT Lane	340	45	45
	WB LT Lanes	450	215	350
	WB Th Lanes	-	215	465
	WB RT Lane	335	0	200
	NB LT Lanes	245	175	<b>260</b>
	NB Th Lane	-	195	205
	NB RT Lane	260	260	200
	SB LT Lanes	115	<b>185</b>	<b>170</b>
	SB Th Lane	-	140	190
	SB RT Lane	125	55	105
2024 Background Conditions	EB LT Lane	350	80	150
	EB Th Lanes	-	430	365
	EB RT Lane	340	95	0
	WB LT Lanes	450	215	350
	WB Th Lanes	-	225	445
	WB RT Lane	335	0	200
	NB LT Lanes	245	195	<b>265</b>
	NB Th Lane	-	250	220
	NB RT Lane	260	<b>315</b>	215
	SB LT Lanes	115	<b>205</b>	<b>175</b>
	SB Th Lane	-	145	190
	SB RT Lane	125	70	120
2024 Buildout Conditions	EB LT Lane	350	125	155
	EB Th Lanes	-	445	370
	EB RT Lane	340	95	45
	WB LT Lanes	450	235	345
	WB Th Lanes	-	230	450
	WB RT Lane	335	0	175
	NB LT Lanes	245	215	<b>255</b>
	NB Th Lane	-	290	235
	NB RT Lane	260	<b>340</b>	225
	SB LT Lanes	115	<b>205</b>	<b>195</b>
	SB Th Lane	-	160	225
	SB RT Lane	125	65	<b>135</b>

Table Notes: **BOLDED** text indicates queue length exceeds available storage.



Table 7: Queuing Analysis Summary (Continued)

		Available Storage (ft)	AM Peak Hour	PM Peak Hour
			95th (ft)	95th (ft)
<b>4. N Springbrook Road at OR-99W</b>				
2024 Future Conditions	EB LT Lane	350	155	190
	EB Th Lanes	-	455	395
	EB RT Lane	340	145	45
	WB LT Lanes	450	225	395
	WB Th Lanes	-	240	495
	WB RT Lane	335	0	240
	NB LT Lanes	245	<b>255</b>	<b>285</b>
	NB Th Lane	-	370	265
	NB RT Lane	260	<b>380</b>	235
	SB LT Lanes	115	<b>230</b>	<b>195</b>
	SB Th Lane	-	170	220
	SB RT Lane	125	70	<b>145</b>

Table Notes: **BOLDED** text indicates queue length exceeds available storage.

Based on the intersection queuing analysis, the projected 95<sup>th</sup> percentile queues at the following turning movements are projected to exceed their respective available striped lane storage:

3. N Springbrook Road at Haworth Avenue (with Traffic Signal Installed)
  - a. Northbound left-turn Lane – 130-foot maximum queue
4. N Springbrook Road at OR-99W
  - a. Northbound left-turn lanes – 285-foot maximum queue
  - b. Northbound right-turn lane – 380-foot maximum queue
  - c. Southbound left-turn lanes – 230-foot maximum queue
  - d. Southbound right-turn lane – 145-foot maximum queue

#### N Springbrook Road at Haworth Avenue

At the intersection of N Springbrook Road at Haworth Avenue with a traffic signal installed, the northbound left-turn lane is projected to have a maximum queue length of 130 feet by year 2024 buildout conditions. The existing striping of the turn lane allows for approximately 90 feet of storage whereby approximately 40 feet of the 95<sup>th</sup> percentile queue will extend beyond this space. Although not striped as storage space, there is an additional 50 feet of space beyond the striped queue area that could accommodate this queue without obstructing northbound through traffic at the intersection. Therefore, no queuing related mitigation is necessary at the intersection to accommodate this queue.

Note that all other extended queues that are projected at the intersection when operating under all-way stop-controls are expected to be mitigated following installation of traffic signal. No additional mitigation is necessary or recommended as part of the proposed development application.

### **N Springbrook Road at OR-99W**

At the intersection of N Springbrook Road at OR-99W the northbound/southbound left-turn and right-turn lanes experienced 95<sup>th</sup> percentile queues in excess of available striped lane storages under the 2029 planning year.

For the northbound left-turn lanes, the maximum queue length of 285 feet exceeds the available striped queue storage of 245 feet by approximately 40 feet. Beyond this striped storage area there is approximately 80 feet of additional storage space for both left-turn lanes that could accommodate this excess queue. Note that the proposed development is not expected to add any trips to the northbound left-turn movement at the intersection. Therefore, no queuing related mitigation is necessary at the intersection to accommodate this queue.

For the northbound right-turn lane, the maximum queue length of 380 feet exceeds the available striped queue storage of 260 feet by approximately 120 feet. Beyond this striped storage area there is approximately 60 feet of additional storage space for the right turn lane prior to extending into a nearby right-in/right-out shopping center intersection along N Springbrook Road. The remaining 60 feet of storage space (which can be equated to the approximate length of 2-3 queued vehicles) can be accommodated within the northbound through lane without significant impact to the through moving traffic or having the total northbound queue extend back to the intersection of N Springbrook Road at Hayes Street. Note that the proposed development is not expected to add any trips to the northbound right-turn movement at the intersection. Therefore, no queuing related mitigation is necessary at the intersection to accommodate this queue.

For the southbound left-turn lanes, the maximum queue length of 230 feet exceeds the available striped queue storage of 115 feet by approximately 115 feet. Beyond this striped storage area there is approximately 50 feet of additional storage space for both left-turn lanes and approximately 90 additional feet of storage for a single left-turn vehicle queue without having queues obstruct the southbound through movement at the intersection. The effective remaining excess queue length is 40 feet which can be equated to a queue of approximately 2 vehicles. This excess 40 feet can be accommodated by the southbound through movement without significant impact to the through moving traffic or having total southbound queues extend back to the adjacent intersection of N Springbrook Road at Haworth Avenue. No queuing related mitigation is necessary at the intersection to accommodate this queue.

For the southbound right-turn lane, the maximum queue length of 145 feet exceeds the available striped queue storage of 125 feet by approximately 20 feet. Beyond this striped storage area there is approximately 50 feet of additional storage space for the right-turn lane before the queue extends into the southbound through lane. Accordingly, this excess 20 feet can be accommodated without impact to the southbound through movement; however, the right-turn queue may partially obstruct the southbound bicycle lane for a short period of time during the evening peak hour under year 2029 conditions. No queuing related mitigation is necessary at the intersection to accommodate this queue.

## Analysis Summary

Based on the above review of 95<sup>th</sup> percentile queues at the study intersections, no queuing related mitigations are recommended at the intersections of N Springbrook Road at Haworth Avenue and N Springbrook Road at OR-99W which are projected to experience occasional 95<sup>th</sup> percentile queues which exceed available lane storages. All other study intersections and their respective turning movements are provided adequate vehicle storage space. No intersection queuing related mitigation is necessary or recommended as part of the proposed development project.

## Turning Movements at Site Access

Based on the queuing analysis, adequate spacing between the proposed site access intersection and the intersection of Haworth Avenue at N Springbrook Road is available to allow un-restricted turning movements at the site access intersection without creating safety issues (i.e. approximately 5 to 10 feet of space will be available between the access intersection and the longest 95<sup>th</sup> percentile queue).

It should be noted that from a site circulation and safety perspective, allowing un-restricted turning movements at an access point is preferable when only a single driveway serves a land use(s) for the following reasons:

- If served by a single restricted access, significant out of direction travel for vehicles entering and exiting the site will potentially be created. This out of direction travel may increase turning movement volumes at nearby intersections along Haworth Avenue, OR-99W, Deborah Road, and N Springbrook Road.
- Emergency vehicle access to/from the site will be limited, where emergency vehicles would either need to enter/exit the site in the eastbound direction of travel along Haworth Avenue or would be required to make U-turns along Haworth Avenue (U-turn would potentially require multiple forward and backward motions for larger vehicles like a fire truck). This could potentially create extended emergency response times and subsequently unsafe conditions for tenants living in the apartment complex if an emergency incident were to occur.

Given sufficient space between the site access and the 95<sup>th</sup> percentile eastbound queues at the N Springbrook Road at Haworth Avenue intersection are available and the potential for circulation/safety issues which could occur with a single restricted access point to the site, it is recommended that the proposed apartment complex be allowed an unrestricted full movement access onto Haworth Avenue.

## Conclusions

No significant trends or crash patterns were identified at any of the study intersections that are indicative of safety concerns with the exception of the intersection of N Springbrook Road at Haworth Avenue which exhibits a crash rate in excess of 1.00 CMEV. Following installation of a traffic signal at the intersection once sufficient proportionate share contributions have been collected (TSP project I09), it is expected the crash rate will decrease to levels below 1.00 CMEV. Accordingly, no other safety mitigation is recommended per the crash data analysis.

Adequate sight distance is available to the east of the proposed site access intersection to allow safe operation along Haworth Avenue. To the west of the access intersection, sight distances are limited by trees which act as a barrier delineating the property line between the project site and the adjacent shopping center to the west. Provided this obstructing foliage is removed, adequate intersection sight distance of 240 feet or greater can be obtained to the west. No other sight distance related mitigation is necessary or recommended at the access intersection.

Left-turn lane warrants are not projected to be met for the site access intersection along Haworth Avenue under any analysis scenario through year 2029. Accordingly, no new turn lanes are necessary or recommended.

Traffic signal warrants are not projected to be met at any of the unsignalized study intersections by the 2029 planning year based on a review of traffic volumes. Specific to the intersection of N Springbrook Road at Haworth Avenue, Warrant 7 is triggered due to the number of recurring crashes at the intersection that could be mitigated by the installation of a traffic signal. Per the City of Newberg's TSP project I09, a traffic signal is planned for installation at the intersection after sufficient proportionate share contributions have been collected. No other traffic signals are necessary or warranted.

All study intersections are currently operating acceptably per jurisdictional standards and are projected to continue operating acceptably through the 2024 site buildout year and the future 2029 planning year, with the exception of the N Springbrook Road at Haworth Avenue intersection under existing all-way stop-controls. Once a traffic signal is installed at the intersection, City of Newberg mobility targets will be met for the intersection. No additional operational mitigation is necessary or recommended at the study intersections.

No queuing related mitigations are recommended at the intersections of N Springbrook Road at Haworth Avenue and N Springbrook Road at OR-99W which are projected to experience occasional 95<sup>th</sup> percentile queues which exceed available lane storages. All other study intersections and their respective turning movements are provided adequate vehicle storage space. Accordingly, no intersection queuing related mitigation is necessary or recommended as part of the proposed development project.

Given sufficient space between the site access and the 95<sup>th</sup> percentile eastbound queues at the N Springbrook Road at Haworth Avenue intersection are available and the potential for circulation/safety issues which could occur with a single restricted access point to the site, it is recommended that the proposed apartment complex be allowed an unrestricted full movement access onto Haworth Avenue.



# Appendix A

## Site Plan





## Appendix B

### Trip Generation Calculations





TRIP GENERATION CALCULATIONS  
Source: Trip Generation Manual, 11th Edition

*Land Use:* Multifamily Housing (Low-Rise)  
*Land Use Code:* 220  
*Land Use Subcategory:* Not Close to Rail Transit  
*Setting/Location:* General Urban/Suburban  
*Variable:* Dwelling Units  
*Trip Type:* Vehicle  
*Variable Quantity:* 30

AM PEAK HOUR

*Trip Rate:* 0.4

	Enter	Exit	Total
Directional Split	24%	76%	
Trip Ends	3	9	12

PM PEAK HOUR

*Trip Rate:* 0.51

	Enter	Exit	Total
Directional Split	63%	37%	
Trip Ends	9	6	15

WEEKDAY

*Trip Rate:* 6.74

	Enter	Exit	Total
Directional Split	50%	50%	
Trip Ends	101	101	202

SATURDAY

*Trip Rate:* 4.55

	Enter	Exit	Total
Directional Split	50%	50%	
Trip Ends	68	68	136

*Caution: Small Sample Size*

## Appendix C

Traffic Counts

In-Process Development Trips





ALL TRAFFIC DATA SERVICES

(303) 216-2439

www.alltrafficdata.net

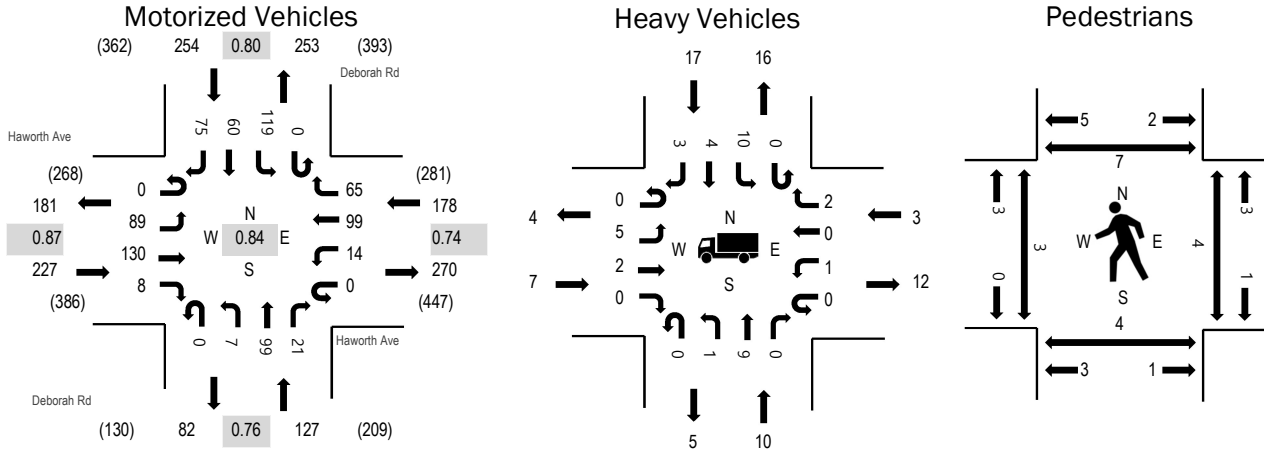
Location: 1 Deborah Rd & Haworth Ave AM

Date: Tuesday, April 19, 2022

Peak Hour: 07:45 AM - 08:45 AM

Peak 15-Minutes: 08:30 AM - 08:45 AM

Peak Hour



Note: Total study counts contained in parentheses.

	HV%	PHF
EB	3.1%	0.87
WB	1.7%	0.74
NB	7.9%	0.76
SB	6.7%	0.80
All	4.7%	0.84

Traffic Counts - Motorized Vehicles

Interval Start Time	Haworth Ave Eastbound				Haworth Ave Westbound				Deborah Rd Northbound				Deborah Rd Southbound				Total	Rolling Hour
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right		
7:00 AM	0	2	6	0	0	0	4	2	0	0	0	0	0	6	0	1	21	505
7:05 AM	0	3	8	0	0	0	3	3	0	0	9	2	0	2	1	1	32	552
7:10 AM	0	3	10	0	0	0	5	3	0	0	3	2	0	2	2	1	31	587
7:15 AM	0	3	5	3	0	2	6	4	0	0	5	3	0	1	4	1	37	607
7:20 AM	0	0	11	1	0	0	4	4	0	1	5	1	0	1	3	2	33	612
7:25 AM	0	6	6	2	0	0	4	5	0	0	5	1	0	6	1	0	36	637
7:30 AM	0	2	11	0	0	1	5	4	0	0	2	1	0	1	3	3	33	675
7:35 AM	0	10	8	1	0	1	6	1	0	0	10	0	0	6	3	0	46	720
7:40 AM	0	4	14	0	0	1	3	4	0	2	6	2	0	2	3	4	45	752
7:45 AM	0	11	9	1	0	1	6	7	0	0	7	1	0	8	2	2	55	786
7:50 AM	0	7	6	0	0	0	5	4	0	0	7	4	0	17	6	7	63	784
7:55 AM	0	9	7	1	0	2	3	8	0	1	10	4	0	14	7	7	73	764
8:00 AM	0	10	12	1	0	1	7	6	0	0	6	3	0	8	5	9	68	733
8:05 AM	0	6	16	0	0	1	7	4	0	0	6	0	0	14	5	8	67	
8:10 AM	0	4	11	2	0	0	8	6	0	1	7	1	0	3	2	6	51	
8:15 AM	0	3	11	1	0	1	8	2	0	1	6	0	0	3	3	3	42	
8:20 AM	0	11	5	1	0	2	8	6	0	1	7	2	0	7	2	6	58	
8:25 AM	0	5	18	1	0	0	11	4	0	1	13	2	0	9	6	4	74	
8:30 AM	0	10	16	0	0	1	13	4	0	2	11	1	0	10	5	5	78	
8:35 AM	0	5	7	0	0	2	11	6	0	0	10	2	0	18	6	11	78	
8:40 AM	0	8	12	0	0	3	12	8	0	0	9	1	0	8	11	7	79	
8:45 AM	0	1	15	1	0	0	8	2	0	2	5	2	0	5	8	4	53	
8:50 AM	0	4	11	0	0	0	5	5	0	0	3	0	0	8	3	4	43	
8:55 AM	0	3	5	0	0	2	4	2	0	0	7	3	0	10	2	4	42	
Count Total	0	130	240	16	0	21	156	104	0	12	159	38	0	169	93	100	1,238	
Peak Hour	0	89	130	8	0	14	99	65	0	7	99	21	0	119	60	75	786	

Location: 1 Deborah Rd & Haworth Ave AM

**Traffic Counts - Heavy Vehicles, Bicycles on Road, and Pedestrians/Bicycles on Crosswalk**

Interval Start Time	Heavy Vehicles					Interval Start Time	Bicycles on Roadway					Interval Start Time	Pedestrians/Bicycles on Crosswalk				
	EB	NB	WB	SB	Total		EB	NB	WB	SB	Total		EB	NB	WB	SB	Total
7:00 AM	0	0	0	0	0	7:00 AM	0	0	0	0	0	7:00 AM	0	0	0	0	0
7:05 AM	0	0	0	0	0	7:05 AM	0	0	0	0	0	7:05 AM	0	0	0	0	0
7:10 AM	0	0	0	0	0	7:10 AM	0	0	0	0	0	7:10 AM	0	0	0	0	0
7:15 AM	0	1	1	0	2	7:15 AM	0	0	0	0	0	7:15 AM	0	1	0	1	2
7:20 AM	1	0	0	1	2	7:20 AM	0	0	0	0	0	7:20 AM	0	0	0	0	0
7:25 AM	0	0	1	0	1	7:25 AM	0	0	0	0	0	7:25 AM	0	0	0	0	0
7:30 AM	0	1	1	0	2	7:30 AM	0	0	0	1	1	7:30 AM	0	0	0	0	0
7:35 AM	1	1	0	0	2	7:35 AM	0	0	0	0	0	7:35 AM	0	0	0	1	1
7:40 AM	0	1	0	2	3	7:40 AM	0	0	0	0	0	7:40 AM	0	0	0	0	0
7:45 AM	1	1	0	2	4	7:45 AM	0	0	0	0	0	7:45 AM	2	0	0	0	2
7:50 AM	0	0	0	1	1	7:50 AM	0	0	0	0	0	7:50 AM	0	0	0	3	3
7:55 AM	0	1	1	0	2	7:55 AM	0	0	0	0	0	7:55 AM	2	0	0	0	2
8:00 AM	0	0	0	0	0	8:00 AM	0	0	0	0	0	8:00 AM	0	1	0	1	2
8:05 AM	0	1	0	1	2	8:05 AM	0	0	0	0	0	8:05 AM	0	0	0	1	1
8:10 AM	0	1	0	0	1	8:10 AM	0	0	0	0	0	8:10 AM	0	0	2	1	3
8:15 AM	2	1	0	0	3	8:15 AM	0	0	0	0	0	8:15 AM	0	2	1	0	3
8:20 AM	2	2	0	1	5	8:20 AM	0	0	0	0	0	8:20 AM	0	1	0	0	1
8:25 AM	0	2	1	1	4	8:25 AM	0	0	0	0	0	8:25 AM	0	0	0	1	1
8:30 AM	0	1	0	4	5	8:30 AM	0	0	0	0	0	8:30 AM	0	0	1	0	1
8:35 AM	0	0	1	4	5	8:35 AM	0	0	0	0	0	8:35 AM	1	0	0	0	1
8:40 AM	2	0	0	3	5	8:40 AM	0	0	0	0	0	8:40 AM	0	0	0	0	0
8:45 AM	0	0	0	0	0	8:45 AM	0	0	0	0	0	8:45 AM	0	0	0	0	0
8:50 AM	0	0	0	1	1	8:50 AM	0	0	0	0	0	8:50 AM	0	0	1	0	1
8:55 AM	0	1	0	1	2	8:55 AM	0	0	0	0	0	8:55 AM	0	0	2	0	2
Count Total	9	15	6	22	52	Count Total	0	0	0	1	1	Count Total	5	5	7	9	26
Peak Hour	7	10	3	17	37	Peak Hour	0	0	0	0	0	Peak Hour	5	4	4	7	20

Location: 2 N Springbrook Rd & Haworth Ave AM



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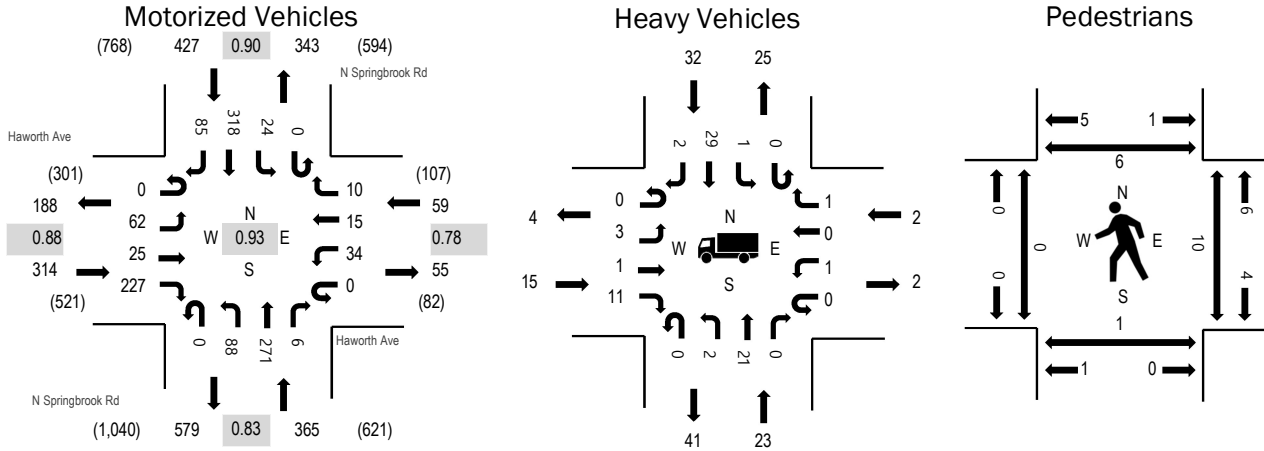
Location: 2 N Springbrook Rd & Haworth Ave AM

Date: Tuesday, April 19, 2022

Peak Hour: 07:45 AM - 08:45 AM

Peak 15-Minutes: 08:30 AM - 08:45 AM

Peak Hour



Note: Total study counts contained in parentheses.

	HV%	PHF
EB	4.8%	0.88
WB	3.4%	0.78
NB	6.3%	0.83
SB	7.5%	0.90
All	6.2%	0.93

Traffic Counts - Motorized Vehicles

Interval Start Time	Haworth Ave Eastbound				Haworth Ave Westbound				N Springbrook Rd Northbound				N Springbrook Rd Southbound				Total	Rolling Hour
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right		
7:00 AM	0	0	0	5	0	1	1	0	0	4	9	0	0	1	19	6	46	943
7:05 AM	0	6	0	14	0	1	1	0	0	1	12	0	0	1	21	0	57	990
7:10 AM	0	3	0	20	0	2	1	2	0	5	19	0	0	2	21	11	86	1,027
7:15 AM	0	3	0	8	0	4	1	0	0	3	12	0	0	1	21	4	57	1,023
7:20 AM	0	2	0	18	0	0	2	1	0	6	13	0	0	1	23	6	72	1,064
7:25 AM	0	4	0	13	0	4	0	0	0	12	26	0	0	0	27	1	87	1,081
7:30 AM	0	2	1	16	0	3	0	1	0	1	19	0	0	0	21	8	72	1,087
7:35 AM	0	4	1	14	0	0	1	0	0	4	20	0	0	0	28	4	76	1,119
7:40 AM	0	5	1	12	0	2	2	0	0	5	25	0	0	1	33	2	88	1,147
7:45 AM	0	3	0	16	0	1	1	0	0	5	30	1	0	0	24	8	89	1,165
7:50 AM	0	5	2	25	0	2	0	0	0	11	33	0	0	2	24	8	112	1,152
7:55 AM	0	7	2	20	0	5	1	2	0	8	20	0	0	2	32	2	101	1,115
8:00 AM	0	5	1	22	0	3	0	0	0	5	22	1	0	0	27	7	93	1,074
8:05 AM	0	2	2	20	0	1	1	1	0	6	18	1	0	1	30	11	94	
8:10 AM	0	6	2	18	0	3	1	1	0	9	20	0	0	1	19	2	82	
8:15 AM	0	8	2	11	0	1	1	1	0	7	25	0	0	6	29	7	98	
8:20 AM	0	4	1	16	0	2	2	2	0	4	28	0	0	3	18	9	89	
8:25 AM	0	6	6	14	0	3	2	1	0	4	21	0	0	4	23	9	93	
8:30 AM	0	4	2	23	0	4	1	0	0	10	18	1	0	3	34	4	104	
8:35 AM	0	6	1	24	0	5	3	2	0	11	18	0	0	0	28	6	104	
8:40 AM	0	6	4	18	0	4	2	0	0	8	18	2	0	2	30	12	106	
8:45 AM	0	4	2	12	0	4	1	1	0	3	18	1	0	2	26	2	76	
8:50 AM	0	5	3	15	0	3	0	5	0	5	16	0	0	2	18	3	75	
8:55 AM	0	3	3	8	0	3	1	0	0	4	11	2	0	2	21	2	60	
Count Total	0	103	36	382	0	61	26	20	0	141	471	9	0	37	597	134	2,017	
Peak Hour	0	62	25	227	0	34	15	10	0	88	271	6	0	24	318	85	1,165	



Location: 2 N Springbrook Rd & Haworth Ave AM

**Traffic Counts - Heavy Vehicles, Bicycles on Road, and Pedestrians/Bicycles on Crosswalk**

Interval Start Time	Heavy Vehicles					Interval Start Time	Bicycles on Roadway					Interval Start Time	Pedestrians/Bicycles on Crosswalk				
	EB	NB	WB	SB	Total		EB	NB	WB	SB	Total		EB	NB	WB	SB	Total
7:00 AM	0	2	0	0	2	7:00 AM	0	0	0	0	0	7:00 AM	0	0	0	0	0
7:05 AM	0	3	0	2	5	7:05 AM	0	0	0	0	0	7:05 AM	0	0	0	0	0
7:10 AM	0	0	0	1	1	7:10 AM	0	0	0	0	0	7:10 AM	0	0	0	0	0
7:15 AM	0	0	0	0	0	7:15 AM	0	0	0	0	0	7:15 AM	0	0	0	1	1
7:20 AM	0	1	0	2	3	7:20 AM	0	0	0	0	0	7:20 AM	1	0	0	0	1
7:25 AM	0	4	0	1	5	7:25 AM	0	0	0	0	0	7:25 AM	0	0	0	0	0
7:30 AM	1	3	1	0	5	7:30 AM	0	0	0	0	0	7:30 AM	0	0	0	0	0
7:35 AM	0	1	0	0	1	7:35 AM	0	0	0	0	0	7:35 AM	0	0	0	0	0
7:40 AM	1	1	1	2	5	7:40 AM	0	0	0	0	0	7:40 AM	0	1	0	0	1
7:45 AM	0	4	0	0	4	7:45 AM	0	0	0	0	0	7:45 AM	0	0	4	2	6
7:50 AM	1	0	0	2	3	7:50 AM	0	0	0	0	0	7:50 AM	0	0	0	1	1
7:55 AM	0	3	0	1	4	7:55 AM	0	0	0	0	0	7:55 AM	0	0	0	0	0
8:00 AM	2	1	0	1	4	8:00 AM	0	0	0	0	0	8:00 AM	0	1	0	0	1
8:05 AM	0	4	0	1	5	8:05 AM	0	0	0	0	0	8:05 AM	0	0	1	0	1
8:10 AM	2	2	0	1	5	8:10 AM	0	0	0	0	0	8:10 AM	0	0	0	0	0
8:15 AM	0	1	0	4	5	8:15 AM	0	0	0	0	0	8:15 AM	0	0	1	1	2
8:20 AM	1	4	0	1	6	8:20 AM	0	0	0	0	0	8:20 AM	0	0	0	0	0
8:25 AM	3	2	1	5	11	8:25 AM	0	0	0	0	0	8:25 AM	0	0	2	0	2
8:30 AM	1	2	1	8	12	8:30 AM	0	0	0	0	0	8:30 AM	0	0	2	0	2
8:35 AM	5	0	0	3	8	8:35 AM	0	0	0	0	0	8:35 AM	0	0	0	1	1
8:40 AM	0	0	0	5	5	8:40 AM	0	0	0	0	0	8:40 AM	0	0	0	1	1
8:45 AM	0	0	1	2	3	8:45 AM	0	0	0	0	0	8:45 AM	0	0	1	0	1
8:50 AM	1	2	0	1	4	8:50 AM	0	0	0	0	0	8:50 AM	0	0	0	0	0
8:55 AM	0	1	0	2	3	8:55 AM	0	0	0	0	0	8:55 AM	0	1	1	0	2
Count Total	18	41	5	45	109	Count Total	0	0	0	0	0	Count Total	1	3	12	7	23
Peak Hour	15	23	2	32	72	Peak Hour	0	0	0	0	0	Peak Hour	0	1	10	6	17



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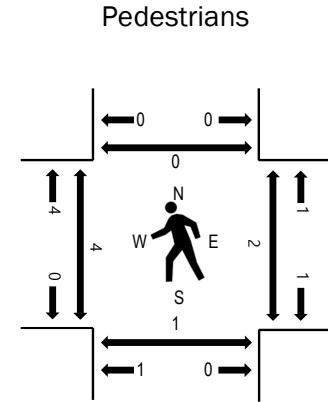
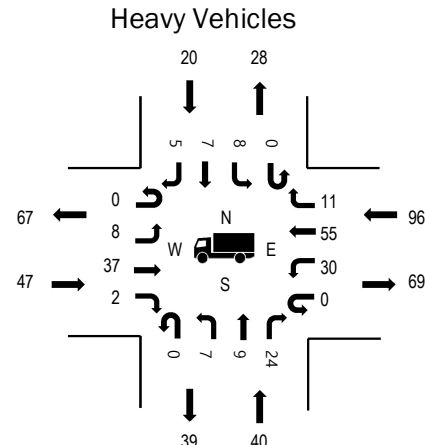
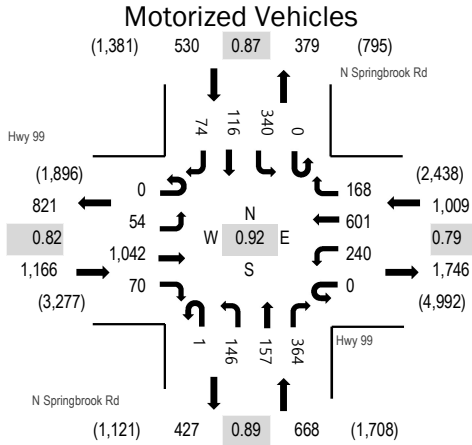
Location: 1 N Springbrook Rd & Hwy 99 AM

Date: Tuesday, April 19, 2022

Peak Hour: 07:25 AM - 08:25 AM

Peak 15-Minutes: 07:45 AM - 08:00 AM

Peak Hour



Note: Total study counts contained in parentheses.

	HV%	PHF
EB	4.0%	0.82
WB	9.5%	0.79
NB	6.0%	0.89
SB	3.8%	0.87
All	6.0%	0.92

Traffic Counts - Motorized Vehicles

Interval Start Time	Hwy 99 Eastbound				Hwy 99 Westbound				N Springbrook Rd Northbound				N Springbrook Rd Southbound				Total	Rolling Hour
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right		
6:00 AM	0	1	55	0	0	15	13	3	0	3	3	16	0	21	7	1	138	2,423
6:05 AM	0	0	97	0	0	9	18	2	0	3	2	14	0	19	0	2	166	2,487
6:10 AM	0	0	57	1	0	10	11	1	0	2	2	25	0	25	6	2	142	2,563
6:15 AM	0	0	99	1	0	15	15	4	0	3	3	24	0	16	1	1	182	2,684
6:20 AM	0	2	76	2	0	7	8	4	0	3	5	28	0	15	2	2	154	2,752
6:25 AM	0	1	125	5	0	15	22	6	0	4	7	31	0	17	6	2	241	2,828
6:30 AM	0	0	82	1	0	16	25	7	0	3	8	35	0	29	6	0	212	2,863
6:35 AM	0	0	124	3	0	14	28	3	0	0	7	40	0	19	8	1	247	2,928
6:40 AM	0	0	112	4	0	13	23	5	0	5	4	38	0	33	7	1	245	2,967
6:45 AM	0	0	122	2	0	16	28	4	0	5	5	29	0	21	10	4	246	3,015
6:50 AM	0	3	76	3	0	22	28	4	0	4	9	30	0	19	8	3	209	3,086
6:55 AM	0	2	95	2	0	16	56	7	0	4	6	24	0	19	7	3	241	3,168
7:00 AM	0	1	59	1	0	30	29	3	0	5	11	32	0	26	5	0	202	3,240
7:05 AM	0	1	103	3	0	22	38	5	0	8	5	24	0	25	5	3	242	3,289
7:10 AM	0	3	78	2	0	22	38	11	0	7	15	43	0	31	10	3	263	3,327
7:15 AM	0	1	105	7	0	18	46	11	0	7	6	17	0	25	4	3	250	3,325
7:20 AM	0	0	62	1	0	18	49	7	0	2	11	34	0	33	9	4	230	3,338
7:25 AM	0	3	107	7	0	19	36	24	0	9	12	23	0	22	9	5	276	3,373
7:30 AM	0	1	93	9	0	22	37	6	0	8	16	44	0	30	6	5	277	3,355
7:35 AM	0	5	105	5	0	22	57	8	0	11	4	34	0	23	4	8	286	3,353
7:40 AM	0	4	83	3	0	29	41	10	0	12	21	42	0	28	11	9	293	3,327
7:45 AM	0	5	92	5	0	14	75	22	0	16	11	28	0	35	9	5	317	3,288
7:50 AM	0	8	64	4	0	27	61	21	0	15	18	32	0	23	13	5	291	3,261
7:55 AM	0	5	97	4	0	27	62	15	0	12	11	25	0	33	13	9	313	3,218
8:00 AM	0	4	53	6	0	15	44	17	0	18	13	32	0	32	9	8	251	3,141
8:05 AM	0	5	88	10	0	26	40	11	1	6	9	30	0	28	19	7	280	
8:10 AM	0	3	88	10	0	9	39	15	0	13	13	31	0	32	5	3	261	
8:15 AM	0	6	68	3	0	20	51	10	0	14	12	27	0	33	12	7	263	

Location: 1 N Springbrook Rd & Hwy 99 AM

8:20 AM	0	5	104	4	0	10	58	9	0	12	17	16	0	21	6	3	265
8:25 AM	0	6	62	6	0	23	41	11	0	10	26	36	0	27	8	2	258
8:30 AM	0	5	82	5	0	20	56	12	0	20	5	20	0	25	20	5	275
8:35 AM	0	3	53	2	0	24	54	6	0	4	20	28	0	38	21	7	260
8:40 AM	0	6	82	4	0	19	52	12	0	12	10	12	0	30	8	7	254
8:45 AM	0	4	63	7	0	20	65	8	0	15	19	36	0	29	20	4	290
8:50 AM	0	3	67	5	0	23	59	13	0	13	7	27	0	16	7	8	248
8:55 AM	0	3	59	4	0	22	46	3	0	13	23	23	0	27	9	4	236
Count Total	0	99	3,037	141	0	669	1,449	320	1	301	376	1,030	0	925	310	146	8,804
Peak Hour	0	54	1,042	70	0	240	601	168	1	146	157	364	0	340	116	74	3,373

Location: 1 N Springbrook Rd & Hwy 99 AM

**Traffic Counts - Heavy Vehicles, Bicycles on Road, and Pedestrians/Bicycles on Crosswalk**

Interval Start Time	Heavy Vehicles					Interval Start Time	Bicycles on Roadway					Interval Start Time	Pedestrians/Bicycles on Crosswalk				
	EB	NB	WB	SB	Total		EB	NB	WB	SB	Total		EB	NB	WB	SB	Total
6:00 AM	1	1	0	0	2	6:00 AM	0	0	0	0	0	6:00 AM	0	0	0	0	0
6:05 AM	1	0	1	0	2	6:05 AM	0	0	0	0	0	6:05 AM	0	0	0	0	0
6:10 AM	2	1	0	1	4	6:10 AM	0	0	0	0	0	6:10 AM	1	0	0	0	1
6:15 AM	2	0	3	0	5	6:15 AM	0	0	0	0	0	6:15 AM	0	0	0	0	0
6:20 AM	0	2	2	2	6	6:20 AM	0	0	0	0	0	6:20 AM	0	0	0	0	0
6:25 AM	4	1	3	0	8	6:25 AM	0	0	0	0	0	6:25 AM	0	0	0	0	0
6:30 AM	4	1	7	0	12	6:30 AM	0	0	0	0	0	6:30 AM	0	0	0	0	0
6:35 AM	3	2	4	1	10	6:35 AM	0	0	0	0	0	6:35 AM	0	0	0	0	0
6:40 AM	1	1	5	2	9	6:40 AM	0	0	0	0	0	6:40 AM	0	0	0	0	0
6:45 AM	2	1	3	0	6	6:45 AM	0	0	0	0	0	6:45 AM	0	0	0	0	0
6:50 AM	1	2	2	1	6	6:50 AM	0	0	0	0	0	6:50 AM	0	0	0	0	0
6:55 AM	2	6	6	0	14	6:55 AM	0	0	0	0	0	6:55 AM	0	0	0	0	0
7:00 AM	4	5	5	2	16	7:00 AM	0	0	0	0	0	7:00 AM	0	0	0	0	0
7:05 AM	2	0	8	2	12	7:05 AM	0	0	0	0	0	7:05 AM	0	0	0	0	0
7:10 AM	2	2	5	0	9	7:10 AM	0	0	0	0	0	7:10 AM	0	0	0	0	0
7:15 AM	1	0	10	0	11	7:15 AM	0	0	0	0	0	7:15 AM	0	1	0	0	1
7:20 AM	1	1	6	2	10	7:20 AM	0	0	0	0	0	7:20 AM	0	0	0	0	0
7:25 AM	5	3	10	0	18	7:25 AM	0	0	0	0	0	7:25 AM	0	0	0	0	0
7:30 AM	1	5	7	1	14	7:30 AM	0	0	0	0	0	7:30 AM	0	0	0	0	0
7:35 AM	5	2	7	1	15	7:35 AM	0	0	0	0	0	7:35 AM	0	0	0	0	0
7:40 AM	1	1	11	4	17	7:40 AM	0	0	0	0	0	7:40 AM	2	0	1	0	3
7:45 AM	7	5	7	0	19	7:45 AM	0	0	0	0	0	7:45 AM	0	0	0	0	0
7:50 AM	4	4	6	2	16	7:50 AM	0	0	0	0	0	7:50 AM	0	0	0	0	0
7:55 AM	3	1	7	1	12	7:55 AM	0	0	0	0	0	7:55 AM	0	0	0	0	0
8:00 AM	0	2	8	1	11	8:00 AM	0	0	0	0	0	8:00 AM	0	0	0	0	0
8:05 AM	1	5	12	2	20	8:05 AM	0	0	0	0	0	8:05 AM	0	0	0	0	0
8:10 AM	7	4	7	2	20	8:10 AM	0	0	0	0	0	8:10 AM	1	1	1	0	3
8:15 AM	5	6	4	4	19	8:15 AM	0	0	0	0	0	8:15 AM	1	0	0	0	1
8:20 AM	8	2	10	2	22	8:20 AM	0	0	0	0	0	8:20 AM	0	0	0	0	0
8:25 AM	5	1	5	2	13	8:25 AM	0	0	0	0	0	8:25 AM	1	0	0	0	1
8:30 AM	5	1	4	9	19	8:30 AM	0	0	0	0	0	8:30 AM	0	0	0	0	0
8:35 AM	2	1	11	9	23	8:35 AM	0	0	0	0	0	8:35 AM	1	0	0	0	1
8:40 AM	5	1	6	5	17	8:40 AM	0	0	0	0	0	8:40 AM	1	0	1	0	2
8:45 AM	4	1	5	3	13	8:45 AM	0	0	0	0	0	8:45 AM	1	0	0	0	1
8:50 AM	4	2	4	2	12	8:50 AM	0	0	0	0	0	8:50 AM	0	0	0	0	0
8:55 AM	1	5	7	2	15	8:55 AM	0	0	0	0	0	8:55 AM	0	0	0	0	0
Count Total	106	78	208	65	457	Count Total	0	0	0	0	0	Count Total	9	2	3	0	14
Peak Hour	47	40	96	20	203	Peak Hour	0	0	0	0	0	Peak Hour	4	1	2	0	7



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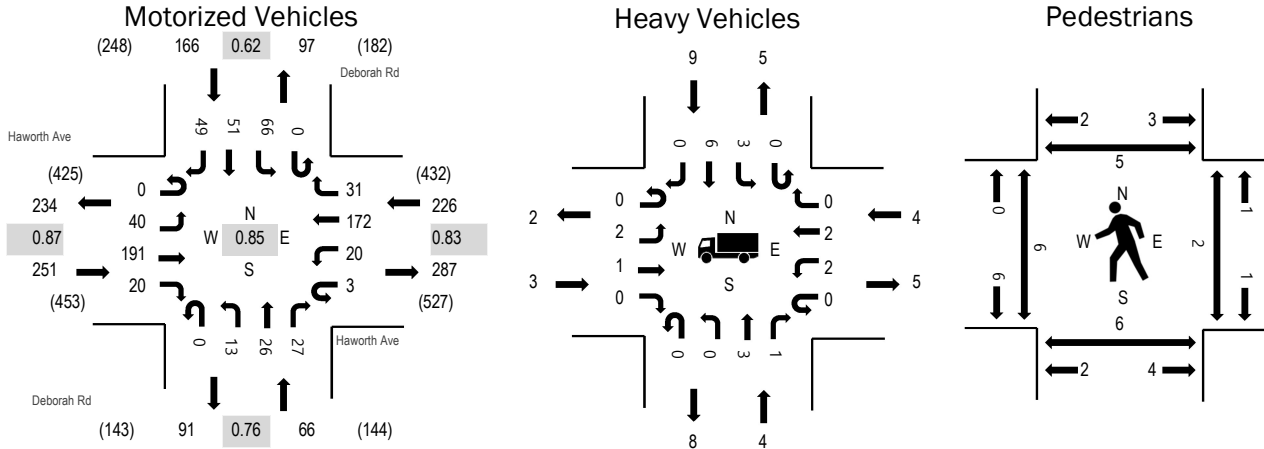
Location: 1 Deborah Rd & Haworth Ave PM

Date: Tuesday, April 19, 2022

Peak Hour: 04:00 PM - 05:00 PM

Peak 15-Minutes: 04:00 PM - 04:15 PM

Peak Hour



Note: Total study counts contained in parentheses.

	HV%	PHF
EB	1.2%	0.87
WB	1.8%	0.83
NB	6.1%	0.76
SB	5.4%	0.62
All	2.8%	0.85

Traffic Counts - Motorized Vehicles

Interval Start Time	Haworth Ave Eastbound				Haworth Ave Westbound				Deborah Rd Northbound				Deborah Rd Southbound				Total	Rolling Hour
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right		
4:00 PM	0	6	17	3	0	1	12	4	0	1	1	2	0	9	13	11	80	709
4:05 PM	0	4	13	3	0	2	16	3	0	2	2	3	0	10	3	5	66	668
4:10 PM	0	1	16	0	3	1	21	0	0	3	0	1	0	5	3	8	62	647
4:15 PM	0	2	17	1	0	1	17	3	0	1	1	5	0	7	2	3	60	640
4:20 PM	0	2	11	2	0	1	12	0	0	1	2	2	0	5	7	3	48	621
4:25 PM	0	6	16	2	0	1	17	2	0	0	6	0	0	7	4	2	63	616
4:30 PM	0	4	12	2	0	2	14	9	0	1	4	2	0	4	5	3	62	594
4:35 PM	0	2	17	1	0	2	20	1	0	1	1	2	0	8	1	4	60	574
4:40 PM	0	3	14	2	0	4	9	1	0	1	2	1	0	3	2	1	43	575
4:45 PM	0	4	18	4	0	4	10	3	0	1	3	2	0	5	1	1	56	587
4:50 PM	0	6	19	0	0	1	13	2	0	0	4	5	0	0	4	4	58	581
4:55 PM	0	0	21	0	0	0	11	3	0	1	0	2	0	3	6	4	51	576
5:00 PM	0	5	6	2	0	1	12	1	0	0	3	3	0	2	1	3	39	568
5:05 PM	0	0	12	0	0	4	13	2	0	3	4	3	0	0	2	2	45	
5:10 PM	0	1	16	0	0	0	19	2	0	1	3	7	0	5	0	1	55	
5:15 PM	0	3	20	0	0	2	10	0	0	0	1	2	0	1	1	1	41	
5:20 PM	0	1	14	0	0	0	15	3	0	0	5	1	0	2	1	1	43	
5:25 PM	0	1	14	0	0	1	14	1	0	1	3	2	0	2	1	1	41	
5:30 PM	0	1	10	0	0	1	9	4	0	1	2	6	0	6	2	0	42	
5:35 PM	0	1	20	0	0	3	10	3	0	1	4	2	0	6	7	4	61	
5:40 PM	0	1	8	2	0	4	20	4	0	0	4	2	0	5	4	1	55	
5:45 PM	0	2	19	2	0	1	11	4	0	1	3	0	0	1	1	5	50	
5:50 PM	0	4	20	2	0	3	15	1	0	0	3	1	0	2	2	0	53	
5:55 PM	0	0	15	0	0	1	10	2	0	3	3	0	0	5	1	3	43	
Count Total	0	60	365	28	3	41	330	58	0	24	64	56	0	103	74	71	1,277	
Peak Hour	0	40	191	20	3	20	172	31	0	13	26	27	0	66	51	49	709	

Location: 1 Deborah Rd & Haworth Ave PM

**Traffic Counts - Heavy Vehicles, Bicycles on Road, and Pedestrians/Bicycles on Crosswalk**

Interval Start Time	Heavy Vehicles					Interval Start Time	Bicycles on Roadway					Interval Start Time	Pedestrians/Bicycles on Crosswalk				
	EB	NB	WB	SB	Total		EB	NB	WB	SB	Total		EB	NB	WB	SB	Total
4:00 PM	1	0	0	5	6	4:00 PM	0	0	0	0	0	4:00 PM	1	2	0	0	3
4:05 PM	0	1	1	1	3	4:05 PM	0	0	0	0	0	4:05 PM	2	0	1	1	4
4:10 PM	0	0	0	2	2	4:10 PM	1	0	0	0	1	4:10 PM	0	0	0	0	0
4:15 PM	0	0	1	0	1	4:15 PM	0	0	0	0	0	4:15 PM	0	0	0	1	1
4:20 PM	0	0	0	0	0	4:20 PM	0	0	0	0	0	4:20 PM	1	2	1	0	4
4:25 PM	0	0	0	0	0	4:25 PM	0	0	0	0	0	4:25 PM	0	0	0	0	0
4:30 PM	0	1	0	0	1	4:30 PM	0	0	1	0	1	4:30 PM	0	0	0	0	0
4:35 PM	0	0	1	1	2	4:35 PM	0	0	0	0	0	4:35 PM	0	0	0	0	0
4:40 PM	0	0	0	0	0	4:40 PM	0	0	0	0	0	4:40 PM	2	2	0	1	5
4:45 PM	2	1	0	0	3	4:45 PM	0	0	0	0	0	4:45 PM	0	0	0	2	2
4:50 PM	0	1	1	0	2	4:50 PM	0	0	0	0	0	4:50 PM	0	0	0	0	0
4:55 PM	0	0	0	0	0	4:55 PM	0	0	0	0	0	4:55 PM	0	0	0	0	0
5:00 PM	0	0	0	0	0	5:00 PM	0	0	0	0	0	5:00 PM	0	0	1	0	1
5:05 PM	0	0	0	1	1	5:05 PM	0	0	0	0	0	5:05 PM	1	0	1	0	2
5:10 PM	0	0	1	0	1	5:10 PM	0	0	0	0	0	5:10 PM	0	0	0	0	0
5:15 PM	0	0	0	0	0	5:15 PM	0	0	0	0	0	5:15 PM	0	0	0	0	0
5:20 PM	0	0	0	0	0	5:20 PM	0	0	0	0	0	5:20 PM	0	0	0	0	0
5:25 PM	0	0	0	0	0	5:25 PM	0	0	0	0	0	5:25 PM	0	2	0	0	2
5:30 PM	0	0	0	0	0	5:30 PM	0	0	0	0	0	5:30 PM	0	1	0	0	1
5:35 PM	0	0	0	0	0	5:35 PM	0	0	0	0	0	5:35 PM	0	0	1	1	2
5:40 PM	0	0	0	0	0	5:40 PM	0	1	0	0	1	5:40 PM	0	2	0	0	2
5:45 PM	0	0	0	0	0	5:45 PM	0	0	0	0	0	5:45 PM	0	0	2	0	2
5:50 PM	0	0	0	0	0	5:50 PM	0	0	0	0	0	5:50 PM	1	0	0	0	1
5:55 PM	0	0	0	0	0	5:55 PM	0	0	0	0	0	5:55 PM	0	0	0	0	0
Count Total	3	4	5	10	22	Count Total	1	1	1	0	3	Count Total	8	11	7	6	32
Peak Hour	3	4	4	9	20	Peak Hour	1	0	1	0	2	Peak Hour	6	6	2	5	19

Location: 2 N Springbrook Rd & Haworth Ave PM



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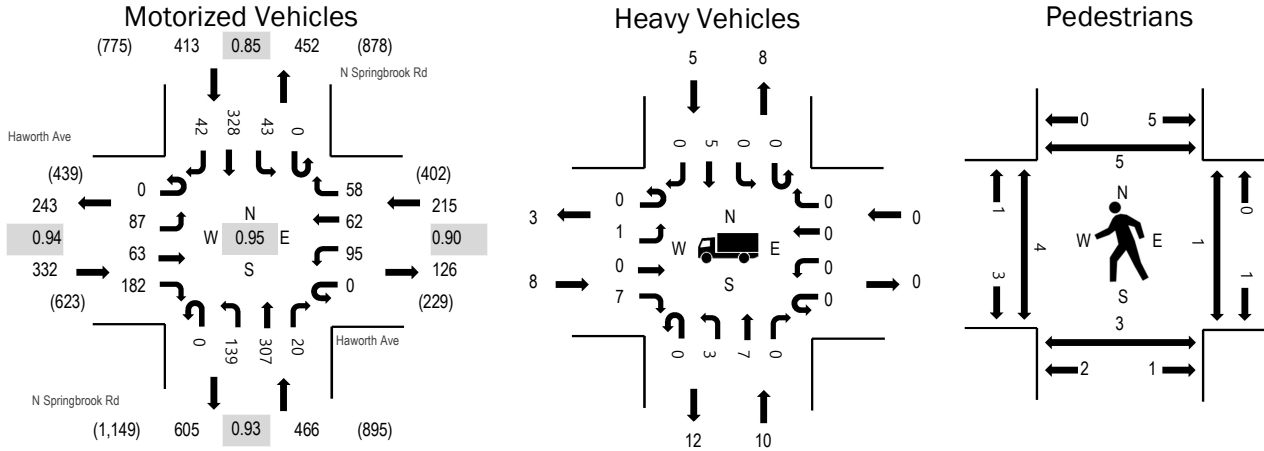
Location: 2 N Springbrook Rd & Haworth Ave PM

Date: Tuesday, April 19, 2022

Peak Hour: 04:00 PM - 05:00 PM

Peak 15-Minutes: 04:05 PM - 04:20 PM

Peak Hour



Note: Total study counts contained in parentheses.

	HV%	PHF
EB	2.4%	0.94
WB	0.0%	0.90
NB	2.1%	0.93
SB	1.2%	0.85
All	1.6%	0.95

Traffic Counts - Motorized Vehicles

Interval Start Time	Haworth Ave Eastbound				Haworth Ave Westbound				N Springbrook Rd Northbound				N Springbrook Rd Southbound				Total	Rolling Hour
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right		
4:00 PM	0	8	2	23	0	14	6	2	0	14	23	1	0	3	26	3	125	1,426
4:05 PM	0	8	7	20	0	9	9	0	0	17	29	0	0	0	32	2	133	1,402
4:10 PM	0	3	5	10	0	6	5	7	0	11	25	0	0	4	37	2	115	1,378
4:15 PM	0	5	3	20	0	8	5	6	0	11	28	4	0	1	31	5	127	1,380
4:20 PM	0	4	6	17	0	2	5	4	0	9	18	2	0	5	29	8	109	1,372
4:25 PM	0	3	7	13	0	4	3	6	0	19	21	2	0	3	27	2	110	1,361
4:30 PM	0	9	11	18	0	10	5	5	0	12	28	1	0	4	28	5	136	1,349
4:35 PM	0	10	4	11	0	7	6	4	0	7	26	2	0	5	24	7	113	1,330
4:40 PM	0	8	4	9	0	5	8	5	0	6	32	3	0	5	23	2	110	1,331
4:45 PM	0	13	3	16	0	11	5	5	0	14	26	3	0	4	25	2	127	1,328
4:50 PM	0	11	3	10	0	7	0	6	0	11	24	1	0	6	23	2	104	1,299
4:55 PM	0	5	8	15	0	12	5	8	0	8	27	1	0	3	23	2	117	1,292
5:00 PM	0	8	4	12	0	10	1	4	0	12	24	1	0	3	20	2	101	1,269
5:05 PM	0	8	2	10	0	7	7	6	0	9	22	5	0	4	26	3	109	
5:10 PM	0	7	8	18	0	6	4	3	0	12	25	2	0	3	26	3	117	
5:15 PM	0	3	4	19	0	8	4	2	0	9	26	0	0	1	39	4	119	
5:20 PM	0	7	1	13	0	8	4	3	0	7	26	2	0	1	25	1	98	
5:25 PM	0	6	2	13	0	8	5	4	0	6	27	2	0	4	15	6	98	
5:30 PM	0	10	4	16	0	11	4	7	0	10	24	3	0	3	22	3	117	
5:35 PM	0	6	5	14	0	5	5	8	0	9	26	1	0	2	31	2	114	
5:40 PM	0	3	4	10	0	8	7	3	0	13	22	1	0	2	30	4	107	
5:45 PM	0	6	6	13	0	7	4	4	0	7	24	1	0	4	21	1	98	
5:50 PM	0	4	4	19	0	2	2	3	1	9	26	1	0	5	15	6	97	
5:55 PM	0	5	6	11	0	6	4	3	0	3	31	0	0	2	19	4	94	
Count Total	0	160	113	350	0	181	113	108	1	245	610	39	0	77	617	81	2,695	
Peak Hour	0	87	63	182	0	95	62	58	0	139	307	20	0	43	328	42	1,426	

Location: 2 N Springbrook Rd & Haworth Ave PM

**Traffic Counts - Heavy Vehicles, Bicycles on Road, and Pedestrians/Bicycles on Crosswalk**

Interval Start Time	Heavy Vehicles					Interval Start Time	Bicycles on Roadway					Interval Start Time	Pedestrians/Bicycles on Crosswalk				
	EB	NB	WB	SB	Total		EB	NB	WB	SB	Total		EB	NB	WB	SB	Total
4:00 PM	1	3	0	1	5	4:00 PM	0	0	0	0	0	4:00 PM	1	0	0	0	1
4:05 PM	0	1	0	0	1	4:05 PM	1	0	0	0	1	4:05 PM	0	0	0	0	0
4:10 PM	0	0	0	0	0	4:10 PM	0	0	0	0	0	4:10 PM	0	0	0	1	1
4:15 PM	1	1	0	0	2	4:15 PM	0	0	0	2	2	4:15 PM	1	1	1	1	4
4:20 PM	0	0	0	0	0	4:20 PM	0	0	0	0	0	4:20 PM	0	0	0	0	0
4:25 PM	0	2	0	2	4	4:25 PM	0	1	0	0	1	4:25 PM	0	0	0	1	1
4:30 PM	1	1	0	0	2	4:30 PM	0	0	0	0	0	4:30 PM	1	0	0	0	1
4:35 PM	0	0	0	0	0	4:35 PM	0	0	0	0	0	4:35 PM	0	0	0	0	0
4:40 PM	0	0	0	0	0	4:40 PM	0	0	0	0	0	4:40 PM	0	1	0	0	1
4:45 PM	2	1	0	0	3	4:45 PM	0	0	0	0	0	4:45 PM	0	0	0	1	1
4:50 PM	1	1	0	0	2	4:50 PM	0	0	0	0	0	4:50 PM	1	1	0	0	2
4:55 PM	2	0	0	2	4	4:55 PM	0	0	0	0	0	4:55 PM	0	0	0	1	1
5:00 PM	0	1	0	0	1	5:00 PM	1	0	0	0	1	5:00 PM	0	1	0	1	2
5:05 PM	0	1	0	2	3	5:05 PM	0	0	0	0	0	5:05 PM	1	0	0	1	2
5:10 PM	0	0	0	0	0	5:10 PM	0	0	0	0	0	5:10 PM	0	0	0	0	0
5:15 PM	0	2	0	1	3	5:15 PM	0	0	0	0	0	5:15 PM	0	0	0	0	0
5:20 PM	0	1	0	1	2	5:20 PM	0	0	0	0	0	5:20 PM	0	0	0	0	0
5:25 PM	0	0	0	0	0	5:25 PM	0	0	0	1	1	5:25 PM	0	0	0	1	1
5:30 PM	0	1	0	0	1	5:30 PM	0	0	0	0	0	5:30 PM	0	0	0	1	1
5:35 PM	0	0	0	0	0	5:35 PM	0	0	0	0	0	5:35 PM	2	0	0	0	2
5:40 PM	0	1	0	1	2	5:40 PM	0	0	0	0	0	5:40 PM	0	0	0	0	0
5:45 PM	0	1	0	0	1	5:45 PM	0	0	0	0	0	5:45 PM	0	0	0	2	2
5:50 PM	0	1	0	0	1	5:50 PM	0	0	0	0	0	5:50 PM	0	0	0	0	0
5:55 PM	0	0	0	0	0	5:55 PM	0	0	0	0	0	5:55 PM	0	1	1	0	2
Count Total	8	19	0	10	37	Count Total	2	1	0	3	6	Count Total	7	5	2	11	25
Peak Hour	8	10	0	5	23	Peak Hour	1	1	0	2	4	Peak Hour	4	3	1	5	13





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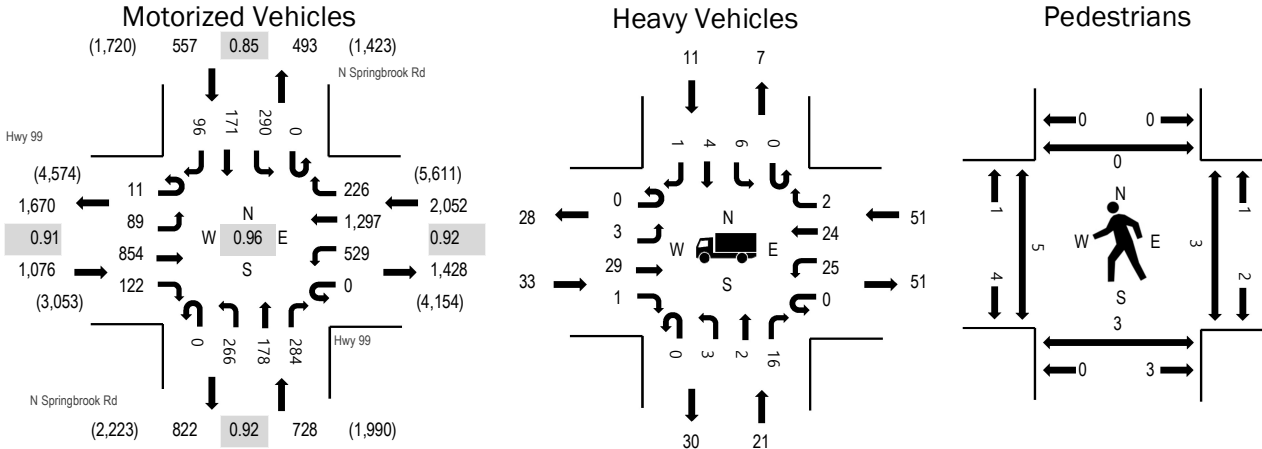
Location: 1 N Springbrook Rd & Hwy 99 PM

Date: Tuesday, April 19, 2022

Peak Hour: 04:15 PM - 05:15 PM

Peak 15-Minutes: 05:00 PM - 05:15 PM

Peak Hour



Note: Total study counts contained in parentheses.

	HV%	PHF
EB	3.1%	0.91
WB	2.5%	0.92
NB	2.9%	0.92
SB	2.0%	0.85
All	2.6%	0.96

Traffic Counts - Motorized Vehicles

Interval Start Time	Hwy 99 Eastbound				Hwy 99 Westbound				N Springbrook Rd Northbound				N Springbrook Rd Southbound				Total	Rolling Hour
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right		
3:00 PM	0	5	71	9	0	23	69	12	0	24	8	18	0	41	13	4	297	3,846
3:05 PM	2	9	69	7	0	31	79	24	0	18	10	21	0	28	12	3	313	3,923
3:10 PM	0	2	92	12	0	30	106	16	0	12	13	18	0	22	4	5	332	3,943
3:15 PM	0	9	76	4	0	39	94	17	0	18	9	9	0	20	10	12	317	3,983
3:20 PM	0	5	50	9	0	27	85	16	0	17	8	16	0	22	6	8	269	4,068
3:25 PM	0	9	53	5	0	24	97	17	0	17	19	25	0	16	11	6	299	4,131
3:30 PM	0	9	70	11	0	36	68	11	0	24	14	20	0	30	16	9	318	4,186
3:35 PM	1	6	61	6	0	42	89	18	0	20	11	22	0	38	14	8	336	4,251
3:40 PM	0	13	65	8	0	34	84	21	0	24	13	19	0	26	9	6	322	4,278
3:45 PM	0	10	62	9	0	32	100	16	0	19	7	23	0	20	17	7	322	4,291
3:50 PM	0	4	69	8	0	46	103	23	0	27	18	19	0	28	11	14	370	4,331
3:55 PM	0	7	67	13	0	40	95	29	0	14	12	16	0	26	19	13	351	4,330
4:00 PM	0	8	73	8	0	42	101	21	0	18	12	30	0	31	15	15	374	4,338
4:05 PM	0	11	59	9	0	46	72	27	0	20	12	20	0	26	23	8	333	4,368
4:10 PM	1	10	66	7	0	43	102	22	0	24	13	19	0	39	17	9	372	4,394
4:15 PM	0	12	65	3	0	60	103	25	0	26	13	25	0	39	22	9	402	4,413
4:20 PM	0	7	73	10	0	36	104	18	0	13	7	16	0	30	13	5	332	4,350
4:25 PM	3	9	59	11	0	47	102	20	0	21	13	27	0	21	19	2	354	4,371
4:30 PM	2	9	81	8	0	45	115	21	0	22	16	19	0	24	11	10	383	4,359
4:35 PM	0	5	77	11	0	38	107	17	0	16	22	30	0	19	12	9	363	4,323
4:40 PM	0	9	53	7	0	32	96	15	0	30	17	26	0	18	21	11	335	4,294
4:45 PM	0	4	76	11	0	53	82	20	0	23	14	22	0	37	13	7	362	4,338
4:50 PM	1	13	60	13	0	57	104	16	0	25	16	28	0	20	10	6	369	4,301
4:55 PM	0	7	68	10	0	35	129	17	0	21	15	19	0	23	8	7	359	4,227
5:00 PM	0	5	87	11	0	56	123	19	0	24	12	22	0	23	12	10	404	4,190
5:05 PM	0	2	76	15	0	36	115	14	0	21	18	17	0	20	14	11	359	
5:10 PM	5	7	79	12	0	34	117	24	0	24	15	33	0	16	16	9	391	
5:15 PM	0	8	57	12	0	36	87	21	0	23	13	22	0	32	18	10	339	

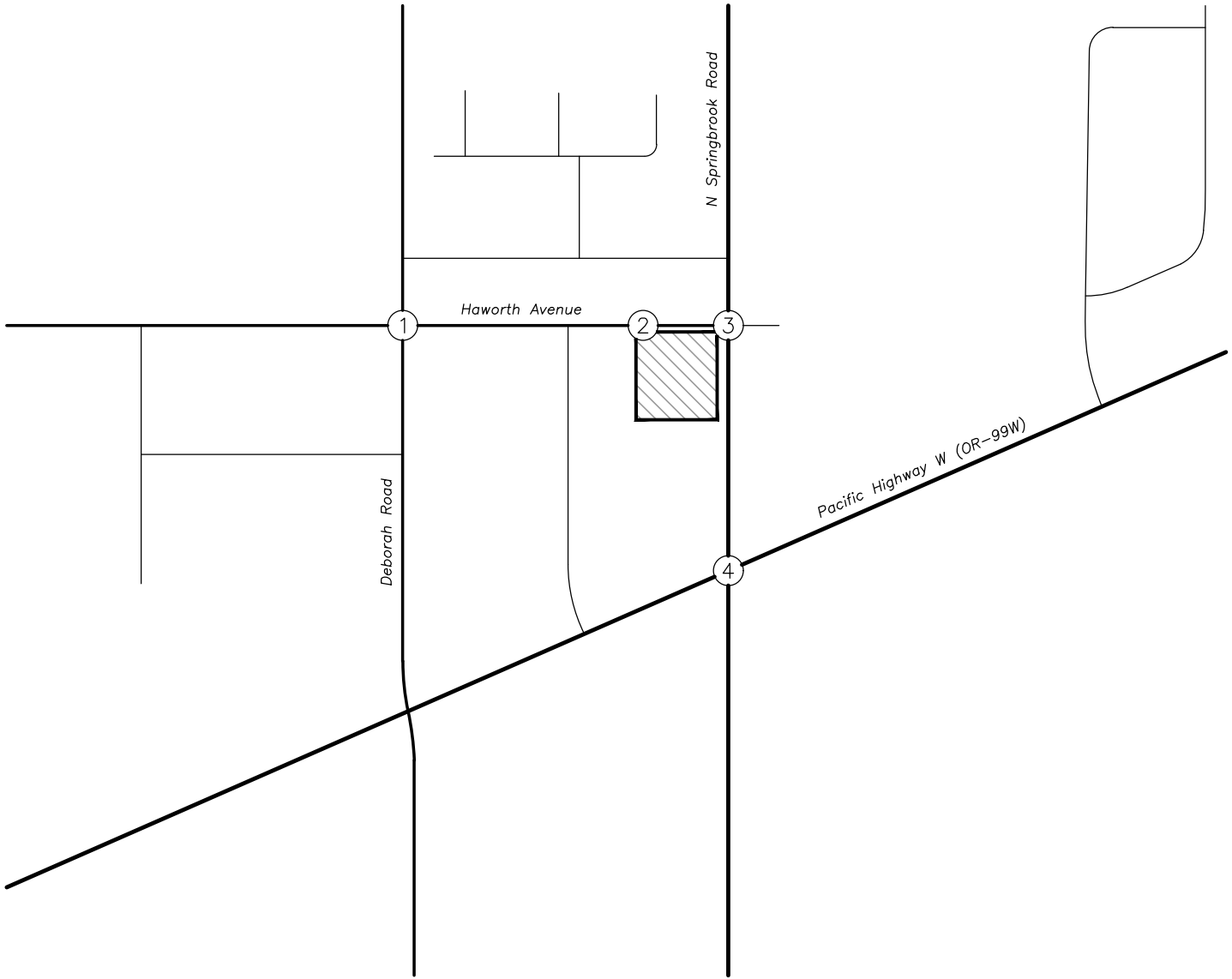
**Location:** 1 N Springbrook Rd & Hwy 99 PM

5:20 PM	0	9	67	6	0	37	109	15	0	24	12	19	0	35	13	7	353
5:25 PM	0	12	64	7	0	49	89	16	0	23	13	19	0	21	19	10	342
5:30 PM	0	8	80	10	0	45	107	15	0	11	13	25	0	16	14	3	347
5:35 PM	0	9	71	10	0	28	113	18	0	15	8	22	0	23	14	3	334
5:40 PM	1	4	87	3	0	52	105	19	0	18	18	19	0	30	14	9	379
5:45 PM	0	4	46	9	0	44	98	17	1	16	15	21	0	23	16	15	325
5:50 PM	0	8	51	7	0	24	91	20	0	25	13	19	0	27	6	4	295
5:55 PM	0	8	61	9	0	32	89	14	0	23	14	28	0	30	9	5	322
Count Total	16	276	2,441	320	0	1,411	3,529	671	1	740	476	773	0	940	491	289	12,374
Peak Hour	11	89	854	122	0	529	1,297	226	0	266	178	284	0	290	171	96	4,413

Location: 1 N Springbrook Rd & Hwy 99 PM

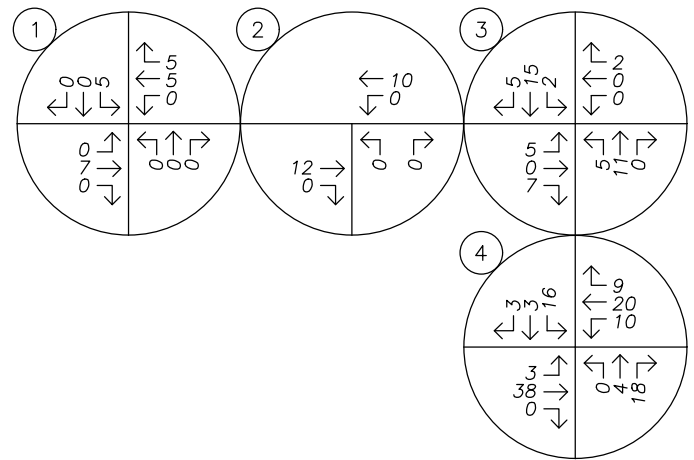
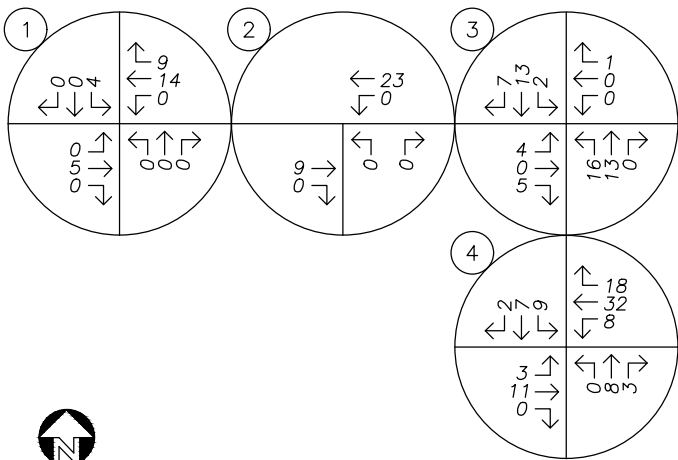
**Traffic Counts - Heavy Vehicles, Bicycles on Road, and Pedestrians/Bicycles on Crosswalk**

Interval Start Time	Heavy Vehicles					Interval Start Time	Bicycles on Roadway					Interval Start Time	Pedestrians/Bicycles on Crosswalk				
	EB	NB	WB	SB	Total		EB	NB	WB	SB	Total		EB	NB	WB	SB	Total
3:00 PM	4	0	5	3	12	3:00 PM	0	0	0	0	0	3:00 PM	0	0	1	0	1
3:05 PM	1	4	8	2	15	3:05 PM	0	0	0	0	0	3:05 PM	0	0	0	0	0
3:10 PM	5	0	4	1	10	3:10 PM	0	0	0	0	0	3:10 PM	0	0	0	0	0
3:15 PM	2	1	5	1	9	3:15 PM	0	0	0	0	0	3:15 PM	0	0	0	0	0
3:20 PM	2	0	10	2	14	3:20 PM	0	0	0	0	0	3:20 PM	0	0	0	0	0
3:25 PM	2	1	4	2	9	3:25 PM	0	0	0	0	0	3:25 PM	0	0	1	0	1
3:30 PM	4	1	8	3	16	3:30 PM	0	0	0	0	0	3:30 PM	0	0	0	0	0
3:35 PM	3	1	4	2	10	3:35 PM	0	0	0	0	0	3:35 PM	1	2	0	0	3
3:40 PM	4	3	2	3	12	3:40 PM	0	0	0	0	0	3:40 PM	0	0	0	0	0
3:45 PM	5	4	6	1	16	3:45 PM	0	0	0	0	0	3:45 PM	1	0	0	0	1
3:50 PM	3	1	8	0	12	3:50 PM	0	0	0	0	0	3:50 PM	0	0	1	0	1
3:55 PM	4	3	8	1	16	3:55 PM	0	0	0	0	0	3:55 PM	1	0	2	0	3
4:00 PM	4	1	5	3	13	4:00 PM	0	0	0	0	0	4:00 PM	2	0	0	0	2
4:05 PM	2	1	6	0	9	4:05 PM	0	0	0	0	0	4:05 PM	1	2	0	0	3
4:10 PM	2	1	5	0	8	4:10 PM	0	0	0	0	0	4:10 PM	0	1	1	0	2
4:15 PM	3	6	7	1	17	4:15 PM	0	0	0	0	0	4:15 PM	2	2	0	0	4
4:20 PM	4	0	2	0	6	4:20 PM	0	0	0	0	0	4:20 PM	0	1	1	0	2
4:25 PM	0	1	7	2	10	4:25 PM	0	0	1	0	1	4:25 PM	0	0	0	0	0
4:30 PM	4	0	9	0	13	4:30 PM	0	0	0	0	0	4:30 PM	1	0	0	0	1
4:35 PM	0	2	6	1	9	4:35 PM	0	0	0	0	0	4:35 PM	0	0	0	0	0
4:40 PM	5	2	3	0	10	4:40 PM	0	0	0	0	0	4:40 PM	0	0	0	0	0
4:45 PM	4	1	3	2	10	4:45 PM	0	0	0	0	0	4:45 PM	1	0	0	0	1
4:50 PM	3	4	4	0	11	4:50 PM	0	0	0	0	0	4:50 PM	0	0	0	0	0
4:55 PM	0	2	5	1	8	4:55 PM	0	0	0	0	0	4:55 PM	0	0	1	0	1
5:00 PM	5	1	2	3	11	5:00 PM	0	0	0	0	0	5:00 PM	0	0	0	0	0
5:05 PM	1	1	1	1	4	5:05 PM	0	0	0	0	0	5:05 PM	0	0	1	0	1
5:10 PM	4	1	2	0	7	5:10 PM	0	0	0	0	0	5:10 PM	1	0	0	0	1
5:15 PM	4	1	3	0	8	5:15 PM	0	0	0	0	0	5:15 PM	0	0	0	0	0
5:20 PM	0	1	1	1	3	5:20 PM	0	0	0	0	0	5:20 PM	0	0	0	0	0
5:25 PM	0	0	3	1	4	5:25 PM	0	0	0	0	0	5:25 PM	0	0	0	0	0
5:30 PM	0	2	1	0	3	5:30 PM	0	0	0	0	0	5:30 PM	0	0	0	0	0
5:35 PM	1	0	2	0	3	5:35 PM	0	0	0	0	0	5:35 PM	0	0	0	2	2
5:40 PM	1	1	1	1	4	5:40 PM	0	0	0	0	0	5:40 PM	0	0	1	0	1
5:45 PM	2	1	2	0	5	5:45 PM	0	0	0	0	0	5:45 PM	0	0	0	0	0
5:50 PM	1	2	3	0	6	5:50 PM	0	0	0	0	0	5:50 PM	0	0	0	0	0
5:55 PM	0	1	1	0	2	5:55 PM	0	0	0	0	0	5:55 PM	0	0	0	0	0
Count Total	89	52	156	38	335	Count Total	0	0	1	0	1	Count Total	11	8	10	2	31
Peak Hour	33	21	51	11	116	Peak Hour	0	0	1	0	1	Peak Hour	5	3	3	0	11



AM PEAK HOUR

PM PEAK HOUR



## Appendix D

### Crash History Data















URBAN NON-SYSTEM CRASH LISTING

HAWORTH AVE and SPRINGBROOK RD, City of Newberg, Yamhill County, 01/01/2016 to 12/31/2020

13 - 17 of 29 Crash records shown.

SER#	P	R	J	S	W	DATE	CLASS	CITY STREET	RD CHAR	INT-TYPE	SPCL USE	TRLR QTY	MOVE	A	S	G	E	LICNS	PED	ACT	EVENT	CAUSE											
INVEST	E	A	U	I	C	O	DIST	FIRST STREET	DIRECT	(MEDIAN)	INT-REL	OFFRD	WTHR	CRASH	OWNER	FROM	PRTC	INJ	G	E	LICNS	PED											
RD DPT	E	L	G	N	H	R	TIME	SECOND STREET	LOCTN	LEGS	TRAF-	RNCBT	SURF	COLL	TO	P#	TYPE	SVRTY	E	X	RES	LOC	ERROR	ACT	EVENT	CAUSE							
UNLOC?	D	C	S	V	L	K	LAT	LRS	LOCTN	(#LANES)	CONTL	DRVWY	LIGHT	SVRTY	V#	TYPE	TO	P#	TYPE	SVRTY	E	X	RES	LOC	ERROR	ACT	EVENT	CAUSE					
												02	NONE	0	TURN-L																		
													PRVTE		N -E																		
													PSNGR	CAR			01	DRVR	INJB	21	F	OR-Y		000		015	00						
00146	N	N	N	N	N	02/03/2018	16	HAWORTH AVE	INTER	3-LEG	N	N	CLR	ANGL-OTH	01	NONE	0	STRGHT										02					
CITY						SA	0	SPRINGBROOK RD	CN		STOP SIGN	N	DRY	ANGL		PRVTE		N -S										015	00				
N						10P			01	0		N	DLIT	INJ		PSNGR	CAR		01	DRVR	INJC	51	F	OR-Y		028	000	00	02				
N						45 18 28.73	-122 56																							OR<25			
																02	NONE	0	STRGHT										015	00			
																PRVTE		E -W											000	000	00		
																PSNGR	CAR		01	DRVR	NONE	33	F	OTH-Y		000		000	000	00			
																															OR<25		
00538	N	N	N			05/30/2018	16	HAWORTH AVE	INTER	3-LEG	N	N	CLR	ANGL-OTH	01	NONE	0	STRGHT											02				
NONE						WE	0	SPRINGBROOK RD	CN		STOP SIGN	N	DRY	ANGL		PRVTE		N -S											000	00			
N						3P			01	0		Y	DAY	INJ		PSNGR	CAR		01	DRVR	NONE	30	M	OR-Y		000	000	00	00	00			
N						45 18 28.73	-122 56																								OR<25		
																02	NONE	0	STRGHT											018	00		
																PRVTE		E -W												000	000	00	
																PSNGR	CAR		01	DRVR	INJC	60	M	OTH-Y		028		000	000	00	02		
																																N-RES	
																02	NONE	0	STRGHT											018	00		
																PRVTE		E -W												000	000	00	
																PSNGR	CAR		02	PSNG	INJC	53	F			000		000	000	00	00		
00838	N	N	N			08/17/2018	16	SPRINGBROOK RD	INTER	3-LEG	N	N	CLR	ANGL-OTH	01	NONE	9	STRGHT											02				
NONE						FR	0	HAWORTH AVE	CN		STOP SIGN	N	DRY	ANGL		N/A		E -W											000	00			
N						10A			01	0		Y	DAY	PDO		PSNGR	CAR		01	DRVR	NONE	00	Unk	UNK		000	000	00	00	00			
N						45 18 28.8	-122 56 49																										
																02	NONE	9	STRGHT												000	000	00
																N/A		S -N												000	000	00	
																PSNGR	CAR		01	DRVR	NONE	00	Unk	UNK		000		000	000	00	00		
01194	N	N	N			11/20/2018	16	HAWORTH AVE	INTER	CROSS	N	N	CLR	ANGL-OTH	01	NONE	9	STRGHT											03				
NONE						TU	0	SPRINGBROOK RD	CN		STOP SIGN	N	DRY	ANGL		N/A		N -S												000	00		
N						7P			03	0		N	DLIT	PDO		PSNGR	CAR		01	DRVR	NONE	00	Unk	UNK		000	000	00	00	00			
N						45 18 28.77	-122 56 49																										
																02	NONE	9	TURN-L												015	00	
																N/A		W -N													000	000	00
																PSNGR	CAR		01	DRVR	NONE	00	Unk	UNK		000		000	000	00	00		

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CITY OF NEWBERG, YAMHILL COUNTY

HAWORTH AVE and SPRINGBROOK RD, City of Newberg, Yamhill County, 01/01/2016 to 12/31/2020

23 - 27 of 29 Crash records shown.

SER#	S D M	P R J S W DATE	CLASS	CITY STREET	INT-TYPE	SPCL USE	INVEST	E A U I C O DAY	DIST	FIRST STREET	RD CHAR	(MEDIAN)	INT-REL	OFFRD	WTHR	CRASH	TRLR QTY	MOVE	A S	
RD DPT	E L G N H R TIME	FROM	SECOND STREET	DIRECT	LEGS	TRAF-	RNDBT	SURF	COLL	OWNER	FROM	PRTC	INJ	G E LICNS	PED					
UNLOC?	D C S V L K LAT	LONG	LRS	LOCTN	(#LANES)	CONTL	DRVWY	LIGHT	SVRTY	V# TYPE	TO	P# TYPE	SVRTY	E X RES	LOC	ERROR	ACT	EVENT	CAUSE	
00775	N N N N	08/13/2019	16	HAWORTH AVE	INTER	3-LEG	N	CLR	ANGL-OTH	01 NONE 9	TURN-R									
CITY		TU	0	SPRINGBROOK RD	CN			STOP SIGN	N	DRY	TURN	N/A	N -W					000	00	
N		10A			01	0		N	DAY	PDO	SEMI TOW		01 DRVR	NONE	00	Unk UNK		000	000	00
N		45 18 28.73	-122 56 49													UNK				
										02 NONE 9	STRGHT									
										N/A	E -W							000	000	00
										PSNGR CAR		01 DRVR	NONE	00	Unk UNK		000	000	00	
00726	N N N N	09/22/2020	17	HAWORTH AVE	INTER	3-LEG	N	CLR	ANGL-OTH	01 NONE	STRGHT									
NONE		TU	0	SPRINGBROOK RD	CN			STOP SIGN	N	DRY	ANGL	PRVTE	S -N						000	00
N		12P			04	0		Y	DAY	INJ	PSNGR CAR		01 DRVR	NONE	68	F OR-Y		028	000	03,02
N		45 18 28.73	-122 56 48.99													OR>25				
										02 NONE	STRGHT									
										PRVTE	W -E							000	000	00
										PSNGR CAR		01 DRVR	INJC	80	F OR-Y		000	000	00	
																OR<25				
01014	N N N	12/20/2020	16	HAWORTH AVE	INTER	3-LEG	N	RAIN	ANGL-OTH	01 NONE	STRGHT									
NONE		SU	0	SPRINGBROOK RD	CN			STOP SIGN	N	WET	ANGL	PRVTE	E -W						018	00
N		10A			01	0		Y	DAY	INJ	PSNGR CAR		01 DRVR	INJC	49	F OR-Y		000,097	000	02
N		45 18 28.73	-122 56 48.99													OR<25				
										02 NONE	STRGHT									
										PRVTE	N -S							000	000	00
										PSNGR CAR		01 DRVR	INJC	49	F OR-Y		000,097	000	000	02
																OR<25				
00407	N N N	Y 04/25/2017	16	SPRINGBROOK RD	ALLEY		N	RAIN	S-STRGHT	01 NONE 9	STRGHT									
NONE		TU	168	HAWORTH AVE	S	(RSDMD)	UNKNOWN	N	WET	REAR	N/A	S -N							000	00
N		9P			08			N	DARK	PDO	PSNGR CAR		01 DRVR	NONE	00	Unk UNK		000	000	00
N		45 18 26.81	-122 56 48.97			(02)										UNK				
										02 NONE 9	TURN-R									
										N/A	S -E							019	000	00
										PSNGR CAR		01 DRVR	NONE	00	Unk UNK		000	000	00	
00549	N N N	05/06/2016	17	HAWORTH AVE	ALLEY		N	CLR	ANGL-OTH	01 NONE 9	TURN-R									
CITY		FR	342	SPRINGBROOK RD	W	(NONE)	NONE	N	DRY	TURN	N/A	W -S							019	00
N		9A			08			N	DAY	PDO	PSNGR CAR		01 DRVR	NONE	00	Unk UNK		000	000	00
N		45 18 28.75	-122 56 54.23			(02)										UNK				
										02 NONE 9	TURN-L									
										N/A	S -W							018	000	00
										SCHL BUS		01 DRVR	NONE	00	Unk UNK		000	000	000	00

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TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT

URBAN NON-SYSTEM CRASH LISTING

CITY OF NEWBERG, YAMHILL COUNTY

HAWORTH AVE and SPRINGBROOK RD, City of Newberg, Yamhill County, 01/01/2016 to 12/31/2020

28 - 29 of 29 Crash records shown.

SER#	S	D	M	P	R	J	S	W	DATE	CLASS	CITY STREET	INT-TYPE	SPCL USE																						
INVEST	E	A	U	I	C	O	DAY			DIST	FIRST STREET	RD CHAR	(MEDIAN)	INT-REL	OFFRD	WTHR	CRASH	TRLR QTY	MOVE	A	S														
RD DPT	E	L	G	N	H	R	TIME			FROM	SECOND STREET	DIRECT	LEGS	TRAF-	RNDBT	SURF	COLL	OWNER	FROM	PRTC	INJ	G	E	LICNS	PED										
UNLOC?	D	C	S	V	L	K	LAT			LONG	LRS	LOCTN	(#LANES)	CONTL	DRVWY	LIGHT	SVRTY	V#	TYPE	TO	P#	TYPE	SVRTY	E	X	RES	LOC	ERROR	ACT	EVENT	CAUSE				
01221	N	N	N	N	N	N	11/03/2017			16	SPRINGBROOK RD	STRGHT		N	N	CLD	S-1STOP	01	NONE	0	STRGHT														
CITY							FR			150	HAWORTH AVE	N	(NONE)	NONE	N	WET	REAR		PRVTE	N	-S								000		00				
N							7A					08			N	DAY	INJ		PSNGR CAR			01	DRVR	INJC	53	F	OR-Y		043	000	07				
N							45 18 30.43			-122 56			(02)																						
							48.97												02	NONE	0	STOP													
																			PRVTE	N	-S								011		00				
																			PSNGR CAR			01	DRVR	INJC	53	F	OR-Y		000	000	00				
00401	N	N	N	N	N	N	04/19/2018			16	SPRINGBROOK RD	STRGHT		Y	N	CLR	S-STRGHT	01	NONE	0	STRGHT											13,50			
CITY							TH			200	HAWORTH AVE	N	(NONE)	L-TURN REF	N	DRY	SS-O		PRVTE	N	-S								000		00				
N							5P					08			N	DUSK	INJ		PSNGR CAR			01	DRVR	INJC	59	F	OTH-Y		045	000	13,50				
N							45 18 30.9			-122 56			(03)																						
							48.97													02	NONE	0	STRGHT												
																			PRVTE	N	-S								000		00				
																			PSNGR CAR			01	DRVR	NONE	23	F	OR-Y		000	000	50				

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URBAN NON-SYSTEM CRASH LISTING

**SPRINGBROOK RD and PACIFIC HY 99W, City of Newberg, Yamhill County, 01/01/2016 to 12/31/2020**

17 - 20 of 77 Crash records shown.

SER#	INVEST	RD DPT	UNLOC?	S P R J S W DATE	CLASS	CITY STREET	INT-TYPE	INT-REL	OFFRD	WTHR	CRASH	SPCL USE	TRLR QTY	MOVE	A	S	E	LICNS	PED	ERROR	ACT	EVENT	CAUSE		
	E A U I C O DAY	E L G N H R TIME	D C S V L K LAT		DIST	FIRST STREET	(MEDIAN)	INT-REL	RNDBT	SURF	COLL	OWNER	FROM												
		FROM	LONG		FROM	SECOND STREET	LEGS	TRAF-	DRVWY	LIGHT	SVRTY	V# TYPE	TO	P#	TYPE	SVRTY	E	X	RES	LOC					
												02 NONE	9	STOP											
												N/A	S -N								011		00		
												PSNGR CAR		01	DRVR	NONE	00	Unk	UNK		000	000	00		
00670	N N N N			09/05/2020	16	PACIFIC HY 99W	INTER	CROSS	N	N	CLR	S-1STOP	01	NONE	9	STRGHT							29,07		
	NONE			SA		SPRINGBROOK RD	S		L-GRN-SIG	N	DRY	REAR		PRVTE		S -N						000	00		
	N			9P			06	2		N	DLIT	INJ		PSNGR CAR			01	DRVR	NONE	58	M	OR-Y	000,026	000	29,07
	N			45 18 22.62	-122 56	003900100S00																	48.99		
												02 NONE		STOP											
												PRVTE		S -N								012	00		
												PSNGR CAR		01	DRVR	INJC	62	F	OR-Y		000	000	00		
																							OR<25		
												02 NONE		STOP											
												PRVTE		S -N								012	00		
												PSNGR CAR		02	PSNG	INJC	05	F			000	000	00		
												02 NONE		STOP											
												PRVTE		S -N								012	00		
												PSNGR CAR		03	PSNG	INJC	66	F			000	000	00		
												02 NONE		STOP											
												PRVTE		S -N								012	00		
												PSNGR CAR		04	PSNG	INJC	07	F			000	000	00		
00085	N N N N			01/19/2016	16	PACIFIC HY 99W	INTER	CROSS	N	N	RAIN	S-1STOP	01	NONE	9	STRGHT							29,17		
	CITY			TU	0	SPRINGBROOK RD	S		TRF SIGNAL	N	WET	REAR		N/A		S -N						000	00		
	N			2P			06	2		N	DAY	PDO		SCHL BUS			01	DRVR	NONE	00	Unk	UNK	000	000	00
	N			45 18 23.12	-122 56																		48.94		
												02 NONE		STOP											
												N/A		S -N								011	00		
												PSNGR CAR		01	DRVR	NONE	00	Unk	UNK		000	000	00		
																							UNK		
01558	N N N N			12/21/2016	14	PACIFIC HY 99W	INTER	CROSS	N	N	CLR	S-1STOP	01	NONE	9	STRGHT							29		
	NO RPT			WE	0	SPRINGBROOK RD	S		TRF SIGNAL	N	DRY	REAR		N/A		S -N						000	00		
	N			UNK			06	2		N	DAY	PDO		PSNGR CAR			01	DRVR	NONE	00	Unk	UNK	000	000	00
	N			45 18 23.12	-122 56																		48.94		
												02 NONE		STOP											
												N/A		S -N								011	00		
												PSNGR CAR		01	DRVR	NONE	00	Unk	UNK		000	000	00		
																							UNK		

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OREGON.. DEPARTMENT OF TRANSPORTATION - TRANSPORTATION DEVELOPMENT DIVISION  
TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT  
URBAN NON-SYSTEM CRASH LISTING

CITY OF NEWBERG, YAMHILL COUNTY

**SPRINGBROOK RD and PACIFIC HY 99W, City of Newberg, Yamhill County, 01/01/2016 to 12/31/2020**  
21 - 24 of 77 Crash records shown.

SER#	P	R	J	S	W	DATE	CLASS	CITY STREET	INT-TYPE	SPCL USE	MOVE	A	S	E	L	C	P	ERROR	ACT	EVENT	CAUSE		
INVEST	E	A	U	I	O	DAY	DIST	FIRST STREET	RD CHAR	TRLR QTY	MOVE					LICNS	PED						
RD DPT	E	L	G	N	H	R TIME	FROM	SECOND STREET	DIRECT	OWNER	FROM												
UNLOC?	D	C	S	V	L	K LAT	LONG	LRS	LOCTN	TYPE	TO												
00907	N	N	N			09/05/2018	14	PACIFIC HY 99W	INTER	01 NONE	STRGHT										07,29		
NONE						WE		SPRINGBROOK RD	SW	PRVTE	SW-NE										000	00	
N						12P			06	PSNGR CAR				01	DRVR	NONE	24	M		OR-Y	026,014	000	07,29
N						45 18 23.12	-122 56	009100100S00													OR<25		
						48.94																	
										02 NONE	STOP											011	00
										PRVTE	SW-NE			01	DRVR	INJC	57	F		OR-Y	000	000	00
										PSNGR CAR											OR<25		00
00007	N	N	N	N		01/03/2019	14	PACIFIC HY 99W	INTER	01 NONE 9	STRGHT										07		
NONE						TH		SPRINGBROOK RD	SW	N/A	SW-NE										000	00	
N						10P			06	PSNGR CAR				01	DRVR	NONE	00	Unk	UNK		000	000	00
N						45 18 22.8	-122 56	009100100S00													UNK		
						50.21																	
										02 NONE 9	STOP											011	00
										N/A	SW-NE			01	DRVR	NONE	00	Unk	UNK		000	000	00
										PSNGR CAR													00
																					UNK		00
00107	Y	N	N			02/05/2020	14	PACIFIC HY 99W	INTER	01 NONE	STRGHT										013	32,01,27	
CITY						WE		SPRINGBROOK RD	SW	PRVTE	SW-NE										000	00	
N						5P			06	PSNGR CAR				01	DRVR	NONE	53	M		OR-Y	026	000	32,01,27
N						45 18 22.77	-122 56	009100100S00													OR>25		
						50.24																	
										02 NONE	STOP											011	013
										PRVTE	SW-NE			01	DRVR	INJB	33	M		OR-Y	000	000	00
										PSNGR CAR											OR<25		00
										03 NONE	STOP											011	00
										PRVTE	SW-NE			01	DRVR	NONE	29	M		OR-Y	000	000	00
										PSNGR CAR											OR<25		00
00689	N	N	N	N	N	09/12/2020	16	PACIFIC HY 99W	INTER	01 NONE	STRGHT											07	
CITY						SA		SPRINGBROOK RD	SW	PRVTE	N -S										000	00	
N						1P			09	PSNGR CAR				01	DRVR	NONE	20	F		OR-Y	043	000	07
N						45 18 22.1	-122 56	003900100S00													OR<25		
						49.05																	
										02 NONE	STOP											012	00
										PRVTE	N -S			01	DRVR	INJC	59	F		OR-Y	000	000	00
										PSNGR CAR											OR<25		
00926	N	N	N			09/23/2019	14	PACIFIC HY 99W	INTER	01 NONE	STRGHT											07	
NONE						MO		SPRINGBROOK RD	W	PRVTE	W -E										000	00	
N						1P			06	PSNGR CAR				01	DRVR	NONE	26	F		OR-Y	026	000	07
N						45 18 22.71	-122 56	009100100S00													OR>25		
						50.36																	

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TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT

URBAN NON-SYSTEM CRASH LISTING

CITY OF NEWBERG, YAMHILL COUNTY

SPRINGBROOK RD and PACIFIC HY 99W, City of Newberg, Yamhill County, 01/01/2016 to 12/31/2020

59 - 61 of 77 Crash records shown.

SER#	P	R	J	S	W	DATE	CLASS	CITY STREET	RD CHAR	INT-TYPE	SPCL USE	MOVE	A	S	E	LICNS	PED	ERROR	ACT	EVENT	CAUSE										
INVEST	E	A	U	I	C	O	DIST	FIRST STREET	DIRECT	(MEDIAN)	INT-REL	OFFRD	WTHR	CRASH	TRLR	QTY															
RD DPT	E	L	G	N	H	R	FROM	SECOND STREET	DIRECT	LEGS	TRAF-	RNDBT	SURF	COLL	OWNER	FROM															
UNLOC?	D	C	S	V	L	K	LONG	LRS	LOCTN	(#LANES)	CONTL	DRVWY	LIGHT	SVRTY	V#	TYPE	TO	P#	TYPE	SVRTY	E	X	RES	LOC	ERROR	ACT	EVENT	CAUSE			
00999	N	N	N	N	N	10/11/2019	14	PACIFIC HY 99W	STRGHT		N	N	CLR	S-1STOP	01	NONE	STRGHT												07		
CITY						FR		SPRINGBROOK RD	NE	(DIVMD)	UNKNOWN	N	DRY	REAR		PRVTE	SW-NE										000	00			
N						4P			05			N	DAY	INJ		PSNGR CAR			01	DRVR	NONE	18	M	OR-Y		043	000	07			
N						45 18 25.22 42.31	-122 56 42.31	009100100S00		(04)														OR>25							
															01	NONE	STRGHT														
																PRVTE	SW-NE											000	00		
																PSNGR CAR			02	PSNG	INJC	18	F			000	000	00	00		
															02	NONE	STOP														
																PRVTE	SW-NE											011	00		
																PSNGR CAR			01	DRVR	INJC	51	M	OTH-Y		000	000	00	00		
																								N-RES							
00980	N	N	N	N	N	12/14/2020	14	PACIFIC HY 99W	STRGHT		N	N	CLR	S-1STOP	01	NONE	STRGHT											013	07		
NO RPT						MO		SPRINGBROOK RD	NE	(RSDMD)	UNKNOWN	N	DRY	REAR		PRVTE	NE-SW											000	00		
N						5P			04			N	DLIT	INJ		PSNGR CAR			01	DRVR	NONE	49	M	OR-Y		026	000	07			
N						45 18 23.98 46.31	-122 56 46.31	009100100S00		(04)															OR<25						
															02	NONE	STOP														
																PRVTE	NE-SW											011	013	00	
																PSNGR CAR			01	DRVR	INJC	55	M	OR-Y		000	000	00	00		
																03	NONE	STOP											011	013	00
																PRVTE	NE-SW												000	00	
																PSNGR CAR			01	DRVR	NONE	52	F	OR-Y		000	000	00	00		
																04	NONE	STOP											022	00	
																PRVTE	NE-SW											000	000	00	
																PSNGR CAR			01	DRVR	NONE	27	M	OTH-Y		000	000	00	00		
																									N-RES						
00949	N	N	N	N	N	12/03/2020	14	PACIFIC HY 99W	STRGHT		Y	N	CLR	S-1STOP	01	NONE	9	STRGHT											07		
NONE						TH		SPRINGBROOK RD	NE	(RSDMD)	UNKNOWN	N	DRY	REAR		N/A	NE-SW											088	00		
N						UNK			04			N	UNK	PDO		PSNGR CAR			01	DRVR	NONE	00	Unk	UNK		000	000	00	00		
N						45 18 23.97 46.29	-122 56 46.29	009100100S00		(04)																					
																02	NONE	STOP											011	00	
																N/A	NE-SW												000	00	
																PSNGR CAR			01	DRVR	NONE	00	Unk	UNK		000	000	00	00		
00804	N	N	N	N	N	08/09/2018	14	PACIFIC HY 99W	STRGHT		N	N	CLR	S-STRGHT	01	NONE	9	STRGHT											07, 29		
NONE						TH		SPRINGBROOK RD	E	(NONE)	UNKNOWN	N	DRY	REAR		N/A	W -E											000	00		
N						11P			05			N	DLIT	PDO		PSNGR CAR			01	DRVR	NONE	00	Unk	UNK		000	000	00	00		
N						45 18 23.69 47.24	-122 56 47.24	009100100S00		(04)																					

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TRANSPORTATION DATA SECTION - CRASH ANALYSIS AND REPORTING UNIT

URBAN NON-SYSTEM CRASH LISTING

CITY OF NEWBERG, YAMHILL COUNTY

SPRINGBROOK RD and PACIFIC HY 99W, City of Newberg, Yamhill County, 01/01/2016 to 12/31/2020

75 - 77 of 77 Crash records shown.

SER#	P	R	J	S	W	DATE	CLASS	CITY STREET	INT-TYPE	SPCL USE																				
INVEST	E	A	U	I	C	O	DAY	DIST	FIRST STREET	RD CHAR	(MEDIAN)	INT-REL	OFFRD	WTHR	CRASH	TRLR QTY	MOVE													
RD DPT	E	L	G	N	H	R	TIME	FROM	SECOND STREET	DIRECT	LEGS	TRAF-	RNDBT	SURF	COLL	OWNER	FROM	PRTC	INJ	G	E	LICNS	PED							
UNLOC?	D	C	S	V	L	K	LAT	LONG	LRS	LOCTN	(#LANES)	CONTL	DRVWY	LIGHT	SVRTY	V#	TYPE	TO	P#	TYPE	SVRTY	E	X	RES	LOC	ERROR	ACT	EVENT	CAUSE	
00886	N	N	N	N			11/06/2020	14	PACIFIC HY 99W	STRGHT		N	N	UNK	S-1STOP	01	NONE	STRGHT												07
NONE							FR		SPRINGBROOK RD	SW	(RSDMD)	UNKNOWN	N	WET	REAR		PRVTE	SW-NE									000		00	
N							12P			06			N	DAY	INJ		PSNGR CAR		01	DRVR	INJC	72	F	OR-Y		026	000		07	
N							45 18 22.19	-122 56 52.16	009100100S00		(04)													OR<25						
																	01	NONE	STRGHT											
																	PRVTE	SW-NE									000		00	
																	PSNGR CAR		02	PSNG	INJC	53	F			000	000		00	
																	02	NONE	STOP								011		00	
																	PRVTE	SW-NE								000	000		00	
																	PSNGR CAR		01	DRVR	NONE	25	M	OR-Y		000	000		00	
																								OR<25						
00358	N	N	N				05/23/2020	14	PACIFIC HY 99W	STRGHT		Y	N	CLR	S-STRGHT	01	NONE	9	STRGHT											06,13
NONE							SA		SPRINGBROOK RD	SW	(RSDMD)	L-GRN-SIG	N	DRY	SS-O		N/A	SW-NE									052		00	
N							10A			05			N	DAY	PDO		PSNGR CAR		01	DRVR	NONE	00	Unk	UNK		000	000		00	
N							45 18 22.19	-122 56 52.16	009100100S00		(04)																			
																	02	NONE	9	STRGHT								000		00
																	N/A	SW-NE									000		00	
																	PSNGR CAR		01	DRVR	NONE	00	Unk	UNK		000	000		00	
00415	N	N	N				06/18/2020	14	PACIFIC HY 99W	STRGHT		N	N	CLR	O-STRGHT	01	NONE		STRGHT									044		15,10
CITY							TH		SPRINGBROOK RD	SW	(RSDMD)	UNKNOWN	N	DRY	HEAD		PRVTE	NE-SW									029		00	
N							10A			04			N	DAY	INJ		PSNGR CAR		01	DRVR	INJB	26	M	OR-Y		039	017		15,10	
N							45 18 22.19	-122 56 52.21	009100100S00		(04)														OR<25					
																	02	NONE	STRGHT									000		00
																	PRVTE	SW-NE									000		00	
																	PSNGR CAR		01	DRVR	INJA	65	M	OR-Y		000	000		00	
																									OR<25					

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## Appendix E

Left-turn Lane Warrant Calculations

Traffic Signal Warrant Calculations



## Left-Turn Lane Warrant Analysis



Project: Haworth Avenue Apartments  
 Intersection: 2. Site Access at Haworth Avenue  
 Date: 5/12/2022  
 Scenario: 2029 Future Conditions - AM Peak Hour (WB)

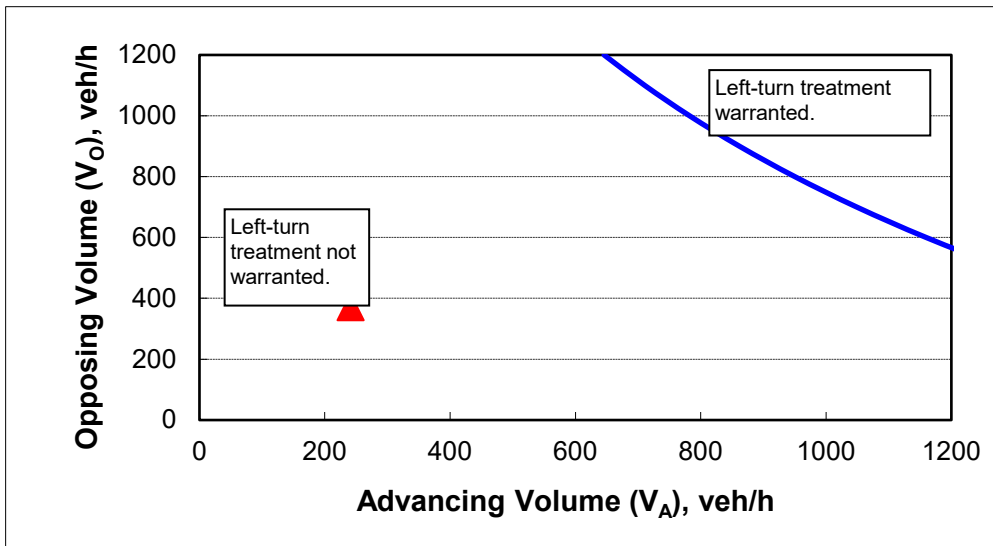
### 2-lane roadway (English)

#### INPUT

Variable	Value
85 <sup>th</sup> percentile speed, mph:	25
Percent of left-turns in advancing volume ( $V_A$ ), %:	1%
Advancing volume ( $V_A$ ), veh/h:	241
Opposing volume ( $V_O$ ), veh/h:	371

#### OUTPUT

Variable	Value
Limiting advancing volume ( $V_A$ ), veh/h:	1471
<b>Guidance for determining the need for a major-road left-turn bay:</b>	
<b>Left-turn treatment NOT warranted.</b>	



#### CALIBRATION CONSTANTS

Variable	Value
Average time for making left-turn, s:	3.0
Critical headway, s:	5.0
Average time for left-turn vehicle to clear the advancing lane, s:	1.9

## Left-Turn Lane Warrant Analysis



Project: Haworth Avenue Apartments  
 Intersection: 2. Site Access at Haworth Avenue  
 Date: 5/12/2022  
 Scenario: 2029 Future Conditions - PM Peak Hour (WB)

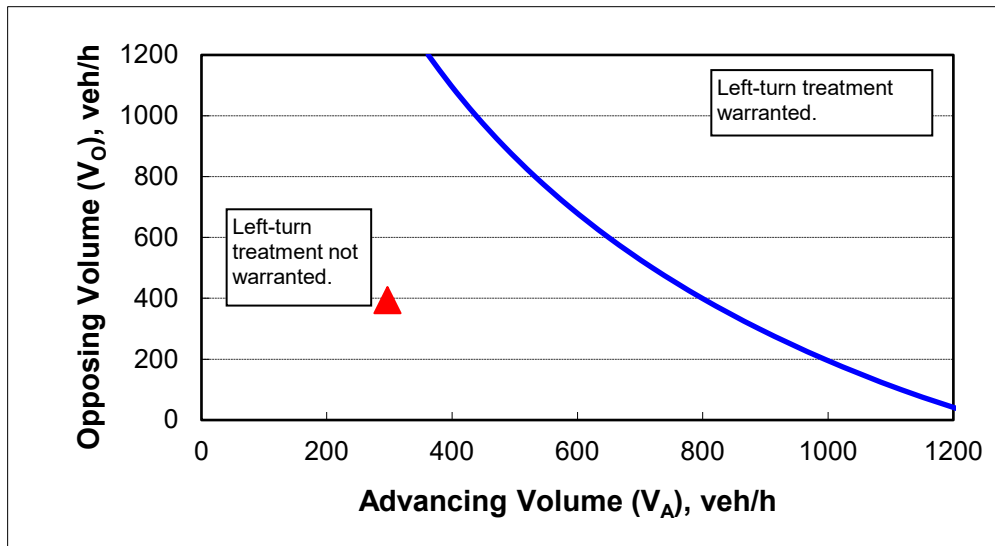
### 2-lane roadway (English)

#### INPUT

Variable	Value
85 <sup>th</sup> percentile speed, mph:	25
Percent of left-turns in advancing volume ( $V_A$ ), %:	3%
Advancing volume ( $V_A$ ), veh/h:	297
Opposing volume ( $V_O$ ), veh/h:	394

#### OUTPUT

Variable	Value
Limiting advancing volume ( $V_A$ ), veh/h:	804
<b>Guidance for determining the need for a major-road left-turn bay:</b>	
<b>Left-turn treatment NOT warranted.</b>	



#### CALIBRATION CONSTANTS

Variable	Value
Average time for making left-turn, s:	3.0
Critical headway, s:	5.0
Average time for left-turn vehicle to clear the advancing lane, s:	1.9

# Traffic Signal Warrant Analysis



Project: Haworth Avenue Apartments  
 Date: 5/12/2022  
 Scenario: 2029 Future Conditions

Major Street:	Haworth Avenue	Minor Street:	N Deborah Road
Number of Lanes:	1	Number of Lanes:	1
PM Peak Hour Volumes:	564	PM Peak Hour Volumes:	182

Warrant Used:  
    X     100 percent of standard warrants used  
           70 percent of standard warrants used due to 85th percentile speed in excess of 40 mph or isolated community with population less than 10,000.

Number of Lanes for Moving Traffic on Each Approach:		ADT on Major St. (total of both approaches)	ADT on Minor St. (higher-volume approach)		
Major St.	Minor St.	100% Warrants	70% Warrants	100% Warrants	70% Warrants
<b>WARRANT 1, CONDITION A</b>					
1	1	8,850	6,200	2,650	1,850
2 or more	1	10,600	7,400	2,650	1,850
2 or more	2 or more	10,600	7,400	3,550	2,500
1	2 or more	8,850	6,200	3,550	2,500
<b>WARRANT 1, CONDITION B</b>					
1	1	13,300	9,300	1,350	950
2 or more	1	15,900	11,100	1,350	950
2 or more	2 or more	15,900	11,100	1,750	1,250
1	2 or more	13,300	9,300	1,750	1,250

Note: ADT volumes assume 8th highest hour is 5.6% of the daily volume

	Approach Volumes	Minimum Volumes	Is Signal Warrant Met?
<i>Warrant 1</i>			
<i>Condition A: Minimum Vehicular Volume</i>			
Major Street	5,640	8,850	
Minor Street*	1,820	2,650	<b>No</b>
<i>Condition B: Interruption of Continuous Traffic</i>			
Major Street	5,640	13,300	
Minor Street*	1,820	1,350	<b>No</b>
<i>Combination Warrant</i>			
Major Street	5,640	10,640	
Minor Street*	1,820	2,120	<b>No</b>

\* Minor street right-turning traffic volumes reduced by 25%

# Traffic Signal Warrant Analysis



Project: Haworth Avenue Apartments  
 Date: 5/12/2022  
 Scenario: 2029 Future Conditions

Major Street:	Haworth Avenue	Minor Street:	Site Access
Number of Lanes:	1	Number of Lanes:	1
PM Peak Hour Volumes:	691	PM Peak Hour Volumes:	7

Warrant Used:  
    X     100 percent of standard warrants used  
           70 percent of standard warrants used due to 85th percentile speed in excess of 40 mph or isolated community with population less than 10,000.

Number of Lanes for Moving Traffic on Each Approach:		ADT on Major St. (total of both approaches)	ADT on Minor St. (higher-volume approach)		
Major St.	Minor St.	100% Warrants	70% Warrants	100% Warrants	70% Warrants
<b>WARRANT 1, CONDITION A</b>					
1	1	8,850	6,200	2,650	1,850
2 or more	1	10,600	7,400	2,650	1,850
2 or more	2 or more	10,600	7,400	3,550	2,500
1	2 or more	8,850	6,200	3,550	2,500
<b>WARRANT 1, CONDITION B</b>					
1	1	13,300	9,300	1,350	950
2 or more	1	15,900	11,100	1,350	950
2 or more	2 or more	15,900	11,100	1,750	1,250
1	2 or more	13,300	9,300	1,750	1,250

Note: ADT volumes assume 8th highest hour is 5.6% of the daily volume

	Approach Volumes	Minimum Volumes	Is Signal Warrant Met?
<i>Warrant 1</i>			
<i>Condition A: Minimum Vehicular Volume</i>			
Major Street	6,910	8,850	
Minor Street*	70	2,650	<b>No</b>
<i>Condition B: Interruption of Continuous Traffic</i>			
Major Street	6,910	13,300	
Minor Street*	70	1,350	<b>No</b>
<i>Combination Warrant</i>			
Major Street	6,910	10,640	
Minor Street*	70	2,120	<b>No</b>

\* Minor street right-turning traffic volumes reduced by 25%

# Traffic Signal Warrant Analysis



Project: Haworth Avenue Apartments  
 Date: 5/12/2022  
 Scenario: 2029 Future Conditions

Major Street:	N Springbrook Road	Minor Street:	Haworth Avenue
Number of Lanes:	2	Number of Lanes:	2
PM Peak Hour Volumes:	1056	PM Peak Hour Volumes:	343

Warrant Used:  
    X     100 percent of standard warrants used  
           70 percent of standard warrants used due to 85th percentile speed in excess of 40 mph or isolated community with population less than 10,000.

Number of Lanes for Moving Traffic on Each Approach:		ADT on Major St. (total of both approaches)		ADT on Minor St. (higher-volume approach)	
Major St.	Minor St.	100% Warrants	70% Warrants	100% Warrants	70% Warrants
<b>WARRANT 1, CONDITION A</b>					
1	1	8,850	6,200	2,650	1,850
2 or more	1	10,600	7,400	2,650	1,850
2 or more	2 or more	10,600	7,400	3,550	2,500
1	2 or more	8,850	6,200	3,550	2,500
<b>WARRANT 1, CONDITION B</b>					
1	1	13,300	9,300	1,350	950
2 or more	1	15,900	11,100	1,350	950
2 or more	2 or more	15,900	11,100	1,750	1,250
1	2 or more	13,300	9,300	1,750	1,250

Note: ADT volumes assume 8th highest hour is 5.6% of the daily volume

	Approach Volumes	Minimum Volumes	Is Signal Warrant Met?
<i>Warrant 1</i>			
<i>Condition A: Minimum Vehicular Volume</i>			
Major Street	10,560	10,600	
Minor Street*	3,430	3,550	<b>No</b>
<i>Condition B: Interruption of Continuous Traffic</i>			
Major Street	10,560	15,900	
Minor Street*	3,430	1,750	<b>No</b>
<i>Combination Warrant</i>			
Major Street	10,560	12,720	
Minor Street*	3,430	2,840	<b>No</b>

\* Minor street right-turning traffic volumes reduced by 25%

## Appendix F

Level of Service Descriptions

Capacity Reports

Queuing Reports







## Level of Service Definitions

Level of service is used to describe the quality of traffic flow. Levels of service A to C are considered good, and rural roads are usually designed for level of service C. Urban streets and signalized intersections are typically designed for level of service D. Level of service E is considered to be the limit of acceptable delay. For unsignalized intersections, level of service E is generally considered acceptable. Here is a more complete description of levels of service:

- *Level of service A:* Very low delay at intersections, with all traffic signal cycles clearing and no vehicles waiting through more than one signal cycle. On highways, low volume and high speeds, with speeds not restricted by other vehicles.
- *Level of service B:* Operating speeds beginning to be affected by other traffic; short traffic delays at intersections. Higher average intersection delay than for level of service A resulting from more vehicles stopping.
- *Level of service C:* Operating speeds and maneuverability closely controlled by other traffic; higher delays at intersections than for level of service B due to a significant number of vehicles stopping. Not all signal cycles clear the waiting vehicles. This is the recommended design standard for rural highways.
- *Level of service D:* Tolerable operating speeds; long traffic delays occur at intersections. The influence of congestion is noticeable. At traffic signals many vehicles stop, and the proportion of vehicles not stopping declines. The number of signal cycle failures, for which vehicles must wait through more than one signal cycle, are noticeable. This is typically the design level for urban signalized intersections.
- *Level of service E:* Restricted speeds, very long traffic delays at traffic signals, and traffic volumes near capacity. Flow is unstable so that any interruption, no matter how minor, will cause queues to form and service to deteriorate to level of service F. Traffic signal cycle failures are frequent occurrences. For unsignalized intersections, level of service E or better is generally considered acceptable.
- *Level of service F:* Extreme delays, resulting in long queues which may interfere with other traffic movements. There may be stoppages of long duration, and speeds may drop to zero. There may be frequent signal cycle failures. Level of service F will typically result when vehicle arrival rates are greater than capacity. It is considered unacceptable by most drivers.



Level of Service Criteria  
For Signalized Intersections

Level of Service (LOS)	Control Delay per Vehicle (Seconds)
A	<10
B	10-20
C	20-35
D	35-55
E	55-80
F	>80

Level of Service Criteria  
For Unsignalized Intersections

Level of Service (LOS)	Control Delay per Vehicle (Seconds)
A	<10
B	10-15
C	15-25
D	25-35
E	35-50
F	>50

HCM 6th AWSC  
1: N Deborah Road & Haworth Avenue

05/03/2022

Intersection	
Intersection Delay, s/veh	12.4
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	89	130	8	14	99	65	7	99	21	119	60	75
Future Vol, veh/h	89	130	8	14	99	65	7	99	21	119	60	75
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Heavy Vehicles, %	3	3	3	2	2	2	8	8	8	7	7	7
Mvmt Flow	106	155	10	17	118	77	8	118	25	142	71	89
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	12.9	11.2	10.9	13.5
HCM LOS	B	B	B	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	6%	39%	8%	47%
Vol Thru, %	78%	57%	56%	24%
Vol Right, %	17%	4%	37%	30%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	127	227	178	254
LT Vol	7	89	14	119
Through Vol	99	130	99	60
RT Vol	21	8	65	75
Lane Flow Rate	151	270	212	302
Geometry Grp	1	1	1	1
Degree of Util (X)	0.246	0.426	0.325	0.468
Departure Headway (Hd)	5.863	5.679	5.519	5.573
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	609	632	648	644
Service Time	3.93	3.738	3.582	3.631
HCM Lane V/C Ratio	0.248	0.427	0.327	0.469
HCM Control Delay	10.9	12.9	11.2	13.5
HCM Lane LOS	B	B	B	B
HCM 95th-tile Q	1	2.1	1.4	2.5

HCM 6th AWSC  
3: N Springbrook Road & Haworth Avenue

05/03/2022

Intersection

Intersection Delay, s/veh 19.9

Intersection LOS C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕	↗		↕		↗	↘		↗	↘	
Traffic Vol, veh/h	62	25	227	34	15	10	88	271	6	24	318	85
Future Vol, veh/h	62	25	227	34	15	10	88	271	6	24	318	85
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Heavy Vehicles, %	2	2	2	2	2	2	7	7	7	6	6	6
Mvmt Flow	67	27	244	37	16	11	95	291	6	26	342	91
Number of Lanes	0	1	1	0	1	0	1	1	0	1	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	2	2	2
Conflicting Approach Left SB		NB	EB	WB
Conflicting Lanes Left	2	2	2	1
Conflicting Approach Right NB		SB	WB	EB
Conflicting Lanes Right	2	2	1	2
HCM Control Delay	13.8	12.4	16.4	28.4
HCM LOS	B	B	C	D

Lane	NBLn1	NBLn2	EBLn1	EBLn2	WBLn1	SBLn1	SBLn2
Vol Left, %	100%	0%	71%	0%	58%	100%	0%
Vol Thru, %	0%	98%	29%	0%	25%	0%	79%
Vol Right, %	0%	2%	0%	100%	17%	0%	21%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	88	277	87	227	59	24	403
LT Vol	88	0	62	0	34	24	0
Through Vol	0	271	25	0	15	0	318
RT Vol	0	6	0	227	10	0	85
Lane Flow Rate	95	298	94	244	63	26	433
Geometry Grp	7	7	7	7	6	7	7
Degree of Util (X)	0.192	0.561	0.198	0.442	0.142	0.052	0.789
Departure Headway (Hd)	7.305	6.779	7.605	6.525	8.046	7.214	6.553
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	491	533	472	552	445	499	555
Service Time	5.048	4.521	5.35	4.27	6.111	4.914	4.253
HCM Lane V/C Ratio	0.193	0.559	0.199	0.442	0.142	0.052	0.78
HCM Control Delay	11.8	17.9	12.2	14.4	12.4	10.3	29.5
HCM Lane LOS	B	C	B	B	B	B	D
HCM 95th-tile Q	0.7	3.4	0.7	2.2	0.5	0.2	7.4

# HCM 6th Signalized Intersection Summary

## 4: N Springbrook Road & OR-99W

05/03/2022



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↙	↑↑	↗	↙↗	↑↑	↗	↙↗	↑	↗	↙↗	↑	↗
Traffic Volume (veh/h)	54	1098	70	240	633	168	147	157	364	340	116	74
Future Volume (veh/h)	54	1098	70	240	633	168	147	157	364	340	116	74
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.99	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
Work Zone On Approach		No		No		No		No		No		No
Adj Sat Flow, veh/h/ln	1695	1695	1695	1614	1614	1614	1668	1668	1668	1695	1695	1695
Adj Flow Rate, veh/h	59	1193	0	261	688	0	160	171	341	370	126	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	4	4	4	10	10	10	6	6	6	4	4	4
Cap, veh/h	74	1361		330	1495		220	285	396	437	406	344
Arrive On Green	0.05	0.42	0.00	0.11	0.49	0.00	0.07	0.17	0.17	0.14	0.24	0.00
Sat Flow, veh/h	1615	3221	1437	2981	3066	1367	3082	1668	1404	3132	1695	1437
Grp Volume(v), veh/h	59	1193	0	261	688	0	160	171	341	370	126	0
Grp Sat Flow(s),veh/h/ln	1615	1611	1437	1491	1533	1367	1541	1668	1404	1566	1695	1437
Q Serve(g_s), s	3.7	34.8	0.0	8.7	15.2	0.0	5.2	9.7	17.5	11.8	6.3	0.0
Cycle Q Clear(g_c), s	3.7	34.8	0.0	8.7	15.2	0.0	5.2	9.7	17.5	11.8	6.3	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	74	1361		330	1495		220	285	396	437	406	344
V/C Ratio(X)	0.80	0.88		0.79	0.46		0.73	0.60	0.86	0.85	0.31	0.00
Avail Cap(c_a), veh/h	166	1542		585	1755		346	285	396	532	406	344
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	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	48.4	27.1	0.0	44.4	17.3	0.0	46.6	39.2	34.9	43.0	32.0	0.0
Incr Delay (d2), s/veh	17.8	5.5	0.0	4.3	0.2	0.0	4.6	3.5	17.2	10.3	0.4	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	1.8	13.7	0.0	3.4	5.1	0.0	2.1	4.2	9.7	5.2	2.6	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	66.2	32.6	0.0	48.6	17.6	0.0	51.1	42.7	52.1	53.3	32.4	0.0
LnGrp LOS	E	C		D	B		D	D	D	D	C	A
Approach Vol, veh/h		1252	A		949	A		672			496	
Approach Delay, s/veh		34.2			26.1			49.4			48.0	
Approach LOS		C			C			D			D	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	18.3	21.5	15.3	47.3	11.3	28.5	8.7	53.9				
Change Period (Y+Rc), s	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0				
Max Green Setting (Gmax), s	17.5	17.5	20.1	49.0	11.5	23.4	10.5	58.6				
Max Q Clear Time (g_c+1/3), s	19.5	19.5	10.7	36.8	7.2	8.3	5.7	17.2				
Green Ext Time (p_c), s	0.5	0.0	0.6	6.5	0.2	0.5	0.0	5.3				

### Intersection Summary

HCM 6th Ctrl Delay	37.0
HCM 6th LOS	D

### Notes

User approved pedestrian interval to be less than phase max green.  
 Unsignalized Delay for [EBR, WBR] is excluded from calculations of the approach delay and intersection delay.

HCM 6th AWSC  
1: N Deborah Road & Haworth Avenue

05/03/2022

Intersection	
Intersection Delay, s/veh	11
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	40	191	20	20	172	31	13	26	27	66	51	49
Future Vol, veh/h	40	191	20	20	172	31	13	26	27	66	51	49
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Heavy Vehicles, %	1	1	1	2	2	2	6	6	6	5	5	5
Mvmt Flow	47	225	24	24	202	36	15	31	32	78	60	58
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	11.6	11	9.4	10.8
HCM LOS	B	B	A	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	20%	16%	9%	40%
Vol Thru, %	39%	76%	77%	31%
Vol Right, %	41%	8%	14%	30%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	66	251	223	166
LT Vol	13	40	20	66
Through Vol	26	191	172	51
RT Vol	27	20	31	49
Lane Flow Rate	78	295	262	195
Geometry Grp	1	1	1	1
Degree of Util (X)	0.12	0.416	0.369	0.295
Departure Headway (Hd)	5.574	5.077	5.064	5.442
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	642	715	711	660
Service Time	3.617	3.077	3.093	3.479
HCM Lane V/C Ratio	0.121	0.413	0.368	0.295
HCM Control Delay	9.4	11.6	11	10.8
HCM Lane LOS	A	B	B	B
HCM 95th-tile Q	0.4	2.1	1.7	1.2

HCM 6th AWSC  
 3: N Springbrook Road & Haworth Avenue

05/03/2022

Intersection

Intersection Delay, s/veh 26.6

Intersection LOS D

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔	↔		↔		↔	↔		↔	↔	
Traffic Vol, veh/h	87	63	182	95	62	58	139	307	20	43	328	42
Future Vol, veh/h	87	63	182	95	62	58	139	307	20	43	328	42
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles, %	1	1	1	1	1	1	2	2	2	1	1	1
Mvmt Flow	92	66	192	100	65	61	146	323	21	45	345	44
Number of Lanes	0	1	1	0	1	0	1	1	0	1	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	2	2	2
Conflicting Approach Left SB		NB	EB	WB
Conflicting Lanes Left	2	2	2	1
Conflicting Approach Right NB		SB	WB	EB
Conflicting Lanes Right	2	2	1	2
HCM Control Delay	16.2	21.7	26.3	38
HCM LOS	C	C	D	E

Lane	NBLn1	NBLn2	EBLn1	EBLn2	WBLn1	SBLn1	SBLn2
Vol Left, %	100%	0%	58%	0%	44%	100%	0%
Vol Thru, %	0%	94%	42%	0%	29%	0%	89%
Vol Right, %	0%	6%	0%	100%	27%	0%	11%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	139	327	150	182	215	43	370
LT Vol	139	0	87	0	95	43	0
Through Vol	0	307	63	0	62	0	328
RT Vol	0	20	0	182	58	0	42
Lane Flow Rate	146	344	158	192	226	45	389
Geometry Grp	7	7	7	7	6	7	7
Degree of Util (X)	0.342	0.752	0.382	0.409	0.545	0.106	0.848
Departure Headway (Hd)	8.425	7.864	8.716	7.691	8.675	8.436	7.837
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	427	461	414	467	416	425	463
Service Time	6.174	5.612	6.466	5.441	6.73	6.183	5.584
HCM Lane V/C Ratio	0.342	0.746	0.382	0.411	0.543	0.106	0.84
HCM Control Delay	15.5	30.9	16.8	15.7	21.7	12.2	41
HCM Lane LOS	C	D	C	C	C	B	E
HCM 95th-tile Q	1.5	6.3	1.8	2	3.2	0.4	8.5

# HCM 6th Signalized Intersection Summary

## 4: N Springbrook Road & OR-99W

05/03/2022



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	100	900	122	529	1367	226	266	178	284	290	171	96
Future Volume (veh/h)	100	900	122	529	1367	226	266	178	284	290	171	96
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.99	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No		No		No		No		No		No
Adj Sat Flow, veh/h/ln	1709	1709	1709	1709	1709	1709	1709	1709	1709	1723	1723	1723
Adj Flow Rate, veh/h	104	938	0	551	1424	0	277	185	270	302	178	3
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	2	2	2
Cap, veh/h	127	1206		622	1592		337	290	529	364	305	256
Arrive On Green	0.08	0.37	0.00	0.20	0.49	0.00	0.11	0.17	0.17	0.11	0.18	0.18
Sat Flow, veh/h	1628	3247	1448	3158	3247	1448	3158	1709	1436	3183	1723	1448
Grp Volume(v), veh/h	104	938	0	551	1424	0	277	185	270	302	178	3
Grp Sat Flow(s),veh/h/ln	1628	1624	1448	1579	1624	1448	1579	1709	1436	1591	1723	1448
Q Serve(g_s), s	6.8	27.6	0.0	18.4	43.1	0.0	9.3	10.9	15.9	10.1	10.3	0.2
Cycle Q Clear(g_c), s	6.8	27.6	0.0	18.4	43.1	0.0	9.3	10.9	15.9	10.1	10.3	0.2
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	127	1206		622	1592		337	290	529	364	305	256
V/C Ratio(X)	0.82	0.78		0.89	0.89		0.82	0.64	0.51	0.83	0.58	0.01
Avail Cap(c_a), veh/h	165	1320		729	1740		408	316	550	441	334	281
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	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	49.1	30.1	0.0	42.3	25.0	0.0	47.3	41.9	26.8	46.9	40.9	36.7
Incr Delay (d2), s/veh	21.0	2.8	0.0	11.3	6.1	0.0	10.8	3.8	0.8	10.7	2.2	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	8.5	10.9	0.0	8.0	16.8	0.0	4.1	4.8	5.4	4.5	4.6	0.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	70.2	32.8	0.0	53.6	31.1	0.0	58.1	45.6	27.5	57.7	43.1	36.8
LnGrp LOS	E	C		D	C		E	D	C	E	D	D
Approach Vol, veh/h		1042	A		1975	A		732			483	
Approach Delay, s/veh		36.6			37.4			43.7			52.2	
Approach LOS		D			D			D			D	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	16.4	22.3	25.3	44.2	15.6	23.2	12.5	57.1				
Change Period (Y+Rc), s	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0				
Max Green Setting (Gmax), s	15.0	20.0	25.0	44.0	14.0	21.0	11.0	58.0				
Max Q Clear Time (g_c+1/2), s	11.0	17.9	20.4	29.6	11.3	12.3	8.8	45.1				
Green Ext Time (p_c), s	0.3	0.5	0.9	5.5	0.3	0.6	0.0	8.0				

### Intersection Summary

HCM 6th Ctrl Delay	40.0
HCM 6th LOS	D

### Notes

Unsignalized Delay for [EBR, WBR] is excluded from calculations of the approach delay and intersection delay.



Intersection	
Intersection Delay, s/veh	13.6
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	93	140	8	15	117	77	7	103	22	128	62	78
Future Vol, veh/h	93	140	8	15	117	77	7	103	22	128	62	78
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Heavy Vehicles, %	3	3	3	2	2	2	8	8	8	7	7	7
Mvmt Flow	111	167	10	18	139	92	8	123	26	152	74	93
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	14.1	12.5	11.5	14.9
HCM LOS	B	B	B	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	5%	39%	7%	48%
Vol Thru, %	78%	58%	56%	23%
Vol Right, %	17%	3%	37%	29%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	132	241	209	268
LT Vol	7	93	15	128
Through Vol	103	140	117	62
RT Vol	22	8	77	78
Lane Flow Rate	157	287	249	319
Geometry Grp	1	1	1	1
Degree of Util (X)	0.267	0.468	0.393	0.513
Departure Headway (Hd)	6.123	5.876	5.685	5.793
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	581	608	627	619
Service Time	4.219	3.957	3.769	3.871
HCM Lane V/C Ratio	0.27	0.472	0.397	0.515
HCM Control Delay	11.5	14.1	12.5	14.9
HCM Lane LOS	B	B	B	B
HCM 95th-tile Q	1.1	2.5	1.9	2.9

HCM 6th AWSC  
3: N Springbrook Road & Haworth Avenue

05/03/2022

Intersection

Intersection Delay, s/veh25.7

Intersection LOS D

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕	↕		↕		↕	↕		↕	↕	
Traffic Vol, veh/h	69	26	241	35	16	11	108	295	6	27	344	95
Future Vol, veh/h	69	26	241	35	16	11	108	295	6	27	344	95
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Heavy Vehicles, %	2	2	2	2	2	2	7	7	7	6	6	6
Mvmt Flow	74	28	259	38	17	12	116	317	6	29	370	102
Number of Lanes	0	1	1	0	1	0	1	1	0	1	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	2	2	2
Conflicting Approach Left SB		NB	EB	WB
Conflicting Lanes Left	2	2	2	1
Conflicting Approach Right NB		SB	WB	EB
Conflicting Lanes Right	2	2	1	2
HCM Control Delay	15.2	13.2	19.1	40.7
HCM LOS	C	B	C	E

Lane	NBLn1	NBLn2	EBLn1	EBLn2	WBLn1	SBLn1	SBLn2
Vol Left, %	100%	0%	73%	0%	56%	100%	0%
Vol Thru, %	0%	98%	27%	0%	26%	0%	78%
Vol Right, %	0%	2%	0%	100%	18%	0%	22%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	108	301	95	241	62	27	439
LT Vol	108	0	69	0	35	27	0
Through Vol	0	295	26	0	16	0	344
RT Vol	0	6	0	241	11	0	95
Lane Flow Rate	116	324	102	259	67	29	472
Geometry Grp	7	7	7	7	6	7	7
Degree of Util (X)	0.245	0.634	0.225	0.492	0.158	0.06	0.889
Departure Headway (Hd)	7.582	7.055	7.924	6.834	8.511	7.446	6.779
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	474	511	453	526	420	481	533
Service Time	5.335	4.807	5.674	4.583	6.589	5.194	4.527
HCM Lane V/C Ratio	0.245	0.634	0.225	0.492	0.16	0.06	0.886
HCM Control Delay	12.8	21.3	13	16.1	13.2	10.7	42.5
HCM Lane LOS	B	C	B	C	B	B	E
HCM 95th-tile Q	1	4.4	0.9	2.7	0.6	0.2	10.1

HCM 6th Signalized Intersection Summary  
 4: N Springbrook Road & OR-99W

05/03/2022



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	59	1109	73	258	665	193	153	171	382	363	128	79
Future Volume (veh/h)	59	1109	73	258	665	193	153	171	382	363	128	79
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.99	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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1695	1695	1695	1614	1614	1614	1668	1668	1668	1695	1695	1695
Adj Flow Rate, veh/h	64	1205	0	280	723	0	166	186	361	395	139	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	4	4	4	10	10	10	6	6	6	4	4	4
Cap, veh/h	80	1344		348	1485		225	283	403	455	411	348
Arrive On Green	0.05	0.42	0.00	0.12	0.48	0.00	0.07	0.17	0.17	0.15	0.24	0.00
Sat Flow, veh/h	1615	3221	1437	2981	3066	1367	3082	1668	1404	3132	1695	1437
Grp Volume(v), veh/h	64	1205	0	280	723	0	166	186	361	395	139	0
Grp Sat Flow(s),veh/h/ln	1615	1611	1437	1491	1533	1367	1541	1668	1404	1566	1695	1437
Q Serve(g_s), s	4.2	36.9	0.0	9.7	16.9	0.0	5.6	11.0	18.0	13.1	7.2	0.0
Cycle Q Clear(g_c), s	4.2	36.9	0.0	9.7	16.9	0.0	5.6	11.0	18.0	13.1	7.2	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	80	1344		348	1485		225	283	403	455	411	348
V/C Ratio(X)	0.80	0.90		0.81	0.49		0.74	0.66	0.90	0.87	0.34	0.00
Avail Cap(c_a), veh/h	165	1460		591	1684		352	283	403	503	411	348
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	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	49.8	28.7	0.0	45.6	18.4	0.0	48.1	41.1	36.3	44.3	33.1	0.0
Incr Delay (d2), s/veh	16.4	7.3	0.0	4.4	0.2	0.0	4.7	5.4	21.8	14.0	0.5	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.0	14.9	0.0	3.7	5.8	0.0	2.3	4.9	11.1	6.0	3.0	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	66.2	36.0	0.0	50.0	18.7	0.0	52.8	46.5	58.1	58.3	33.6	0.0
LnGrp LOS	E	D		D	B		D	D	E	E	C	A
Approach Vol, veh/h		1269	A		1003	A		713			534	
Approach Delay, s/veh		37.5			27.4			53.8			51.9	
Approach LOS		D			C			D			D	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	19.4	22.0	16.4	48.2	11.7	29.7	9.3	55.3				
Change Period (Y+Rc), s	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0				
Max Green Setting (Gmax), s	18.0	21.0	48.0	12.1	22.9	10.8	58.2					
Max Q Clear Time (g_c+1/3), s	20.0	11.7	38.9	7.6	9.2	6.2	18.9					
Green Ext Time (p_c), s	0.3	0.0	0.7	5.3	0.2	0.6	5.7					

Intersection Summary

HCM 6th Ctrl Delay	40.1
HCM 6th LOS	D

Notes

User approved pedestrian interval to be less than phase max green.  
 Unsignalized Delay for [EBR, WBR] is excluded from calculations of the approach delay and intersection delay.

# HCM 6th Signalized Intersection Summary

## 3: N Springbrook Road & Haworth Avenue

05/03/2022



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	69	26	241	35	16	11	108	295	6	27	344	95
Future Volume (veh/h)	69	26	241	35	16	11	108	295	6	27	344	95
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.98		0.98	0.99		0.98	0.99		0.99	0.99		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1796	1796	1796	1811	1811	1811
Adj Flow Rate, veh/h	74	28	86	38	17	4	116	317	5	29	370	86
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	2	2	2	2	2	2	7	7	7	6	6	6
Cap, veh/h	438	60	186	248	86	12	499	756	12	574	521	121
Arrive On Green	0.15	0.15	0.15	0.15	0.15	0.15	0.10	0.43	0.43	0.04	0.37	0.37
Sat Flow, veh/h	1370	398	1223	525	569	80	1711	1763	28	1725	1417	329
Grp Volume(v), veh/h	74	0	114	59	0	0	116	0	322	29	0	456
Grp Sat Flow(s),veh/h/ln	1370	0	1621	1173	0	0	1711	0	1791	1725	0	1746
Q Serve(g_s), s	0.0	0.0	2.3	0.1	0.0	0.0	1.4	0.0	4.4	0.4	0.0	7.9
Cycle Q Clear(g_c), s	1.3	0.0	2.3	2.3	0.0	0.0	1.4	0.0	4.4	0.4	0.0	7.9
Prop In Lane	1.00		0.75	0.64		0.07	1.00		0.02	1.00		0.19
Lane Grp Cap(c), veh/h	438	0	246	346	0	0	499	0	768	574	0	642
V/C Ratio(X)	0.17	0.00	0.46	0.17	0.00	0.00	0.23	0.00	0.42	0.05	0.00	0.71
Avail Cap(c_a), veh/h	936	0	835	859	0	0	602	0	1187	764	0	1138
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	13.2	0.0	13.6	13.1	0.0	0.0	6.4	0.0	7.0	6.4	0.0	9.5
Incr Delay (d2), s/veh	0.2	0.0	1.4	0.2	0.0	0.0	0.2	0.0	0.4	0.0	0.0	1.5
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	0.5	0.0	0.8	0.4	0.0	0.0	0.3	0.0	1.2	0.1	0.0	2.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	13.4	0.0	15.0	13.3	0.0	0.0	6.7	0.0	7.3	6.5	0.0	11.0
LnGrp LOS	B	A	B	B	A	A	A	A	A	A	A	B
Approach Vol, veh/h		188			59			438				485
Approach Delay, s/veh		14.3			13.3			7.2				10.7
Approach LOS		B			B			A				B
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	5.7	19.6		9.8	7.9	17.4		9.8				
Change Period (Y+Rc), s	4.5	4.5		4.5	4.5	4.5		4.5				
Max Green Setting (Gmax), s	5.1	23.3		18.1	5.5	22.9		18.1				
Max Q Clear Time (g_c+I1), s	2.4	6.4		4.3	3.4	9.9		4.3				
Green Ext Time (p_c), s	0.0	1.8		0.7	0.1	2.5		0.2				
<b>Intersection Summary</b>												
HCM 6th Ctrl Delay				10.1								
HCM 6th LOS				B								

Intersection	
Intersection Delay, s/veh	11.7
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	42	206	21	21	184	37	14	27	28	74	53	51
Future Vol, veh/h	42	206	21	21	184	37	14	27	28	74	53	51
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Heavy Vehicles, %	1	1	1	2	2	2	6	6	6	5	5	5
Mvmt Flow	49	242	25	25	216	44	16	32	33	87	62	60
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	12.5	11.8	9.7	11.3
HCM LOS	B	B	A	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	20%	16%	9%	42%
Vol Thru, %	39%	77%	76%	30%
Vol Right, %	41%	8%	15%	29%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	69	269	242	178
LT Vol	14	42	21	74
Through Vol	27	206	184	53
RT Vol	28	21	37	51
Lane Flow Rate	81	316	285	209
Geometry Grp	1	1	1	1
Degree of Util (X)	0.13	0.454	0.409	0.326
Departure Headway (Hd)	5.763	5.169	5.174	5.599
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	620	696	695	641
Service Time	3.813	3.204	3.21	3.64
HCM Lane V/C Ratio	0.131	0.454	0.41	0.326
HCM Control Delay	9.7	12.5	11.8	11.3
HCM Lane LOS	A	B	B	B
HCM 95th-tile Q	0.4	2.4	2	1.4

HCM 6th AWSC  
 3: N Springbrook Road & Haworth Avenue

05/03/2022

Intersection

Intersection Delay, s/veh 37.6

Intersection LOS E

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕	↗		↕		↗	↘		↗	↘	
Traffic Vol, veh/h	96	66	196	99	65	62	150	330	21	47	356	49
Future Vol, veh/h	96	66	196	99	65	62	150	330	21	47	356	49
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles, %	1	1	1	1	1	1	2	2	2	1	1	1
Mvmt Flow	101	69	206	104	68	65	158	347	22	49	375	52
Number of Lanes	0	1	1	0	1	0	1	1	0	1	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	2	2	2
Conflicting Approach Left SB		NB	EB	WB
Conflicting Lanes Left	2	2	2	1
Conflicting Approach Right NB		SB	WB	EB
Conflicting Lanes Right	2	2	1	2
HCM Control Delay	18.4	25.8	36	60.6
HCM LOS	C	D	E	F

Lane	NBLn1	NBLn2	EBLn1	EBLn2	WBLn1	SBLn1	SBLn2
Vol Left, %	100%	0%	59%	0%	44%	100%	0%
Vol Thru, %	0%	94%	41%	0%	29%	0%	88%
Vol Right, %	0%	6%	0%	100%	27%	0%	12%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	150	351	162	196	226	47	405
LT Vol	150	0	96	0	99	47	0
Through Vol	0	330	66	0	65	0	356
RT Vol	0	21	0	196	62	0	49
Lane Flow Rate	158	369	171	206	238	49	426
Geometry Grp	7	7	7	7	6	7	7
Degree of Util (X)	0.39	0.855	0.436	0.468	0.61	0.122	0.976
Departure Headway (Hd)	8.89	8.326	9.194	8.158	9.229	8.848	8.24
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	404	436	391	442	390	405	439
Service Time	6.661	6.097	6.964	5.927	7.31	6.614	6.006
HCM Lane V/C Ratio	0.391	0.846	0.437	0.466	0.61	0.121	0.97
HCM Control Delay	17.3	44	18.9	18	25.8	12.8	66.2
HCM Lane LOS	C	E	C	C	D	B	F
HCM 95th-tile Q	1.8	8.5	2.2	2.4	3.9	0.4	12

HCM 6th Signalized Intersection Summary  
 4: N Springbrook Road & OR-99W

05/03/2022



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	107	938	127	560	1387	244	277	189	313	318	181	103
Future Volume (veh/h)	107	938	127	560	1387	244	277	189	313	318	181	103
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.99	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No		No		No		No		No		No
Adj Sat Flow, veh/h/ln	1709	1709	1709	1709	1709	1709	1709	1709	1709	1723	1723	1723
Adj Flow Rate, veh/h	111	977	0	583	1445	0	289	197	300	331	189	9
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	2	2	2
Cap, veh/h	135	1184		651	1584		346	281	534	390	305	256
Arrive On Green	0.08	0.36	0.00	0.21	0.49	0.00	0.11	0.16	0.16	0.12	0.18	0.18
Sat Flow, veh/h	1628	3247	1448	3158	3247	1448	3158	1709	1435	3183	1723	1448
Grp Volume(v), veh/h	111	977	0	583	1445	0	289	197	300	331	189	9
Grp Sat Flow(s),veh/h/ln	1628	1624	1448	1579	1624	1448	1579	1709	1435	1591	1723	1448
Q Serve(g_s), s	7.5	30.6	0.0	20.1	46.0	0.0	10.1	12.2	18.4	11.4	11.4	0.6
Cycle Q Clear(g_c), s	7.5	30.6	0.0	20.1	46.0	0.0	10.1	12.2	18.4	11.4	11.4	0.6
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	135	1184		651	1584		346	281	534	390	305	256
V/C Ratio(X)	0.82	0.83		0.90	0.91		0.84	0.70	0.56	0.85	0.62	0.04
Avail Cap(c_a), veh/h	171	1258		744	1681		403	281	534	449	306	257
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	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	50.6	32.4	0.0	43.3	26.5	0.0	48.9	44.2	28.1	48.2	42.6	38.2
Incr Delay (d2), s/veh	22.0	4.4	0.0	12.4	7.7	0.0	12.5	7.6	1.3	12.9	3.8	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	8.9	12.4	0.0	8.8	18.4	0.0	4.5	5.7	6.4	5.3	5.2	0.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	72.6	36.8	0.0	55.7	34.2	0.0	61.4	51.9	29.4	61.1	46.4	38.2
LnGrp LOS	E	D		E	C		E	D	C	E	D	D
Approach Vol, veh/h		1088	A		2028	A		786			529	
Approach Delay, s/veh		40.4			40.4			46.8			55.4	
Approach LOS		D			D			D			E	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	17.7	22.4	27.1	44.9	16.3	23.8	13.3	58.7				
Change Period (Y+Rc), s	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0				
Max Green Setting (Gmax), s	15.8	18.4	26.4	43.4	14.3	19.9	11.8	58.0				
Max Q Clear Time (g_c+1/3), s	11.4	20.4	22.1	32.6	12.1	13.4	9.5	48.0				
Green Ext Time (p_c), s	0.3	0.0	1.0	4.9	0.2	0.5	0.0	6.7				

Intersection Summary

HCM 6th Ctrl Delay	43.3
HCM 6th LOS	D

Notes

Unsignalized Delay for [EBR, WBR] is excluded from calculations of the approach delay and intersection delay.

# HCM 6th Signalized Intersection Summary

## 3: N Springbrook Road & Haworth Avenue

05/03/2022



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	96	66	196	99	65	62	150	330	21	47	356	49
Future Volume (veh/h)	96	66	196	99	65	62	150	330	21	47	356	49
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.97	0.99		0.99	1.00		0.97	1.00		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1885	1885	1885	1885	1885	1885	1870	1870	1870	1885	1885	1885
Adj Flow Rate, veh/h	101	69	72	104	68	44	158	347	19	49	375	45
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	1	1	1	1	1	1	2	2	2	1	1	1
Cap, veh/h	499	197	205	254	139	66	479	644	35	493	519	62
Arrive On Green	0.24	0.24	0.24	0.24	0.24	0.24	0.10	0.37	0.37	0.05	0.32	0.32
Sat Flow, veh/h	1283	830	866	500	586	278	1781	1754	96	1795	1645	197
Grp Volume(v), veh/h	101	0	141	216	0	0	158	0	366	49	0	420
Grp Sat Flow(s),veh/h/ln	1283	0	1696	1363	0	0	1781	0	1850	1795	0	1843
Q Serve(g_s), s	0.0	0.0	2.7	3.2	0.0	0.0	2.2	0.0	6.1	0.7	0.0	7.9
Cycle Q Clear(g_c), s	2.4	0.0	2.7	6.0	0.0	0.0	2.2	0.0	6.1	0.7	0.0	7.9
Prop In Lane	1.00		0.51	0.48		0.20	1.00		0.05	1.00		0.11
Lane Grp Cap(c), veh/h	499	0	402	458	0	0	479	0	680	493	0	582
V/C Ratio(X)	0.20	0.00	0.35	0.47	0.00	0.00	0.33	0.00	0.54	0.10	0.00	0.72
Avail Cap(c_a), veh/h	798	0	797	801	0	0	541	0	1077	631	0	1054
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	12.4	0.0	12.5	13.7	0.0	0.0	8.2	0.0	9.8	8.3	0.0	11.9
Incr Delay (d2), s/veh	0.2	0.0	0.5	0.8	0.0	0.0	0.4	0.0	0.7	0.1	0.0	1.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.6	0.0	0.9	1.6	0.0	0.0	0.7	0.0	2.1	0.2	0.0	2.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	12.6	0.0	13.0	14.5	0.0	0.0	8.6	0.0	10.5	8.4	0.0	13.7
LnGrp LOS	B	A	B	B	A	A	A	A	B	A	A	B
Approach Vol, veh/h		242			216			524				469
Approach Delay, s/veh		12.8			14.5			9.9				13.1
Approach LOS		B			B			A				B
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	6.6	19.0		13.8	8.6	16.9		13.8				
Change Period (Y+Rc), s	4.5	4.5		4.5	4.5	4.5		4.5				
Max Green Setting (Gmax), s	5.1	22.9		18.5	5.5	22.5		18.5				
Max Q Clear Time (g_c+I1), s	2.7	8.1		4.7	4.2	9.9		8.0				
Green Ext Time (p_c), s	0.0	2.0		1.0	0.1	2.2		0.9				

### Intersection Summary

HCM 6th Ctrl Delay	12.1
HCM 6th LOS	B



Intersection	
Intersection Delay, s/veh	13.6
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	93	140	8	15	118	77	7	103	22	129	62	78
Future Vol, veh/h	93	140	8	15	118	77	7	103	22	129	62	78
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Heavy Vehicles, %	3	3	3	2	2	2	8	8	8	7	7	7
Mvmt Flow	111	167	10	18	140	92	8	123	26	154	74	93
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	14.1	12.5	11.5	15
HCM LOS	B	B	B	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	5%	39%	7%	48%
Vol Thru, %	78%	58%	56%	23%
Vol Right, %	17%	3%	37%	29%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	132	241	210	269
LT Vol	7	93	15	129
Through Vol	103	140	118	62
RT Vol	22	8	77	78
Lane Flow Rate	157	287	250	320
Geometry Grp	1	1	1	1
Degree of Util (X)	0.268	0.469	0.395	0.516
Departure Headway (Hd)	6.13	5.883	5.69	5.798
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	580	608	628	618
Service Time	4.229	3.968	3.779	3.879
HCM Lane V/C Ratio	0.271	0.472	0.398	0.518
HCM Control Delay	11.5	14.1	12.5	15
HCM Lane LOS	B	B	B	B
HCM 95th-tile Q	1.1	2.5	1.9	3

HCM 6th TWSC  
2: Site Access & Haworth Avenue

05/03/2022

Intersection						
Int Delay, s/veh	0.2					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	336	1	2	219	1	8
Future Vol, veh/h	336	1	2	219	1	8
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	365	1	2	238	1	9

Major/Minor	Major1	Major2	Minor1	Minor2	Minor3
Conflicting Flow All	0	0	366	0	608
Stage 1	-	-	-	-	366
Stage 2	-	-	-	-	242
Critical Hdwy	-	-	4.12	-	6.42
Critical Hdwy Stg 1	-	-	-	-	5.42
Critical Hdwy Stg 2	-	-	-	-	5.42
Follow-up Hdwy	-	-	2.218	-	3.518
Pot Cap-1 Maneuver	-	-	1193	-	459
Stage 1	-	-	-	-	702
Stage 2	-	-	-	-	798
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1193	-	458
Mov Cap-2 Maneuver	-	-	-	-	458
Stage 1	-	-	-	-	702
Stage 2	-	-	-	-	796

Approach	EB	WB	NB
HCM Control Delay, s	0	0.1	10.7
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	644	-	-	1193	-
HCM Lane V/C Ratio	0.015	-	-	0.002	-
HCM Control Delay (s)	10.7	-	-	8	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	0	-

HCM 6th AWSC  
3: N Springbrook Road & Haworth Avenue

05/03/2022

Intersection	
Intersection Delay, s/veh	26.1
Intersection LOS	D

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕	↕		↕		↕	↕		↕	↕	
Traffic Vol, veh/h	70	26	248	35	16	11	110	295	6	27	344	95
Future Vol, veh/h	70	26	248	35	16	11	110	295	6	27	344	95
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Heavy Vehicles, %	2	2	2	2	2	2	7	7	7	6	6	6
Mvmt Flow	75	28	267	38	17	12	118	317	6	29	370	102
Number of Lanes	0	1	1	0	1	0	1	1	0	1	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	2	2	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	2	2	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	2	1	2
HCM Control Delay	15.5	13.3	19.3	41.7
HCM LOS	C	B	C	E

Lane	NBLn1	NBLn2	EBLn1	EBLn2	WBLn1	SBLn1	SBLn2
Vol Left, %	100%	0%	73%	0%	56%	100%	0%
Vol Thru, %	0%	98%	27%	0%	26%	0%	78%
Vol Right, %	0%	2%	0%	100%	18%	0%	22%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	110	301	96	248	62	27	439
LT Vol	110	0	70	0	35	27	0
Through Vol	0	295	26	0	16	0	344
RT Vol	0	6	0	248	11	0	95
Lane Flow Rate	118	324	103	267	67	29	472
Geometry Grp	7	7	7	7	6	7	7
Degree of Util (X)	0.251	0.638	0.228	0.508	0.159	0.06	0.895
Departure Headway (Hd)	7.626	7.099	7.944	6.852	8.563	7.491	6.824
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	471	508	452	525	417	478	529
Service Time	5.38	4.852	5.695	4.603	6.643	5.239	4.572
HCM Lane V/C Ratio	0.251	0.638	0.228	0.509	0.161	0.061	0.892
HCM Control Delay	12.9	21.6	13	16.5	13.3	10.7	43.6
HCM Lane LOS	B	C	B	C	B	B	E
HCM 95th-tile Q	1	4.4	0.9	2.8	0.6	0.2	10.3

# HCM 6th Signalized Intersection Summary

## 4: N Springbrook Road & OR-99W

05/03/2022



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	60	1109	73	258	665	194	153	171	382	366	130	81
Future Volume (veh/h)	60	1109	73	258	665	194	153	171	382	366	130	81
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.99	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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1695	1695	1695	1614	1614	1614	1668	1668	1668	1695	1695	1695
Adj Flow Rate, veh/h	65	1205	0	280	723	0	166	186	360	398	141	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	4	4	4	10	10	10	6	6	6	4	4	4
Cap, veh/h	81	1351		349	1490		225	271	394	463	402	341
Arrive On Green	0.05	0.42	0.00	0.12	0.49	0.00	0.07	0.16	0.16	0.15	0.24	0.00
Sat Flow, veh/h	1615	3221	1437	2981	3066	1367	3082	1668	1403	3132	1695	1437
Grp Volume(v), veh/h	65	1205	0	280	723	0	166	186	360	398	141	0
Grp Sat Flow(s),veh/h/ln	1615	1611	1437	1491	1533	1367	1541	1668	1403	1566	1695	1437
Q Serve(g_s), s	4.2	36.2	0.0	9.6	16.6	0.0	5.5	11.0	17.0	13.0	7.2	0.0
Cycle Q Clear(g_c), s	4.2	36.2	0.0	9.6	16.6	0.0	5.5	11.0	17.0	13.0	7.2	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	81	1351		349	1490		225	271	394	463	402	341
V/C Ratio(X)	0.80	0.89		0.80	0.49		0.74	0.69	0.91	0.86	0.35	0.00
Avail Cap(c_a), veh/h	168	1480		599	1705		357	271	394	540	402	341
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	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	49.1	28.1	0.0	45.0	18.1	0.0	47.4	41.2	36.5	43.5	33.2	0.0
Incr Delay (d2), s/veh	16.2	6.8	0.0	4.3	0.2	0.0	4.6	7.0	25.5	11.8	0.5	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.0	14.5	0.0	3.7	5.6	0.0	2.2	5.0	11.4	5.8	3.1	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	65.3	34.9	0.0	49.3	18.3	0.0	52.1	48.2	62.0	55.3	33.7	0.0
LnGrp LOS	E	C		D	B		D	D	E	E	C	A
Approach Vol, veh/h		1270	A		1003	A		712			539	
Approach Delay, s/veh		36.5			27.0			56.1			49.7	
Approach LOS		D			C			E			D	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	19.4	21.0	16.2	47.8	11.6	28.8	9.3	54.8				
Change Period (Y+Rc), s	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0				
Max Green Setting (Gmax), s	10.0	17.0	21.0	48.0	12.1	22.9	10.9	58.1				
Max Q Clear Time (g_c+1/2g), s	11.0	19.0	11.6	38.2	7.5	9.2	6.2	18.6				
Green Ext Time (p_c), s	0.5	0.0	0.7	5.6	0.2	0.6	0.0	5.7				

### Intersection Summary

HCM 6th Ctrl Delay	39.7
HCM 6th LOS	D

### Notes

User approved pedestrian interval to be less than phase max green.  
 Unsignalized Delay for [EBR, WBR] is excluded from calculations of the approach delay and intersection delay.

# HCM 6th Signalized Intersection Summary

## 3: N Springbrook Road & Haworth Avenue

05/03/2022



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	70	26	248	35	16	11	110	295	6	27	344	95
Future Volume (veh/h)	70	26	248	35	16	11	110	295	6	27	344	95
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.98	0.99		0.98	0.99		0.99	0.99		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1796	1796	1796	1811	1811	1811
Adj Flow Rate, veh/h	75	28	89	38	17	4	118	317	5	29	370	86
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	2	2	2	2	2	2	7	7	7	6	6	6
Cap, veh/h	440	59	188	247	86	12	499	757	12	574	520	121
Arrive On Green	0.15	0.15	0.15	0.15	0.15	0.15	0.10	0.43	0.43	0.04	0.37	0.37
Sat Flow, veh/h	1370	388	1232	516	562	78	1711	1763	28	1725	1417	329
Grp Volume(v), veh/h	75	0	117	59	0	0	118	0	322	29	0	456
Grp Sat Flow(s),veh/h/ln	1370	0	1620	1156	0	0	1711	0	1791	1725	0	1746
Q Serve(g_s), s	0.0	0.0	2.3	0.1	0.0	0.0	1.4	0.0	4.4	0.4	0.0	7.9
Cycle Q Clear(g_c), s	1.3	0.0	2.3	2.4	0.0	0.0	1.4	0.0	4.4	0.4	0.0	7.9
Prop In Lane	1.00		0.76	0.64		0.07	1.00		0.02	1.00		0.19
Lane Grp Cap(c), veh/h	440	0	248	345	0	0	499	0	769	574	0	641
V/C Ratio(X)	0.17	0.00	0.47	0.17	0.00	0.00	0.24	0.00	0.42	0.05	0.00	0.71
Avail Cap(c_a), veh/h	933	0	831	852	0	0	599	0	1183	763	0	1134
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	13.2	0.0	13.6	13.1	0.0	0.0	6.5	0.0	7.0	6.5	0.0	9.6
Incr Delay (d2), s/veh	0.2	0.0	1.4	0.2	0.0	0.0	0.2	0.0	0.4	0.0	0.0	1.5
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	0.5	0.0	0.8	0.4	0.0	0.0	0.4	0.0	1.2	0.1	0.0	2.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	13.4	0.0	15.0	13.3	0.0	0.0	6.7	0.0	7.4	6.5	0.0	11.0
LnGrp LOS	B	A	B	B	A	A	A	A	A	A	A	B
Approach Vol, veh/h		192			59			440				485
Approach Delay, s/veh		14.4			13.3			7.2				10.8
Approach LOS		B			B			A				B
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	5.7	19.6		9.9	7.9	17.5		9.9				
Change Period (Y+Rc), s	4.5	4.5		4.5	4.5	4.5		4.5				
Max Green Setting (Gmax), s	5.1	23.3		18.1	5.5	22.9		18.1				
Max Q Clear Time (g_c+I1), s	2.4	6.4		4.3	3.4	9.9		4.4				
Green Ext Time (p_c), s	0.0	1.8		0.7	0.1	2.5		0.2				

### Intersection Summary

HCM 6th Ctrl Delay	10.1
HCM 6th LOS	B

HCM 6th AWSC  
1: N Deborah Road & Haworth Avenue

05/03/2022

Intersection	
Intersection Delay, s/veh	11.8
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	42	207	21	21	185	37	14	27	28	74	53	51
Future Vol, veh/h	42	207	21	21	185	37	14	27	28	74	53	51
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Heavy Vehicles, %	1	1	1	2	2	2	6	6	6	5	5	5
Mvmt Flow	49	244	25	25	218	44	16	32	33	87	62	60
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	12.5	11.8	9.7	11.4
HCM LOS	B	B	A	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	20%	16%	9%	42%
Vol Thru, %	39%	77%	76%	30%
Vol Right, %	41%	8%	15%	29%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	69	270	243	178
LT Vol	14	42	21	74
Through Vol	27	207	185	53
RT Vol	28	21	37	51
Lane Flow Rate	81	318	286	209
Geometry Grp	1	1	1	1
Degree of Util (X)	0.13	0.456	0.411	0.326
Departure Headway (Hd)	5.771	5.171	5.177	5.606
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	619	696	695	641
Service Time	3.82	3.207	3.213	3.647
HCM Lane V/C Ratio	0.131	0.457	0.412	0.326
HCM Control Delay	9.7	12.5	11.8	11.4
HCM Lane LOS	A	B	B	B
HCM 95th-tile Q	0.4	2.4	2	1.4

HCM 6th TWSC  
2: Site Access & Haworth Avenue

05/11/2022

Intersection						
Int Delay, s/veh	0.2					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	358	1	8	264	1	5
Future Vol, veh/h	358	1	8	264	1	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	389	1	9	287	1	5

Major/Minor	Major1	Major2	Minor1		
Conflicting Flow All	0	0	390	0	695 390
Stage 1	-	-	-	-	390 -
Stage 2	-	-	-	-	305 -
Critical Hdwy	-	-	4.12	-	6.42 6.22
Critical Hdwy Stg 1	-	-	-	-	5.42 -
Critical Hdwy Stg 2	-	-	-	-	5.42 -
Follow-up Hdwy	-	-	2.218	-	3.518 3.318
Pot Cap-1 Maneuver	-	-	1169	-	408 658
Stage 1	-	-	-	-	684 -
Stage 2	-	-	-	-	748 -
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1169	-	404 658
Mov Cap-2 Maneuver	-	-	-	-	404 -
Stage 1	-	-	-	-	684 -
Stage 2	-	-	-	-	741 -

Approach	EB	WB	NB
HCM Control Delay, s	0	0.2	11.1
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	596	-	-	1169	-
HCM Lane V/C Ratio	0.011	-	-	0.007	-
HCM Control Delay (s)	11.1	-	-	8.1	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	0	-

HCM 6th AWSC  
3: N Springbrook Road & Haworth Avenue

05/03/2022

Intersection	
Intersection Delay, s/veh	38.3
Intersection LOS	E

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕	↕		↕		↕	↕		↕	↕	
Traffic Vol, veh/h	97	66	200	99	65	62	157	330	21	47	356	50
Future Vol, veh/h	97	66	200	99	65	62	157	330	21	47	356	50
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles, %	1	1	1	1	1	1	2	2	2	1	1	1
Mvmt Flow	102	69	211	104	68	65	165	347	22	49	375	53
Number of Lanes	0	1	1	0	1	0	1	1	0	1	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	2	2	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	2	2	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	2	1	2
HCM Control Delay	18.7	26.1	36.3	62.4
HCM LOS	C	D	E	F

Lane	NBLn1	NBLn2	EBLn1	EBLn2	WBLn1	SBLn1	SBLn2
Vol Left, %	100%	0%	60%	0%	44%	100%	0%
Vol Thru, %	0%	94%	40%	0%	29%	0%	88%
Vol Right, %	0%	6%	0%	100%	27%	0%	12%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	157	351	163	200	226	47	406
LT Vol	157	0	97	0	99	47	0
Through Vol	0	330	66	0	65	0	356
RT Vol	0	21	0	200	62	0	50
Lane Flow Rate	165	369	172	211	238	49	427
Geometry Grp	7	7	7	7	6	7	7
Degree of Util (X)	0.41	0.858	0.44	0.479	0.613	0.122	0.983
Departure Headway (Hd)	8.925	8.362	9.224	8.186	9.275	8.889	8.28
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	403	432	389	440	388	403	436
Service Time	6.698	6.133	6.994	5.955	7.356	6.654	6.044
HCM Lane V/C Ratio	0.409	0.854	0.442	0.48	0.613	0.122	0.979
HCM Control Delay	17.8	44.6	19.1	18.3	26.1	12.9	68.1
HCM Lane LOS	C	E	C	C	D	B	F
HCM 95th-tile Q	2	8.5	2.2	2.5	3.9	0.4	12.2



# HCM 6th Signalized Intersection Summary

## 4: N Springbrook Road & OR-99W

05/03/2022



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	110	938	127	560	1387	247	277	190	313	320	182	104
Future Volume (veh/h)	110	938	127	560	1387	247	277	190	313	320	182	104
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.99	1.00		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No		No		No		No		No		No
Adj Sat Flow, veh/h/ln	1709	1709	1709	1709	1709	1709	1709	1709	1709	1723	1723	1723
Adj Flow Rate, veh/h	115	977	0	583	1445	0	289	198	300	333	190	9
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	2	2	2
Cap, veh/h	139	1193		651	1585		346	275	529	391	300	252
Arrive On Green	0.09	0.37	0.00	0.21	0.49	0.00	0.11	0.16	0.16	0.12	0.17	0.17
Sat Flow, veh/h	1628	3247	1448	3158	3247	1448	3158	1709	1435	3183	1723	1447
Grp Volume(v), veh/h	115	977	0	583	1445	0	289	198	300	333	190	9
Grp Sat Flow(s),veh/h/ln	1628	1624	1448	1579	1624	1448	1579	1709	1435	1591	1723	1447
Q Serve(g_s), s	7.8	30.5	0.0	20.1	46.0	0.0	10.0	12.3	18.0	11.5	11.5	0.6
Cycle Q Clear(g_c), s	7.8	30.5	0.0	20.1	46.0	0.0	10.0	12.3	18.0	11.5	11.5	0.6
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	139	1193		651	1585		346	275	529	391	300	252
V/C Ratio(X)	0.83	0.82		0.90	0.91		0.84	0.72	0.57	0.85	0.63	0.04
Avail Cap(c_a), veh/h	177	1270		744	1681		403	275	529	449	300	252
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	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	50.4	32.1	0.0	43.3	26.4	0.0	48.9	44.6	28.4	48.1	42.9	38.4
Incr Delay (d2), s/veh	21.7	4.2	0.0	12.4	7.7	0.0	12.5	8.9	1.4	13.1	4.3	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	4.0	12.3	0.0	8.8	18.4	0.0	4.5	5.8	6.5	5.3	5.3	0.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	72.2	36.2	0.0	55.7	34.1	0.0	61.4	53.5	29.8	61.2	47.2	38.5
LnGrp LOS	E	D		E	C		E	D	C	E	D	D
Approach Vol, veh/h		1092	A		2028	A		787			532	
Approach Delay, s/veh		40.0			40.3			47.4			55.8	
Approach LOS		D			D			D			E	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	17.8	22.0	27.1	45.1	16.3	23.5	13.6	58.7				
Change Period (Y+Rc), s	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0				
Max Green Setting (Gmax), s	15.8	18.0	26.4	43.8	14.3	19.5	12.2	58.0				
Max Q Clear Time (g_c+1/3), s	11.5	20.0	22.1	32.5	12.0	13.5	9.8	48.0				
Green Ext Time (p_c), s	0.3	0.0	1.0	5.0	0.2	0.5	0.1	6.7				

### Intersection Summary

HCM 6th Ctrl Delay	43.3
HCM 6th LOS	D

### Notes

Unsignalized Delay for [EBR, WBR] is excluded from calculations of the approach delay and intersection delay.

# HCM 6th Signalized Intersection Summary

## 3: N Springbrook Road & Haworth Avenue

05/03/2022



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	97	66	200	99	65	62	157	330	21	47	356	50
Future Volume (veh/h)	97	66	200	99	65	62	157	330	21	47	356	50
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.97	0.99		0.99	1.00		0.97	1.00		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1885	1885	1885	1885	1885	1885	1870	1870	1870	1885	1885	1885
Adj Flow Rate, veh/h	102	69	74	104	68	44	165	347	19	49	375	45
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	1	1	1	1	1	1	2	2	2	1	1	1
Cap, veh/h	498	194	208	253	139	66	480	646	35	494	518	62
Arrive On Green	0.24	0.24	0.24	0.24	0.24	0.24	0.11	0.37	0.37	0.05	0.32	0.32
Sat Flow, veh/h	1283	817	876	497	584	276	1781	1754	96	1795	1645	197
Grp Volume(v), veh/h	102	0	143	216	0	0	165	0	366	49	0	420
Grp Sat Flow(s),veh/h/ln	1283	0	1693	1357	0	0	1781	0	1850	1795	0	1843
Q Serve(g_s), s	0.0	0.0	2.8	3.2	0.0	0.0	2.3	0.0	6.2	0.7	0.0	8.0
Cycle Q Clear(g_c), s	2.5	0.0	2.8	6.0	0.0	0.0	2.3	0.0	6.2	0.7	0.0	8.0
Prop In Lane	1.00		0.52	0.48		0.20	1.00		0.05	1.00		0.11
Lane Grp Cap(c), veh/h	498	0	402	457	0	0	480	0	681	494	0	581
V/C Ratio(X)	0.21	0.00	0.36	0.47	0.00	0.00	0.34	0.00	0.54	0.10	0.00	0.72
Avail Cap(c_a), veh/h	794	0	793	795	0	0	539	0	1072	631	0	1049
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	12.4	0.0	12.5	13.8	0.0	0.0	8.3	0.0	9.8	8.3	0.0	12.0
Incr Delay (d2), s/veh	0.2	0.0	0.5	0.8	0.0	0.0	0.4	0.0	0.7	0.1	0.0	1.7
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.7	0.0	1.0	1.6	0.0	0.0	0.7	0.0	2.1	0.2	0.0	2.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	12.6	0.0	13.1	14.5	0.0	0.0	8.7	0.0	10.5	8.4	0.0	13.7
LnGrp LOS	B	A	B	B	A	A	A	A	B	A	A	B
Approach Vol, veh/h		245			216			531				469
Approach Delay, s/veh		12.9			14.5			9.9				13.2
Approach LOS		B			B			A				B
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	6.6	19.1		13.9	8.7	17.0		13.9				
Change Period (Y+Rc), s	4.5	4.5		4.5	4.5	4.5		4.5				
Max Green Setting (Gmax), s	5.1	22.9		18.5	5.5	22.5		18.5				
Max Q Clear Time (g_c+I1), s	2.7	8.2		4.8	4.3	10.0		8.0				
Green Ext Time (p_c), s	0.0	2.0		1.0	0.1	2.2		0.9				
<b>Intersection Summary</b>												
HCM 6th Ctrl Delay				12.2								
HCM 6th LOS				B								

HCM 6th AWSC  
1: N Deborah Road & Haworth Avenue

05/03/2022

Intersection	
Intersection Delay, s/veh	16.2
Intersection LOS	C

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	102	154	9	16	129	84	8	114	24	142	69	86
Future Vol, veh/h	102	154	9	16	129	84	8	114	24	142	69	86
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Heavy Vehicles, %	3	3	3	2	2	2	8	8	8	7	7	7
Mvmt Flow	121	183	11	19	154	100	10	136	29	169	82	102
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	16.9	14.5	12.8	18.5
HCM LOS	C	B	B	C

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	5%	38%	7%	48%
Vol Thru, %	78%	58%	56%	23%
Vol Right, %	16%	3%	37%	29%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	146	265	229	297
LT Vol	8	102	16	142
Through Vol	114	154	129	69
RT Vol	24	9	84	86
Lane Flow Rate	174	315	273	354
Geometry Grp	1	1	1	1
Degree of Util (X)	0.32	0.553	0.465	0.608
Departure Headway (Hd)	6.629	6.306	6.141	6.194
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	541	571	586	580
Service Time	4.693	4.357	4.196	4.247
HCM Lane V/C Ratio	0.322	0.552	0.466	0.61
HCM Control Delay	12.8	16.9	14.5	18.5
HCM Lane LOS	B	C	B	C
HCM 95th-tile Q	1.4	3.4	2.5	4.1

HCM 6th TWSC  
2: Site Access & Haworth Avenue

05/03/2022

Intersection						
Int Delay, s/veh	0.2					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	370	1	2	239	1	8
Future Vol, veh/h	370	1	2	239	1	8
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	402	1	2	260	1	9

Major/Minor	Major1	Major2	Minor1	Minor2	Minor3
Conflicting Flow All	0	0	403	0	667
Stage 1	-	-	-	-	403
Stage 2	-	-	-	-	264
Critical Hdwy	-	-	4.12	-	6.42
Critical Hdwy Stg 1	-	-	-	-	5.42
Critical Hdwy Stg 2	-	-	-	-	5.42
Follow-up Hdwy	-	-	2.218	-	3.518
Pot Cap-1 Maneuver	-	-	1156	-	424
Stage 1	-	-	-	-	675
Stage 2	-	-	-	-	780
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1156	-	423
Mov Cap-2 Maneuver	-	-	-	-	423
Stage 1	-	-	-	-	675
Stage 2	-	-	-	-	778

Approach	EB	WB	NB
HCM Control Delay, s	0	0.1	11
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	611	-	-	1156	-
HCM Lane V/C Ratio	0.016	-	-	0.002	-
HCM Control Delay (s)	11	-	-	8.1	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	0	-

HCM 6th AWSC  
3: N Springbrook Road & Haworth Avenue

05/03/2022

Intersection	
Intersection Delay, s/veh	39.5
Intersection LOS	E

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕	↕		↕		↕	↕		↕	↕	
Traffic Vol, veh/h	76	29	273	39	17	12	119	324	7	30	378	105
Future Vol, veh/h	76	29	273	39	17	12	119	324	7	30	378	105
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Heavy Vehicles, %	2	2	2	2	2	2	7	7	7	6	6	6
Mvmt Flow	82	31	294	42	18	13	128	348	8	32	406	113
Number of Lanes	0	1	1	0	1	0	1	1	0	1	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	2	2	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	2	2	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	2	1	2
HCM Control Delay	17.8	14.3	23.9	72.6
HCM LOS	C	B	C	F

Lane	NBLn1	NBLn2	EBLn1	EBLn2	WBLn1	SBLn1	SBLn2
Vol Left, %	100%	0%	72%	0%	57%	100%	0%
Vol Thru, %	0%	98%	28%	0%	25%	0%	78%
Vol Right, %	0%	2%	0%	100%	18%	0%	22%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	119	331	105	273	68	30	483
LT Vol	119	0	76	0	39	30	0
Through Vol	0	324	29	0	17	0	378
RT Vol	0	7	0	273	12	0	105
Lane Flow Rate	128	356	113	294	73	32	519
Geometry Grp	7	7	7	7	6	7	7
Degree of Util (X)	0.279	0.723	0.255	0.575	0.181	0.07	1.036
Departure Headway (Hd)	8.059	7.529	8.358	7.263	9.246	7.848	7.179
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	449	484	432	499	390	459	509
Service Time	5.759	5.229	6.058	4.963	7.246	5.548	4.879
HCM Lane V/C Ratio	0.285	0.736	0.262	0.589	0.187	0.07	1.02
HCM Control Delay	13.8	27.5	13.9	19.3	14.3	11.1	76.4
HCM Lane LOS	B	D	B	C	B	B	F
HCM 95th-tile Q	1.1	5.8	1	3.6	0.7	0.2	15.1

# HCM 6th Signalized Intersection Summary

## 4: N Springbrook Road & OR-99W

05/03/2022



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	66	1110	80	284	666	212	169	188	421	403	142	89
Future Volume (veh/h)	66	1110	80	284	666	212	169	188	421	403	142	89
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.99	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
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1695	1695	1695	1614	1614	1614	1668	1668	1668	1695	1695	1695
Adj Flow Rate, veh/h	72	1207	0	309	724	0	184	204	404	438	154	0
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Percent Heavy Veh, %	4	4	4	10	10	10	6	6	6	4	4	4
Cap, veh/h	90	1305		371	1453		241	284	415	490	422	357
Arrive On Green	0.06	0.41	0.00	0.12	0.47	0.00	0.08	0.17	0.17	0.16	0.25	0.00
Sat Flow, veh/h	1615	3221	1437	2981	3066	1367	3082	1668	1404	3132	1695	1437
Grp Volume(v), veh/h	72	1207	0	309	724	0	184	204	404	438	154	0
Grp Sat Flow(s),veh/h/ln	1615	1611	1437	1491	1533	1367	1541	1668	1404	1566	1695	1437
Q Serve(g_s), s	4.9	39.7	0.0	11.3	18.1	0.0	6.5	12.9	19.0	15.3	8.4	0.0
Cycle Q Clear(g_c), s	4.9	39.7	0.0	11.3	18.1	0.0	6.5	12.9	19.0	15.3	8.4	0.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Lane Grp Cap(c), veh/h	90	1305		371	1453		241	284	415	490	422	357
V/C Ratio(X)	0.80	0.92		0.83	0.50		0.76	0.72	0.97	0.89	0.37	0.00
Avail Cap(c_a), veh/h	165	1358		535	1529		354	284	415	506	422	357
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	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	0.00
Uniform Delay (d), s/veh	52.0	31.5	0.0	47.7	20.2	0.0	50.4	43.7	38.9	46.1	34.6	0.0
Incr Delay (d2), s/veh	14.9	10.7	0.0	7.4	0.3	0.0	5.7	8.4	36.9	17.9	0.5	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	2.3	16.7	0.0	4.5	6.3	0.0	2.7	5.9	14.9	7.2	3.6	0.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	66.9	42.2	0.0	55.0	20.5	0.0	56.1	52.1	75.8	64.0	35.1	0.0
LnGrp LOS	E	D		E	C		E	D	E	E	D	A
Approach Vol, veh/h		1279	A		1033	A		792			592	
Approach Delay, s/veh		43.6			30.8			65.1			56.5	
Approach LOS		D			C			E			E	
Timer - Assigned Phs	1	2	3	4	5	6	7	8				
Phs Duration (G+Y+Rc), s	21.4	23.0	17.9	49.2	12.7	31.7	10.2	56.8				
Change Period (Y+Rc), s	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0				
Max Green Setting (Gmax), s	19.0	19.0	20.0	47.0	12.8	24.2	11.4	55.6				
Max Q Clear Time (g_c+1/3), s	17.3	21.0	13.3	41.7	8.5	10.4	6.9	20.1				
Green Ext Time (p_c), s	0.1	0.0	0.6	3.4	0.2	0.6	0.0	5.6				

### Intersection Summary

HCM 6th Ctrl Delay	46.7
HCM 6th LOS	D

### Notes

Unsignalized Delay for [EBR, WBR] is excluded from calculations of the approach delay and intersection delay.

# HCM 6th Signalized Intersection Summary

## 3: N Springbrook Road & Haworth Avenue

05/03/2022



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	76	29	273	39	17	12	119	324	7	30	378	105
Future Volume (veh/h)	76	29	273	39	17	12	119	324	7	30	378	105
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.98		0.98	0.99		0.98	1.00		0.99	0.99		0.99
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1870	1870	1870	1870	1870	1870	1796	1796	1796	1811	1811	1811
Adj Flow Rate, veh/h	82	31	72	42	18	3	128	348	7	32	406	98
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Percent Heavy Veh, %	2	2	2	2	2	2	7	7	7	6	6	6
Cap, veh/h	411	69	159	240	78	8	493	801	16	578	556	134
Arrive On Green	0.14	0.14	0.14	0.14	0.14	0.14	0.10	0.46	0.46	0.04	0.40	0.40
Sat Flow, veh/h	1369	492	1143	552	559	56	1711	1754	35	1725	1406	339
Grp Volume(v), veh/h	82	0	103	63	0	0	128	0	355	32	0	504
Grp Sat Flow(s),veh/h/ln	1369	0	1635	1166	0	0	1711	0	1789	1725	0	1745
Q Serve(g_s), s	0.0	0.0	2.1	0.3	0.0	0.0	1.5	0.0	5.0	0.4	0.0	9.1
Cycle Q Clear(g_c), s	1.6	0.0	2.1	2.4	0.0	0.0	1.5	0.0	5.0	0.4	0.0	9.1
Prop In Lane	1.00		0.70	0.67		0.05	1.00		0.02	1.00		0.19
Lane Grp Cap(c), veh/h	411	0	228	325	0	0	493	0	817	578	0	690
V/C Ratio(X)	0.20	0.00	0.45	0.19	0.00	0.00	0.26	0.00	0.43	0.06	0.00	0.73
Avail Cap(c_a), veh/h	722	0	599	646	0	0	616	0	1354	751	0	1263
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	14.3	0.0	14.6	14.3	0.0	0.0	6.4	0.0	6.8	6.1	0.0	9.5
Incr Delay (d2), s/veh	0.2	0.0	1.4	0.3	0.0	0.0	0.3	0.0	0.4	0.0	0.0	1.5
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	0.6	0.0	0.8	0.4	0.0	0.0	0.4	0.0	1.4	0.1	0.0	2.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	14.6	0.0	16.0	14.6	0.0	0.0	6.7	0.0	7.2	6.2	0.0	11.0
LnGrp LOS	B	A	B	B	A	A	A	A	A	A	A	B
Approach Vol, veh/h		185			63			483				536
Approach Delay, s/veh		15.3			14.6			7.0				10.7
Approach LOS		B			B			A				B
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	5.9	21.3		9.6	8.2	19.1		9.6				
Change Period (Y+Rc), s	4.5	4.5		4.5	4.5	4.5		4.5				
Max Green Setting (Gmax), s	5.1	27.9		13.5	6.3	26.7		13.5				
Max Q Clear Time (g_c+I1), s	2.4	7.0		4.1	3.5	11.1		4.4				
Green Ext Time (p_c), s	0.0	2.2		0.5	0.1	3.1		0.1				

### Intersection Summary

HCM 6th Ctrl Delay	10.2
HCM 6th LOS	B

### Notes

User approved pedestrian interval to be less than phase max green.

HCM 6th AWSC  
1: N Deborah Road & Haworth Avenue

05/03/2022

Intersection	
Intersection Delay, s/veh	13
Intersection LOS	B

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	46	227	23	23	204	41	15	30	31	81	59	56
Future Vol, veh/h	46	227	23	23	204	41	15	30	31	81	59	56
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Heavy Vehicles, %	1	1	1	2	2	2	6	6	6	5	5	5
Mvmt Flow	54	267	27	27	240	48	18	35	36	95	69	66
Number of Lanes	0	1	0	0	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	1	1
HCM Control Delay	14.1	13.1	10.2	12.4
HCM LOS	B	B	B	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
Vol Left, %	20%	16%	9%	41%
Vol Thru, %	39%	77%	76%	30%
Vol Right, %	41%	8%	15%	29%
Sign Control	Stop	Stop	Stop	Stop
Traffic Vol by Lane	76	296	268	196
LT Vol	15	46	23	81
Through Vol	30	227	204	59
RT Vol	31	23	41	56
Lane Flow Rate	89	348	315	231
Geometry Grp	1	1	1	1
Degree of Util (X)	0.15	0.519	0.47	0.373
Departure Headway (Hd)	6.048	5.363	5.372	5.831
Convergence, Y/N	Yes	Yes	Yes	Yes
Cap	589	672	668	616
Service Time	4.123	3.412	3.424	3.891
HCM Lane V/C Ratio	0.151	0.518	0.472	0.375
HCM Control Delay	10.2	14.1	13.1	12.4
HCM Lane LOS	B	B	B	B
HCM 95th-tile Q	0.5	3	2.5	1.7



HCM 6th TWSC  
2: Site Access & Haworth Avenue

05/03/2022

Intersection						
Int Delay, s/veh	0.2					
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Vol, veh/h	393	1	8	289	1	5
Future Vol, veh/h	393	1	8	289	1	5
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Stop	Stop
RT Channelized	-	None	-	None	-	None
Storage Length	-	-	-	-	0	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	92	92	92	92	92	92
Heavy Vehicles, %	2	2	2	2	2	2
Mvmt Flow	427	1	9	314	1	5

Major/Minor	Major1	Major2	Minor1	Minor2	Minor3
Conflicting Flow All	0	0	428	0	760
Stage 1	-	-	-	-	428
Stage 2	-	-	-	-	332
Critical Hdwy	-	-	4.12	-	6.42
Critical Hdwy Stg 1	-	-	-	-	5.42
Critical Hdwy Stg 2	-	-	-	-	5.42
Follow-up Hdwy	-	-	2.218	-	3.518
Pot Cap-1 Maneuver	-	-	1131	-	374
Stage 1	-	-	-	-	657
Stage 2	-	-	-	-	727
Platoon blocked, %	-	-	-	-	-
Mov Cap-1 Maneuver	-	-	1131	-	370
Mov Cap-2 Maneuver	-	-	-	-	370
Stage 1	-	-	-	-	657
Stage 2	-	-	-	-	720

Approach	EB	WB	NB
HCM Control Delay, s	0	0.2	11.5
HCM LOS			B

Minor Lane/Major Mvmt	NBLn1	EBT	EBR	WBL	WBT
Capacity (veh/h)	562	-	-	1131	-
HCM Lane V/C Ratio	0.012	-	-	0.008	-
HCM Control Delay (s)	11.5	-	-	8.2	0
HCM Lane LOS	B	-	-	A	A
HCM 95th %tile Q(veh)	0	-	-	0	-

HCM 6th AWSC  
3: N Springbrook Road & Haworth Avenue

05/03/2022

Intersection	
Intersection Delay, s/veh	57.8
Intersection LOS	F

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕	↕		↕		↕	↕		↕	↕	
Traffic Vol, veh/h	106	72	220	109	71	69	172	364	23	51	392	54
Future Vol, veh/h	106	72	220	109	71	69	172	364	23	51	392	54
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Heavy Vehicles, %	1	1	1	1	1	1	2	2	2	1	1	1
Mvmt Flow	112	76	232	115	75	73	181	383	24	54	413	57
Number of Lanes	0	1	1	0	1	0	1	1	0	1	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	2	2	2
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	2	2	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	2	2	1	2
HCM Control Delay	21.3	31.8	52.7	105.8
HCM LOS	C	D	F	F

Lane	NBLn1	NBLn2	EBLn1	EBLn2	WBLn1	SBLn1	SBLn2
Vol Left, %	100%	0%	60%	0%	44%	100%	0%
Vol Thru, %	0%	94%	40%	0%	29%	0%	88%
Vol Right, %	0%	6%	0%	100%	28%	0%	12%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	172	387	178	220	249	51	446
LT Vol	172	0	106	0	109	51	0
Through Vol	0	364	72	0	71	0	392
RT Vol	0	23	0	220	69	0	54
Lane Flow Rate	181	407	187	232	262	54	469
Geometry Grp	7	7	7	7	6	7	7
Degree of Util (X)	0.458	0.968	0.484	0.538	0.681	0.139	1.138
Departure Headway (Hd)	9.513	8.946	9.821	8.776	9.966	9.334	8.724
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cap	382	407	369	415	364	385	418
Service Time	7.213	6.646	7.521	6.476	7.966	7.06	6.449
HCM Lane V/C Ratio	0.474	1	0.507	0.559	0.72	0.14	1.122
HCM Control Delay	20	67.3	21.4	21.2	31.8	13.6	116.3
HCM Lane LOS	C	F	C	C	D	B	F
HCM 95th-tile Q	2.3	11.3	2.5	3.1	4.8	0.5	17.3

HCM 6th Signalized Intersection Summary  
 4: N Springbrook Road & OR-99W

05/03/2022



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR						
Lane Configurations																		
Traffic Volume (veh/h)	121	939	140	618	1388	272	306	209	344	351	200	114						
Future Volume (veh/h)	121	939	140	618	1388	272	306	209	344	351	200	114						
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0						
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		0.99	1.00		0.99						
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00						
Work Zone On Approach	No			No			No			No								
Adj Sat Flow, veh/h/ln	1709	1709	1709	1709	1709	1709	1709	1709	1709	1723	1723	1723						
Adj Flow Rate, veh/h	126	978	0	644	1446	0	319	218	332	366	208	21						
Peak Hour Factor	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96	0.96						
Percent Heavy Veh, %	3	3	3	3	3	3	3	3	3	2	2	2						
Cap, veh/h	150	1126		699	1545		369	279	555	418	306	257						
Arrive On Green	0.09	0.35	0.00	0.22	0.48	0.00	0.12	0.16	0.16	0.13	0.18	0.18						
Sat Flow, veh/h	1628	3247	1448	3158	3247	1448	3158	1709	1435	3183	1723	1448						
Grp Volume(v), veh/h	126	978	0	644	1446	0	319	218	332	366	208	21						
Grp Sat Flow(s),veh/h/ln	1628	1624	1448	1579	1624	1448	1579	1709	1435	1591	1723	1448						
Q Serve(g_s), s	8.9	32.8	0.0	23.2	49.0	0.0	11.5	14.2	19.0	13.1	13.1	1.4						
Cycle Q Clear(g_c), s	8.9	32.8	0.0	23.2	49.0	0.0	11.5	14.2	19.0	13.1	13.1	1.4						
Prop In Lane	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00						
Lane Grp Cap(c), veh/h	150	1126		699	1545		369	279	555	418	306	257						
V/C Ratio(X)	0.84	0.87		0.92	0.94		0.86	0.78	0.60	0.88	0.68	0.08						
Avail Cap(c_a), veh/h	168	1172		733	1591		380	279	555	438	311	261						
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	0.00	1.00	1.00	0.00	1.00	1.00	1.00	1.00	1.00	1.00						
Uniform Delay (d), s/veh	52.0	35.5	0.0	44.3	28.8	0.0	50.5	46.7	28.7	49.6	44.7	39.9						
Incr Delay (d2), s/veh	27.9	7.0	0.0	16.7	10.6	0.0	17.9	13.3	1.8	17.3	5.8	0.1						
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0						
%ile BackOfQ(50%),veh/ln	4.7	13.7	0.0	10.5	20.3	0.0	5.4	7.0	7.5	6.3	6.1	0.5						
Unsig. Movement Delay, s/veh																		
LnGrp Delay(d),s/veh	79.8	42.5	0.0	61.0	39.4	0.0	68.4	60.0	30.4	66.9	50.5	40.1						
LnGrp LOS	E	D		E	D		E	E	C	E	D	D						
Approach Vol, veh/h	1104			A			2090			A			869			595		
Approach Delay, s/veh	46.8			46.1			51.8			60.2								
Approach LOS	D			D			D			E								
Timer - Assigned Phs	1	2	3	4	5	6	7	8										
Phs Duration (G+Y+Rc), s	19.3	23.0	29.7	44.3	17.6	24.7	14.7	59.4										
Change Period (Y+Rc), s	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0										
Max Green Setting (Gmax), s	16.0	19.0	27.0	42.0	14.0	21.0	12.0	57.0										
Max Q Clear Time (g_c+1/4), s	11.0	21.0	25.2	34.8	13.5	15.1	10.9	51.0										
Green Ext Time (p_c), s	0.1	0.0	0.5	3.7	0.1	0.6	0.0	4.4										

Intersection Summary

HCM 6th Ctrl Delay	49.1
HCM 6th LOS	D

Notes

Unsignalized Delay for [EBR, WBR] is excluded from calculations of the approach delay and intersection delay.

# HCM 6th Signalized Intersection Summary

## 3: N Springbrook Road & Haworth Avenue

05/03/2022



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	106	72	220	109	71	69	172	364	23	51	392	54
Future Volume (veh/h)	106	72	220	109	71	69	172	364	23	51	392	54
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	0.99		0.97	0.99		0.99	1.00		0.97	1.00		0.97
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1885	1885	1885	1885	1885	1885	1870	1870	1870	1885	1885	1885
Adj Flow Rate, veh/h	112	76	81	115	75	51	181	383	21	54	413	50
Peak Hour Factor	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Percent Heavy Veh, %	1	1	1	1	1	1	2	2	2	1	1	1
Cap, veh/h	504	211	225	259	146	73	476	679	37	493	552	67
Arrive On Green	0.26	0.26	0.26	0.26	0.26	0.26	0.11	0.39	0.39	0.06	0.34	0.34
Sat Flow, veh/h	1268	820	874	491	566	284	1781	1754	96	1795	1644	199
Grp Volume(v), veh/h	112	0	157	241	0	0	181	0	404	54	0	463
Grp Sat Flow(s),veh/h/ln	1268	0	1695	1341	0	0	1781	0	1850	1795	0	1843
Q Serve(g_s), s	0.0	0.0	3.0	3.9	0.0	0.0	2.5	0.0	6.9	0.8	0.0	9.0
Cycle Q Clear(g_c), s	2.9	0.0	3.0	6.9	0.0	0.0	2.5	0.0	6.9	0.8	0.0	9.0
Prop In Lane	1.00		0.52	0.48		0.21	1.00		0.05	1.00		0.11
Lane Grp Cap(c), veh/h	504	0	437	478	0	0	476	0	717	493	0	619
V/C Ratio(X)	0.22	0.00	0.36	0.50	0.00	0.00	0.38	0.00	0.56	0.11	0.00	0.75
Avail Cap(c_a), veh/h	777	0	801	791	0	0	594	0	1077	643	0	1009
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	0.00	1.00	1.00	0.00	0.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	12.2	0.0	12.2	13.7	0.0	0.0	8.1	0.0	9.6	8.0	0.0	11.8
Incr Delay (d2), s/veh	0.2	0.0	0.5	0.8	0.0	0.0	0.5	0.0	0.7	0.1	0.0	1.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(50%),veh/ln	0.7	0.0	1.0	1.8	0.0	0.0	0.8	0.0	2.3	0.2	0.0	3.2
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	12.4	0.0	12.7	14.5	0.0	0.0	8.6	0.0	10.3	8.1	0.0	13.7
LnGrp LOS	B	A	B	B	A	A	A	A	B	A	A	B
Approach Vol, veh/h		269			241			585				517
Approach Delay, s/veh		12.6			14.5			9.8				13.1
Approach LOS		B			B			A				B
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	6.3	19.6		14.4	8.3	17.5		14.4				
Change Period (Y+Rc), s	4.0	4.0		4.0	4.0	4.0		4.0				
Max Green Setting (Gmax), s	5.6	23.4		19.0	7.0	22.0		19.0				
Max Q Clear Time (g_c+I1), s	2.8	8.9		5.0	4.5	11.0		8.9				
Green Ext Time (p_c), s	0.0	2.3		1.1	0.1	2.3		1.0				
<b>Intersection Summary</b>												
HCM 6th Ctrl Delay				12.0								
HCM 6th LOS				B								

**3. N Springbrook Road at Haworth Avenue**

Right Turns on Red  
 APM Section 13.4.2: RTOR  
 Equation:  $vRTOR = sRTOR * (r/C)$

AM Peak Hour													
	sRTOR				r				C	vRTOR			
	EBR	WBR	NBR	SBR	EBR	WBR	NBR	SBR		EBR	WBR	NBR	SBR
2022 Existing Conditions	-	-	-	-	-	-	-	-	60	#VALUE!	#VALUE!	#VALUE!	#VALUE!
2024 Background Conditions	259	12	2	27	37.4	37.4	32.2	32.6	60	161	7	1	15
2024 Buildout Conditions	267	12	2	27	37.4	37.4	32.2	32.6	60	166	7	1	15
2029 Future Conditions	294	13	3	30	42	42	27.6	28.8	60	206	9	1	14

Intersection v/c  
 APM Section 13.4.4: Critical Intersection v/c ratio  
 Method: Determine Critical Movements in HCM 2000 reports & CMA Method  
 HCM 6th reports, determine adjusted and sat flow rates  
 Adjust Flow/Sat Flow  
 Sum up Crit Movement Flow Rates  
 $X_c \text{ of intersection} = \text{sum}(\text{crit.move. Flow rates} * (C/(C-L)))$

AM Peak Hour														
	Critical Movement	Adjust Flow			Saturated Flow			Adj/Sat Flows			C	L	Xc	
		EBTR	NBL	SBTR	EBTR	NBL	SBTR	EBTR	NBL	SBTR				Sum
2024 Background Conditions		114	116	456	1621	1711	1746	0.070327	0.067797	0.261168	0.399292	60	12	0.50
2024 Buildout Conditions	EBTR	117	118	456	1620	1711	1746	0.072222	0.068966	0.261168	0.402356	60	12	0.50
2029 Future Conditions		103	128	504	1635	1711	1745	0.062997	0.07481	0.288825	0.426632	60	12	0.53

**4. N Springbrook Road at OR-99W**

Right Turns on Red  
 APM Section 13.4.2: RTOR  
 Equation:  $vRTOR = sRTOR * (r/C)$

AM Peak Hour													
	sRTOR				r				C	vRTOR			
	EBR	WBR	NBR	SBR	EBR	WBR	NBR	SBR		EBR	WBR	NBR	SBR
2022 Existing Conditions	155	183	82	118	67	57.4	74.4	92.6	120	87	88	51	91
2024 Background Conditions	155	210	82	118	68	57.8	73	93.1	120	88	101	50	92
2024 Buildout Conditions	155	211	82	118	68	57.9	74	93.1	120	88	102	51	92
2029 Future Conditions	155	230	82	118	69	60.4	73	91.8	120	89	116	50	90

Intersection v/c  
 APM Section 13.4.4: Critical Intersection v/c ratio  
 Method: Determine Critical Movements in HCM 2000 reports & CMA Method  
 HCM 6th reports, determine adjusted and sat flow rates  
 Adjust Flow/Sat Flow  
 Sum up Crit Movement Flow Rates  
 $X_c \text{ of intersection} = \text{sum}(\text{crit.move. Flow rates} * (C/(C-L)))$

AM Peak Hour																				
	Critical Movement				Adjust Flow				Saturated Flow				Adj/Sat Flows				C	L	Xc	
	EBT	WBL	NBT	SBL	EBT	WBL	NBT	SBL	EBT	WBL	NBT	SBL	EBT	WBL	NBT	SBL				Sum
2022 Existing Conditions					1193	261	171	370	3221	2981	1668	3132	0.370382	0.087555	0.102518	0.118135	0.67859	120	16	0.78
2024 Background Conditions	EBT	WBL	NBT	SBL	1205	280	186	395	3221	2981	1668	3132	0.374107	0.093928	0.111511	0.126117	0.705664	120	16	0.81
2024 Buildout Conditions					1205	280	186	398	3221	2981	1668	3132	0.374107	0.093928	0.111511	0.127075	0.706622	120	16	0.82
2029 Future Conditions					1207	309	204	438	3221	2981	1668	3132	0.374728	0.103656	0.122302	0.139847	0.740534	120	16	0.85

**3. N Springbrook Road at Haworth Avenue**

Right Turns on Red  
 APM Section 13.4.2: RTOR  
 Equation:  $vRTOR = sRTOR * (r/C)$

PM Peak Hour													
	sRTOR				r	C	vRTOR						
	EBR	WBR	NBR	SBR			EBR	WBR	NBR	SBR			
2022 Existing Conditions	-	-	-	-	-	60	#VALUE!	#VALUE!	#VALUE!	#VALUE!			
2024 Background Conditions	206	33	6	13	37	37	32.6	33	60	127	20	3	7
2024 Buildout Conditions	211	33	6	14	37	37	32.6	33	60	130	20	3	8
2029 Future Conditions	232	34	6	13	37	37	32.6	34	60	143	21	3	7

Intersection v/c  
 APM Section 13.4.4: Critical Intersection v/c ratio  
 Method: Determine Critical Movements in HCM 2000 reports & CMA Method  
 HCM 6th reports, determine adjusted and sat flow rates  
 Adjust Flow/Sat Flow  
 Sum up Crit Movement Flow Rates  
 $X_c \text{ of intersection} = \text{sum}(\text{crit.move. Flow rates} * (C/(C-L)))$

PM Peak Hour														
	Critical Movement	Adjust Flow			Saturated Flow			Adj/Sat Flows				C	L	Xc
		WBLTR	NBL	SBTR	WBLTR	NBL	SBTR	WBLTR	NBL	SBTR	Sum			
2024 Background Conditions		216	158	420	1364	1781	1842	0.158358	0.088714	0.228013	0.475085	60	12	0.59
2024 Buildout Conditions	WBLTR NBL SBTR	216	165	420	1357	1781	1842	0.159175	0.092645	0.228013	0.479832	60	12	0.60
2029 Future Conditions		241	181	463	1341	1781	1843	0.179717	0.101628	0.251221	0.532566	60	12	0.67

**4. N Springbrook Road at OR-99W**

Right Turns on Red

APM Section 13.4.2: RTOR

Equation:  $vRTOR = sRTOR * (r/C)$

PM Peak Hour														
	sRTOR				EBR	r				C	vRTOR			
	EBR	WBR	NBR	SBR		WBR	NBR	SBR	EBR		WBR	NBR	SBR	
2022 Existing Conditions	127	235	45	118	72	58	67	95	120	76	114	25	93	
2024 Background Conditions	132	254	45	118	72.6	58	67.2	96.1	120	80	123	25	94	
2024 Buildout Conditions	132	257	45	118	72.2	58	67.6	96.5	120	79	124	25	95	
2029 Future Conditions	146	283	45	119	74	59	66	95	120	90	139	25	94	

Intersection v/c

APM Section 13.4.4: Critical Intersection v/c ratio

Method: Determine Critical Movements in HCM 2000 reports & CMA Method  
 HCM 6th reports, determine adjusted and sat flow rates  
 Adjust Flow/Sat Flow  
 Sum up Crit Movement Flow Rates  
 $X_c \text{ of intersection} = \text{sum}(\text{crit.move. Flow rates} * (C/(C-L)))$

PM Peak Hour																				
	Critical Movement				Adjust Flow				Saturated Flow				Adj/Sat Flows				Sum	C	L	Xc
	EBL	WBT	NBT	SBL	EBL	WBT	NBT	SBL	EBL	WBT	NBT	SBL	EBL	WBT	NBT	SBL				
2022 Existing Conditions					104	1424	185	302	1628	3247	1709	3183	0.063882	0.438559	0.10825	0.094879	0.70557	120	16	0.81
2024 Background Conditions					111	1445	197	331	1628	3247	1709	3183	0.068182	0.445026	0.115272	0.10399	0.73247	120	16	0.85
2024 Buildout Conditions	EBL	WBT	NBT	SBL	115	1445	198	333	1628	3247	1709	3183	0.070639	0.445026	0.115857	0.104618	0.736141	120	16	0.85
2029 Future Conditions					126	1446	218	366	1628	3247	1709	3183	0.077396	0.445334	0.12756	0.114986	0.765276	120	16	0.88



Queuing and Blocking Report  
 2022 Existing Conditions - AM Peak Hour

05/03/2022

Intersection: 1: N Deborah Road & Haworth Avenue

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	114	91	90	128
Average Queue (ft)	55	43	46	64
95th Queue (ft)	90	72	76	103
Link Distance (ft)	719	674	772	717
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 3: N Springbrook Road & Haworth Avenue

Movement	EB	EB	WB	NB	NB	SB	SB
Directions Served	LT	R	LTR	L	TR	L	TR
Maximum Queue (ft)	68	94	63	84	150	48	220
Average Queue (ft)	34	53	29	35	68	15	100
95th Queue (ft)	55	83	55	66	119	44	176
Link Distance (ft)		674	363		454		722
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)	150			140		100	
Storage Blk Time (%)				0	0		10
Queuing Penalty (veh)				0	0		2

Queuing and Blocking Report  
 2022 Existing Conditions - AM Peak Hour

05/03/2022

Intersection: 4: N Springbrook Road & OR-99W

Movement	EB	EB	EB	EB	WB	WB	WB	WB	NB	NB	NB	NB
Directions Served	L	T	T	R	L	L	T	T	L	L	T	R
Maximum Queue (ft)	143	442	419	45	211	244	242	218	155	205	235	294
Average Queue (ft)	38	279	257	2	74	136	129	105	28	100	101	147
95th Queue (ft)	102	405	393	45	182	213	213	190	112	173	193	258
Link Distance (ft)		1106	1106				817	817				358
Upstream Blk Time (%)										0	0	0
Queuing Penalty (veh)										0	0	0
Storage Bay Dist (ft)	400			350	500	500			300	300		300
Storage Blk Time (%)		1	2									1
Queuing Penalty (veh)		1	1									2

Intersection: 4: N Springbrook Road & OR-99W

Movement	SB	SB	SB	SB
Directions Served	L	L	T	R
Maximum Queue (ft)	189	202	163	74
Average Queue (ft)	107	125	73	25
95th Queue (ft)	168	185	137	54
Link Distance (ft)			454	
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)	220	220		125
Storage Blk Time (%)	0	0	3	
Queuing Penalty (veh)	0	0	11	

Network Summary

Network wide Queuing Penalty: 18

Queuing and Blocking Report  
 2022 Existing Conditions - PM Peak Hour

05/03/2022

Intersection: 1: N Deborah Road & Haworth Avenue

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	103	84	71	101
Average Queue (ft)	53	45	34	49
95th Queue (ft)	85	71	61	81
Link Distance (ft)	719	674	772	717
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 3: N Springbrook Road & Haworth Avenue

Movement	EB	EB	WB	NB	NB	SB	SB
Directions Served	LT	R	LTR	L	TR	L	TR
Maximum Queue (ft)	97	99	129	135	202	156	278
Average Queue (ft)	49	51	65	47	88	33	114
95th Queue (ft)	81	83	107	93	160	97	217
Link Distance (ft)		674	363		454		722
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)	150			140		100	
Storage Blk Time (%)				0	2		19
Queuing Penalty (veh)				0	3		8

Queuing and Blocking Report  
 2022 Existing Conditions - PM Peak Hour

05/03/2022

Intersection: 4: N Springbrook Road & OR-99W

Movement	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB	NB
Directions Served	L	T	T	R	L	L	T	T	R	L	L	T
Maximum Queue (ft)	179	369	349	44	321	401	509	535	335	232	287	247
Average Queue (ft)	84	242	220	2	186	236	306	306	27	111	173	111
95th Queue (ft)	156	337	315	44	285	349	460	462	199	230	258	204
Link Distance (ft)		1106	1106				817	817				358
Upstream Blk Time (%)								0				0
Queuing Penalty (veh)								0				0
Storage Bay Dist (ft)	400			350	500	500			350	300	300	
Storage Blk Time (%)		0	0				1	4		0	0	0
Queuing Penalty (veh)		0	0				3	10		0	1	0

Intersection: 4: N Springbrook Road & OR-99W

Movement	NB	SB	SB	SB	SB
Directions Served	R	L	L	T	R
Maximum Queue (ft)	259	180	204	217	150
Average Queue (ft)	98	90	111	113	48
95th Queue (ft)	196	148	169	188	104
Link Distance (ft)				454	
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (ft)	300	220	220		125
Storage Blk Time (%)	0	0	0	9	0
Queuing Penalty (veh)	1	0	0	33	1

Network Summary

Network wide Queuing Penalty: 61

Queuing and Blocking Report  
 2024 Background Conditions - AM Peak Hour

05/03/2022

Intersection: 1: N Deborah Road & Haworth Avenue

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	126	86	100	132
Average Queue (ft)	58	46	48	66
95th Queue (ft)	94	74	83	105
Link Distance (ft)	719	674	772	717
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 3: N Springbrook Road & Haworth Avenue

Movement	EB	EB	WB	NB	NB	SB	SB
Directions Served	LT	R	LTR	L	TR	L	TR
Maximum Queue (ft)	71	109	63	83	156	96	268
Average Queue (ft)	35	58	30	36	73	22	112
95th Queue (ft)	58	91	57	67	127	70	206
Link Distance (ft)		674	363		454		722
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)	150			140		100	
Storage Blk Time (%)		0			1		14
Queuing Penalty (veh)		0			1		4

Queuing and Blocking Report  
 2024 Background Conditions - AM Peak Hour

05/03/2022

Intersection: 4: N Springbrook Road & OR-99W

Movement	EB	EB	EB	EB	WB	WB	WB	WB	NB	NB	NB	NB
Directions Served	L	T	T	R	L	L	T	T	L	L	T	R
Maximum Queue (ft)	96	463	434	90	202	227	239	228	158	257	304	338
Average Queue (ft)	37	298	271	6	76	139	141	115	27	103	123	178
95th Queue (ft)	79	429	404	93	183	215	224	201	113	193	249	312
Link Distance (ft)		1106	1106				817	817				358
Upstream Blk Time (%)										0	1	0
Queuing Penalty (veh)										0	0	0
Storage Bay Dist (ft)	400			350	500	500			300	300		300
Storage Blk Time (%)		2	2							0	0	2
Queuing Penalty (veh)		1	2							0	2	8

Intersection: 4: N Springbrook Road & OR-99W

Movement	SB	SB	SB	SB
Directions Served	L	L	T	R
Maximum Queue (ft)	222	227	164	101
Average Queue (ft)	120	135	81	30
95th Queue (ft)	191	203	144	68
Link Distance (ft)			454	
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)	220	220		125
Storage Blk Time (%)	0	0	3	
Queuing Penalty (veh)	0	1	12	

Network Summary

Network wide Queuing Penalty: 31

Queuing and Blocking Report  
 2024 Background Conditions w/ Mitigation - AM Peak Hour

05/03/2022

Intersection: 3: N Springbrook Road & Haworth Avenue

Movement	EB	EB	WB	NB	NB	SB	SB
Directions Served	L	TR	LTR	L	TR	L	TR
Maximum Queue (ft)	84	140	84	109	200	106	255
Average Queue (ft)	38	68	32	50	90	20	120
95th Queue (ft)	70	117	66	91	171	70	210
Link Distance (ft)		675	363		460		716
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)	150			140		100	
Storage Blk Time (%)		0		0	2	0	10
Queuing Penalty (veh)		0		0	2	0	3

Queuing and Blocking Report  
 2024 Background Conditions - PM Peak Hour

05/03/2022

Intersection: 1: N Deborah Road & Haworth Avenue

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	107	90	73	99
Average Queue (ft)	54	46	34	50
95th Queue (ft)	84	73	61	81
Link Distance (ft)	719	674	772	717
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 3: N Springbrook Road & Haworth Avenue

Movement	EB	EB	WB	NB	NB	SB	SB
Directions Served	LT	R	LTR	L	TR	L	TR
Maximum Queue (ft)	95	112	143	145	228	185	436
Average Queue (ft)	50	53	69	49	110	61	193
95th Queue (ft)	83	85	116	100	198	178	408
Link Distance (ft)		674	363		454		722
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)	150			140		100	
Storage Blk Time (%)	0	0		0	6		45
Queuing Penalty (veh)	0	0		0	9		21



Queuing and Blocking Report  
 2024 Background Conditions - PM Peak Hour

05/03/2022

Intersection: 4: N Springbrook Road & OR-99W

Movement	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB	NB	NB
Directions Served	L	T	T	L	L	T	T	R	L	L	T	R
Maximum Queue (ft)	184	405	382	332	428	495	491	314	251	294	242	267
Average Queue (ft)	78	262	245	196	244	303	300	27	134	184	126	114
95th Queue (ft)	149	365	347	295	350	444	444	199	238	264	219	215
Link Distance (ft)		1106	1106			817	817					358
Upstream Blk Time (%)												
Queuing Penalty (veh)												
Storage Bay Dist (ft)	400			500	500			350	300	300		300
Storage Blk Time (%)		0	1			0	4		0	0	0	0
Queuing Penalty (veh)		0	1			2	10		0	1	1	0

Intersection: 4: N Springbrook Road & OR-99W

Movement	SB	SB	SB	SB
Directions Served	L	L	T	R
Maximum Queue (ft)	186	193	209	178
Average Queue (ft)	105	124	114	54
95th Queue (ft)	159	175	188	120
Link Distance (ft)			454	
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)	220	220		125
Storage Blk Time (%)	0	0	10	0
Queuing Penalty (veh)	0	0	42	2

Network Summary

Network wide Queuing Penalty: 89

Queuing and Blocking Report  
 2024 Background Conditions w/ Mitigation - PM Peak Hour

05/03/2022

Intersection: 3: N Springbrook Road & Haworth Avenue

Movement	EB	EB	WB	NB	NB	SB	SB
Directions Served	L	TR	LTR	L	TR	L	TR
Maximum Queue (ft)	113	137	212	178	230	119	224
Average Queue (ft)	46	68	91	65	106	28	116
95th Queue (ft)	84	113	168	124	189	72	195
Link Distance (ft)		675	363		460		716
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)	150			140		100	
Storage Blk Time (%)	0	0		0	3		11
Queuing Penalty (veh)	0	0		0	4		5

Queuing and Blocking Report  
 2024 Buildout Conditions - AM Peak Hour

05/03/2022

Intersection: 1: N Deborah Road & Haworth Avenue

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	114	82	99	140
Average Queue (ft)	58	45	49	66
95th Queue (ft)	93	71	83	111
Link Distance (ft)	719	328	778	723
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 2: Site Access & Haworth Avenue

Movement	WB	NB
Directions Served	LT	LR
Maximum Queue (ft)	9	33
Average Queue (ft)	0	8
95th Queue (ft)	5	30
Link Distance (ft)	290	267
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 3: N Springbrook Road & Haworth Avenue

Movement	EB	EB	WB	NB	NB	SB	SB
Directions Served	LT	R	LTR	L	TR	L	TR
Maximum Queue (ft)	70	120	63	82	162	133	337
Average Queue (ft)	37	59	32	37	74	25	129
95th Queue (ft)	61	97	57	65	131	89	257
Link Distance (ft)		290	363		454		722
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)	150			140		100	
Storage Blk Time (%)		0			1	0	20
Queuing Penalty (veh)		0			1	0	6

Queuing and Blocking Report  
 2024 Buildout Conditions - AM Peak Hour

05/03/2022

Intersection: 4: N Springbrook Road & OR-99W

Movement	EB	EB	EB	EB	WB	WB	WB	WB	NB	NB	NB	NB
Directions Served	L	T	T	R	L	L	T	T	L	L	T	R
Maximum Queue (ft)	195	489	466	45	228	260	274	244	164	264	340	342
Average Queue (ft)	43	295	269	6	90	144	143	114	29	111	135	192
95th Queue (ft)	122	443	413	93	206	231	228	206	116	213	288	338
Link Distance (ft)		1106	1106				817	817				358
Upstream Blk Time (%)										0	2	1
Queuing Penalty (veh)										0	0	0
Storage Bay Dist (ft)	400			350	500	500			300	300		300
Storage Blk Time (%)		2	3								0	5
Queuing Penalty (veh)		1	2								1	18

Intersection: 4: N Springbrook Road & OR-99W

Movement	SB	SB	SB	SB
Directions Served	L	L	T	R
Maximum Queue (ft)	210	226	205	84
Average Queue (ft)	122	138	83	27
95th Queue (ft)	190	205	159	61
Link Distance (ft)			454	
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)	220	220		125
Storage Blk Time (%)	0	1	4	
Queuing Penalty (veh)	0	2	16	

Network Summary

Network wide Queuing Penalty: 47

Queuing and Blocking Report  
 2024 Buildout Conditions w/ Mitigations - AM Peak Hour

05/03/2022

Intersection: 3: N Springbrook Road & Haworth Avenue

Movement	EB	EB	WB	NB	NB	SB	SB
Directions Served	L	TR	LTR	L	TR	L	TR
Maximum Queue (ft)	79	136	78	121	185	70	247
Average Queue (ft)	33	69	32	49	88	19	119
95th Queue (ft)	68	114	64	95	159	53	206
Link Distance (ft)		290	363		459		717
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)	150			140		100	
Storage Blk Time (%)		0		0	1		10
Queuing Penalty (veh)		0		0	1		3

Queuing and Blocking Report  
 2024 Buildout Conditions - PM Peak Hour

05/03/2022

Intersection: 1: N Deborah Road & Haworth Avenue

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	104	89	76	95
Average Queue (ft)	54	45	35	52
95th Queue (ft)	87	73	63	83
Link Distance (ft)	719	328	778	723
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 2: Site Access & Haworth Avenue

Movement	WB	NB
Directions Served	LT	LR
Maximum Queue (ft)	44	31
Average Queue (ft)	4	6
95th Queue (ft)	23	26
Link Distance (ft)	290	267
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 3: N Springbrook Road & Haworth Avenue

Movement	EB	EB	WB	NB	NB	SB	SB
Directions Served	LT	R	LTR	L	TR	L	TR
Maximum Queue (ft)	106	121	159	168	254	200	418
Average Queue (ft)	52	57	72	55	109	58	183
95th Queue (ft)	85	96	127	118	203	173	383
Link Distance (ft)		290	363		454		722
Upstream Blk Time (%)							0
Queuing Penalty (veh)							0
Storage Bay Dist (ft)	150			140		100	
Storage Blk Time (%)	0	0		0	6		45
Queuing Penalty (veh)	0	0		0	9		21

Queuing and Blocking Report  
 2024 Buildout Conditions - PM Peak Hour

05/03/2022

Intersection: 4: N Springbrook Road & OR-99W

Movement	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB	NB	
Directions Served	L	T	T	R	L	L	T	T	R	L	L	T	
Maximum Queue (ft)	185	400	388	45	346	386	514	509	335	236	293	256	
Average Queue (ft)	79	264	245	2	197	243	304	303	21	119	176	133	
95th Queue (ft)	154	370	347	45	299	345	438	446	175	226	253	232	
Link Distance (ft)		1106	1106				817	817				358	
Upstream Blk Time (%)												0	0
Queuing Penalty (veh)												0	0
Storage Bay Dist (ft)	400			350	500	500			350	300	300		
Storage Blk Time (%)		0	1				0	4		0	0	0	0
Queuing Penalty (veh)		0	1				1	11		0	1	2	

Intersection: 4: N Springbrook Road & OR-99W

Movement	NB	SB	SB	SB	SB
Directions Served	R	L	L	T	R
Maximum Queue (ft)	274	184	221	256	198
Average Queue (ft)	118	106	127	129	58
95th Queue (ft)	224	163	193	225	133
Link Distance (ft)				454	
Upstream Blk Time (%)	0			0	
Queuing Penalty (veh)	0			0	
Storage Bay Dist (ft)	300	220	220		125
Storage Blk Time (%)	0	0	0	14	1
Queuing Penalty (veh)	1	0	1	58	3

Network Summary

Network wide Queuing Penalty: 109

Queuing and Blocking Report  
 2024 Buildout Conditions w/ Mitigation - PM Peak Hour

05/03/2022

Intersection: 3: N Springbrook Road & Haworth Avenue

Movement	EB	EB	WB	NB	NB	SB	SB
Directions Served	L	TR	LTR	L	TR	L	TR
Maximum Queue (ft)	117	171	227	182	272	84	234
Average Queue (ft)	47	80	94	64	106	27	122
95th Queue (ft)	88	141	177	127	197	67	197
Link Distance (ft)		290	363		459		717
Upstream Blk Time (%)			0		0		
Queuing Penalty (veh)			0		0		
Storage Bay Dist (ft)	150			140		100	
Storage Blk Time (%)	0	1		0	2		12
Queuing Penalty (veh)	0	1		0	4		6



Queuing and Blocking Report  
 2029 Future Conditions - AM Peak Hour

05/03/2022

Intersection: 1: N Deborah Road & Haworth Avenue

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	140	107	99	151
Average Queue (ft)	63	50	50	72
95th Queue (ft)	105	86	82	119
Link Distance (ft)	719	328	778	723
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 2: Site Access & Haworth Avenue

Movement	WB	NB
Directions Served	LT	LR
Maximum Queue (ft)	24	33
Average Queue (ft)	1	8
95th Queue (ft)	10	30
Link Distance (ft)	290	267
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 3: N Springbrook Road & Haworth Avenue

Movement	EB	EB	WB	NB	NB	SB	SB
Directions Served	LT	R	LTR	L	TR	L	TR
Maximum Queue (ft)	82	128	64	88	189	200	472
Average Queue (ft)	41	67	33	41	86	42	195
95th Queue (ft)	66	107	57	75	149	143	404
Link Distance (ft)		290	363		454		722
Upstream Blk Time (%)							0
Queuing Penalty (veh)							0
Storage Bay Dist (ft)	150			140		100	
Storage Blk Time (%)		0			1		42
Queuing Penalty (veh)		0			2		13

Queuing and Blocking Report  
 2029 Future Conditions - AM Peak Hour

05/03/2022

Intersection: 4: N Springbrook Road & OR-99W

Movement	EB	EB	EB	EB	WB	WB	WB	WB	NB	NB	NB	NB
Directions Served	L	T	T	R	L	L	T	T	L	L	T	R
Maximum Queue (ft)	239	512	477	135	210	261	262	254	167	324	385	354
Average Queue (ft)	52	310	285	14	93	150	145	126	42	131	177	234
95th Queue (ft)	153	451	424	142	199	225	238	221	142	251	366	378
Link Distance (ft)		1106	1106				817	817				358
Upstream Blk Time (%)										0	5	3
Queuing Penalty (veh)										0	0	0
Storage Bay Dist (ft)	400			350	500	500			300	300		300
Storage Blk Time (%)		3	4					0		0	0	13
Queuing Penalty (veh)		2	3					0		0	2	46

Intersection: 4: N Springbrook Road & OR-99W

Movement	SB	SB	SB	SB
Directions Served	L	L	T	R
Maximum Queue (ft)	246	254	215	97
Average Queue (ft)	139	155	93	30
95th Queue (ft)	212	228	166	68
Link Distance (ft)			454	
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)	220	220		125
Storage Blk Time (%)	0	1	4	
Queuing Penalty (veh)	1	3	20	

Network Summary

Network wide Queuing Penalty: 91
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Queuing and Blocking Report  
 2029 Future Conditions w/ Mitigation - AM Peak Hour

05/03/2022

Intersection: 3: N Springbrook Road & Haworth Avenue

Movement	EB	EB	WB	NB	NB	SB	SB
Directions Served	L	TR	LTR	L	TR	L	TR
Maximum Queue (ft)	100	168	92	137	215	116	248
Average Queue (ft)	38	79	37	55	93	20	125
95th Queue (ft)	77	136	75	108	176	69	213
Link Distance (ft)		290	363		459		717
Upstream Blk Time (%)							
Queuing Penalty (veh)							
Storage Bay Dist (ft)	150			140		100	
Storage Blk Time (%)	0	1		0	2		10
Queuing Penalty (veh)	0	0		0	2		3

Queuing and Blocking Report  
 2029 Future Conditions - PM Peak Hour

05/03/2022

Intersection: 1: N Deborah Road & Haworth Avenue

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (ft)	116	95	79	103
Average Queue (ft)	59	45	34	54
95th Queue (ft)	93	74	61	85
Link Distance (ft)	719	328	778	723
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 2: Site Access & Haworth Avenue

Movement	WB	NB
Directions Served	LT	LR
Maximum Queue (ft)	55	31
Average Queue (ft)	4	6
95th Queue (ft)	27	26
Link Distance (ft)	290	267
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (ft)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 3: N Springbrook Road & Haworth Avenue

Movement	EB	EB	WB	NB	NB	SB	SB
Directions Served	LT	R	LTR	L	TR	L	TR
Maximum Queue (ft)	142	141	188	211	363	200	755
Average Queue (ft)	63	65	83	75	148	144	541
95th Queue (ft)	106	111	147	170	286	285	894
Link Distance (ft)		290	363		454		722
Upstream Blk Time (%)					0		35
Queuing Penalty (veh)					2		0
Storage Bay Dist (ft)	150			140		100	
Storage Blk Time (%)	0	1		1	16	0	93
Queuing Penalty (veh)	1	1		2	27	0	47

Queuing and Blocking Report  
 2029 Future Conditions - PM Peak Hour

05/03/2022

Intersection: 4: N Springbrook Road & OR-99W

Movement	EB	EB	EB	EB	WB	WB	WB	WB	WB	NB	NB	NB
Directions Served	L	T	T	R	L	L	T	T	R	L	L	T
Maximum Queue (ft)	234	414	393	45	359	443	536	567	449	238	321	316
Average Queue (ft)	98	284	265	2	222	271	325	333	36	140	195	141
95th Queue (ft)	188	394	374	45	329	393	467	492	236	244	284	262
Link Distance (ft)		1106	1106				817	817				358
Upstream Blk Time (%)							0	0			0	0
Queuing Penalty (veh)							0	0			0	0
Storage Bay Dist (ft)	400			350	500	500			350	300	300	
Storage Blk Time (%)		1	1				0	6			0	1
Queuing Penalty (veh)		1	2				3	16			2	5

Intersection: 4: N Springbrook Road & OR-99W

Movement	NB	SB	SB	SB	SB
Directions Served	R	L	L	T	R
Maximum Queue (ft)	296	182	221	256	204
Average Queue (ft)	127	115	135	132	61
95th Queue (ft)	235	169	195	219	143
Link Distance (ft)				454	
Upstream Blk Time (%)	0				
Queuing Penalty (veh)	0				
Storage Bay Dist (ft)	300	220	220		125
Storage Blk Time (%)	0	0	0	15	1
Queuing Penalty (veh)	1	0	0	70	3

Network Summary

Network wide Queuing Penalty: 184

Queuing and Blocking Report  
 2029 Future Conditions w/ Mitigation - PM Peak Hour

05/03/2022

Intersection: 3: N Springbrook Road & Haworth Avenue

Movement	EB	EB	WB	NB	NB	SB	SB
Directions Served	L	TR	LTR	L	TR	L	TR
Maximum Queue (ft)	128	177	277	189	257	159	288
Average Queue (ft)	52	84	118	71	116	34	143
95th Queue (ft)	98	143	224	125	195	95	234
Link Distance (ft)		290	363		459		717
Upstream Blk Time (%)			0				
Queuing Penalty (veh)			0				
Storage Bay Dist (ft)	150			140		100	
Storage Blk Time (%)	0	1		0	3	0	17
Queuing Penalty (veh)	0	1		1	6	0	9