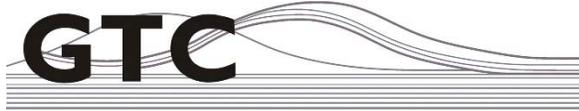


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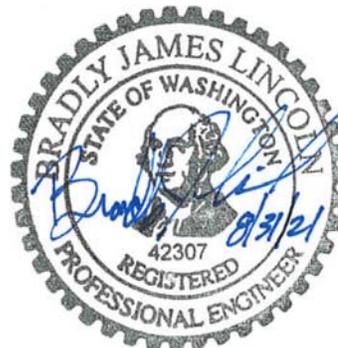


Gibson Traffic Consultants, Inc.
2813 Rockefeller Avenue
Suite B
Everett, WA 98201
425.339.8266

Garibaldi Traffic Impact Analysis

Jurisdiction: City of Monroe

August 2021



GTC #18-334

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1. DEVELOPMENT IDENTIFICATION

Gibson Traffic Consultants, Inc. (GTC) has been retained to provide a traffic impact analysis for the proposed Garibaldi development to address the City of Monroe, Snohomish County and Washington State Department of Transportation (WSDOT) traffic impacts. This report also addresses comments from City of Monroe staff and corrections in the analysis for consistency through the analysis. Brad Lincoln, responsible for this report and traffic analysis, is a licensed professional engineer (Civil) in the State of Washington and member of the Washington State section of ITE.

The Garibaldi development is proposed to consist of a total of 90 single-family residential units that will be constructed in one phase. There are 4 existing single-family residential units on site that will be removed and credited to the development. The analysis in this report has therefore been performed for 86 net new single-family residential units. The development site is located along the west side of Chain Lake Road, north of Rainier View Road SE. A site vicinity map has been included in Figure 1.

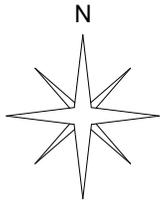
2. METHODOLOGY

Trip generation calculations for the Garibaldi development have been performed utilizing average trip generation data contained in the Institute of Transportation Engineers' (ITE) *Trip Generation, 10th Edition (2017)*. The distribution of trips generated by the site is based on approved distributions for developments in the site vicinity.

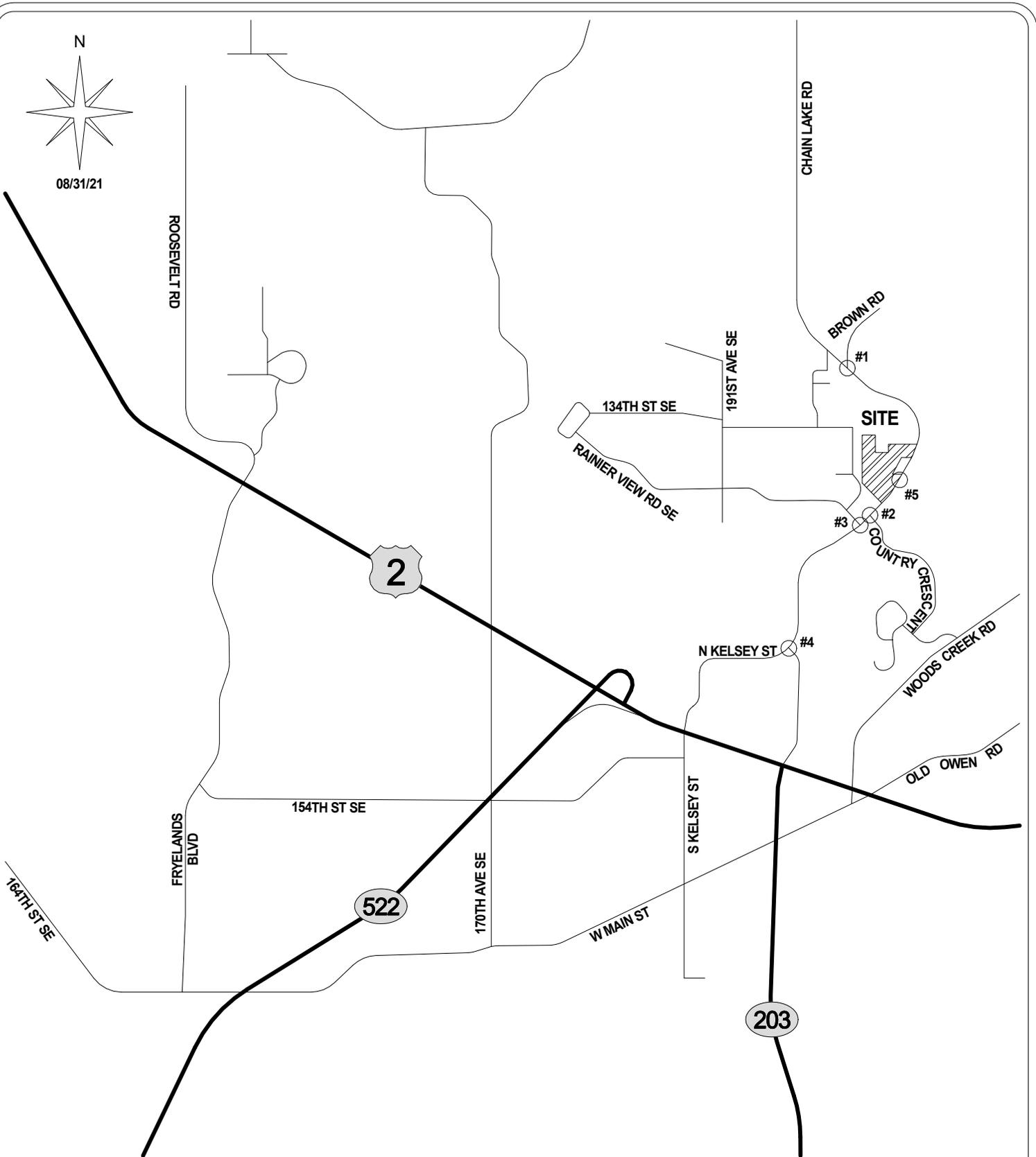
Intersection level of service analysis has been performed based on typical City of Monroe requirements and previous scoping conversations with City of Monroe staff. Level of service analysis has been performed for the following intersections:

1. Chain Lake Road at Brown Road
2. Chain Lake Road at Country Crescent Boulevard
3. Chain Lake Road at Rainier View Road SE
4. Chain Lake Road at Kelsey Street
5. Chain Lake Road at Site Access

Congestion at intersections is generally measured in terms of level of service (LOS). In accordance with *Highway Capacity Manual: 6th Edition (HCM)* by the Transportation Research Board, road facilities and intersections are rated between LOS A and LOS F, with LOS A being free flow and LOS F being forced flow or over-capacity conditions. The level of service at two-way stop-controlled intersections is based on the approach with the highest delay. The level of service at all-way stop-controlled, signalized, and roundabout intersections is based on the average delay of all approaches. Geometric characteristics and conflicting traffic movements are taken into consideration when determining level of service values. A summary of the intersection level of service criteria is included in Table 1.



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GTC #18-334**

**GARIBALDI DEVELOPMENT
86 NET NEW SINGLE FAMILY
DWELLINGS**

LEGEND



DEVELOPMENT SITE



STUDY INTERSECTION

**FIGURE 1
SITE VICINITY
MAP**

CITY OF MONROE

Table 1: Level of Service Criteria for Intersections

Level of ¹ Service	Expected Delay	Intersection Control Delay (Seconds per Vehicle)	
		Unsignalized Intersections	Signalized Intersections
A	Little/No Delay	≤10	≤10
B	Short Delays	>10 and ≤15	>10 and ≤20
C	Average Delays	>15 and ≤25	>20 and ≤35
D	Long Delays	>25 and ≤35	>35 and ≤55
E	Very Long Delays	>35 and ≤50	>55 and ≤80
F	Extreme Delays ²	>50	>80

The City of Monroe evaluates operations on a corridor level based on the weighted average delay of the intersections along the corridor. The level of service analysis has been performed utilizing the *Synchro 10.3 Build 151* software for signalized, two-way stop-controlled and all-way stop controlled intersections. The *Sidra 8.0* software has been utilized for the intersection of Chain Lake Road at Kelsey Street (Intersection 4), which is a roundabout. This intersection is not part of the Chain Lake Road corridor. The intersection level of service threshold for the Chain Lake Road corridor and the intersection of Chain Lake Road at Kelsey Street is LOS D.

The City of Monroe also has an interlocal agreement with Snohomish County to provide turning movements at Snohomish County key intersections impacted with 3 or more directional peak-hour trips on any approach or departure and for traffic mitigation fees.

¹ **Source:** *Highway Capacity Manual 6th Edition*.

LOS A: Free-flow traffic conditions, with minimal delay to stopped vehicles (no vehicle is delayed longer than one cycle at signalized intersection).

LOS B: Generally stable traffic flow conditions.

LOS C: Occasional back-ups may develop, but delay to vehicles is short term and still tolerable.

LOS D: During short periods of the peak hour, delays to approaching vehicles may be substantial but are tolerable during times of less demand (i.e. vehicles delayed one cycle or less at signal).

LOS E: Intersections operate at or near capacity, with long queues developing on all approaches and long delays.

LOS F: Jammed conditions on all approaches with excessively long delays and vehicles unable to move at times.

² When demand volume exceeds the capacity of the lane, extreme delays will be encountered with queuing which may cause severe congestion affecting other traffic movements in the intersection.

3. TRIP GENERATION

The trip generation calculations for the Garibaldi development are based on the average trip generation rates for ITE Land Use Code 210, Single-Family Detached Housing. The trip generation calculations are based on the 86 net new units of the Garibaldi development, which includes credit for the 2 existing units on the site, and are summarized in Table 2.

Table 2: Trip Generation Summary

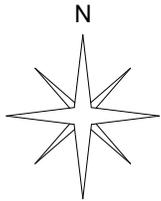
86 Net New Single-Family Residential Units	Average Daily Trips			AM Peak-Hour Trips			PM Peak-Hour Trips		
	Inbound	Outbound	Total	Inbound	Outbound	Total	Inbound	Outbound	Total
Generation Rate	9.44 trips per unit			0.74 trips per unit			0.99 trips per unit		
Splits	50%	50%	100%	25%	75%	100%	63%	37%	100%
Trips	405.92	405.92	811.84	15.91	47.73	63.64	53.64	31.50	85.14

The 86 net new units are anticipated to generate approximately 812 average daily trips with approximately 64 AM peak-hour trips and 85 PM peak-hour trips.

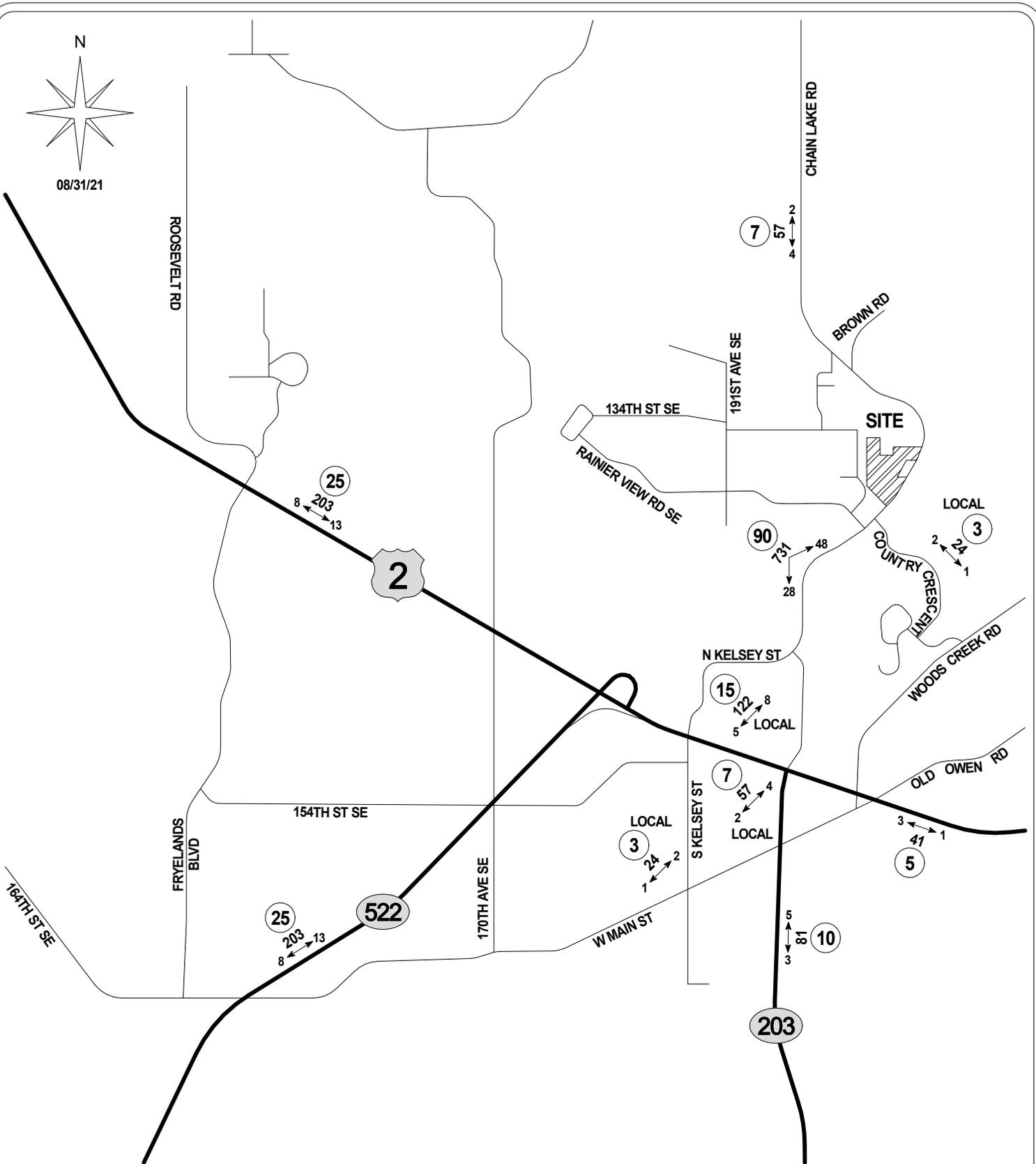
4. TRIP DISTRIBUTION

The distribution of trips generated by the Garibaldi development is based on approved distributions for developments in the site vicinity. It is anticipated that 25% of the trips generated by the development will travel to and from the west along US-2. Approximately 35% of the trips generated by the development will travel to and from the south, twenty-five percent along SR-522 and ten percent along SR-203. It is estimated that 28% of the trips generated by the development will travel to and from local areas in the vicinity of the development, ten percent south of US-2, fifteen percent north of US-2, and three percent to the east. The remaining 12% of the trips generated by the development are anticipated to travel to and from the north and east, seven percent to and from the north along Chain Lake Road and five percent to and from the east along US-2. Detailed distributions are included in Figure 2 for the AM peak-hour and Figure 3 for the PM peak-hour.

The interlocal agreement with Snohomish County requires key intersections impacted with 3 or more directional peak-hour trips on any approach or departure to be shown. The Garibaldi development will impact 7 key intersections during the AM and PM peak-hours. The key intersection impacts are shown in detail in the attachments of this report. Snohomish County's trip distribution policy states that trips along US-2 do not need to be distributed west of 88th Street SE. Trips traveling to and from the south along SR-522 and SR-203 are anticipated to travel to and from King County.



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GARIBALDI DEVELOPMENT
86 NET NEW SINGLE FAMILY DWELLINGS

LEGEND
AWDT
PM ↔ PEAK

NEW SITE TRAFFIC
(DAILY/PEAK-HOUR)



TRIP DISTRIBUTION %

FIGURE 3
DEVELOPMENT
TRIP DISTRIBUTION
PM PEAK-HOUR

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5. INTERSECTION LEVEL OF SERVICE ANALYSIS

The intersections that have been analyzed as part of this report are based on the typical City of Monroe and WSDOT requirements and previous scoping discussions with City of Monroe staff. Level of service analysis has been performed for the following intersections for the weekday PM peak-hour:

1. Chain Lake Road at Brown Road
2. Chain Lake Road at Country Crescent Boulevard
3. Chain Lake Road at Rainier View Road SE
4. Chain Lake Road at Kelsey Street
5. Chain Lake Road at Site Access

The analysis has been completed for the 2018 existing, 2031 baseline and 2031 future with development conditions.

5.1 Turning Movement Volumes

Historical counts were used in lieu of collecting new counts at the study intersection due to the Covid-19 Pandemic. The existing turning movements at the study intersections are based on data collected by the independent count firm, Traffic Data Gathering (TDG), in January and March 2018. An additional count was provided by the City of Monroe, performed in September 2018 by the independent count firm Idax. The existing turning movements at the study intersections are shown in Figure 4.

The 2031 baseline volumes have been calculated using a 10-year horizon period and applying a 2% annually compounding growth rate with the following pipeline developments (new units after credit for existing units are shown):

- Eaglemont I-III (F.K.A. Eaglemont) – 15 unconstructed new single-family units
- Eaglemont IV (F.K.A. Eaglemont IV-VIII) – 117 new single-family units
- Eaglemont V – 15 new single-family units
- Eaglemont VI (F.K.A. Sky View Ridge) – 44 new single-family units
- Eaglemont VII – 41 new single-family units
- Easton Cove (F.K.A. Klier Property) – 88 new single-family units
- Sweetbriar – 100 new single-family units
- Skycroft – 25 new single-family units
- Clothier Short Plat – 6 new single-family units
- Woods Creek Highlands – 24 new single-family units
- Kestrel Ridge – 44 new single-family units

The approved PM peak-hour trip distributions for the pipeline developments are included in the attachments. For the pipeline projects where a trip distribution was not available, the pipeline trips were distributed in accordance with the Garibaldi distribution.

The Eaglemont I-III development is anticipated to have a total of 149 units, however, GTC staff surveyed the area and found 134 completed and lived-in houses at the time of the counts in March 2018, resulting in 15 unconstructed houses for the Eaglemont I-III development. Additionally, Easton Cove has been updated to include one more unit (one more inbound trip) and Sweetbriar has been updated to include 6 fewer units (four fewer inbound trips and two fewer outbound trips) from the information provided in the attachments. Although the count provided by the city was performed later in the year, the same number of pipeline trips were applied to the intersection. This will make the volume at the intersection conservatively high as more houses would have been completed between the January/March counts and the September count.

The 2031 baseline turning movements at the study intersections are shown in Figure 5. The 2031 future with development turning movements were calculated by adding the trips from the development to the 2031 baseline turning movements. The 2031 future with development turning movements are shown in Figure 6. The existing turning movement counts and turning movement calculations are included in the attachments.

5.2 Intersection Level of Service Results

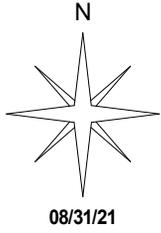
The level of service analysis has been performed utilizing the existing control, channelization, peak-hour factors and heavy-vehicle factors from the 2018 counts.

The level of service analysis shows that the development will not cause the level of service to change at any of the study intersections and the Chain Lake Corridor is anticipated to operate at acceptable LOS D with the development. The level of service results for the study intersections are summarized in Table 3.

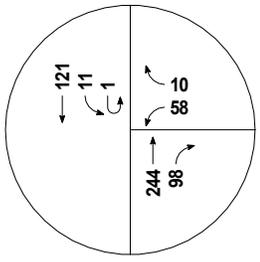
Table 3: Intersection Level of Service Summary

Intersection	Intersection Type	2018 Existing Conditions		2031 Baseline Conditions		2031 Future Conditions with Development	
		LOS	Delay	LOS	Delay	LOS	Delay
1. Chain Lake Road at Brown Road	Two-Way Stop-Control	B	11.0 sec	C	18.7 sec	C	18.8 sec
2. Chain Lake Road at Country Crescent Blvd	Two-Way Stop-Controlled	C	15.1 sec	D	29.5 sec	D	34.4 sec
3. Chain Lake Road at Rainier View Road SW	Two-Way Stop-Control	B	13.0 sec	E	37.0 sec	E	44.6 sec
Chain Lake Corridor		B	12.9 sec	C	30.9 sec	D	36.2 sec
4. Chain Lake Road at Kelsey Street	Roundabout	A	7.3 sec	B	13.4 sec	B	16.5 sec
5. Chain Lake Road at Site Access	Two-Way Stop-Controlled	---	---	---	---	B	12.0 sec

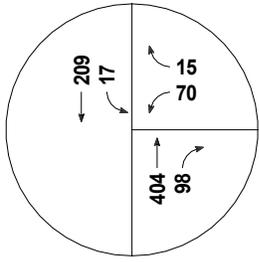
The level of service calculations are included in the attachments.



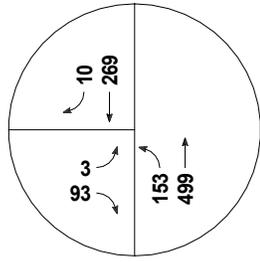
#1 CHAIN LAKE RD @ BROWN RD



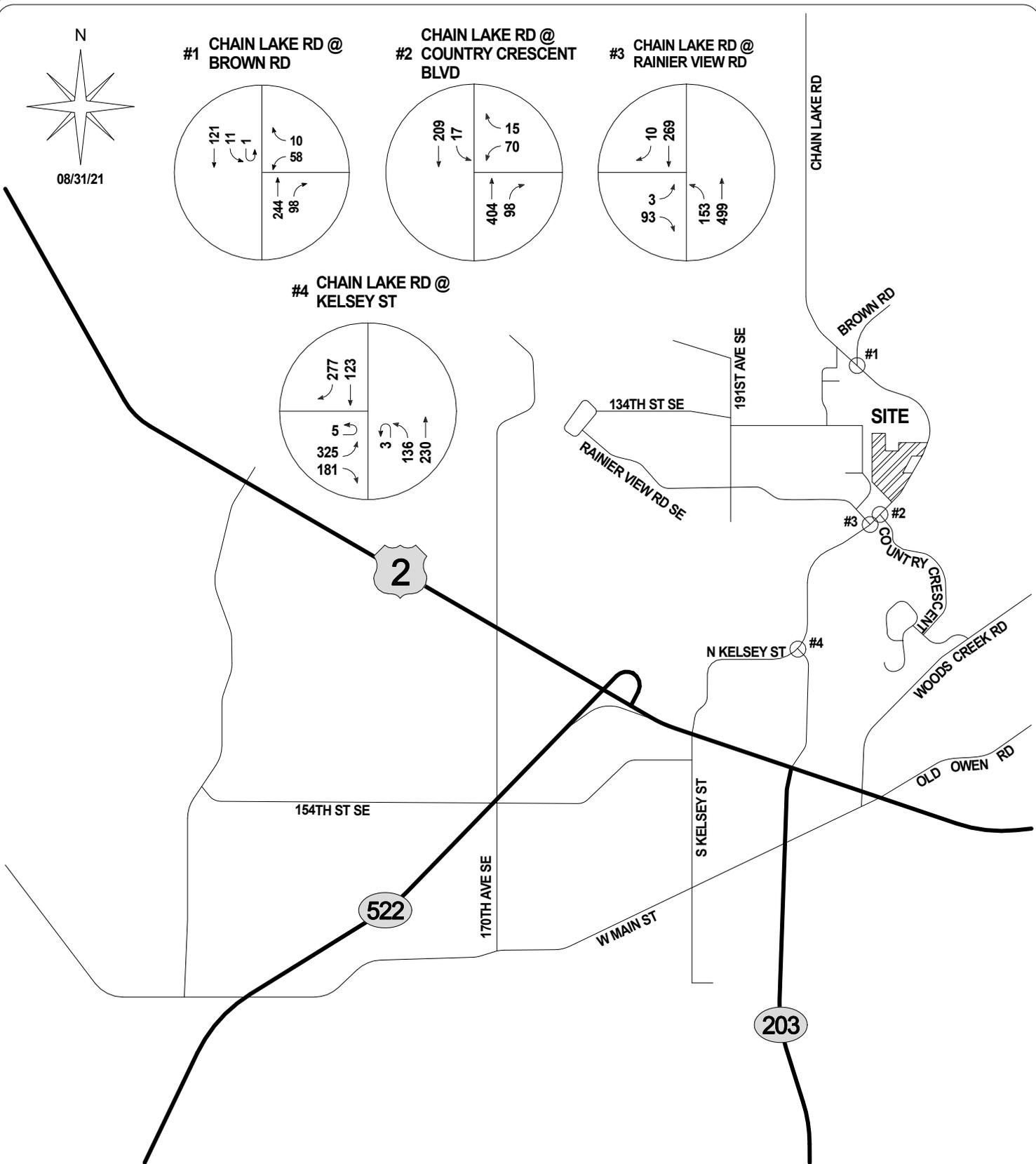
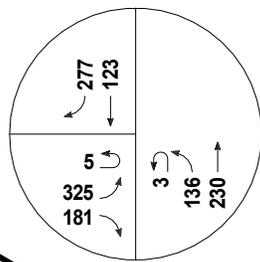
#2 CHAIN LAKE RD @ COUNTRY CRESCENT BLVD



#3 CHAIN LAKE RD @ RAINIER VIEW RD



#4 CHAIN LAKE RD @ KELSEY ST



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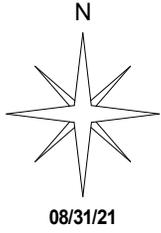
GARIBALDI DEVELOPMENT
86 NET NEW SINGLE FAMILY DWELLINGS

LEGEND

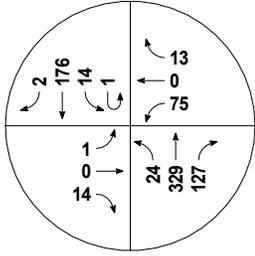
XXX → PM PEAK-HOUR TURNING MOVEMENT VOLUMES

FIGURE 4
EXISTING
TURNING MOVEMENTS

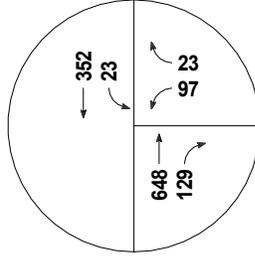
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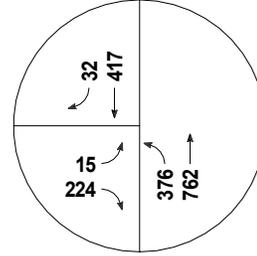
#1 CHAIN LAKE RD @ BROWN RD



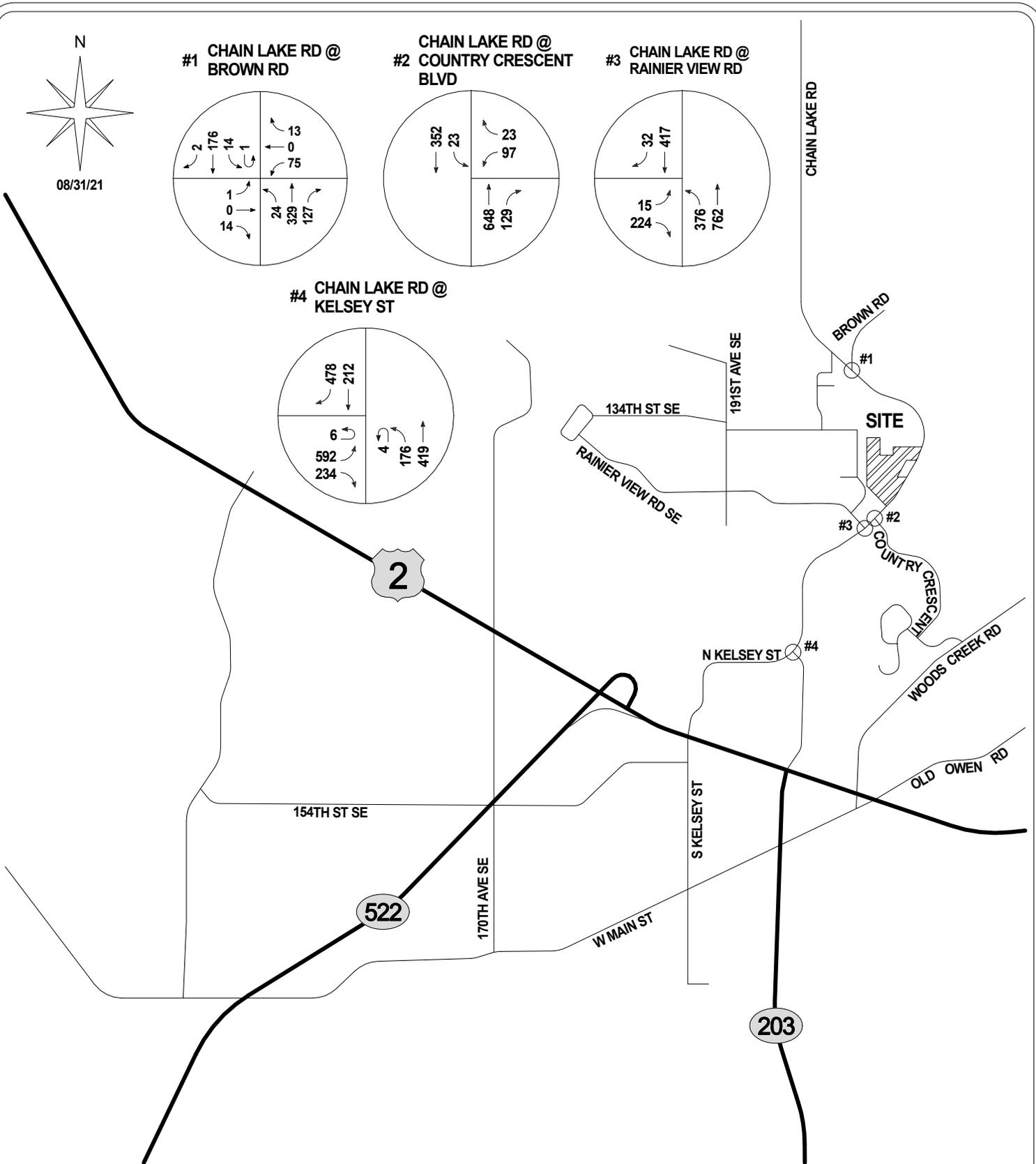
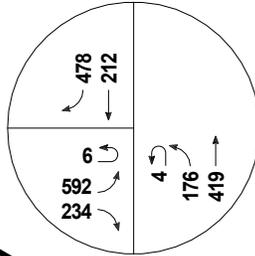
#2 CHAIN LAKE RD @ COUNTRY CRESCENT BLVD



#3 CHAIN LAKE RD @ RAINIER VIEW RD



#4 CHAIN LAKE RD @ KELSEY ST



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GTC #18-334

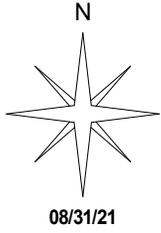
GARIBALDI DEVELOPMENT
86 NET NEW SINGLE FAMILY DWELLINGS

LEGEND

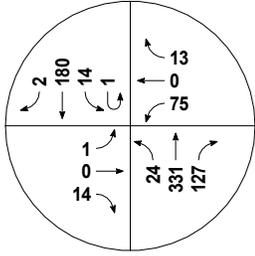
XXX → PM PEAK-HOUR TURNING MOVEMENT VOLUMES

FIGURE 5
2031 BASELINE
TURNING MOVEMENTS

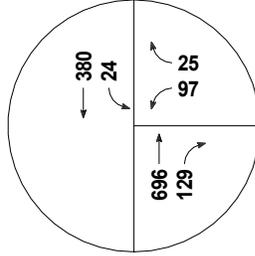
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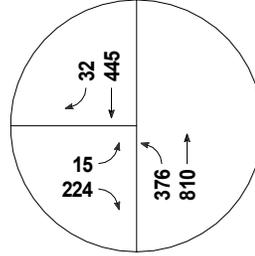
#1 CHAIN LAKE RD @ BROWN RD



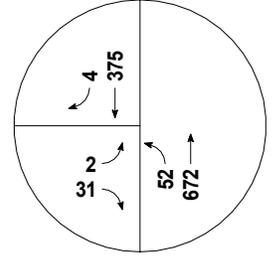
#2 CHAIN LAKE RD @ COUNTRY CRESCENT BLVD



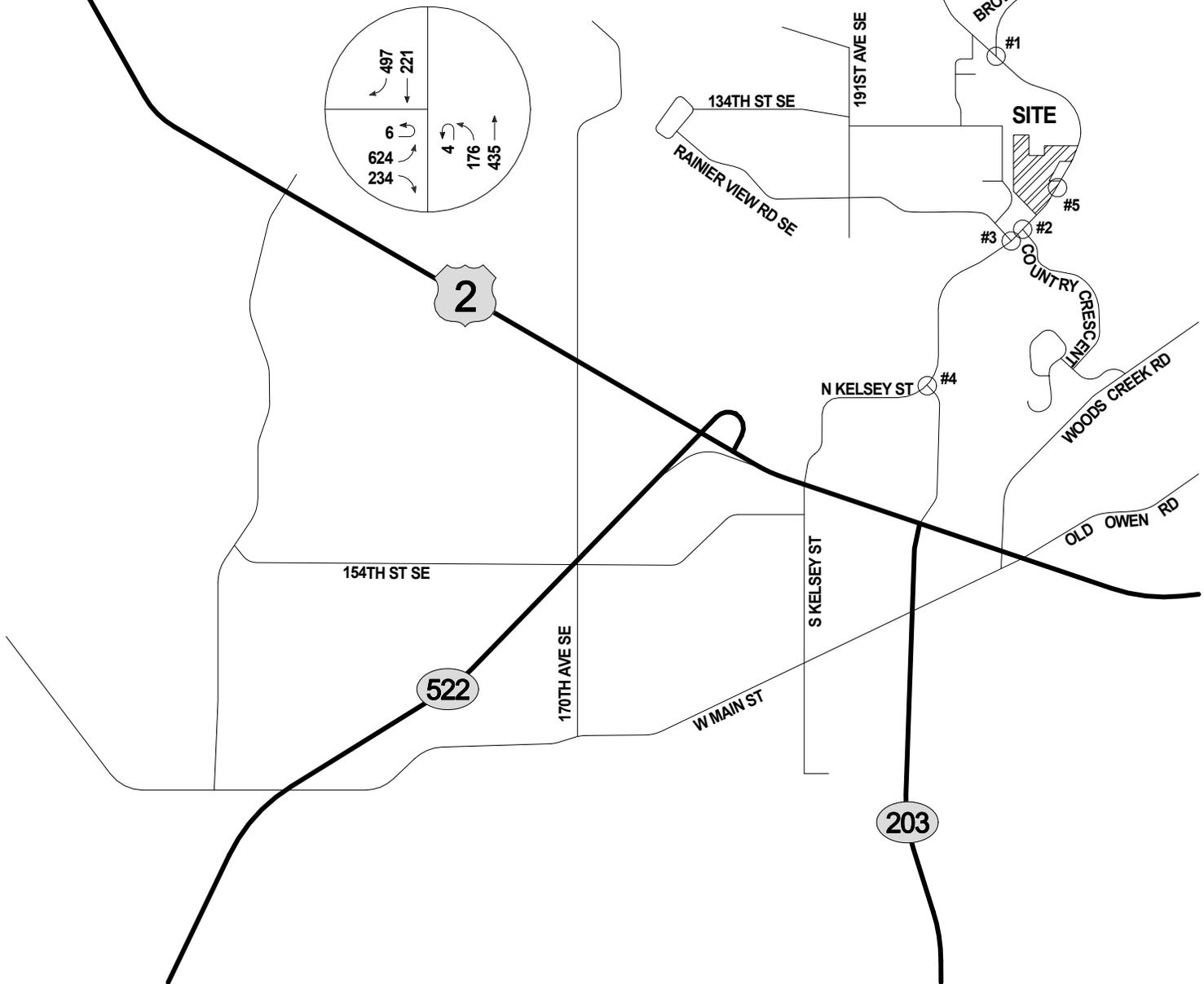
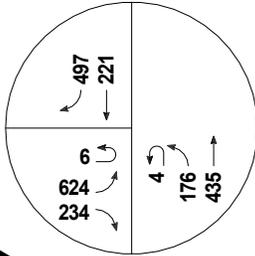
#3 CHAIN LAKE RD @ RAINIER VIEW RD



#5 CHAIN LAKE RD @ SITE ACCESS



#4 CHAIN LAKE RD @ KELSEY ST



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**GARIBALDI DEVELOPMENT
86 NET NEW SINGLE FAMILY
DWELLINGS**

LEGEND

XXX → PM PEAK-HOUR TURNING MOVEMENT VOLUMES

CITY OF MONROE

**FIGURE 6
2031 FUTURE
WITH DEVELOPMENT
TURNING MOVEMENTS**

6. TRAFFIC MITIGATION FEES

The Washington Growth Management Act and Revised Code of Washington 82.02.050(2) authorize local jurisdictions to establish proportionate share traffic mitigation fees in order to fund capital facilities, such as roads and intersections. The Garibaldi development is located within the City of Monroe, which has established traffic mitigation fees. The City of Monroe also has interlocal agreements with Snohomish County and WSDOT for traffic mitigation fees.

6.1 City of Monroe

The City of Monroe has established a traffic mitigation fee schedule. The fee for single-family residential units is \$3,570 per unit. The 86 net new units of the Garibaldi development will result in City of Monroe traffic mitigation fees of \$307,020. It should be noted that these fees may not vest and may be higher when the building applications are pulled.

6.2 Snohomish County

The City of Monroe and Snohomish County have an interlocal agreement that provides for the payment of traffic mitigation for impacts to Snohomish County roadways by City of Monroe developments. Traffic mitigation fees are based on predetermined area impacts or impacts to actual improvement projects. The trip distribution shows that the Garibaldi development will not impact any Snohomish County improvement projects in the Transportation Needs Report with three directional PM peak-hour trips. According to Section 3(a)2 of the *Snohomish County Traffic Worksheet and Traffic Study Requirements for Developments in the City of Monroe*, City of Monroe developments are only required to pay traffic mitigation fees for improvements in the Transportation Needs Report impacted with three directional peak-hour trips. Snohomish County traffic mitigation fees should therefore not be required for the Garibaldi development.

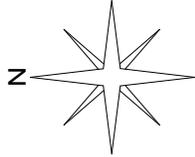
6.3 WSDOT

The City of Monroe and WSDOT have an interlocal agreement that provides for the payment of traffic mitigation fees. The interlocal agreement states that a development only has a “significant adverse impact” if the development contributes 25 or more trips to a WSDOT intersection. The WSDOT intersection impacted with more than 25 development trips is expected to operate at acceptable levels of service according to the interlocal agreement between the City of Monroe and WSDOT. WSDOT does not have a collection project for this intersection and therefore the WSDOT traffic mitigation fees should not be required for the Garibaldi development.

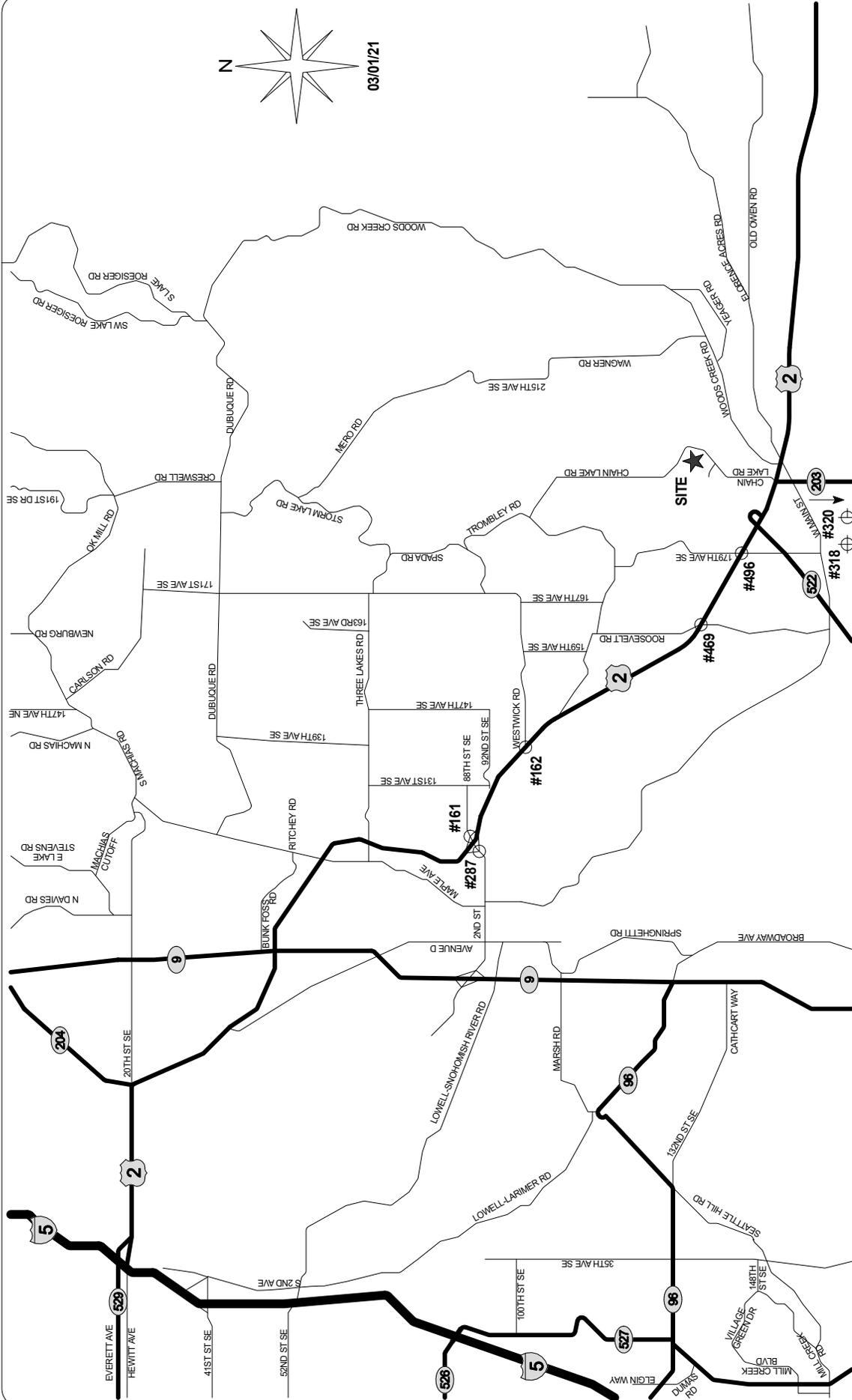
7. CONCLUSIONS

The Garibaldi development is proposed to consist of 90 single-family residential units with 4 existing units being removed. The 86 net new units of the Garibaldi development are anticipated to generate approximately 812 average daily trips with approximately 64 AM peak-hour trips and 85 PM peak-hour trips. The level of service analysis shows that the Chain Lake Road corridor will operate at LOS D and the intersection of Chain Lake Road at Kelsey Street will operate at LOS B, both of which meet City of Monroe standards. The Garibaldi development will have City of Monroe traffic mitigation fees of \$307,020. The impacts of the development will not meet the thresholds for paying traffic mitigation fees to Snohomish County or WSDOT.

Snohomish County Key Intersection Impacts



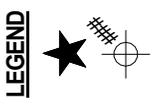
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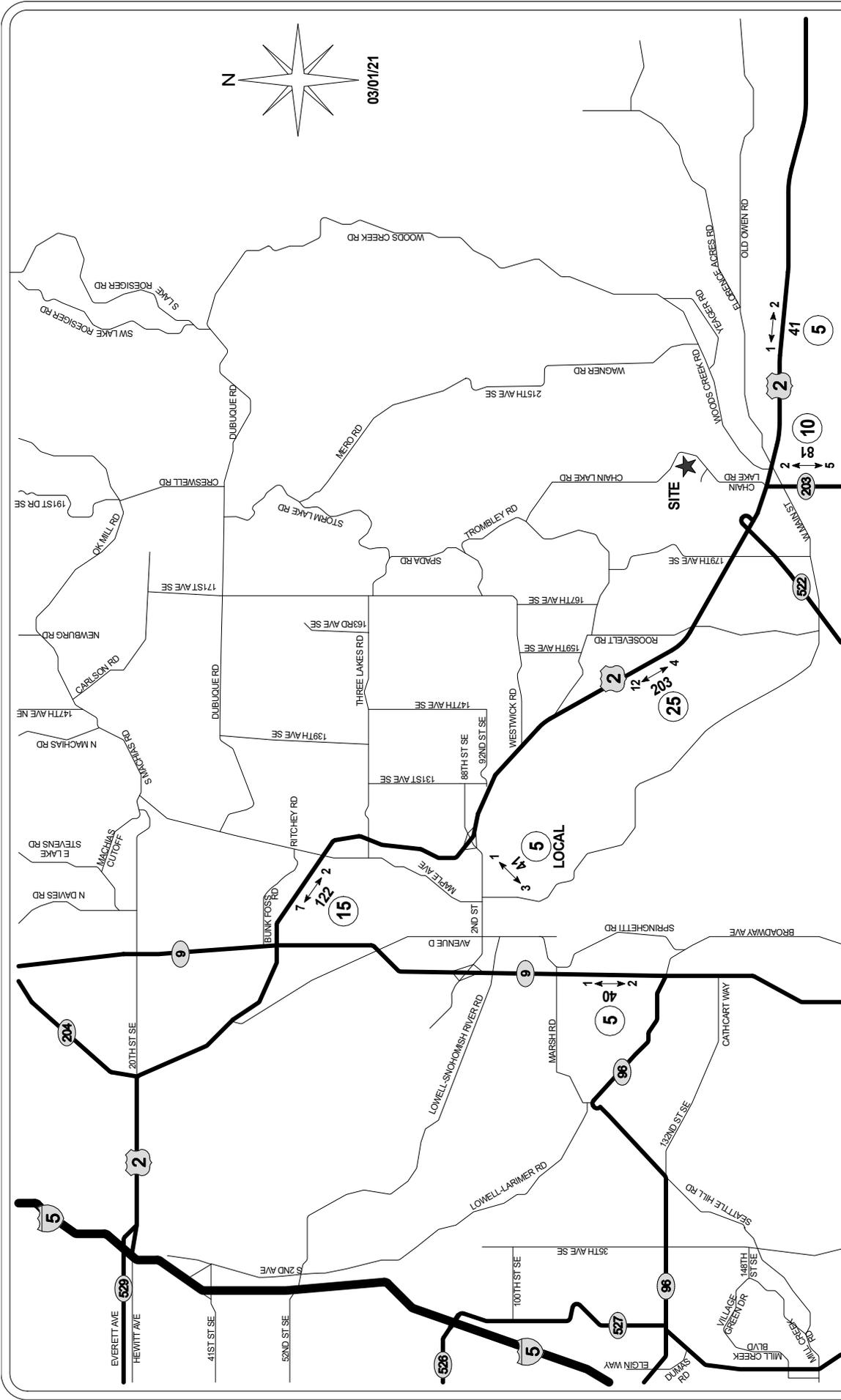
FIGURE A1
KEY INTERSECTION
LOCATIONS

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GARIBALDI DEVELOPMENT
86 NET NEW SINGLE FAMILY
DWELLINGS

CITY OF MONROE



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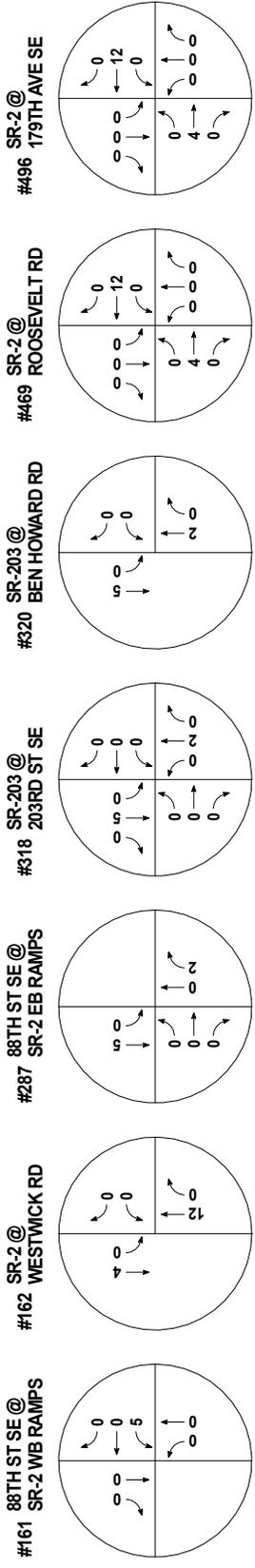
FIGURE A2
DEVELOPMENT
TRIP DISTRIBUTION
AM PEAK-HOUR

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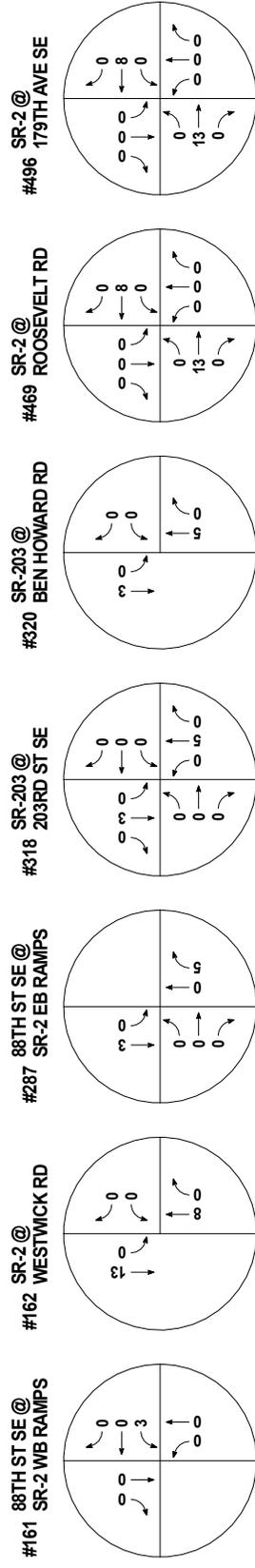
LEGEND
 NEW SITE TRAFFIC
 DAILY AND AM PEAK-HOUR
 AM ← PEAK
 TRIP DISTRIBUTION %
 (XX)

GARIBALDI DEVELOPMENT
86 NET NEW SINGLE FAMILY
DWELLINGS

CITY OF MONROE



**AM
PEAK-HOUR**



**PM
PEAK-HOUR**

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GARIBALDI DEVELOPMENT
86 NET NEW SINGLE FAMILY DWELLINGS

LEGEND

XXX → PEAK HOUR TURNING MOVEMENT VOLUME

FIGURE A4
DEVELOPMENT
KEY INTERSECTION VOLUMES
AM & PM PEAK-HOURS

CITY OF MONROE

Key AM Peak-Hour Key Intersection Volumes

Intersection	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
#161: 88 th St SE at SR-2 WB Ramps	N/A	N/A	N/A	5	0	0	0	0	N/A	N/A	0	0
#162: SR-2 at Westwick Rd	N/A	N/A	N/A	0	N/A	0	N/A	12	0	0	5	N/A
#287: 88 th St SE at SR-2 EB Ramps	0	0	0	N/A	N/A	N/A	N/A	0	2	0	5	N/A
#318: SR-203 at 203 rd St SE	0	0	0	0	0	0	0	2	0	0	5	0
#320: SR-203 at Ben Howard Rd	N/A	N/A	N/A	0	N/A	0	N/A	2	0	0	5	N/A
#469: SR-2 at Roosevelt Rd	0	4	0	0	12	0	0	0	0	0	0	0
#496: SR-2 at 179 th Ave SE	0	4	0	0	12	0	0	0	0	0	0	0

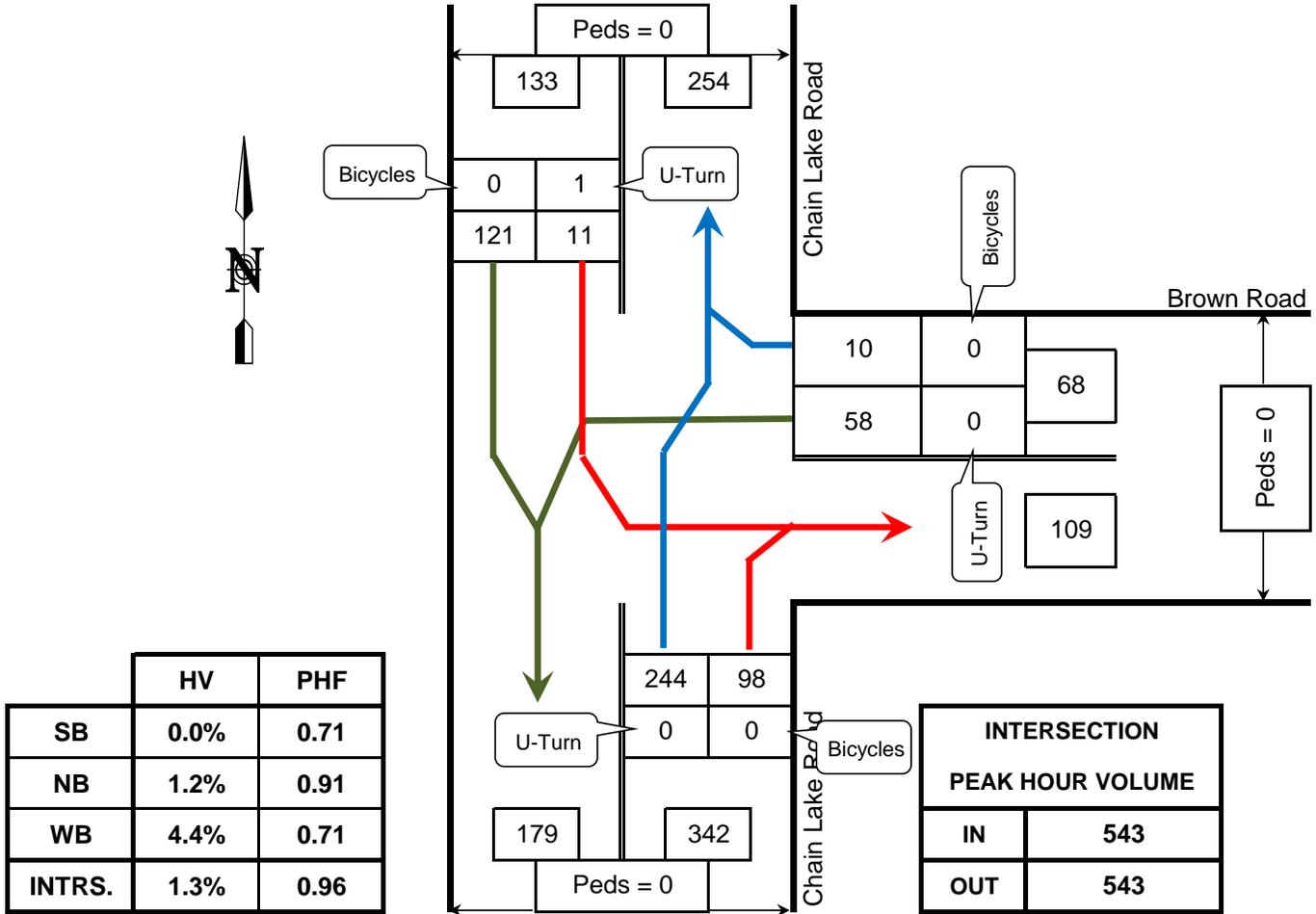
PM Peak-Hour Key Intersection Volumes

Intersection	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
#161: 88 th St SE at SR-2 WB Ramps	N/A	N/A	N/A	3	0	0	0	0	N/A	N/A	0	0
#162: SR-2 at Westwick Rd	N/A	N/A	N/A	0	N/A	0	N/A	8	0	0	13	N/A
#287: 88 th St SE at SR-2 EB Ramps	0	0	0	N/A	N/A	N/A	N/A	0	5	0	3	N/A
#318: SR-203 at 203 rd St SE	0	0	0	0	0	0	0	5	0	0	3	0
#320: SR-203 at Ben Howard Rd	N/A	N/A	N/A	0	N/A	0	N/A	5	0	0	3	N/A
#469: SR-2 at Roosevelt Rd	0	13	0	0	8	0	0	0	0	0	0	0
#496: SR-2 at 179 th Ave SE	0	13	0	0	8	0	0	0	0	0	0	0

Turning Movement Calculations and Counts

TURNING MOVEMENTS DIAGRAM

4:00 PM - 6:00 PM PEAK HOUR: 4:15 PM TO 5:15 PM



HV = Heavy Vehicles
PHF = Peak Hour Factor

Chain Lake Road @ Brown Road

Monroe, WA

COUNTED BY: VT/CN

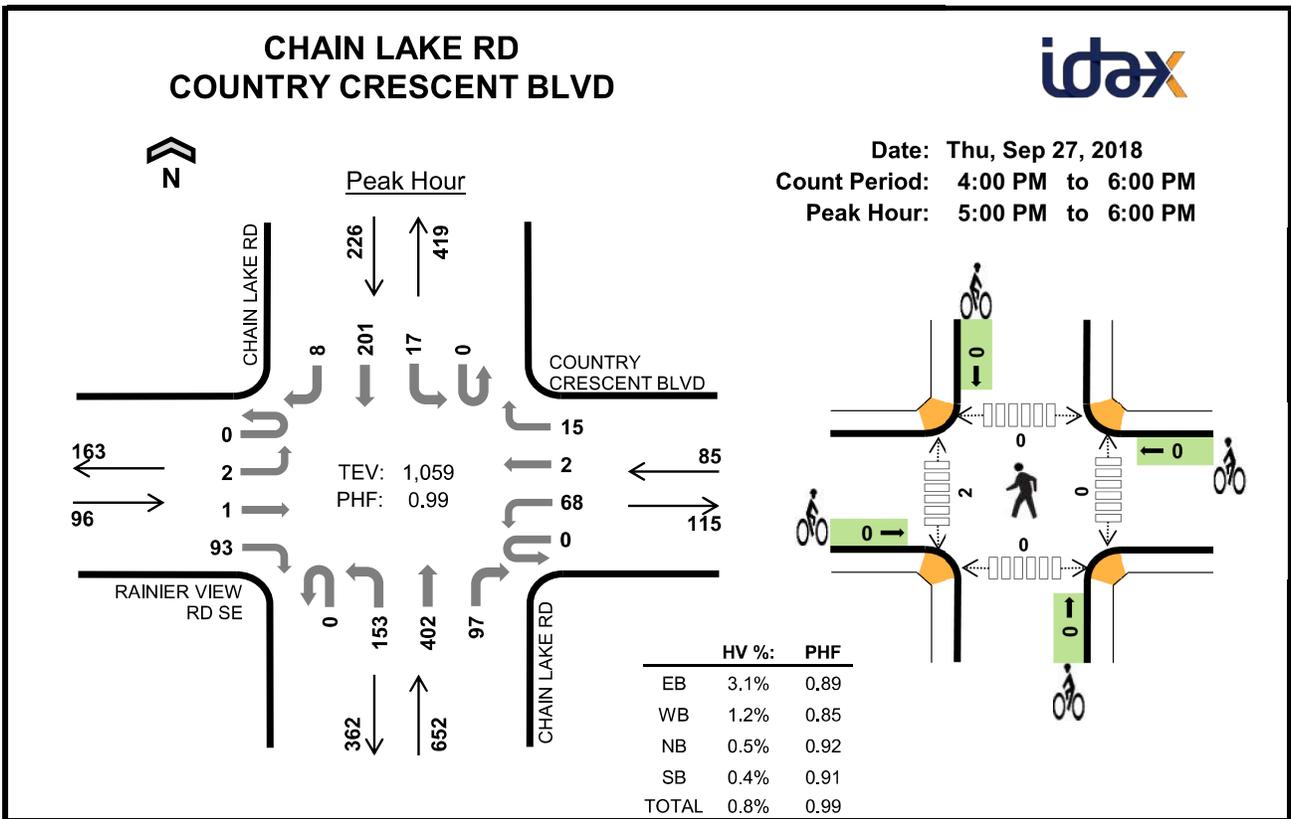
DATE OF COUNT: Wed. 1/31/18

REDUCED BY: CN

TIME OF COUNT: 4:00 PM - 6:00 PM

REDUCTION DATE: Tue. 2/6/18

WEATHER: Rainy



Two-Hour Count Summaries

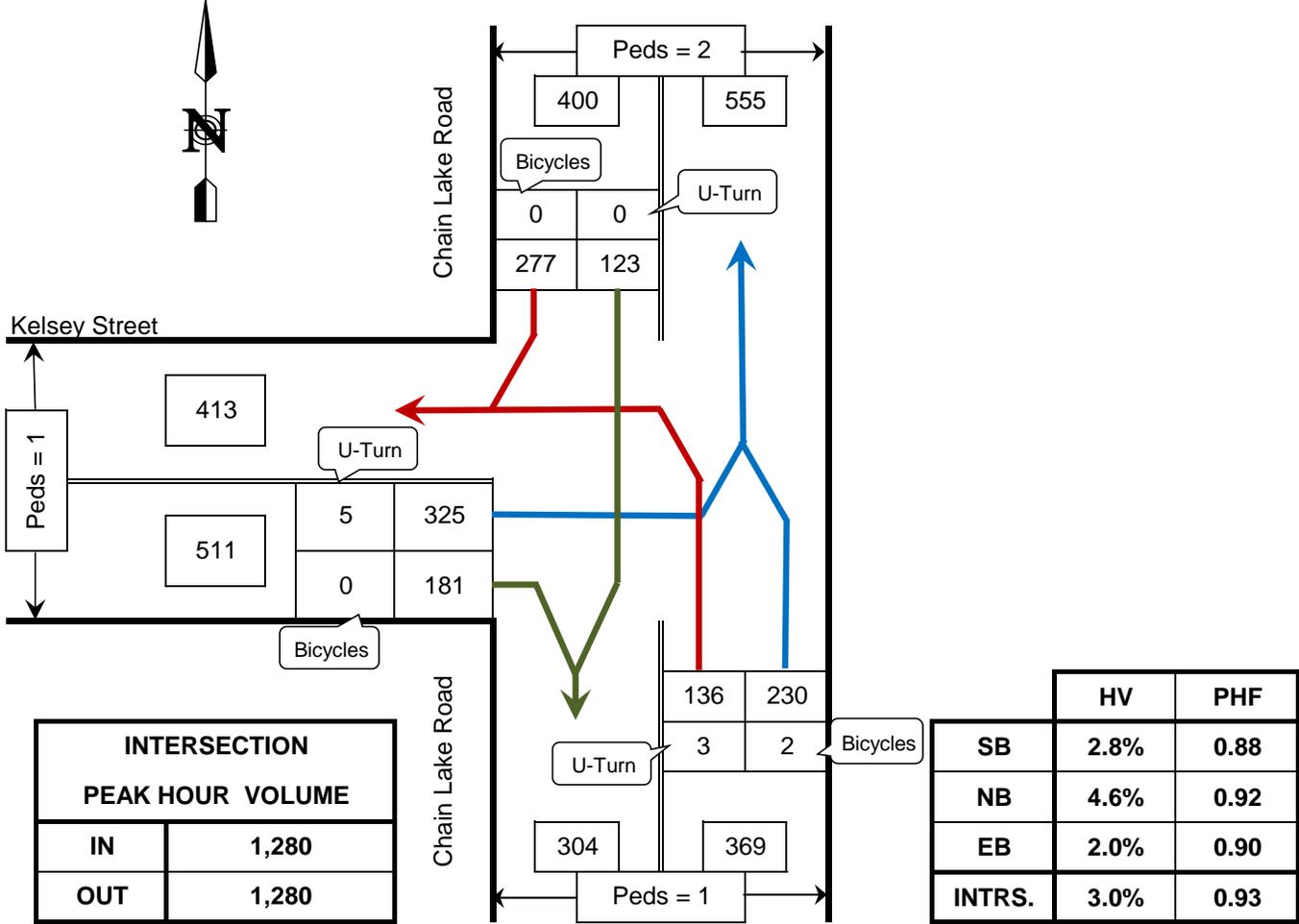
Interval Start	RAINIER VIEW RD SE				COUNTRY CRESCENT BLVD				CHAIN LAKE RD				CHAIN LAKE RD				15-min Total	Rolling One Hour
	Eastbound				Westbound				Northbound				Southbound					
	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT	UT	LT	TH	RT		
4:00 PM	0	3	3	23	0	11	0	1	0	39	87	15	0	4	36	4	226	0
4:15 PM	0	1	1	24	1	14	2	5	0	35	95	22	0	2	55	2	259	0
4:30 PM	0	4	1	29	0	16	0	3	0	31	86	17	0	1	63	1	252	0
4:45 PM	0	1	0	22	0	18	2	2	0	35	68	23	0	5	48	1	225	962
5:00 PM	0	0	0	19	0	13	1	3	0	40	106	32	0	2	47	2	265	1,001
5:15 PM	0	1	0	23	0	21	1	3	0	35	104	20	0	5	53	2	268	1,010
5:30 PM	0	0	1	25	0	15	0	4	0	38	100	24	0	6	45	2	260	1,018
5:45 PM	0	1	0	26	0	19	0	5	0	40	92	21	0	4	56	2	266	1,059
Count Total	0	11	6	191	1	127	6	26	0	293	738	174	0	29	403	16	2,021	0
Peak Hour	0	2	1	93	0	68	2	15	0	153	402	97	0	17	201	8	1,059	0

Note: Two-hour count summary volumes include heavy vehicles but exclude bicycles in overall count.

Interval Start	Heavy Vehicle Totals					Bicycles					Pedestrians (Crossing Leg)				
	EB	WB	NB	SB	Total	EB	WB	NB	SB	Total	East	West	North	South	Total
4:00 PM	0	0	5	1	6	0	0	0	0	0	0	0	0	0	0
4:15 PM	3	0	3	0	6	0	0	0	0	0	0	0	0	0	0
4:30 PM	1	0	2	3	6	0	0	0	0	0	0	2	0	0	2
4:45 PM	0	0	1	0	1	0	0	0	0	0	0	4	0	0	4
5:00 PM	1	0	1	1	3	0	0	0	0	0	0	0	0	0	0
5:15 PM	1	0	0	0	1	0	0	0	0	0	0	0	0	0	0
5:30 PM	0	1	1	0	2	0	0	0	0	0	0	2	0	0	2
5:45 PM	1	0	1	0	2	0	0	0	0	0	0	0	0	0	0
Count Total	7	1	14	5	27	0	0	0	0	0	0	8	0	0	8
Peak Hour	3	1	3	1	8	0	0	0	0	0	0	2	0	0	2

TURNING MOVEMENTS DIAGRAM

4:00 PM - 6:00 PM PEAK HOUR: 4:00 PM TO 5:00 PM



HV = Heavy Vehicles
PHF = Peak Hour Factor

Chain Lake Road @ Kelsey Street

Monroe, WA

COUNTED BY: VT
 REDUCED BY: CN
 REDUCTION DATE: Fri. 3/9/18

DATE OF COUNT: Wed. 3/7/18
 TIME OF COUNT: 4:00 PM - 6:00 PM
 WEATHER: Overcast

2 Country Crescent @ Chain Lake

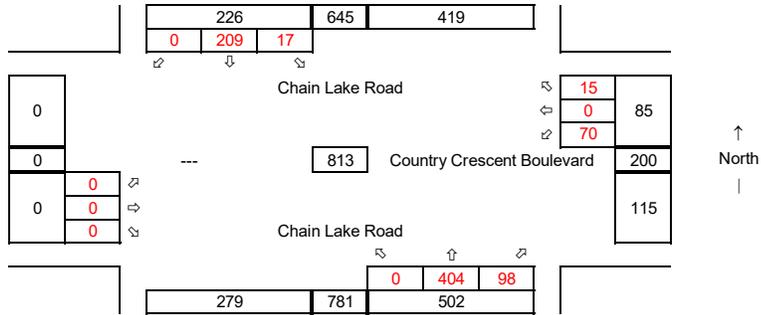
Synchro ID: 2

Existing

Average Weekday
PM Peak Hour

Year: 9/27/18

Data Source: Idax



Future without Project

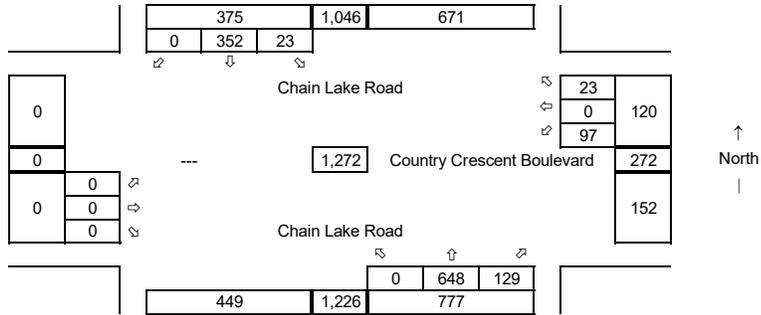
Average Weekday
PM Peak Hour

Year: 2031

Growth Rate = 2.0%

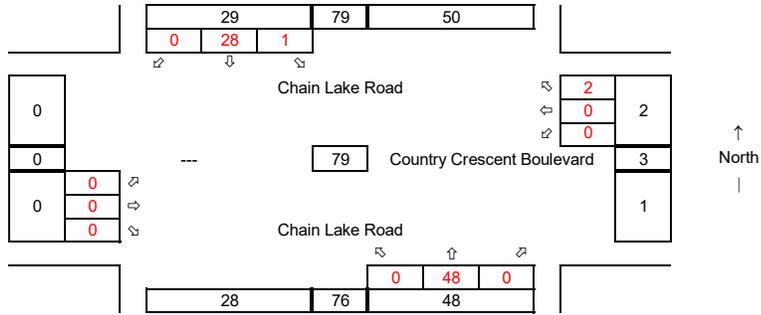
Years of Growth = 13

Total Growth = 1.2936



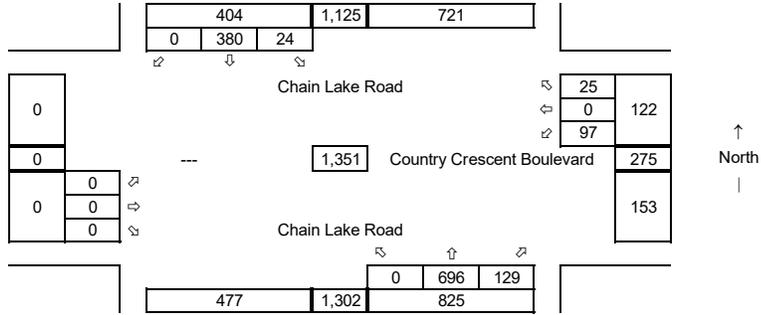
Total Project Trips

Average Weekday
PM Peak Hour



Future with Project

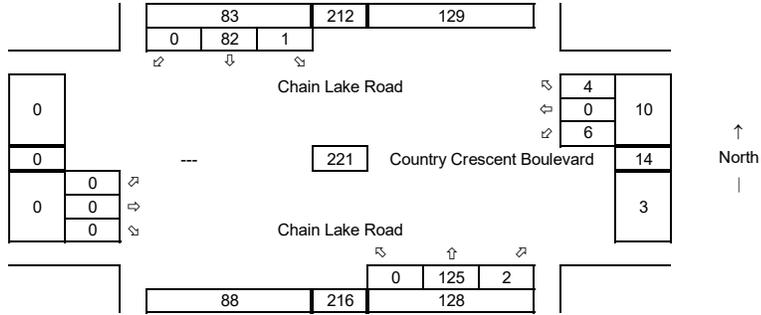
Average Weekday
PM Peak Hour



Pipeline Trips

Average Weekday
PM Peak Hour

- Eaglemont 1-7
- Easton Cove
- Sweetbriar
- Skycroft
- Clothier Short Plat
- Woods Creek Highlands
- Kestrel Ridge



3 Rainier View @ Chain Lake

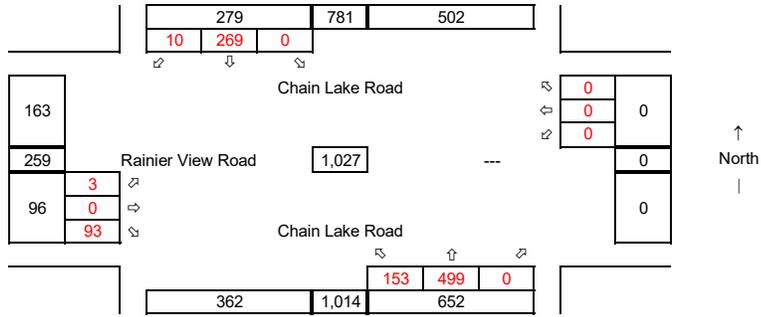
Synchro ID: 3

Existing

Average Weekday
PM Peak Hour

Year: 1/31/18

Data Source: TDG



Future without Project

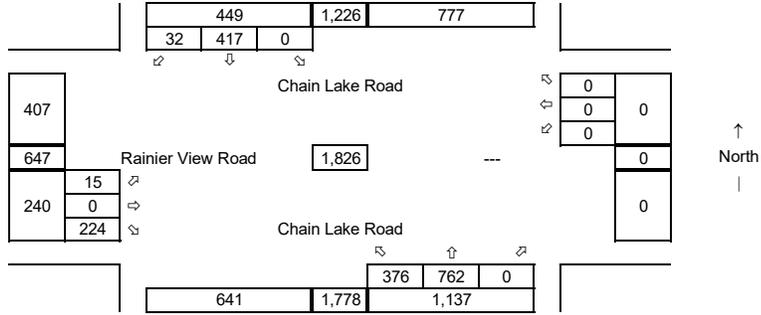
Average Weekday
PM Peak Hour

Year: 2031

Growth Rate = 2.0%

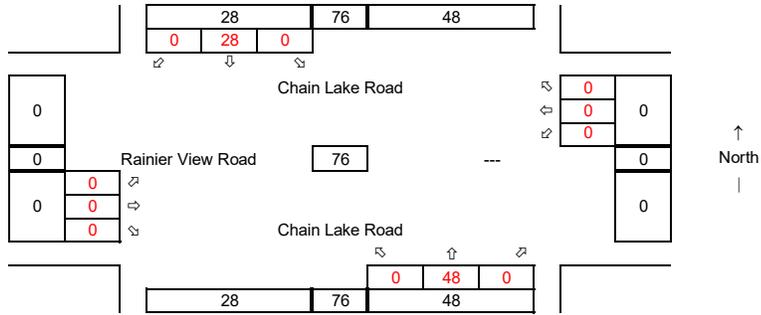
Years of Growth = 13

Total Growth = 1.2936



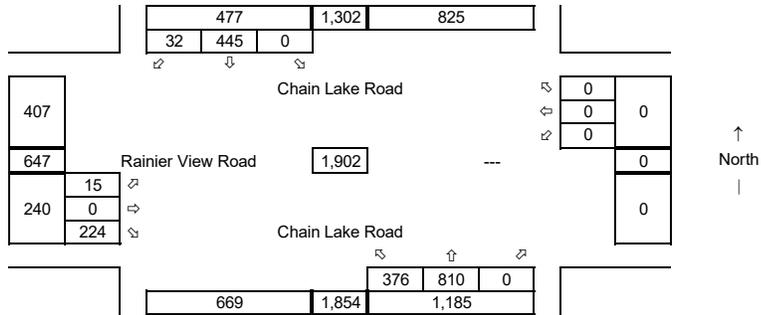
Total Project Trips

Average Weekday
PM Peak Hour



Future with Project

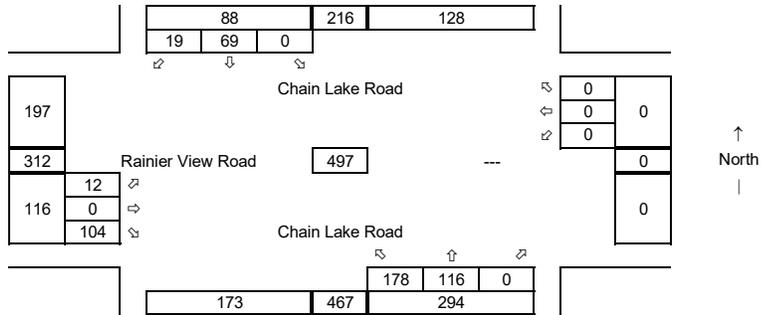
Average Weekday
PM Peak Hour



Pipeline Trips

Average Weekday
PM Peak Hour

- Eaglemont 1-7
- Easton Cove
- Sweetbriar
- Skycroft
- Clothier Short Plat
- Woods Creek Highlands
- Kestrel Ridge



4 Kelsey St @ Chain Lake Rd

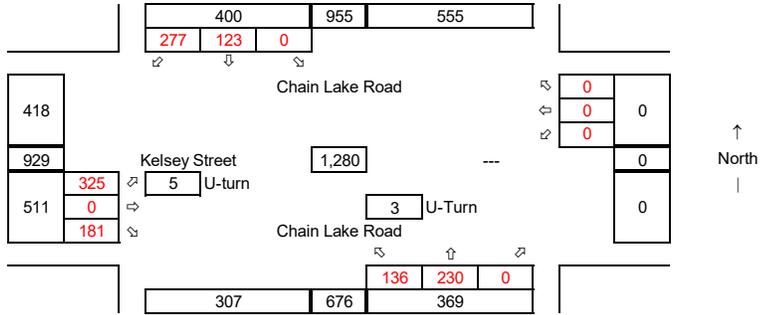
Synchro ID: 4

Existing

Average Weekday
PM Peak Hour

Year: 3/7/18

Data Source: TDG



Future without Project

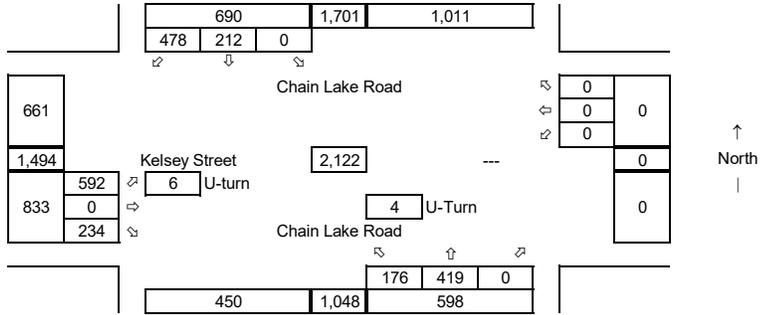
Average Weekday
PM Peak Hour

Year: 2031

Growth Rate = 2.0%

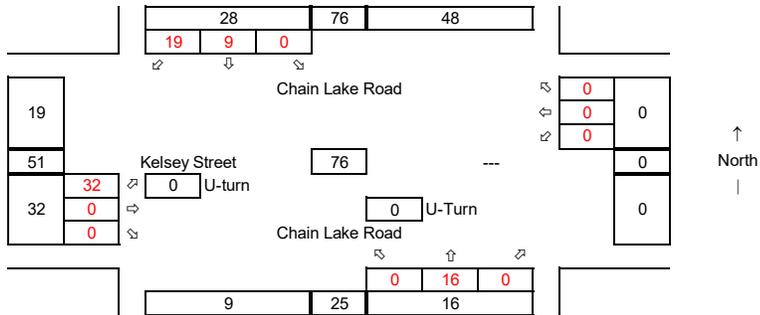
Years of Growth = 13

Total Growth = 1.2936



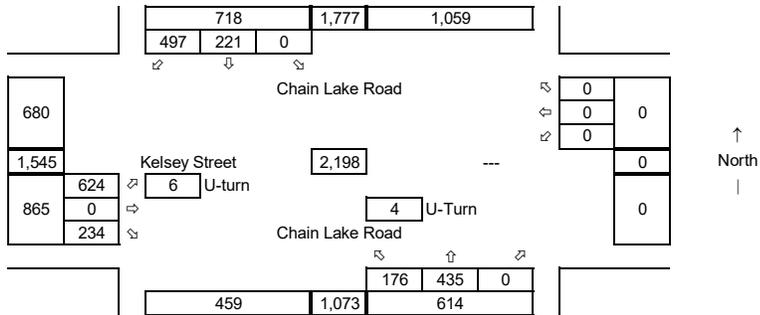
Total Project Trips

Average Weekday
PM Peak Hour



Future with Project

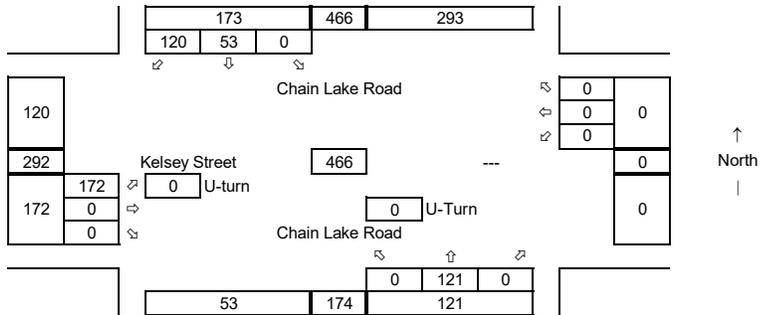
Average Weekday
PM Peak Hour



Pipeline Trips

Average Weekday
PM Peak Hour

- Eaglemont 1-7
- Easton Cove
- Sweetbriar
- Skycroft
- Clothier Short Plat
- Woods Creek Highlands
- Kestrel Ridge



5 Site Access @ Chain Lake Rd

Synchro ID: 5

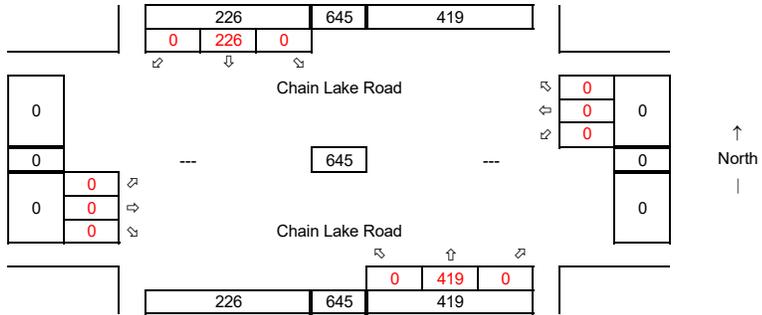
Existing

Average Weekday
PM Peak Hour

Year: 1/31/18

Data Source: **GTC**

Volumes extrapolated from the
north leg of Country Crescent
Blvd at Chain Lake Rd.



Future without Project

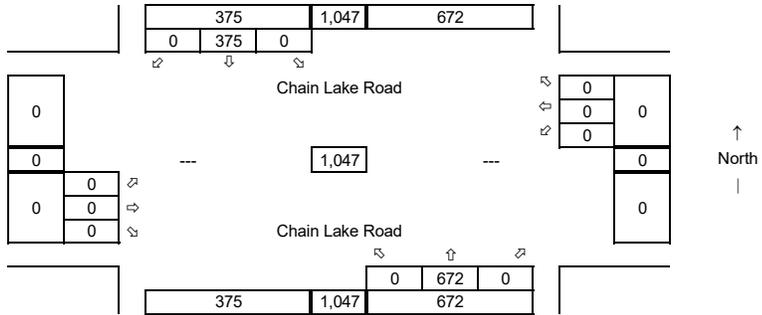
Average Weekday
PM Peak Hour

Year: 2031

Growth Rate = 2.0%

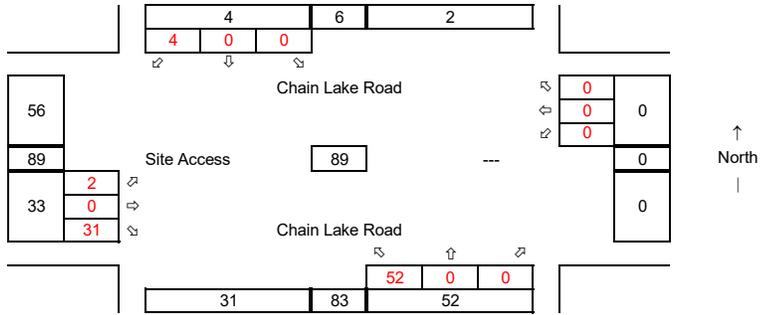
Years of Growth = 13

Total Growth = 1.2936



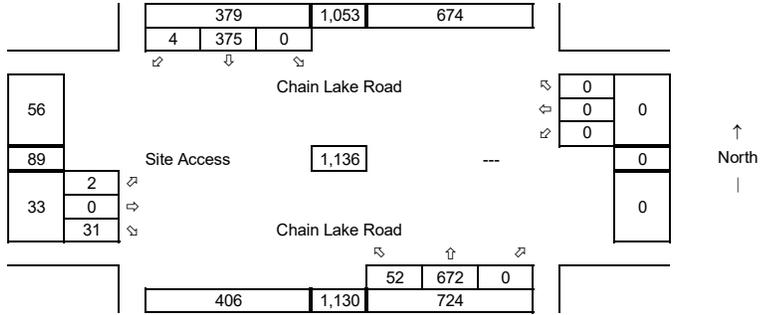
Total Project Trips

Average Weekday
PM Peak Hour



Future with Project

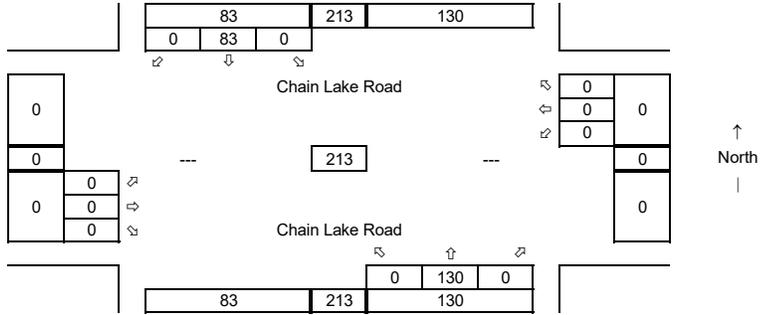
Average Weekday
PM Peak Hour



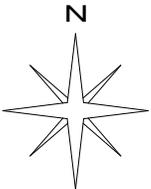
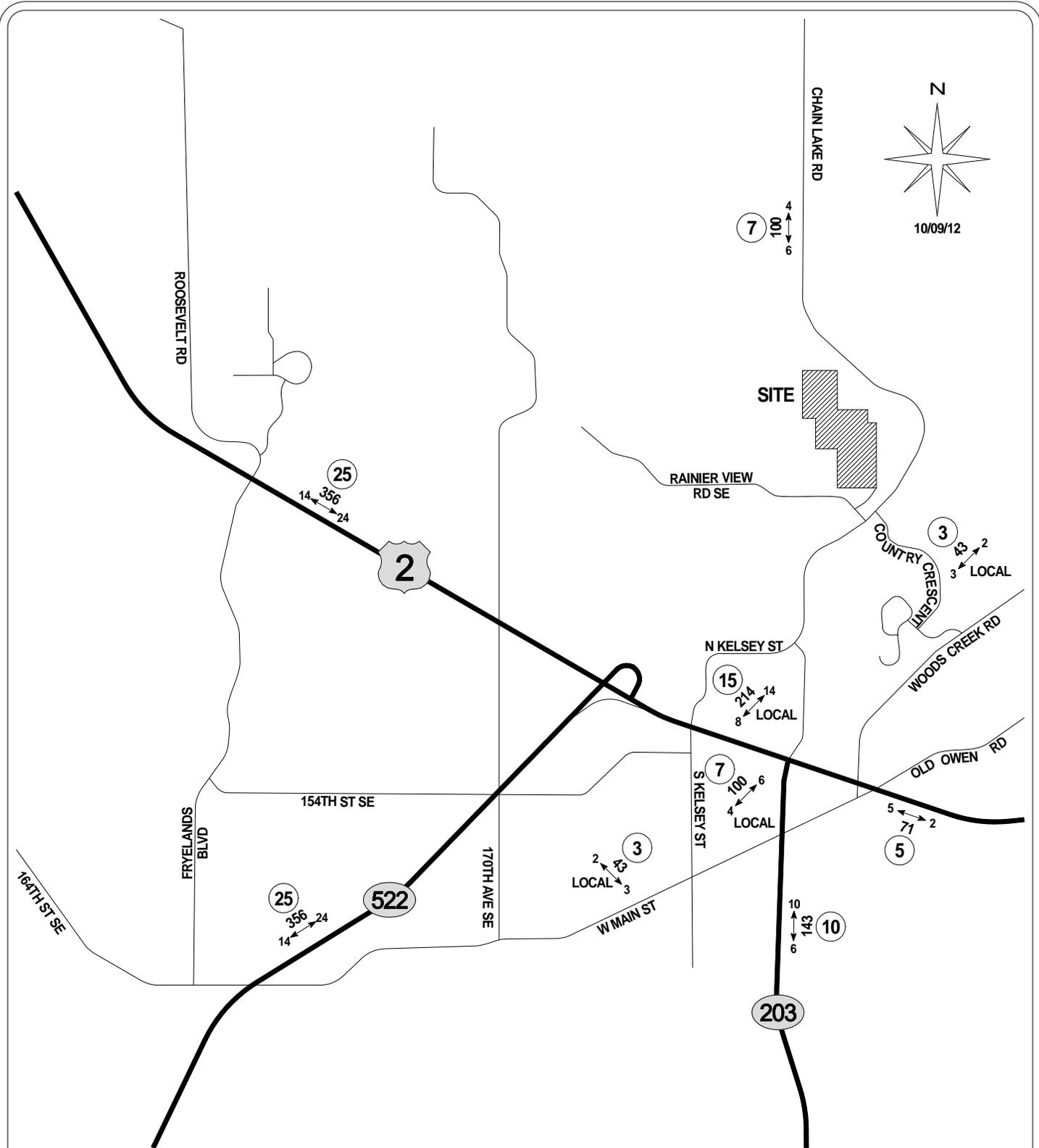
Pipeline Trips

Average Weekday
PM Peak Hour

Eaglemont 1-7
Easton Cove
Sweetbriar
Skycroft
Clothier Short Plat
Woods Creek Highlands
Kestrel Ridge



Pipeline Information



10/09/12

GIBSON TRAFFIC CONSULTANTS

TRAFFIC IMPACT STUDY
GTC #12-087

EAGLEMONT
149 SINGLE-FAMILY UNITS

LEGEND

AWDT
PM ↔ PEAK

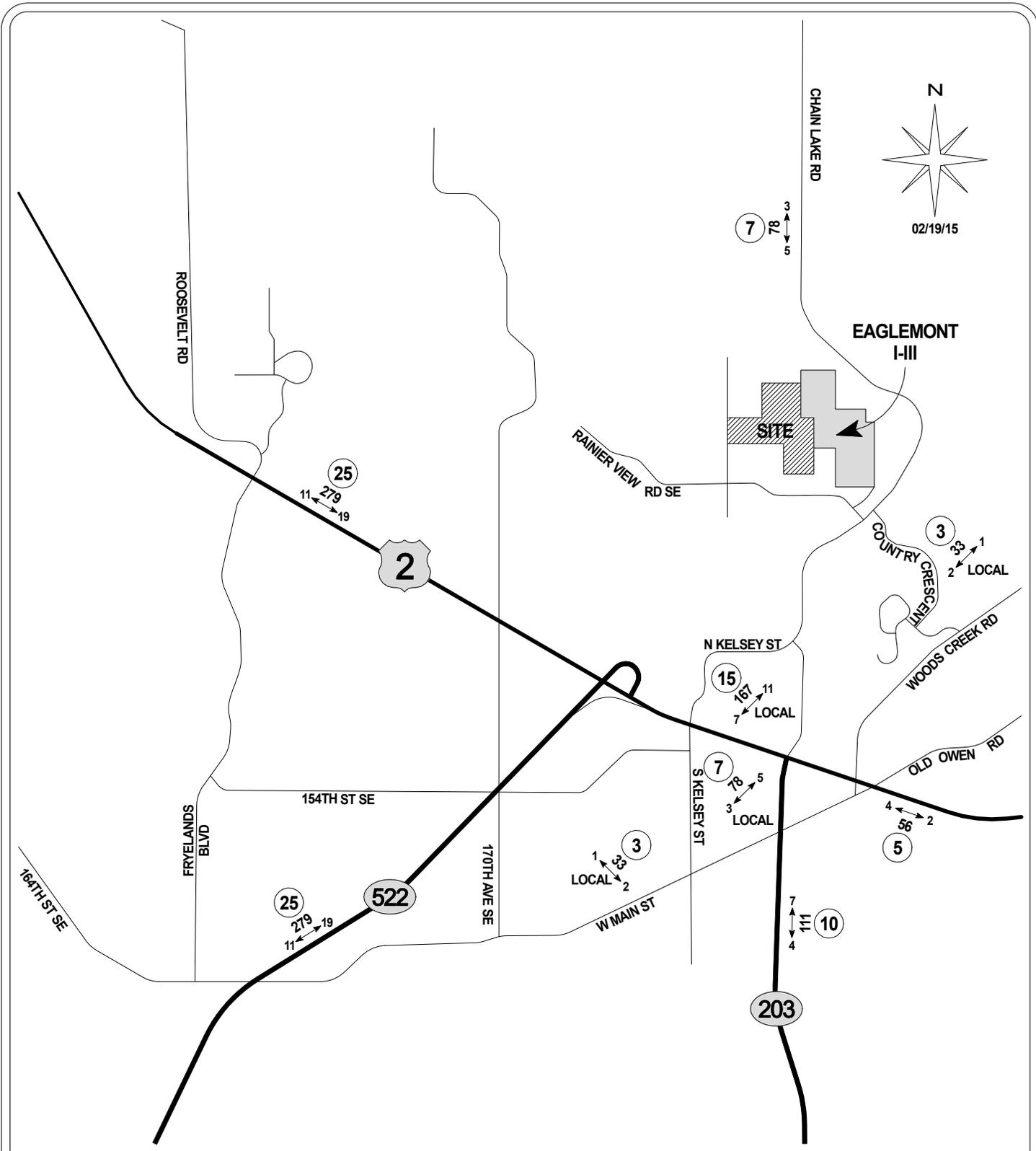
NEW SITE TRAFFIC
(DAILY/PEAK-HOUR)



TRIP DISTRIBUTION %

FIGURE 3
DEVELOPMENT
TRIP DISTRIBUTION
PM PEAK-HOUR

CITY OF MONROE



GIBSON TRAFFIC CONSULTANTS

TRAFFIC IMPACT STUDY
GTC #15-045

EAGLEMONT IV-VIII
117 NEW SINGLE-FAMILY UNITS

LEGEND

AWDT
PM ↔ PEAK

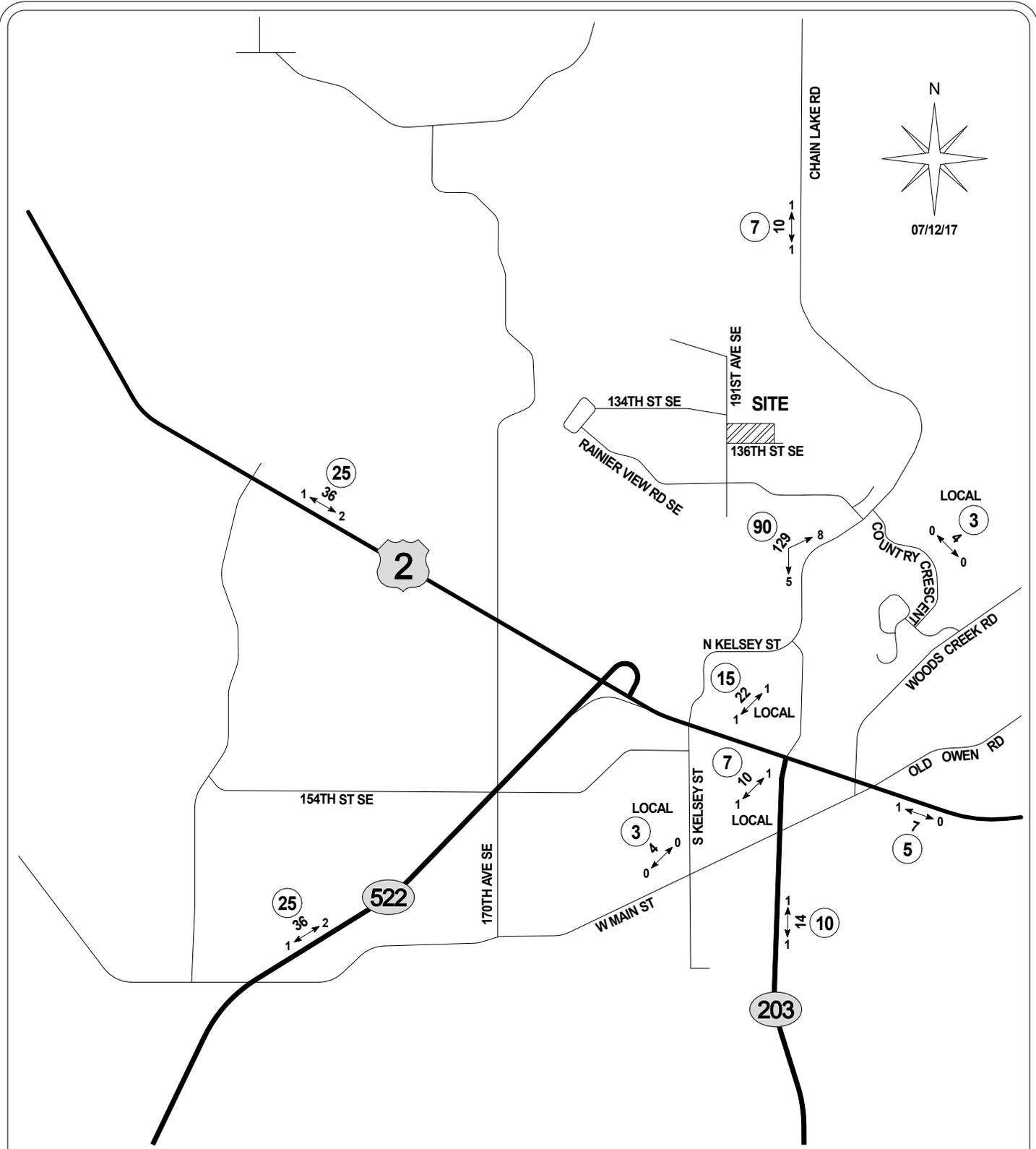
NEW SITE TRAFFIC
(DAILY/PEAK-HOUR)

XX

TRIP DISTRIBUTION %

FIGURE 3
DEVELOPMENT
TRIP DISTRIBUTION
PM PEAK-HOUR

CITY OF MONROE



GIBSON TRAFFIC CONSULTANTS

TRAFFIC IMPACT STUDY
GTC #17-130

EAGLEMONT 5
15 NEW SINGLE FAMILY
DWELLINGS

CITY OF MONROE

LEGEND

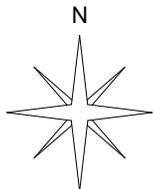
AWDT
PM ↔ PEAK

NEW SITE TRAFFIC
(DAILY/PEAK-HOUR)

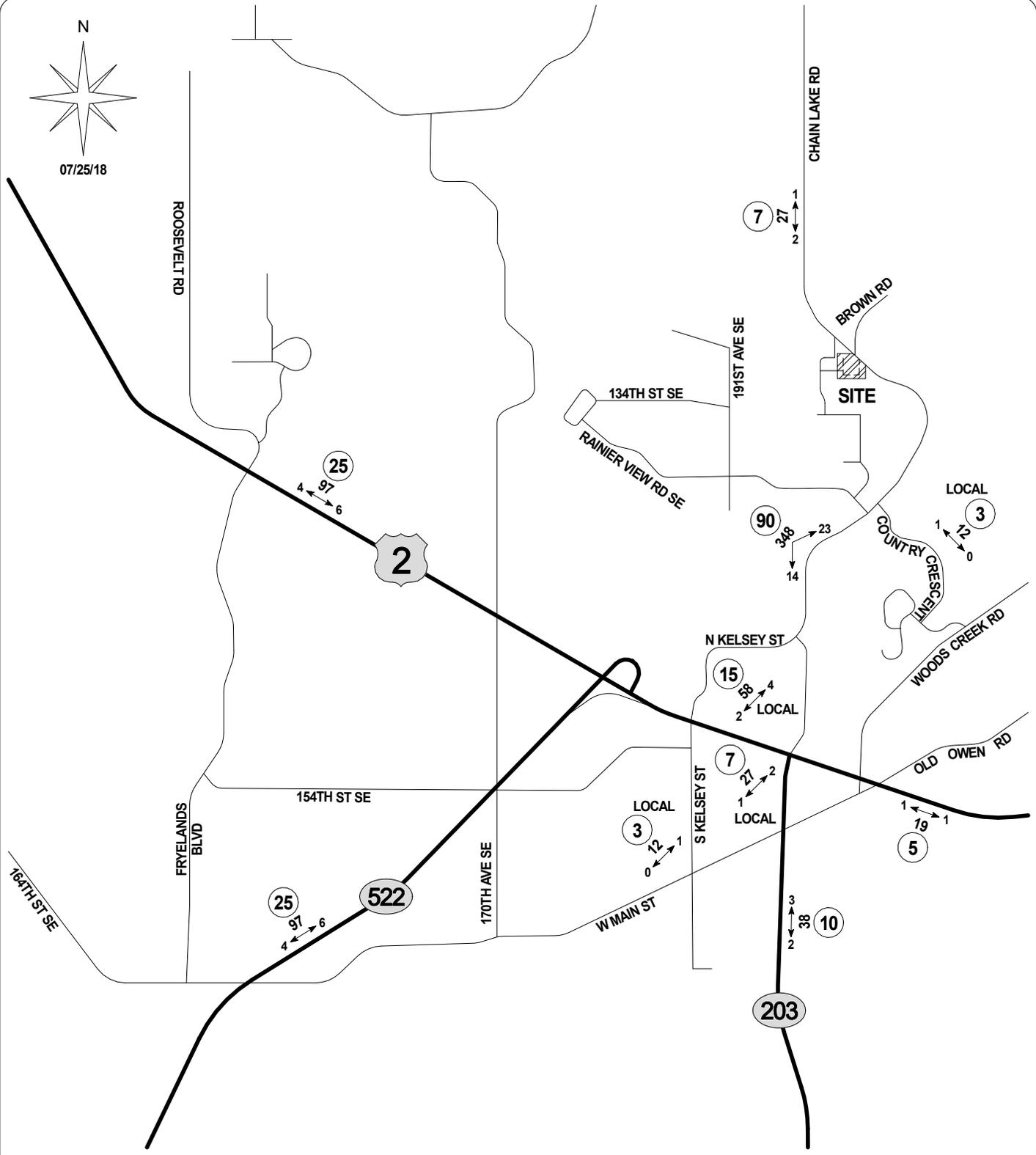


TRIP DISTRIBUTION %

FIGURE 3
DEVELOPMENT
TRIP DISTRIBUTION
PM PEAK-HOUR



07/25/18



GIBSON TRAFFIC CONSULTANTS

**TRAFFIC IMPACT STUDY
GTC #18-042**

**EAGLEMONT 7
41 NEW SINGLE FAMILY
DWELLINGS**

CITY OF MONROE

LEGEND

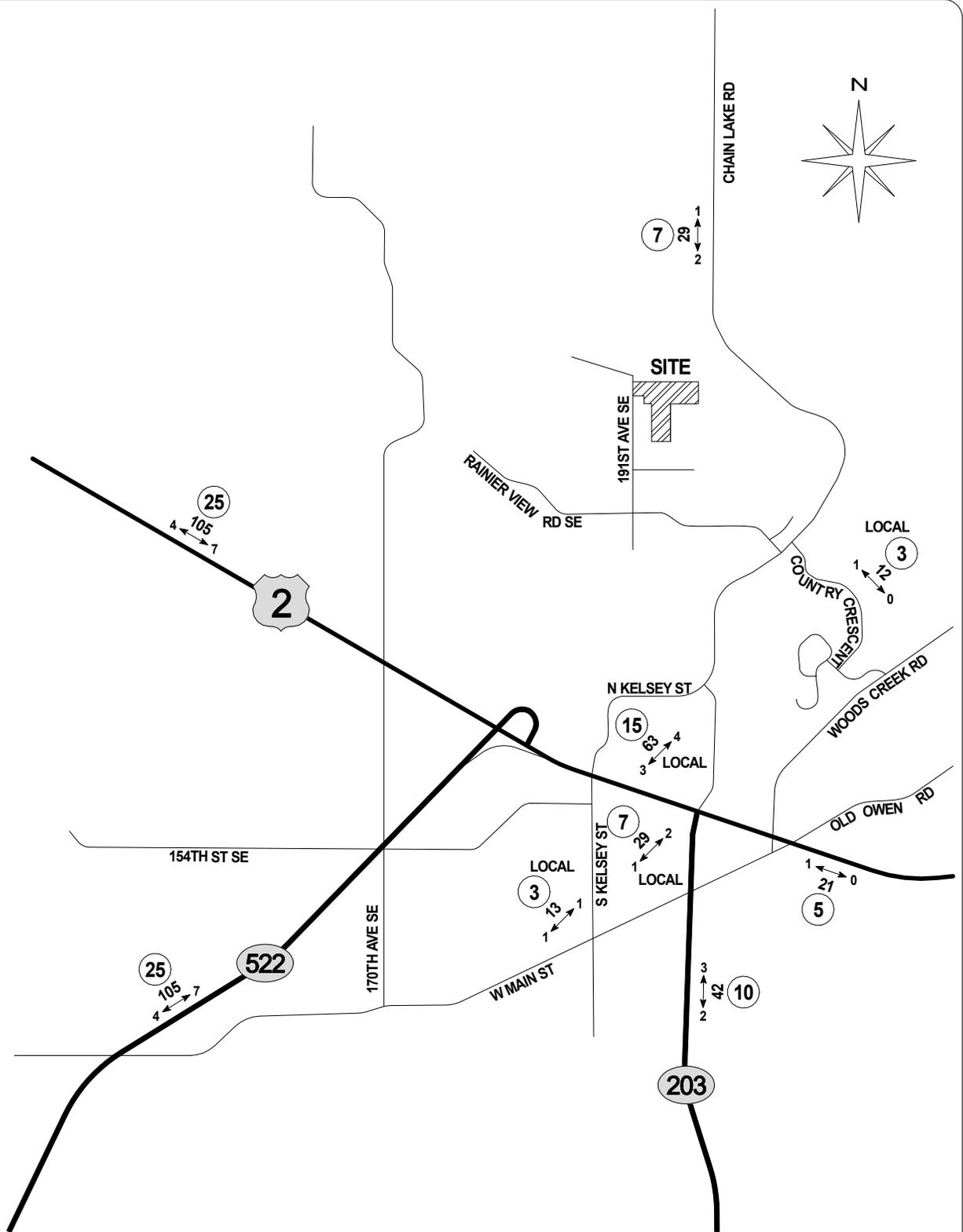
AWDT
PM ↔ PEAK



NEW SITE TRAFFIC
(DAILY/PEAK-HOUR)

TRIP DISTRIBUTION %

**FIGURE 3
DEVELOPMENT
TRIP DISTRIBUTION
PM PEAK-HOUR**



GIBSON TRAFFIC CONSULTANTS

TRAFFIC IMPACT STUDY
GTC #15-244

SKY VIEW RIDGE
44 NEW SINGLE-FAMILY UNITS

CITY OF MONROE

LEGEND

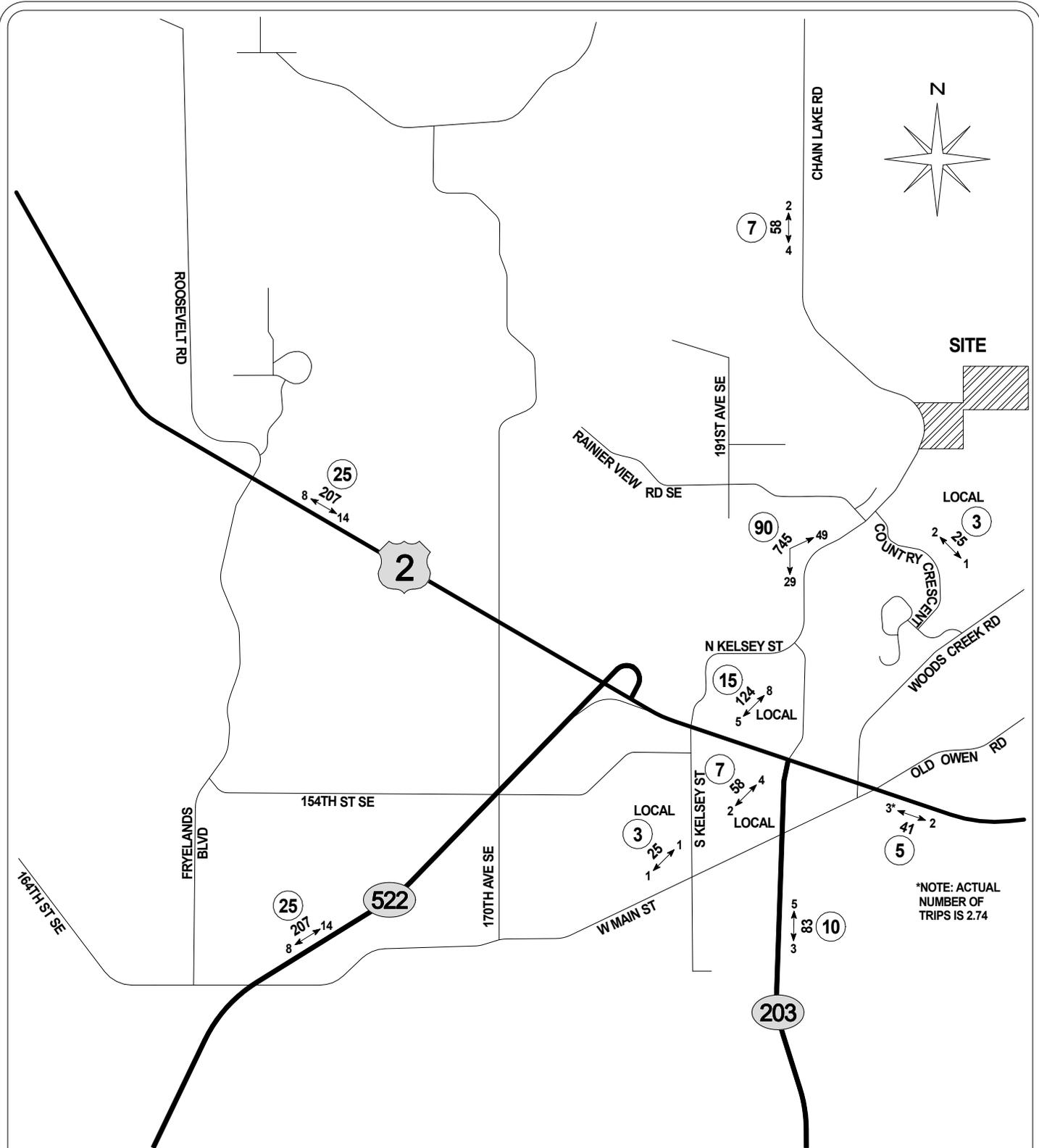
AWDT
PM ←→ PEAK

NEW SITE TRAFFIC
(DAILY/PEAK-HOUR)



TRIP DISTRIBUTION %

FIGURE 2
DEVELOPMENT
TRIP DISTRIBUTION
PM PEAK-HOUR



*NOTE: ACTUAL NUMBER OF TRIPS IS 2.74

GIBSON TRAFFIC CONSULTANTS

TRAFFIC IMPACT STUDY
GTC #16-030

KLIER DEVELOPMENT
87 NEW SINGLE FAMILY
DWELLINGS

LEGEND

AWDT
PM ↔ PEAK

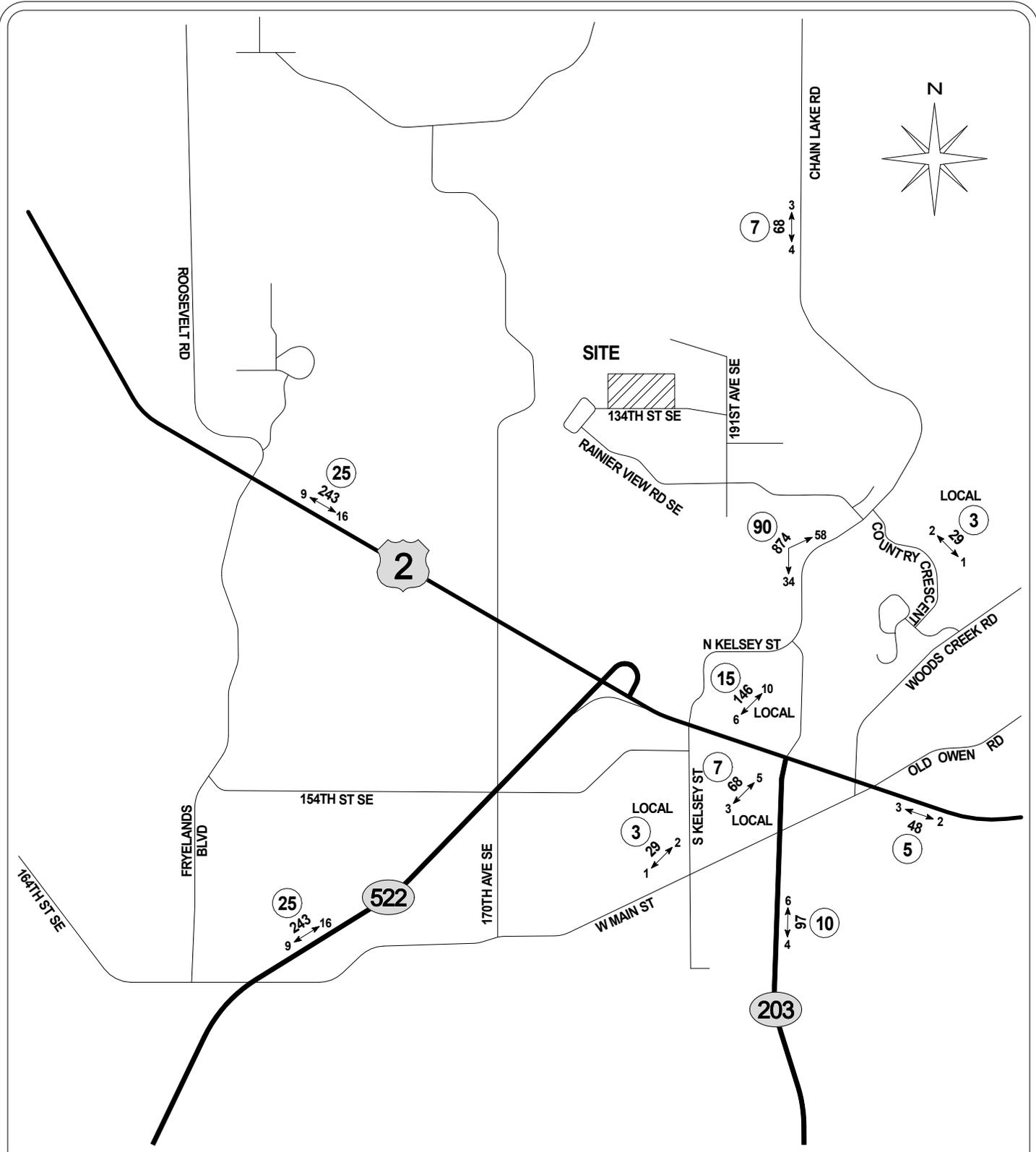
NEW SITE TRAFFIC
(DAILY/PEAK-HOUR)



TRIP DISTRIBUTION %

FIGURE 3
DEVELOPMENT
TRIP DISTRIBUTION
PM PEAK-HOUR

CITY OF MONROE



GIBSON TRAFFIC CONSULTANTS

TRAFFIC IMPACT STUDY
GTC #16-171

WORTHINGTON HEIGHTS
106 SINGLE FAMILY
DWELLINGS

LEGEND

AWDT
PM ↔ PEAK

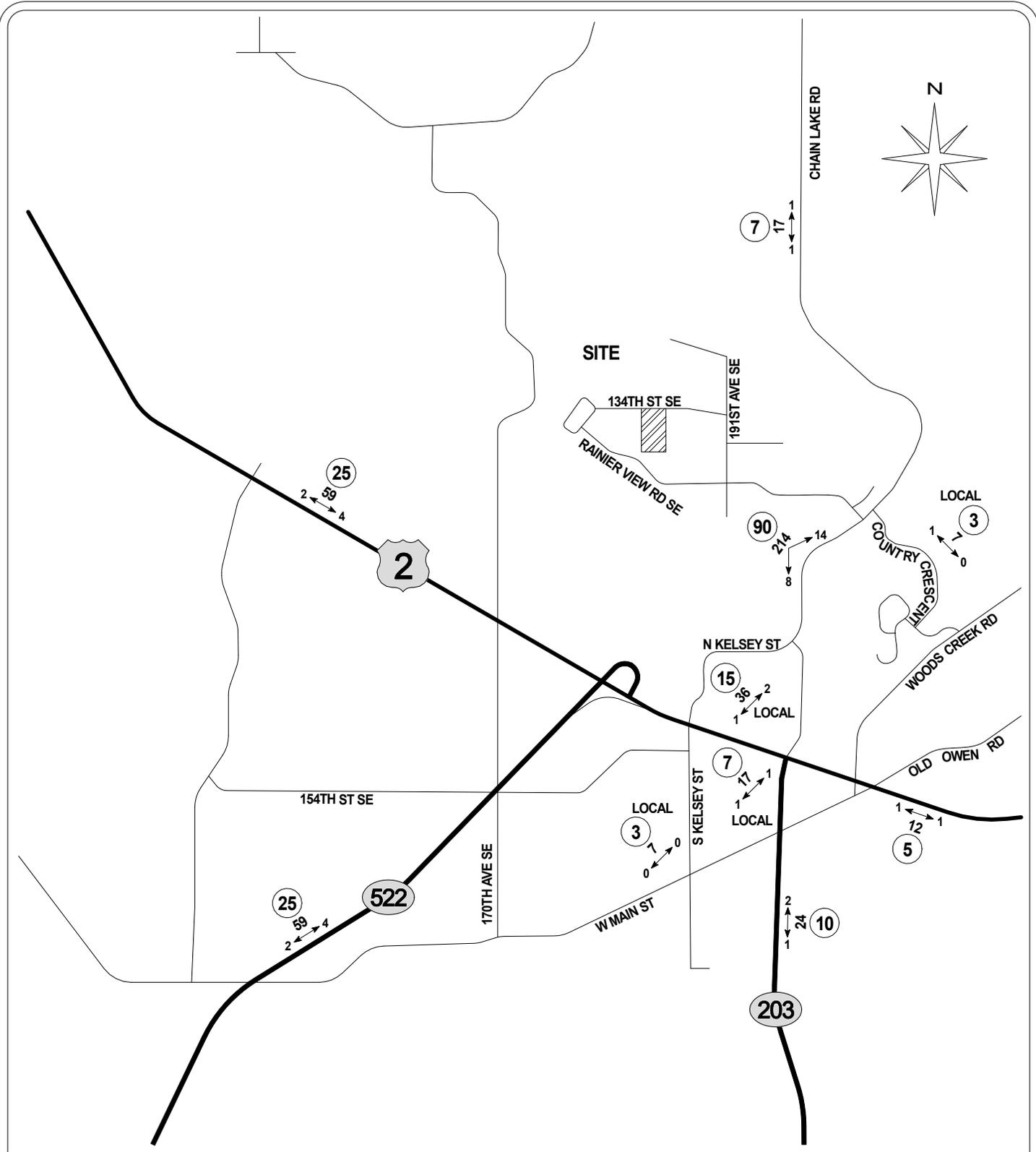
NEW SITE TRAFFIC
(DAILY/PEAK-HOUR)



TRIP DISTRIBUTION %

CITY OF MONROE

FIGURE 3
DEVELOPMENT
TRIP DISTRIBUTION
PM PEAK-HOUR



GIBSON TRAFFIC CONSULTANTS

TRAFFIC IMPACT STUDY
GTC #16-165

RASPBERRY HILL
25 NEW SINGLE FAMILY
DWELLINGS

CITY OF MONROE

LEGEND

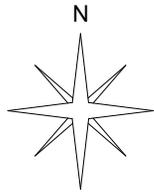
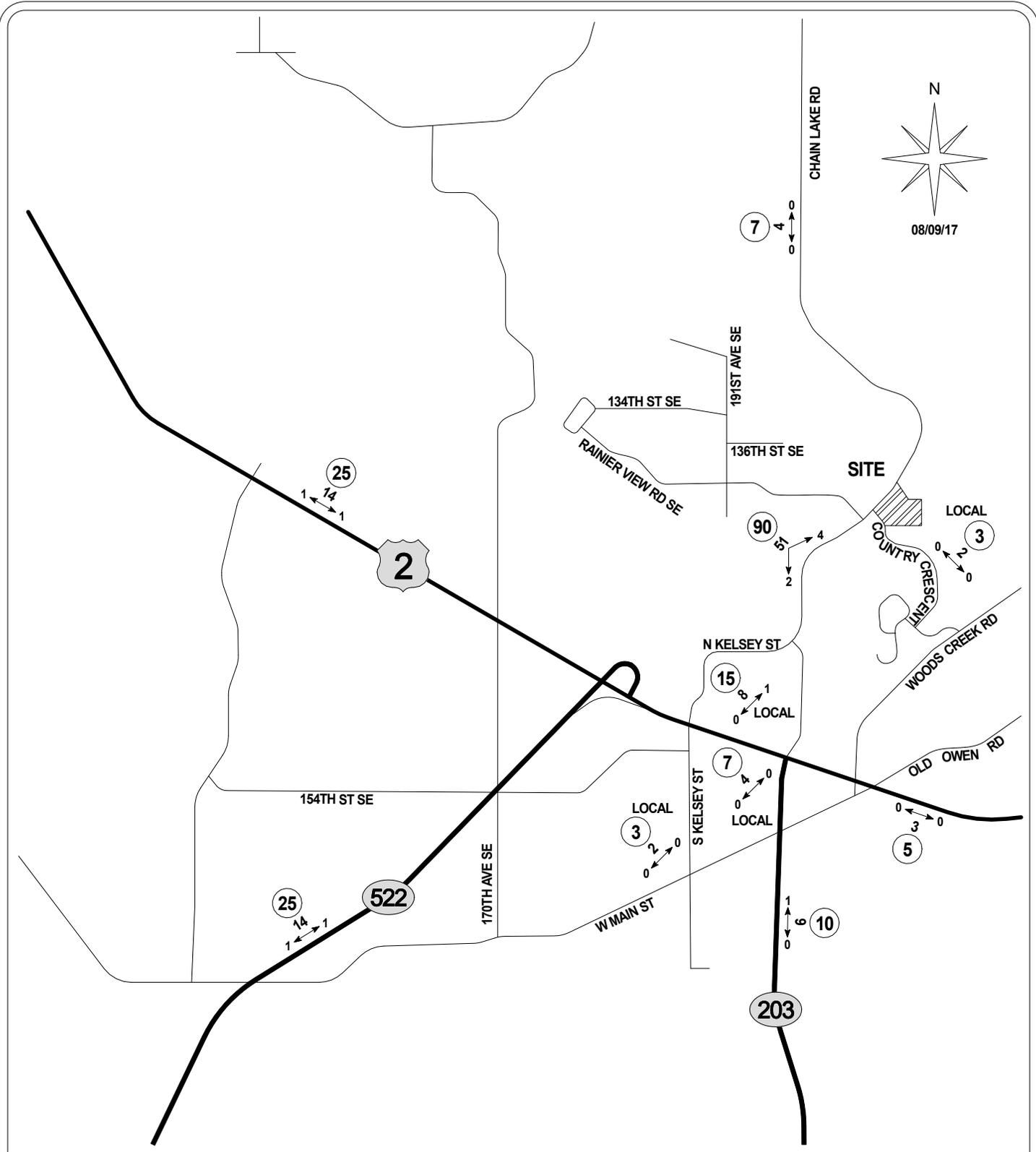
AWDT
PM ↔ PEAK

NEW SITE TRAFFIC
(DAILY/PEAK-HOUR)



TRIP DISTRIBUTION %

FIGURE 3
DEVELOPMENT
TRIP DISTRIBUTION
PM PEAK-HOUR



08/09/17

GIBSON TRAFFIC CONSULTANTS

**TRAFFIC IMPACT STUDY
GTC #17-167**

**CLOTHIER SHORT PLAT
6 NEW SINGLE FAMILY
DWELLINGS**

LEGEND

AWDT
PM ↔ PEAK

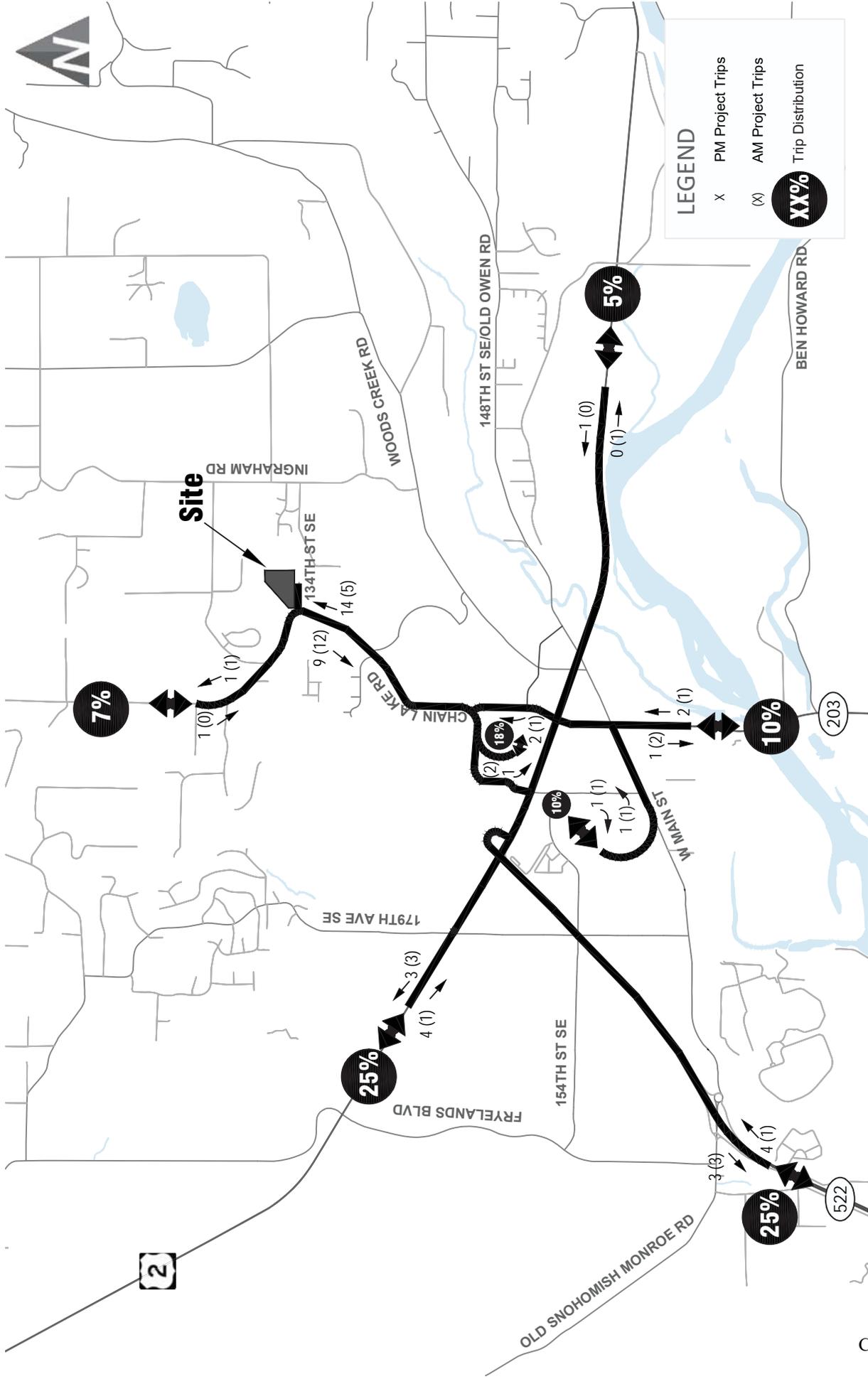
NEW SITE TRAFFIC
(DAILY/PEAK-HOUR)



TRIP DISTRIBUTION %

**FIGURE 3
DEVELOPMENT
TRIP DISTRIBUTION
PM PEAK-HOUR**

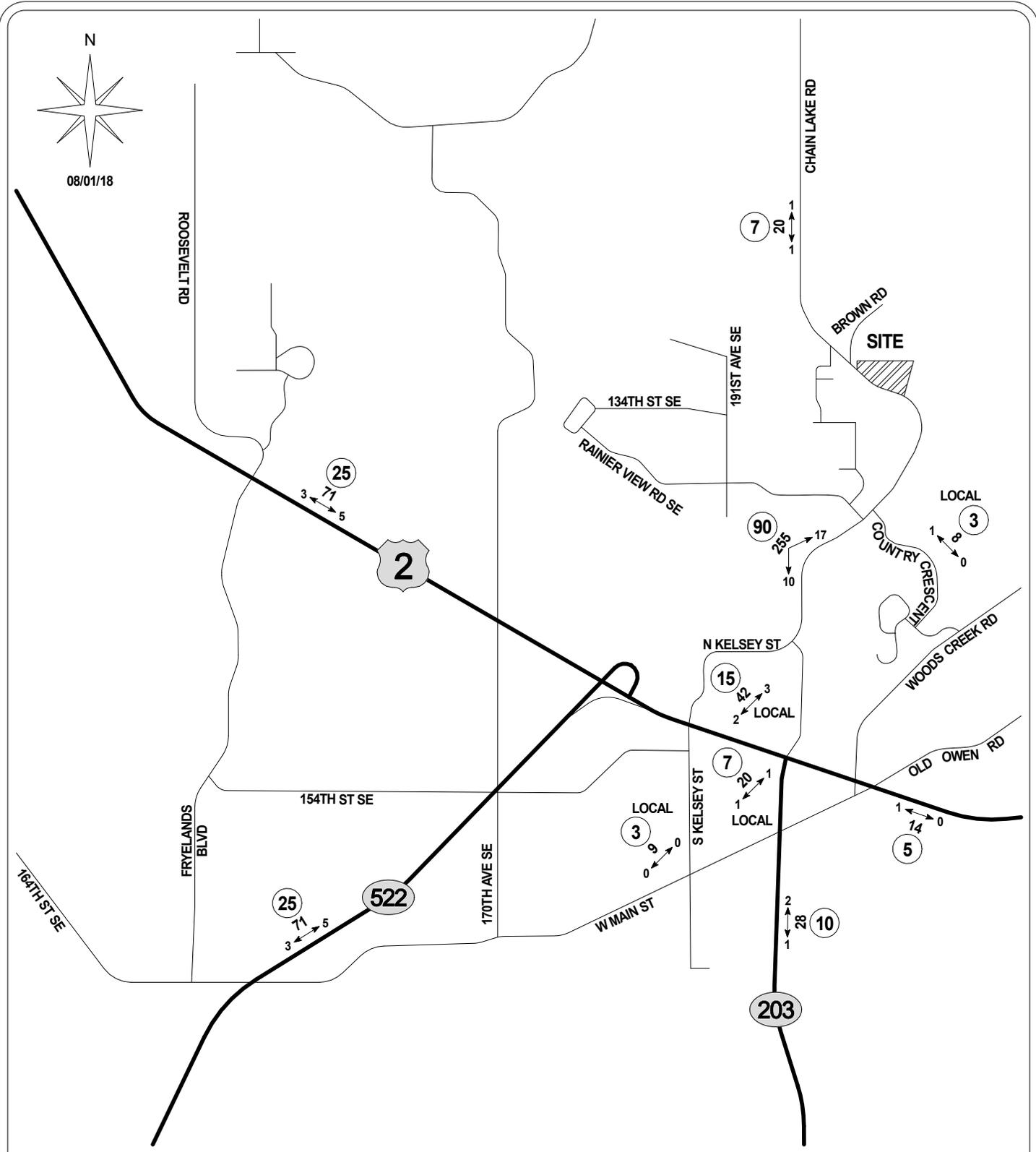
CITY OF MONROE



Vehicle Trip Distribution & Assignment

Woods Creek Highlands

FIGURE



GIBSON TRAFFIC CONSULTANTS

TRAFFIC IMPACT STUDY
GTC #18-042

KESTREL RIDGE
30 NEW SINGLE FAMILY
DWELLINGS

CITY OF MONROE

LEGEND

AWDT
PM ↔ PEAK

NEW SITE TRAFFIC
(DAILY/PEAK-HOUR)



TRIP DISTRIBUTION %

FIGURE 3
DEVELOPMENT
TRIP DISTRIBUTION
PM PEAK-HOUR

Level of Service Calculations

HCM 6th TWSC
 1: Chain Lake Road & Eaglemont 7 Access/Brown Road

Garibaldi

Intersection

Int Delay, s/veh	1.8											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↔			↔	
Traffic Vol, veh/h	0	0	0	58	0	10	0	244	98	11	121	0
Future Vol, veh/h	0	0	0	58	0	10	0	244	98	11	121	0
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None									
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	1	1	1	1	1	1	1	1	1	1	1	1
Mvmt Flow	0	0	0	63	0	11	0	265	107	12	132	0

Major/Minor	Minor2		Minor1		Major1		Major2					
Conflicting Flow All	480	528	132	475	475	319	132	0	0	372	0	0
Stage 1	156	156	-	319	319	-	-	-	-	-	-	-
Stage 2	324	372	-	156	156	-	-	-	-	-	-	-
Critical Hdwy	7.11	6.51	6.21	7.11	6.51	6.21	4.11	-	-	4.11	-	-
Critical Hdwy Stg 1	6.11	5.51	-	6.11	5.51	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.11	5.51	-	6.11	5.51	-	-	-	-	-	-	-
Follow-up Hdwy	3.509	4.009	3.309	3.509	4.009	3.309	2.209	-	-	2.209	-	-
Pot Cap-1 Maneuver	498	457	920	502	490	724	1459	-	-	1192	-	-
Stage 1	849	770	-	695	655	-	-	-	-	-	-	-
Stage 2	690	621	-	849	770	-	-	-	-	-	-	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	487	452	920	498	485	724	1459	-	-	1192	-	-
Mov Cap-2 Maneuver	487	452	-	498	485	-	-	-	-	-	-	-
Stage 1	849	762	-	695	655	-	-	-	-	-	-	-
Stage 2	680	621	-	840	762	-	-	-	-	-	-	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0	13	0	0.7
HCM LOS	A	B		

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1459	-	-	-	522	1192	-
HCM Lane V/C Ratio	-	-	-	-	0.142	0.01	-
HCM Control Delay (s)	0	-	-	0	13	8.1	0
HCM Lane LOS	A	-	-	A	B	A	A
HCM 95th %tile Q(veh)	0	-	-	-	0.5	0	-

HCM 6th TWSC
 2: Chain Lake Road & Country Crescent Boulevard

Garibaldi

Intersection

Int Delay, s/veh	1.7					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	70	15	404	98	17	209
Future Vol, veh/h	70	15	404	98	17	209
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	100	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	99	99	99	99	99	99
Heavy Vehicles, %	1	1	1	1	1	1
Mvmt Flow	71	15	408	99	17	211

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	703	458	0	0	507
Stage 1	458	-	-	-	-
Stage 2	245	-	-	-	-
Critical Hdwy	6.41	6.21	-	-	4.11
Critical Hdwy Stg 1	5.41	-	-	-	-
Critical Hdwy Stg 2	5.41	-	-	-	-
Follow-up Hdwy	3.509	3.309	-	-	2.209
Pot Cap-1 Maneuver	405	605	-	-	1063
Stage 1	639	-	-	-	-
Stage 2	798	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	399	605	-	-	1063
Mov Cap-2 Maneuver	399	-	-	-	-
Stage 1	639	-	-	-	-
Stage 2	785	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	15.1	0	0.6
HCM LOS	C		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	399	605	1063
HCM Lane V/C Ratio	-	-	0.177	0.025	0.016
HCM Control Delay (s)	-	-	16	11.1	8.4
HCM Lane LOS	-	-	C	B	A
HCM 95th %tile Q(veh)	-	-	0.6	0.1	0

HCM 6th TWSC
 3: Chain Lake Road & Rainier View Road SE

Garibaldi

Intersection

Int Delay, s/veh	2.2					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	WT		WT	↑	↑	
Traffic Vol, veh/h	3	93	153	499	269	10
Future Vol, veh/h	3	93	153	499	269	10
Conflicting Peds, #/hr	0	0	4	0	0	4
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	200	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	99	99	99	99	99	99
Heavy Vehicles, %	1	1	1	1	1	1
Mvmt Flow	3	94	155	504	272	10

Major/Minor	Minor2	Major1		Major2	
Conflicting Flow All	1095	281	286	0	0
Stage 1	281	-	-	-	-
Stage 2	814	-	-	-	-
Critical Hdwy	6.41	6.21	4.11	-	-
Critical Hdwy Stg 1	5.41	-	-	-	-
Critical Hdwy Stg 2	5.41	-	-	-	-
Follow-up Hdwy	3.509	3.309	2.209	-	-
Pot Cap-1 Maneuver	238	760	1282	-	-
Stage 1	769	-	-	-	-
Stage 2	437	-	-	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	208	757	1277	-	-
Mov Cap-2 Maneuver	208	-	-	-	-
Stage 1	673	-	-	-	-
Stage 2	435	-	-	-	-

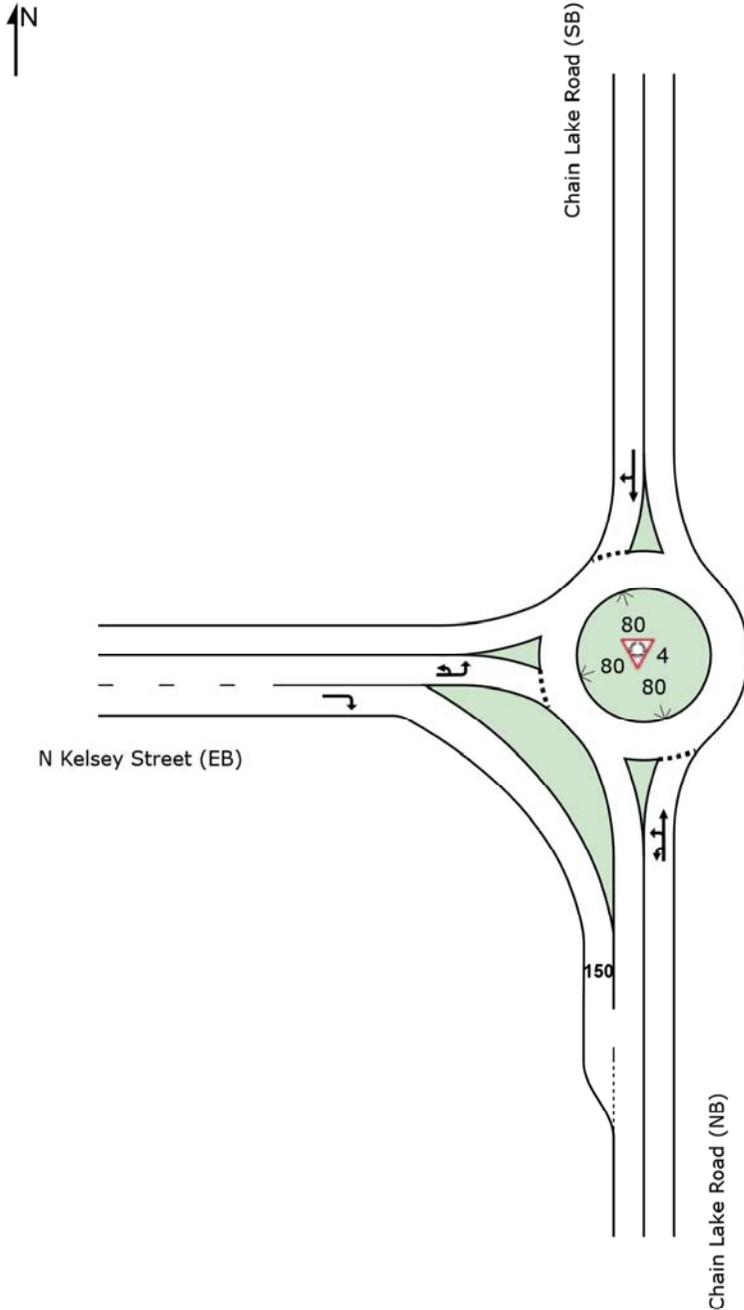
Approach	EB	NB	SB
HCM Control Delay, s	11	1.9	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1277	-	699	-	-
HCM Lane V/C Ratio	0.121	-	0.139	-	-
HCM Control Delay (s)	8.2	-	11	-	-
HCM Lane LOS	A	-	B	-	-
HCM 95th %tile Q(veh)	0.4	-	0.5	-	-

SITE LAYOUT

Site: 4 [Existing Conditions]

Chain Lake Road at N Kelsey Street
Site Category: (None)
Roundabout



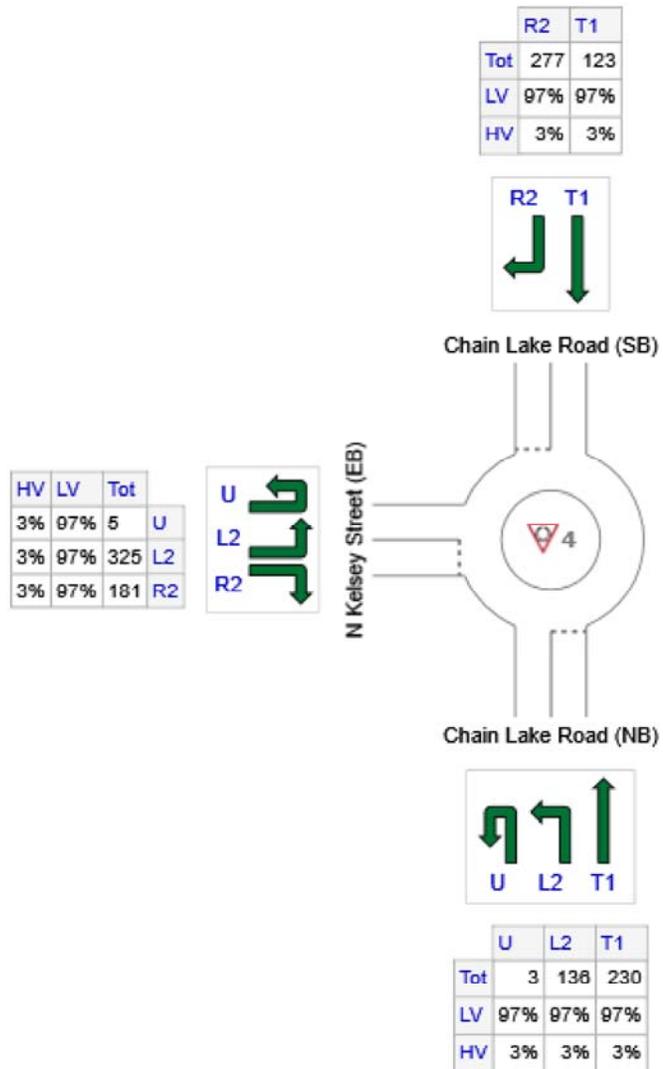
INPUT VOLUMES

Vehicles and pedestrians per 60 minutes

Site: 4 [Existing Conditions]

Chain Lake Road at N Kelsey Street
 Site Category: (None)
 Roundabout

Volume Display Method: Total and %



	All MCs	Light Vehicles (LV)	Heavy Vehicles (HV)
S: Chain Lake Road (NB)	369	358	11
N: Chain Lake Road (SB)	400	388	12
W: N Kelsey Street (EB)	511	496	15
Total	1280	1242	38

MOVEMENT SUMMARY

Site: 4 [Existing Conditions]

Chain Lake Road at N Kelsey Street
 Site Category: (None)
 Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: Chain Lake Road (NB)												
3u	U	3	3.0	0.397	14.2	LOS B	2.7	68.8	0.63	0.71	0.63	35.2
3	L2	146	3.0	0.397	12.0	LOS B	2.7	68.8	0.63	0.71	0.63	34.5
8	T1	247	3.0	0.397	6.7	LOS A	2.7	68.8	0.63	0.71	0.63	34.6
Approach		397	3.0	0.397	8.7	LOS A	2.7	68.8	0.63	0.71	0.63	34.5
North: Chain Lake Road (SB)												
4	T1	132	3.0	0.369	5.3	LOS A	2.7	68.1	0.46	0.54	0.46	36.2
14	R2	298	3.0	0.369	5.2	LOS A	2.7	68.1	0.46	0.54	0.46	35.2
Approach		430	3.0	0.369	5.2	LOS A	2.7	68.1	0.46	0.54	0.46	35.5
West: N Kelsey Street (EB)												
5u	U	5	3.0	0.248	12.3	LOS B	1.6	40.7	0.35	0.62	0.35	34.4
5	L2	349	3.0	0.248	10.1	LOS B	1.6	40.7	0.35	0.62	0.35	33.8
12	R2	195	3.0	0.120	3.8	LOS A	0.0	0.0	0.00	0.47	0.00	36.8
Approach		549	3.0	0.248	7.9	LOS A	1.6	40.7	0.23	0.57	0.23	34.8
All Vehicles		1376	3.0	0.397	7.3	LOS A	2.7	68.8	0.42	0.60	0.42	34.9

Site Level of Service (LOS) Method: Delay & Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Signalised Intersections.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.

Intersection and Approach LOS values are based on average delay for all movements (v/c not used).

Roundabout Capacity Model: SIDRA Standard.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

HCM 6th TWSC
 1: Chain Lake Road & Eaglemont 7 Access/Brown Road

Garibaldi

Intersection												
Int Delay, s/veh	2.7											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	1	0	14	75	0	13	24	329	127	14	176	2
Future Vol, veh/h	1	0	14	75	0	13	24	329	127	14	176	2
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None									
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	1	1	1	1	1	1	1	1	1	1	1	1
Mvmt Flow	1	0	15	82	0	14	26	358	138	15	191	2

Major/Minor	Minor2		Minor1		Major1			Major2				
Conflicting Flow All	708	770	192	709	702	427	193	0	0	496	0	0
Stage 1	222	222	-	479	479	-	-	-	-	-	-	-
Stage 2	486	548	-	230	223	-	-	-	-	-	-	-
Critical Hdwy	7.11	6.51	6.21	7.11	6.51	6.21	4.11	-	-	4.11	-	-
Critical Hdwy Stg 1	6.11	5.51	-	6.11	5.51	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.11	5.51	-	6.11	5.51	-	-	-	-	-	-	-
Follow-up Hdwy	3.509	4.009	3.309	3.509	4.009	3.309	2.209	-	-	2.209	-	-
Pot Cap-1 Maneuver	351	332	852	350	364	630	1386	-	-	1073	-	-
Stage 1	783	722	-	570	557	-	-	-	-	-	-	-
Stage 2	565	519	-	775	721	-	-	-	-	-	-	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	332	318	852	333	349	630	1386	-	-	1073	-	-
Mov Cap-2 Maneuver	332	318	-	333	349	-	-	-	-	-	-	-
Stage 1	763	710	-	555	543	-	-	-	-	-	-	-
Stage 2	538	506	-	749	709	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	9.8		18.7		0.4		0.6	
HCM LOS	A		C					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1386	-	-	771	358	1073	-	-
HCM Lane V/C Ratio	0.019	-	-	0.021	0.267	0.014	-	-
HCM Control Delay (s)	7.6	0	-	9.8	18.7	8.4	0	-
HCM Lane LOS	A	A	-	A	C	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0.1	1.1	0	-	-

HCM 6th TWSC
 2: Chain Lake Road & Country Crescent Boulevard

Garibaldi

Intersection

Int Delay, s/veh	3					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	97	23	648	129	23	352
Future Vol, veh/h	97	23	648	129	23	352
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	100	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	99	99	99	99	99	99
Heavy Vehicles, %	1	1	1	1	1	1
Mvmt Flow	98	23	655	130	23	356

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	1122	720	0	0	785
Stage 1	720	-	-	-	-
Stage 2	402	-	-	-	-
Critical Hdwy	6.41	6.21	-	-	4.11
Critical Hdwy Stg 1	5.41	-	-	-	-
Critical Hdwy Stg 2	5.41	-	-	-	-
Follow-up Hdwy	3.509	3.309	-	-	2.209
Pot Cap-1 Maneuver	229	430	-	-	838
Stage 1	484	-	-	-	-
Stage 2	678	-	-	-	-
Platoon blocked, %			-	-	-
Mov Cap-1 Maneuver	223	430	-	-	838
Mov Cap-2 Maneuver	223	-	-	-	-
Stage 1	484	-	-	-	-
Stage 2	660	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	29.5	0	0.6
HCM LOS	D		

Minor Lane/Major Mvmt	NBT	NBRWBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	223	430	838
HCM Lane V/C Ratio	-	-	0.439	0.054	0.028
HCM Control Delay (s)	-	-	33.2	13.9	9.4
HCM Lane LOS	-	-	D	B	A
HCM 95th %tile Q(veh)	-	-	2.1	0.2	0.1

HCM 6th TWSC
 3: Chain Lake Road & Rainier View Road SE

Garibaldi

Intersection

Int Delay, s/veh	6.9					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	W		W	↑	↑	
Traffic Vol, veh/h	15	224	376	762	417	32
Future Vol, veh/h	15	224	376	762	417	32
Conflicting Peds, #/hr	0	0	4	0	0	4
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	200	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	99	99	99	99	99	99
Heavy Vehicles, %	1	1	1	1	1	1
Mvmt Flow	15	226	380	770	421	32

Major/Minor	Minor2	Major1		Major2	
Conflicting Flow All	1971	441	457	0	0
Stage 1	441	-	-	-	-
Stage 2	1530	-	-	-	-
Critical Hdwy	6.41	6.21	4.11	-	-
Critical Hdwy Stg 1	5.41	-	-	-	-
Critical Hdwy Stg 2	5.41	-	-	-	-
Follow-up Hdwy	3.509	3.309	2.209	-	-
Pot Cap-1 Maneuver	69	618	1109	-	-
Stage 1	651	-	-	-	-
Stage 2	198	-	-	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	45	616	1105	-	-
Mov Cap-2 Maneuver	45	-	-	-	-
Stage 1	425	-	-	-	-
Stage 2	197	-	-	-	-

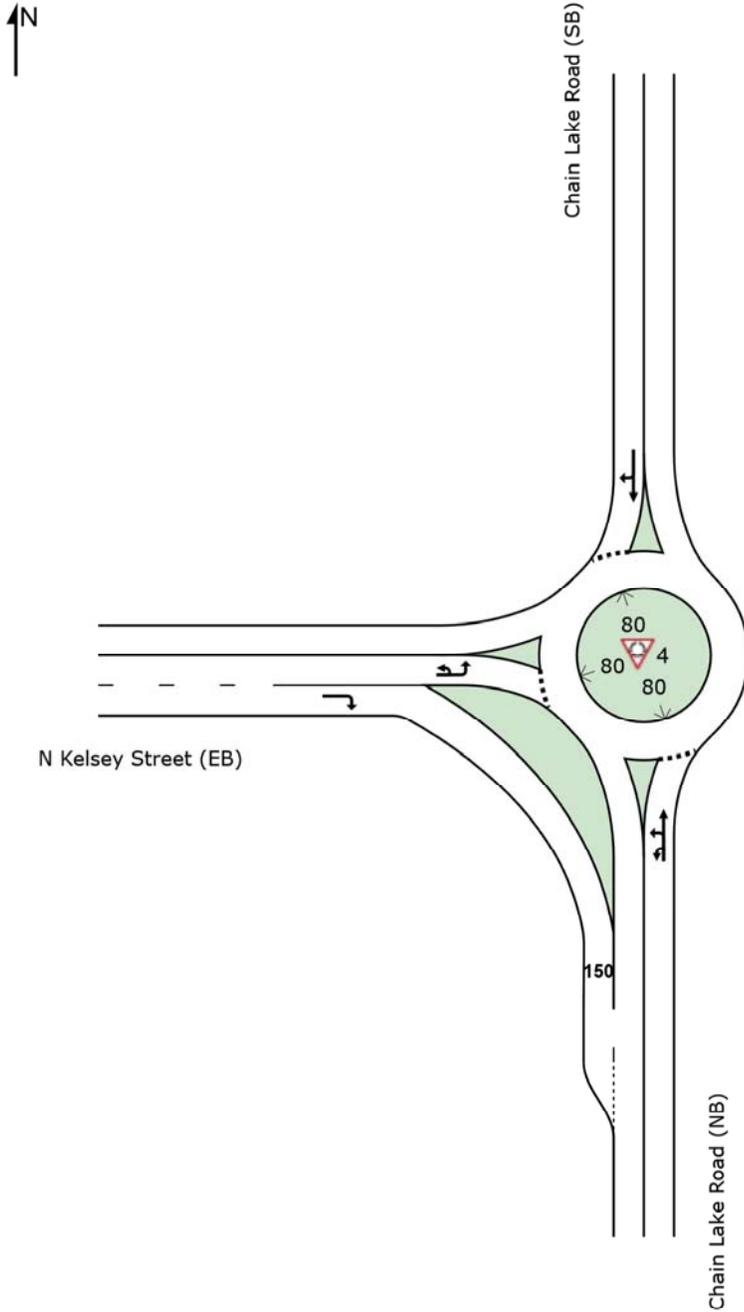
Approach	EB	NB	SB
HCM Control Delay, s	37	3.3	0
HCM LOS	E		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1105	-	343	-	-
HCM Lane V/C Ratio	0.344	-	0.704	-	-
HCM Control Delay (s)	10	-	37	-	-
HCM Lane LOS	A	-	E	-	-
HCM 95th %tile Q(veh)	1.5	-	5.1	-	-

SITE LAYOUT

Site: 4 [2031 Baseline Conditions]

Chain Lake Road at N Kelsey Street
Site Category: (None)
Roundabout



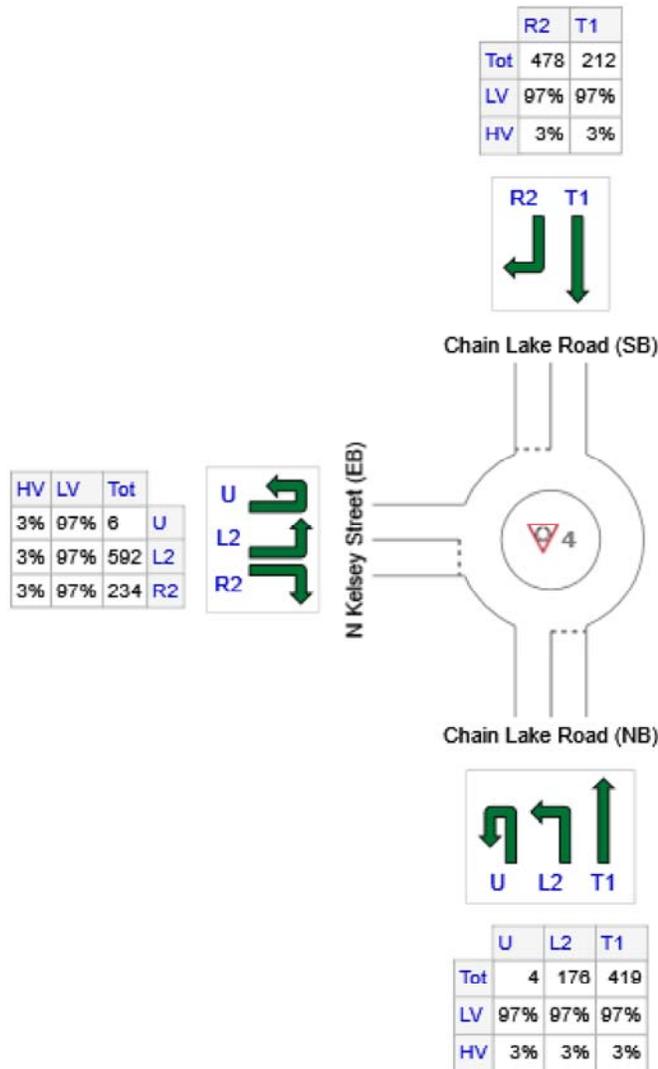
INPUT VOLUMES

Vehicles and pedestrians per 60 minutes

 Site: 4 [2031 Baseline Conditions]

Chain Lake Road at N Kelsey Street
 Site Category: (None)
 Roundabout

Volume Display Method: Total and %



	All MCs	Light Vehicles (LV)	Heavy Vehicles (HV)
S: Chain Lake Road (NB)	599	581	18
N: Chain Lake Road (SB)	690	669	21
W: N Kelsey Street (EB)	832	807	25
Total	2121	2057	64

MOVEMENT SUMMARY

Site: 4 [2031 Baseline Conditions]

Chain Lake Road at N Kelsey Street
 Site Category: (None)
 Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: Chain Lake Road (NB)												
3u	U	4	3.0	0.883	33.2	LOS D	16.8	428.8	1.00	1.40	2.00	27.6
3	L2	189	3.0	0.883	31.0	LOS D	16.8	428.8	1.00	1.40	2.00	27.2
8	T1	451	3.0	0.883	25.7	LOS D	16.8	428.8	1.00	1.40	2.00	27.2
Approach		644	3.0	0.883	27.3	LOS C	16.8	428.8	1.00	1.40	2.00	27.2
North: Chain Lake Road (SB)												
4	T1	228	3.0	0.681	6.7	LOS A	7.8	198.9	0.78	0.67	0.80	35.4
14	R2	514	3.0	0.681	6.6	LOS A	7.8	198.9	0.78	0.67	0.80	34.4
Approach		742	3.0	0.681	6.6	LOS A	7.8	198.9	0.78	0.67	0.80	34.7
West: N Kelsey Street (EB)												
5u	U	6	3.0	0.496	13.1	LOS B	4.2	108.7	0.61	0.68	0.61	33.8
5	L2	637	3.0	0.496	10.9	LOS B	4.2	108.7	0.61	0.68	0.61	33.2
12	R2	252	3.0	0.155	3.8	LOS A	0.0	0.0	0.00	0.47	0.00	36.8
Approach		895	3.0	0.496	8.9	LOS A	4.2	108.7	0.44	0.62	0.44	34.1
All Vehicles		2281	3.0	0.883	13.4	LOS B	16.8	428.8	0.71	0.86	1.00	32.0

Site Level of Service (LOS) Method: Delay & Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Signalised Intersections.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.

Intersection and Approach LOS values are based on average delay for all movements (v/c not used).

Roundabout Capacity Model: SIDRA Standard.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

HCM 6th TWSC
 1: Chain Lake Road & Eaglemont 7 Access/Brown Road

Garibaldi

Intersection

Int Delay, s/veh	2.7											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Vol, veh/h	1	0	14	75	0	13	24	331	127	14	180	2
Future Vol, veh/h	1	0	14	75	0	13	24	331	127	14	180	2
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop	Free	Free	Free	Free	Free	Free
RT Channelized	-	-	None									
Storage Length	-	-	-	-	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	92	92	92	92	92	92	92	92	92	92	92	92
Heavy Vehicles, %	1	1	1	1	1	1	1	1	1	1	1	1
Mvmt Flow	1	0	15	82	0	14	26	360	138	15	196	2

Major/Minor	Minor2		Minor1		Major1			Major2				
Conflicting Flow All	715	777	197	716	709	429	198	0	0	498	0	0
Stage 1	227	227	-	481	481	-	-	-	-	-	-	-
Stage 2	488	550	-	235	228	-	-	-	-	-	-	-
Critical Hdwy	7.11	6.51	6.21	7.11	6.51	6.21	4.11	-	-	4.11	-	-
Critical Hdwy Stg 1	6.11	5.51	-	6.11	5.51	-	-	-	-	-	-	-
Critical Hdwy Stg 2	6.11	5.51	-	6.11	5.51	-	-	-	-	-	-	-
Follow-up Hdwy	3.509	4.009	3.309	3.509	4.009	3.309	2.209	-	-	2.209	-	-
Pot Cap-1 Maneuver	347	329	847	347	360	628	1381	-	-	1071	-	-
Stage 1	778	718	-	568	555	-	-	-	-	-	-	-
Stage 2	563	517	-	770	717	-	-	-	-	-	-	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	328	315	847	330	345	628	1381	-	-	1071	-	-
Mov Cap-2 Maneuver	328	315	-	330	345	-	-	-	-	-	-	-
Stage 1	757	707	-	553	540	-	-	-	-	-	-	-
Stage 2	535	503	-	744	706	-	-	-	-	-	-	-

Approach	EB		WB		NB		SB	
HCM Control Delay, s	9.8		18.8		0.4		0.6	
HCM LOS	A		C					

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1381	-	-	766	355	1071	-	-
HCM Lane V/C Ratio	0.019	-	-	0.021	0.269	0.014	-	-
HCM Control Delay (s)	7.7	0	-	9.8	18.8	8.4	0	-
HCM Lane LOS	A	A	-	A	C	A	A	-
HCM 95th %tile Q(veh)	0.1	-	-	0.1	1.1	0	-	-

HCM 6th TWSC

2: Chain Lake Road & Country Crescent Boulevard

Garibaldi

Intersection

Int Delay, s/veh	3.3					
Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Vol, veh/h	97	25	696	129	24	380
Future Vol, veh/h	97	25	696	129	24	380
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	0	-	-	100	-
Veh in Median Storage, #	0	-	0	-	-	0
Grade, %	0	-	0	-	-	0
Peak Hour Factor	99	99	99	99	99	99
Heavy Vehicles, %	1	1	1	1	1	1
Mvmt Flow	98	25	703	130	24	384

Major/Minor	Minor1	Major1	Major2		
Conflicting Flow All	1200	768	0	0	833
Stage 1	768	-	-	-	-
Stage 2	432	-	-	-	-
Critical Hdwy	6.41	6.21	-	-	4.11
Critical Hdwy Stg 1	5.41	-	-	-	-
Critical Hdwy Stg 2	5.41	-	-	-	-
Follow-up Hdwy	3.509	3.309	-	-	2.209
Pot Cap-1 Maneuver	205	403	-	-	804
Stage 1	460	-	-	-	-
Stage 2	657	-	-	-	-
Platoon blocked, %					
Mov Cap-1 Maneuver	199	403	-	-	804
Mov Cap-2 Maneuver	199	-	-	-	-
Stage 1	460	-	-	-	-
Stage 2	637	-	-	-	-

Approach	WB	NB	SB
HCM Control Delay, s	34.4	0	0.6
HCM LOS	D		

Minor Lane/Major Mvmt	NBT	NBR	WBLn1	WBLn2	SBL	SBT
Capacity (veh/h)	-	-	199	403	804	-
HCM Lane V/C Ratio	-	-	0.492	0.063	0.03	-
HCM Control Delay (s)	-	-	39.5	14.5	9.6	-
HCM Lane LOS	-	-	E	B	A	-
HCM 95th %tile Q(veh)	-	-	2.4	0.2	0.1	-

HCM 6th TWSC
 3: Chain Lake Road & Rainier View Road SE

Garibaldi

Intersection

Int Delay, s/veh	7.6					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations	W		W	↑	↑	
Traffic Vol, veh/h	15	224	376	810	445	32
Future Vol, veh/h	15	224	376	810	445	32
Conflicting Peds, #/hr	0	0	4	0	0	4
Sign Control	Stop	Stop	Free	Free	Free	Free
RT Channelized	-	None	-	None	-	None
Storage Length	0	-	200	-	-	-
Veh in Median Storage, #	0	-	-	0	0	-
Grade, %	0	-	-	0	0	-
Peak Hour Factor	99	99	99	99	99	99
Heavy Vehicles, %	1	1	1	1	1	1
Mvmt Flow	15	226	380	818	449	32

Major/Minor	Minor2	Major1		Major2	
Conflicting Flow All	2047	469	485	0	0
Stage 1	469	-	-	-	-
Stage 2	1578	-	-	-	-
Critical Hdwy	6.41	6.21	4.11	-	-
Critical Hdwy Stg 1	5.41	-	-	-	-
Critical Hdwy Stg 2	5.41	-	-	-	-
Follow-up Hdwy	3.509	3.309	2.209	-	-
Pot Cap-1 Maneuver	62	596	1083	-	-
Stage 1	632	-	-	-	-
Stage 2	188	-	-	-	-
Platoon blocked, %				-	-
Mov Cap-1 Maneuver	40	594	1079	-	-
Mov Cap-2 Maneuver	40	-	-	-	-
Stage 1	408	-	-	-	-
Stage 2	187	-	-	-	-

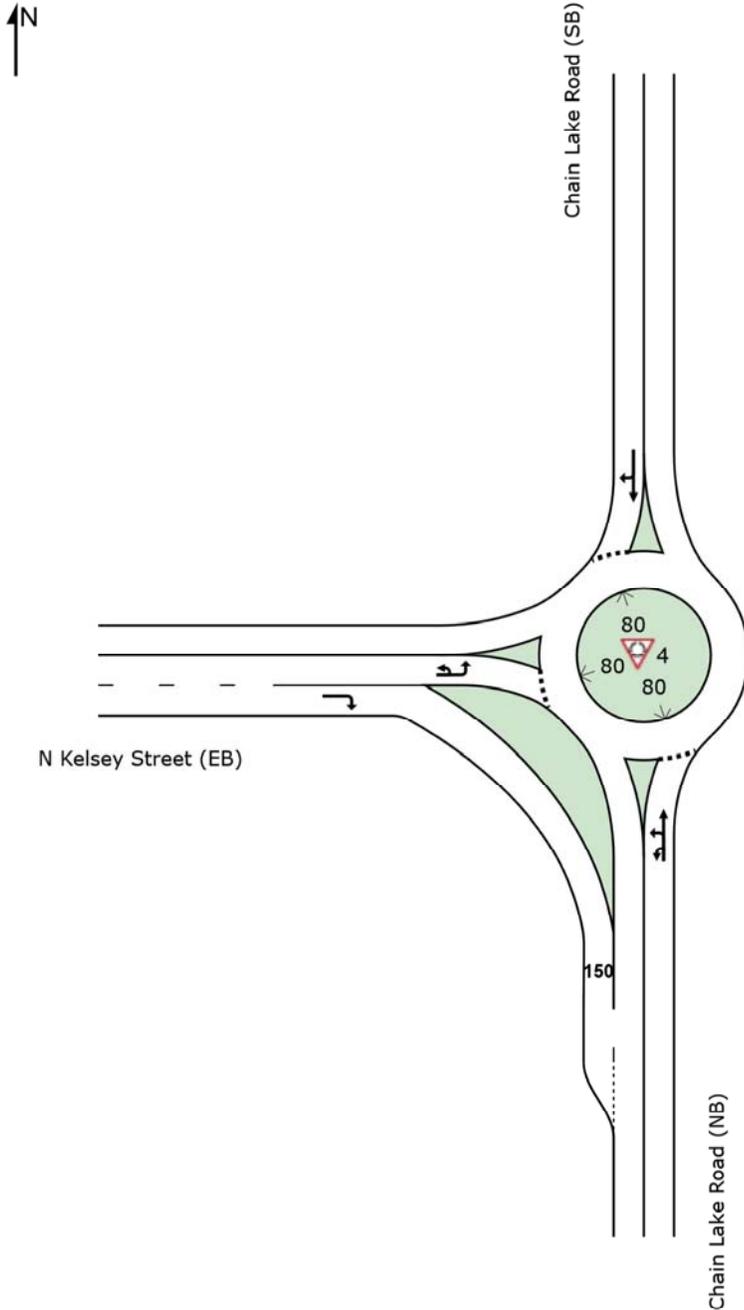
Approach	EB	NB	SB
HCM Control Delay, s	44.6	3.2	0
HCM LOS	E		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1079	-	318	-	-
HCM Lane V/C Ratio	0.352	-	0.759	-	-
HCM Control Delay (s)	10.1	-	44.6	-	-
HCM Lane LOS	B	-	E	-	-
HCM 95th %tile Q(veh)	1.6	-	5.9	-	-

SITE LAYOUT

Site: 4 [2031 Future Conditions w Development]

Chain Lake Road at N Kelsey Street
Site Category: (None)
Roundabout



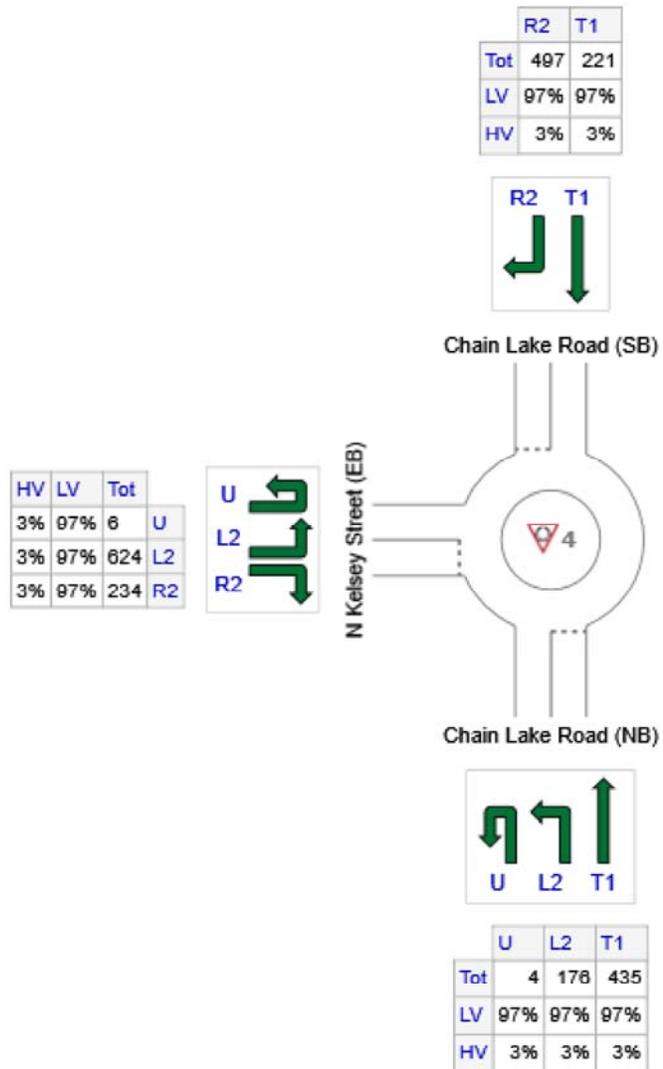
INPUT VOLUMES

Vehicles and pedestrians per 60 minutes

 Site: 4 [2031 Future Conditions w Development]

Chain Lake Road at N Kelsey Street
 Site Category: (None)
 Roundabout

Volume Display Method: Total and %



	All MCs	Light Vehicles (LV)	Heavy Vehicles (HV)
S: Chain Lake Road (NB)	615	597	18
N: Chain Lake Road (SB)	718	696	22
W: N Kelsey Street (EB)	864	838	26
Total	2197	2131	66

MOVEMENT SUMMARY

Site: 4 [2031 Future Conditions w Development]

Chain Lake Road at N Kelsey Street
 Site Category: (None)
 Roundabout

Movement Performance - Vehicles												
Mov ID	Turn	Demand Total veh/h	Flows HV %	Deg. Satn v/c	Average Delay sec	Level of Service	95% Back of Queue Vehicles veh	Distance ft	Prop. Queued	Effective Stop Rate	Aver. No. Cycles	Average Speed mph
South: Chain Lake Road (NB)												
3u	U	4	3.0	0.949	44.0	LOS D	22.6	578.3	1.00	1.60	2.51	24.4
3	L2	189	3.0	0.949	41.7	LOS D	22.6	578.3	1.00	1.60	2.51	24.1
8	T1	468	3.0	0.949	36.5	LOS D	22.6	578.3	1.00	1.60	2.51	24.1
Approach		661	3.0	0.949	38.0	LOS D	22.6	578.3	1.00	1.60	2.51	24.1
North: Chain Lake Road (SB)												
4	T1	238	3.0	0.708	7.1	LOS A	8.7	223.5	0.81	0.69	0.85	35.3
14	R2	534	3.0	0.708	7.0	LOS A	8.7	223.5	0.81	0.69	0.85	34.3
Approach		772	3.0	0.708	7.0	LOS A	8.7	223.5	0.81	0.69	0.85	34.6
West: N Kelsey Street (EB)												
5u	U	6	3.0	0.527	13.3	LOS B	4.7	120.0	0.64	0.69	0.64	33.8
5	L2	671	3.0	0.527	11.0	LOS B	4.7	120.0	0.64	0.69	0.64	33.1
12	R2	252	3.0	0.155	3.8	LOS A	0.0	0.0	0.00	0.47	0.00	36.8
Approach		929	3.0	0.527	9.1	LOS A	4.7	120.0	0.47	0.63	0.47	34.0
All Vehicles		2362	3.0	0.949	16.5	LOS B	22.6	578.3	0.73	0.92	1.16	30.6

Site Level of Service (LOS) Method: Delay & Degree of Saturation (SIDRA). Site LOS Method is specified in the Parameter Settings dialog (Site tab).

Roundabout LOS Method: Same as Signalised Intersections.

Vehicle movement LOS values are based on average delay and v/c ratio (degree of saturation) per movement.

Intersection and Approach LOS values are based on average delay for all movements (v/c not used).

Roundabout Capacity Model: SIDRA Standard.

SIDRA Standard Delay Model is used. Control Delay includes Geometric Delay.

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

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 Organisation: GIBSON TRAFFIC CONSULTANTS | Processed: Monday, August 30, 2021 11:11:49 AM
 Project: H:\2018\18-334\Update February 2021\Comment Response\Sidra\Chain Lake Rd at Kelsey St.sip8

HCM 6th TWSC
5: Chain Lake Road & Site Access

Garibaldi

Intersection

Int Delay, s/veh	0.7					
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Vol, veh/h	2	31	52	672	375	4
Future Vol, veh/h	2	31	52	672	375	4
Conflicting Peds, #/hr	0	0	0	0	0	0
Sign Control	Stop	Stop	Free	Free	Free	Free
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	2	34	57	730	408	4

Major/Minor	Minor2	Major1	Major2			
Conflicting Flow All	1254	410	412	0	-	0
Stage 1	410	-	-	-	-	-
Stage 2	844	-	-	-	-	-
Critical Hdwy	6.42	6.22	4.12	-	-	-
Critical Hdwy Stg 1	5.42	-	-	-	-	-
Critical Hdwy Stg 2	5.42	-	-	-	-	-
Follow-up Hdwy	3.518	3.318	2.218	-	-	-
Pot Cap-1 Maneuver	190	642	1147	-	-	-
Stage 1	670	-	-	-	-	-
Stage 2	422	-	-	-	-	-
Platoon blocked, %				-	-	-
Mov Cap-1 Maneuver	174	642	1147	-	-	-
Mov Cap-2 Maneuver	174	-	-	-	-	-
Stage 1	614	-	-	-	-	-
Stage 2	422	-	-	-	-	-

Approach	EB	NB	SB
HCM Control Delay, s	12	0.6	0
HCM LOS	B		

Minor Lane/Major Mvmt	NBL	NBT	EBLn1	SBT	SBR
Capacity (veh/h)	1147	-	552	-	-
HCM Lane V/C Ratio	0.049	-	0.065	-	-
HCM Control Delay (s)	8.3	0	12	-	-
HCM Lane LOS	A	A	B	-	-
HCM 95th %tile Q(veh)	0.2	-	0.2	-	-