MWSH Boone Road Master Plan

Traffic Impact Analysis
Salem, Oregon

Date:
November 18, 2021

Prepared by:
Tegan Enloe, PE

ENLOE
CONSULTING, LLC

CHAPTER 1: INTRODUCTION AND SUMMARY

MWSH Boone Road Property, LLC, is proposing to build a master planned area with a combination of housing, storage, and light industrial business park uses located adjacent to 36th Ave SE in Salem, Oregon. The development would be built in two phases described as follows:

Phase 2 (this submittal):

- 210 units of Multi-Family Mid-Rise (ITE Code 210)
- 62 units of Multi-Family Low-Rise (ITE Code 220)
- 192,000 SQFT of Business Park (ITE Code 770)
- 60,000 SQFT of Mini Warehouse (ITE Code 151)

Phase 3 (future work):

- To be determined amount of Senior Adult Housing Attached (ITE Code 252)
- To be determined amount of General Light Industrial (ITE Code 110)

These will be added to the previously approved Phase 1 work of 210 units of Multi-Family Mid-Rise approved by the City under CU-SPR-ADJ-DAP-DR21-02.

The purpose of this Transportation Impact Analysis (TIA) is to evaluate possible system impacts from the proposed development and, where necessary, recommend mitigation measures on the nearby transportation network. The impact analysis is focused on intersections identified as being in the study area based on City standards and shown in **Figure 1**. These intersections include:

1. I-5 SB Ramps/ Kuebler Blvd
2. I-5 NB Ramps/ Kuebler Blvd
3. Kuebler Blvd/ 36th Ave SE
4. 32nd Ave SE/ Boone Rd SE (future connection)
5. 36th Ave SE/ Boone Rd SE
6. 32nd Ave SE/ Street “A” (future connection)
7. 32nd Ave SE/ 36th Ave SE (future connection)
8. 36th Ave SE/Kashmir Way SE

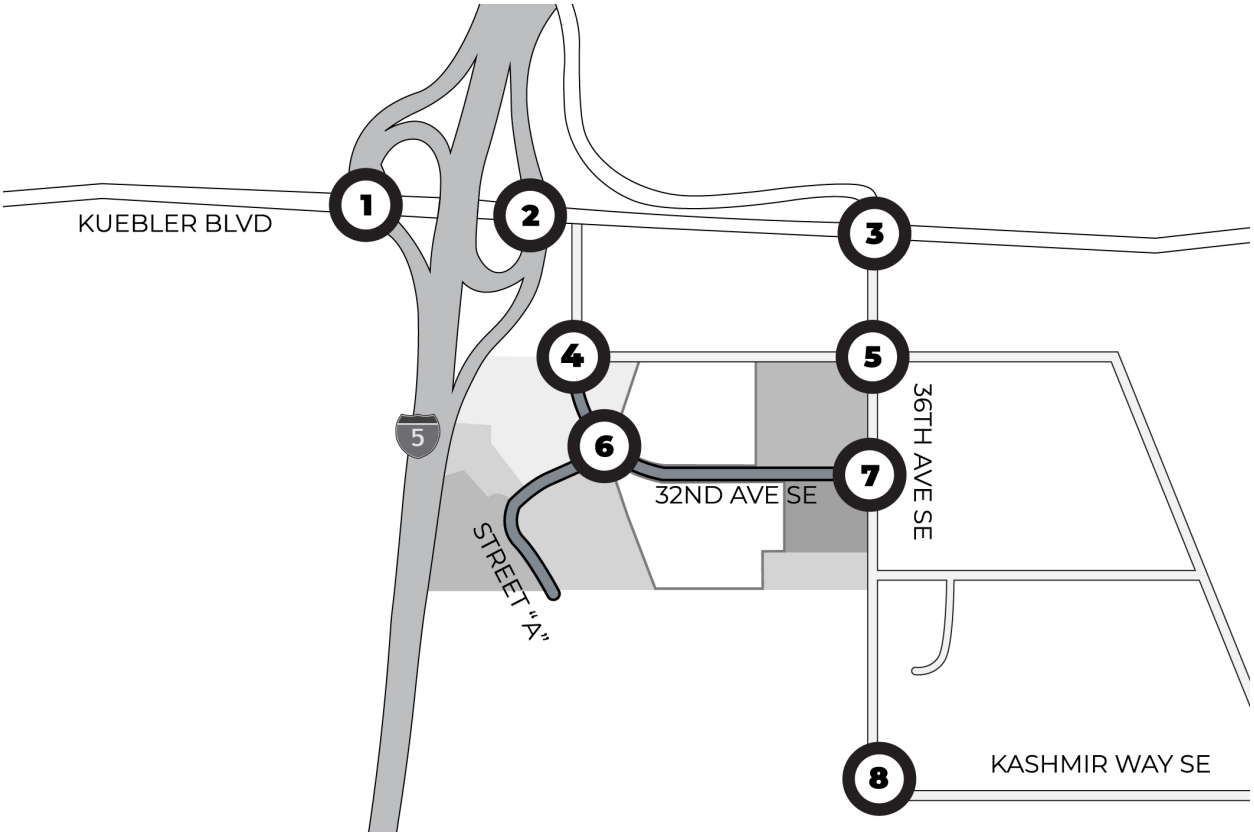

Figure 1: Study Area

Appendix A provides the site plan of the proposed development. **Table 1** lists important characteristics of the study area and proposed project.

Table 1: Key Study Area and Proposed Development Characteristics

Characteristics	Information
Study Area	
Number of Study Intersections	Eight
Analysis Period	Weekday A.M and P.M. Peak Hours
Analysis Scenarios	2021 Existing Conditions, AM Peak Hour 2021 Existing Conditions, PM Peak Hour 2025 Background Traffic, AM Peak Hour 2025 Background Traffic, PM Peak Hour 2025 Total Traffic (Background + Site), AM Peak Hour 2025 Total Traffic (Background + Site), PM Peak Hour
Project Site	
Existing Land Use	Vacant
Proposed Development	210 units of Multi-Family Mid-Rise 62 units of Multi-Family Low-Rise 192,000 SQFT of Business Park 60,000 SQFT of Mini Warehouse
Project Access	The development will have access via: a new public street, currently referred to as Street “A”, an extension of 32nd Ave SE, a driveway creating a fourth leg at the intersection of 36th Ave SE/ Kashmir Way SE, and driveways on Boone Rd SE

Existing Conditions and Intersection Operations

Transportation operations for the existing roadway network are evaluated to establish a baseline of performance. The following intersections were identified for existing conditions evaluation:

1 I-5 SB Ramps/ Kuebler Blvd

2 I-5 NB Ramps/ Kuebler Blvd

3 Kuebler Blvd/ 36th Ave SE

5 36th Ave SE/ Boone Rd SE

8 36th Ave SE/Kashmir Way SE

Table 2 shows the existing intersection operations at the study intersections.

Table 2: 2021 Existing Traffic at Study Intersection Operations

No.	Intersection	Traffic Control	Operating Standard	AM Peak Hour	P.M. Peak Hour
1	I-5 SB Ramps/ Kuebler Blvd	Signalized	V/C 0.85	***V/C 0.89***	***V/C 0.95***
2	I-5 NB Ramps/ Kuebler Blvd	Signalized	V/C 0.85	***V/C 0.96***	V/C 0.71
3	Kuebler Blvd/ 36th Ave SE	Signalized	LOS E, V/C 0.90	V/C 1.14	V/C 1.01
5	36th Ave SE/ Boone Rd SE	Unsignalized (Two way stop)	LOS E	LOS B (EBL)	LOS C (EBL)
8	36th Ave SE/Kashmir Way SE	Unsignalized (Two way stop)	LOS E	LOS A (WBL)	LOS A (WBL)

V/C = Volume-to-Capacity Ratio of Worst Movement
LOS = Level of Service of Worst Movement
Locations exceeding mobility standards are shown with ***bold/italicized***

Project Traffic Impact

Construction of the proposed planned development is expected to begin in 2023 and be completed in 2025. To determine whether the proposed project will result in off-site traffic impacts, future traffic volumes were estimated. **Tables 3 and 4** provide the intersection operations for the future scenarios with and without project traffic.

Table 3: 2025 Background Intersection Operations (Without Project)

No.	Intersection	Traffic Control	Operating Standard	AM Peak Hour	P.M. Peak Hour
1	I-5 SB Ramps/ Kuebler Blvd	Signalized	V/C 0.85	***V/C 0.95***	***V/C 1.17***
2	I-5 NB Ramps/ Kuebler Blvd	Signalized	V/C 0.85	***V/C 1.01***	***V/C 0.88***
3	Kuebler Blvd/ 36th Ave SE	Signalized	LOS E, V/C 0.90	V/C 0.79	V/C 0.75
4	32nd Ave SE/ Boone Rd SE	Unsignalized (Two way stop)	LOS E	LOS A (WBL)	LOS A (WBL)
5	36th Ave SE/ Boone Rd SE	Unsignalized (Two way stop)	LOS E	LOS B (EBL)	LOS C (EBL)
8	36th Ave SE/Kashmir Way SE	Unsignalized (Two way stop)	LOS E	LOS A (WBL)	LOS A (WBL)

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Table 4: 2025 Total Intersection Operations (With Project)

No.	Intersection	Traffic Control	Operating Standard	AM Peak Hour	P.M. Peak Hour
1	I-5 SB Ramps/ Kuebler Blvd	Signalized	V/C 0.85	***V/C 0.97***	***V/C 1.18***
2	I-5 NB Ramps/ Kuebler Blvd	Signalized	V/C 0.85	***V/C 1.08***	***V/C 0.88***
3	Kuebler Blvd/ 36th Ave SE	Signalized	LOS E, V/C 0.90	V/C 0.89	V/C 0.83
4	32nd Ave SE/ Boone Rd SE	Unsignalized (Two way stop)	LOS E	LOS A (WBL)	LOS A (WBL)
5	36th Ave SE/ Boone Rd SE	Unsignalized (Two way stop)	LOS E	LOS D (EBL)	LOS D (EBL)
6	32nd Ave SE/ Street "A"	Unsignalized (Two way stop)	LOS E	LOS A (EBL)	LOS A (EBL)
7	32nd Ave SE/ 36th Ave SE	Unsignalized (Two way stop)	LOS E	LOS A (EBL)	LOS B (EBL)
8	36th Ave SE/Kashmir Way SE	Unsignalized (Two way stop)	LOS E	LOS A (WBL)	LOS A (WBL)

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Key Findings

Key findings associated with the proposed development include the following items:

- The proposed development would generate 375 (257 in, 118 out) AM peak hour trips and 405 (154 in, 251 out) PM peak hour vehicle trips.
- All study intersections are expected to operate within mobility standards with the addition of the proposed site for the 2025 opening year, with the exceptions of Kuebler Blvd at I-5 NB and I-5 SB Ramps. Both of these study intersections fail to meet ODOT mobility standards in the existing, background, and total traffic conditions.
- All study intersections will function within their available turn lane storage for the planned opening year with the proposed development, except for Kuebler Blvd/ 36th Ave SE. At this location, the northbound left, southbound left, and westbound left turns all exceed available storage. It is important to note that these movements fail in both the background (without the development) and total (with development) conditions. In general, the difference between the two is typically one car length or less impact.

CHAPTER 2: EXISTING CONDITIONS

This chapter provides documentation of existing study area conditions, including the project site, study area roadway network, and existing traffic volumes and operations.

Project Site

MWSH Boone Road Property, LLC, is proposing to build a master planned area with a combination of housing, storage, and light industrial business park uses located adjacent to 36th Ave SE in Salem, Oregon. The development would be built in two phases described as follows:

Phase 2 (this submittal):

- 210 units of Multi-Family Mid-Rise (ITE Code 210)
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Phase 3 (future work):

- To be determined amount of Senior Adult Housing Attached (ITE Code 252)
- To be determined amount of General Light Industrial (ITE Code 110)

These will be added to the previously approved Phase 1 which includes 210 units of Multi-Family Mid-Rise approved by the City under CU-SPR-ADJ-DAP-DR21-02.

Existing Traffic Volumes and Operations

Existing AM and PM peak hour traffic operations were analyzed at the following study intersections:

1 I-5 SB Ramps/ Kuebler Blvd

2 I-5 NB Ramps/ Kuebler Blvd

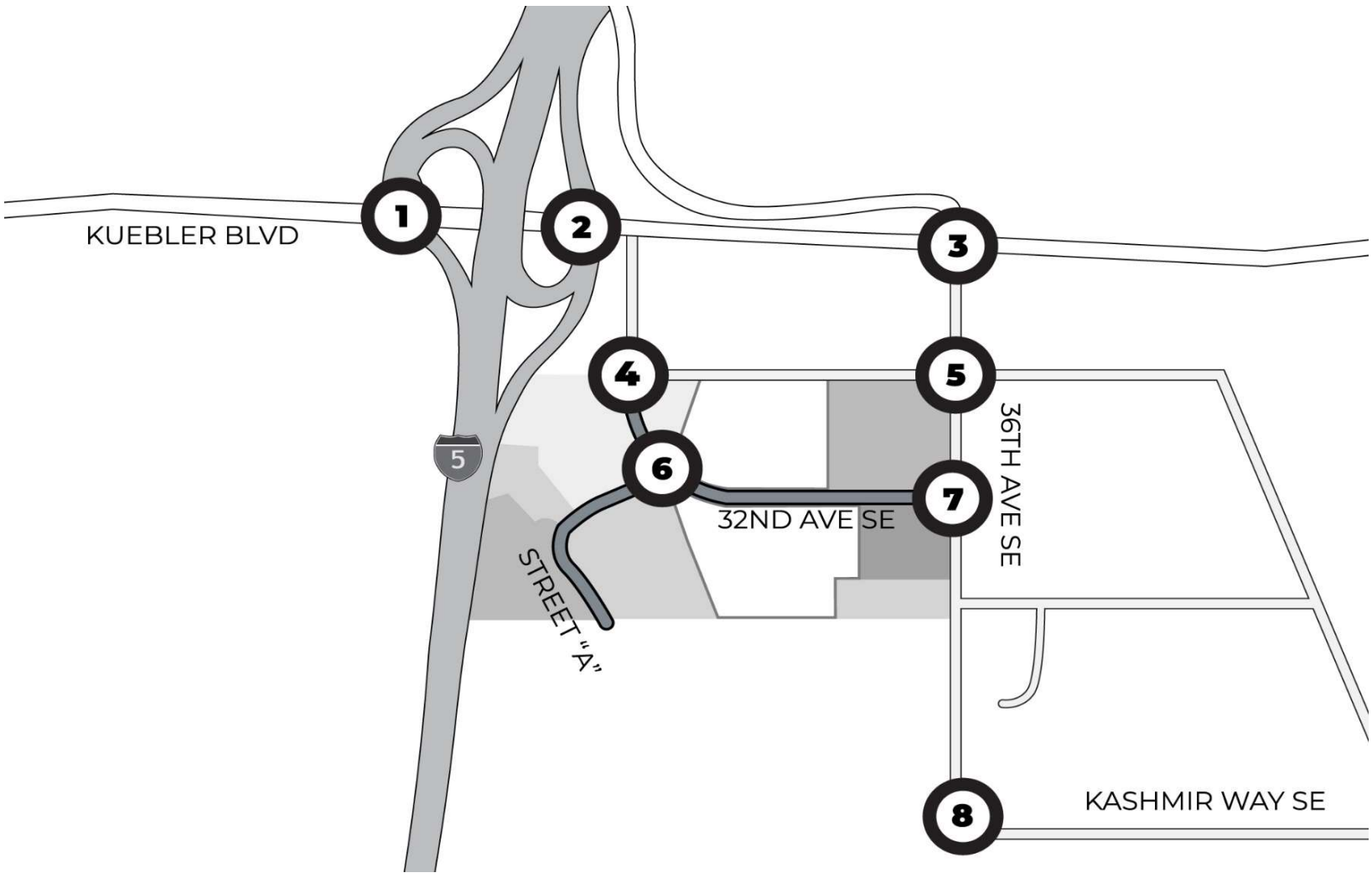
3 Kuebler Blvd/ 36th Ave SE

5 36th Ave SE/ Boone Rd SE

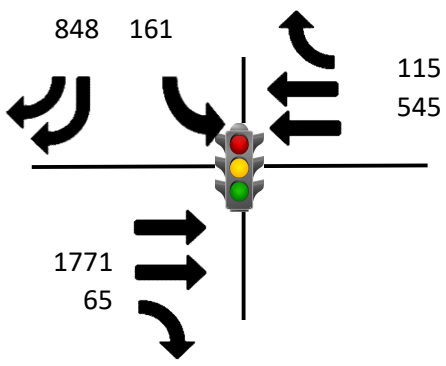
8 36th Ave SE/Kashmir Way SE

Traffic counts used for this study were collected on November 19 and 20, 2019. These are used instead of more current counts because the study area overlaps with current construction on Kuebler Blvd, making data collection problematic. In addition, these counts also have the benefit of being collected prior to the COVID-19 pandemic, which caused a period of unusual traffic patterns. Volumes for the intersection of 36th Ave SE/Kashmir Way SE are based on counts collected on November 9, 2021. The peak hour traffic volumes analyzed under existing conditions are shown in **Figure 2 and Figure 3**, with the detailed traffic counts included in **Appendix B.**

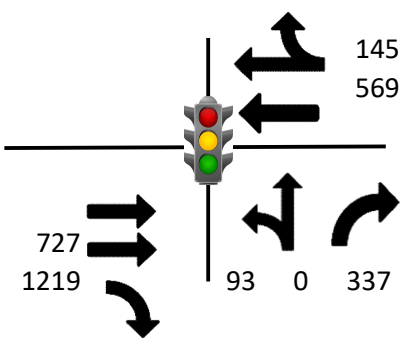
Figure 2: 2021 AM Peak Hour Existing Conditions



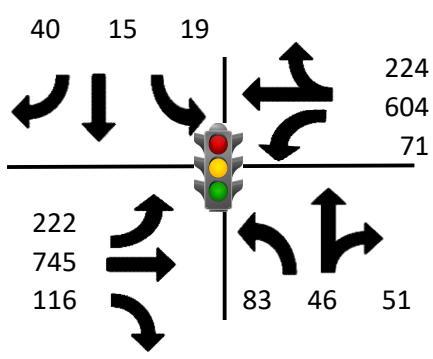
1 I-5 SB Ramps/ Kuebler Blvd



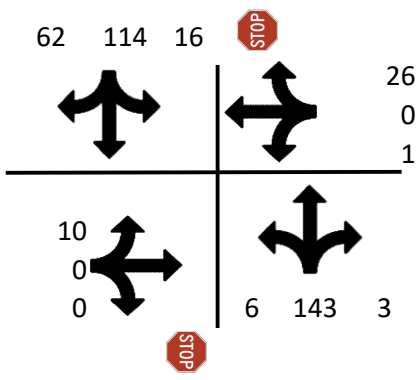
2 I-5 NB Ramps/ Kuebler Blvd



3 Kuebler Blvd/ 36th Ave SE



5 36th Ave SE/ Boone Rd SE



8 36th Ave SE/Kashmir Way SE

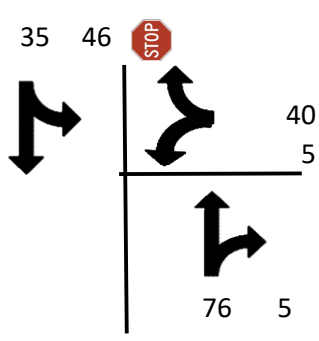
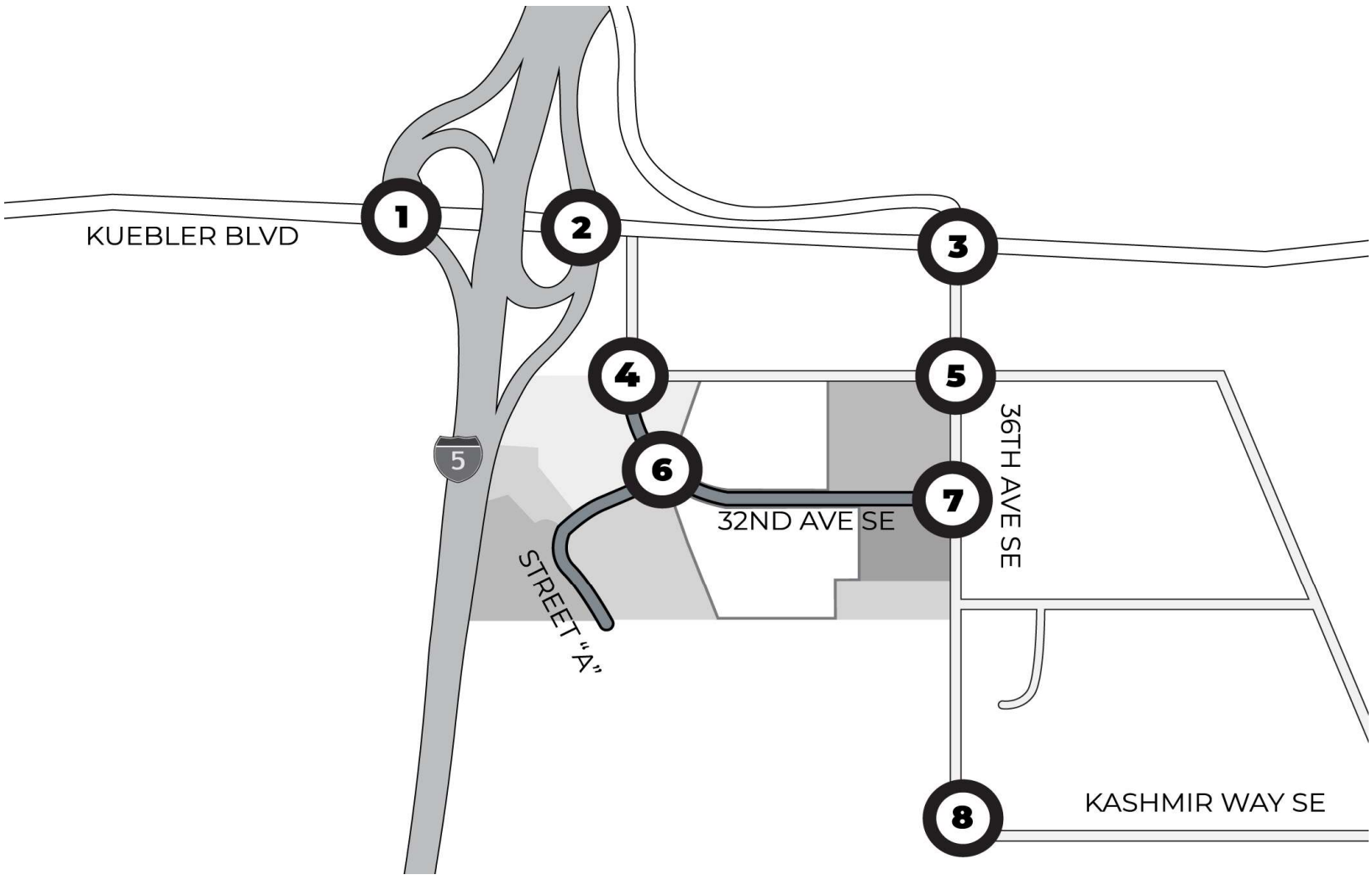
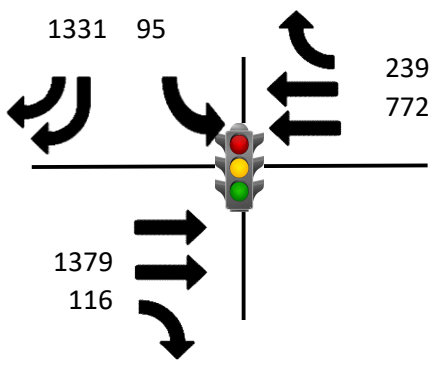


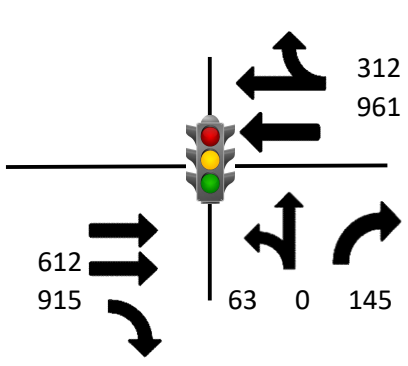
Figure 3: 2021 PM Peak Hour Existing Conditions



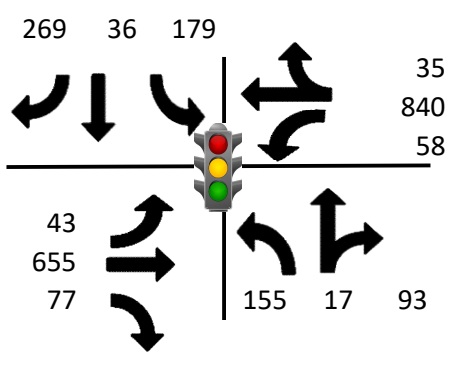
1 I-5 SB Ramps/ Kuebler Blvd



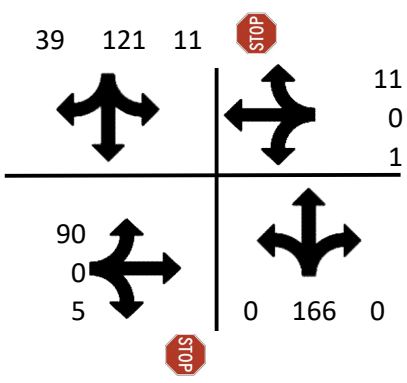
2 I-5 NB Ramps/ Kuebler Blvd



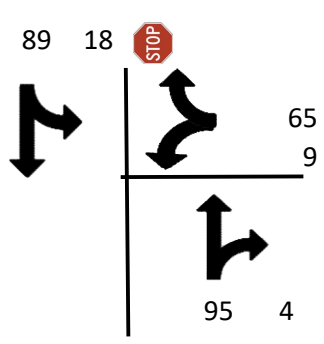
3 Kuebler Blvd/ 36th Ave SE



5 36th Ave SE/ Boone Rd SE



8 36th Ave SE/Kashmir Way SE



Existing Operating Conditions

Existing traffic operations at the study intersections were evaluated for the AM and PM peak hours. The estimated operational results of each study intersection are shown in **Table 5** and is based on the 2000 Highway Capacity Manual[1] methodology for signalized intersections and 2016 Highway Capacity Manual methodology[2] for unsignalized intersections. **Appendix C** provides detailed reports summarizing these results. Traffic volumes for all study intersections, except 36th Ave SE/ Kashmir Way SE, are developed by applying a one percent annual growth rate to counts from November 19 and 20, 2019. Volumes for 36th Ave SE/Kashmir Way SE are based on counts collected on November 9, 2021. All study intersections meet existing mobility standards except for Kuebler Blvd at the I-5 NB and SB ramps.

Table 5: 2021 Existing Intersection Operations

No.	Intersection	Traffic Control	Operating Standard	AM Peak Hour	P.M. Peak Hour
1	I-5 SB Ramps/ Kuebler Blvd	Signalized	V/C 0.85	***V/C 0.89***	***V/C 0.95***
2	I-5 NB Ramps/ Kuebler Blvd	Signalized	V/C 0.85	***V/C 0.96***	V/C 0.71
3	Kuebler Blvd/ 36th Ave SE	Signalized	LOS E, V/C 0.90	V/C 1.14	V/C 1.01
5	36th Ave SE/ Boone Rd SE	Unsignalized (Two way stop)	LOS E	LOS B (EBL)	LOS C (EBL)
8	36th Ave SE/Kashmir Way SE	Unsignalized (Two way stop)	LOS E	LOS A (WBL)	LOS A (WBL)

V/C = Volume-to-Capacity Ratio of Worst Movement
LOS = Level of Service of Worst Movement
Locations exceeding mobility standards are shown with ***bold/italicized***

Crash Analysis

The five most recent years of crash records (Jan 1, 2015- Dec 31, 2019) for the study area were obtained from Oregon Department of Transportation (ODOT's) online database. A copy of these records is provided in **Appendix D**. Crashes identified by ODOT as intersectional for the two cross streets were included in the analysis.

Crash rates are calculated for the five existing study intersections and compared with ODOT's 90th percentile crash rates from Exhibit 4-1 of ODOT's Analysis Procedures Manual (APM). All intersections have crash rates below their comparable 90th percentile crash rates except for the intersection of 36th Ave SE/ Boone Rd SE. This indicates that this study intersection experiences more crashes than would be expected when compared to a similar reference population throughout Oregon.

[1] *2000 Highway Capacity Manual*, Transportation Research Board, Washington DC, 2000

[2] *Highway Capacity Manual 6th Edition: A Guide for Multimodal Mobility Analysis*, Transportation Research Board, Washington DC, 2016.

Table 6: Crash Rate Analysis

No.	Intersection	AADT	5 Year Crash Total (2015-2019)	Crash Rate	Intersection Type	90th Percentile Crash Rate
1	I-5 SB Ramps/ Kuebler Blvd	38,560	31	0.44	4SG	0.86
2	I-5 NB Ramps/ Kuebler Blvd	29,490	14	0.32	4SG	0.86
3	Kuebler Blvd/ 36th Ave SE	24,080	19	0.432	4SG	0.86
5	36th Ave SE/ Boone Rd SE	4,360	4	***0.503***	3ST	0.293
8	36th Ave SE/Kashmir Way SE	2,800	0	0	3ST	0.293

Note: AADT is estimated using the industry standard of practice that the intersection PM Peak Hour traffic is approximately 10% of the AADT. The PM Peak Hour traffic used reflects raw counts.

Locations exceeding 90th percentile crash rate are shown with ***bold/italicized***

** Location does not exist in state database

CHAPTER 3: BACKGROUND TRAFFIC

Construction of the proposed planned development is expected to begin in 2023 and be completed in 2025. To account for traffic growth a 1.0% growth rate was used to forecast the existing traffic volumes to future background traffic volumes on roads within the study area. This is consistent with other TIA's recently completed in the area, including Costco which is located nearby. In process volumes from Phase 1 of the development, which was previously approved and includes 210 units of Multi-Family Mid-Rise approved by the City under CU-SPR-ADJ-DAP-DR21-02, and Costco are included in the background traffic volumes.

In addition to the in-process developments, the area also has planned capacity improvement projects as identified in the Regional Transportation Plan (RTSP ID S110 and S287), as well as the City's Transportation System Plan (TSP). Of relevance to this project study area is the widening of Kuebler Blvd to four travel lanes from I-5 to Hwy 22 overpass. This widening project is included in the background traffic analysis.

Background traffic volumes are show in **Figures 4 and 5**.

Background Intersection Operations

Background traffic operations at the study intersections were determined based on the 2016 Highway Capacity Manual methodology[3] for unsignalized intersections and the 2000 Highway Capacity Manual methodology for signalized intersections[4]. The estimated operations of each study intersection are shown in **Table 7**. **Appendix E** provides detailed reports summarizing these results. All study intersections meet existing mobility standards except for Kuebler Blvd at the I-5 NB and SB ramps.

[3] *Highway Capacity Manual 6th Edition: A Guide for Multimodal Mobility Analysis,* Transportation Research Board, Washington DC, 2016.

[4] *2000 Highway Capacity Manual*, Transportation Research Board, Washington DC, 2010.

Table 7: 2025 Background Intersection Operations

No.	Intersection	Traffic Control	Operating Standard	AM Peak Hour	P.M. Peak Hour
1	I-5 SB Ramps/ Kuebler Blvd	Signalized	V/C 0.85	***V/C 0.95***	***V/C 1.17***
2	I-5 NB Ramps/ Kuebler Blvd	Signalized	V/C 0.85	***V/C 1.01***	***V/C 0.88***
3	Kuebler Blvd/ 36th Ave SE	Signalized	LOS E, V/C 0.90	V/C 0.79	V/C 0.75
4	32nd Ave SE/ Boone Rd SE	Unsignalized (Two way stop)	LOS E	LOS A (WBL)	LOS A (WBL)
5	36th Ave SE/ Boone Rd SE	Unsignalized (Two way stop)	LOS E	LOS B (EBL)	LOS C (EBL)
8	36th Ave SE/Kashmir Way SE	Unsignalized (Two way stop)	LOS E	LOS A (WBL)	LOS A (WBL)

V/C = Volume-to-Capacity Ratio of Worst Movement
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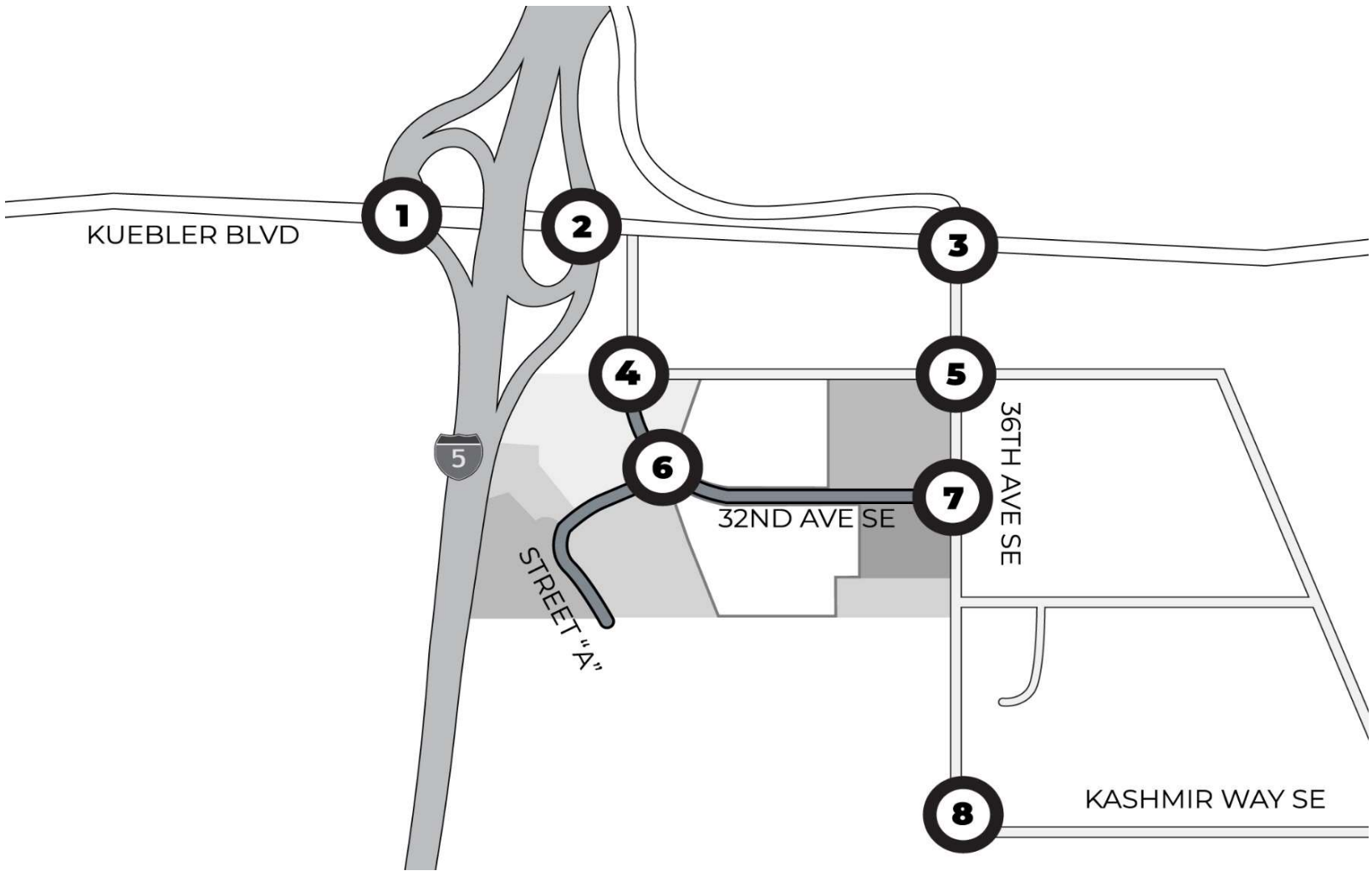
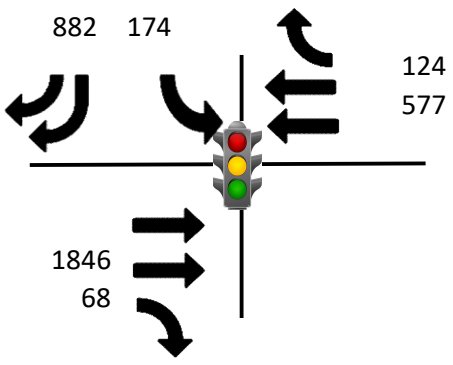
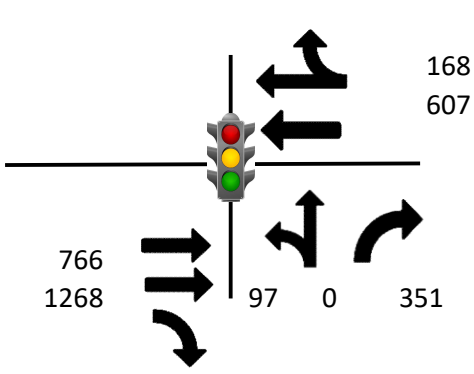
Figure 4: 2025 AM Peak Hour Background Conditions



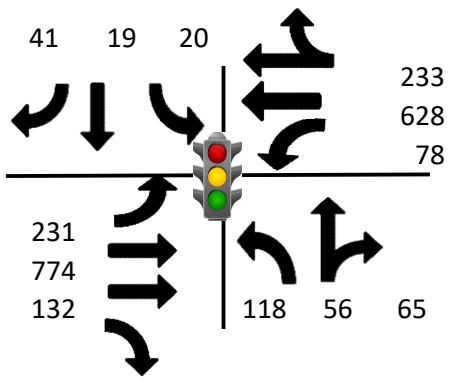
1 I-5 SB Ramps/ Kuebler Blvd



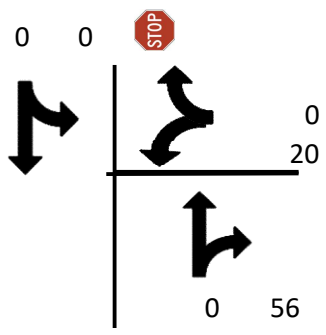
2 I-5 NB Ramps/ Kuebler Blvd



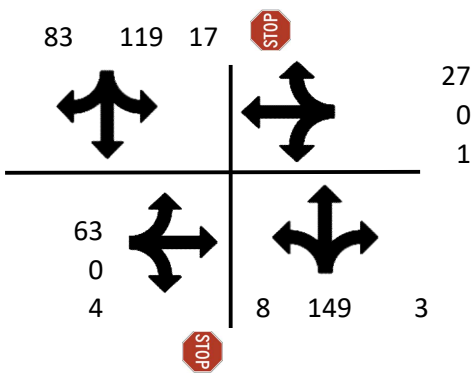
3 Kuebler Blvd/ 36th Ave SE



4 32nd Ave SE/ Boone Rd SE



5 36th Ave SE/ Boone Rd SE



8 36th Ave SE/Kashmir Way SE

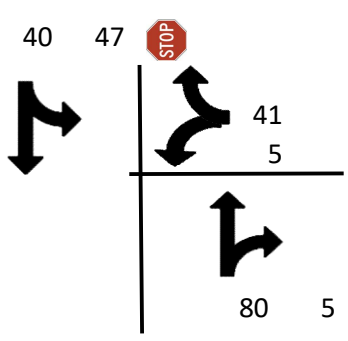
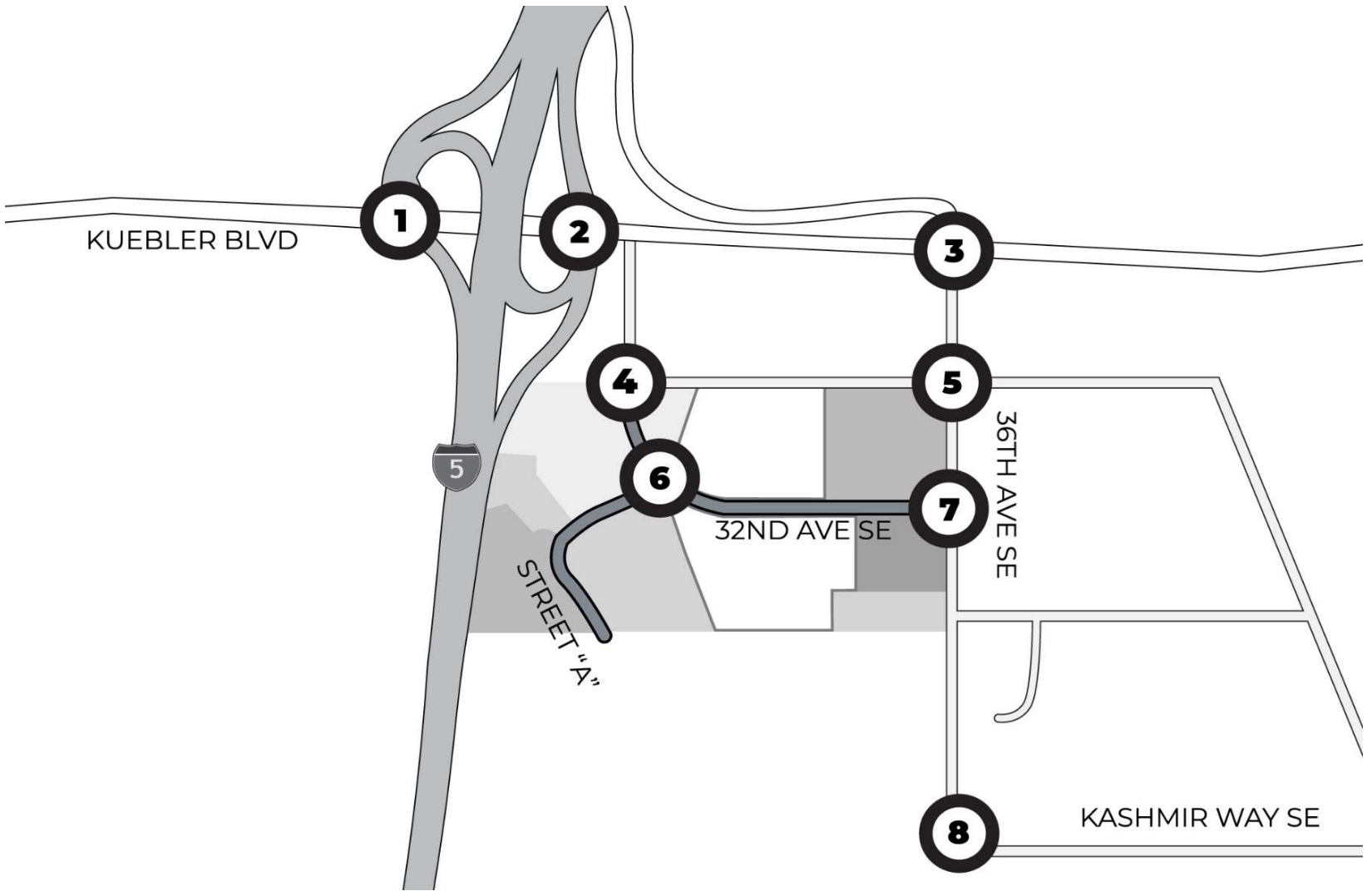
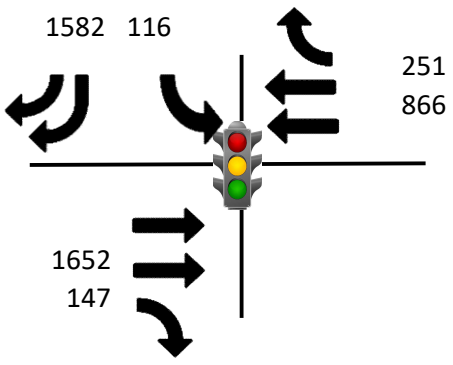


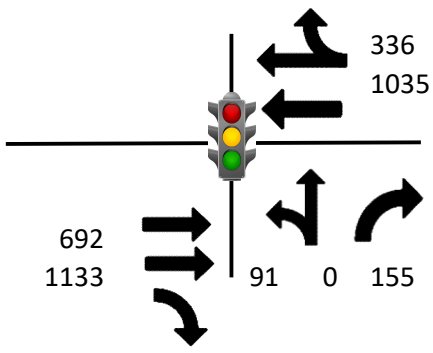
Figure 5: 2025 PM Peak Hour Background Conditions



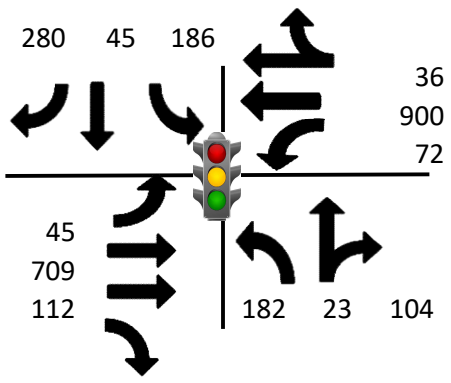
1 I-5 SB Ramps/ Kuebler Blvd



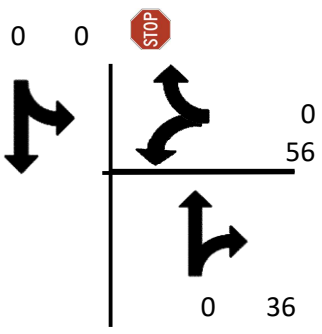
2 I-5 NB Ramps/ Kuebler Blvd



3 Kuebler Blvd/ 36th Ave SE



4 32nd Ave SE/ Boone Rd SE



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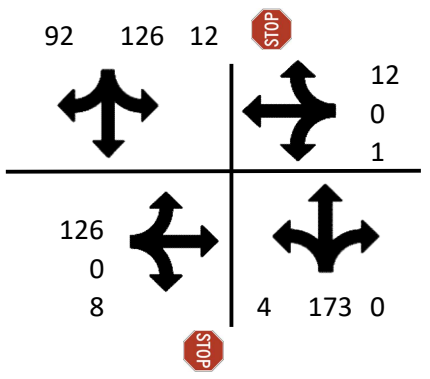
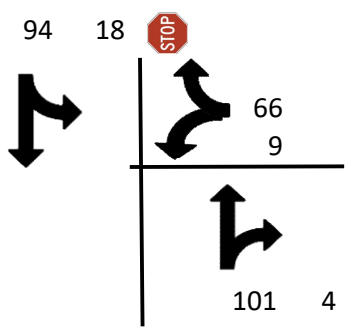


8 36th Ave SE/Kashmir Way SE



CHAPTER 4: PROJECT IMPACTS

This chapter reviews the impacts that the proposed development would have on the study area transportation system. The focus of the impact analysis is on the following study intersections:

1. I-5 SB Ramps/ Kuebler Blvd
2. I-5 NB Ramps/ Kuebler Blvd
3. Kuebler Blvd/ 36th Ave SE
4. 32nd Ave SE/ Boone Rd SE (future connection)
5. 36th Ave SE/ Boone Rd SE
6. 32nd Ave SE/ Street "A" (future connection)
7. 32nd Ave SE/ 36th Ave SE (future connection)
8. 36th Ave SE/Kashmir Way SE

Trip Generation

Trip generation is used to estimate the number of vehicle trips added to the roadway network by a development during a specified period. In this case, the AM and PM peak hour periods are studied. Trip generation estimates are established using data and methodology provided by the Institute of Transportation Engineers (ITE).[5]

Trip generation values for the proposed development are estimated using the ITE Trip Generation Manual, 10th Edition. Multi-Family Mid-Rise (221) is used to estimate trips for the planned apartments. Multi-Family Low-Rise is used to estimate trips for the planned townhomes. The development will also include a Business Park (770) and Self-Storage (Mini Warehouse [151]). Trip generation values are provided in **Table 8**.

[5] *Trip Generation, 10th Edition*, Institute of Transportation Engineers, 2017.

Table 8: Trip Generation Summary

Land Use	Unit of Measure	Time Period	Peak Hour Trips		
			In	Out	Total
Multi-Family Mid-Rise (221)	210 Dwelling Units	AM Peak	18	52	71
Multi-Family Low-Rise (220)	62 Dwelling Units	AM Peak	7	23	30
Business Park (770)	192,000 SQFT	AM Peak	228	40	268
Mini Warehouse (151)	60,000 SQFT	AM Peak	4	2	6
AM PEAK HOUR TRIPS			**257**	**118**	**375**
Multi-Family Mid-Rise (221)	210 Dwelling Units	PM Peak	55	35	90
Multi-Family Low-Rise (220)	62 Dwelling Units	PM Peak	25	14	39
Business Park (770)	192,000 SQFT	PM Peak	69	197	266
Mini Warehouse (151)	60,000 SQFT	PM Peak	5	5	10
TOTAL PM PEAK HOUR			**154**	**251**	**405**

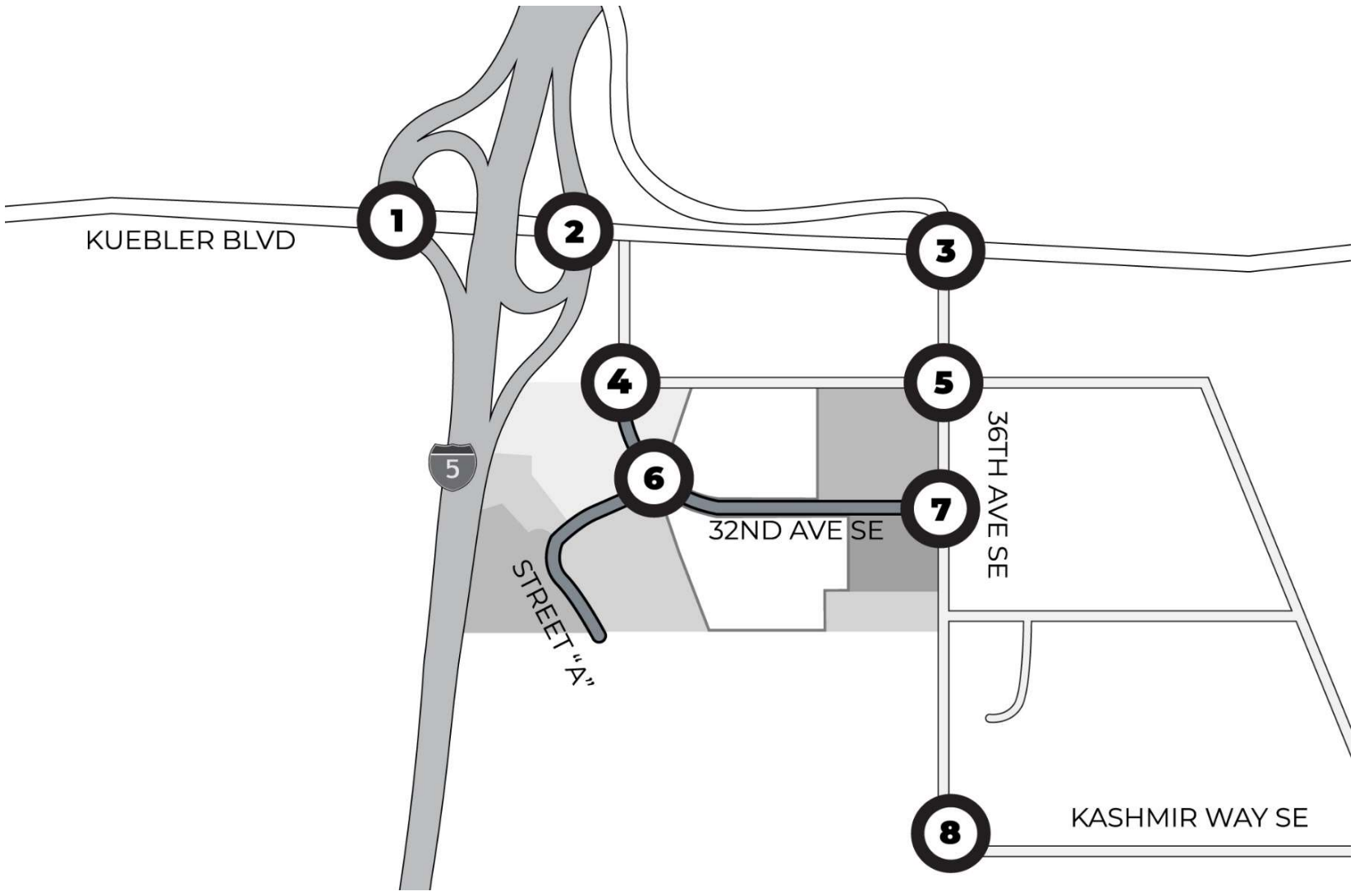
Trip Distribution

Trip distribution provides an estimation of where trips from the development originate and end on the study area network. This is represented as percentages where large portions of the trips generated enter and exit the project study area. The trip distribution percentages are based off travel demand model outputs from MWCOG. These include:

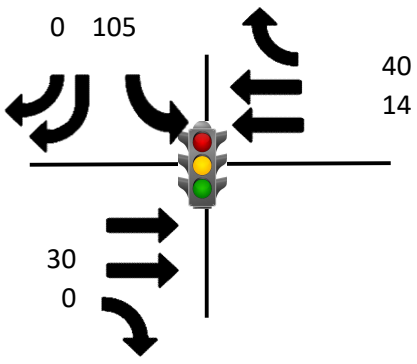
- 40% north on I-5
- 34% south on I-5
- 12% west on Kuebler Blvd
- 8% east on Kuebler Blvd
- 4% north on 36th Ave SE
- 2% south on 36th Ave SE

Site generated trips are distributed on the network as shown in **Figures 6 and 7**.

Figure 6: AM Peak Hour Site Generated Volumes



1 I-5 SB Ramps/ Kuebler Blvd



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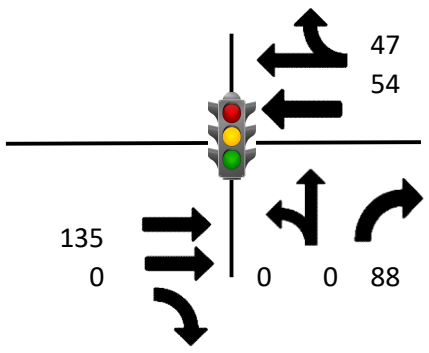
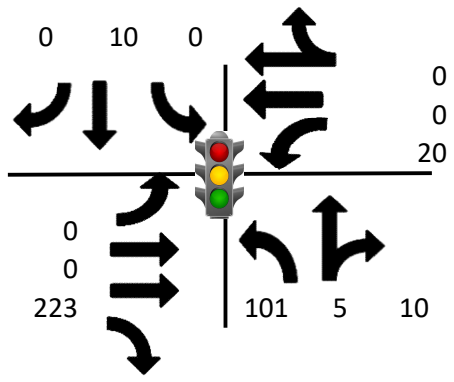


3 Kuebler Blvd/ 36th Ave SE



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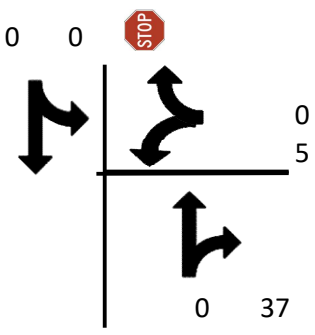

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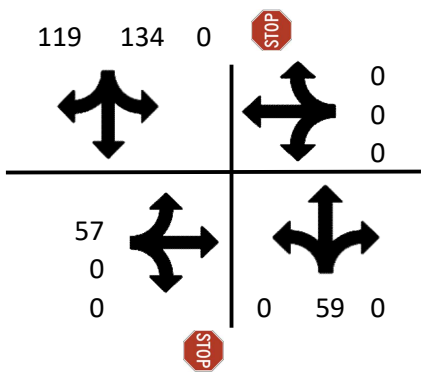

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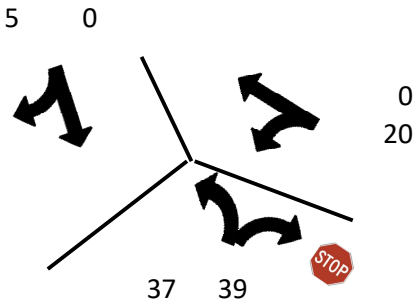

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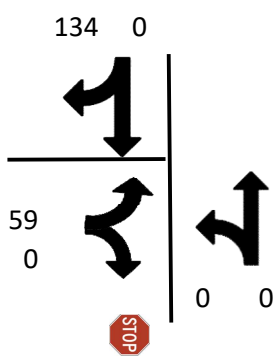

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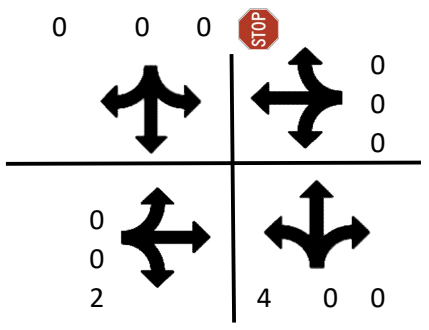
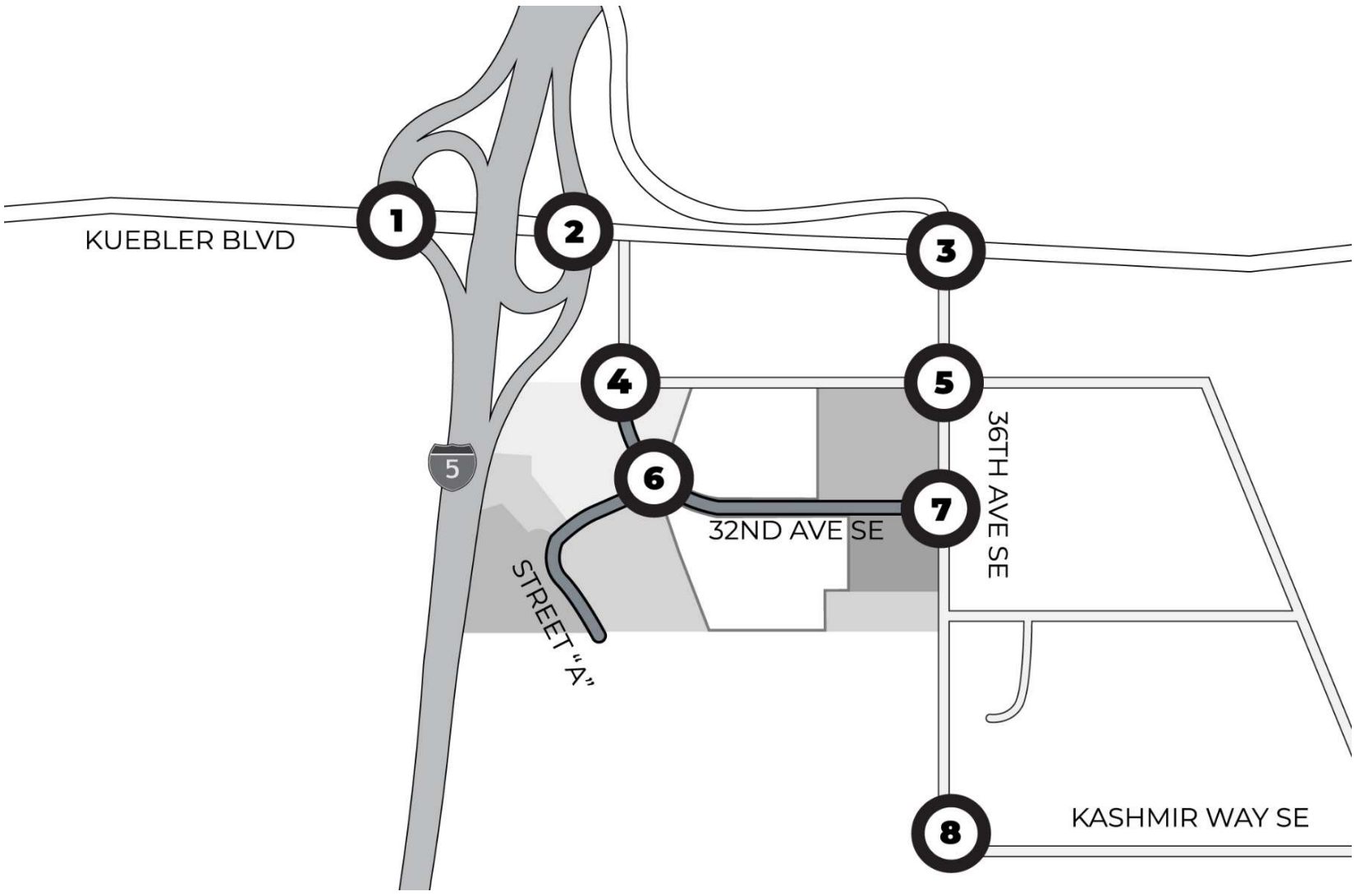
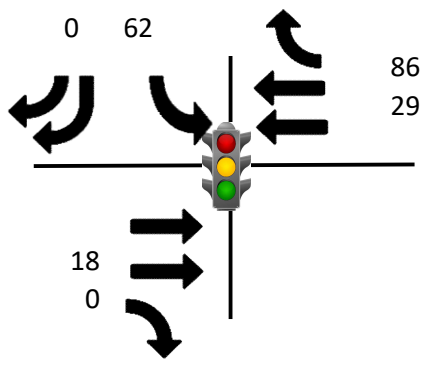


Figure 7: PM Peak Hour Site Generated Volumes



1 I-5 SB Ramps/ Kuebler Blvd



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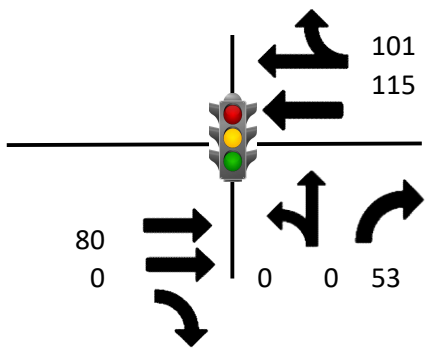

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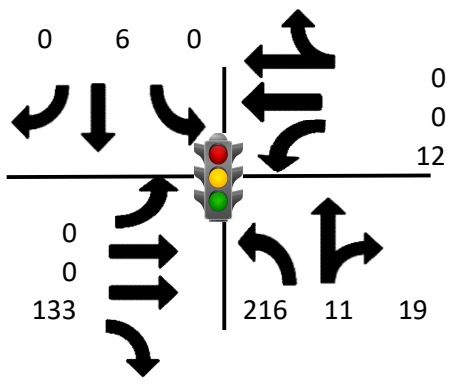

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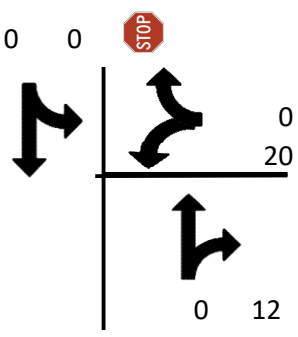

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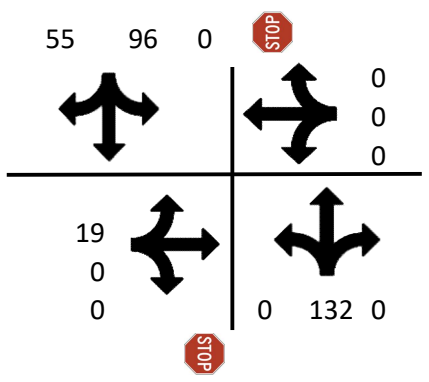

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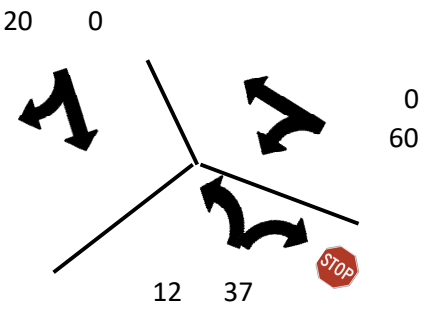

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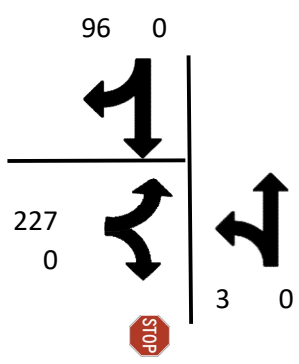

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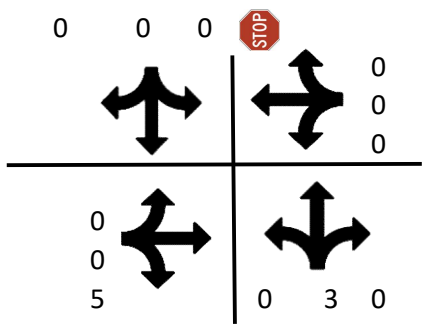


Future Traffic Volumes with the Proposed Development

The estimated trips associated with the proposed development are added to the background volumes to estimate the total traffic scenario traffic volumes. **Figure 8 and Figure 9** show the 2025 total traffic volumes used for the opening year analysis.

Table 9 lists the study intersection total traffic operating conditions for the AM and PM peak hours. Traffic operations at the study intersections were determined for the peak hours based on the 2016 Highway Capacity Manual methodology[6] for unsignalized intersections and the 2000 Highway Capacity Manual methodology for signalized intersections[7]. **Appendix F** provides detailed reports for the operational results.

Based on the operational analysis, all study intersections meet existing mobility standards except for Kuebler Blvd at the I-5 NB and SB ramps.

Table 9: 2025 Total Intersection Operations (with Project)

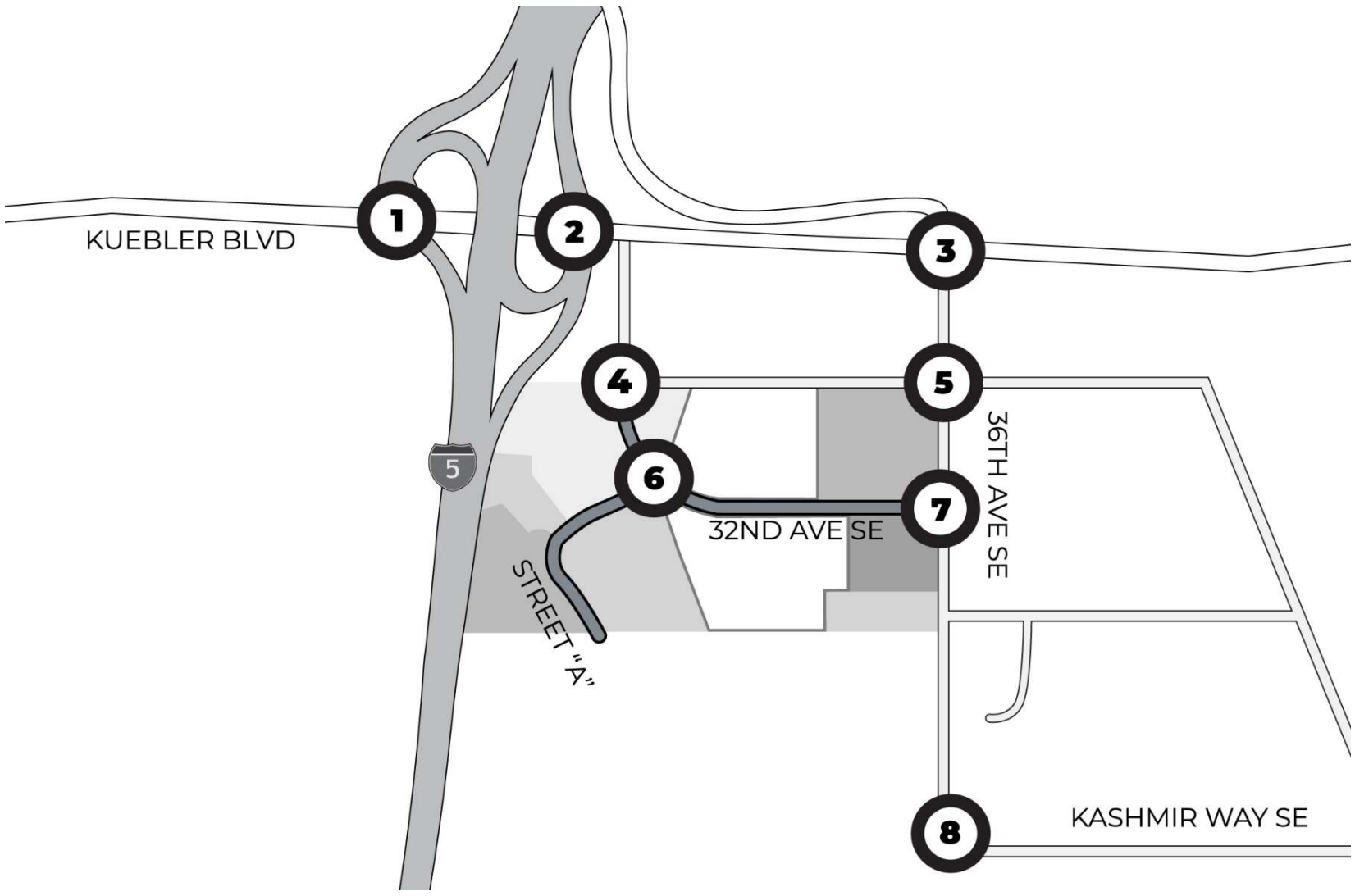
No.	Intersection	Traffic Control	Operating Standard	AM Peak Hour	P.M. Peak Hour
1	I-5 SB Ramps/ Kuebler Blvd	Signalized	V/C 0.85	***V/C 0.97***	***V/C 1.18***
2	I-5 NB Ramps/ Kuebler Blvd	Signalized	V/C 0.85	***V/C 1.08***	***V/C 0.88***
3	Kuebler Blvd/ 36th Ave SE	Signalized	LOS E, V/C 0.90	V/C 0.89	V/C 0.83
4	32nd Ave SE/ Boone Rd SE	Unsignalized (Two way stop)	LOS E	LOS A (WBL)	LOS A (WBL)
5	36th Ave SE/ Boone Rd SE	Unsignalized (Two way stop)	LOS E	LOS D (EBL)	LOS D (EBL)
6	32nd Ave SE/ Street "A"	Unsignalized (Two way stop)	LOS E	LOS A (EBL)	LOS A (EBL)
7	32nd Ave SE/ 36th Ave SE	Unsignalized (Two way stop)	LOS E	LOS A (EBL)	LOS B (EBL)
8	36th Ave SE/Kashmir Way SE	Unsignalized (Two way stop)	LOS E	LOS A (WBL)	LOS A (WBL)

V/C = Volume-to-Capacity Ratio of Worst Movement
LOS = Level of Service of Worst Movement
Locations exceeding mobility standards are shown with ***bold/italicized***

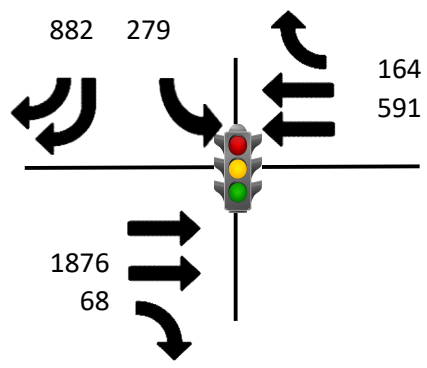
[6] *Highway Capacity Manual 6th Edition: A Guide for Multimodal Mobility Analysis*, Transportation Research Board, Washington DC, 2016.

[7] *2000 Highway Capacity Manual*, Transportation Research Board, Washington DC, 2010.

Figure 8: 2025 AM Peak Hour Total Conditions



1 I-5 SB Ramps/ Kuebler Blvd



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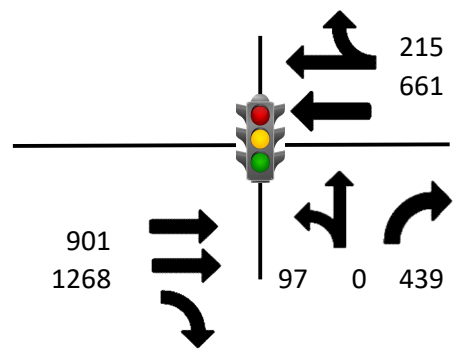
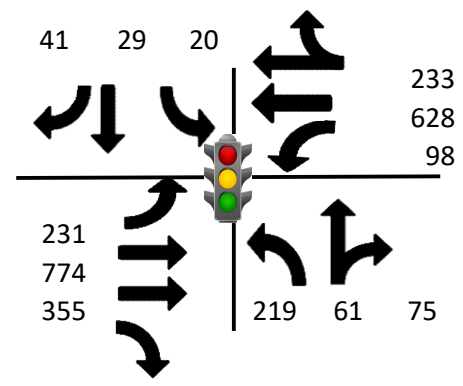
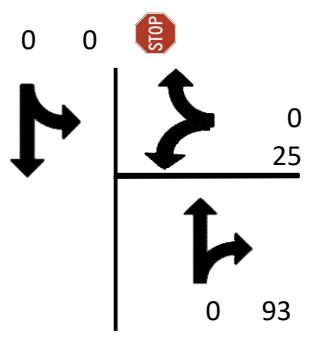


3 Kuebler Blvd/ 36th Ave SE



4 32nd Ave SE/ Boone Rd SE



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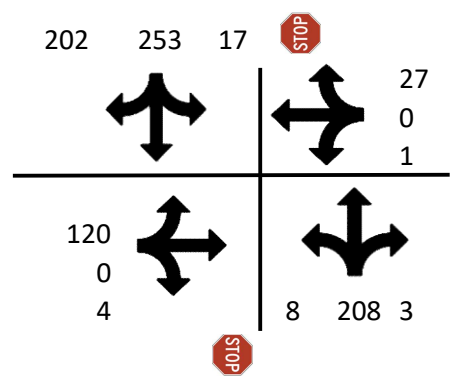

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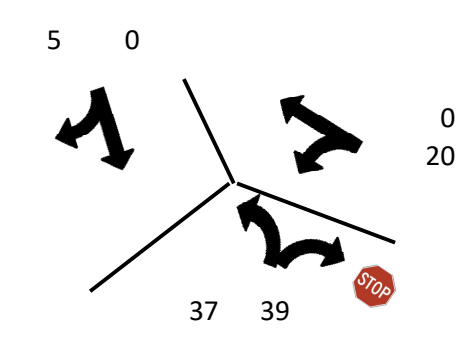

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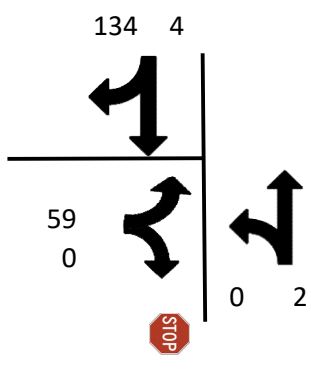

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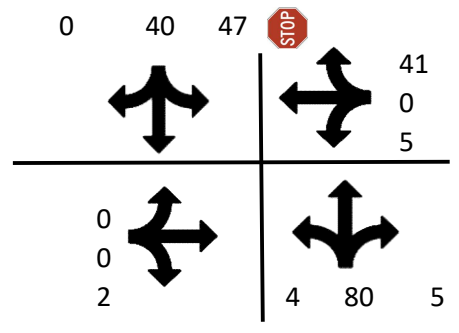
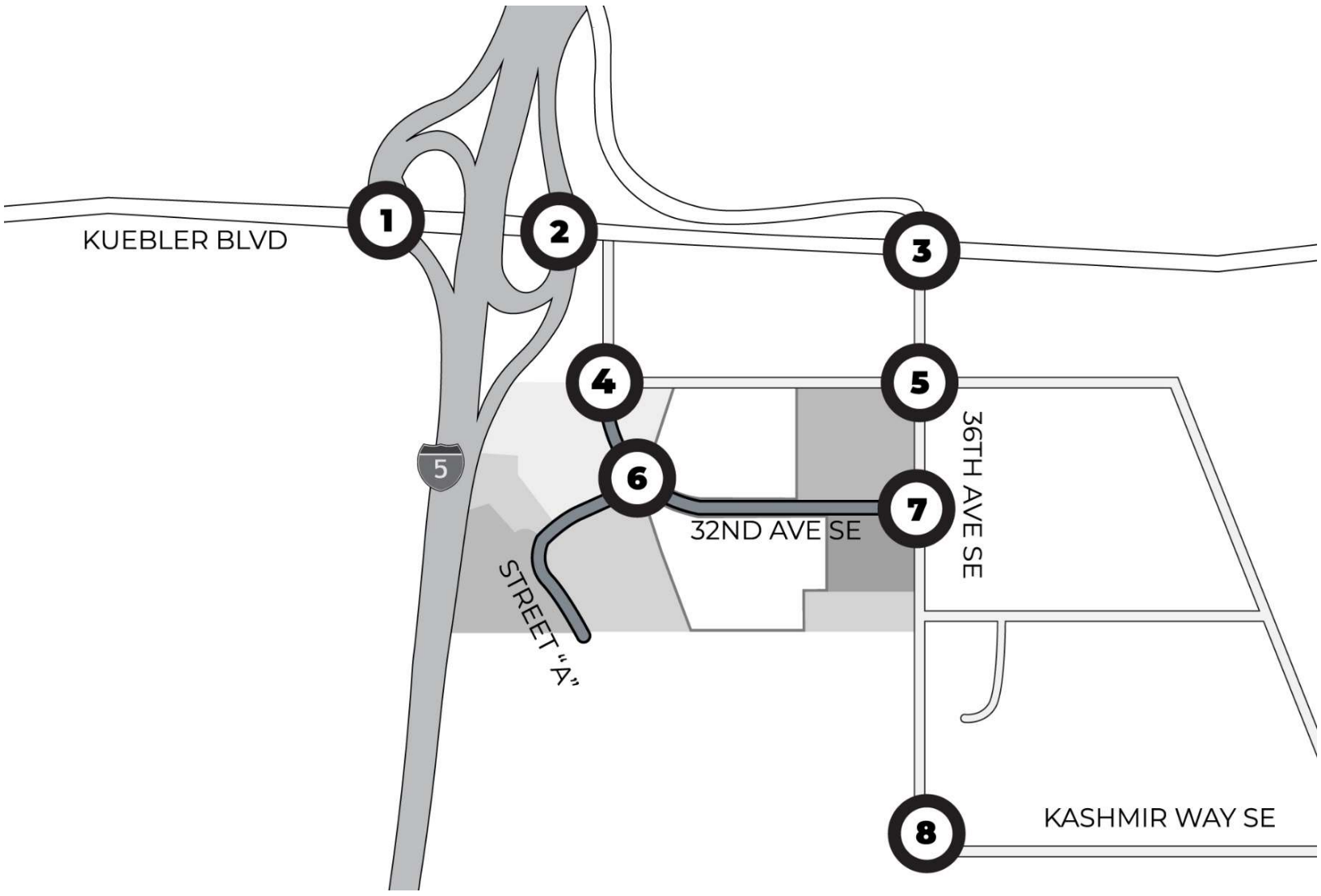
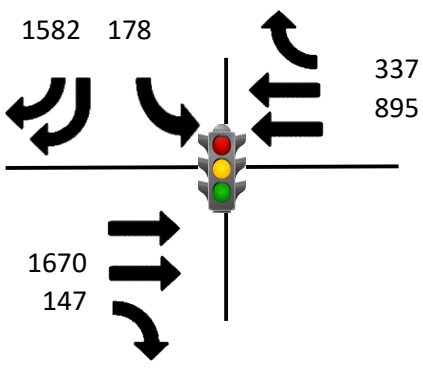


Figure 9: 2025 PM Peak Hour Total Conditions



1 I-5 SB Ramps/ Kuebler Blvd



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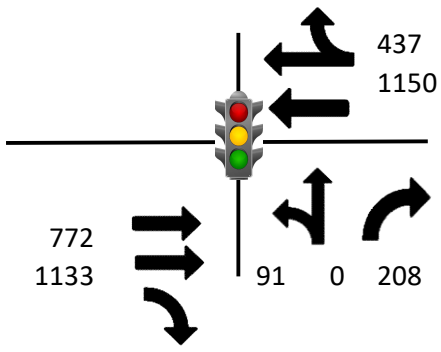

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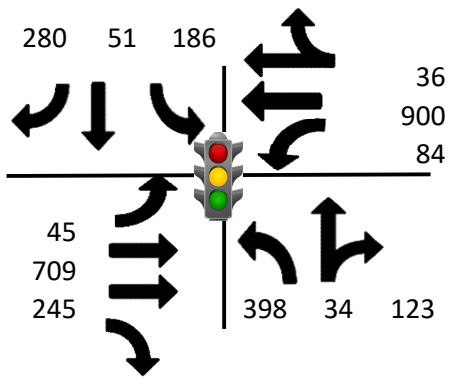

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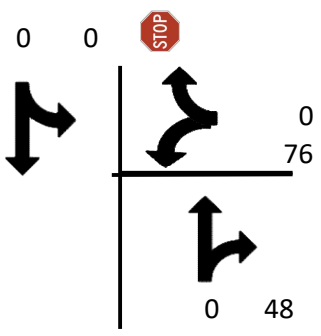

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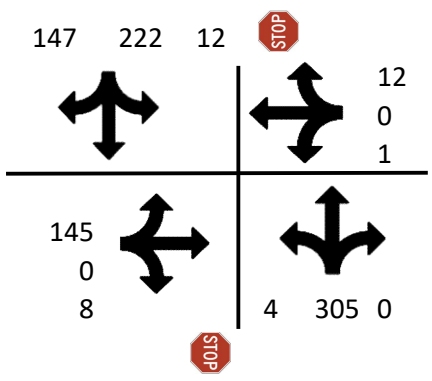

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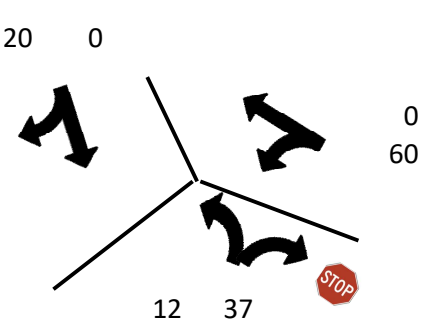
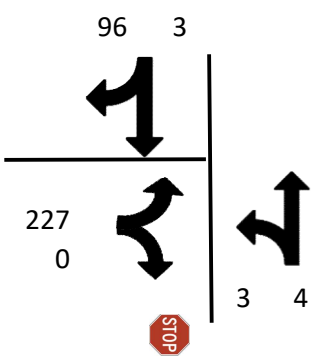
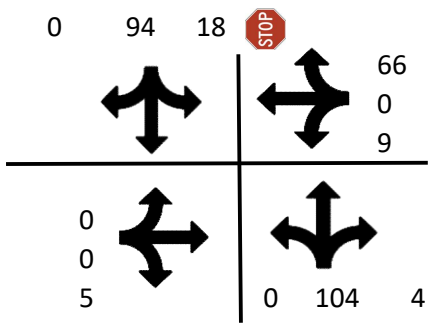


7 32nd Ave SE/ 36th Ave SE



8 36th Ave SE/Kashmir Way SE



Vehicle Queuing Analysis

The City of Salem requires a queuing analysis be included in any traffic impact analysis to account for queuing on the roadway network. **Table 10** lists the anticipated queuing at the study intersections. Queues are reported at the 95th percentile using Synchro SimTraffic. The model is calibrated using the ODOT Analysis Procedures Manual (APM) SimTraffic guidance.

The queuing analysis shows that all intersections can operate within their available turn lane storage, except for the intersection of Kuebler Blvd/ 36th Ave SE. At this location, the following movements exceed their available storage:

- Northbound left
- Southbound left
- Westbound left

These turning movements exceed their available storage in both the 2025 Background and 2025 Total conditions, which indicates that the development does not contribute significant increase to queuing for these movements (at most one car length if assumed at 25 feet per car).

Table 10: Vehicle Queuing Analysis

No.	Intersection	Movement	Available Storage (ft)	95th Percentile Queue (ft) (AM/PM)	
				2025 Background	2025 Total Traffic
1	I-5 SB Ramps/ Kuebler Blvd	SBL	>1,000	260/595	525/585
		SBR	>1,000	330/530	400/525
2	I-5 NB Ramps/ Kuebler Blvd	NBR	200	175/140	185/170
3	Kuebler Blvd/ 36th Ave SE	NBL	200	190/***215***	235/***205***
		SBL	125	65/***175***	60/***175***
		SBR	125	60/***180***	60/***200***
		EBL	375	290/125	290/130
		EBR	>1,000	75/145	145/210
		WBL	250	***275***/225	***295***/235
4	32nd Ave SE/ Boone Rd SE	WBL/T/R	>1,000	60/60	45/55
5	36th Ave SE/ Boone Rd SE	EBL/T/R	>1,000	60/90	130/585
		WBL/T/R	>1,000	60/40	25/60
6	32nd Ave SE/ Street "A"	EBL/R	100	N/A	50/45
7	32nd Ave SE/ 36th Ave SE	EBL/T/R	>1,000	N/A	50/75
8	36th Ave SE/Kashmir Way SE	WBL/T/R	>1,000	75/60	70/55

Locations exceeding available storage by more than 10 feet are shown with ***bold/italicized***
Values are rounded to the nearest increment of 5

Key Findings

Key findings associated with the proposed development include the following items:

- The proposed development would generate 375 (257 in, 118 out) AM peak hour trips and 405 (154 in, 251 out) PM peak hour vehicle trips.
- All study intersections are expected to operate within mobility standards with the addition of the proposed site for the 2025 opening year, with the exceptions of Kuebler Blvd at I-5 NB and I-5 SB Ramps. Both of these study intersections fail to meet ODOT mobility standards in the existing, background, and total traffic conditions.
- All study intersections will function within their available turn lane storage for the planned opening year with the proposed development, except for Kuebler Blvd/ 36th Ave SE. At this location, the northbound left, southbound left, and westbound left turns all exceed available storage. It is important to note that these movements fail in both the background (without the development) and total (with development) conditions. In general, the difference between the two is typically one car length or less impact.