Traffic Impact Study

Residential Development

(East of CR10)

Fallis Line, Millbrook, ON

Township of Cavan Monaghan,

County of Peterborough

ASURZA ENGINEERS

July 28, 2023

Project 2124-19

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Project Nº 2124-19

July 28, 2023

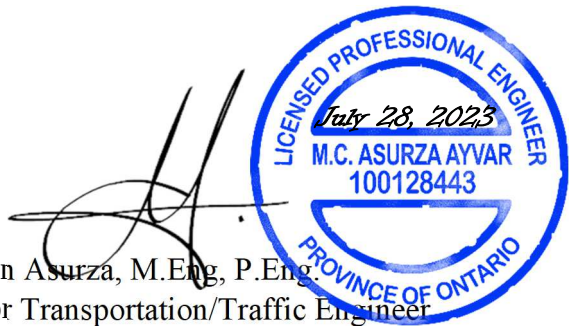
Mr. Peter Berardi,
Vargas Properties Inc. / Charter Properties Inc.
P.O. Box 147, Station Main
Peterborough, ON
K9J 6Y5

Dear Mr. Berardi,

Reference: Residential Development (East of CR10)
Traffic Impact Study Report
Township of Cavan Monaghan, County of Peterborough
Project Nº 2124-19

Asurza Engineers Ltd. is pleased to submit the enclosed Traffic Report for the proposed Residential Development in Millbrook. The study and report were prepared on behalf of the proponent as part of the documentation required by the Township of Cavan Monaghan.

Should you have any questions regarding this report, please do not hesitate to contact the undersigned.



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Project Team Member List

Project Manager:	Martin C. Asurza, M.Eng., P.Eng.
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Executive Summary

Asurza Engineers Ltd. was retained to undertake a traffic impact study in order to review, assess, and determine any traffic impact the proposed development may generate on the adjacent road and intersections.

The subject site is a vacant land located on the southeast quadrant of the County Road 10 / Fallis Line intersection in the Township of Cavan Monaghan, County of Peterborough. The site is proposed for a residential development to include single family detached homes and townhouses.

For purposes of this study, the proposed commercial plaza to be located on the northeast quadrant of CR10 / Fallis Ln will be included in the analysis. It is expected that by 2026, the commercial plaza Phase 1 will be completed, and the residential development will be 50% completed. By 2031, the commercial plaza Phase 2 will be completed, and the residential development will be 100% completed.

In order to evaluate existing conditions, traffic operations were evaluated at intersections within the study area, using video counts performed by Asurza Engineers. The traffic operations for the existing condition (2021) shows that turning movements at intersections are operating well, with levels of service “A” or “B”.

In order to establish base conditions for comparison and evaluation of future scenarios, it is necessary to review results of traffic operations over time, with the assumption that traffic will continue to grow over time and geometric upgrades identified in previous traffic studies will be in place.

As part of the background volumes, the study includes the major proposed developments that are approved or in construction in Millbrook. The traffic volumes of these developments were obtained from “Millbrook Development

Phase 2 – Traffic Impact Study for the Tower Hill Developments Ltd." a report prepared by JD Engineering.

With the normal growth over time and the additional traffic generated by the nearby developments, the intersections become more saturated with some movements reaching their capacity. Without the subject residential and commercial developments in place, CR10 / Larmer Ln will require signals and further geometric upgrades by 2031. CR10 / Fallis Ln will require a signal timing adjustment by 2031. Also, CR10 / King St will require traffic signals and geometric upgrades by 2036.

The estimation of trips generated by the subject developments were derived from the Trip Generation Manual, 11th Edition, published by the Institute of Transportation Engineers (ITE).

With the normal growth over time and the additional traffic generated by the nearby developments, as well as the subject residential and commercial developments in place, delays increase as expected. CR10 / Fallis Ln will require a signal timing adjustment and minor geometric upgrades by 2026. Also, both CR10 / Larmer Ln & CR10 / King St will require traffic signals and geometric upgrades by 2031.

By 2036, five years after the full build-out of the subject residential and commercial developments, traffic operations will remain stable with mostly LOS "C" or better due to the upgrades.

From the traffic point of view, it is concluded that the proposed developments can take place with the inclusion of the appropriate intersection upgrades.

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1 Introduction

1.1 Overview

Asurza Engineers Ltd. was retained by the developer to undertake a traffic impact study for a residential development located at County Road 10 / Fallis Line. The report was prepared for the Township's review and approval to permit the proposed development.

1.2 Objectives

The purpose of this study is to determine any traffic impact the proposed development may generate on the adjacent roadways and intersections, as well as to identify the required improvements to maintain acceptable operational levels on the roadways within the study area. The general scope of this study includes the following key elements:

- Establish baseline traffic conditions for the study area.
- Estimate the traffic growth for future planning horizons.
- Estimate the additional traffic generated by the proposed development.
- Estimate the total future traffic and identify impacts within the study area.
- Identify any operational and/or geometric issues within the study area.
- Provide recommendations to address any deficiencies, if identified.

To achieve these objectives, the traffic study makes use of accepted methodologies and procedures including informational reports, publications from recognized institutions and agencies, recommended best practice manuals and municipal guidelines when available.

2 Existing Conditions

2.1 Study Area

The Township of Cavan Monaghan, with a population of 8,829 residents, according to the 2016 Census, is located approximately 20 kilometres southwest of the city of Peterborough. The proposed development is located in the village of Millbrook. See ***Exhibit 1***.

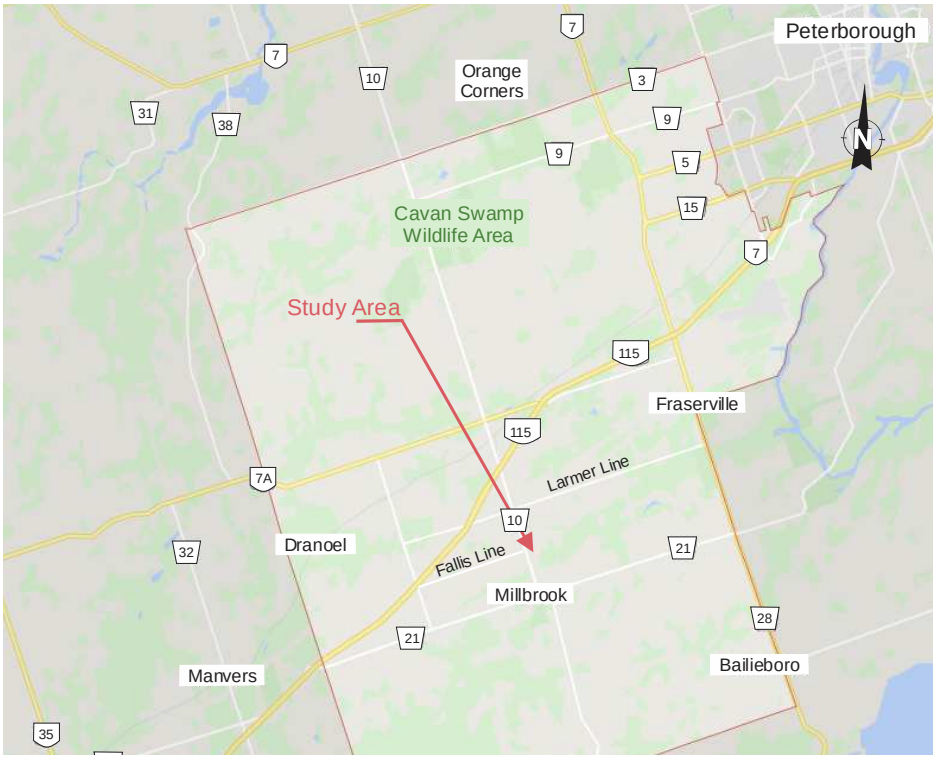

Exhibit 1: *Study Area.*

The presence of other developments in Millbrook that are approved or in construction will be included in this study. The sketch of these developments is shown in ***Exhibit 2***. The traffic volumes of these developments were obtained

from “Millbrook Development Phase 2 – Traffic Impact Study for the Tower Hill Developments Ltd.”, a report prepared by JD Engineering.

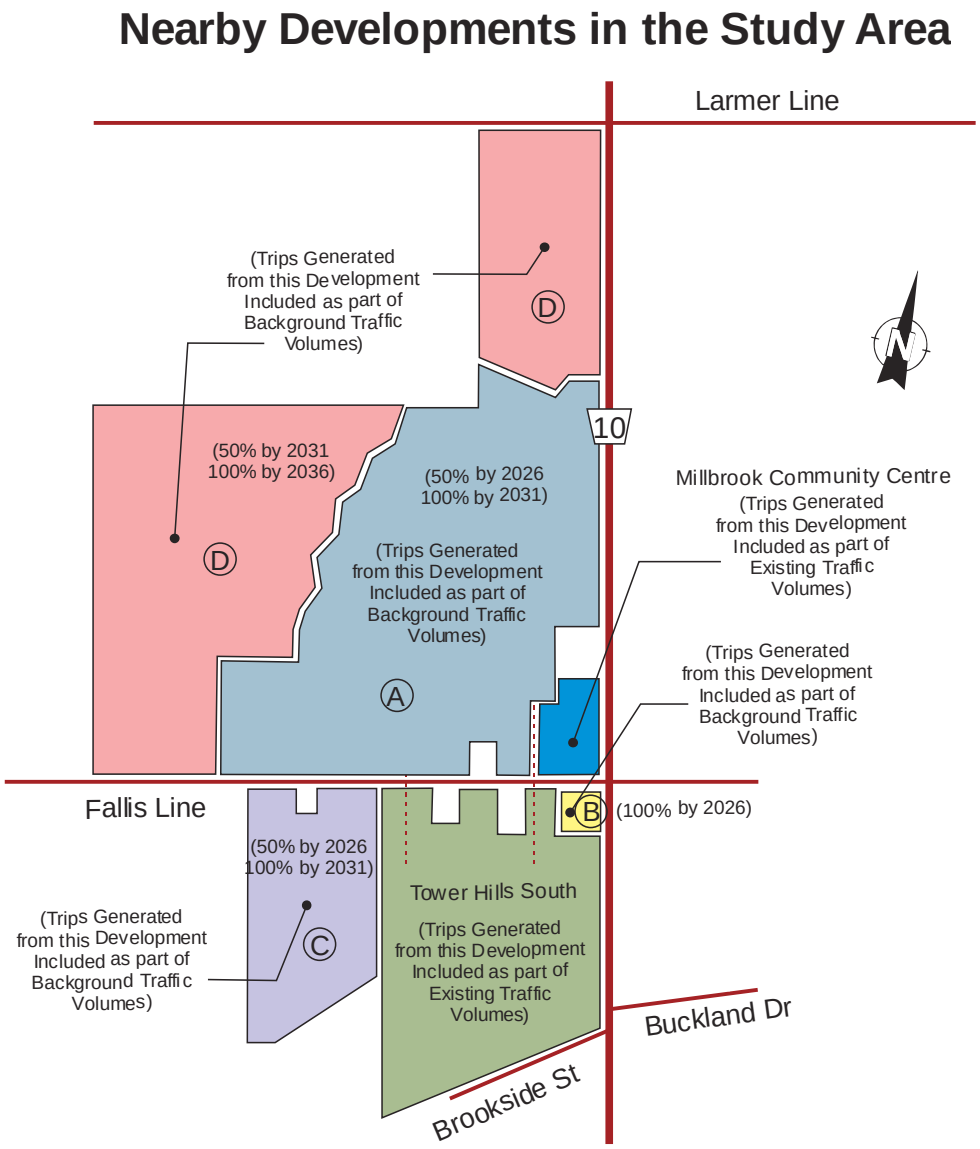

Exhibit 2: *Nearby Developments in the Study Area.*

2.2 The Site

The subject site for the proposed residential development is a vacant parcel of land located on the southeast quadrant of the County Road 10 / Fallis Line intersection. Immediately north of the site is parcel of land proposed for a commercial plaza, see ***Exhibit 3***.

Due to the expected coinciding build-out horizons of both developments, the traffic impact analysis for both developments will be performed in conjunction with each other.

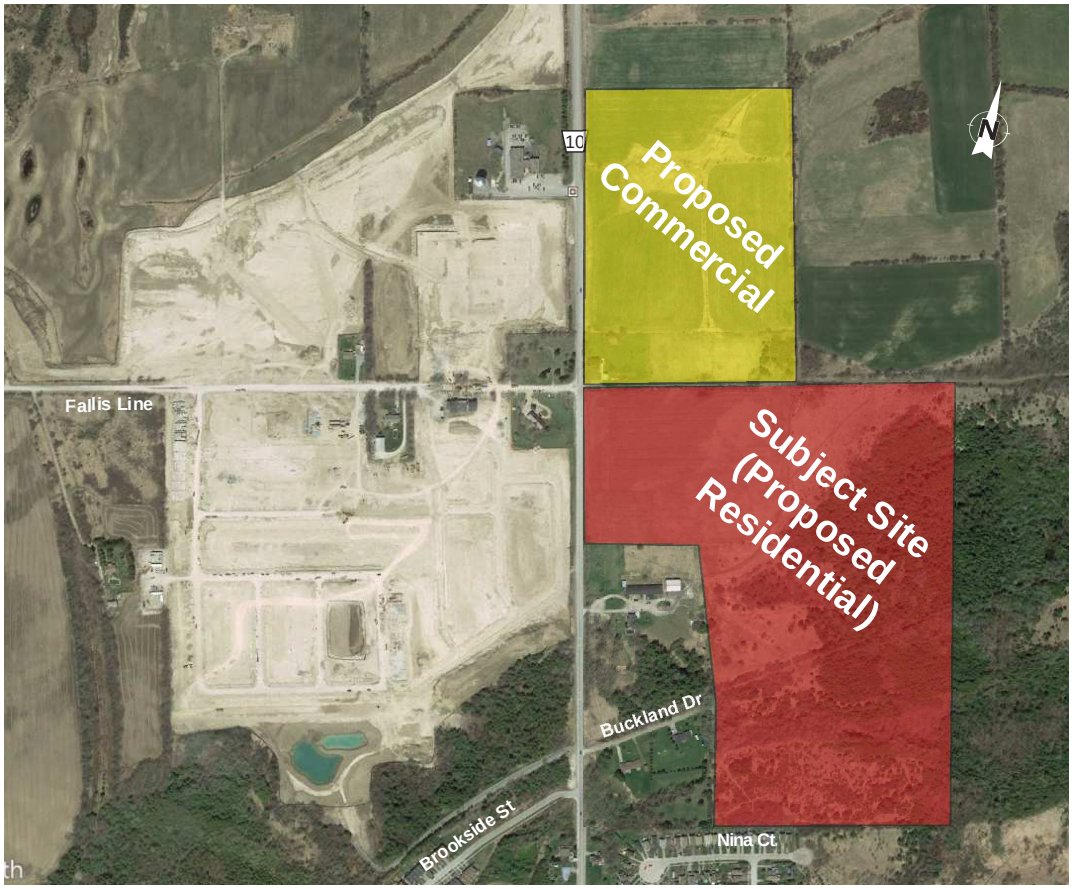

Exhibit 3: *The Site.*

The subject site is intended to feature the following:

- Single Detached – 127 units
- Street Townhouse – 55 units
- Mixed Use Block 144 – 80 units

See *Appendix A – Draft Site Plan* for further details. It is expected that the mixed-use units and residential units are 100% and 50% developed / occupied respectively by 2026, and that all units in the development are 100% developed / occupied by 2031.

2.3 Roadway Network

County Road 10 (CR10), known locally as Tupper St, is a two-lane (one lane per direction) north/south arterial road. In general, CR10 shows a rural cross-section with granular shoulders and ditches for surface water drainage; as the road approaches the Downtown, CR10 becomes and urban roadway with curb & gutter, sidewalks and catch basins for surface water collection. CR10 connects with King St to make a 4-way stop intersection. CR10 has a posted speed of 80 km/h north of the site, which is reduced to 60 km/h near the site.

Larmer Line is a two-lane (one lane per direction) east/west rural road. It connects with CR10 to make a 4-leg intersection with stop signs at both approaches of Larmer Line. No posted speed was identified in proximity within the area; therefore, the legislative speed limit of 50 km/h is adopted.

Fallis Line is a two-lane (one lane per direction) east/west rural road. It also connects with CR10 to form a 4-leg intersection; the east leg of Fallis Line is more like an unpaved pathway which currently serves like a driveway for the adjacent property. Fallis Line has a posted speed limit of 50 km/h.

Tapley Quarter Line is a two-lane (one lane per direction) north/south rural road, Fallis Line connects with Tapley Quarter Line to form a "T" type intersection. No posted speed was identified in proximity within the area; therefore, the legislative speed limit of 50 km/h is adopted.

County Road 21 (CR21), also known locally as King Street, is a two-lane (one lane per direction) east/west urban arterial road. The road has a mix of a residential and commercial environment within the intersection area. A speed of 50 km/h is posted within this area.

2.4 Traffic Data

Asurza Engineers has performed video-based traffic counts for all intersections in the study area for the AM, PM, and Saturday peak hours.

The data for CR10 / Fallis Ln, CR10 / Larmer Ln, and CR10 / King St are from June 2023, and the data for Fallis Ln / Tapley Quarter Ln is from December 2021. See *Appendix B – Traffic Data and Volume Projections*.

2.5 Existing Traffic Volumes

The existing lane configuration at the subject intersections are shown in ***Exhibit 4***. The existing traffic volumes for the morning, afternoon and Saturday peak hours are shown in ***Exhibits 5 to 7.***

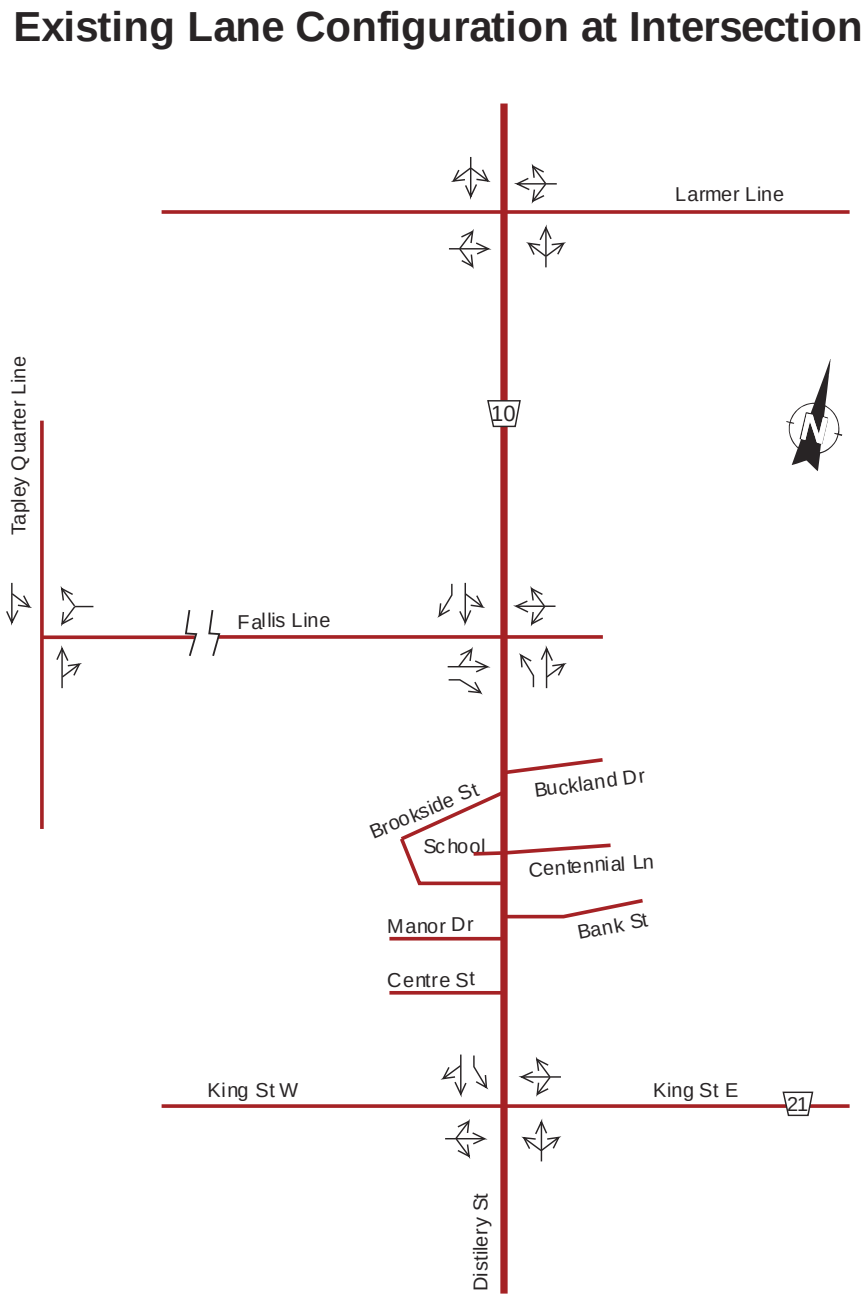

Exhibit 4: *Existing Lane Configuration at Intersections.*

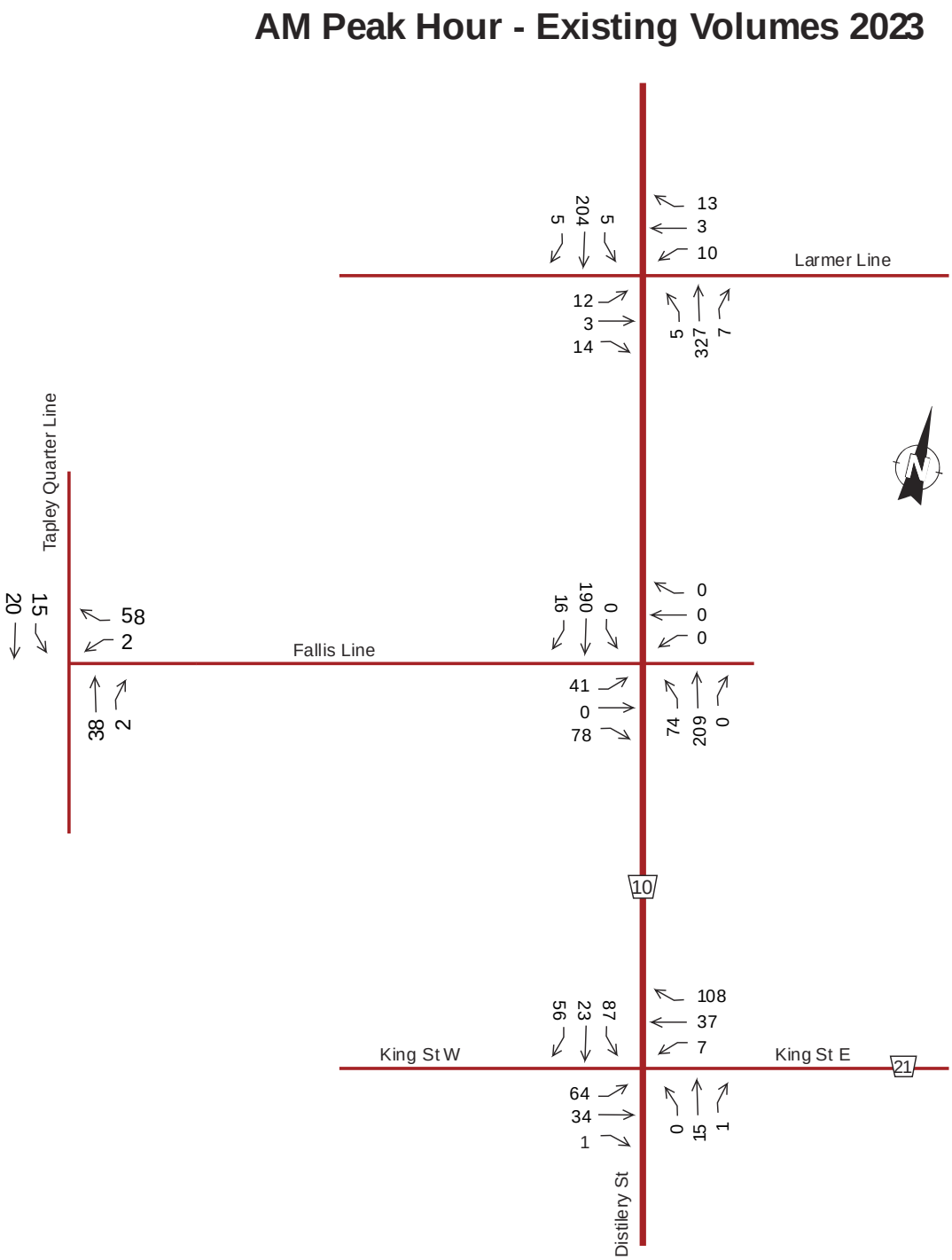

Exhibit 5: *Existing AM Peak Hour Volumes, 2023.*

PM Peak Hour - Existing Volumes 2023

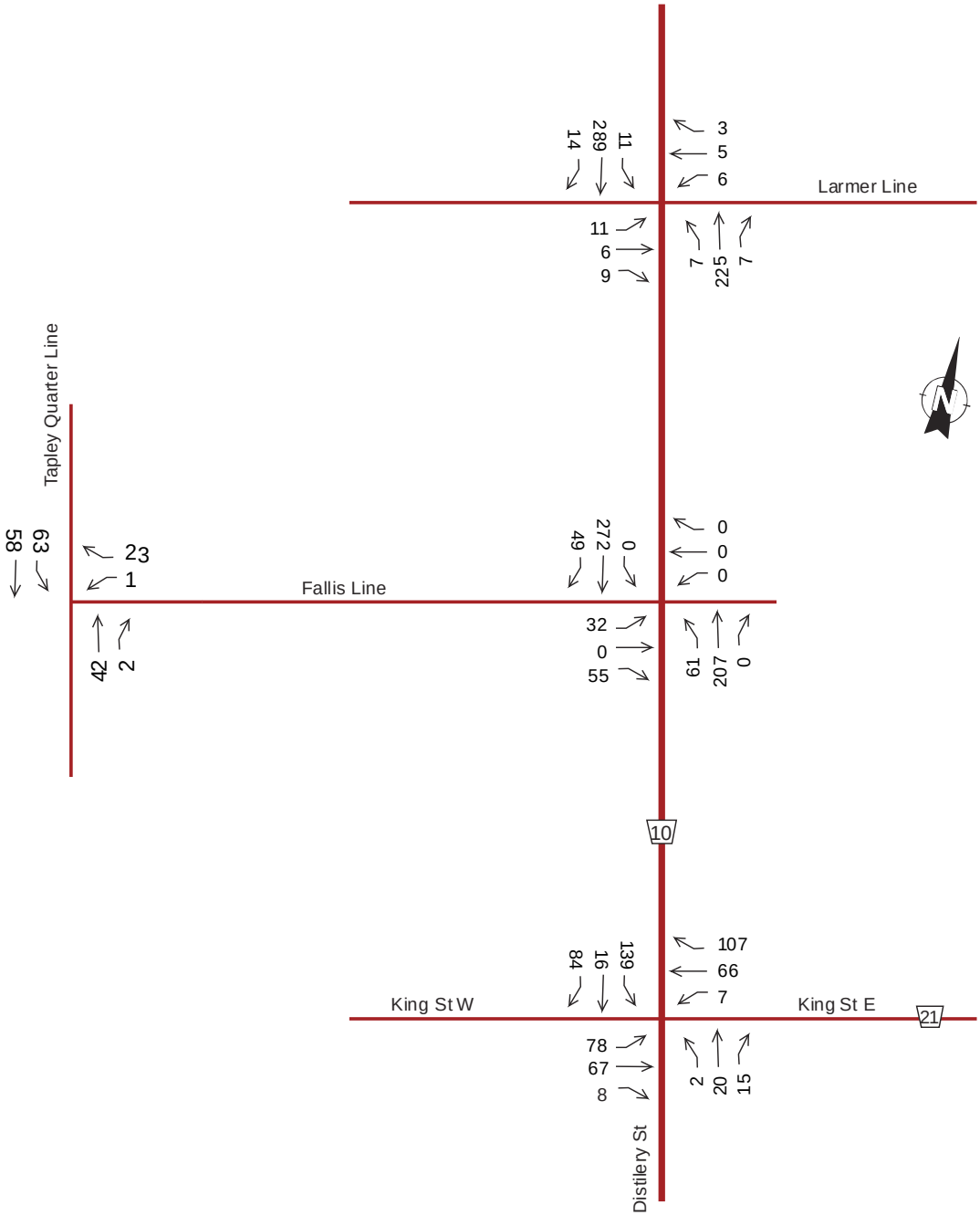

Exhibit 6: *Existing PM Peak Hour Volumes, 2023.*

SAT Peak Hour - Existing Volumes 2023

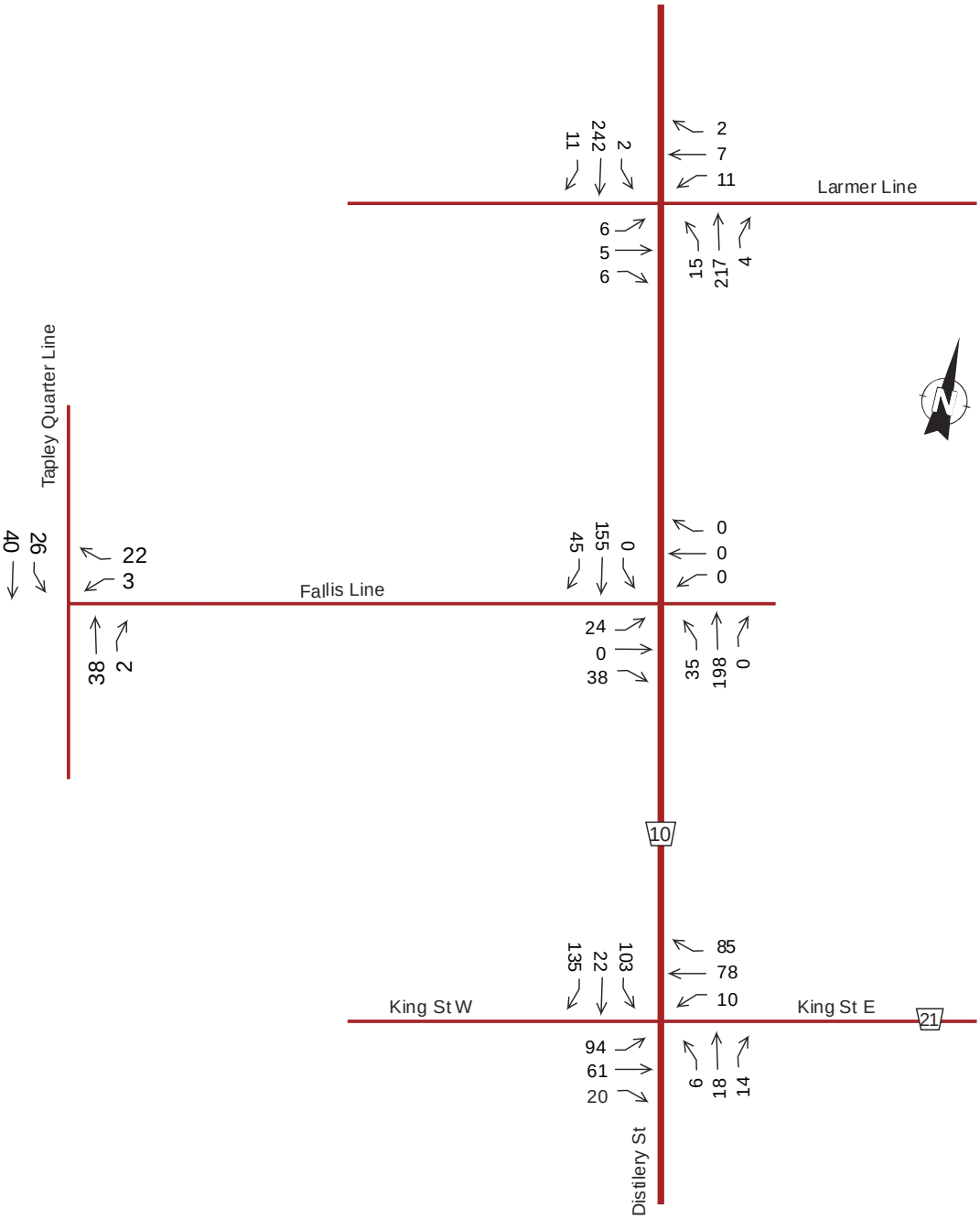

Exhibit 7: *Existing SAT Peak Hour Volumes, 2023.*

2.6 Existing Traffic Operations

Intersection level of service (LOS) is a recognized method of quantifying the efficiency of traffic flow at intersections. The assigned LOS is determined by the delay caused by the control system experienced by individual vehicles executing the various movements. The delay is related to the number of vehicles desiring to make a particular movement, compared to the estimated capacity for that movement.

Table 1 shows the LOS criteria for intersections, ranging from 'A' to 'F,' where 'A' represents ideal traffic and 'F' represents extreme congestion.

LOS	Signalized Control Delay (sec/veh)	Unsignalized Control Delay (sec/veh)
A	0 - 10	0 - 10
B	> 10 - 20	> 10 - 15
C	> 20 - 35	> 15 - 25
D	> 35 - 55	> 25 - 35
E	> 55 - 80	> 35 - 50
F	> 80	> 50

Table 1: *Level of Service Definition.*

The intersection analysis considers the following:

- The volume to capacity (v/c) ratio for the intersection and for each movement.
- The average delay in seconds for each movement and overall delay of the intersection.
- The 95th percentile queue length for each movement.
- The level of service for each movement and overall level of service of the intersection.

The existing operations for the subject intersections were evaluated using the existing traffic volumes for the AM, PM and Saturday peak hours, and the results are summarized below in ***Table 2.***

		Existing Volumes 2023											
		AM Peak Hour				PM Peak Hour				SAT Peak Hour			
		V/C	Delay (s)	Q_{95} (m)	LOS	V/C	Delay (s)	Q_{95} (m)	LOS	V/C	Delay (s)	Q_{95} (m)	LOS
CR10 / Larmer Line	EB-LTR	0.06	12.3	1.4	B	0.06	13.2	1.5	B	0.04	12.2	0.9	B
	WB-LTR	0.06	12.6	1.4	B	0.03	13.6	0.8	B	0.05	13.4	1.2	B
	NB-LTR	0.00	0.1	0.1	A	0.01	0.3	0.1	A	0.01	0.6	0.3	A
	SB-LTR	0.00	0.2	0.1	A	0.01	0.4	0.2	A	0.00	0.1	0.0	A
CR10 / Fallis Line	EB-LTR	0.11	11.7	2.9	B	0.10	12.3	2.4	B	0.05	10.6	1.2	B
	WB-LTR	0.00	0.0	0.0	A	0.00	0.0	0.0	A	0.00	0.0	0.0	A
	NB-L	0.06	7.8	1.4	A	0.05	8.1	1.3	A	0.03	7.7	0.7	A
	NB-TR	0.13	0.0	0.0	A	0.13	0.0	0.0	A	0.13	0.0	0.0	A
	SB-TL	0.00	0.0	0.0	A	0.00	0.0	0.0	A	0.00	0.0	0.0	A
	SB-R	0.01	0.0	0.0	A	0.03	0.0	0.0	A	0.03	0.0	0.0	A
Fallis Line / Tapley Q. Line	WB-LR	0.06	8.8	1.6	A	0.03	8.7	0.1	A	0.03	8.7	0.6	A
	NB-TR	0.03	0.0	0.0	A	0.03	0.0	0.0	A	0.03	0.0	0.0	A
	SB-LTR	0.01	3.1	0.2	A	0.04	4.0	1.1	A	0.02	3.0	0.4	A
CR10 / King St	EB-LTR	0.18	8.9	15.5	A	0.28	10.1	27.6	B	0.31	10.5	15.7	B
	WB-LTR	0.23	8.5	22.6	A	0.30	9.6	18.3	A	0.30	9.8	17.1	A
	NB-LTR	0.03	8.2	11.1	A	0.07	8.7	12.6	A	0.07	8.9	10.9	A
	SB-L	0.16	8.7	17.2	A	0.27	10.2	23.8	B	0.20	9.6	15.3	A
	SB-TR	0.12	7.3	18.8	A	0.15	7.8	17.5	A	0.25	8.6	18.9	A

Table 2: *Existing Volumes Intersection Capacity, 2023.*

During typical peak hours, results show that all movements at intersections are operating very well with LOS “B” or better.

3 Background Traffic Volumes

3.1 Background Traffic Volumes

In order to establish base conditions for comparison and evaluation of future scenarios, it is necessary to review the results of traffic operations over time. To maintain a conservative estimate of future traffic, a growth rate of 2.0% per year will be implemented for the purposes of this study.

The background traffic volumes were estimated by applying the growth rate to the existing traffic volumes. The growth rate is annually compounded.

For this study, the horizon years for analysis are 2026, 2031, and 2036, which are expected to coincide with the 50% build-out, the full build-out, and five years after the full build-out of the proposed development, respectively.

As previously mentioned, the presence of other developments in Millbrook that are approved or in construction must be accounted for better project future traffic. These volumes were obtained from "Millbrook Development Phase 2 – Traffic Impact Study for the Tower Hill Developments Ltd.", a report prepared by JD Engineering.

The trips generated by these developments are included in the background volumes for this study as shown in ***Exhibit 2***. For a full breakdown, see *Appendix B - Traffic Data and Volume Projections* and *Appendix D - Volumes Added by Nearby Developments*.

The following ***Exhibits 8 to 16*** show the projected traffic volumes for the morning, afternoon, and Saturday peak hours for the horizon years 2026, 2031 and 2036.

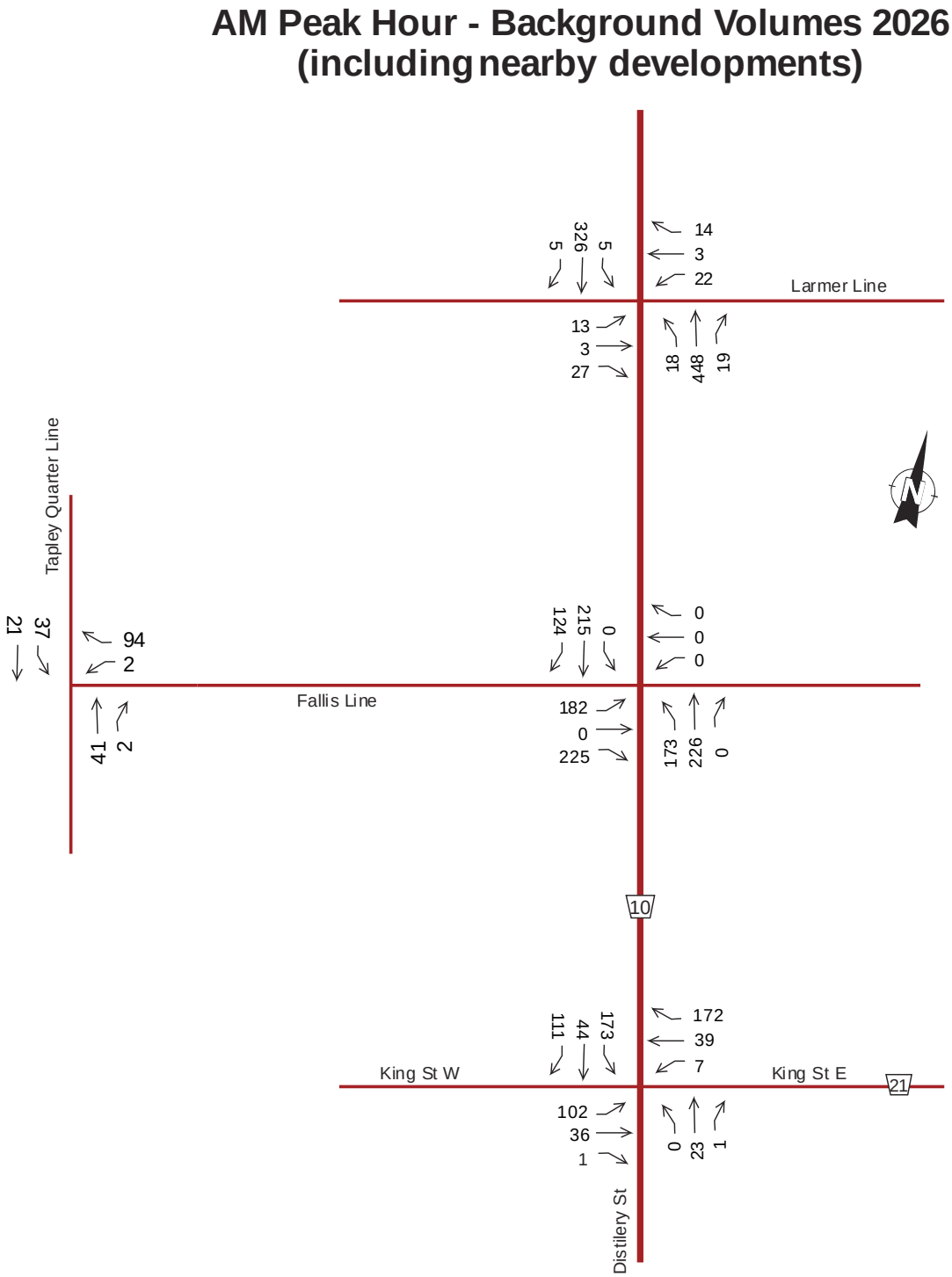

Exhibit 8: *Background AM Peak Hour Volumes, 2026.*

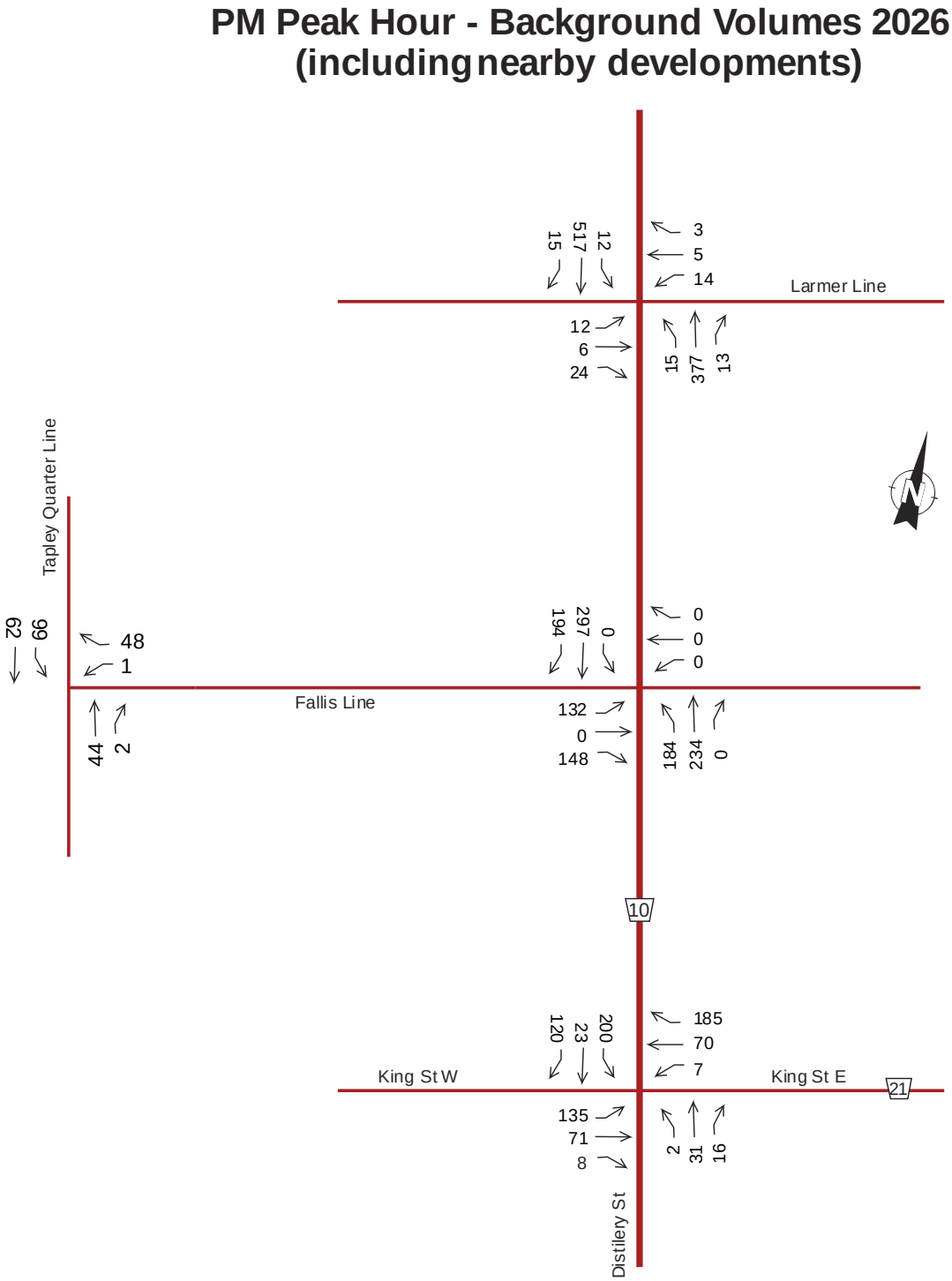

Exhibit 9: *Background PM Peak Hour Volumes, 2026.*

SAT Peak Hour - Background Volumes 2026 (including nearby developments)

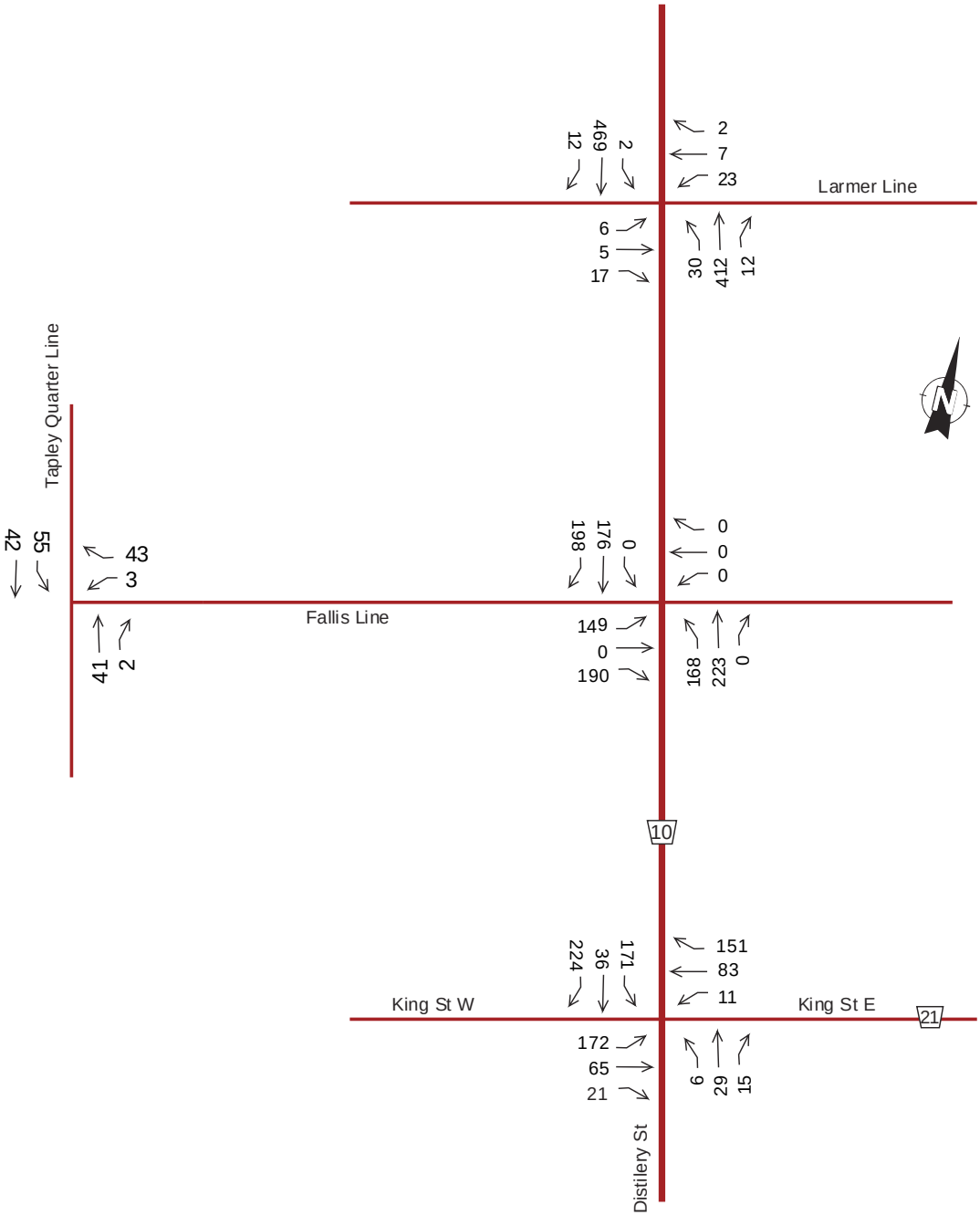

Exhibit 10: *Background SAT Peak Hour Volumes, 2026.*

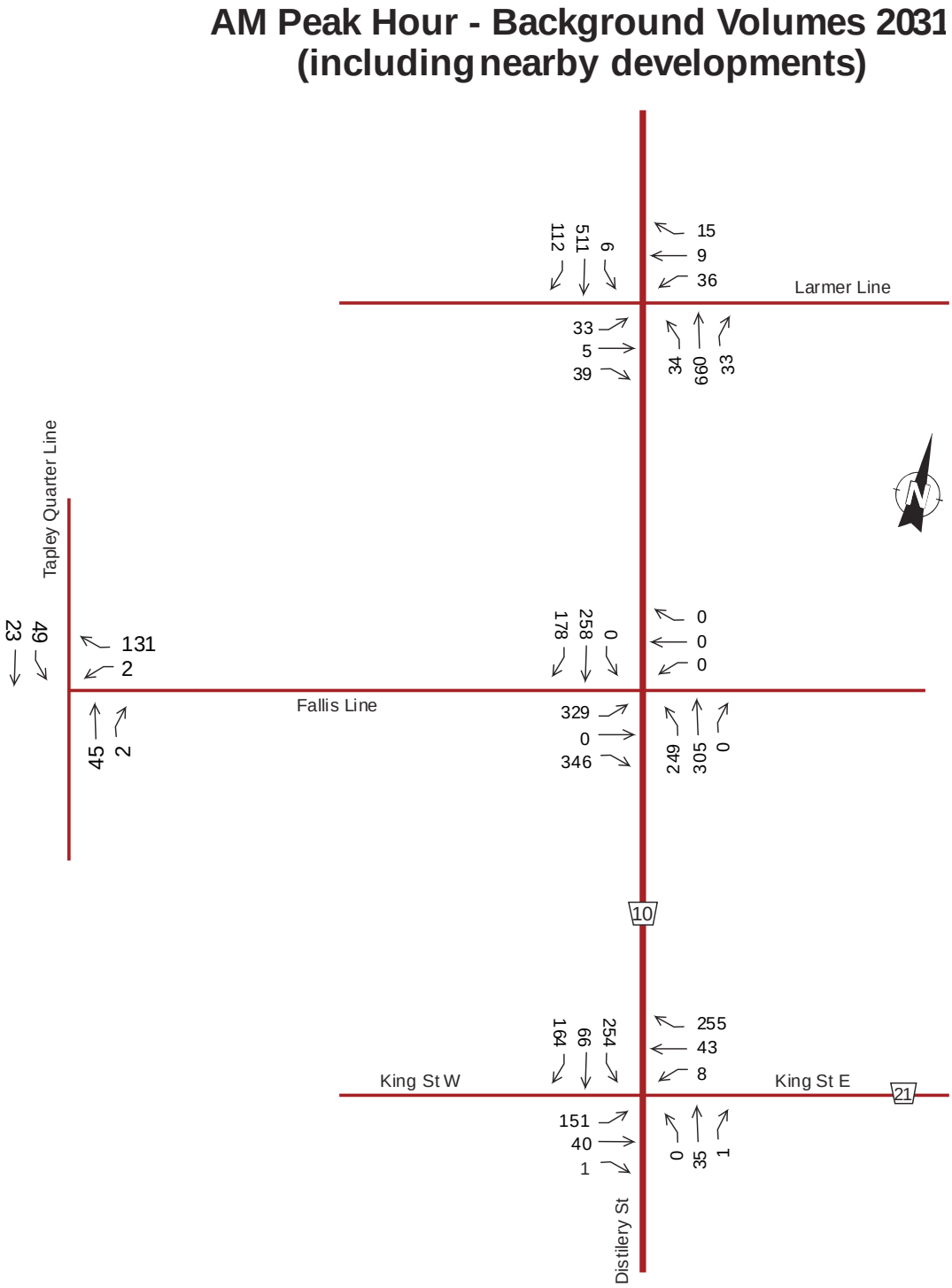

Exhibit 11: *Background AM Peak Hour Volumes, 2031.*

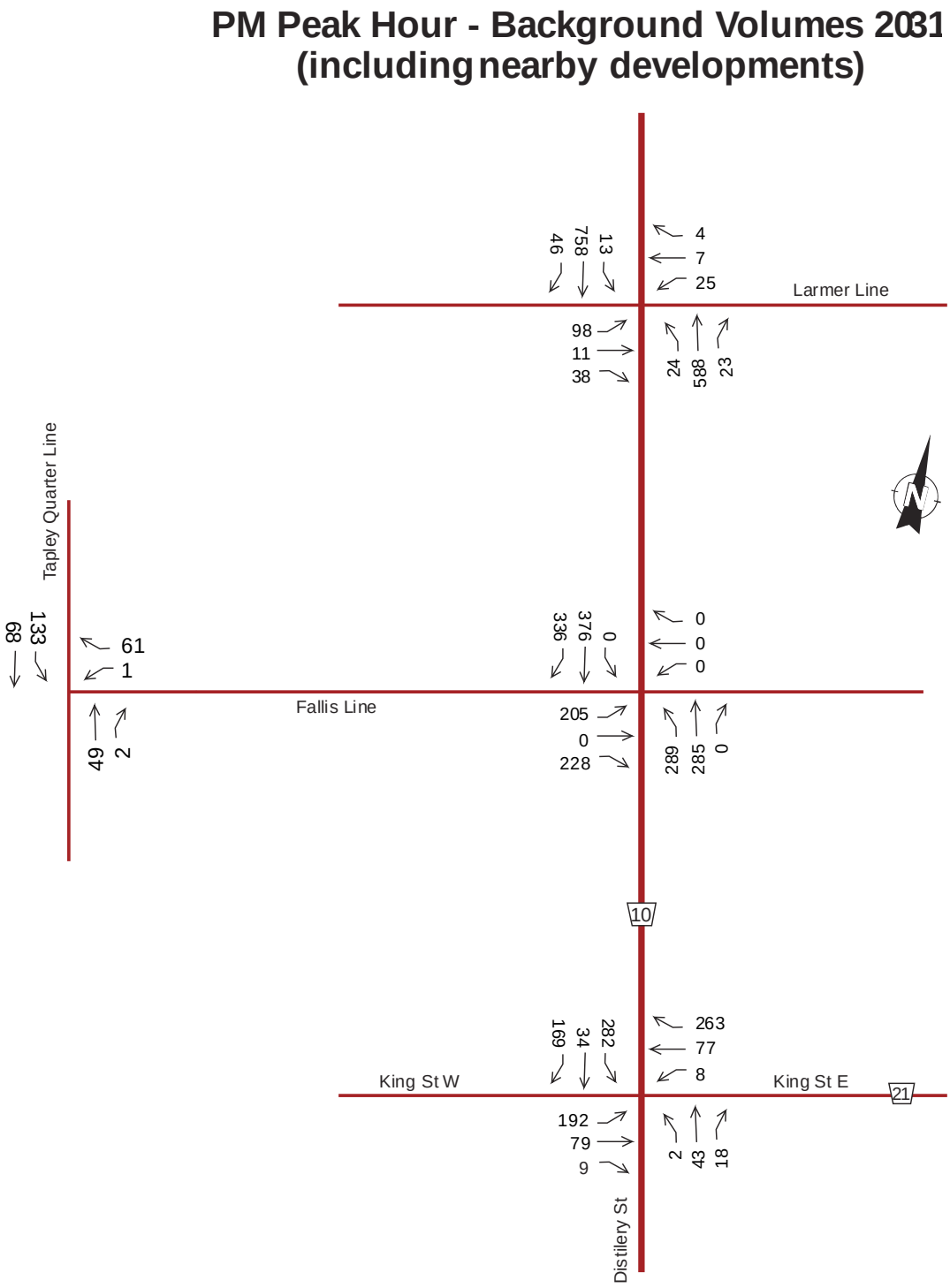

Exhibit 12: *Background PM Peak Hour Volumes, 2031.*

SAT Peak Hour - Background Volumes 2031 (including nearby developments)

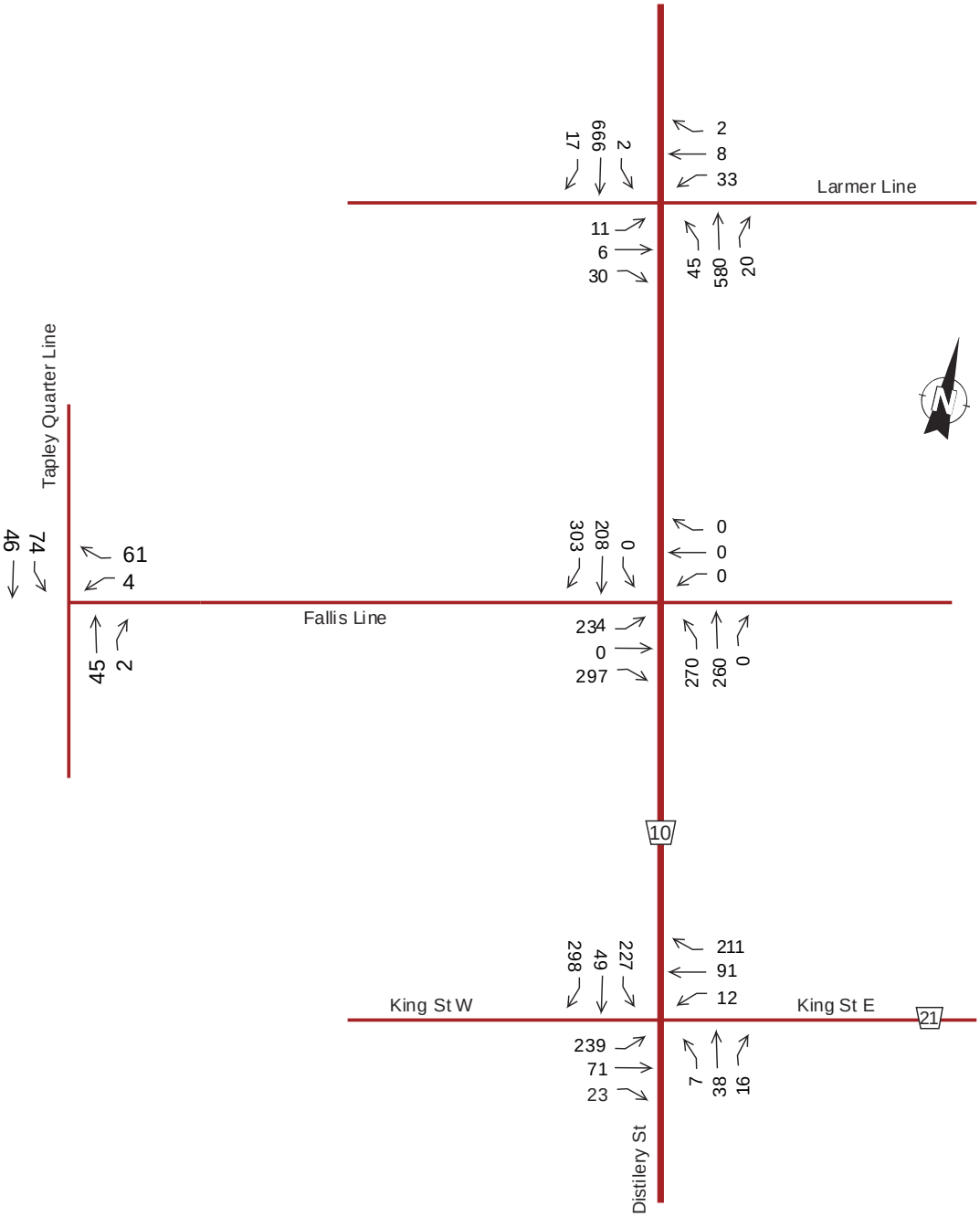

Exhibit 13: *Background SAT Peak Hour Volumes, 2031.*

AM Peak Hour - Background Volumes 2036 (including nearby developments)

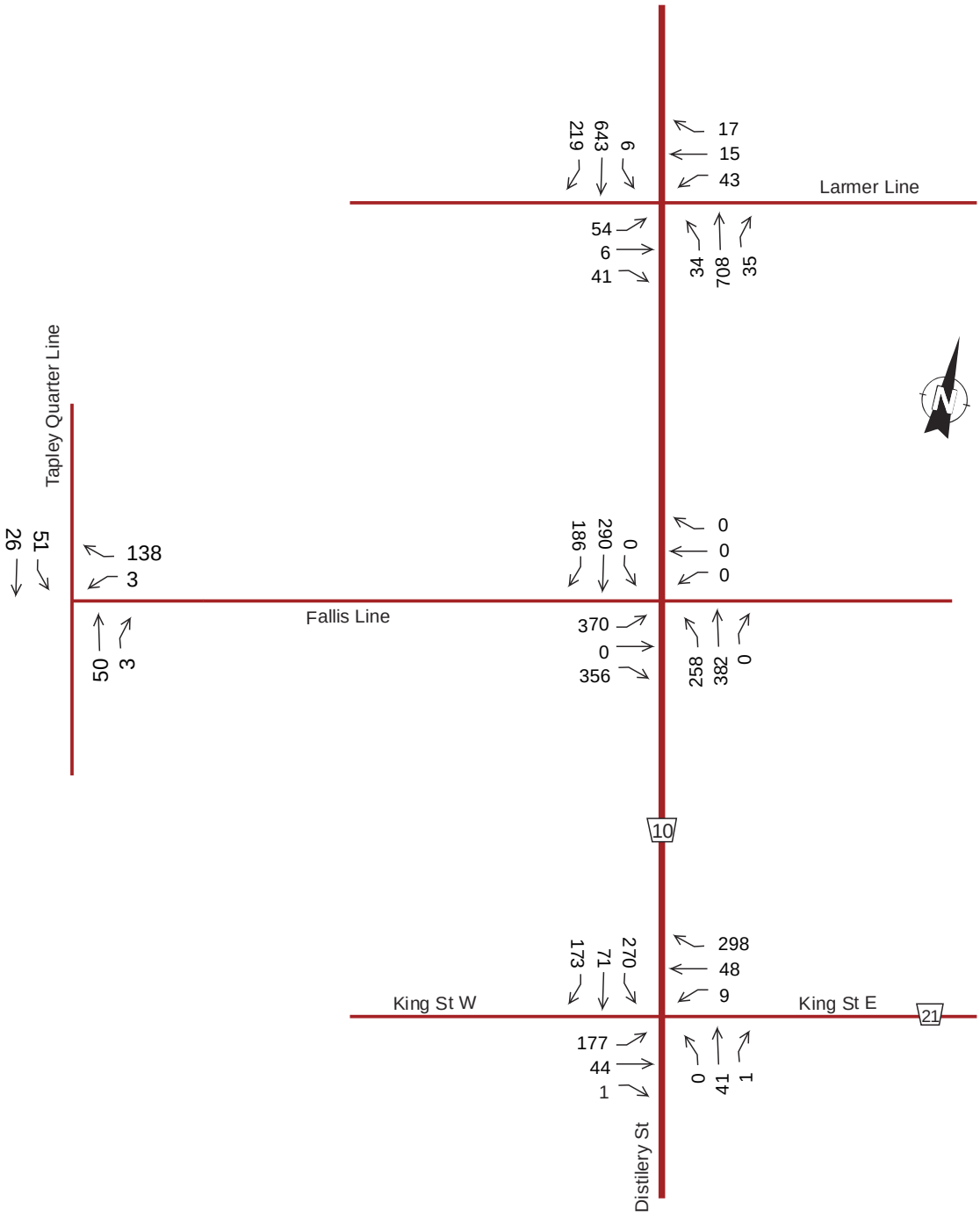

Exhibit 14: *Background AM Peak Hour Volumes, 2036.*

PM Peak Hour - Background Volumes 2036 (including nearby developments)

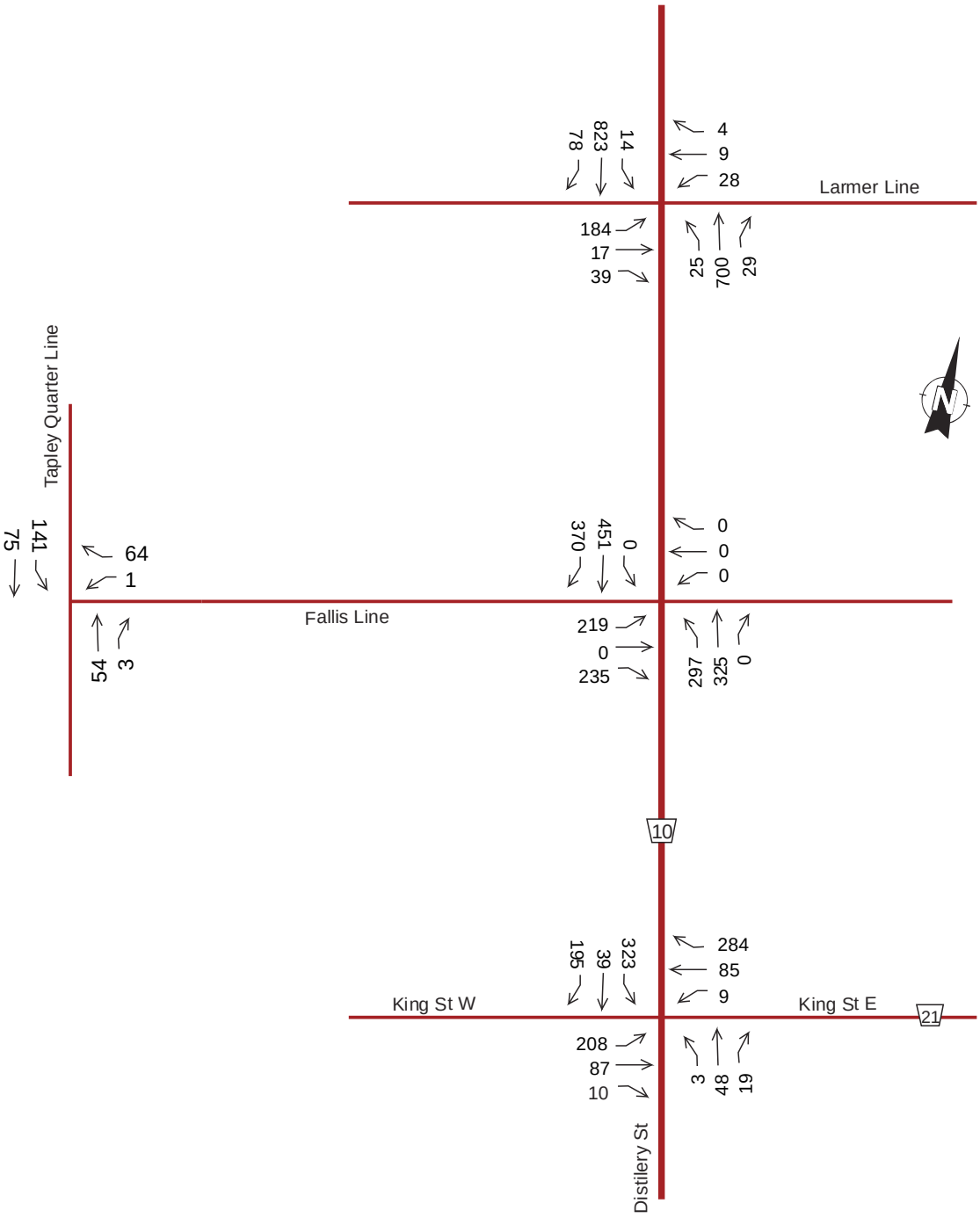

Exhibit 15: *Background PM Peak Hour Volumes, 2036.*

SAT Peak Hour - Background Volumes 2036 (including nearby developments)

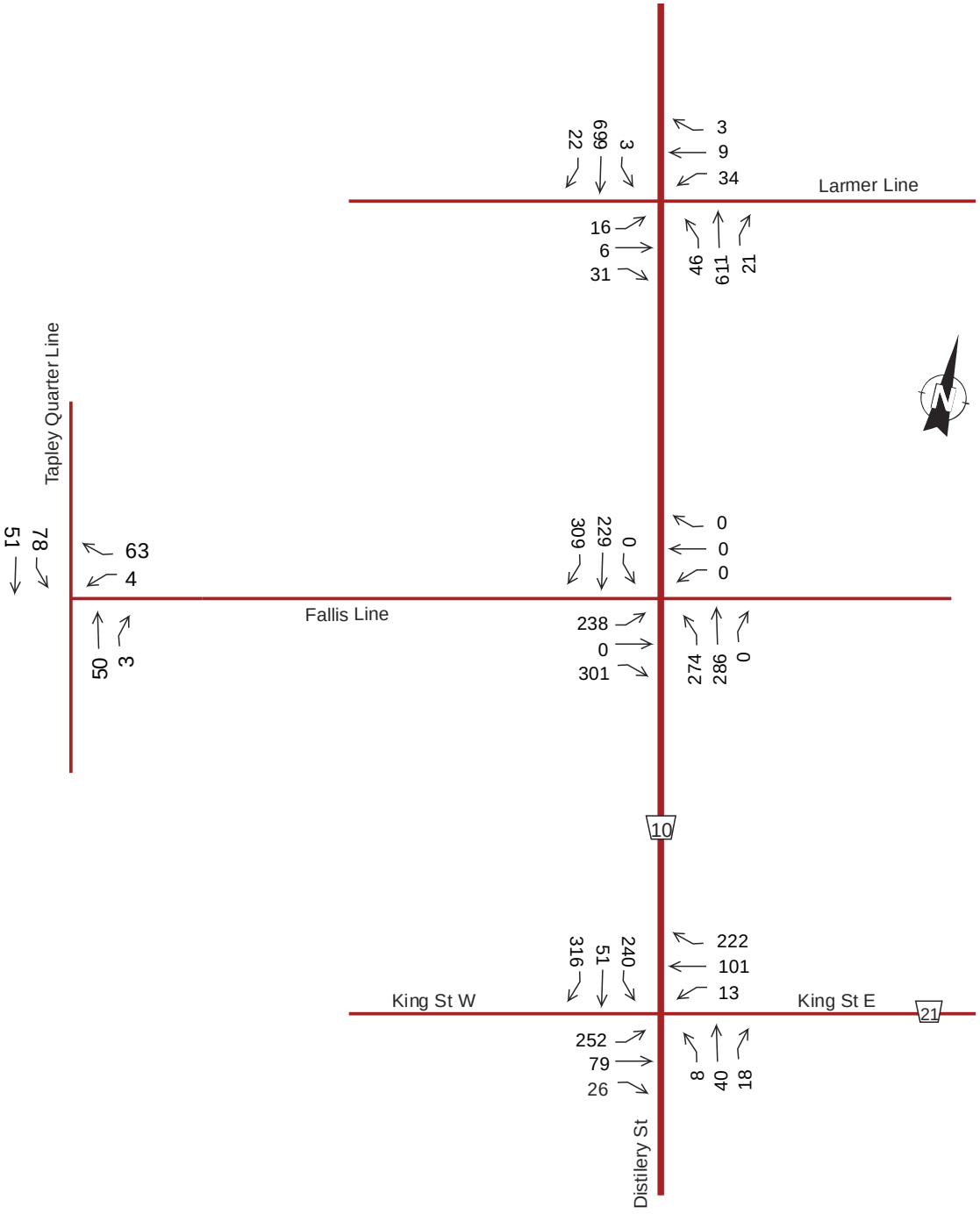

Exhibit 16: *Background SAT Peak Hour Volumes, 2036.*

3.2 Background Traffic Operations

These operations occur in the context of the upgrades identified as part of previous traffic studies for development in Millbrook. The following upgrades are assumed to have been implemented as part of the background traffic operations from 2026 onwards:

CR10 / Larmer Ln:

- Dedicated northbound left turn lane (25 m storage, 25 m taper)
- Dedicated southbound left turn lane (25 m storage, 25 m taper)

CR10 / Fallis Ln:

- Traffic Signals, for preliminary timing see *Appendices E, F, or G*
- Dedicated eastbound left turn lane (90 m storage, 90 m taper)
- Shared eastbound thru & right lane
- Dedicated northbound left turn lane (150 m storage, 100 m taper)
- Dedicated northbound thru lane
- Dedicated northbound right turn taper (60 m taper)
- Dedicated westbound left turn lane (60 m storage, 60 m taper)
- Shared westbound thru & right lane
- Dedicated southbound left turn lane (60 m storage, 60 m taper)
- Dedicated southbound thru lane
- Dedicated southbound right turn lane (75 storage, 70 m taper)

CR10 / King St:

- Dedicated southbound left turn lane extended (14 m storage, 22 m taper extended to 45 m storage, 60 m taper)

The results for the background traffic operations in 2026, 2031, and 2036 are shown in the following ***Tables 3 to 5***.

		Background Volumes 2026											
		AM Peak Hour				PM Peak Hour				SAT Peak Hour			
		V/C	Delay (s)	Q_{95} (m)	LOS	V/C	Delay (s)	Q_{95} (m)	LOS	V/C	Delay (s)	Q_{95} (m)	LOS
CR10 / Larmer Line	EB-LTR	0.11	14.8	2.8	B	0.15	18.5	3.9	C	0.09	16.9	2.3	C
	WB-LTR	0.14	19.1	3.7	C	0.11	24.4	2.8	C	0.17	26.4	4.6	D
	NB-L	0.02	8.1	0.4	A	0.02	8.7	0.4	A	0.03	8.6	0.7	A
	NB-TR	0.30	0.0	0.0	A	0.25	0.0	0.0	A	0.27	0.0	0.0	A
	SB-L	0.00	8.4	0.1	A	0.01	8.2	0.3	A	0.00	8.3	0.0	A
	SB-TR	0.21	0.0	0.0	A	0.34	0.0	0.0	A	0.31	0.0	0.0	A
CR10 / Fallis Line	EB-L	0.63	35.2	41.7	D	0.49	31.2	31.1	C	0.50	30.5	34.8	C
	EB-TR	0.28	0.8	0.0	A	0.21	0.6	0.0	A	0.23	0.6	0.0	A
	WB-L	0.00	0.0	0.0	A	0.00	0.0	0.0	A	0.00	0.0	0.0	A
	WB-TR	0.00	0.0	0.0	A	0.00	0.0	0.0	A	0.00	0.0	0.0	A
	NB-L	0.22	3.5	10.6	A	0.25	3.4	11.3	A	0.21	3.4	10.3	A
	NB-T	0.18	3.8	15.3	A	0.19	3.6	15.9	A	0.18	3.8	15.1	A
	NB-R	0.00	0.0	0.0	A	0.00	0.0	0.0	A	0.00	0.0	0.0	A
	SB-L	0.00	0.0	0.0	A	0.00	0.0	0.0	A	0.00	0.0	0.0	A
	SB-T	0.23	9.4	26.4	A	0.32	9.7	36.8	A	0.19	9.0	21.7	A
	SB-R	0.15	2.2	6.8	A	0.22	2.1	8.4	A	0.23	2.1	8.5	A
	Overall	0.63	9.0	-	A	0.49	7.5	-	A	0.50	7.3	-	A
Fallis Line / Tapley Q. Line	WB-LR	0.10	9.0	2.6	A	0.05	8.8	1.3	A	0.05	8.8	1.2	A
	NB-TR	0.03	0.0	0.0	A	0.03	0.0	0.0	A	0.03	0.0	0.0	A
	SB-LTR	0.03	4.8	0.6	A	0.07	4.9	1.7	A	0.04	4.3	0.9	A
CR10 / King St	EB-LTR	0.23	9.9	18.4	A	0.36	11.8	23.8	B	0.45	13.6	19.8	B
	WB-LTR	0.31	9.7	15.7	A	0.40	11.4	25.3	B	0.40	12.1	23.8	B
	NB-LTR	0.04	8.8	5.4	A	0.09	9.5	13.0	A	0.10	10.0	12.9	A
	SB-L	0.32	10.6	23.5	B	0.39	12.5	19.5	B	0.35	12.0	26.4	B
	SB-TR	0.24	8.4	23.0	A	0.23	8.9	19.2	A	0.40	11.6	29.9	B

Table 3: *Background Volumes Intersection Capacity, 2026.*

By 2026, with the previously identified upgrades and the Millbrook development progress indicated in ***Exhibit 2***, and without the subject developments in place, traffic will be operating well with LOS "A" for most movements, with the exception of CR10 / Fallis Ln and CR10 / Larmer Ln showing LOS "D" for vehicles exiting minor approaches.

		Background Volumes 2031											
		AM Peak Hour				PM Peak Hour				SAT Peak Hour			
		V/C	Delay (s)	Q_{95} (m)	LOS	V/C	Delay (s)	Q_{95} (m)	LOS	V/C	Delay (s)	Q_{95} (m)	LOS
CR10 / Larmer Line	EB-LTR	0.50	47.2	18.7	E	1.57	374.0	92.8	F	0.27	29.9	7.8	D
	WB-LTR	0.53	62.7	18.9	F	0.50	89.4	15.8	F	0.51	79.2	17.0	F
	NB-L	0.04	9.1	1.0	A	0.03	9.8	0.8	A	0.06	9.4	1.4	A
	NB-TR	0.44	0.0	0.0	A	0.39	0.0	0.0	A	0.38	0.0	0.0	A
	SB-L	0.01	9.2	0.2	A	0.02	9.0	0.4	A	0.00	8.9	0.0	A
	SB-TR	0.40	0.0	0.0	A	0.51	0.0	0.0	A	0.44	0.0	0.0	A
CR10 / Fallis Line	EB-L	1.05	92.0	96.0	F	0.70	39.1	51.7	D	0.78	44.6	62.2	D
	EB-TR	0.45	1.7	0.0	A	0.33	1.2	0.0	A	0.37	1.2	0.0	A
	WB-L	0.00	0.0	0.0	A	0.00	0.0	0.0	A	0.00	0.0	0.0	A
	WB-TR	0.00	0.0	0.0	A	0.00	0.0	0.0	A	0.00	0.0	0.0	A
	NB-L	0.33	4.3	8.8	A	0.44	5.2	17.7	A	0.34	4.2	16.4	A
	NB-T	0.25	4.4	12.5	A	0.23	4.1	19.4	A	0.21	4.1	17.6	A
	NB-R	0.00	0.0	0.0	A	0.00	0.0	0.0	A	0.00	0.0	0.0	A
	SB-L	0.00	0.0	0.0	A	0.00	0.0	0.0	A	0.00	0.0	0.0	A
	SB-T	0.29	10.2	18.6	B	0.41	11.3	48.0	B	0.23	9.6	25.5	A
	SB-R	0.21	2.1	0.0	A	0.36	2.2	10.8	A	0.33	2.2	10.2	A
	Overall	1.05	21.8	-	C	0.70	9.3	-	A	0.78	9.9	-	A
Fallis Line / Tapley Q. Line	WB-LR	0.14	9.2	3.8	A	0.07	8.9	1.6	A	0.07	8.9	1.7	A
	NB-TR	0.03	0.0	0.0	A	0.03	0.0	0.0	A	0.03	0.0	0.0	A
	SB-LTR	0.03	5.1	0.8	A	0.09	5.3	2.4	A	0.05	4.8	1.3	A
CR10 / King St	EB-LTR	0.35	12.4	26.2	B	0.55	17.2	23.6	C	0.66	21.7	28.7	C
	WB-LTR	0.49	13.2	23.2	B	0.62	17.7	28.8	C	0.59	17.6	20.8	C
	NB-LTR	0.07	10.0	15.4	A	0.14	11.3	13.0	B	0.14	11.7	20.3	B
	SB-L	0.51	15.1	29.3	C	0.62	20.3	27.0	C	0.51	16.7	30.2	C
	SB-TR	0.39	11.0	26.3	B	0.38	11.7	21.3	B	0.66	19.4	30.6	C

Table 4: *Background Volumes Intersection Capacity, 2031.*

By 2031, traffic will continue to operate well for most movements. However, due to the further development progress, vehicles desiring to exit Fallis Ln onto CR10, as well as exiting Larmer Ln onto CR10, show LOS "F". This indicates the need for signals and further geometric upgrades at CR10 / Larmer Ln, and a signal timing adjustment at CR10 / Fallis Ln.

		Background Volumes 2036											
		AM Peak Hour				PM Peak Hour				SAT Peak Hour			
		V/C	Delay (s)	Q_{95} (m)	LOS	V/C	Delay (s)	Q_{95} (m)	LOS	V/C	Delay (s)	Q_{95} (m)	LOS
CR10 / Larmer Line	EB-LTR	1.27	273.3	61.6	F	4.14	Err	Err	F	0.36	39.6	11.5	E
	WB-LTR	0.99	186	41.5	F	0.88	219.0	28.0	F	0.61	101.4	21.0	F
	NB-L	0.05	10.2	1.2	B	0.04	10.3	0.9	B	0.06	9.6	1.5	A
	NB-TR	0.48	0.0	0.0	A	0.47	0.0	0.0	A	0.40	0.0	0.0	A
	SB-L	0.01	9.4	0.2	A	0.02	9.4	0.4	A	0.00	9.0	0.1	A
	SB-TR	0.55	0.0	0.0	A	0.58	0.0	0.0	A	0.46	0.0	0.0	A
CR10 / Fallis Line	EB-L	1.17	133.6	110.1	F	0.74	41.7	56.8	D	0.79	45.6	63.8	D
	EB-TR	0.48	2.0	0.0	A	0.36	1.4	0.0	A	0.38	1.3	0.0	A
	WB-L	0.00	0.0	0.0	A	0.00	0.0	0.0	A	0.00	0.0	0.0	A
	WB-TR	0.00	0.0	0.0	A	0.00	0.0	0.0	A	0.00	0.0	0.0	A
	NB-L	0.36	4.5	15.6	A	0.50	6.1	18.2	A	0.35	4.3	16.8	A
	NB-T	0.32	4.8	27.0	A	0.27	4.3	22.4	A	0.24	4.2	19.5	A
	NB-R	0.00	0.0	0.0	A	0.00	0.0	0.0	A	0.00	0.0	0.0	A
	SB-L	0.00	0.0	0.0	A	0.00	0.0	0.0	A	0.00	0.0	0.0	A
	SB-T	0.32	10.6	35.8	B	0.49	12.6	60.1	B	0.25	9.8	28.1	A
	SB-R	0.22	2.1	8.2	A	0.39	2.3	11.2	A	0.34	2.2	10.3	A
	Overall	1.17	30.7	-	C	0.74	10.1	-	C	0.79	10.1	-	A
Fallis Line / Tapley Q. Line	WB-LR	0.17	9.4	4.7	A	0.08	9.0	2.0	A	0.09	9.1	2.3	A
	NB-TR	0.03	0.0	0.0	A	0.04	0.0	0.0	A	0.03	0.0	0.0	A
	SB-LTR	0.05	5.5	1.1	A	0.13	5.8	3.4	A	0.08	5.4	2.0	A
CR10 / King St	EB-LTR	0.60	20.0	21.6	C	0.87	43.9	33.5	E	1.11	101.9	23.4	F
	WB-LTR	0.83	31.8	32.9	D	0.98	60.4	33.9	F	0.95	54.7	28.9	F
	NB-LTR	0.14	12.4	15.3	B	0.24	15.2	9.5	C	0.24	15.3	14.7	C
	SB-L	0.70	25.9	26.1	D	0.95	61.3	32.7	F	0.74	31.4	36.9	D
	SB-TR	0.56	16.5	21.3	C	0.60	19.8	25.4	C	0.99	64.4	39.9	F

Table 5: *Background Volumes Intersection Capacity, 2036.*

By 2036, the movements that were already critical have gained significantly more delays. Also, numerous movements at CR10 / King St will show LOS “F”, indicating the need for traffic signals at this intersection by 2036.

4 Proposed Development Traffic Forecasting

4.1 Traffic Impact Study Methodology

The traffic impact analysis was completed in accordance with the methodologies published by the Transportation Research Board (TRB) and the Transportation Impact Analysis for Site Developments published by the Institute of Transportation Engineers (ITE).

The estimation of trips generated by the proposed development were derived from the Trip Generation Manual, 11th Edition, published by the Institute of Transportation Engineers.

4.2 Site Trip Generation

The land uses which most closely describe the proposed residential development are the following:

- Single-Family Detached Housing – Land Use 210
- Multifamily Housing (Low Rise) – Land Use 220
- Mid-rise Residential w/ 1st Floor Commercial – Land Use 231

As previously mentioned, the traffic impact analysis for both the subject residential development and the nearby proposed commercial plaza will be performed in conjunction with each other. The land uses which most closely describe the commercial plaza are the following:

- General Office Building – Land Use 710
- Supermarket – Land Use 850

- Department Store – Land Use 875
- Walk-in Bank – Land Use 911
- Fine Dining Restaurant – Land Use 931
- Fast Food Restaurant w/ Drive-thru Window – Land Use 934
- Coffee / Donut Shop w/ Drive-thru Window – Land Use 937
- Automated Car Wash – Land Use 948
- Super Convenience Market / Gas Station – Land Use 960

The ITE trip generation rates for the above land uses are shown in ***Table 6:***

TRIP GENERATION RATES BY LAND USE - RESIDENTIAL DEVELOPMENT										
ITE	ITE	Unit of	AM Peak Hr. of Adj. Street			PM Peak Hr. of Adj. Street			SAT Peak Hr. of Adj. Street		
Code	Land Use	Measure	Rate	In	Out	Rate	In	Out	Rate	In	Out
210	Single-Family Detached Housing	Dwelling Units	0.70	25%	75%	0.94	63%	37%	0.92	54%	46%
220	Multifamily Housing (Low Rise)	Dwelling Units	0.40	24%	76%	0.51	63%	37%	0.41	50%	50%
231	Low-Rise Residential with Ground Floor Commercial	Dwelling Units	0.30	28%	72%	0.36	70%	30%	0.86	50%	50%

TRIP GENERATION RATES BY LAND USE - COMMERCIAL DEVELOPMENT										
ITE	ITE	Unit of	AM Peak Hr. of Adj. Street			PM Peak Hr. of Adj. Street			SAT Peak Hr. of Adj. Street		
Code	Land Use	Measure	Rate	In	Out	Rate	In	Out	Rate	In	Out
710	General Office Building	GFA	1.52	88%	12%	1.44	17%	83%	0.53	54%	46%
850	Supermarket	GFA	2.86	59%	41%	8.95	50%	50%	10.10	50%	50%
875	Department Store	GFA	0.58	64%	36%	1.95	50%	50%	3.45	53%	47%
911	Walk-In Bank	GFA	22.54	52%	48%	12.13	44%	56%	22.54	52%	48%
931	Fine Dining Restaurant	GFA	0.73	50%	50%	7.80	67%	33%	10.68	59%	41%
934	Fast-Food Restaurant with Drive-Thru Window	GFA	44.61	51%	49%	33.03	52%	48%	55.25	51%	49%
937	Coffee/Donut Shop with Drive-Thru Window	GFA	85.88	51%	49%	38.99	50%	50%	87.91	50%	50%
948	Automated Car Wash	Tunnels	0	50%	50%	77.50	50%	50%	41.00	46%	54%
960	Super Convenience Market / Gas Station	Fueling Positions	28.08	50%	50%	22.96	50%	50%	23.26	50%	50%

Table 6: *ITE Trip Rates per Land Use.*

For the purposes of this study, it is assumed that the subject residential development is 50% built by 2026 and fully built by 2031. The commercial plaza is assumed to have its Phase 1 completed by 2026, and to have its Phase 2 completed by 2031. The estimated number of trips generated by both developments by 2026 is shown in the following ***Table 7***:

ESTIMATED NUMBER OF TRIPS BY LAND USE - RESIDENTIAL DEVELOPMENT 50%, 2026											
ITE Code	ITE Land Use	Total Units	AM Peak Hr. of Adj. Street			PM Peak Hr. of Adj. Street			SAT Peak Hr. of Adj. Street		
			Trips	In	Out	Trips	In	Out	Trips	In	Out
210	Single Family Detached Housing	63	44	11	33	59	37	22	58	31	27
220	Multifamily Housing (Low Rise)	27	11	3	8	14	9	5	11	6	6
710	Mid-rise Residential w/ 1st Floor Commercial	80	24	7	17	29	20	9	69	34	34
NEW TRIPS BEFORE REDUCTIONS			79	20	59	102	66	36	138	71	67

ESTIMATED NUMBER OF TRIPS BY LAND USE - COMMERCIAL PLAZA PHASE 1, 2026											
ITE Code	ITE Land Use	Total Units	AM Peak Hr. of Adj. Street			PM Peak Hr. of Adj. Street			SAT Peak Hr. of Adj. Street		
			Trips	In	Out	Trips	In	Out	Trips	In	Out
710	General Office Building	11.65	18	16	2	17	3	14	6	3	3
850	Supermarket	25.71	74	43	30	230	115	115	260	130	130
931	Fine Dining Restaurant	3.11	2	1	1	24	16	8	33	20	14
934	Fast-Food Restaurant w/ Drive-Thru Window	5.79	258	132	127	191	99	92	320	163	157
948	Automated Car Wash	1	0	0	0	78	39	39	41	19	22
960	Super Convenience Market / Gas Station	8	225	112	112	184	92	92	186	93	93
NEW TRIPS BEFORE REDUCTIONS			576	304	272	724	364	359	846	428	418

ESTIMATED TRIP REDUCTION, 2026 (SEE APPENDIX G)									
Type of Reduced Trip	AM Peak Hr. of Adj. Street			PM Peak Hr. of Adj. Street			SAT Peak Hr. of Adj. Street		
	Trips	In	Out	Trips	In	Out	Trips	In	Out
Internal Trips	20	10	10	120	60	60	142	71	71
Pass-by Trips	263	133	130	264	137	127	334	170	164
NEW TRIPS (BOTH DEVELOPMENTS)	372	182	190	442	233	209	509	258	251

Table 7: *Trips Generated by the Proposed Developments, 2026.*

The estimated number of trips for the commercial development is shown in the following ***Table 8***:

ESTIMATED NUMBER OF TRIPS BY LAND USE - RESIDENTIAL DEVELOPMENT 100%, 2031											
ITE Code	ITE Land Use	Total Units	AM Peak Hr. of Adj. Street			PM Peak Hr. of Adj. Street			SAT Peak Hr. of Adj. Street		
			Trips	In	Out	Trips	In	Out	Trips	In	Out
210	Single Family Detached Housing	127	89	22	67	119	75	44	117	63	54
220	Multifamily Housing (Low Rise)	55	22	5	17	28	18	10	23	11	11
710	Mid-rise Residential w/ 1st Floor Commercial	80	24	7	17	29	20	9	69	34	34
NEW TRIPS BEFORE REDUCTIONS			135	34	101	176	113	63	208	109	99

ESTIMATED NUMBER OF TRIPS BY LAND USE - COMMERCIAL PLAZA PHASE 2, 2031											
ITE Code	ITE Land Use	Total Units	AM Peak Hr. of Adj. Street			PM Peak Hr. of Adj. Street			SAT Peak Hr. of Adj. Street		
			Trips	In	Out	Trips	In	Out	Trips	In	Out
710	General Office Building	76.28	116	102	14	110	19	91	40	22	19
850	Supermarket	25.71	74	43	30	230	115	115	260	130	130
875	Department Store	96.49	56	36	20	188	94	94	333	176	156
911	Walk-In Bank	3.23	73	38	35	39	17	22	73	38	35
931	Fine Dining Restaurant	3.11	2	1	1	24	16	8	33	20	14
934	Fast-Food Restaurant with Drive-Thru Window	11.69	521	266	256	386	201	185	646	329	316
937	Coffee/Donut Shop with Drive-Thru Window	1.95	167	85	82	76	38	38	171	86	86
948	Automated Car Wash	1	0	0	0	78	39	39	41	19	22
960	Super Convenience Market / Gas Station	8	225	112	112	184	92	92	186	93	93
NEW TRIPS BEFORE REDUCTIONS			1234	684	550	1315	631	684	1783	913	871

ESTIMATED TRIP REDUCTION, 2031 (SEE APPENDIX G)									
Type of Reduced Trip	AM Peak Hr. of Adj. Street			PM Peak Hr. of Adj. Street			SAT Peak Hr. of Adj. Street		
	Trips	In	Out	Trips	In	Out	Trips	In	Out
Internal Trips	64	32	32	176	88	88	208	104	104
Pass-by Trips	467	238	229	389	200	189	570	292	278
NEW TRIPS (BOTH DEVELOPMENTS)	829	443	386	902	440	462	1179	605	574

Table 8: *Trips Generated by the Proposed Developments, 2031.*

According to the ITE Trip Generation Handbook, 3rd Edition, a key characteristic of a multi-use development is that trips among the various land uses can be made internally as opposed to beginning or ending on the road network.

Pass-by trips are another phenomenon to consider. They are made as intermediate stops from an origin to a primary trip destination. These trips already exist on the link passing the site, but they are temporarily attracted by the new development and will enter and exit.

For a full breakdown of the trip generation, including the estimation of internal trips and pass-by trips, see *Appendix H – Trip Generation*.

It is estimated that the combined developments will generate a total of 372 new trips during the morning peak hour, 442 new trips during the afternoon peak hour, and 509 new trips during the Saturday peak hour for the year 2026 (50% Residential and Phase 1 Commercial).

It is estimated that the combined developments will generate a total of 829 trips during the morning peak hour, 902 trips during the afternoon peak hour, and 1179 trips during the Saturday peak hour for the year 2031 (100% Residential and Phase 2 Commercial).

4.3 Trip Distribution/Assignment

The number of vehicles entering and leaving the sites are distributed proportional to the existing directional traffic patterns.

The proportions of trips within the study area were independently distributed between the residential and the commercial development. The resulting new trips from each of these two developments were added to obtain the set of new trips. It should be noted that the trips generated on the west leg of Fallis Ln have been reduced, because the majority of these trips are coming from the developments on Fallis Ln, the volumes of which have already been captured as part of the background volumes. These trips are new for the subject developments, but not new for Fallis Ln itself.

For the unmodified trips generated, the proportions for each development, as well as the pass-by trip assignment, see *Appendix I – Trip Distribution*. The total new trips are shown in the following ***Figures 17 to 22***:

AM Site Generated Trips w/ Diversion 2026
(Bromont Commercial Phase 1 + Vargas Residential 50%)

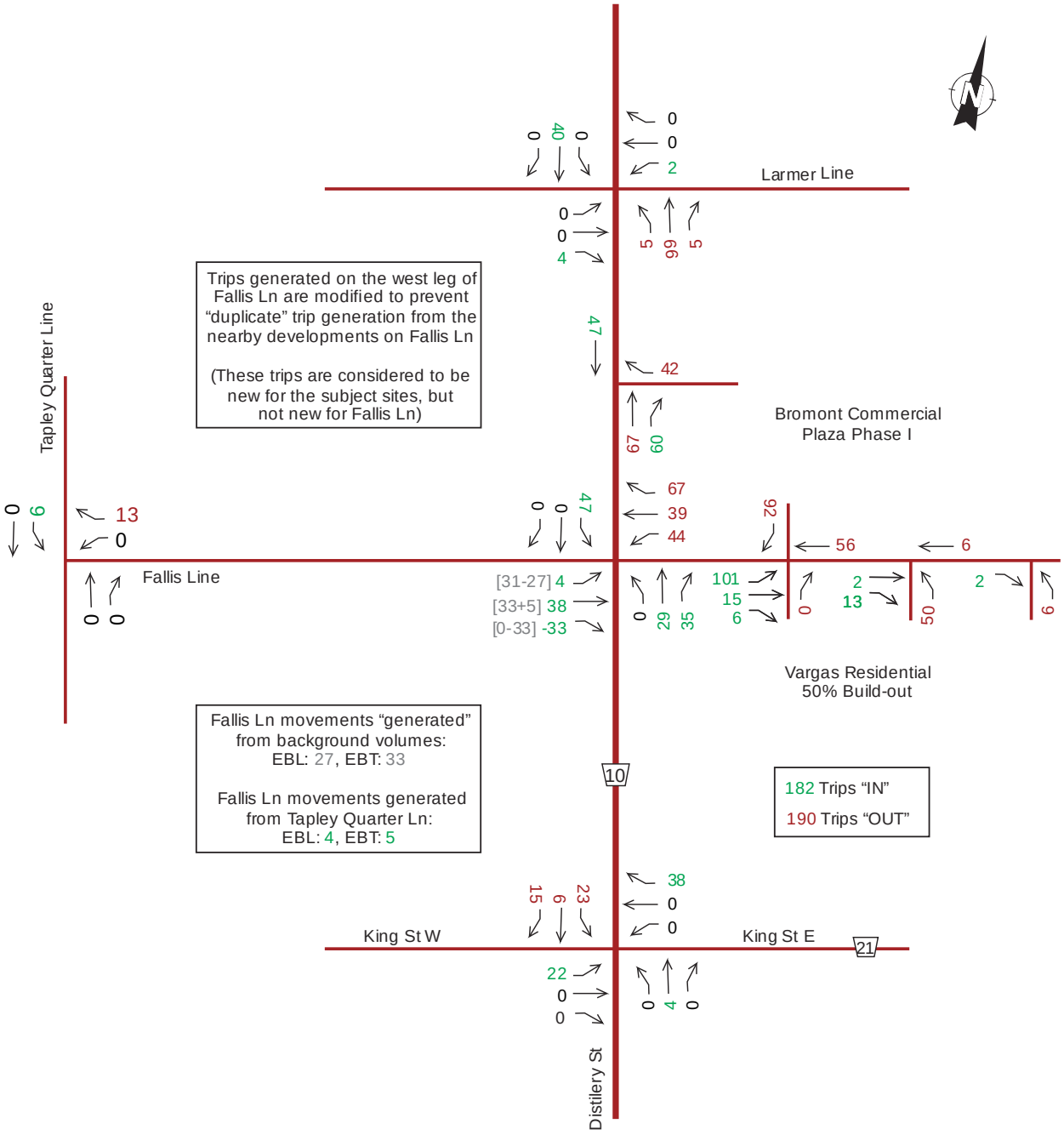

Exhibit 17: *AM New Trips Generated, 2026.*

PM Site Generated Trips w/ Diversion 2026
(Bromont Commercial Phase 1 + Vargas Residential 50%)

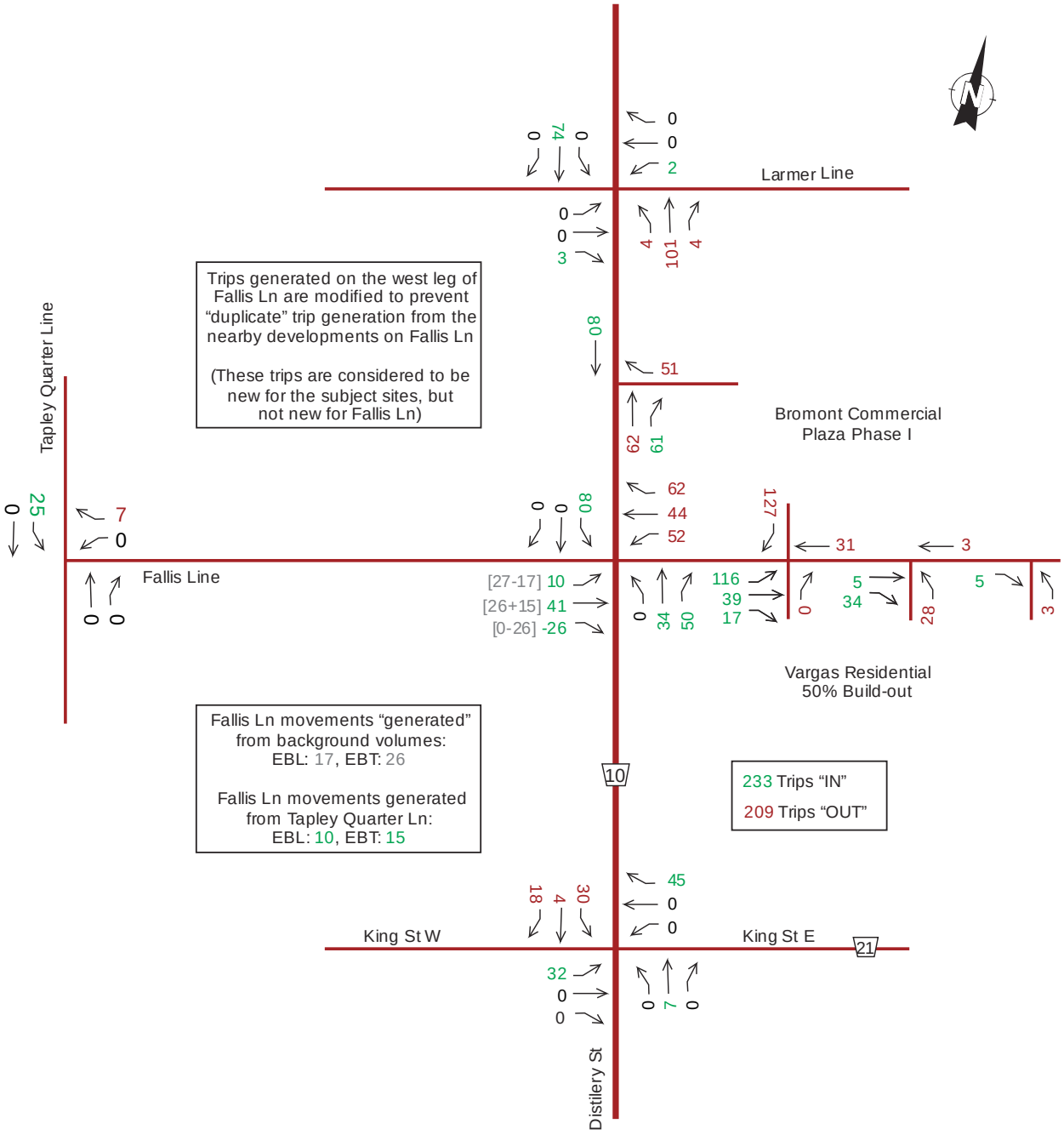

Exhibit 18: *PM New Trips Generated, 2026.*

SAT Site Generated Trips w/ Diversion 2026
(Bromont Commercial Phase 1 + Vargas Residential 50%)

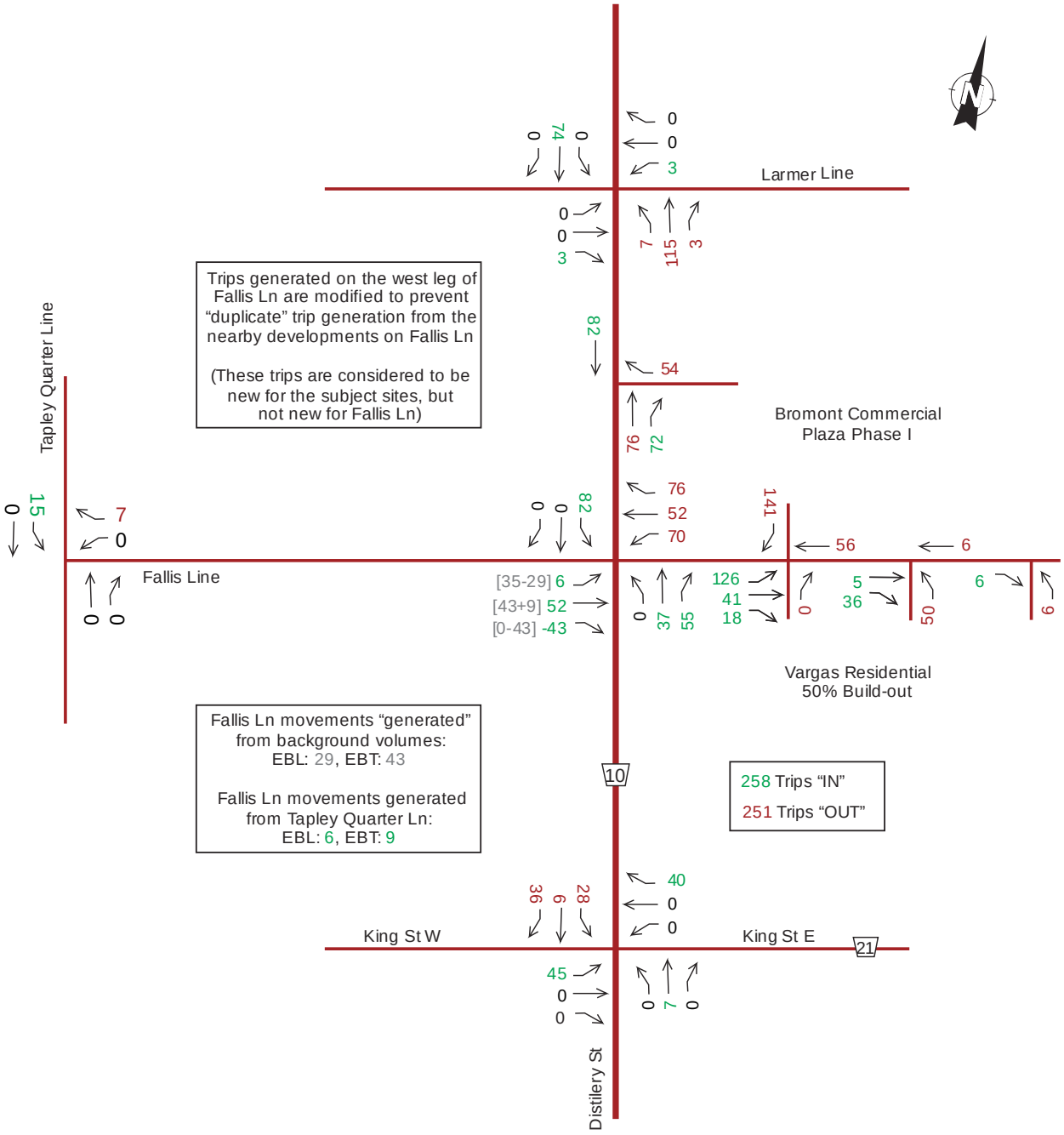

Exhibit 19: *SAT New Trips Generated, 2026.*

AM Site Generated Trips w/ Diversion 2031
(Bromont Commercial Phase 2 + Vargas Residential 100%)

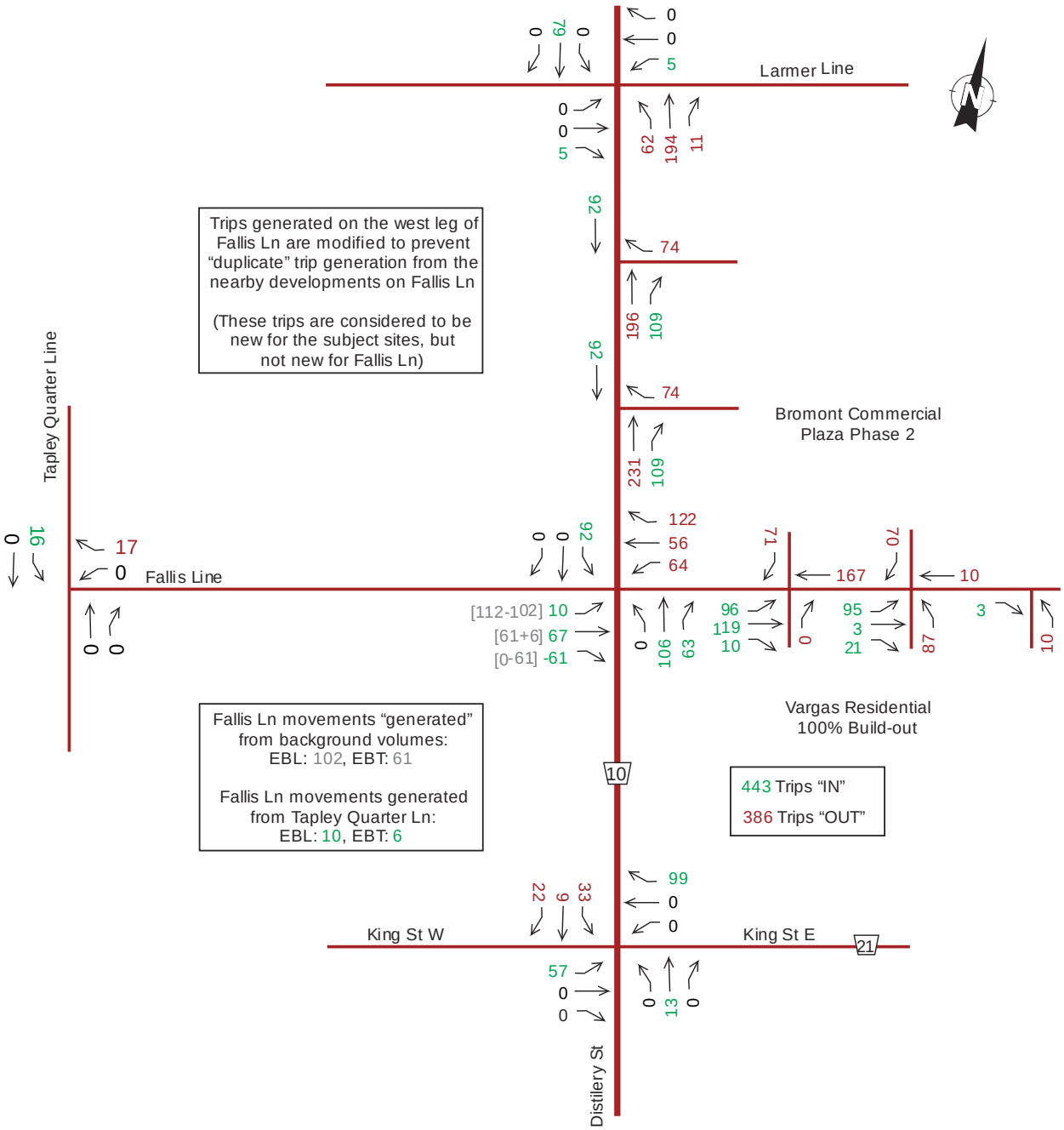

Exhibit 20: *AM New Trips Generated, 2031.*

PM Site Generated Trips w/ Diversion 2031
(Bromont Commercial Phase 2 + Vargas Residential 100%)

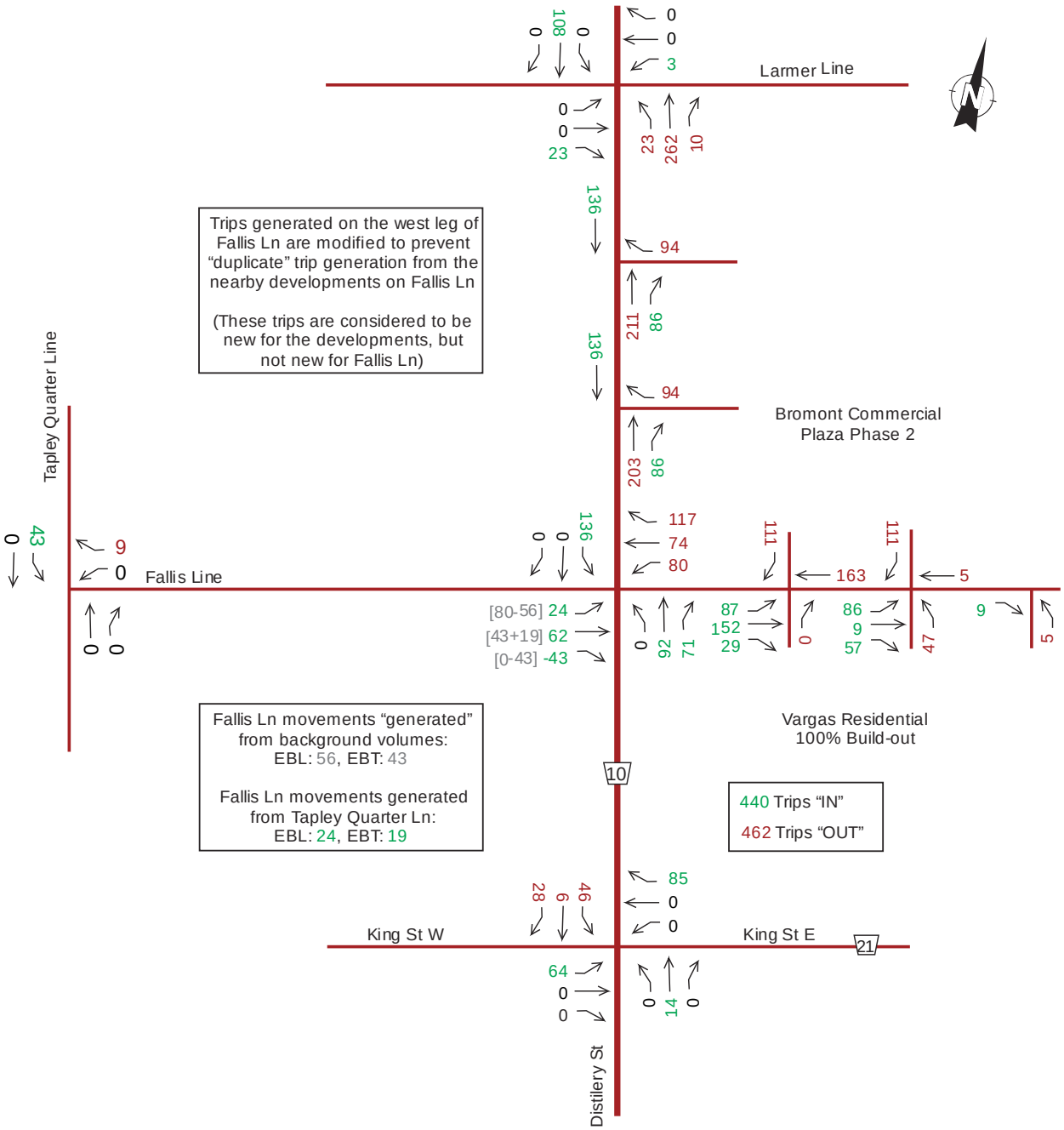

Exhibit 21: *PM New Trips Generated, 2031.*

SAT Site Generated Trips w/ Diversion 2031
(Bromont Commercial Phase 2 + Vargas Residential 100%)

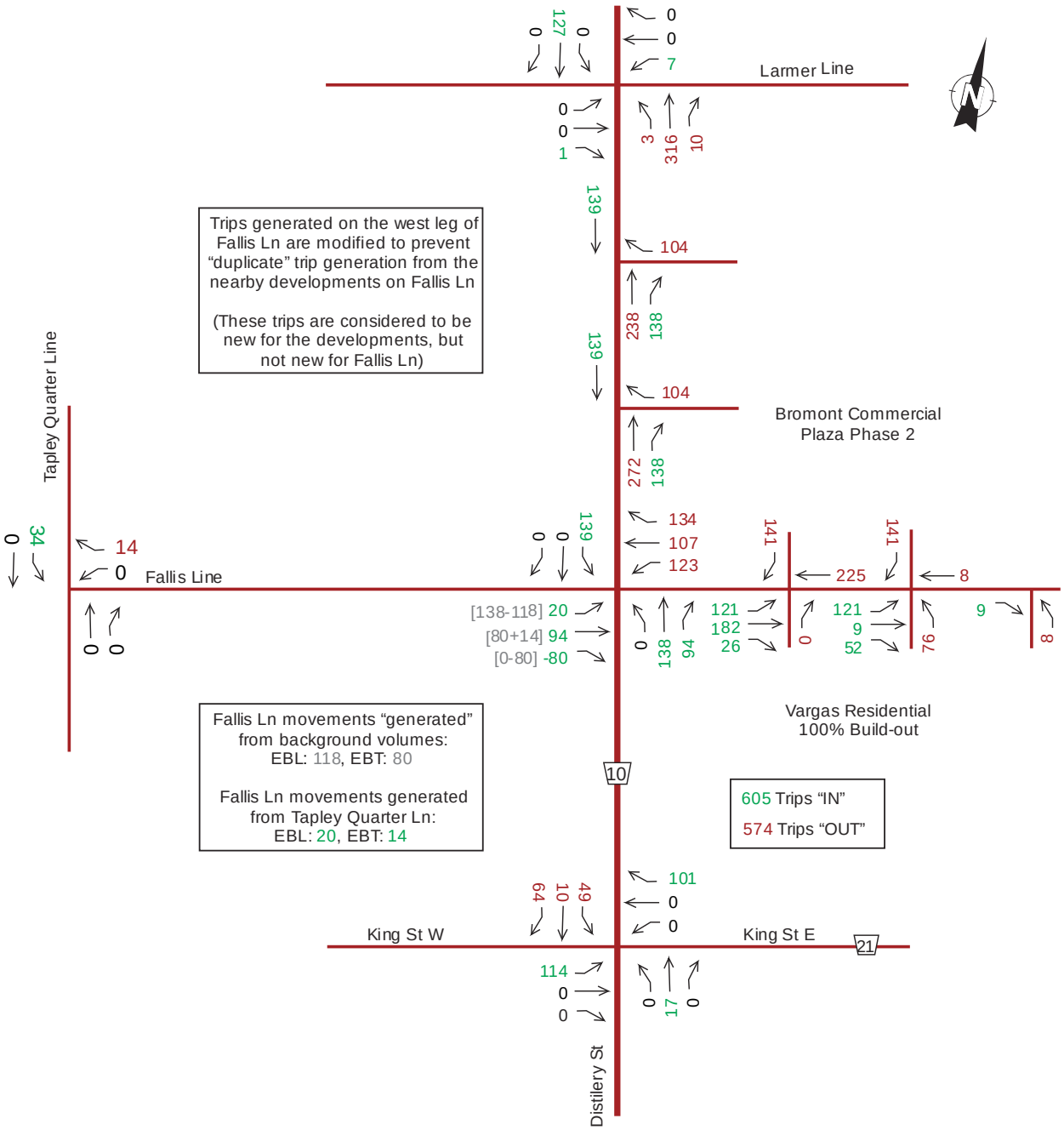

Exhibit 22: *SAT New Trips Generated, 2031.*

5 Future Traffic Operations

5.1 Future Traffic Volumes

The future total traffic volumes for the horizon years were obtained by adding the background volumes to the new volumes generated by the proposed development. The background traffic volumes and the total traffic volumes will be the basis for comparisons to identify any impacts for future years.

5.2 Scenarios

The analysis will review the intersection operations for the year 2026 (50% residential and Phase 1 commercial build-out), for the year 2031 (100% residential and Phase 2 commercial build-out), and for the year 2036 (five years after the full build-out).

5.3 Total Traffic Volumes for the Horizon Years

The total traffic volumes for the horizon years 2026, 2031, and 2036 are shown in ***Exhibits 23 to 31***:

AM Peak Hour - Total Volumes 2026

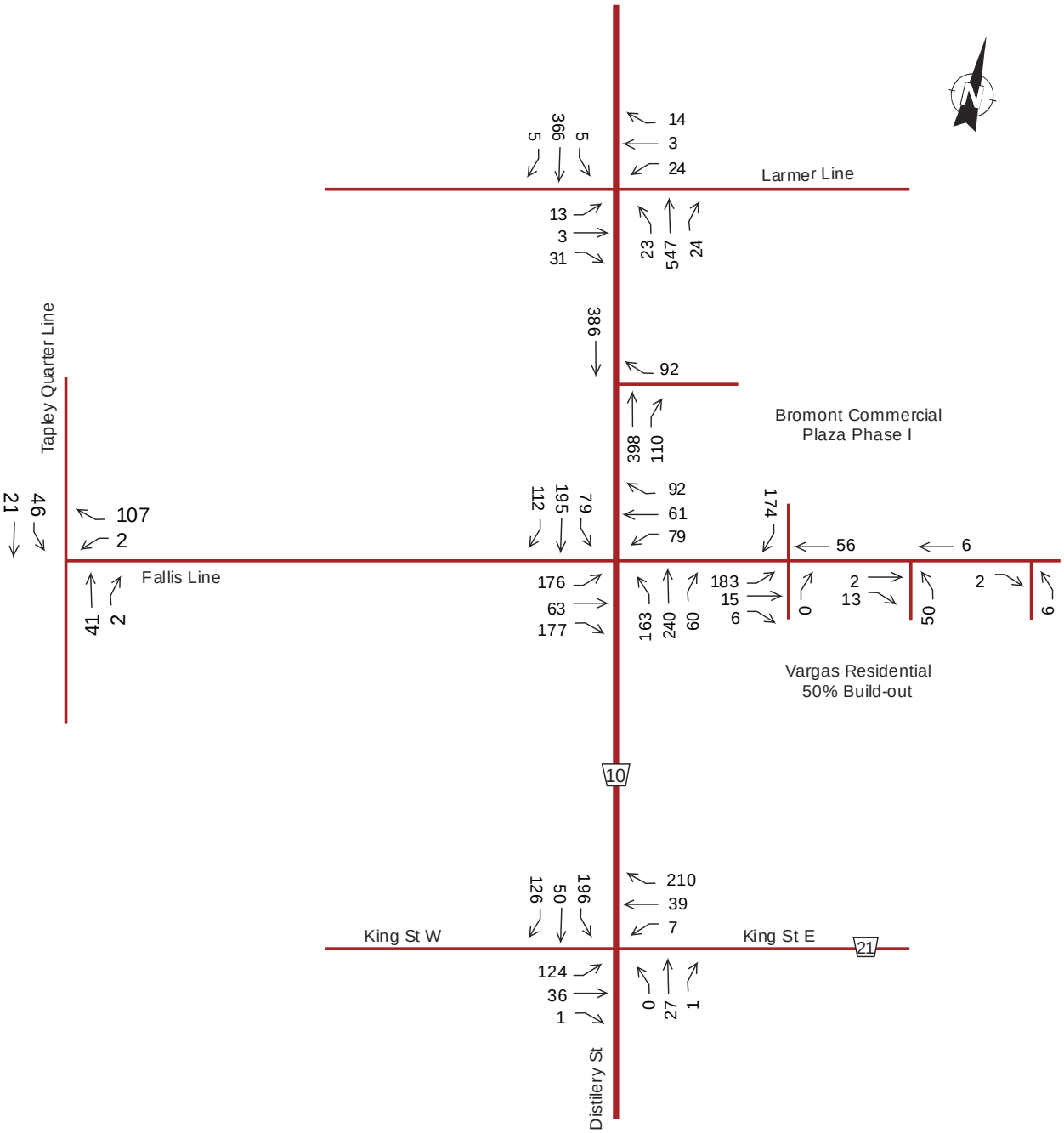

Exhibit 23: *Total AM Peak Hour Volumes, 2026.*

PM Peak Hour - Total Volumes 2026

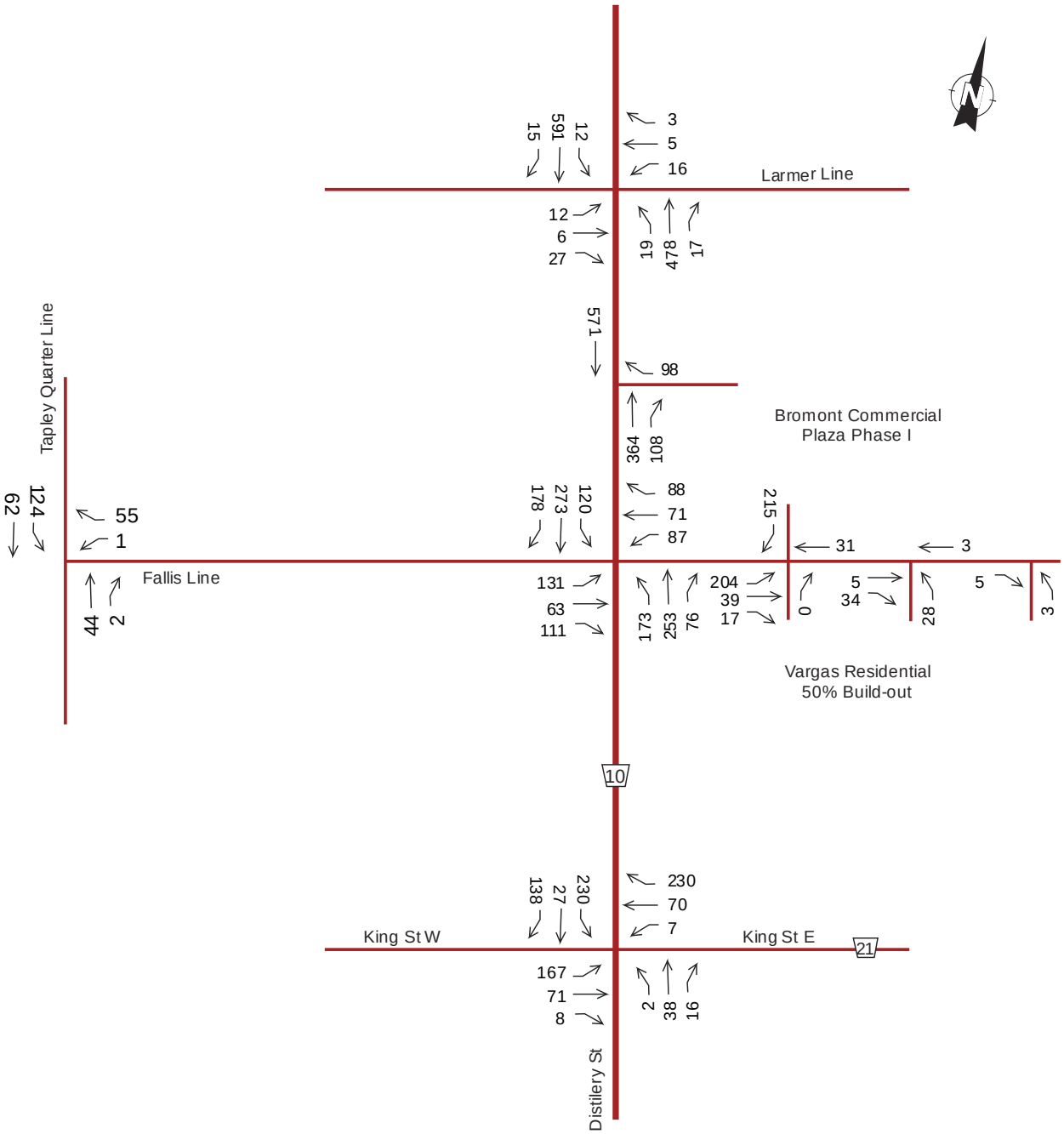

Exhibit 24: *Total PM Peak Hour Volumes, 2026.*

SAT Peak Hour - Total Volumes 2026

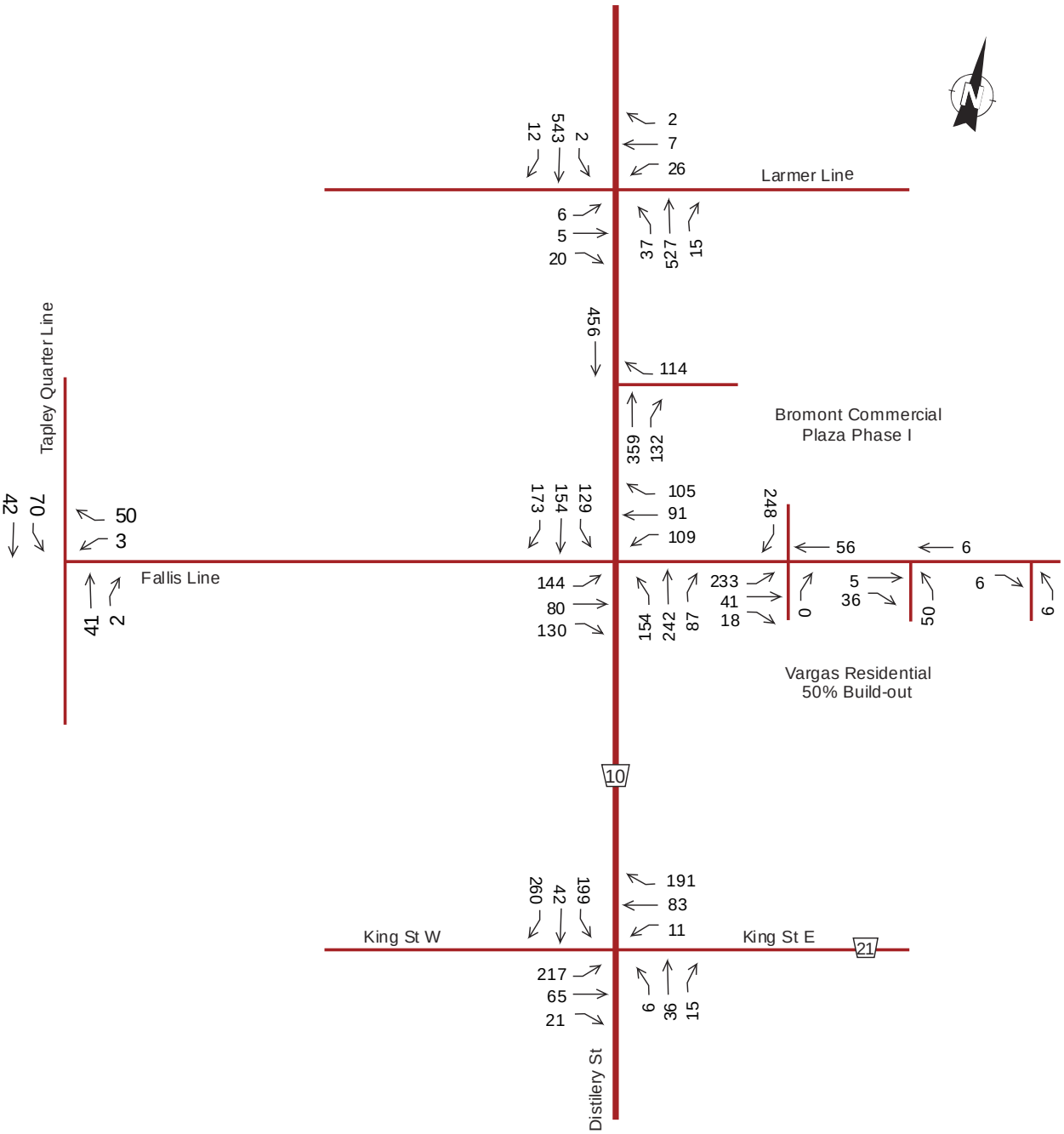

Exhibit 25: *Total SAT Peak Hour Volumes, 2026.*

AM Peak Hour - Total Volumes 2031

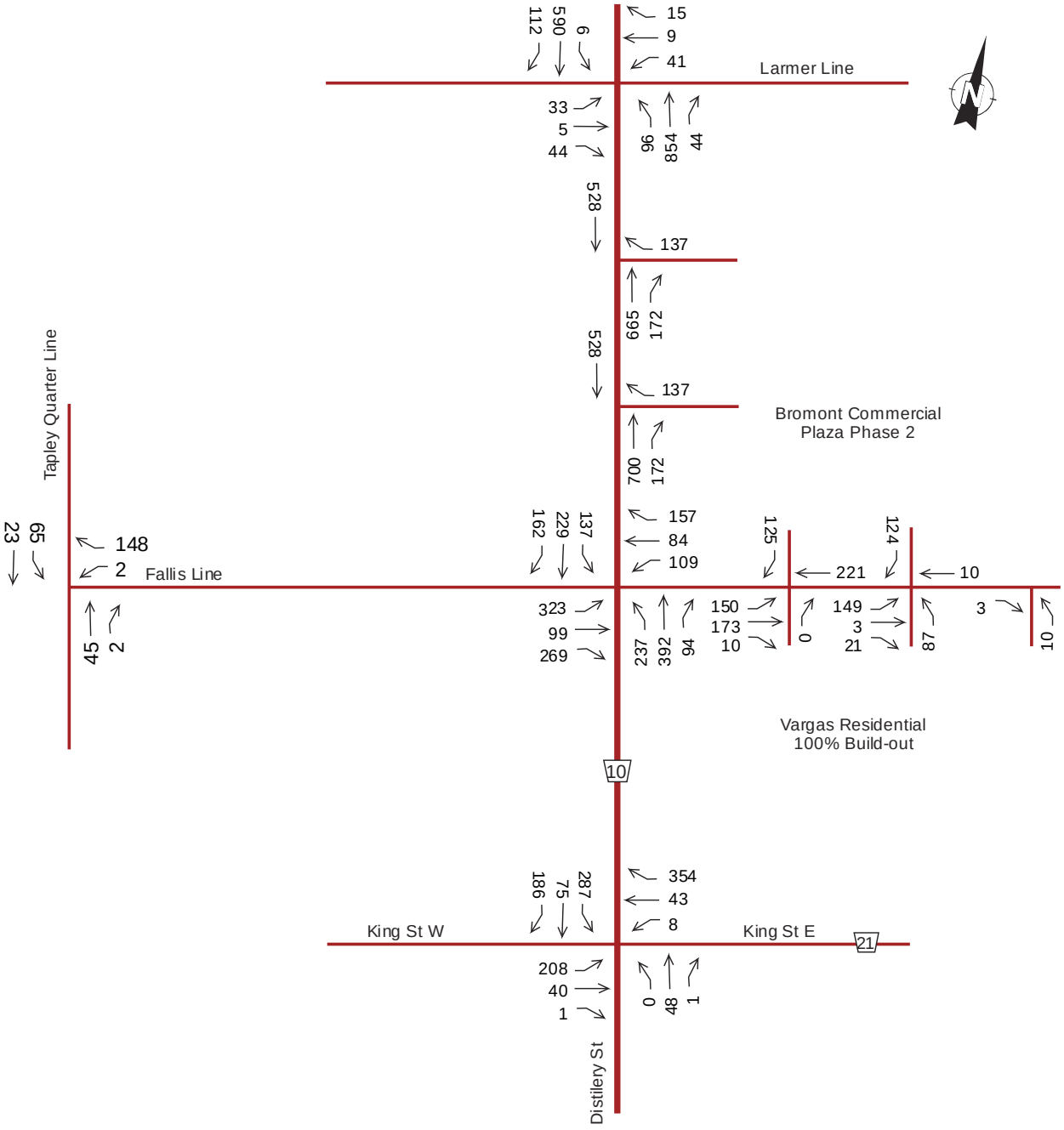

Exhibit 26: *Total AM Peak Hour Volumes, 2031.*

PM Peak Hour - Total Volumes 2031

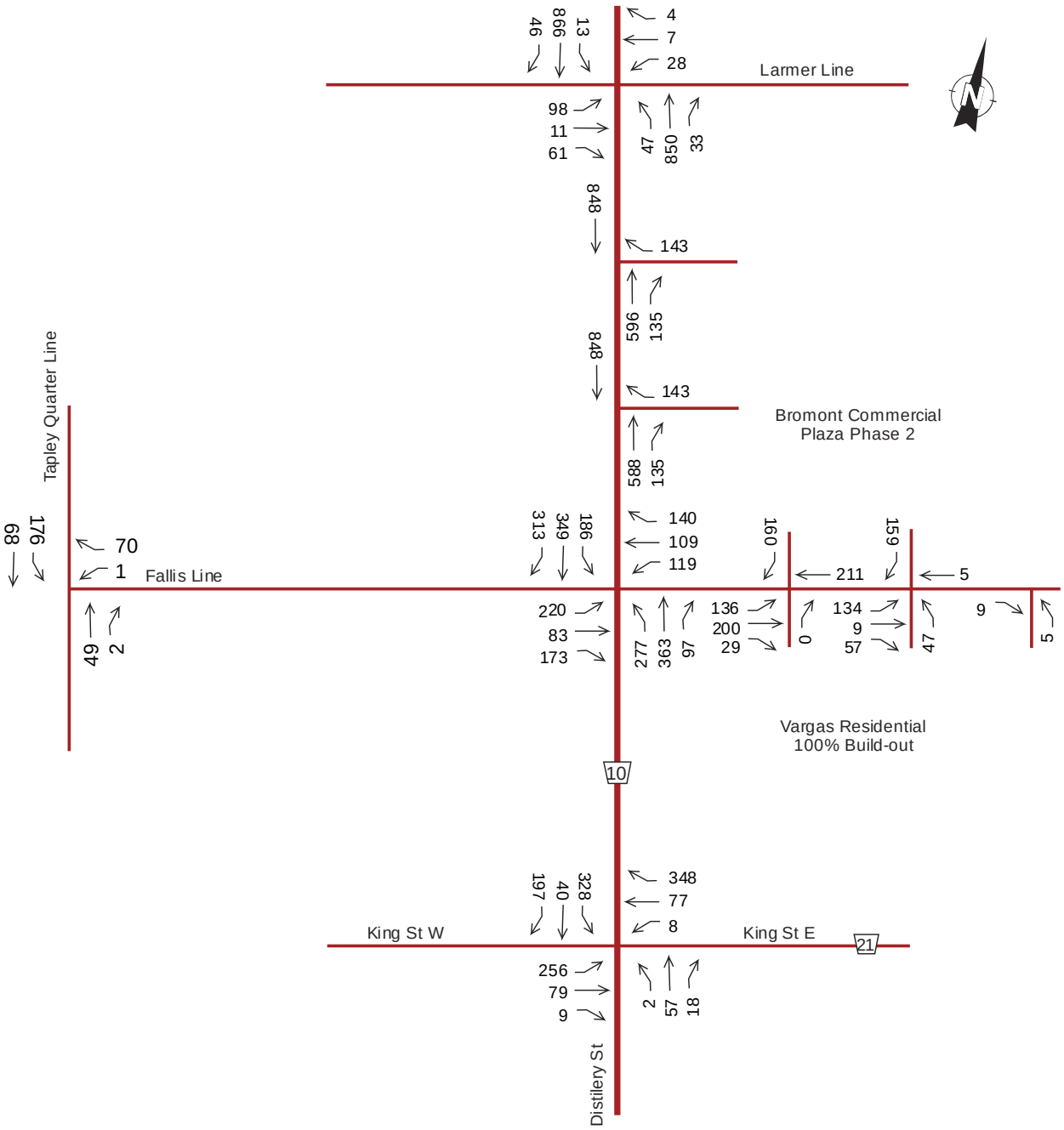

Exhibit 27: *Total PM Peak Hour Volumes, 2031.*

SAT Peak Hour - Total Volumes 2031

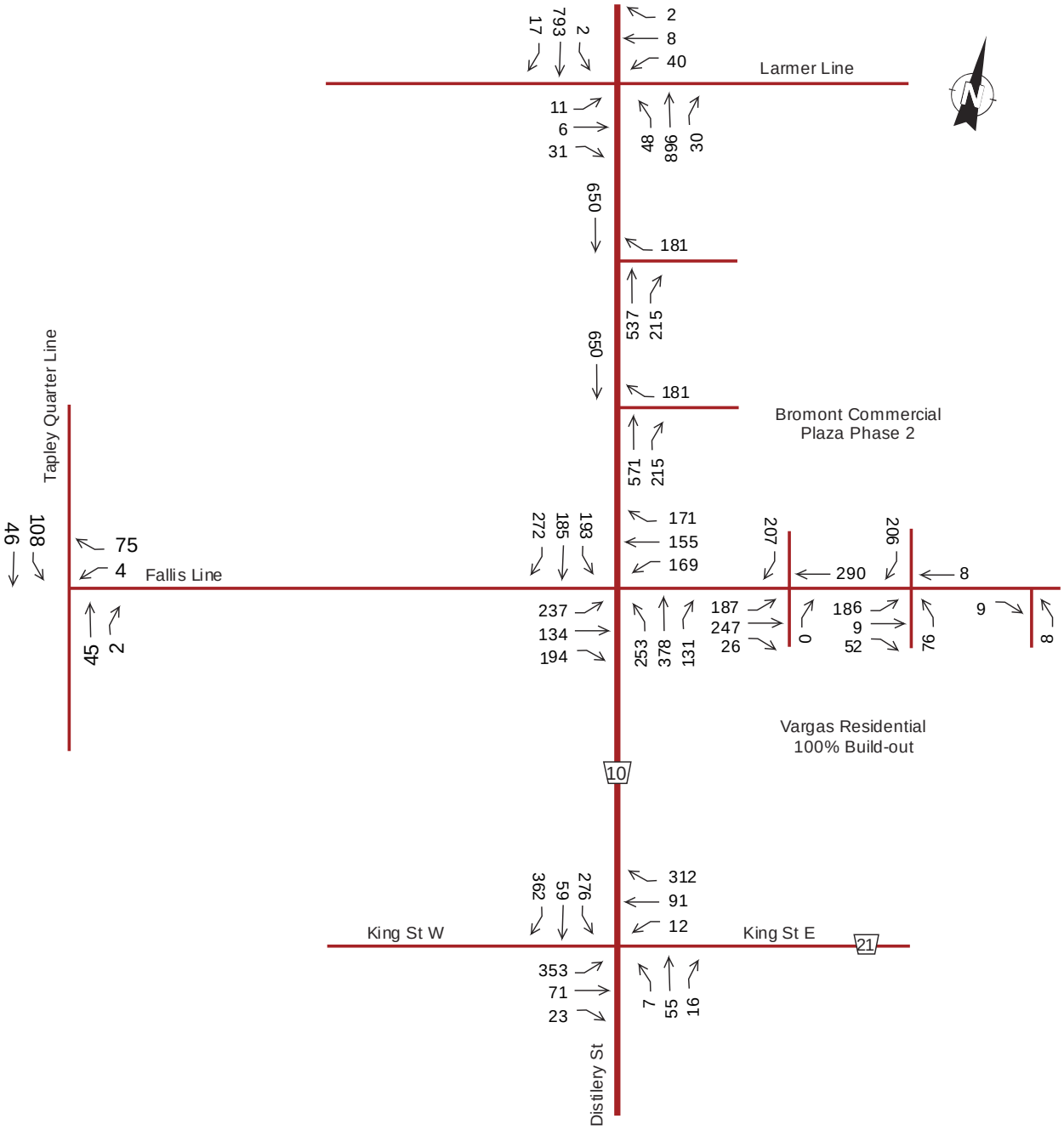

Exhibit 28: *Total SAT Peak Hour Volumes, 2031.*

AM Peak Hour - Total Volumes 2036

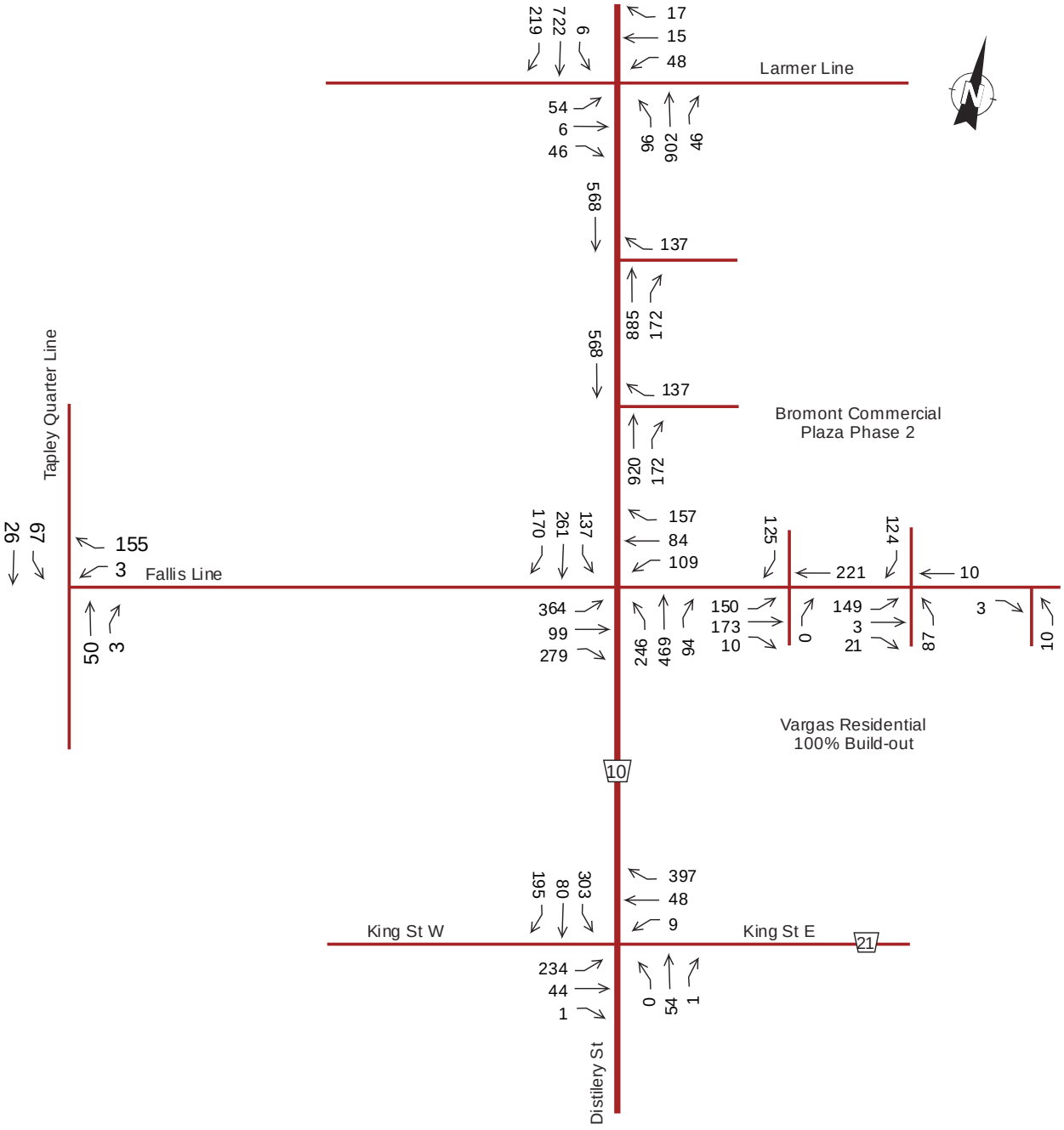

Exhibit 29: *Total AM Peak Hour Volumes, 2036.*

PM Peak Hour - Total Volumes 2036

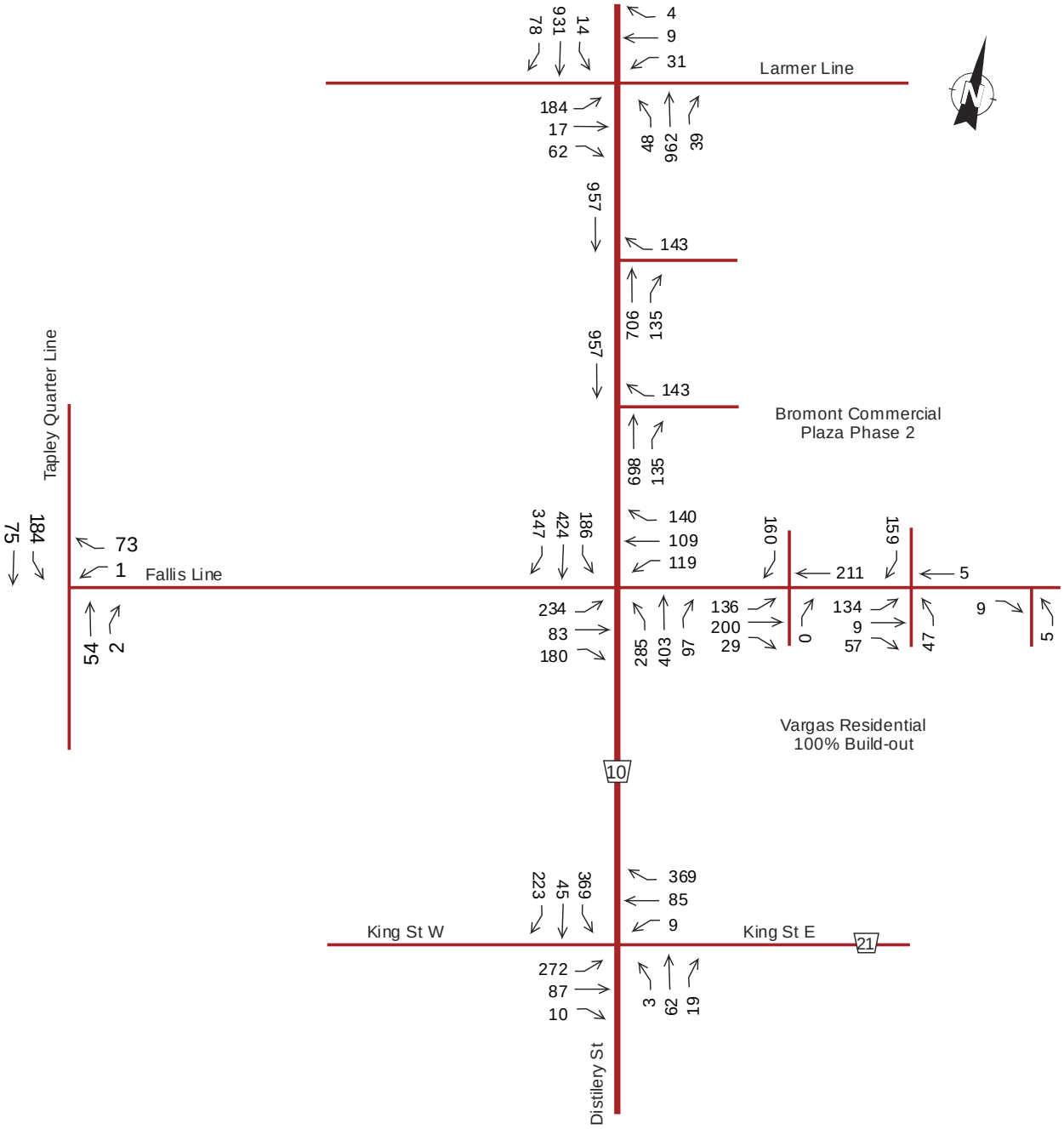

Exhibit 30: *Total PM Peak Hour Volumes, 2036.*

SAT Peak Hour - Total Volumes 2036

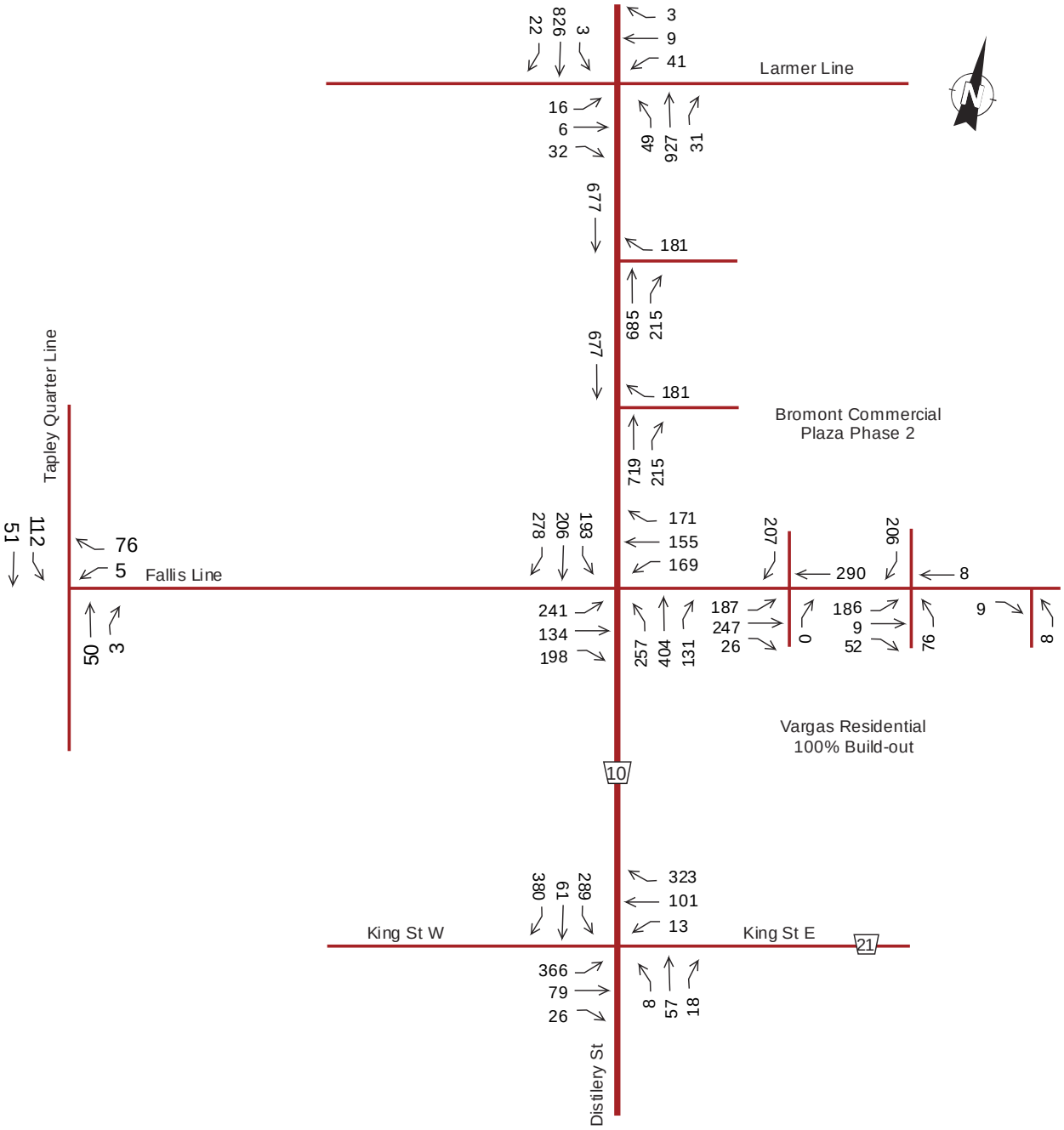

Exhibit 31: *Total SAT Peak Hour Volumes, 2036.*

5.4 Future Traffic Operations at Intersections

The traffic operations results including the new trips generated by the proposed development are shown on ***Tables 9 to 13*** for the horizon years.

Due to the addition of the subject developments to the preexisting developments, by 2026, the following are required for CR10 / Fallis Ln:

- Adjusted signal timing, for preliminary timing see *Appendix J*
- Dedicated eastbound left turn lane (100 m storage, 100 m taper)
- Shared eastbound thru & right lane
- Dedicated northbound left turn lane (150 m storage, 100 m taper)
- Dedicated northbound thru lane
- Dedicated northbound right turn lane (75 m storage, 70 m taper)
- Dedicated westbound left turn lane (40 m storage, 30 m taper)
- Shared westbound thru & right lane
- Dedicated southbound left turn lane (60 m storage, 60 m taper)
- Dedicated southbound thru lane
- Dedicated Southbound right turn lane (75 storage, 70 m taper)

These recommendations are the almost same as those already identified in previous traffic studies for 2026. The storage and taper lengths vary slightly, the previous NB-R taper now requires storage, and the signal timing is optimized compared to the previous recommended signal timing.

Alongside the subject developments, the implementation of these upgrades will result in the capacity factors shown in ***Table 9*** for the year 2026.

		Total Volumes 2026											
		AM Peak Hour				PM Peak Hour				SAT Peak Hour			
		V/C	Delay (s)	Q_{95} (m)	LOS	V/C	Delay (s)	Q_{95} (m)	LOS	V/C	Delay (s)	Q_{95} (m)	LOS
CR10 / Larmer Line	EB-LTR	0.14	16.8	3.8	C	0.20	22.9	5.4	C	0.13	20.3	3.3	C
	WB-LTR	0.19	24.7	5.3	C	0.17	34.5	4.5	D	0.27	40.3	7.9	E
	NB-LTR	0.02	0.6	0.5	A	0.02	0.6	0.5	A	0.04	1.1	1.0	A
	SB-LTR	0.01	0.2	0.1	A	0.01	0.3	0.3	A	0.00	0.1	0.0	A
CR10 / Fallis Line (upgraded)	EB-L	0.45	21.1	33.4	C	0.37	20.0	25.7	B	0.41	20.1	27.8	C
	EB-TR	0.57	18.1	36.9	B	0.47	19.4	30.6	B	0.54	23.1	40.7	C
	WB-L	0.24	18.3	16.7	B	0.24	18.3	18.3	B	0.29	18.4	21.6	B
	WB-TR	0.57	25.6	30.3	C	0.58	27.6	33.2	C	0.65	31.6	43.0	C
	NB-L	0.27	10.3	25.7	B	0.32	10.3	26.2	B	0.24	10.7	25.9	B
	NB-T	0.31	17.1	49.2	B	0.32	16.7	50.6	B	0.34	18.7	51.9	B
	NB-R	0.09	2.3	4.5	A	0.11	3.8	7.2	A	0.13	4.8	9.2	A
	SB-L	0.13	9.4	13.8	A	0.20	9.3	18.8	A	0.23	10.7	22.1	B
	SB-T	0.27	17.0	40.0	B	0.37	17.7	54.7	B	0.22	17.3	33.6	B
	SB-R	0.17	4.2	10.1	A	0.24	3.6	12.2	A	0.25	3.9	12.6	A
	Overall	0.57	15.9	-	B	0.58	15.3	-	B	0.65	17.0	-	B
Fallis Line / Tapley Q. Line	WB-LR	0.12	9.0	3.0	A	0.06	8.8	1.5	A	0.06	8.8	1.4	A
	NB-TR	0.03	0.0	0.0	A	0.03	0.0	0.0	A	0.03	0.0	0.0	A
	SB-LTR	0.03	5.2	0.8	A	0.09	5.3	2.2	A	0.05	4.8	1.2	A
CR10 / King St	EB-LTR	0.27	10.7	19.1	B	0.45	13.7	22.9	B	0.57	17.3	21.7	C
	WB-LTR	0.37	10.7	16.7	B	0.50	13.5	29.0	B	0.50	14.6	19.7	B
	NB-LTR	0.05	9.2	16.3	A	0.11	10.2	21.7	B	0.12	10.9	17.0	B
	SB-L	0.37	11.7	27.2	B	0.48	14.7	18.0	B	0.43	14.1	21.5	B
	SB-TR	0.28	9.1	23.1	A	0.29	9.8	17.1	A	0.55	14.8	32.7	B

Table 9: *Total Volumes Intersection Capacity, 2026.*

By 2026, with the updated signal timing at CR10 / Fallis Ln and the Millbrook development progress indicated in ***Exhibit 2***, and with the proposed residential development and commercial plaza in place, the levels of service for almost all movements are operating well. Delays have increased moderately as expected as compared to the background conditions.

By 2031, without the subject developments in place, traffic signals at CR10 / Larmer Ln are already justified. With the subject developments in place, for traffic operations to remain stable, the following are required for CR10 / Larmer Ln:

- Traffic Signals, for preliminary timing see *Appendix K*
- Dedicated eastbound left turn lane (50 m storage, 60 m taper)
- Shared eastbound thru & right lane
- Dedicated northbound left turn lane (60 m storage, 60 m taper)
- Dedicated northbound thru lane
- Dedicated northbound right turn lane (75 m storage, 70 m taper)
- Dedicated westbound left turn lane (25 m storage, 60 m taper)
- Shared westbound thru & right lane
- Dedicated southbound left turn lane (60 m storage, 60 m taper)
- Dedicated southbound thru lane
- Dedicated southbound right turn lane (75 m storage, 70 m taper)

By 2036, without the subject developments in place, traffic signals at CR10 / King St are justified. With the subject developments in place, signals are now justified by 2031. For traffic operations to remain stable, the following are required for CR10 / King St:

- Traffic Signals, for preliminary timing see *Appendix K*
- Dedicated eastbound left turn lane (75 m storage, 60 m taper)
- Shared eastbound thru & right lane
- Shared northbound left, thru & right lane
- Shared westbound left & thru lane
- Dedicated westbound right turn lane (35 m storage, 60 m taper)
- Dedicated southbound left turn lane (65 m storage, 60 m taper)
- Shared southbound thru & right lane

Alongside the subject developments, the implementation of these upgrades will result in the capacity factors shown in ***Table 10*** for the year 2031, and ***Table 11*** for the year 2036. The levels of service will remain stable throughout all study years.

		Total Volumes 2031											
		AM Peak Hour				PM Peak Hour				SAT Peak Hour			
		V/C	Delay (s)	Q_{95} (m)	LOS	V/C	Delay (s)	Q_{95} (m)	LOS	V/C	Delay (s)	Q_{95} (m)	LOS
CR10 / Larmer Line (upgraded)	EB-L	0.12	24.2	11.2	C	0.32	27.4	25.6	C	0.04	22.8	5.2	C
	EB-TR	0.20	14.4	10.5	B	0.28	14.6	13.6	B	0.16	16.4	9.6	B
	WB-L	0.16	24.7	13.0	C	0.13	29.3	9.6	C	0.16	24.4	12.6	C
	WB-TR	0.09	20.8	8.5	C	0.05	27.4	5.8	C	0.03	26.1	5.7	C
	NB-L	0.19	5.4	10.4	A	0.16	5.4	5.9	A	0.13	5.3	6.0	A
	NB-T	0.65	14.2	216.8	B	0.68	14.4	215.6	B	0.68	15.1	233.0	B
	NB-R	0.04	0.6	1.3	A	0.03	0.1	0.0	A	0.03	0.0	0.0	A
	SB-L	0.02	5.2	1.6	A	0.04	4.8	2.4	A	0.01	5.0	0.7	A
	SB-T	0.52	13.9	109.4	B	0.75	19.9	223.1	B	0.65	17.2	194.6	B
	SB-R	0.11	2.6	7.6	A	0.05	0.7	1.5	A	0.02	0.0	0.0	A
	Overall	0.65	13.1	-	B	0.75	16.8	-	B	0.68	15.7	-	B
CR10 / Fallis Line (upgraded)	EB-L	0.80	33.1	72.1	C	0.58	22.7	40.9	C	0.68	26.4	46.5	C
	EB-TR	0.73	27.2	73.7	C	0.54	21.2	48.3	C	0.76	36.4	87.5	D
	WB-L	0.37	19.2	21.4	B	0.31	17.8	23.1	B	0.52	21.4	31.8	C
	WB-TR	0.74	34.0	49.9	C	0.75	38.3	57.7	D	0.87	50.7	96.6	D
	NB-L	0.47	16.4	42.2	B	0.67	23.8	56.2	C	0.48	17.4	45.1	B
	NB-T	0.60	26.3	92.6	C	0.55	24.8	84.7	C	0.59	27.2	88.7	C
	NB-R	0.15	5.1	9.9	A	0.15	5.0	10.1	A	0.21	4.6	11.5	A
	SB-L	0.38	14.9	25.0	B	0.47	16.3	33.2	B	0.54	19.3	34.4	B
	SB-T	0.35	21.6	51.6	C	0.52	24.3	80.8	C	0.29	21.7	41.9	C
	SB-R	0.25	4.4	12.8	A	0.41	4.2	16.9	A	0.38	4.2	16.0	A
	Overall	0.80	23.3	-	C	0.75	21.0	-	C	0.87	25.3	-	C
Fallis Line / Tapley Q. Line	WB-LR	0.16	9.3	4.4	A	0.08	8.9	1.9	A	0.09	9.0	2.2	A
	NB-TR	0.03	0.0	0.0	A	0.03	0.0	0.0	A	0.03	0.0	0.0	A
	SB-LTR	0.05	5.6	1.1	A	0.12	5.8	3.2	A	0.08	5.5	1.9	A
CR10 / King St (upgraded)	EB-L	0.45	20.6	39.3	C	0.55	22.6	48.6	C	0.75	30.2	69.6	C
	EB-TR	0.07	16.6	10.3	B	0.15	16.2	18.0	B	0.16	14.1	17.4	B
	WB-LT	0.21	31.0	16.8	C	0.34	33.2	25.1	C	0.41	35.0	29.4	C
	WB-R	0.68	10.2	21.8	B	0.67	10.1	21.6	B	0.64	9.8	20.6	A
	NB-LTR	0.09	21.3	15.4	C	0.15	19.4	19.8	B	0.15	19.4	20.4	B
	SB-L	0.41	11.8	45.5	B	0.45	12.5	52.5	B	0.38	11.7	42.1	B
	SB-TR	0.29	5.0	21.8	A	0.26	3.4	15.1	A	0.44	3.6	20.0	A
	Overall	0.68	12.7	-	B	0.67	14.1	-	B	0.75	15.2	-	B

Table 10: *Total Volumes Intersection Capacity, 2031.*

		Total Volumes 2036											
		AM Peak Hour				PM Peak Hour				SAT Peak Hour			
		V/C	Delay (s)	Q_{95} (m)	LOS	V/C	Delay (s)	Q_{95} (m)	LOS	V/C	Delay (s)	Q_{95} (m)	LOS
CR10 / Larmer Line (upgraded)	EB-L	0.20	25.1	16.1	C	0.51	30.8	44.7	C	0.06	23.1	6.7	C
	EB-TR	0.21	14.8	11.2	B	0.31	16.1	15.2	D	0.16	16.3	9.8	B
	WB-L	0.17	24.8	14.6	C	0.15	30.4	10.5	C	0.16	24.5	13.0	C
	WB-TR	0.13	22.7	10.3	C	0.06	28.5	6.6	C	0.04	25.4	6.4	C
	NB-L	0.23	5.8	10.4	A	0.20	6.8	6.1	A	0.14	5.5	6.1	A
	NB-T	0.69	15.3	235.3	B	0.86	23.1	259.5	C	0.71	15.9	245.1	B
	NB-R	0.04	0.7	1.5	A	0.04	0.3	6.0	A	0.03	0.0	0.0	A
	SB-L	0.02	5.2	1.6	A	0.06	5.5	2.5	A	0.01	5.0	1.0	A
	SB-T	0.64	17.0	159.9	B	0.90	31.0	249.0	C	0.67	18.3	207.7	B
	SB-R	0.21	2.2	10.2	A	0.09	2.5	5.8	A	0.02	0.0	0.0	A
	Overall	0.69	14.3	-	B	0.90	25.2	-	C	0.71	16.5	-	B
CR10 / Fallis Line (upgraded)	EB-L	0.88	41.2	92.4	D	0.61	23.3	43.5	C	0.68	26.7	47.6	C
	EB-TR	0.72	26.9	76.1	C	0.55	21.0	49.5	C	0.77	36.5	88.7	D
	WB-L	0.37	19.2	21.4	B	0.32	17.8	23.1	B	0.52	21.4	31.8	C
	WB-TR	0.74	34.3	49.9	C	0.76	38.6	57.7	D	0.87	50.9	96.6	D
	NB-L	0.52	17.9	43.6	B	0.83	37.9	74.1	D	0.50	18.1	45.8	B
	NB-T	0.73	31.0	124.8	C	0.61	26.6	95.6	C	0.64	28.5	95.9	C
	NB-R	0.15	5.1	9.9	A	0.16	5.1	10.1	A	0.21	4.7	11.5	A
	SB-L	0.47	17.3	25.0	B	0.52	17.9	33.2	B	0.57	20.7	34.4	C
	SB-T	0.40	22.6	58.8	C	0.64	27.5	101.9	C	0.32	22.2	46.6	C
	SB-R	0.26	4.3	13.0	A	0.45	4.3	17.6	A	0.39	4.3	16.1	A
	Overall	0.88	25.9	-	C	0.83	23.5	-	C	0.87	25.7	-	C
Fallis Line / Tapley Q. Line	WB-LR	0.17	9.4	4.7	A	0.08	9.0	2.0	A	0.09	9.1	2.3	A
	NB-TR	0.03	0.0	0.0	A	0.04	0.0	0.0	A	0.03	0.0	0.0	A
	SB-LTR	0.05	5.5	1.1	A	0.13	5.8	3.4	A	0.08	5.4	2.0	A
CR10 / King St (upgraded)	EB-L	0.50	21.4	44.2	C	0.58	23.3	51.8	C	0.78	32.4	75.7	C
	EB-TR	0.07	16.6	11.1	B	0.16	16.4	19.5	B	0.17	14.4	19.2	B
	WB-LT	0.23	31.1	18.1	C	0.37	33.6	27.0	C	0.45	35.7	32.1	D
	WB-R	0.71	10.4	23.0	B	0.69	10.1	22.3	B	0.65	9.8	20.9	A
	NB-LTR	0.10	21.9	17.3	C	0.17	20.6	21.6	C	0.16	19.5	21.3	B
	SB-L	0.43	12.4	49.6	B	0.51	13.6	61.1	B	0.40	12.1	44.7	B
	SB-TR	0.31	5.5	24.8	A	0.30	3.5	16.6	A	0.45	3.7	20.8	A
	Overall	0.71	13.3	-	B	0.69	14.5	-	B	0.78	15.9	-	B

Table 11: *Total Volumes Intersection Capacity, 2036.*

5.5 Future Traffic Operations at Entrances

The “West” Residential / Commercial Entrance on Fallis Ln is planned as a two way stop control, having a dedicated EB-L lane (25 m storage, 30 m taper), added during Phase 1.

The “Middle” Residential / Commercial Entrance on Fallis Ln is planned as a two way stop control with no auxiliary lanes, added during Phase 2.

A summary of the traffic operations results for 2036, the worst-case scenario for this study, is shown in ***Table 12***. The entrances to the development are expected to have acceptable operations throughout the study years.

		Total Volumes 2036 - Entrances											
		AM Peak Hour				PM Peak Hour				SAT Peak Hour			
		V/C	Delay (s)	Q_{95} (m)	LOS	V/C	Delay (s)	Q_{95} (m)	LOS	V/C	Delay (s)	Q_{95} (m)	LOS
"West" Residential / Commercial Entrance on Fallis Ln	EB-L	0.12	8.1	3.2	A	0.11	8.0	2.8	A	0.16	8.5	4.4	A
	EB-TR	0.12	0.0	0.0	A	0.15	0.0	0.0	A	0.17	0.0	0.0	A
	WB-TR	0.00	0.0	0.0	A	0.00	0.0	0.0	A	0.00	0.0	0.0	A
	NB-R	0.00	0.0	0.0	A	0.00	0.0	0.0	A	0.00	0.0	0.0	A
	SB-LR	0.17	10.4	4.6	B	0.21	10.7	6.2	B	0.31	12.2	10.0	B
"Middle" Residential / Commercial Entrance on Fallis Ln	EB	0.10	6.6	2.5	A	0.90	5.2	2.3	A	0.13	5.9	3.3	A
	WB	0.00	0.0	0.0	A	0.00	0.0	0.0	A	0.00	0.0	0.0	A
	NB	0.24	16.9	7.0	C	0.14	16.3	3.6	C	0.32	24.9	9.9	C
	SB	0.13	8.8	3.3	A	0.16	9.0	4.3	A	0.21	9.2	6.0	A

Table 12: *Total Volumes Entrances Capacity, 2036.*

6 Conclusions/Recommendations

The subject site is located on the southeast quadrant of CR10 / Fallis Ln, proposed for a residential development to include single family detached housing, residential townhouses, and mixed-use townhouses. For purposes of this study, the proposed commercial plaza to be located on the northeast quadrant of CR10 / Fallis Ln will be included in the analysis.

It is expected that by 2026, the residential development will be 50% completed and the commercial plaza Phase 1 will be completed. It is expected that by 2031, the residential development will be 100% completed and the commercial plaza Phase 2 will be completed.

The following recommended upgrades have been identified as part of previous traffic studies to be implemented from 2026 onwards:

CR10 / Larmer Ln:

- Dedicated northbound left turn lane (25 m storage, 25 m taper)
- Dedicated southbound left turn lane (25 m storage, 25 m taper)

CR10 / Fallis Ln:

- Traffic Signals, for preliminary timing see *Appendices E, F or G*
- Dedicated eastbound left turn lane (90 m storage, 90 m taper)
- Shared eastbound thru & right lane
- Dedicated northbound left turn lane (150 m storage, 100 m taper)
- Dedicated northbound thru lane
- Dedicated northbound right turn taper (60 m taper)
- Dedicated westbound left turn lane (60 m storage, 60 m taper)
- Shared westbound thru & right lane
- Dedicated southbound left turn lane (60 m storage, 60 m taper)

- Dedicated southbound thru lane
- Dedicated southbound right turn lane (75 storage, 70 m taper)

CR10 / King St:

- Dedicated southbound left turn lane extended (14 m storage, 22 m taper extended to 45 m storage, 60 m taper)

With the normal growth over time and the additional traffic generated by the nearby developments, the intersections become more saturated with some movements reaching their capacity. Without the subject residential and commercial developments in place, CR10 / Larmer Ln will require signals and further geometric upgrades by 2031. CR10 / Fallis Ln will require a signal timing adjustment by 2031. Also, CR10 / King St will require traffic signals and geometric upgrades by 2036.

With the normal growth over time and the additional traffic generated by the nearby developments, as well as the subject residential and commercial developments in place, delays increase as expected. CR10 / Fallis Ln will require a signal timing adjustment and minor geometric upgrades by 2026. Also, both CR10 / Larmer Ln & CR10 / King St will require traffic signals and geometric upgrades by 2031.

With these upgrades, the traffic operations will remain stable with LOS “C” or better for most movements throughout all study years. In particular, the newly recommended upgrades are as follows:

By 2026, the following are required for CR10 / Fallis Ln:

- Traffic Signals, for preliminary timing see *Appendix J*
- Dedicated eastbound left turn lane (100 m storage, 100 m taper)
- Shared eastbound thru & right lane
- Dedicated northbound left turn lane (150 m storage, 100 m taper)
- Dedicated northbound thru lane
- Dedicated northbound right turn lane (75 m storage, 70 m taper)
- Dedicated westbound left turn lane (40 m storage, 30 m taper)
- Shared westbound thru & right lane
- Dedicated southbound left turn lane (60 m storage, 60 m taper)
- Dedicated southbound thru lane

- Dedicated Southbound right turn lane (75 storage, 70 m taper)

By 2031, the following are required for CR10 / Larmer Ln:

- Traffic Signals, for preliminary timing see *Appendix K*
- Dedicated eastbound left turn lane (50 m storage, 60 m taper)
- Shared eastbound thru & right lane
- Dedicated northbound left turn lane (60 m storage, 60 m taper)
- Dedicated northbound thru lane
- Dedicated northbound right turn lane (75 m storage, 70 m taper)
- Dedicated westbound left turn lane (25 m storage, 60 m taper)
- Shared westbound thru & right lane
- Dedicated southbound left turn lane (60 m storage, 60 m taper)
- Dedicated southbound thru lane
- Dedicated Southbound right turn lane (75 m storage, 70 m taper)

By 2031, the following are required for CR10 / King St:

- Traffic Signals, for preliminary timing see *Appendix K*
- Dedicated eastbound left turn lane (75 m storage, 60 m taper)
- Shared eastbound thru & right lane
- Shared northbound left, thru & right lane (existing)
- Shared westbound left & thru lane
- Dedicated westbound right turn lane (35 m storage, 60 m taper)
- Dedicated southbound left turn lane (65 m storage, 60 m taper)
- Shared southbound thru & right lane

Required for “West” Residential / Commercial Entrance on Fallis Ln:

- Two-way stop control
- Dedicated eastbound left turn lane (25 m storage, 30 m taper)
- Shared eastbound thru & right lane
- Northbound right with right-in-right-out island
- Shared westbound thru & right lane (no left turns)
- Shared southbound left turn & turn lane (no thru)

Required for “West” Residential / Commercial Entrance on Fallis Ln:

- Two-way stop control

- Shared eastbound left, thru & right lane
- Shared northbound left, thru & right lane
- Shared westbound left, thru & right lane
- Shared southbound left, thru & right lane

From the traffic point of view, it is concluded that the proposed developments can take place with the inclusion of the appropriate intersection upgrades.

For final geometry configuration at intersections and proposed entrances, please see *Appendix N*.