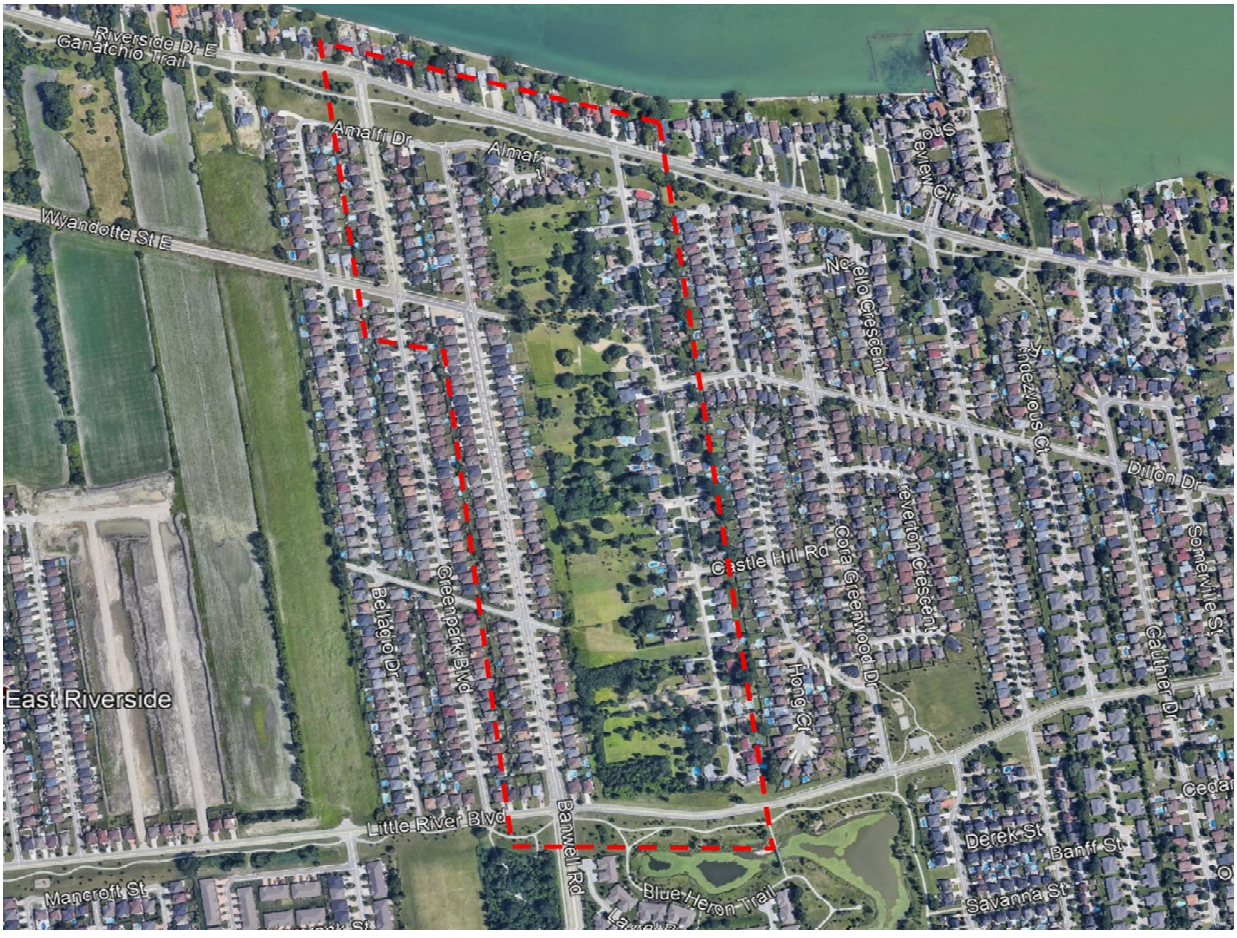
CITY OF WINDSOR

TRAFFIC IMPACTS OF POTENTIAL ROAD NETWORK CHANGES

EAST RIVERSIDE PLANNING AREA

OCTOBER 10, 2019



wsp

TRAFFIC IMPACTS OF POTENTIAL ROAD NETWORK CHANGES

EAST RIVERSIDE PLANNING AREA

CITY OF WINDSOR

TECHNICAL MEMORANDUM

PROJECT NO.: 191-03509-00
DATE: OCTOBER 10, 2019

WSP
100 COMMERCE VALLEY DRIVE WEST
THORNHILL, ON
CANADA L3T 0A1

T: +1 905 882-1100
F: +1 905 882-0055
WSP.COM

October 10, 2019

CITY OF WINDSOR
1266 McDougall Street
Windsor, ON N8X 3M7

Attention: Andrew Dowie, P.Eng., FEC

Dear Mr. Dowie:

Subject: Traffic Impacts of Potential Road Network Changes - East Riverside Planning Area

WSP is pleased to submit this Technical Memorandum that reviews the traffic impacts of the various potential changes to the road network in the East Riverside Planning Area, proposed by the City of Windsor.

The findings of the study indicate:

- The Wyandotte Street extension would improve traffic operations and network connectivity. The extension would provide vehicles with an alternative east-west route and therefore, a reduction of traffic would be expected at Riverside Drive, Little River Boulevard, and Banwell Road.
- The Beverly Glen Street extension, the closure of Jarvis Avenue at Riverside Drive, and the extension of Jarvis Avenue to Little River Boulevard would have a minimal traffic impact on the overall road network.
- Operational deficiencies at Banwell Road and Little River Boulevard would be expected within the 10-year and 20-year horizons. A signalized intersection or a roundabout can be considered to improve the intersection operations in the future.

The attached memorandum provides the details of the analyses that were completed. If you have any questions, please do not hesitate to contact the undersigned.

Yours sincerely,

Craig Kelly, P.Eng, PTOE
Senior Project Manager

BC/TY/CK

WSP ref.: 191-03509-00

100 COMMERCE VALLEY DRIVE WEST
THORNHILL, ON
CANADA L3T 0A1

T: +1 905 882-1100
F: +1 905 882-0055
wsp.com

SIGNATURES

PREPARED BY

Brittany Chung, EIT, MASc
Designer

Thomas You, P.Eng., MASc
Project Manager

REVIEWED BY

Craig Kelly, P.Eng, PTOE
Senior Project Manager

TABLE OF CONTENTS

TABLES

FIGURES

APPENDICES

1 INTRODUCTION

WSP was retained by the City of Windsor to undertake a study to determine the traffic impacts of several potential changes to the road network in the East Riverside Planning Area of the City of Windsor. The potential road network changes include:

- Extension of Wyandotte Street East from Banwell Road to Jarvis Avenue;
- Closure of Jarvis Avenue south of Riverside East;
- Extension of Beverly Glen Street from Banwell Road to Jarvis Avenue; and
- Extension of Jarvis Avenue to Little River Boulevard.

The study area, as shown in **Figure 1-1**, is bounded by Riverside Drive East to the north, Little River Boulevard to the south, Greenpark Boulevard and Banwell Road to the west, and Jarvis Avenue to the east.

This technical memorandum details a review of the existing traffic conditions, the forecasted traffic conditions for 10-year and 20-year horizons, traffic assessments of the various network scenarios, and a summary of the results and recommendations.

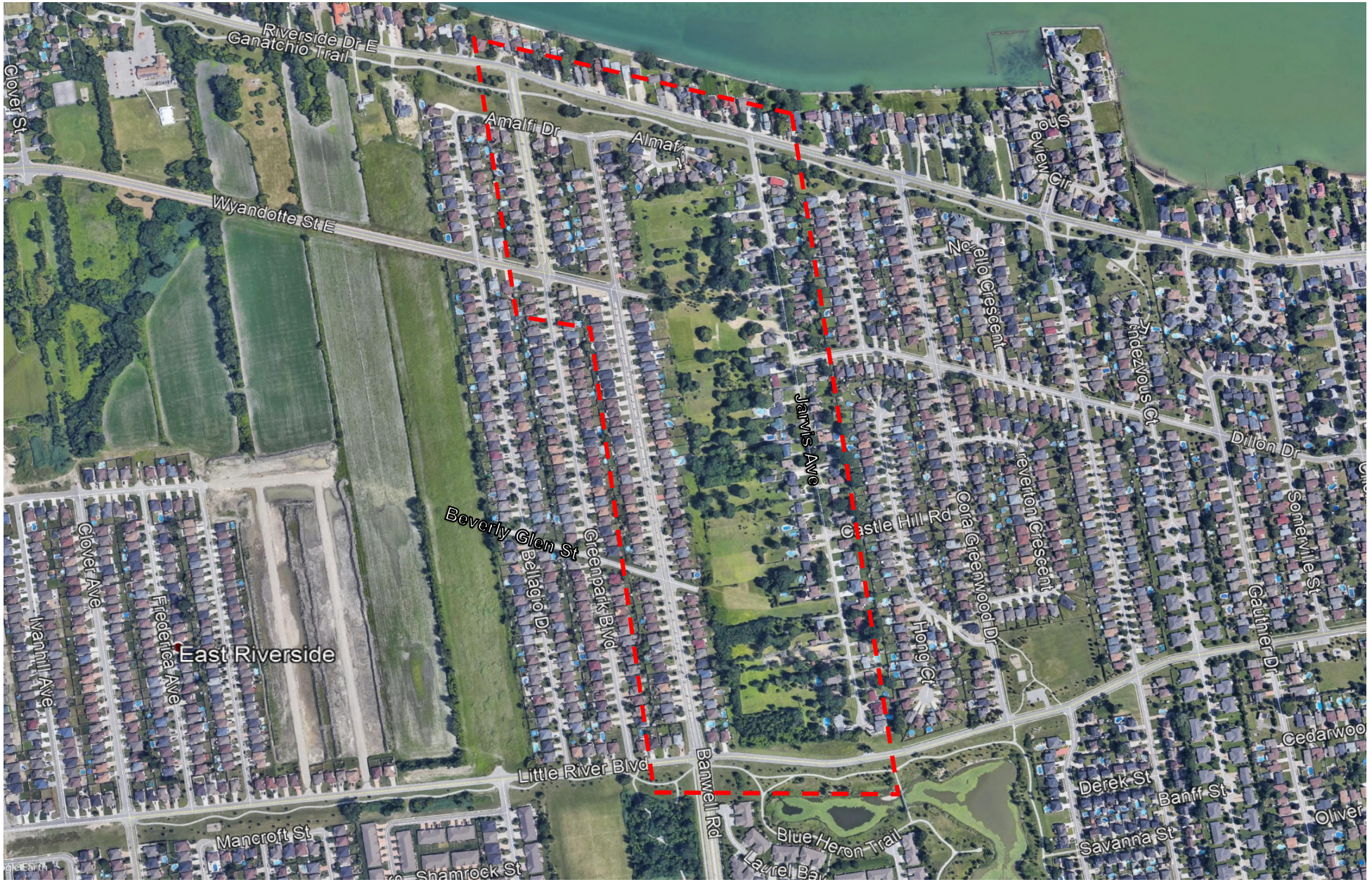


Image source: Google Earth

wsp

Legend

Study area boundary

Figure 1-1

Study Area

2 EXISTING CONDITIONS

The residential community within the study area is serviced by a network of arterial, collector, and local roads. **Table 2-1** details the road classification and capacity of the study roadways, as per the City of Windsor's Official Plan (2013) and the Windsor Area Long Range Transportation Plan Study (WALT – 1998).

Table 2-1 Road Classification and Traffic Capacity of Study Roadways

Roadway	Road Classification	City of Windsor Planning Capacity (Vehicles Per Hour Per Lane)
Wyandotte Street	Class II Arterial	800
Banwell Road		
Riverside Drive [(1)]		
Little River Road	Class I Collector	650
Greenpark Boulevard	Local	350
Jarvis Avenue		
Dillon Drive		
Castle Hill Road		
Beverly Glen St		

Note: (1) The Official Plan classified Riverside Drive as a scenic drive; however, a capacity for this classification was not provided in WALT. It is assumed that Riverside Drive has the capacity of a class II arterial given that its roadway cross-section is similar to Wyandotte Street.

As shown in **Figure 2-1**, all study intersections are currently stop-controlled. Furthermore, all study roadways are currently two-lane roads (one lane per direction), except for the south leg at Banwell Road / Little River Boulevard which has an additional exclusive northbound right-turn lane.

Turning movement counts (TMCs) for the following intersections were provided by the City of Windsor:

- Wyandotte Street East and Banwell Road;
- Wyandotte Street East and Greenpark Boulevard;
- Jarvis Avenue and Riverside Drive East;
- Jarvis Avenue and Dillon Drive;
- Riverside Drive and Greenpark Boulevard;
- Beverley Glen Street and Banwell Road;
- Jarvis Avenue and Castle Hill Road; and
- Little River Boulevard and Banwell Road.

The TMCs were collected between April 1st to April 4th, 2019. Existing AM and PM peak hour traffic volumes along the study roadways are illustrated in **Figure 2-2**. It should be note that traffic volumes for some movements have been adjusted due to discrepancies in the data collection periods between adjacent intersections.

The existing traffic counts have the following characteristics:

- Overall, the peak hour volumes within the study area are relatively low, noting that the study area is a low-density residential community.
- As expected, traffic volumes are highest along the arterial roads.
- The termination of Wyandotte Street at Banwell Road results in high eastbound right-turning traffic volumes in the a.m. peak and high northbound left-turning traffic volumes in the p.m. peak.

- Relatively high westbound right-turning traffic volumes are observed at Little River Boulevard and Banwell Road, indicating that a significant number of vehicles originating from the east of Jarvis Avenue travel to the west via Little River Boulevard, up Banwell Road and onto Wyandotte Street. Different from Wyandotte Street and Riverside Drive, Little River Boulevard terminates at Florence Avenue, and it does not provide a direct east-west connection to the city centre.

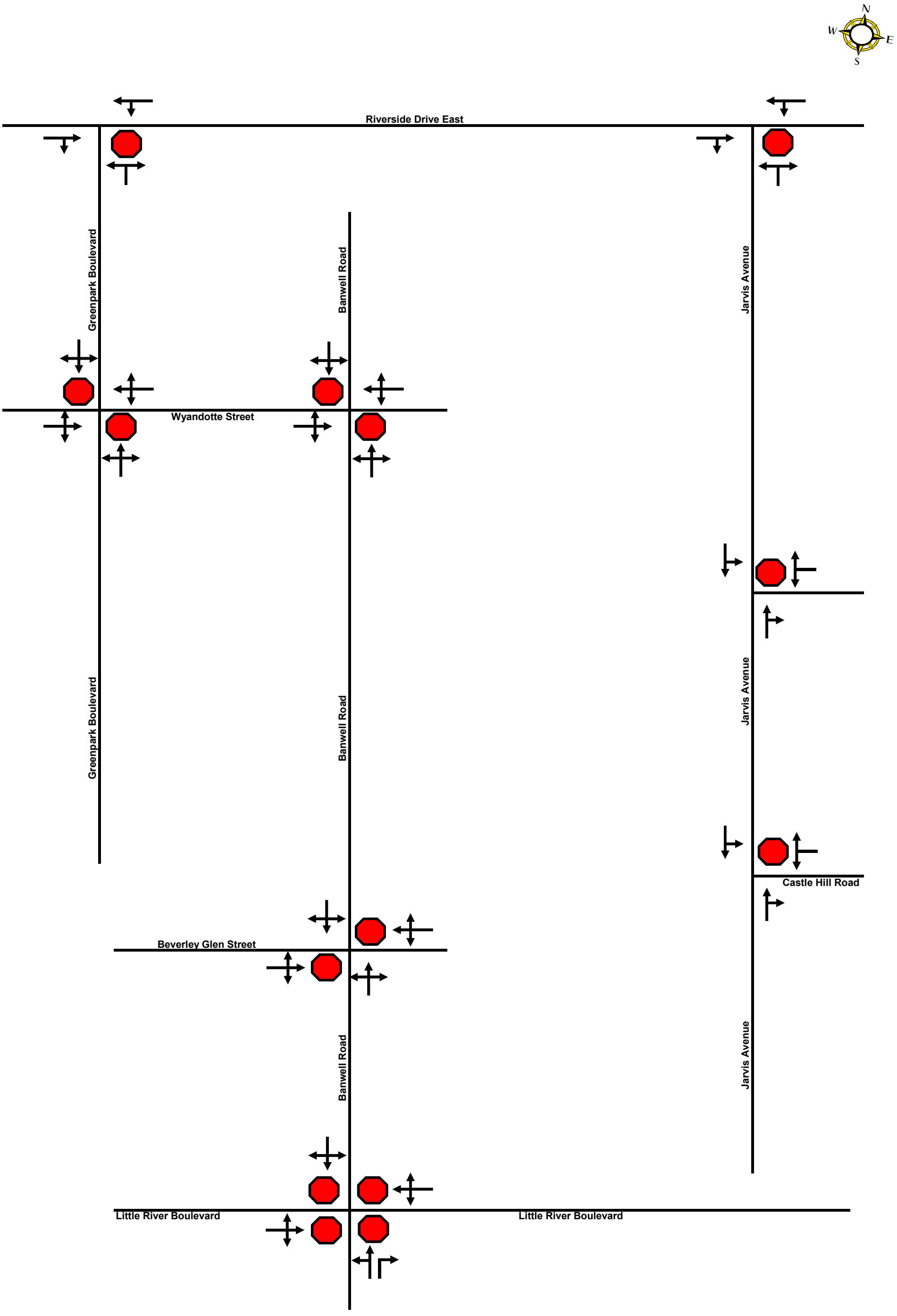
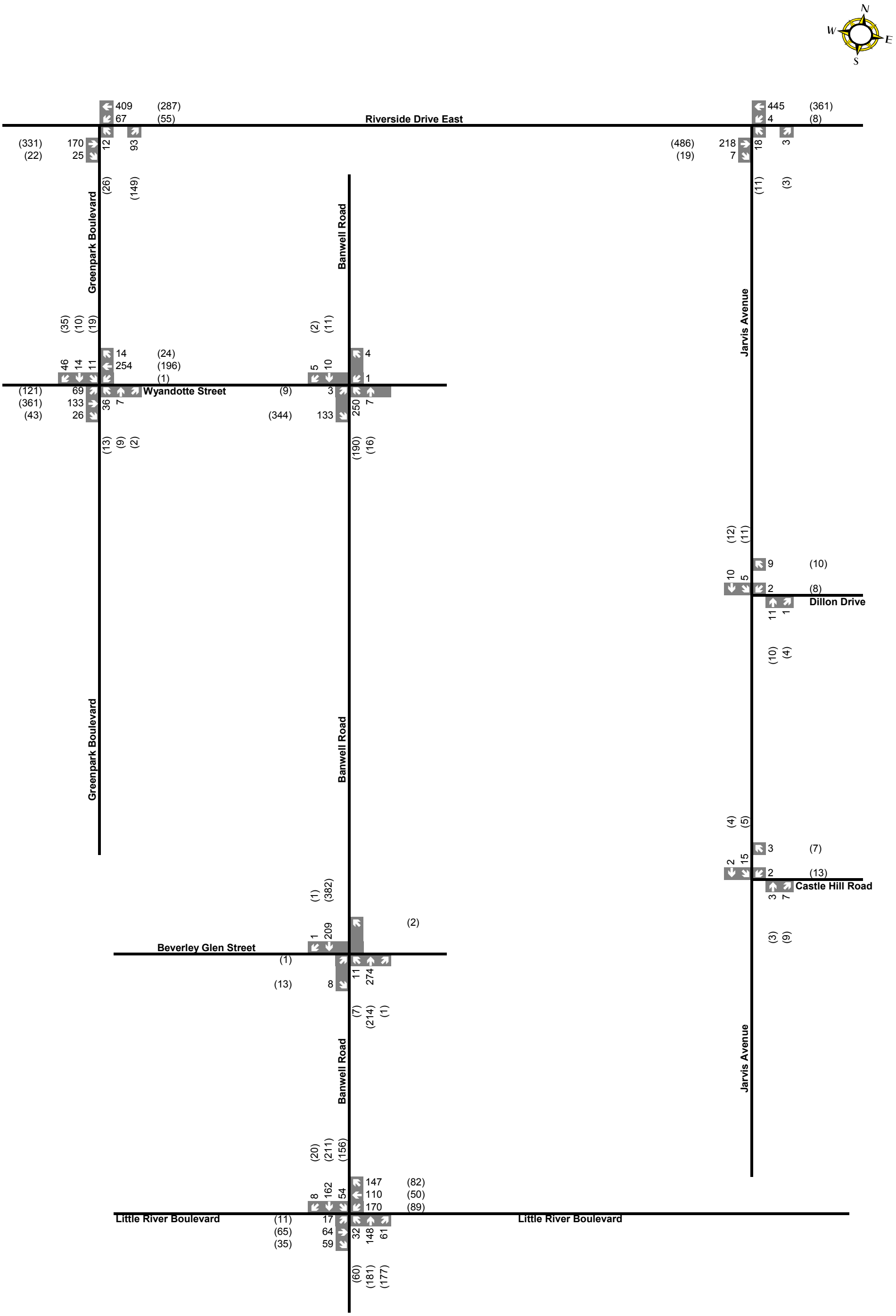


Figure 2-1

Existing Lane Configurations



Legend

xx A.M. Peak Hour Traffic Volumes

(xx) P.M. Peak Hour Traffic Volumes

Figure 2-2

Existing Traffic Volumes (Balanced)

3 FUTURE TRAFFIC FORECASTING METHODOLOGY

3.1 FUTURE NETWORK SCENARIOS

To assess the traffic impacts of the potential road network changes, the following future network scenarios for 10 and 20-year horizons were evaluated:

- **SCENARIO 1**: Base scenario, do-nothing;
- **SCENARIO 2a**: Extension of Wyandotte Street East as an offset intersection at Jarvis Avenue;
- **SCENARIO 2b**: Extension of Wyandotte Street East as a continuous alignment connecting to Dillon Drive;
- **SCENARIO 3**: Extension of Wyandotte Street East with an offset intersection at Jarvis Avenue, extension of Beverly Glen Street to Jarvis Avenue, and closure of Jarvis Avenue at Riverside Drive East;
- **SCENARIO 4**: Extension of Wyandotte Street East with an offset intersection at Jarvis Avenue, and extension of Beverly Glen Street to Jarvis Avenue; and
- **SCENARIO 5**: Extension of Wyandotte Street East with an offset intersection at Jarvis Avenue, extension of Beverly Glen Street to Jarvis Avenue, and extension of Jarvis Avenue to Little River Boulevard.

The future network configurations of the scenarios are also illustrated in **Figure 3-1**.

3.2 FUTURE TRAFFIC FORECASTS AND REDISTRIBUTION

3.2.1 INTERSECTION AND LINK VOLUMES

Scenario 1 serves as the base future scenario which assumes no change to the current road network. To determine the future traffic volumes for Scenario 1, a compound annual growth of 1% was applied for all movements. City staff provided a projected annual growth rate of 0.65% which is based on the City's multi-year traffic count data. However, for conservative measures the growth rate was rounded up to a nominal rate of 1%.

City staff confirmed there are no imminent developments proposed that would add to the existing traffic volume within the study area. However, it is noted that there is potential future development to the west of the site. It is likely most of the traffic generated by the growth to the west will be going to/from points further west towards the City's centre. Also considering that the traffic volumes within the study area are quite low otherwise, even with the 1% growth rate, the additional growth from the west development should not change levels of service significantly.

The future total traffic volumes were estimated by adding the background traffic growth to existing traffic volumes.

For each future network scenario, various assumptions were made to redistribute the future total traffic volumes estimated in the base network. For example, when new east-west connections were added to the network, such as the extension of Wyandotte Street East and Beverly Glen Street, a portion of the traffic on the existing east-west roadways such as Riverside Drive East and Little River Boulevard was rerouted to the new roadways. A similar methodology was applied when redistributing traffic for scenarios when a north-south connection was added or removed from the network, such as the closure of Jarvis Avenue at Riverside Drive East and the extension of Jarvis Avenue to Little River Boulevard. Note, a relatively aggressive approach was taken when forecasting the percentage of traffic that will redistribute in the network. This was done to ensure the analysis captured the possible impacts from these proposed road improvements.

The percentage of traffic redistributed within the network are consistent between the 10-year and 20-year horizons. The future forecasted total volumes at the roadway links and intersections for each scenario are provided in **Appendix A**.

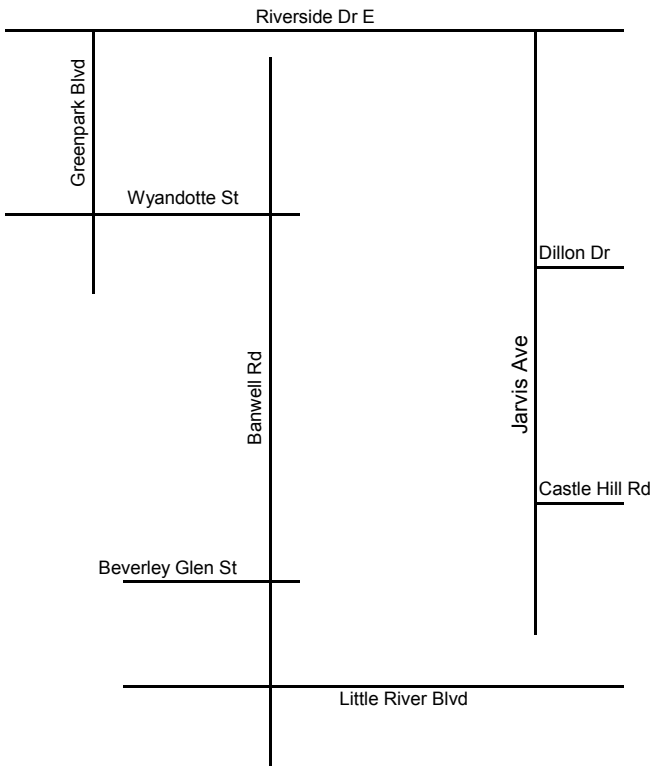
It is possible that some form of traffic calming may develop east of the City boundary on Dillon Drive if Wyandotte is extended. However, it is anticipated that this would only reduce the amount of traffic that would use the extended Wyandotte Street East and consequently reduce any impacts of the network changes

3.2.2 ROADWAY SERVICE DAILY VOLUMES

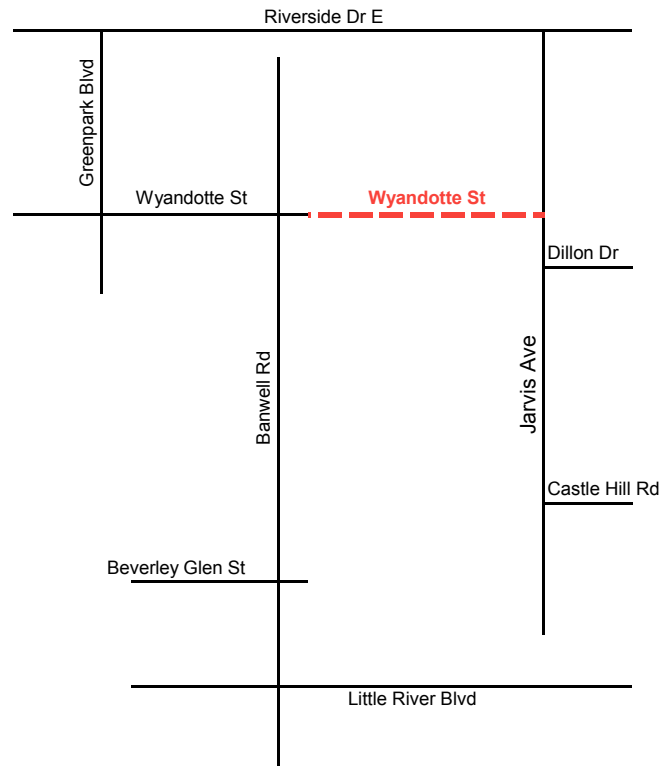
To investigate the general travel pattern in the study area, the Annual Average Daily Traffic (AADT) volume was assessed. The AADT volume for each future scenario was estimated from the forecasted peak hour volumes for both 10-year and 20-year horizons. The AADT volumes were estimated by taking the sum of the a.m. and p.m. peak hour traffic and multiplying it by a factor of five. Typically, local data is required to determine the multiplicative factor between the peak hour volumes and AADT volumes. Due to data limitations at the time of the study, an average factor of five was applied to estimate the future AADT. The forecasted future AADT volumes on roadway links are provided in **Appendix D**.

Furthermore, in consultation with City staff, traffic generally peaks in the month of September at 113% of the average and is at it's lowest in August at 89% of the average. The remainder of the months in the year are in line with the average, except for June which is approximately 93% of the average. Based on this limited information, the Summer Average Daily Traffic (SADT) volumes can be expected to be no more than 10% less than the AADT.

SCENARIO 1
Base (Do nothing)



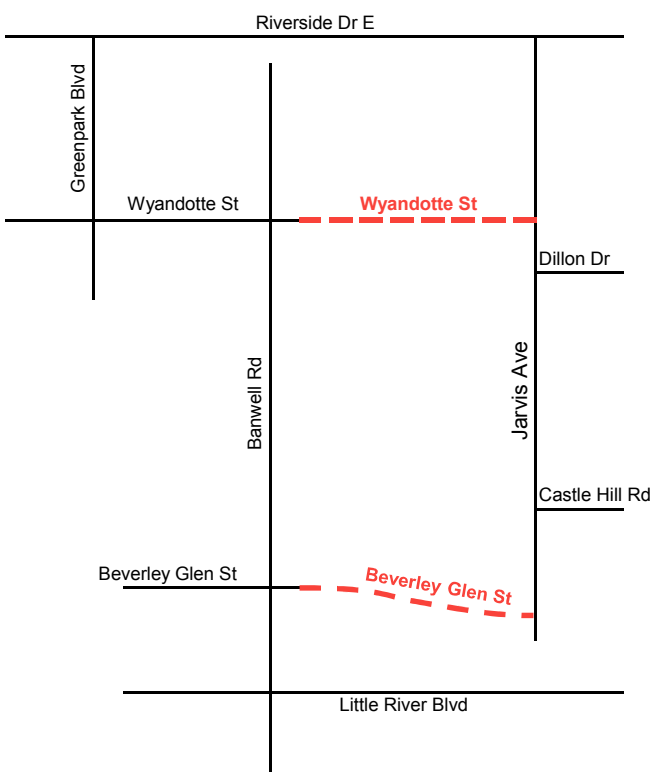
SCENARIO 2a
Extension of Wyandotte Street, offset at Jarvis Avenue



SCENARIO 2b
Extension of Wyandotte Street, continuous alignment of Wyandotte Street

SCENARIO 3
Extension of Wyandotte Street East and closure of Jarvis Avenue at Riverside Drive East, and Beverly Glen Extension

SCENARIO 4
Extension of Wyandotte Street East and Beverly Glen Street



SCENARIO 5
Extension of Wyandotte Street East and Beverly Glen Street, and extension of Jarvis Avenue to Little River Boulevard

wsp

Legend

Existing Road Network

Proposed Network Changes

Figure 3-1

Network Scenarios

4 TRAFFIC ASSESSMENT RESULTS

4.1 LINK LEVEL CAPACITY ANALYSIS

A comparison between the forecasted volumes resulting from the network improvements/changes in Scenarios 2a to 5 and the base case scenario was conducted. The volume changes are provided in **Appendix B**.

To measure the traffic impacts of the various future scenarios, link volume-to-capacity (v/c) ratios were calculated for each scenario, and are provided in **Appendix C**.

The results of the volume redistribution and v/c analyses for each scenario are summarized below:

SCENARIO 1

Volumes were directly grown from the existing turning movement counts. Traffic was not redistributed as the network is the same as existing. All roadway links operate at a v/c ratio less than 0.85.

SCENARIO 2A

The Wyandotte Street East extension is forecasted to significantly reduce traffic along Riverside Drive East, Little River Boulevard, Banwell Road and Greenpark Boulevard. The extension would provide vehicles an alternative east-west route to Riverside Drive East and Little River Boulevard, and therefore, a reduction of traffic would be expected on these major east-west roadways. Since Banwell Road and Greenpark Boulevard are the north-south roads that connect Riverside Drive East and Little River Boulevard, a decrease in traffic would be expected on these roads as well.

The traffic would be expected to be directed along Wyandotte Street East and Dillon Drive. Although a significant increase of traffic would be observed along the small section of Jarvis Avenue between Wyandotte Street East and Dillon Drive, Jarvis Avenue would operate within the capacity of its local roadway classification.

Similarly, Dillon Drive would continue to operate within its collector roadway classification despite the increase in traffic.

All roadway links operate at a v/c ratio less than 0.85.

SCENARIO 2B

The changes in traffic volumes is similar to Scenario 2a; however, it is assumed that the continuous Wyandotte Street East to Dillon Drive connection would make the extension a slightly more attractive route. Therefore, it was assumed that 5% more traffic would be rerouted to the new extension, compared to Scenario 2a.

In this scenario, all roadway links would still operate at a v/c ratio less than 0.85. Even if the percentage of traffic attracted to the extension is significantly greater than estimated, Wyandotte Street and Dillon Drive would remain within the capacity of its arterial and collector roadway classifications respectively.

SCENARIO 3

The extension of Beverley Street would be expected to result in a minor redistribution of traffic volumes, given that it does not connect directly to a broad network. This connection would have a trivial impact on the traffic; however, it will provide residents of Jarvis Avenue a shorter alternative route to Banwell Road and Little River Boulevard. Without the Beverley Street extension, currently residents travel west along Castle Hill Road and then onto Cora Greenwood Drive to access Little River Boulevard and Banwell Road. Therefore, with the extension a slight reduction in traffic volumes would be expected on Castle Hill Road.

The closure of Jarvis Avenue at Riverside Drive will result in a minor increase of traffic along the Wyandotte Street East connection. As shown in the existing TMCs and Scenario 1, there are only a few vehicles entering and existing Jarvis at this intersection. These few vehicles will be forced to reroute to Wyandotte Street or Dillon Drive to access

Riverside Drive East. The traffic impact of the closure will be very minor; however, it will create longer travel times for residents of Jarvis Avenue who want to access Little River Boulevard.

All roadway links would operate at a v/c ratio less than 0.85.

SCENARIO 4

The changes in traffic volumes are nearly the same as Scenario 3 except for the minor diversion of traffic resulting from the closure at Jarvis Avenue and Riverside Drive.

All roadway links would operate at a v/c ratio less than 0.85 in this scenario.

SCENARIO 5

The extension of Jarvis Avenue to Little River Boulevard would slightly increase traffic on Jarvis Avenue and decrease the traffic accessing Little River Boulevard via Dillon Drive, Castle Hill Road and Cora Greenwood Drive. The traffic impacts of this extension would be minimal. The extension would predominantly service the Jarvis Avenue residents as it would provide them a more direct connection to Little River Boulevard.

All roadway links would operate at a v/c ratio less than 0.85.

4.2 INTERSECTION TRAFFIC OPERATIONS ANALYSIS

4.2.1 SYNCHRO CAPACITY ANALYSIS

The following intersections were analyzed in Synchro 10 Traffic Software to assess potential future intersection operational deficiencies:

- Greenpark Boulevard and Wyandotte Street East;
- Wyandotte Street East and Banwell Road;
- Jarvis Avenue and Dillon Drive;
- Jarvis Avenue and Wyandotte Street East;
- Banwell Road and Little River Boulevard; and
- Jarvis Avenue and Little River Boulevard.

Synchro analysis was conducted for 20-year horizon scenarios. The a.m. and p.m. peak hour results are provided in **Table 4-1** and **Table 4-2** respectively. Detailed Synchro reports are provided in **Appendix E**.

A turning movement for unsignalized intersections with LOS E or worse were defined as a critical movement in the City of Windsor 2013 Transportation Impact Study Guidelines. This criterion was applied in this study. The results presented in **Table 4-1** and **Table 4-2** have the following findings:

- For all scenarios, the westbound approach at Banwell Road and Little River Boulevard would be operating at a LOS F in the a.m. peak hour. In the p.m. peak hour, the southbound approach would be operating at LOS F or E. Therefore, the westbound and southbound approaches would be critical movements.
- In Scenario 1, the northbound approach at Greenpark Boulevard and Wyandotte Street would be a critical movement, operating at LOS E. The v/c ratio for this critical movement would incrementally improve in other scenarios as more roadway connections are added to the network.
- All other intersections would operate under capacity.

It can be deduced that the intersections operating under capacity in the 20-year horizon would operate better in the 10-year horizon since the forecasted volumes in the 10-year horizon would proportionally less. Therefore, for the 10-year horizon, a Synchro analysis was only conducted for the critical intersections identified.

Table 4-1 20-year Horizon Intersection Operations, AM Peak Hour

Intersection Movement (signal control)	Scenario 1		Scenario 2a		Scenario 2b		Scenario 3		Scenario 4		Scenario 5	
	LOS	V/C	LOS	V/C	LOS	V/C	LOS	V/C	LOS	V/C	LOS	V/C
Greenpark Boulevard and Wyandotte Street East												
Eastbound (free flow)	A	0.08	A	0.06	A	0.05	A	0.06	A	0.06	A	0.06
Westbound (free flow)	A	0.00	A	0.00	A	0.00	A	0.00	A	0.00	A	0.00
Nouthbound (stop)	D	0.27	C	0.24	C	0.23	D	0.25	C	0.24	C	0.24
Southbound (stop)	C	0.28	C	0.22	C	0.21	C	0.23	C	0.22	C	0.22
Wyandotte Street East and Banwell Road												
Eastbound (free flow)	A	0.00	A	0.00	A	0.00	A	0.00	A	0.00	A	0.00
Westbound (free flow)	A	0.00	A	0.00	A	0.00	A	0.00	A	0.00	A	0.00
Nouthbound Right (stop)	C	0.58	C	0.63	C	0.63	C	0.66	C	0.63	C	0.62
Southbound (stop)	B	0.08	B	0.09	B	0.09	B	0.09	B	0.09	B	0.09
Jarvis Avenue and Dillon Drive (offset alignment)												
Westbound (stop)	A	0.02	A	0.07	N/A	N/A	A	0.15	A	0.15	A	0.14
Nouthbound (free-flow)	A	0.01	A	0.08	N/A	N/A	A	0.01	A	0.01	A	0.03
Southbound (free-flow)	A	0.01	A	0.01	N/A	N/A	A	0.06	A	0.05	A	0.05
Javis Avenue and Wyandotte Street East (offset alignment)												
Eastbound (stop)	N/A	N/A	A	0.16	N/A	N/A	A	0.08	A	0.07	A	0.08
Nouthbound (free-flow)	N/A	N/A	A	0.01	N/A	N/A	A	0.09	A	0.08	A	0.09
Southbound (free-flow)	N/A	N/A	A	0.06	N/A	N/A	A	0.01	A	0.01	A	0.01
Jarvis Avenue and Wyandotte Street East / Dillon Drive (continuous alignment)												
Eastbound (free flow)	N/A	N/A	A	0.00	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Westbound (free flow)	N/A	N/A	A	0.00	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Nouthbound Right (stop)	N/A	N/A	B	0.03	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Southbound (stop)	N/A	N/A	B	0.04	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Banwell Road and Little River Boulevard												
Eastbound (stop)	C	0.43	C	0.43	C	0.42	C	0.43	C	0.43	C	0.41
Westbound (stop)	**F**	**1.15**	**F**	**1.00**	**F**	**0.98**	**F**	**0.98**	**F**	**0.98**	**F**	**0.94**
Nouthbound Through and Left (stop)	C	0.59	C	0.59	C	0.58	C	0.59	C	0.59	C	0.58
Nouthbound Right (stop)	C	0.18	C	0.18	C	0.17	C	0.17	C	0.17	C	0.17
Southbound (stop)	C	0.67	C	0.61	C	0.59	C	0.63	C	0.63	C	0.58
Jarvis Avenue and Little River Boulevard												
Eastbound (free flow)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	A	0.00
Westbound (free flow)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	A	0.29
Southbound (stop)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	B	0.06

Note: Critical movements (LOS E or greater) are shown in **red**.

Table 4-2 20-year Horizon Intersection Operations, PM Peak Hour

Intersection Movement (signal control)	Scenario 1		Scenario 2a		Scenario 2b		Scenario 3		Scenario 4		Scenario 5	
	LOS	V/C	LOS	V/C	LOS	V/C	LOS	V/C	LOS	V/C	LOS	V/C
Greenpark Boulevard and Wyandotte Street East												
Eastbound (free flow)	A	0.14	A	0.11	A	0.10	A	0.11	A	0.11	A	0.11
Westbound (free flow)	A	0.00	A	0.00	A	0.00	A	0.00	A	0.00	A	0.00
Nouthbound (stop)	E	0.24	D	0.20	D	0.20	D	0.22	D	0.21	D	0.21
Southbound (stop)	D	0.36	D	0.30	D	0.29	D	0.32	D	0.31	D	0.31
Wyandotte Street East and Banwell Road												
Eastbound (free flow)	A	0.01	A	0.01	A	0.01	A	0.01	A	0.01	A	0.01
Westbound (free flow)	A	0.00	A	0.00	A	0.00	A	0.00	A	0.00	A	0.00
Nouthbound Right (stop)	B	0.44	C	0.50	C	0.51	C	0.53	C	0.50	C	0.49
Southbound (stop)	B	0.03	B	0.03	B	0.03	B	0.04	B	0.03	B	0.04
Jarvis Avenue and Dillon Drive (offset alignment)												
Westbound (stop)	A	0.03	A	0.12	B	0.17	A	0.12	A	0.12	A	0.10
Nouthbound (free-flow)	A	0.01	A	0.01	A	0.00	A	0.01	A	0.01	A	0.02
Southbound (free-flow)	A	0.01	A	0.12	A	0.01	A	0.12	A	0.12	A	0.09
Javis Avenue and Wyandotte Street East (offset alignment)												
Eastbound (stop)	N/A	N/A	A	0.15	B	0.24	A	0.18	A	0.16	A	0.16
Nouthbound (free-flow)	N/A	N/A	A	0.05	A	0.00	A	0.06	A	0.05	A	0.06
Southbound (free-flow)	N/A	N/A	A	0.01	A	0.01	A	0.01	A	0.01	A	0.01
Jarvis Avenue and Wyandotte Street East / Dillon Drive (continuous alignment)												
Eastbound (free flow)	N/A	N/A	A	0.00	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Westbound (free flow)	N/A	N/A	A	0.01	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Nouthbound Right (stop)	N/A	N/A	B	0.03	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Southbound (stop)	N/A	N/A	B	0.05	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Banwell Road and Little River Boulevard												
Eastbound (stop)	C	0.38	C	0.36	C	0.35	C	0.36	C	0.36	C	0.35
Westbound (stop)	D	0.69	C	0.59	C	0.57	C	0.56	C	0.55	C	0.55
Nouthbound Through and Left (stop)	C	0.76	C	0.73	C	0.72	C	0.72	C	0.72	C	0.72
Nouthbound Right (stop)	C	0.50	C	0.47	C	0.47	C	0.47	C	0.47	C	0.46
Southbound (stop)	**F**	**1.15**	**E**	**0.87**	**E**	**0.84**	**E**	**0.88**	**E**	**0.88**	**E**	**0.86**
Jarvis Avenue and Little River Boulevard												
Eastbound (free flow)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	A	0.00
Westbound (free flow)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	A	0.15
Southbound (stop)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	B	0.11

Note: Critical movements (LOS E or greater) are shown in **red**.

4.2.2 BANWELL AND LITTLE RIVER BOULEVARD INTERSECTION OPERATIONS

To assess whether the critical movements emerges within the 10-year horizon, a Synchro analysis of Banwell Road and Little River Boulevard was conducted for the 10-year horizon for Scenarios 1 and 5. Scenario 1 and 5 were selected as they represent the 'worst' and 'best' intersection operations at the critical movements. The results of the analyses are provided in **Table 4-3**. As shown for the 10-year horizon analysis for Scenario 1, the westbound and southbound approaches are still critical movements operating at LOS F. However, with the network improvements in place in Scenario 5, all movements operate under capacity in the 10-year horizon.

Table 4-3 Intersection Operations at Intersection of Banwell and Little River Boulevard, 10- and 20-Year Horizons

	Intersection Movement	AM Peak Hour				PM Peak Hour			
		Scenario 1		Scenario 5		Scenario 1		Scenario 5	
		LOS	V/C	LOS	V/C	LOS	V/C	LOS	V/C
10-year Horizon	Eastbound	C	0.38	B	0.34	C	0.33	B	0.29
	Westbound	**F**	**1.00**	D	0.78	C	0.61	C	0.60
	Nouthbound Through and Left	C	0.53	B	0.48	C	0.67	C	0.39
	Northbound Right	C	0.16	B	0.14	C	0.44	C	0.46
	Southbound	C	0.61	C	0.47	**F**	**0.99**	C	0.72
20-year Horizon	Eastbound	C	0.43	C	0.41	C	0.38	C	0.35
	Westbound	**F**	**1.15**	**F**	**0.94**	D	0.69	C	0.55
	Nouthbound Through and Left	C	0.59	C	0.58	C	0.76	C	0.72
	Northbound Right	C	0.18	C	0.17	C	0.50	C	0.46
	Southbound	C	0.67	C	0.58	**F**	**1.15**	**E**	**0.86**

Note: Critical movements (LOS E or greater) are shown in **red**.

Since the intersection is expected to operate over capacity as an all-way stop intersection in the future, a signal warrant analysis was conducted using the projected volumes. The signal warrant analysis per Ontario Traffic Manual Book 12 Justification 7 was conducted for the 20-year horizon volumes for Scenario 1 at the intersection. The results of the analysis reveal that a signal would not be required. Given that Scenario 1 has the highest volumes on Banwell Road and Little River Boulevard, it can be deduced that signalization would not be justified for all other scenarios as well. The signal warrant analysis results are provided in **Appendix F**.

However, provided the uncertainty of the forecasted volumes, it is recommended to conduct a signal warrant analysis with traffic counts in the future when capacity deficiencies occur. Signalization of the intersection could significantly improve traffic operations. Signal timing plans can be optimized to serve the westbound approach with more green time in the a.m. period, and the southbound approach in the p.m. period.

The installation of a roundabout at the intersection could also be an alterative future solution to improve traffic operations. Compared to the current all-way stop control, a roundabout can significantly reduce the number of vehicles making a full stop at the intersection, as well as provide added safety benefits. Although it may appear to be sufficient land for a roundabout at Banwell Road and Little River Boulevard, a preliminary design review should be conducted to determine the feasibility of this potential future solution.

4.2.3 REVIEW OF INTERSECTION OFFSET AT WYANDOTTE STREET

4.2.3.1 INTERSECTION SPACING

With the extension of Wyandotte Street to Jarvis Avenue with an offset from the intersection at Dillon Drive, the intersection spacing between Wyandotte Street and Dillon Drive would be approximately 60 metres, which just meets the minimum required intersection spacing of 60 metres recommended in the Transportation Association of Canada (TAC) Geometric Design Guide for a local road.

4.2.3.2 TRAFFIC OPERATIONS

The intersection operations at the offset (i.e. Scenario 2a) and continuous (i.e. Scenario 2b) Wyandotte Street extension configurations do not differ significantly. In both scenarios, the intersections at the extensions would operate well under capacity and at LOS B or better.

The potential queue blocking was analyzed with SimTraffic simulations for these two offset intersections at Jarvis Avenue. The SimTraffic queuing analysis was executed for Scenario 3 in the 20-year horizon volumes as Scenario 3 would produce the highest volumes along Wyandotte Street and Jarvis Avenue because of the Wyandotte Street extension and the closure of Jarvis at Riverside Drive.

The queuing results are summarized in **Table 4-4**. The detailed SimTraffic queue blocking reports are provided in **Appendix E**.

Table 4-4 Queuing Analysis at Wyandotte Street Extension (offset), Scenario 3 20-year Horizon

Intersection Movement	Available Storage (m)	AM Peak Hour		PM Peak Hour	
		95th Percentile Queues (m)	Average Queues (m)	95th Percentile Queues (m)	Average Queues (m)
Jarvis Avenue and Dillon Drive					
Westbound	98	23.1	13.4	14.8	9.8
Southbound	49	3.7	0.4	6.5	1.2
Jarvis Avenue and Wyandotte Street East					
Eastbound	229	10.4	5.7	14.9	8.5
Northbound	49	5.6	0.9	3.3	0.4

As shown in Table 4-4, the average and 95th percentile queues would be well within the available distance between the two offset intersections at Jarvis Avenue.

4.3 ROADWAY DAILY SERVICE VOLUMES AND CLASSIFICATION

The estimated future AADT volumes for 10-year and 20-year horizons are provided in **Appendix D**. Based on the AADT, the traffic volumes generally remain within the current classification of each respective roadway.

However, if Wyandotte Street East is extended to Jarvis Avenue as an offset intersection, the City may need to consider changing the classification of Jarvis Avenue between Wyandotte Street East and Dillon Drive from a local road to a collector road. This new extension would serve as a major east-west corridor, and thus could have an increase in transit buses and heavy vehicles in the future. The roadway functions would be changed. It may be in the City's interest to reclassify the stretch of Jarvis Avenue connecting Wyandotte Street and Dillon Drive. There would be a discontinuity in road classification with a transition from an arterial road (Wyandotte Street), a local road (Jarvis Avenue) to a collector road (Dillon Drive).

4.4 SUMMARY OF FINDINGS

To conclude, the findings of traffic impacts resulting from the potential network changes are summarized below:

- All link v/c ratios are less than 0.85 for all scenarios.
- Banwell and Little River experiences operational deficiencies in all scenarios and in both the 10-year and 20-year horizons. A signalized intersection or a roundabout can be considered at the intersection of Banwell Road and Little River Boulevard in the future.
- **Scenario 1 (base):**
  - With the "do-nothing" to the network, operational deficiencies would also be experienced at Greenpark Boulevard and Wyandotte Street East.
- **Scenario 2a:**
  - Traffic operations and network connectivity would be significantly improved with the Wyandotte Street East extension.
  - If Wyandotte Street East is extended to Jarvis Avenue as an offset intersection, the City may need to consider changing the classification of Jarvis Avenue between Wyandotte Street East and Dillon Drive from a local road to a collector road.
- **Scenario 2b:**
  - Traffic operations would not be significantly changed with a continuous alignment versus an offset intersection at Wyandotte Street East and Jarvis Avenue. However, from a safety and road design perspective, a continuous alignment is the more attractive alternative. A detailed design review of both design alternatives of the Wyandotte Street extension with cost estimates is recommended.
- **Scenario 3:**
  - Beverly Glen Street extension would result in a low increase in traffic volumes as it does not connect to a broad road network. This connection would have a very minor impact on traffic.
  - The closure of Jarvis Avenue at Riverside Drive would have a minimal impact on traffic as the current volumes of traffic in and out of Jarvis Avenue from the intersection are very low.
- **Scenario 4:**
  - Traffic operations and network connectivity would be significantly improved with the Wyandotte Street East extension. Beverly Glen Street extension would result in a minor increase in traffic volumes as it does not connect to a broad network.

- **Scenario 5:**
  - The traffic impact of the Jarvis Avenue extension to Little River Boulevard would be minimal. The extension would predominantly service the Jarvis Avenue residents as it would provide a more direct connection to Little River Boulevard.

In addition to traffic impacts, other factors such as property and community impacts were also considered when evaluating the alternative scenarios.

Table 4-5 provides a high-level evaluation of each scenario against various impacting factors. Note that, although cost should be a significant evaluation measure, it was not included in the high-level evaluation. The engineering design and cost factors are beyond the scope of this study.

Table 4-5 High-level Evaluation of Scenarios

Future Scenarios	Intersection Operations and Level of Service	Reduction in Travel Time and Distance	Functional Design	Level of Network Continuity	Property Impact	Community Impact
Scenario 1 Base scenario, do-nothing	Operational deficiencies expected at the intersections of Banwell Road and Little River Blvd, and Greenpark Blvd and Wyandotte Street in the future.	No reduction in travel time.	Not applicable.	Wyandotte St (arterial) and Dillon Dr. (collector) are disconnected, both terminating at Banwell Rd.	No property impact.	No changes to the community. Traffic along Jarvis Avenue and Dillon Drive will remain low.
						
Scenario 2a Extension of Wyandotte Street East (offset intersection)	Operational deficiencies expected at the intersection of Banwell Road and Little River Blvd in the future.	Significant reduction in travel time and distance for residents due to the Wyandotte Street extension.	The offset configuration creates additional turning movements with short intersection spacing.	Significantly improve east-west connectivity with Wyandotte Street extension.	Minimal property may need to be acquired for the Wyandotte Street extension.	Connectivity and accessibility to major roadways will improve for residents; however, they may experience higher traffic volumes along Jarvis Avenue and Dillon Drive. Roadways would remain at a good LOS.
						
Scenario 2b Extension of Wyandotte Street East as a continuous alignment connecting to Dillon Drive	Operational deficiencies expected at the intersection of Banwell Road and Little River Blvd in the future.	Significant reduction in travel time and distance for residents due to the Wyandotte Street extension.	The continuous alignment would elimilate offset intersection spacing and discontinuity in road classification and alignment.	Significantly improve east-west connectivity with Wyandotte Street extension.	A continous alignment of Wyandotte Street and Dillon Drive impacts residential properties.	Connectivity and accessibility to major roadways will improve for residents; however, they may experience higher traffic volumes along Dillon Drive. Roadways would remain at a good LOS.
						
Scenario 3 Extension of Wyandotte Street East to Jarvis Avenue (offset intersection) + Extension of Beverly Glen Street to Jarvis Avenue + Closure of Jarvis Avenue at Riverside Drive East	Operational deficiencies expected at the intersection of Banwell Road and Little River Blvd in the future.	Significant reduction in travel time and distance for residents due to the Wyandotte Street extension. Minimal reduction in travel time and distance with the Beverley Glen Street extension. Minimal reduction in travel time with the closure of Jarvis Avenue at Riverside Drive.	The offset configuration creates additional turning movements with short intersection spacing.	Significantly improve east-west connectivity with Wyandotte Street extension. Have a minimal improvement in connectivity with Beverley Glen Street extension. Reduce connectivity for Jarvis Avenue residents with closure of Jarvis Avenue and Riverside Drive.	Minimal property may need to be acquired for the Wyandotte Street and Beverly Glen Street extensions.	Connectivity and accessibility to major roadways will improve for residents; however, they may experience higher traffic volumes along Jarvis Avenue and Dillon Avenue. Roadways would remain at a good LOS.
						
Scenerio 4 Extension of Wyandotte Street East to Jarvis Avenue (offset intersection) + Extension of Beverly Glen Street to Jarvis Avenue.	Operational deficiencies expected at the intersection of Banwell Road and Little River Blvd in the future.	Significant reduction in travel time and distance for residents due to the Wyandotte Street extension. Minimal reduction in travel time and distance with the Beverley Glen Street extension.	The offset configuration creates additional turning movements with short intersection spacing.	Significantly improve east-west connectivity with Wyandotte Street extension. Have a minimal improvement in connectivity with Beverley Glen Street extension.	Minimal property may need to be acquired for the Wyandotte Street and Beverly Glen Street extensions.	Connectivity and accessibility to major roadways will improve for residents, however, they may experience higher traffic volumes along Jarvis Avenue and Dillon Drive. Roadways would remain at a good LOS.
						
Scenario 5 Extension of Wyandotte Street East to Jarvis Avenue (offset intersection) + Extension of Beverly Glen Street to Jarvis Avenue + Extension of Jarvis Avenue to Little River Boulevard	Operational deficiencies expected at the intersection of Banwell Road and Little River Blvd in the future.	Significant reduction in travel time and distance for residents due to the Wyandotte Street extension. Moderate reduction in travel time and distance with the Beverley Glen Street extension and Jarvis Avenue extension.	The offset configuration creates additional turning movements with short intersection spacing.	Significantly improve east-west connectivity with Wyandotte Street extension. Have a minimal improvement in connectivity with Beverley Glen Street extension and Jarvis Avenue extension.	Minimal property may need to be acquired for the Wyandotte Street and Beverly Glen Street extensions.	Connectivity and accessibility to major roadways will improve for residents; however they may experience higher traffic volumes along Jarvis Avenue and Dillon Drive. Roadways would remain at a good LOS.
						

Symbol	Description
	Worst: significant adverse impact
	Poor: some adverse impact
	Neutral: little or no adverse impact
	Good: improvement from existing condition and supports both existing and future community
	Best: significant improvement from existing condition and supports both existing and future community

5 CONCLUSIONS

Based on the complete analyses and review of traffic impacts resulting from the potential roadway improvements/changes, the following conclusions are made:

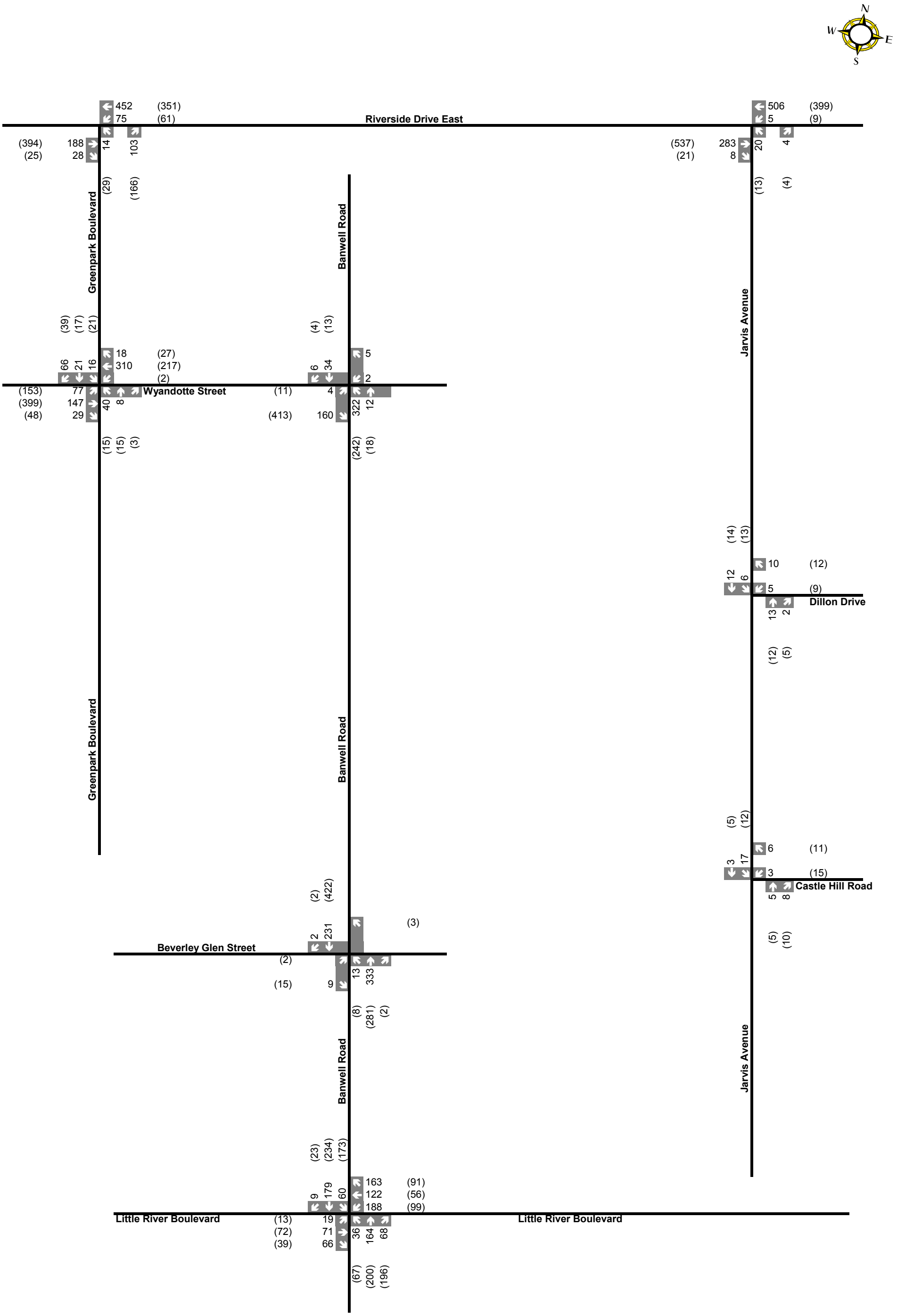
- The Wyandotte Street extension would significantly improve traffic operations and network connectivity. The extension would provide vehicles with an alternative east-west route and therefore, a reduction of traffic would be expected at Riverside Drive, Little River Boulevard, and Banwell Road.
- Both the offset and continuous alignment of the Wyandotte Street extension would operate within the roadway's capacity. However, if an offset extension is implemented, the City may need to consider changing the classification of Jarvis Avenue between Wyandotte Street and Dillon Drive from a local road to a collector road. A detailed design review of the extension is proposed.
- The Beverly Glen Street extension, the closure of Jarvis Avenue at Riverside Drive, and the extension of Jarvis Avenue to Little River Boulevard would have a minimal traffic impact on the overall road network.
- Operational deficiencies at Banwell Road and Little River Boulevard would be expected within the 10-year and 20-year horizons. A signalized intersection or a roundabout can be considered to improve the intersection operations in the future. Although it appears there may be sufficient land for a roundabout, a preliminary design review should be conducted to determine the feasibility of this potential future solution.

APPENDIX

A FUTURE TRAFFIC VOLUMES

APPENDIX

A-1 10-YEAR HORIZON TRAFFIC VOLUMES



wsp

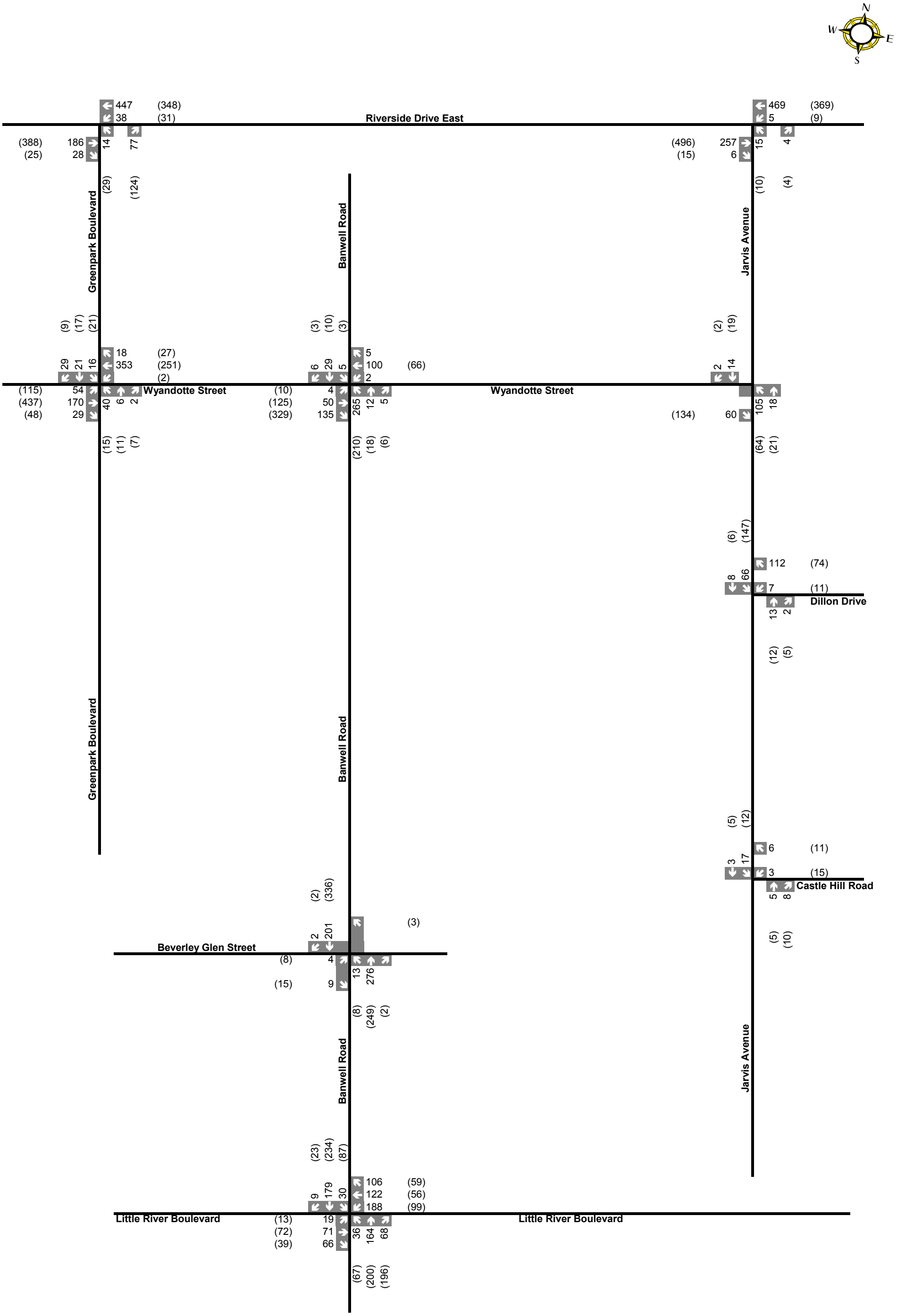
Legend

xx A.M. Peak Hour Traffic Volumes

(xx) P.M. Peak Hour Traffic Volumes

Figure A 1-1

Scenario 1 Traffic Volumes
10-year Horizon



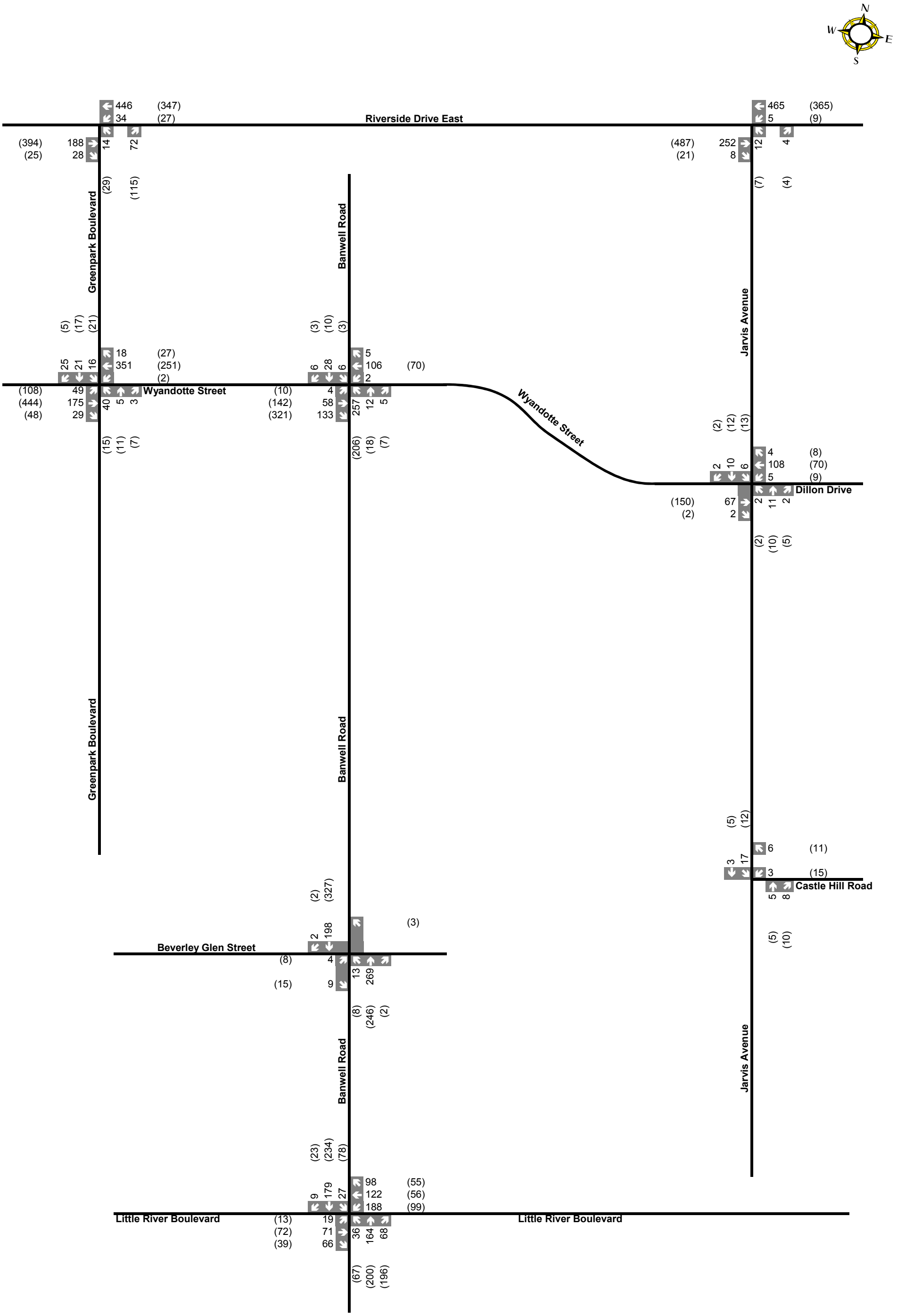
Legend

xx A.M. Peak Hour Traffic Volumes

(xx) P.M. Peak Hour Traffic Volumes

Figure A 1-2

Scenario 2a Traffic Volumes
10-year Horizon



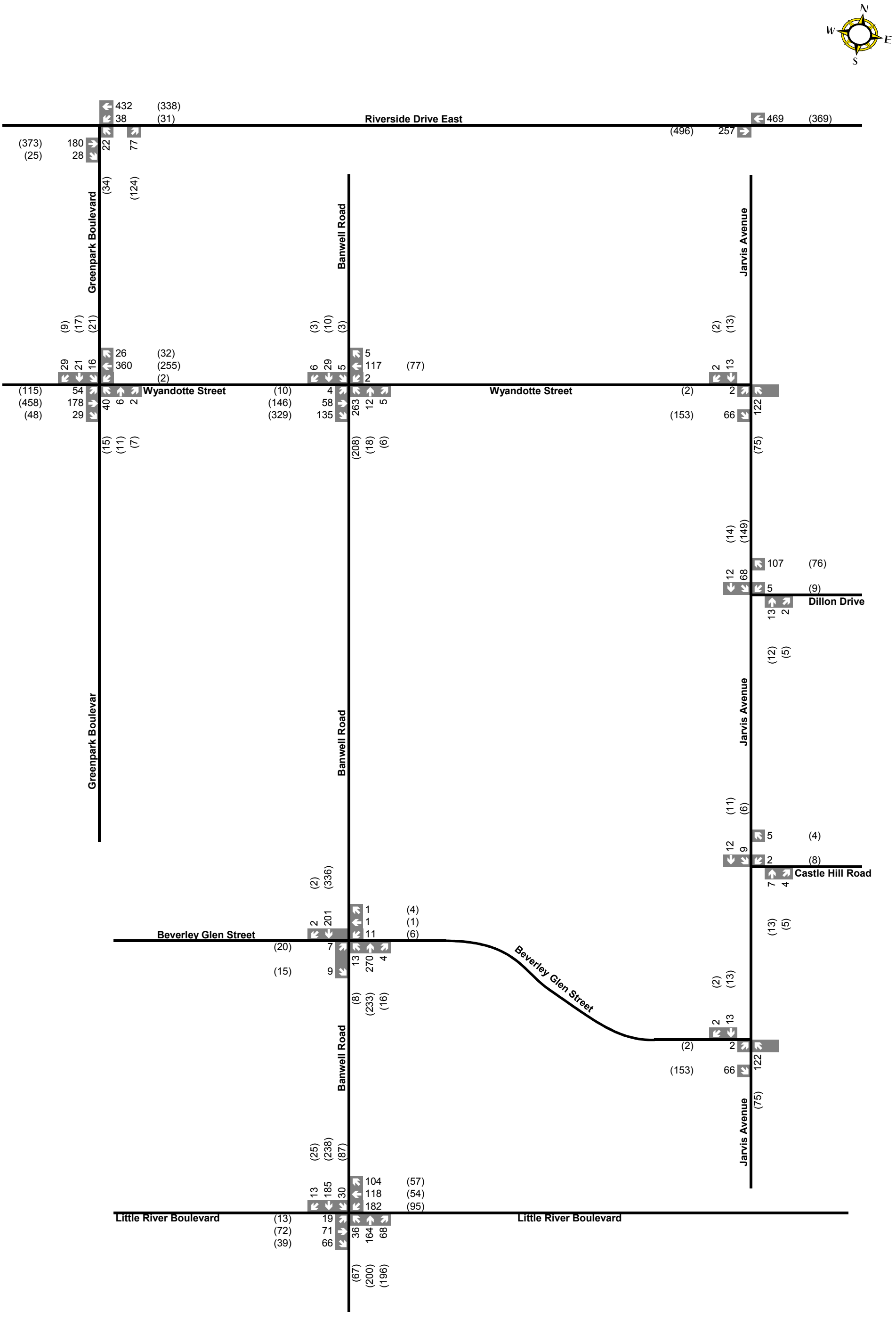
Legend

xx A.M. Peak Hour Traffic Volumes

(xx) P.M. Peak Hour Traffic Volumes

Figure A 1-3

Scenario 2b Traffic Volumes 10-year Horizon



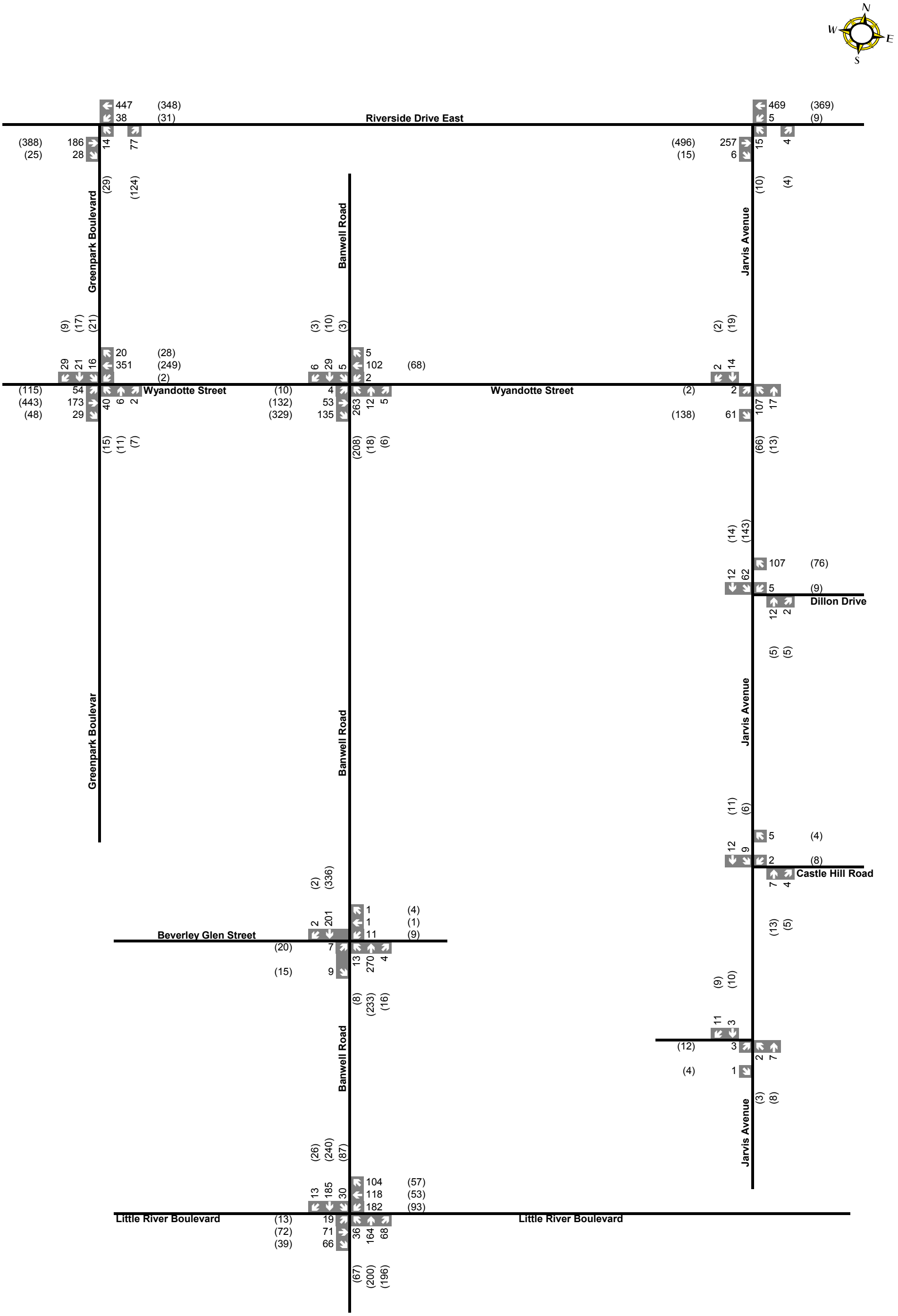
Legend

xx A.M. Peak Hour Traffic Volumes

(xx) P.M. Peak Hour Traffic Volumes

Figure A 1-4

Scenario 3 Traffic Volumes
10-year Horizon



wsp

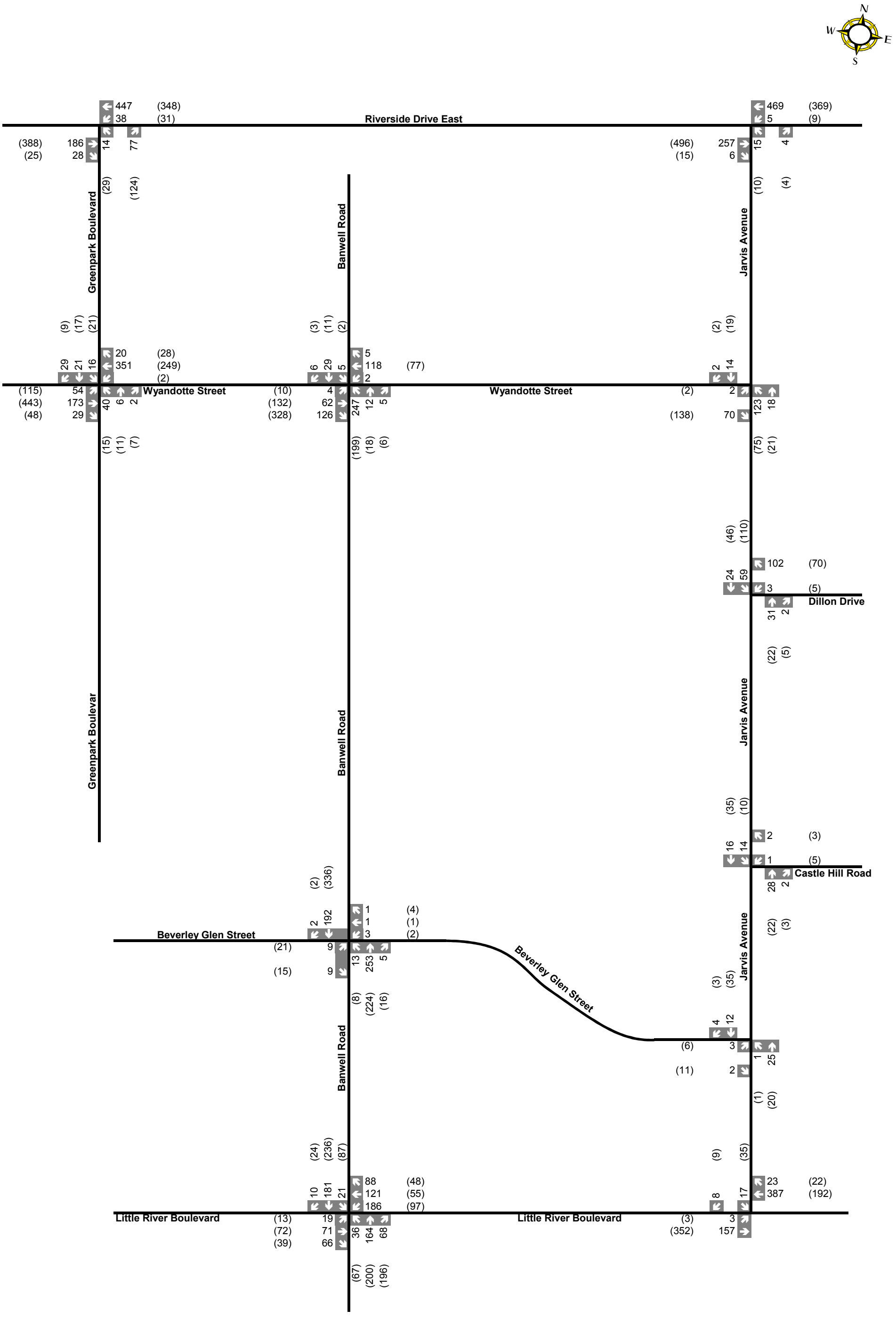
Legend

xx A.M. Peak Hour Traffic Volumes

(xx) P.M. Peak Hour Traffic Volumes

Figure A 1-5

Scenario 4 Traffic Volumes
10-year Horizon



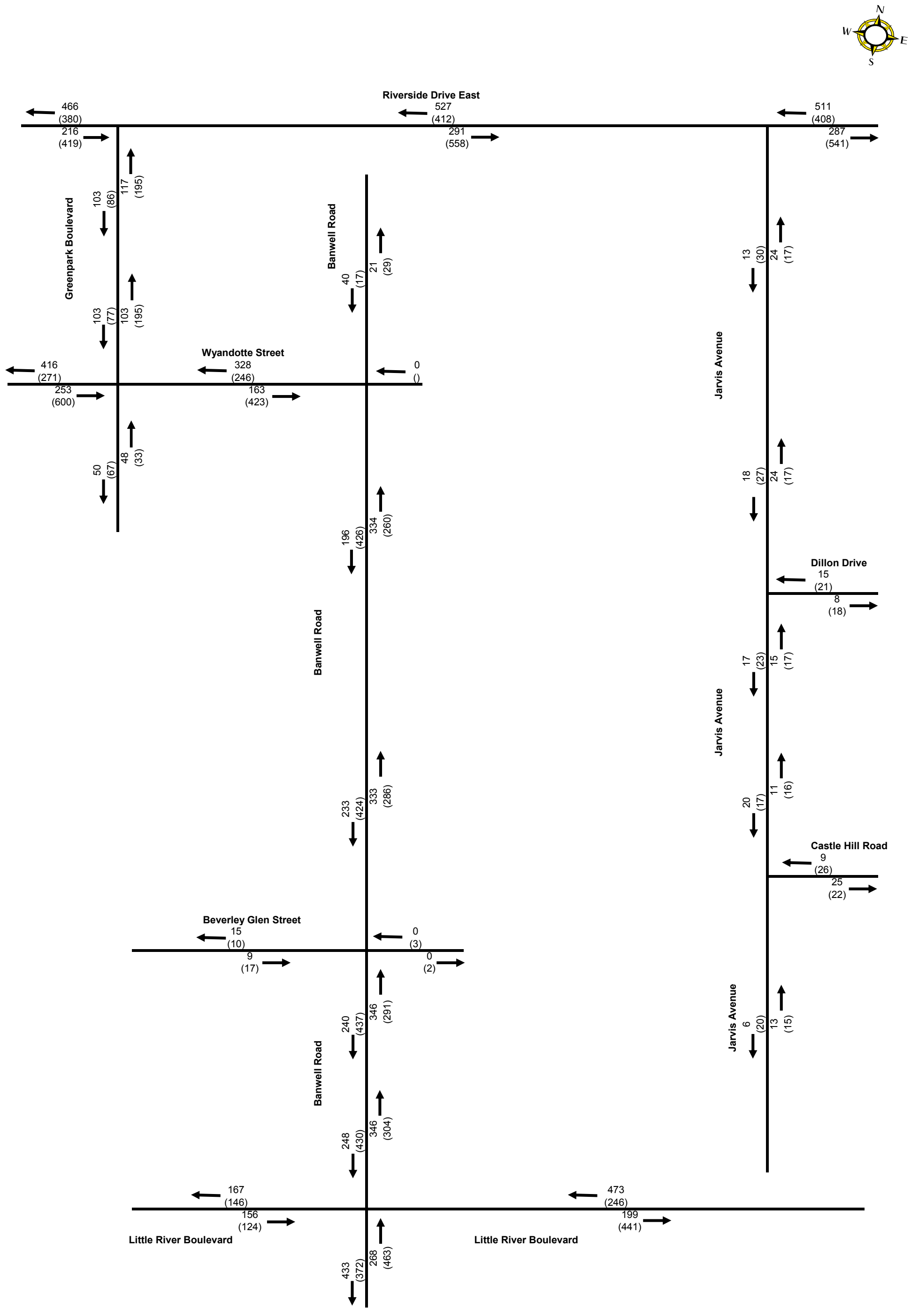
Legend

xx A.M. Peak Hour Traffic Volumes

(xx) P.M. Peak Hour Traffic Volumes

Figure A 1-6

Scenario 5 Traffic Volumes
10-year Horizon



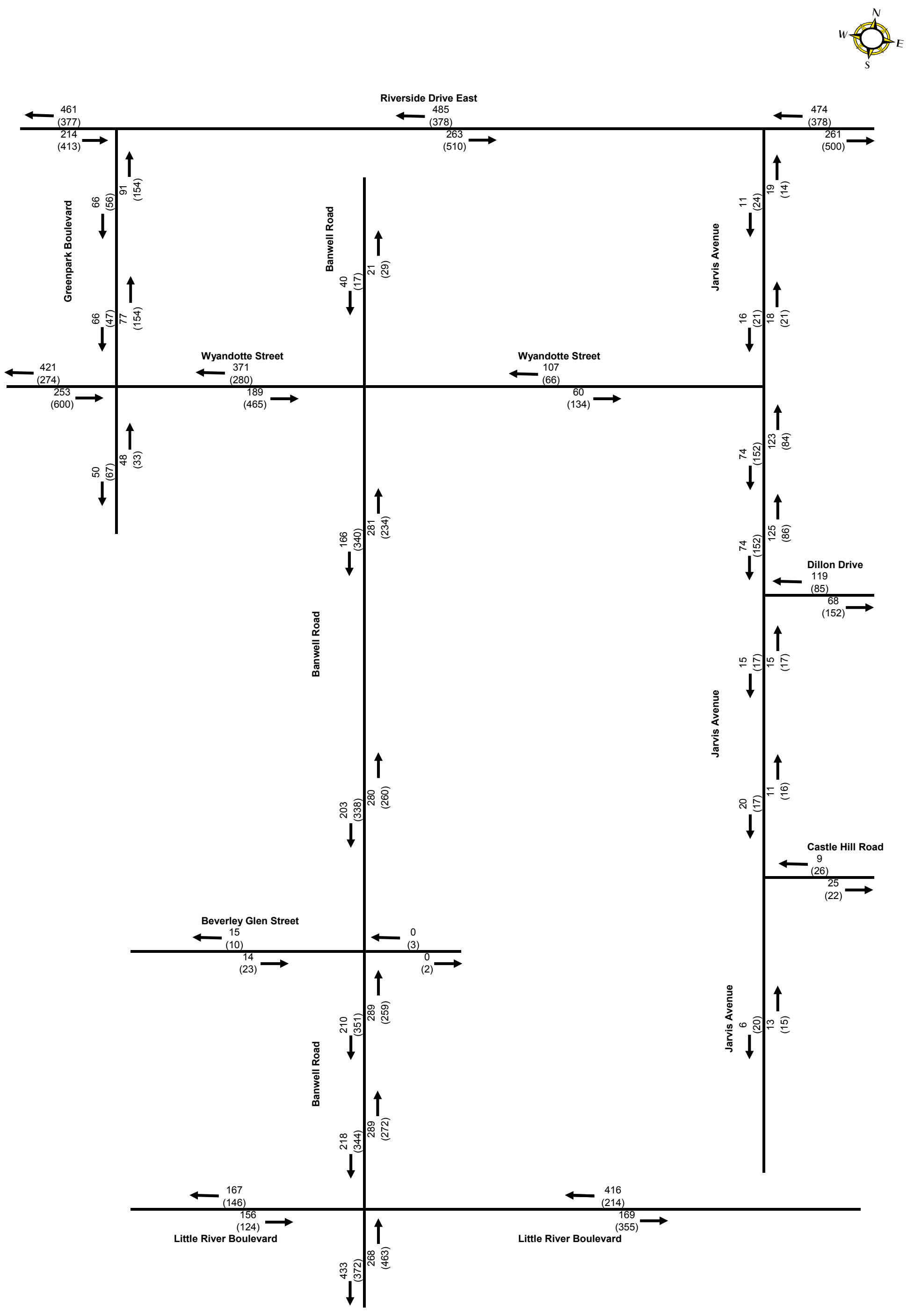
Legend

xx A.M. Peak Hour Link Volumes

(xx) P.M. Peak Hour Link Volumes

Figure A 1-7

Scenario 2a Link Volumes
10-year Horizon



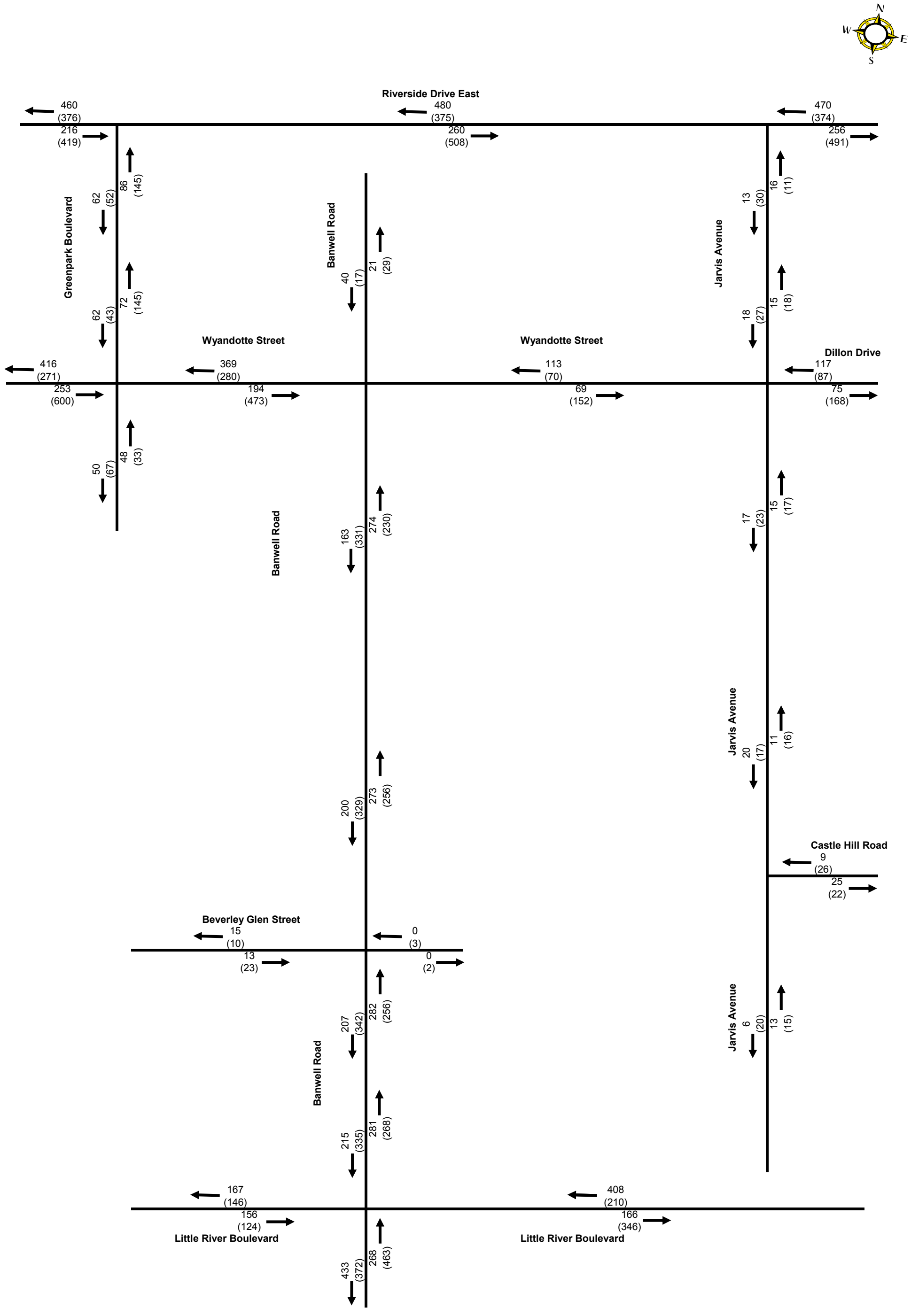
Legend

xx A.M. Peak Hour Link Volumes

(xx) P.M. Peak Hour Link Volumes

Figure A 1-8

Scenario 2a Link Volumes
10-year Horizon



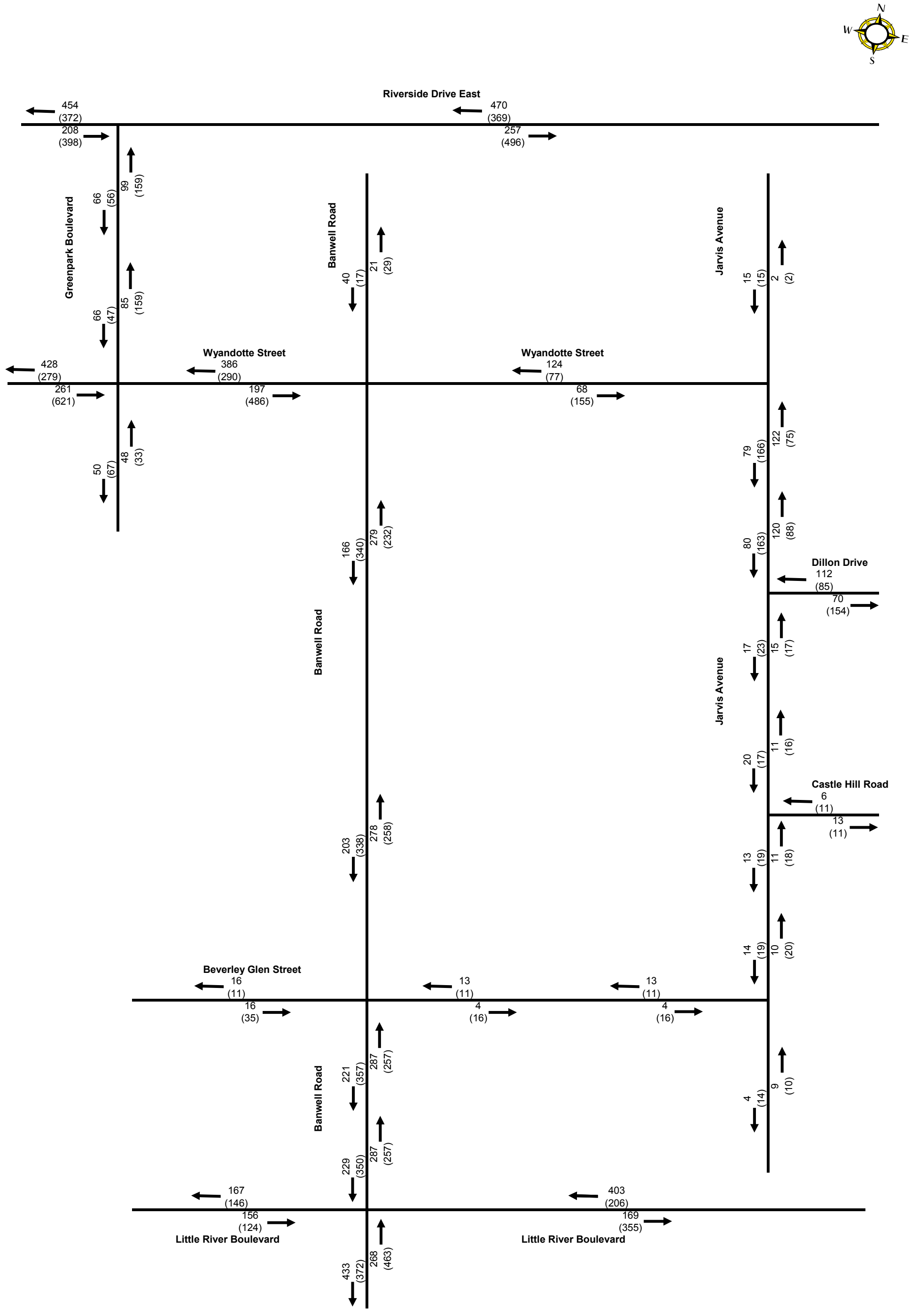
Legend

xx A.M. Peak Hour Link Volumes

(xx) P.M. Peak Hour Link Volumes

Figure A 1-9

Scenario 2b Link Volumes
10-year Horizon



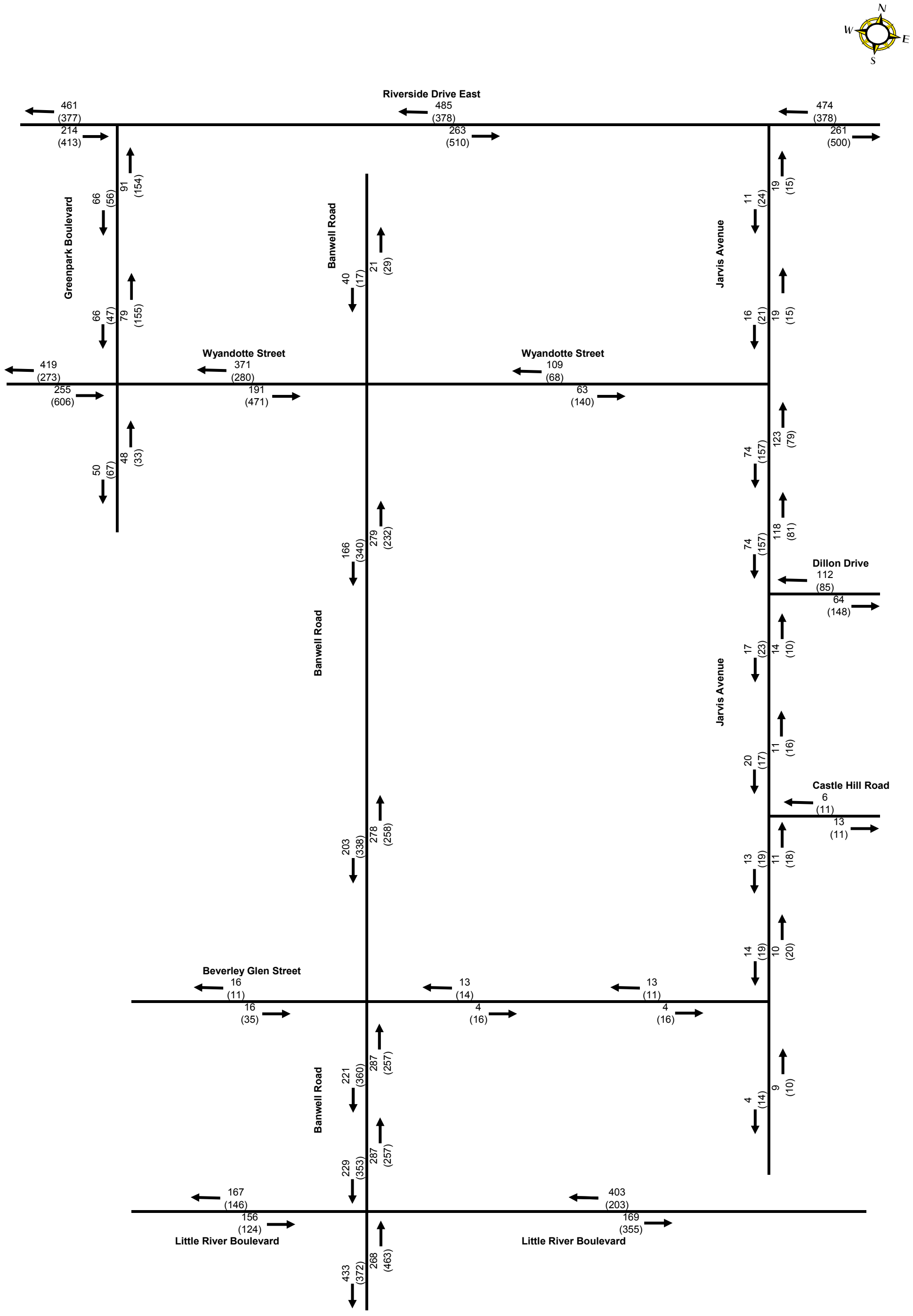
Legend

xx A.M. Peak Hour Link Volumes

(xx) P.M. Peak Hour Link Volumes

Figure A 1-10

Scenario 3 Link Volumes
10-year Horizon



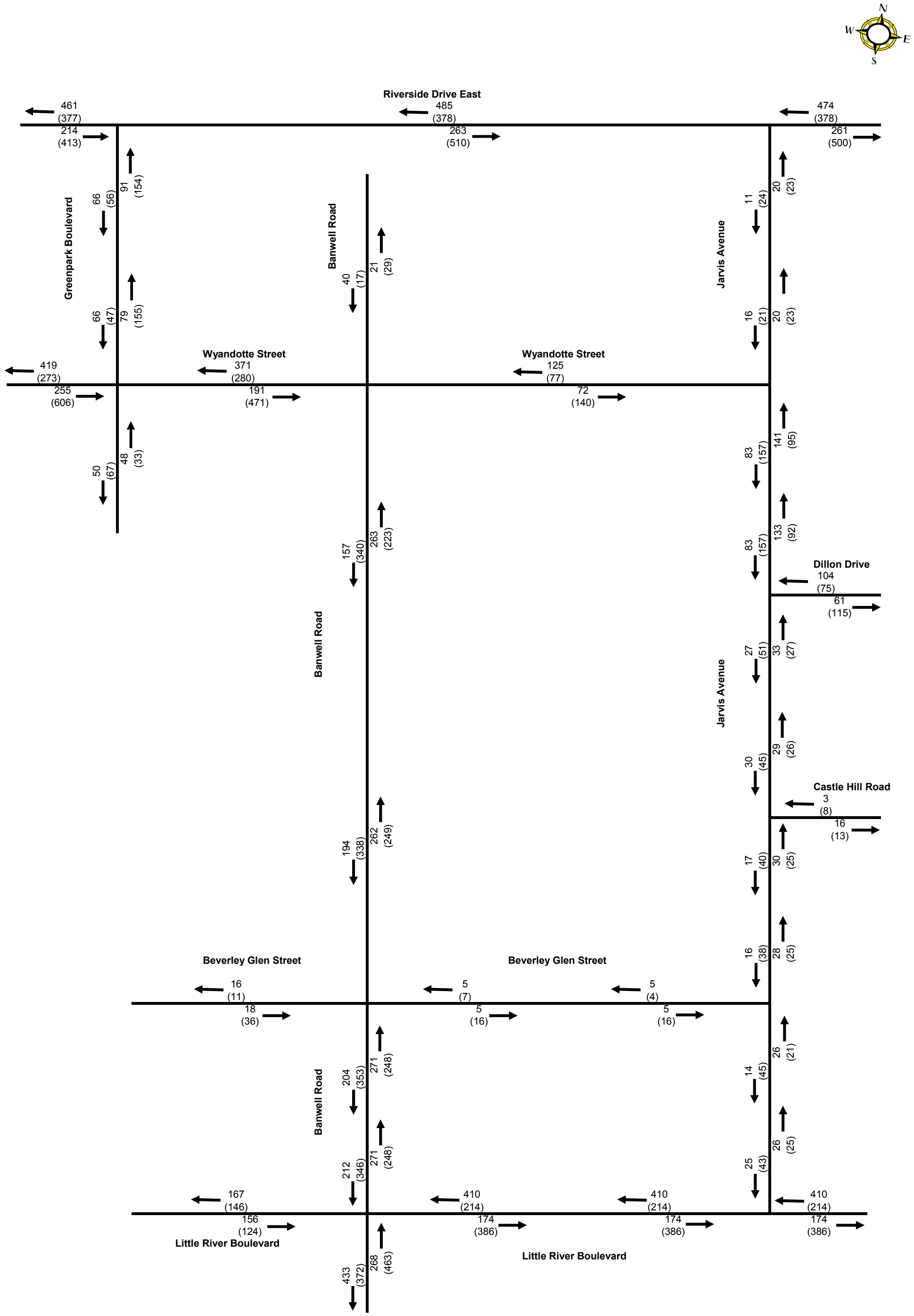
Legend

xx A.M. Peak Hour Link Volumes

(xx) P.M. Peak Hour Link Volumes

Figure A 1-11

Scenario 4 Link Volumes
10-year Horizon



Legend

xx A.M. Peak Hour Link Volumes

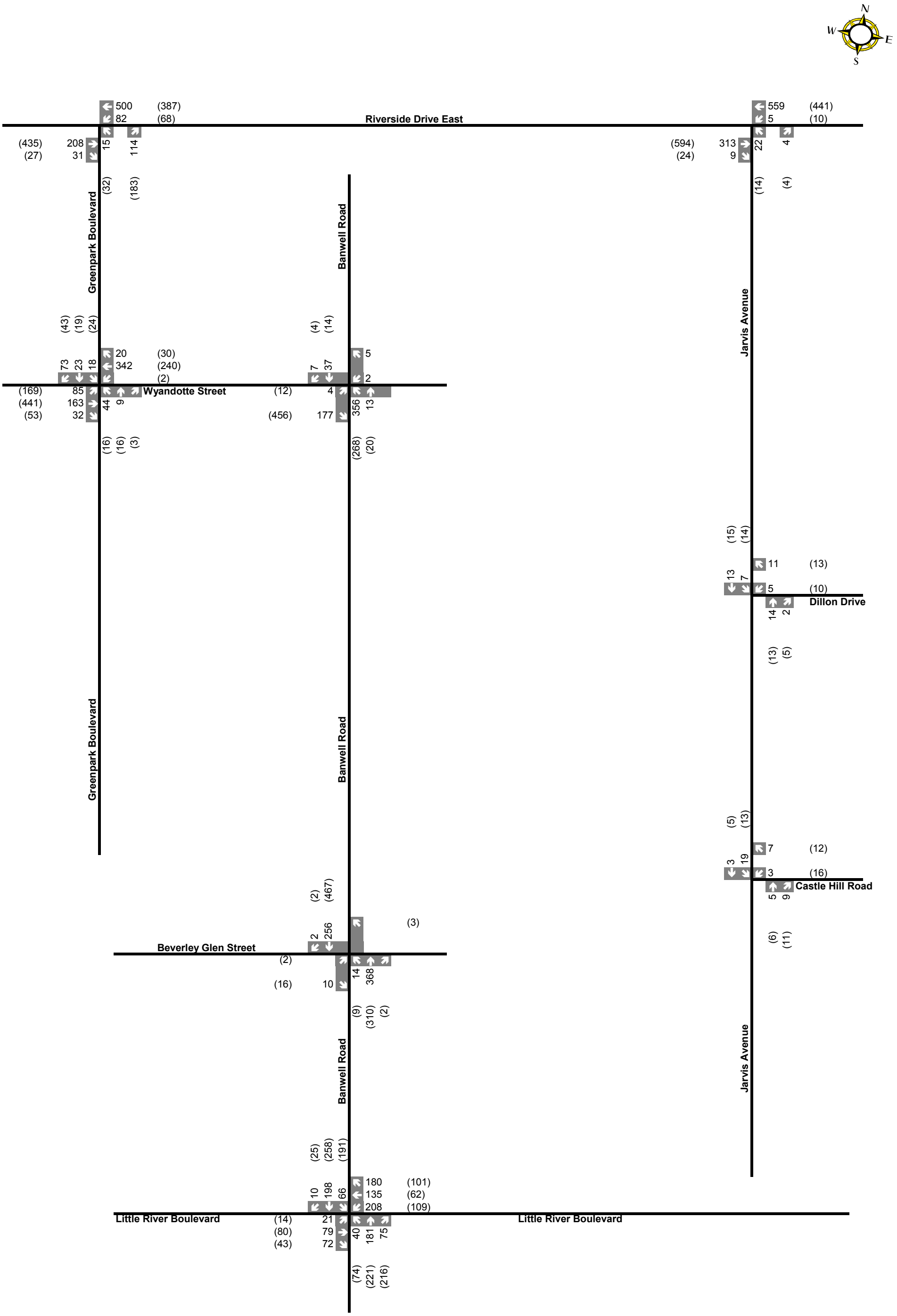
(xx) P.M. Peak Hour Link Volumes

Figure A 1-12

Scenario 5 Link Volumes
10-year Horizon

APPENDIX

A-2 20-YEAR HORIZON TRAFFIC VOLUMES



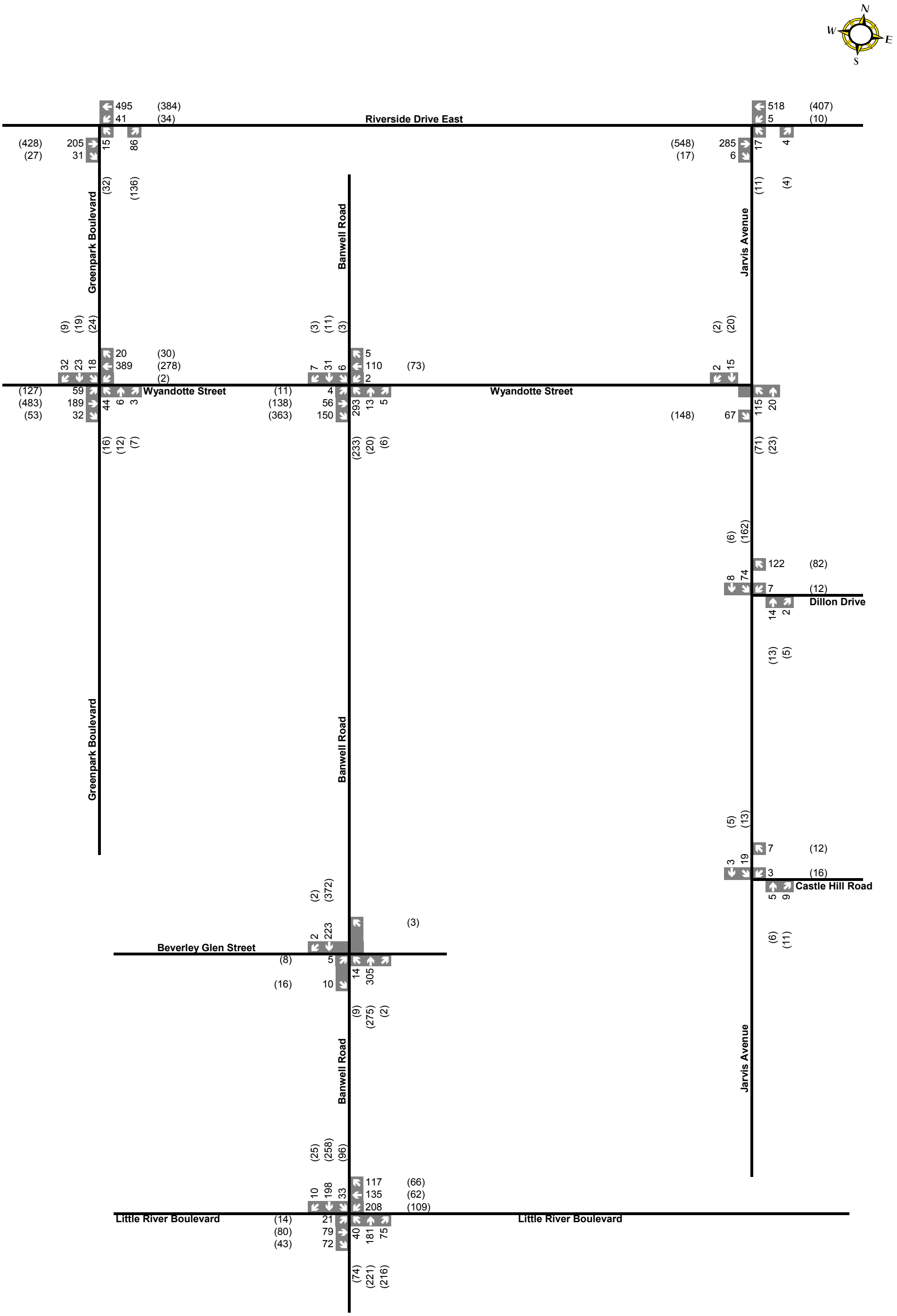
Legend

xx A.M. Peak Hour Traffic Volumes

(xx) P.M. Peak Hour Traffic Volumes

Figure A 2-1

Scenario 1 Traffic Volumes 20-year Horizon



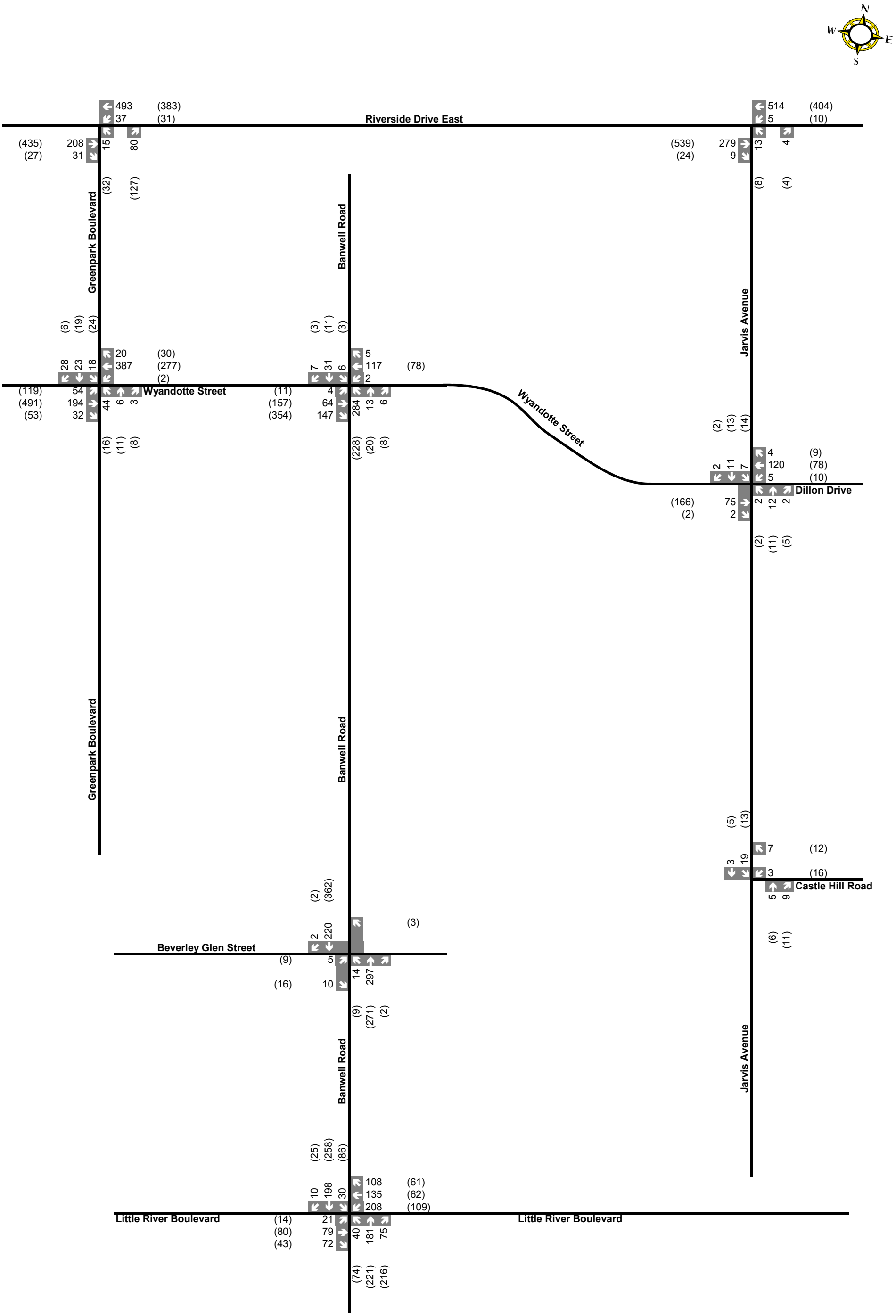
Legend

xx A.M. Peak Hour Traffic Volumes

(xx) P.M. Peak Hour Traffic Volumes

Figure A 2-2

Scenario 2a Traffic Volumes
20-year Horizon



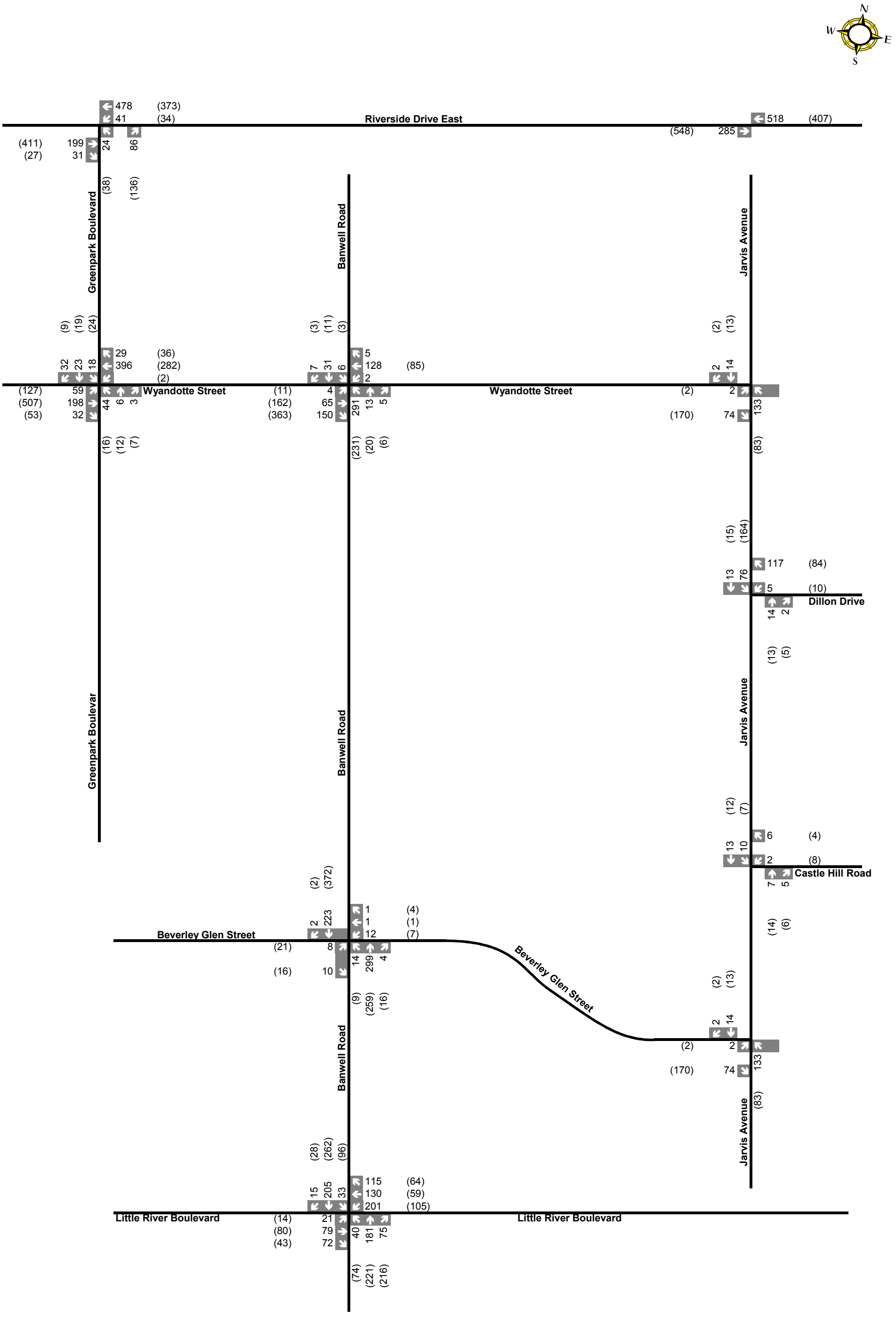
Legend

xx A.M. Peak Hour Traffic Volumes

(xx) P.M. Peak Hour Traffic Volumes

Figure A 2-3

Scenario 2b Traffic Volumes 20-year Horizon



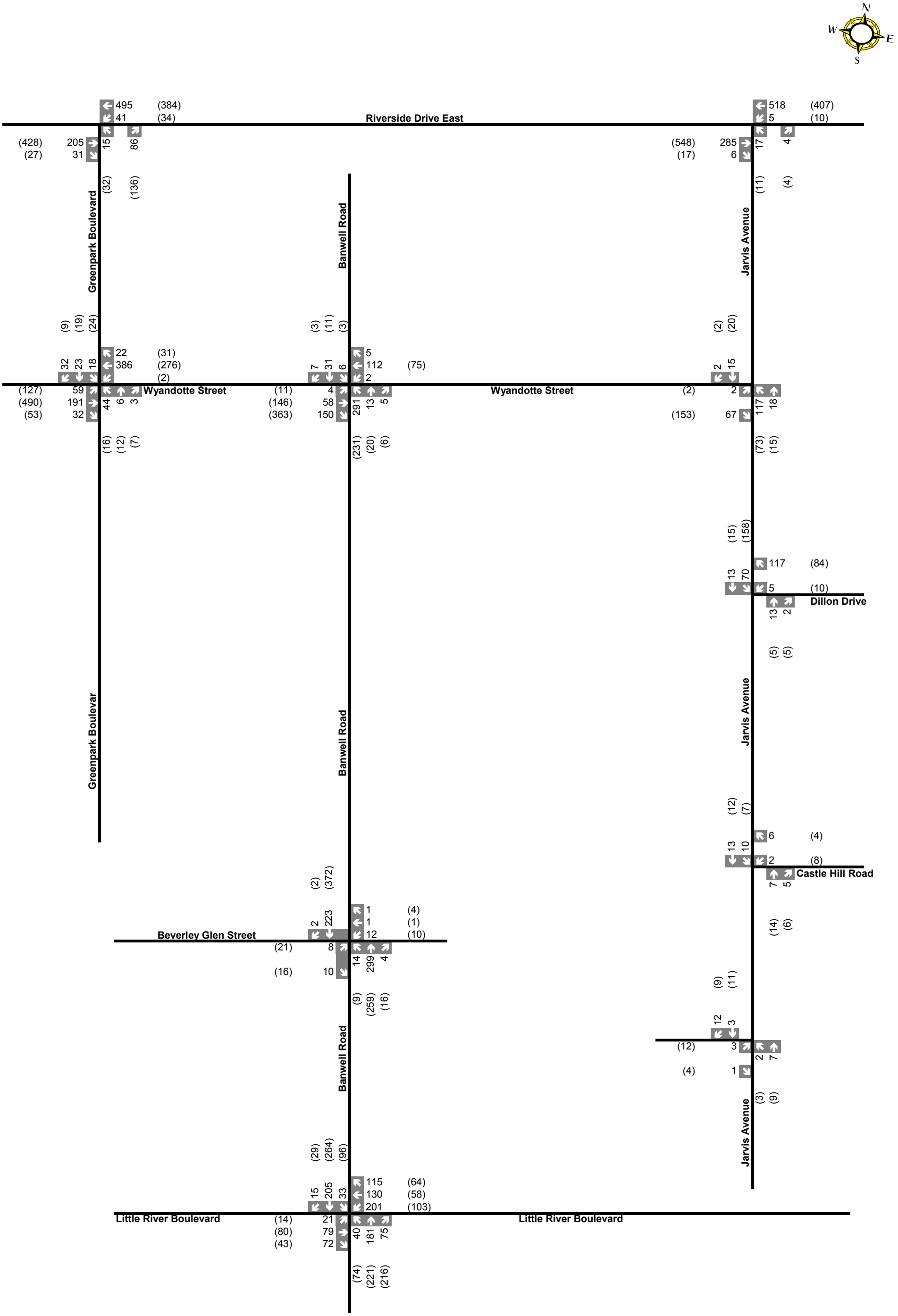
Legend

xx A.M. Peak Hour Traffic Volumes

(xx) P.M. Peak Hour Traffic Volumes

Figure A 2-4

Scenario 3 Traffic Volumes 20-year Horizon



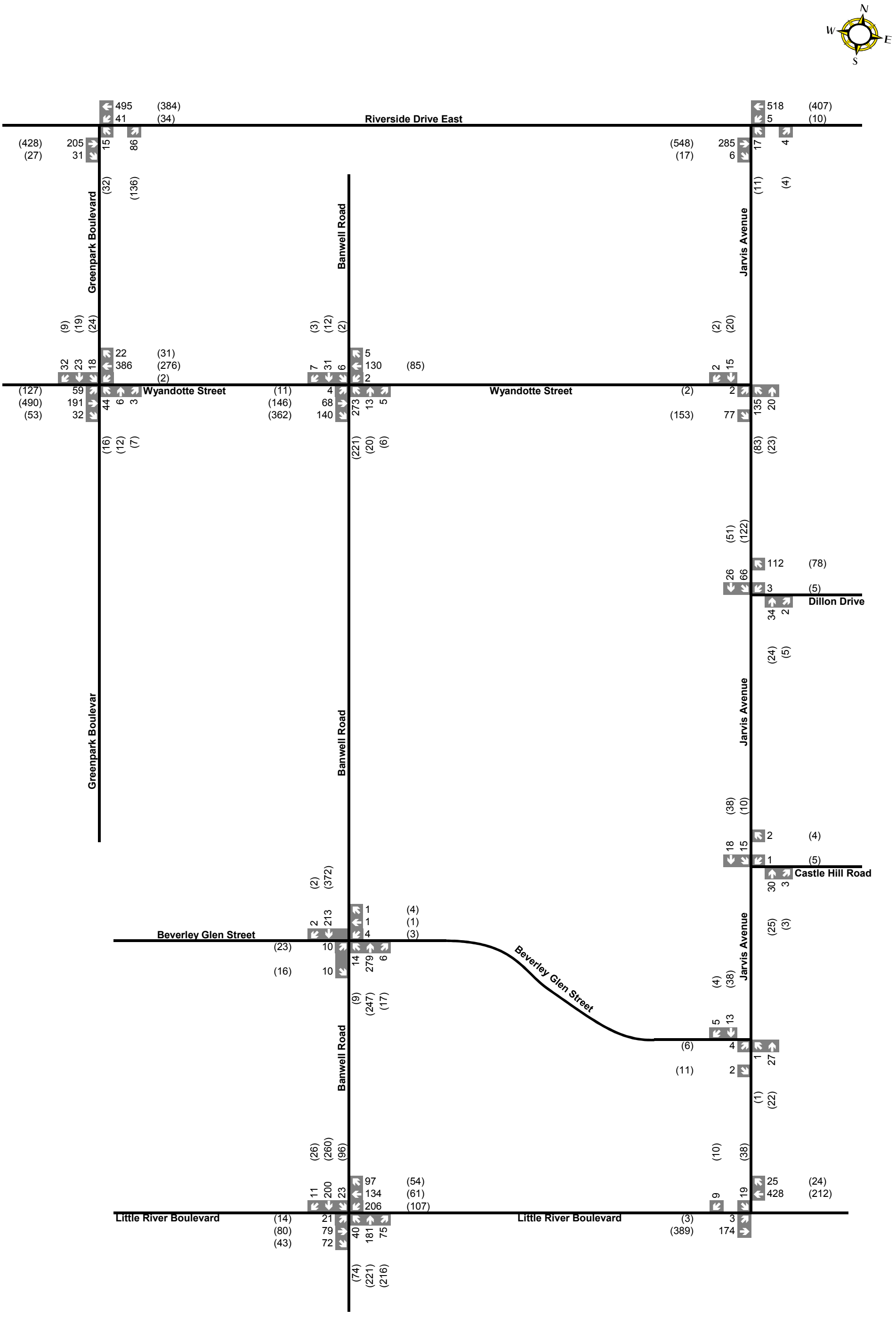
Legend

xx A.M. Peak Hour Traffic Volumes

(xx) P.M. Peak Hour Traffic Volumes

Figure A 2-5

Scenario 4 Traffic Volumes
20-year Horizon



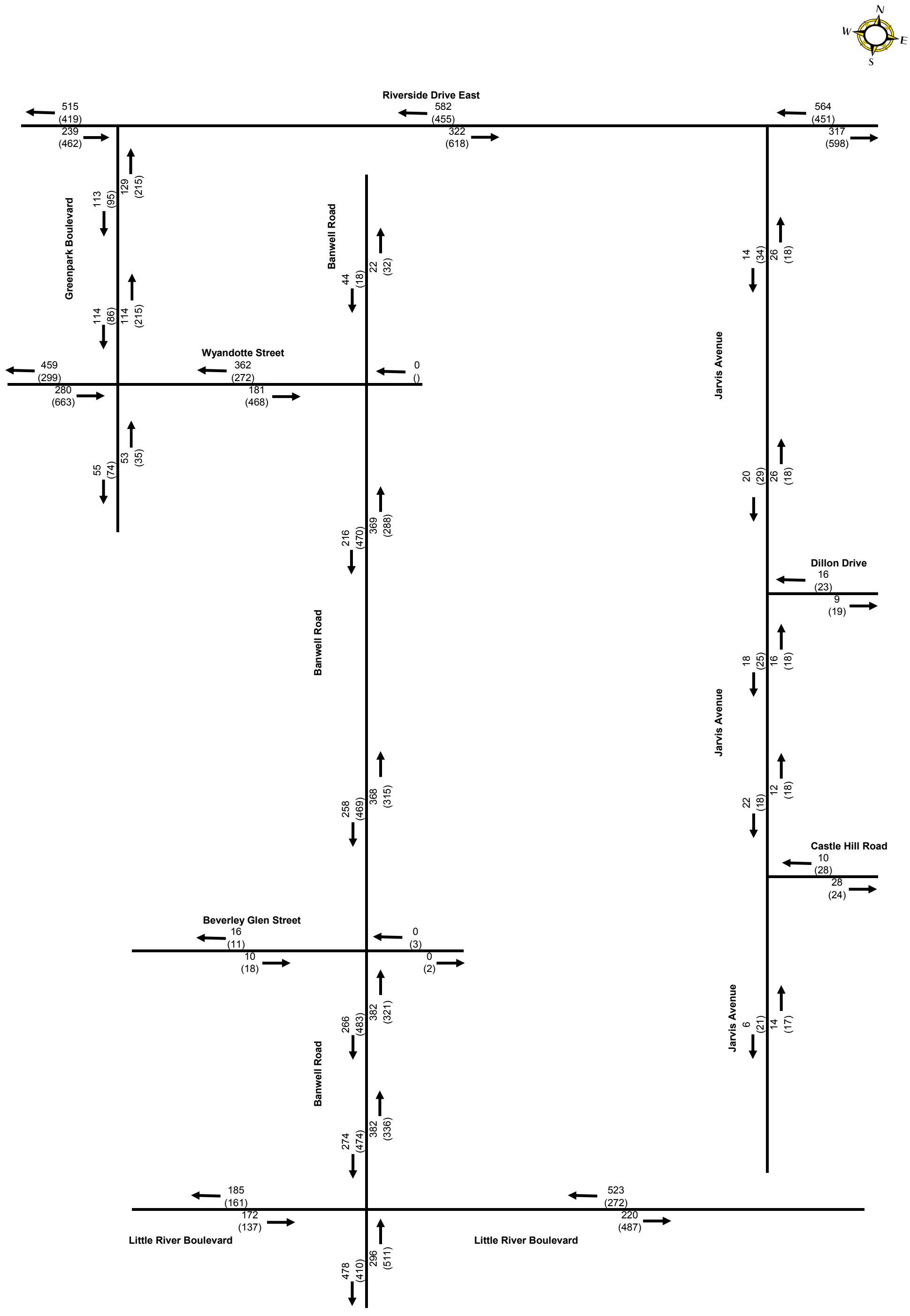
Legend

xx A.M. Peak Hour Traffic Volumes

(xx) P.M. Peak Hour Traffic Volumes

Figure A 2-6

Scenario 5 Traffic Volumes
20-year Horizon



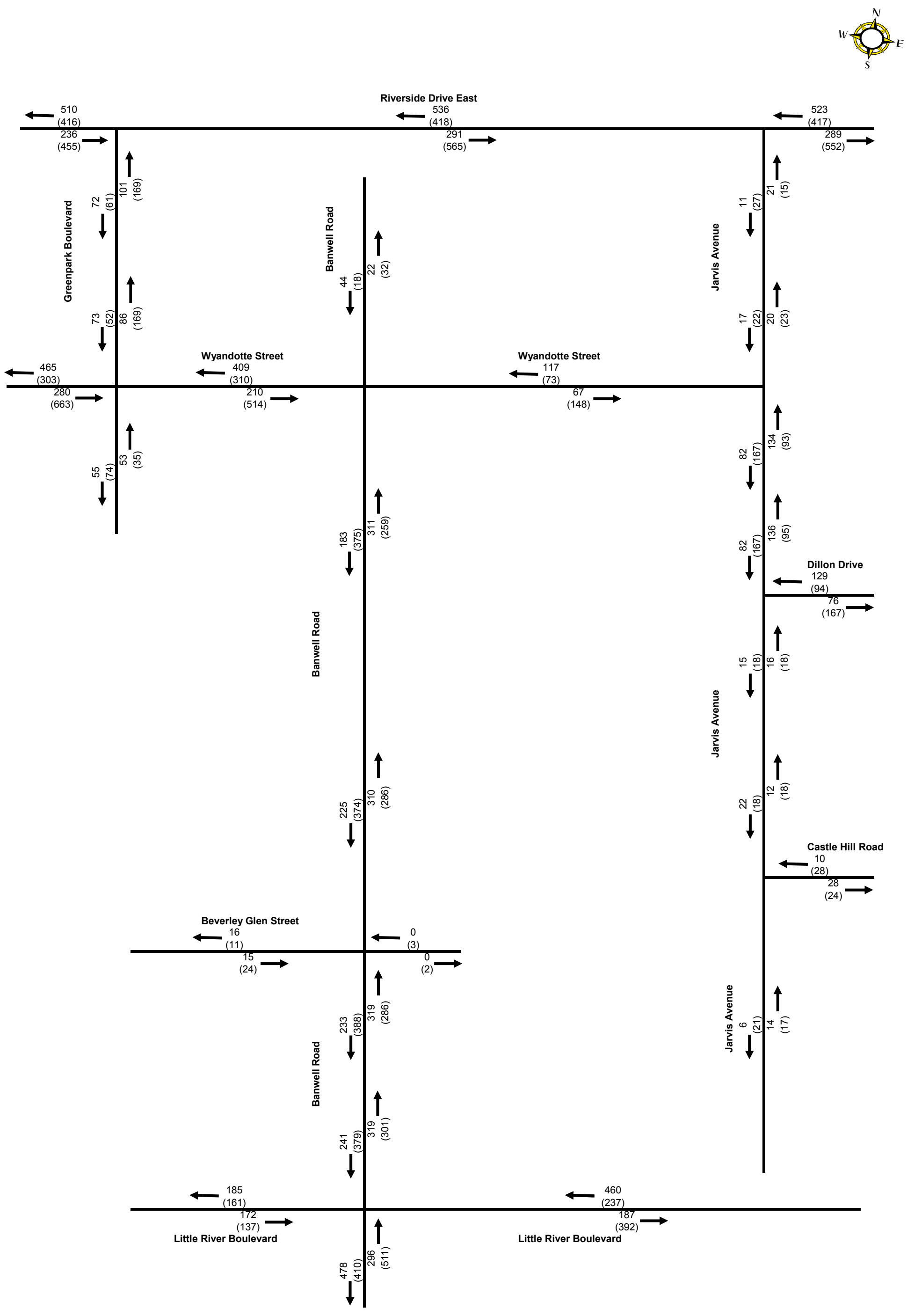
Legend

xx A.M. Peak Hour Link Volumes

(xx) P.M. Peak Hour Link Volumes

Figure A 2-7

Scenario 2a Link Volumes
20-year Horizon



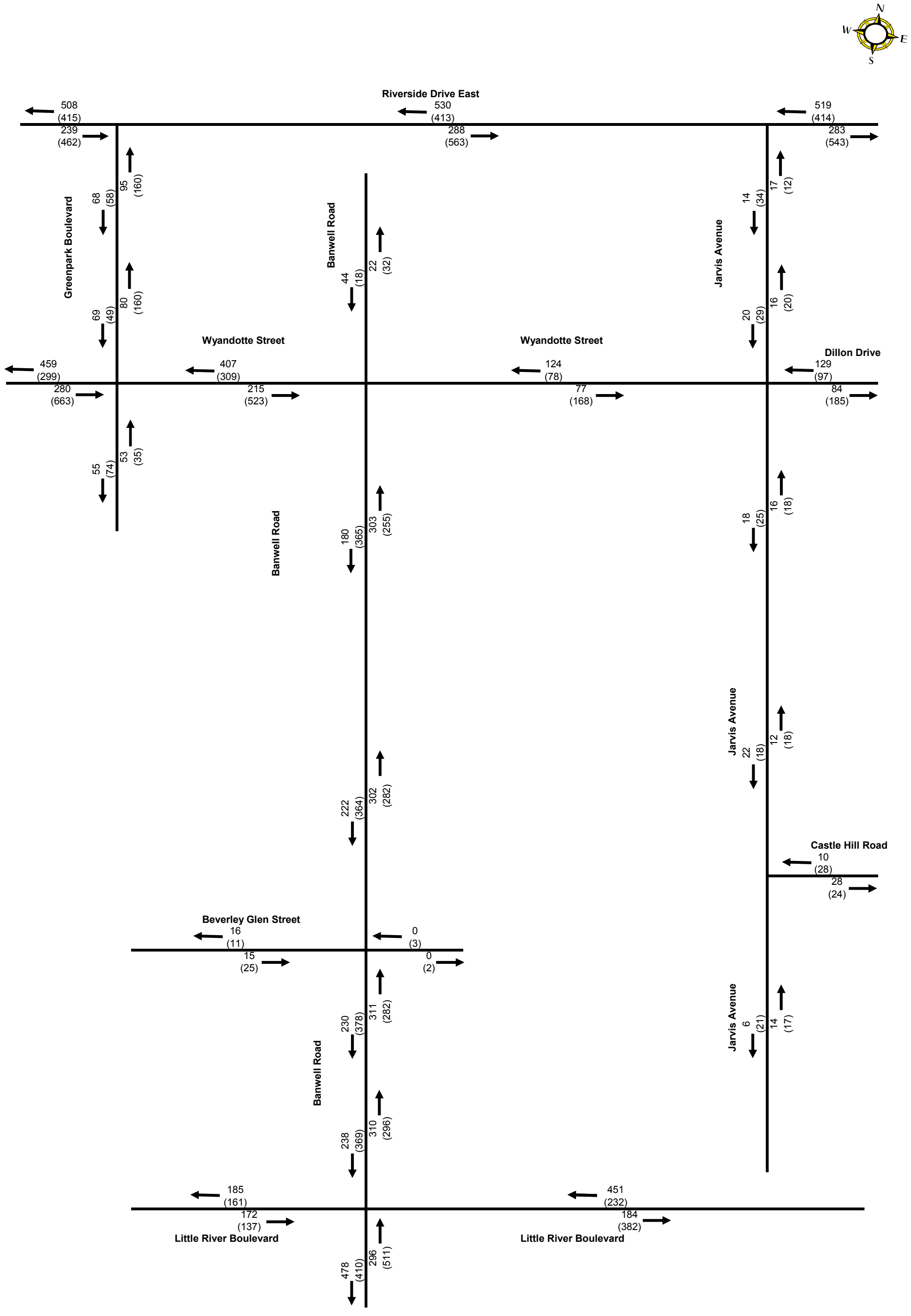
Legend

xx A.M. Peak Hour Link Volumes

(xx) P.M. Peak Hour Link Volumes

Figure A 2-8

Scenario 2a Link Volumes
20-year Horizon



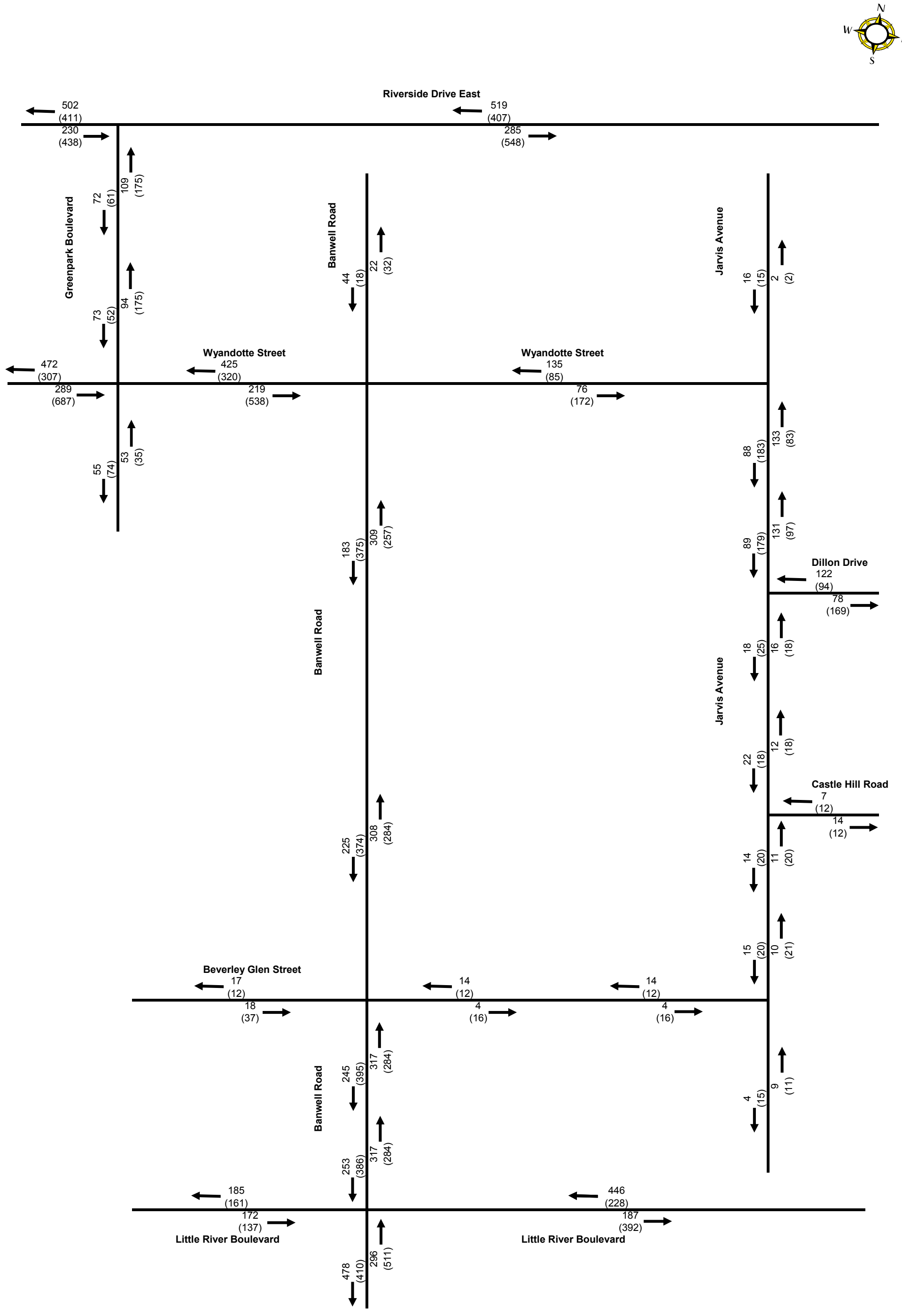
Legend

xx A.M. Peak Hour Link Volumes

(xx) P.M. Peak Hour Link Volumes

Figure A 2-9

Scenario 2b Link Volumes
20-year Horizon



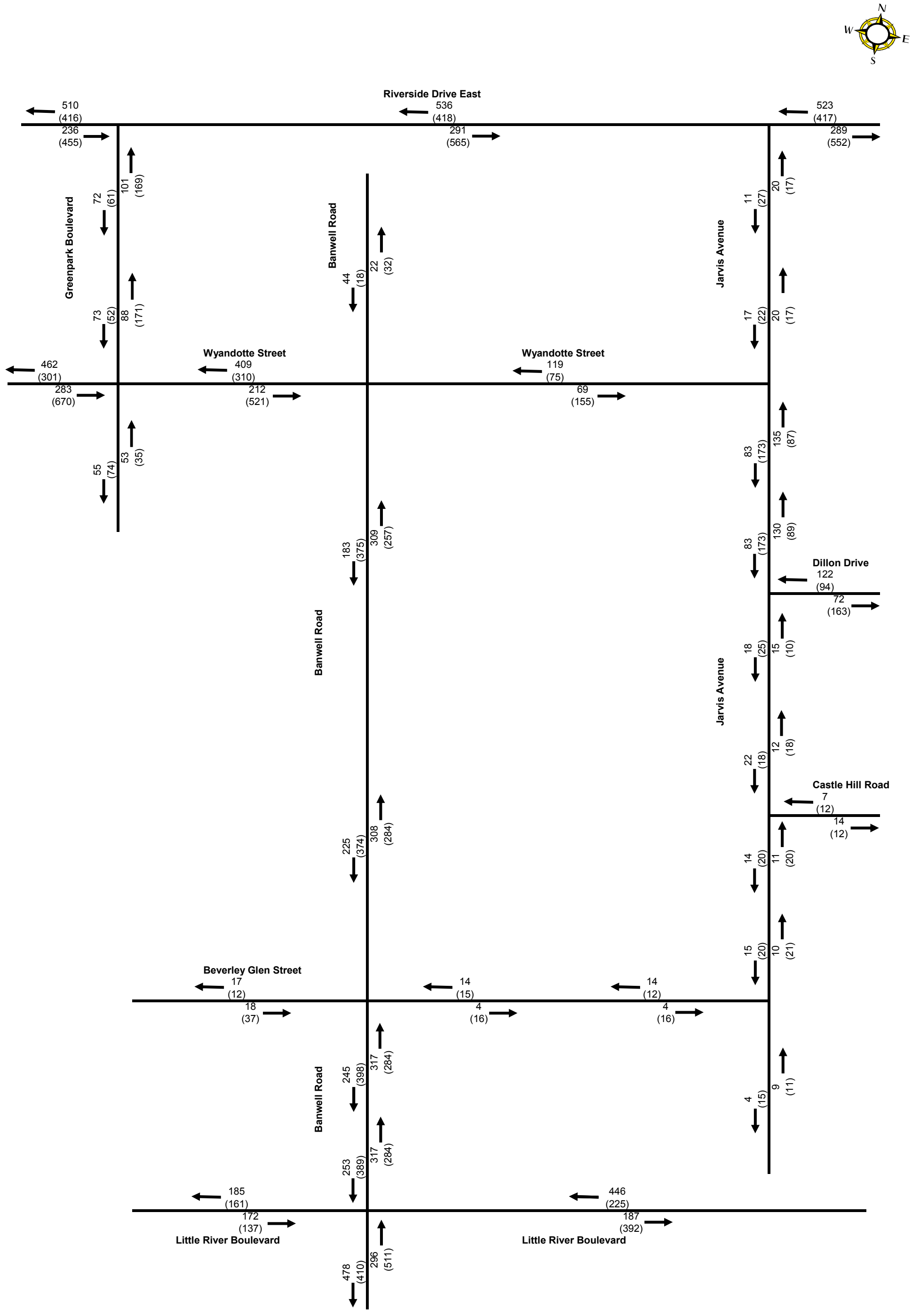
Legend

xx A.M. Peak Hour Link Volumes

(xx) P.M. Peak Hour Link Volumes

Figure A 2-10

Scenario 3 Link Volumes
20-year Horizon



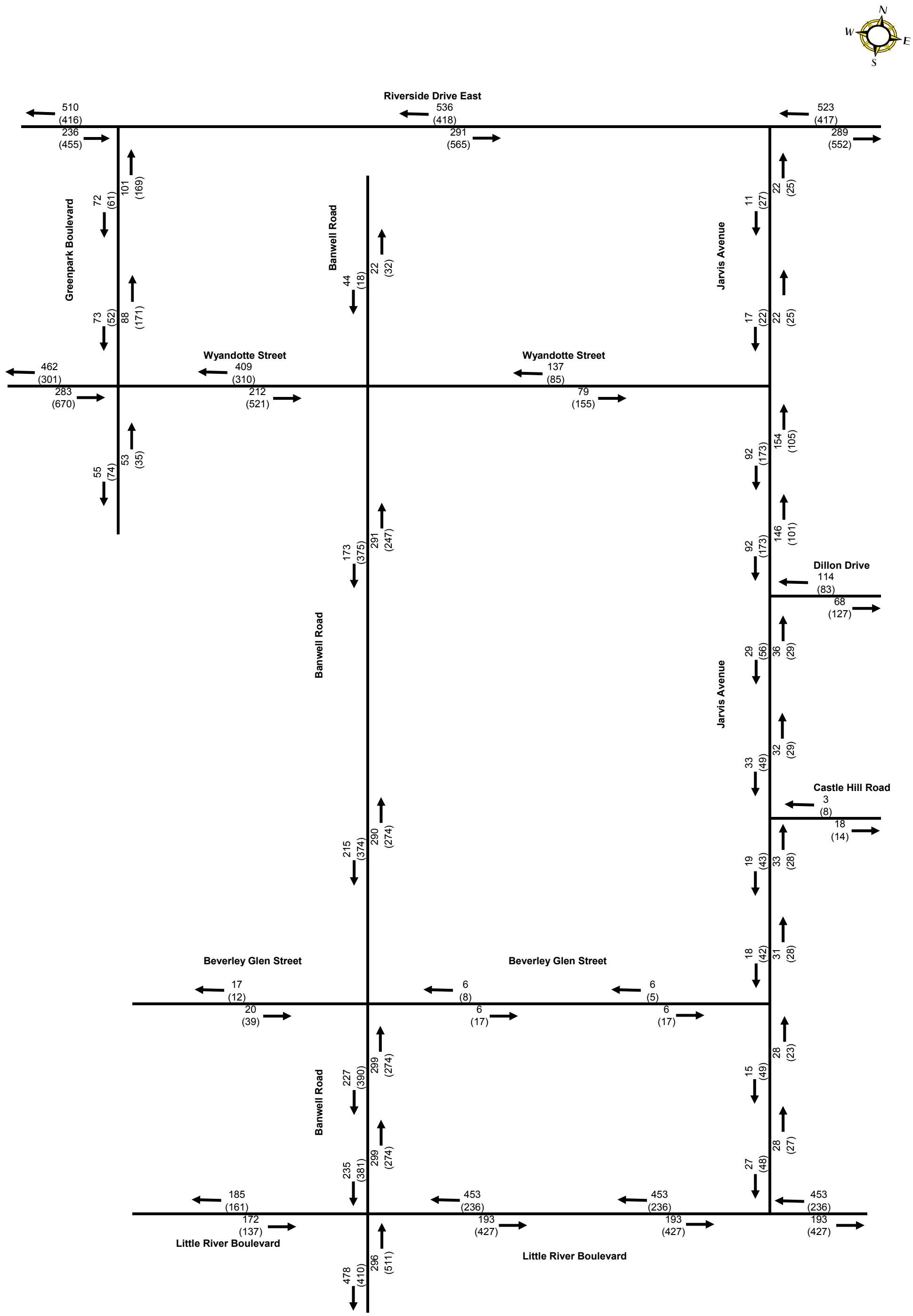
Legend

xx A.M. Peak Hour Link Volumes

(xx) P.M. Peak Hour Link Volumes

Figure A 2-11

Scenario 4 Link Volumes
20-year Horizon



wsp

Legend

xx A.M. Peak Hour Link Volumes

(xx) P.M. Peak Hour Link Volumes

Figure A 2-12

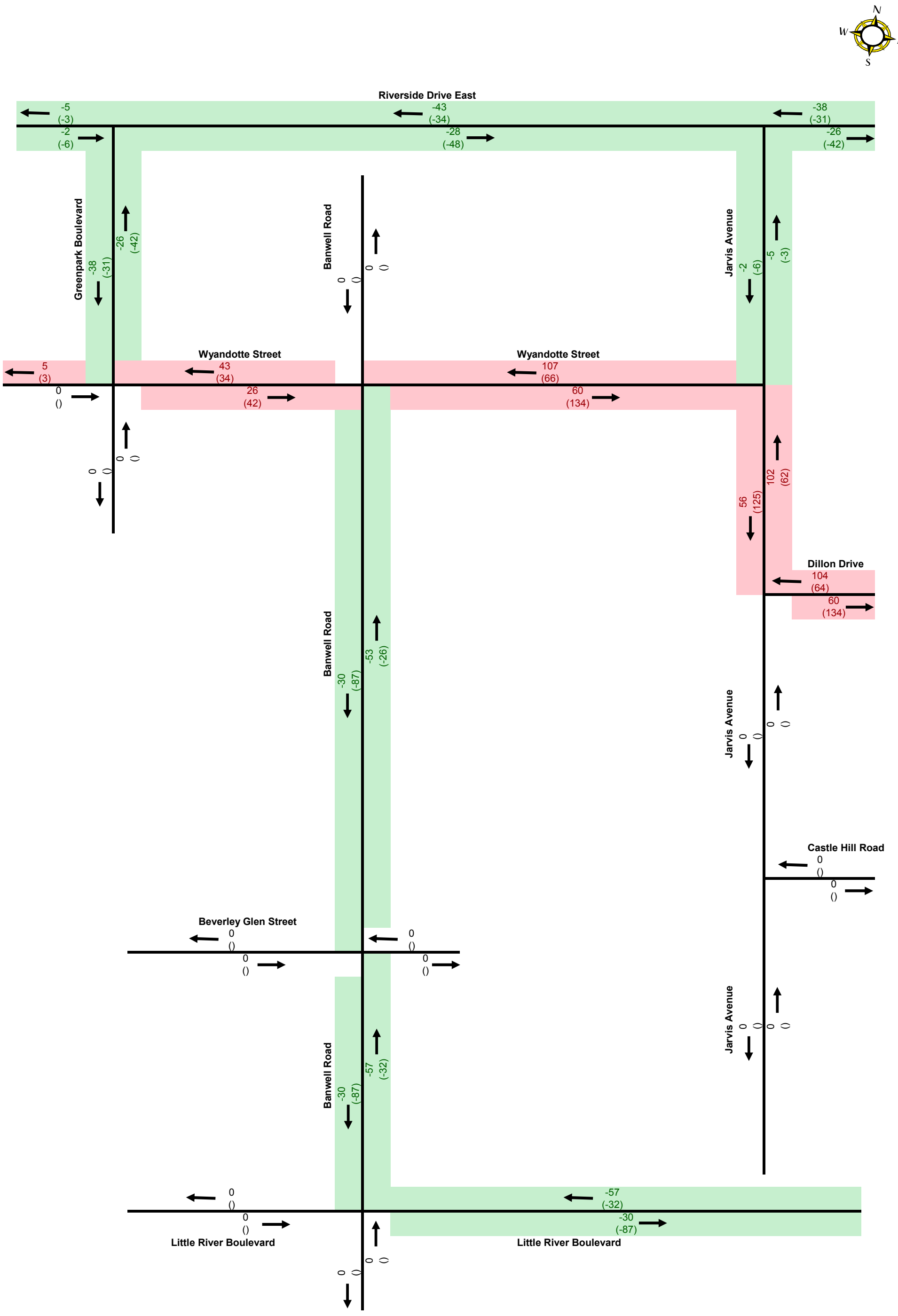
Scenario 5 Link Volumes
20-year Horizon

APPENDIX

B LINK VOLUME CHANGES

APPENDIX

B-1 10-YEAR HORIZON TRAFFIC VOLUMES



wsp

Legend

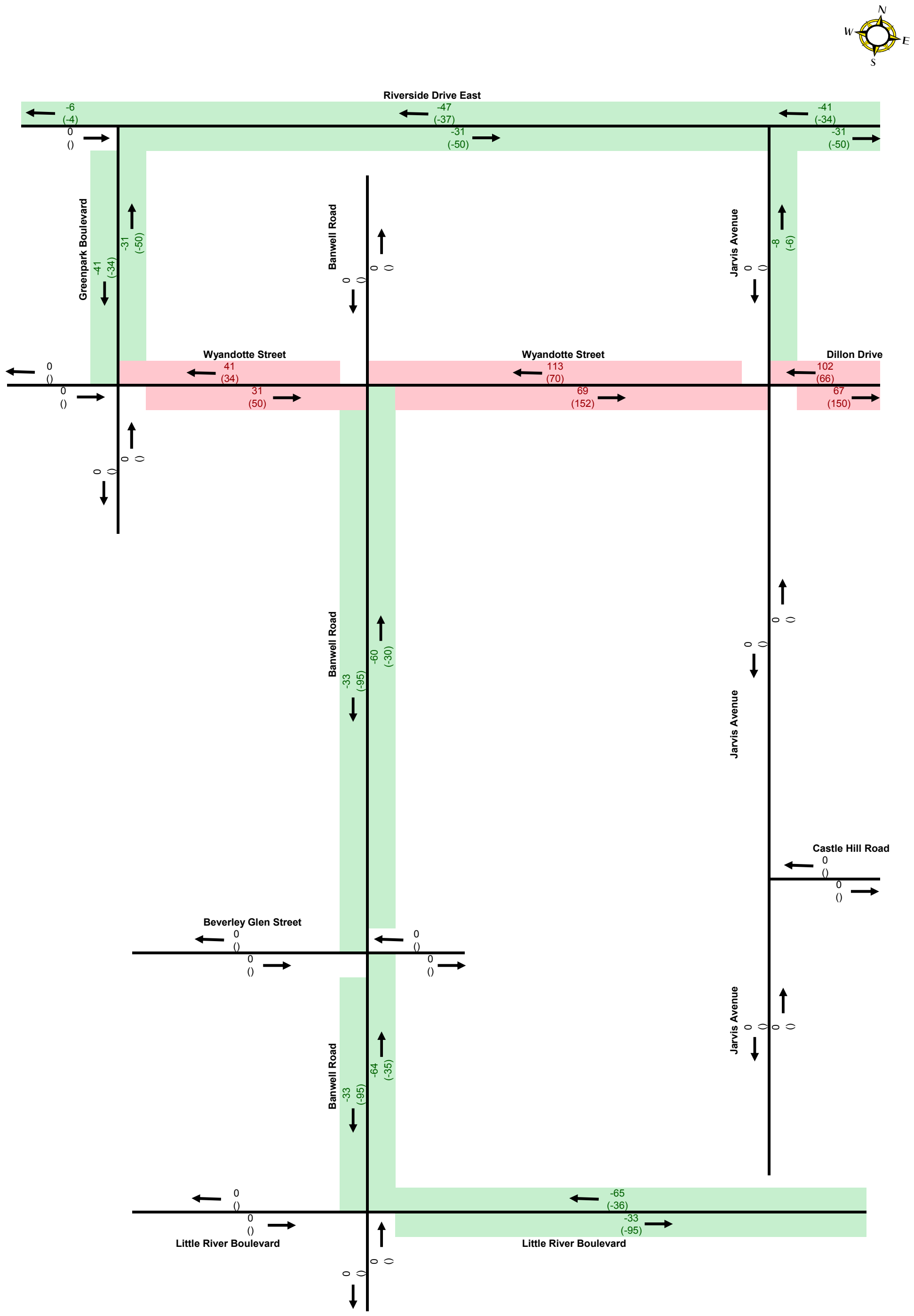
xx A.M. Peak Hour Link Volume Difference

(xx) P.M. Peak Hour Link Volume Difference

Decrease in Volume

Increase in Volume

Figure B 1-1
Link Volume Difference
(Scenario 2a - Scenario 1)
10-year Horizon



Legend

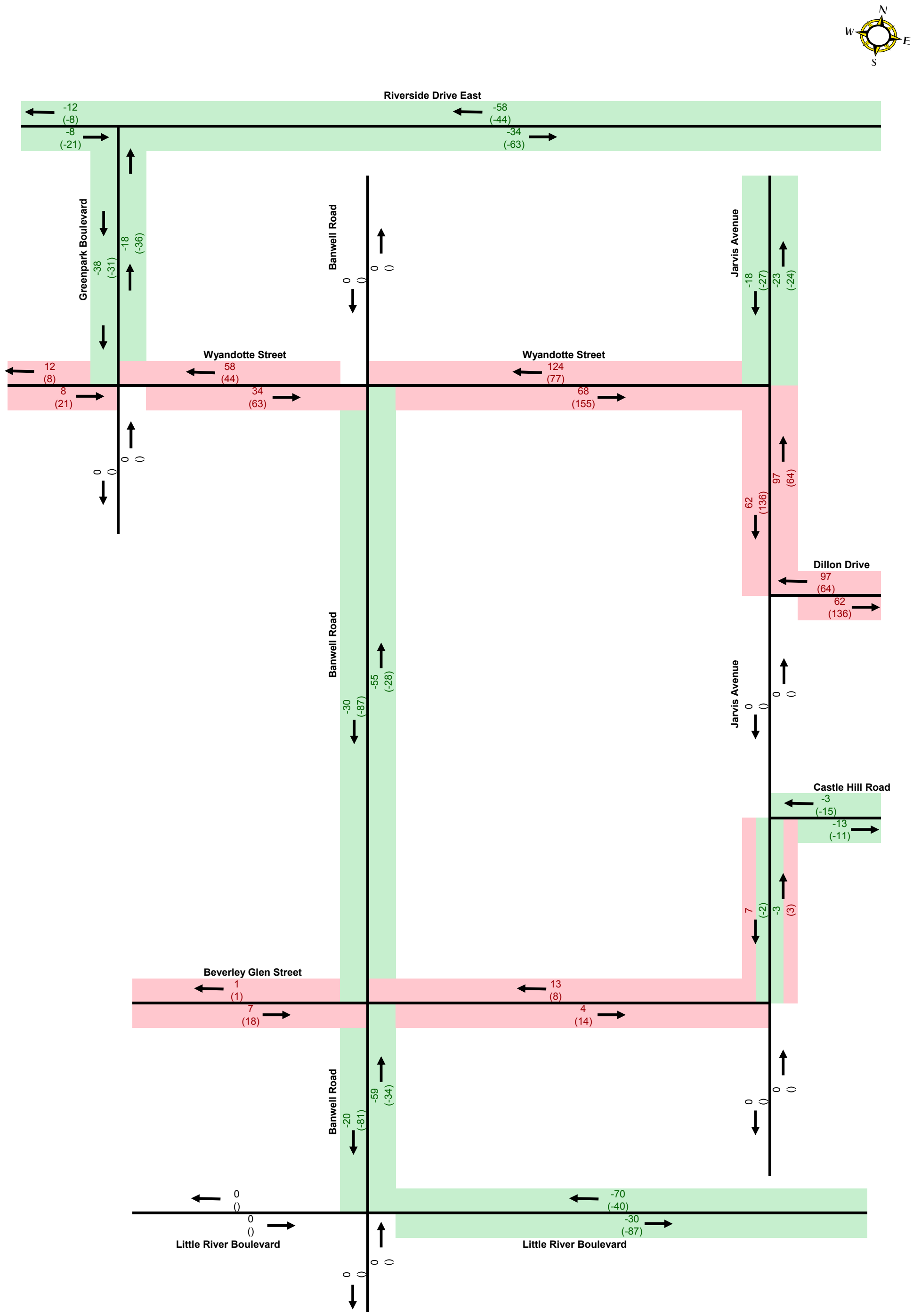
xx A.M. Peak Hour Link Volume Difference

(xx) P.M. Peak Hour Link Volume Difference

Decrease in Volume

Increase in Volume

Figure B 1-2
Link Volume Difference
(Scenario 2b - Scenario 1)
10-year Horizon



Legend

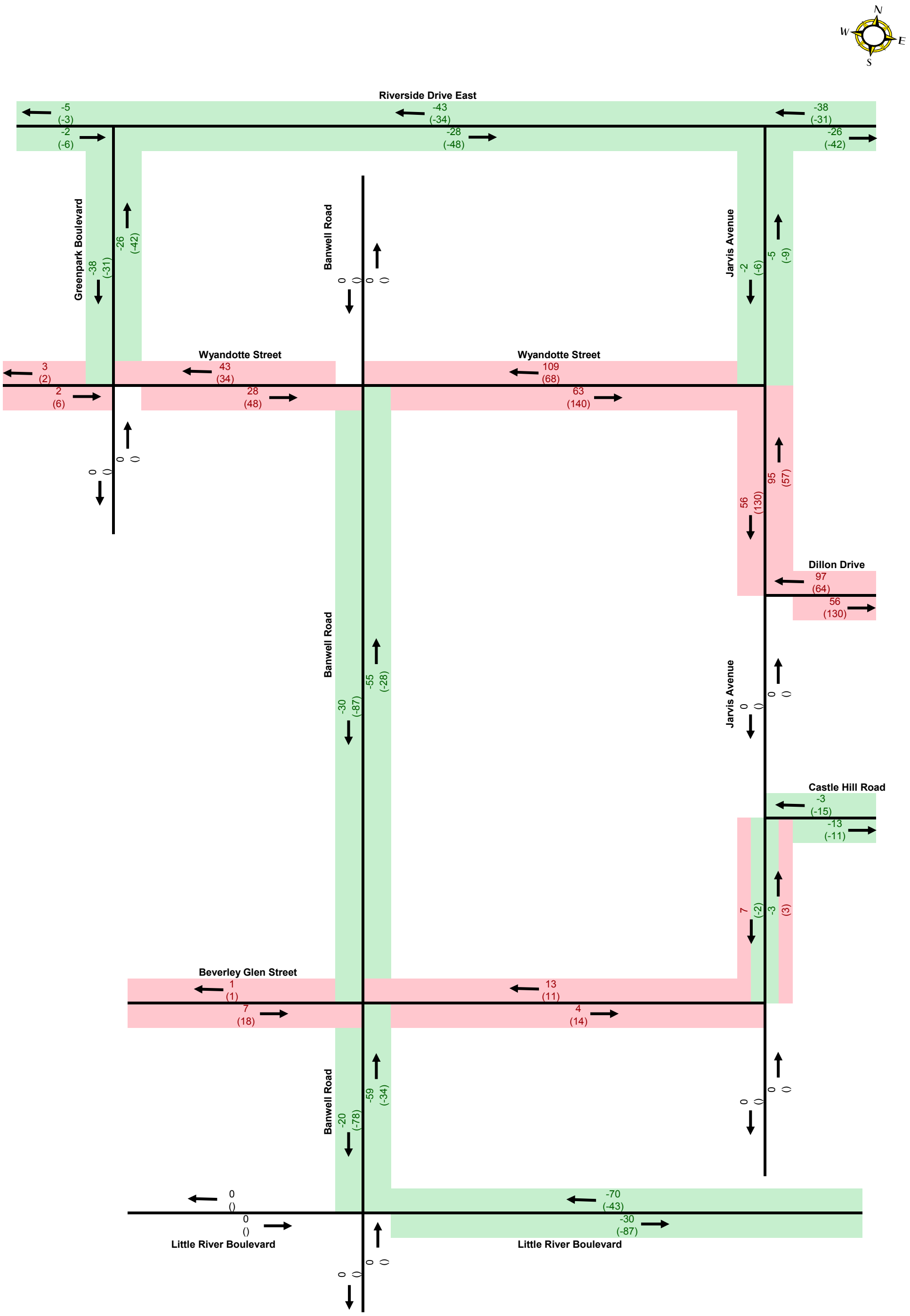
xx A.M. Peak Hour Link Volume Difference

(xx) P.M. Peak Hour Link Volume Difference

Decrease in Volume

Increase in Volume

Figure B 1-3
Link Volume Difference
(Scenario 3 - Scenario 1)
10-year Horizon



Legend

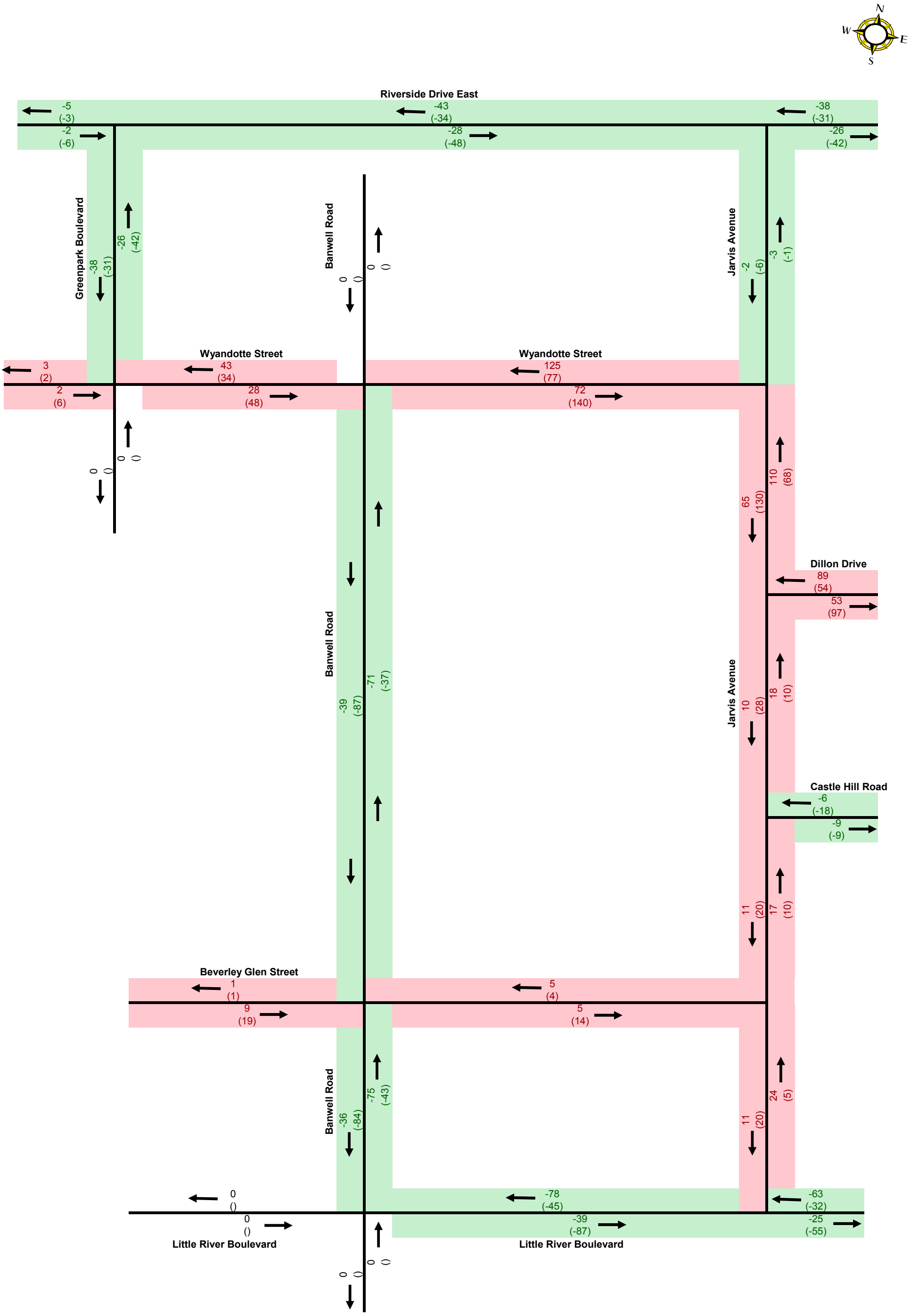
xx A.M. Peak Hour Link Volume Difference

(xx) P.M. Peak Hour Link Volume Difference

Decrease in Volume

Increase in Volume

Figure B 1-4
Link Volume Difference
(Scenario 4 - Scenario 1)
10-year Horizon



wsp

Legend

xx A.M. Peak Hour Link Volume Difference

(xx) P.M. Peak Hour Link Volume Difference

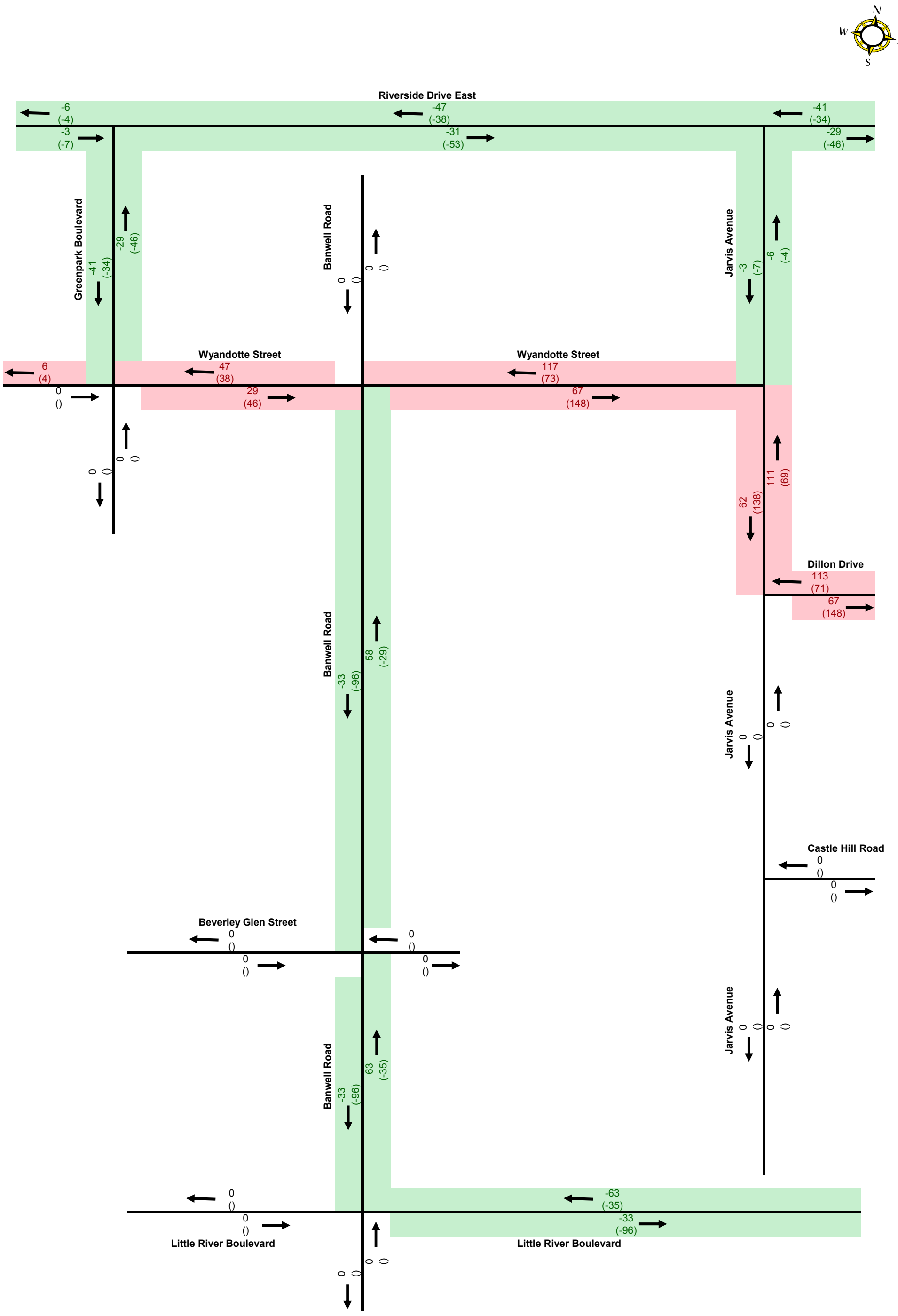
Decrease in Volume

Increase in Volume

Figure B 1-5
Link Volume Difference
(Scenario 5 - Scenario 1)
10-year Horizon

APPENDIX

B-2 20-YEAR HORIZON LINK VOLUME CHANGES



Legend

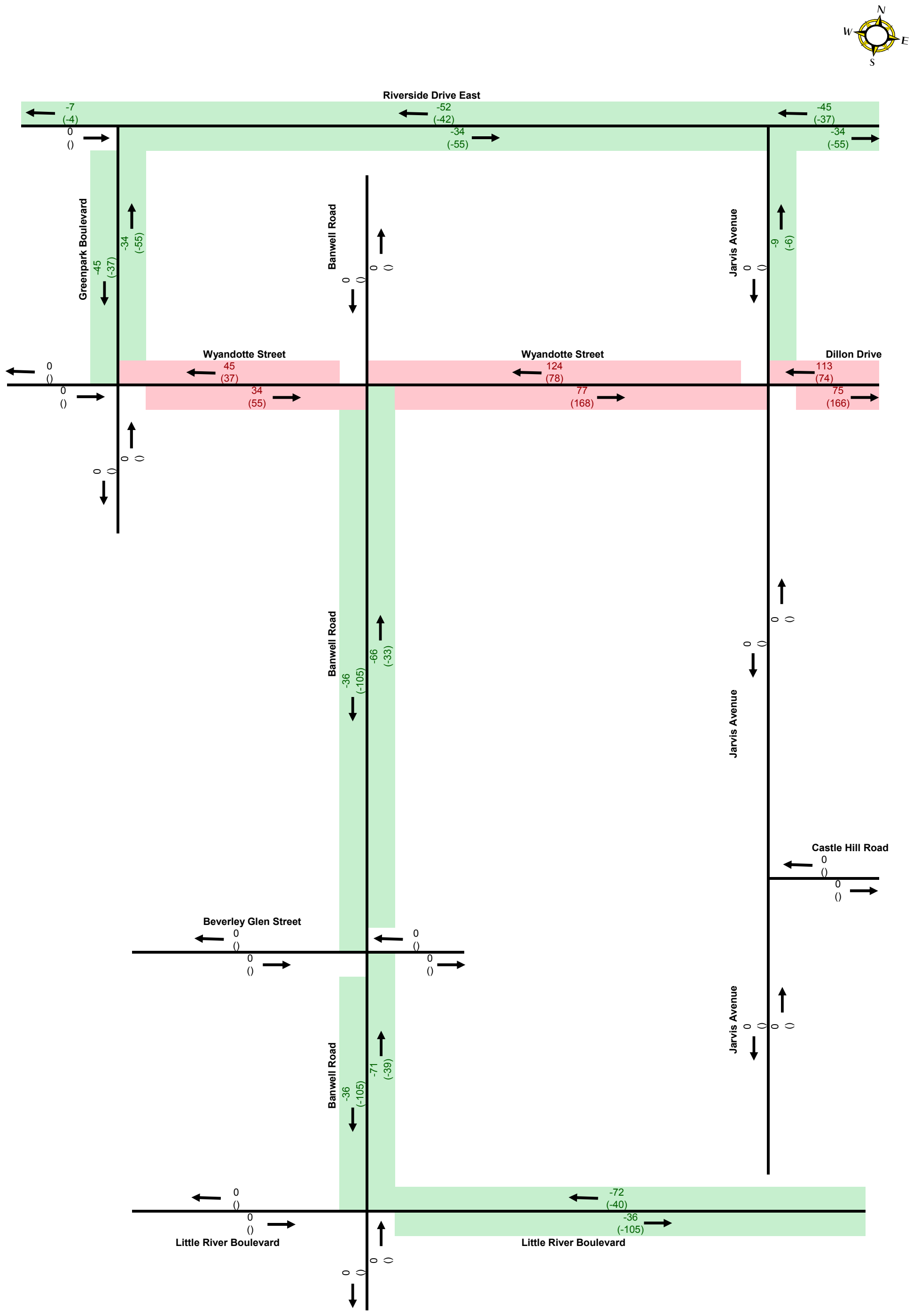
xx A.M. Peak Hour Link Volume Difference

(xx) P.M. Peak Hour Link Volume Difference

Decrease in Volume

Increase in Volume

Figure B 2-1
Link Volume Difference
(Scenario 2a - Scenario 1)
20-year Horizon



Legend

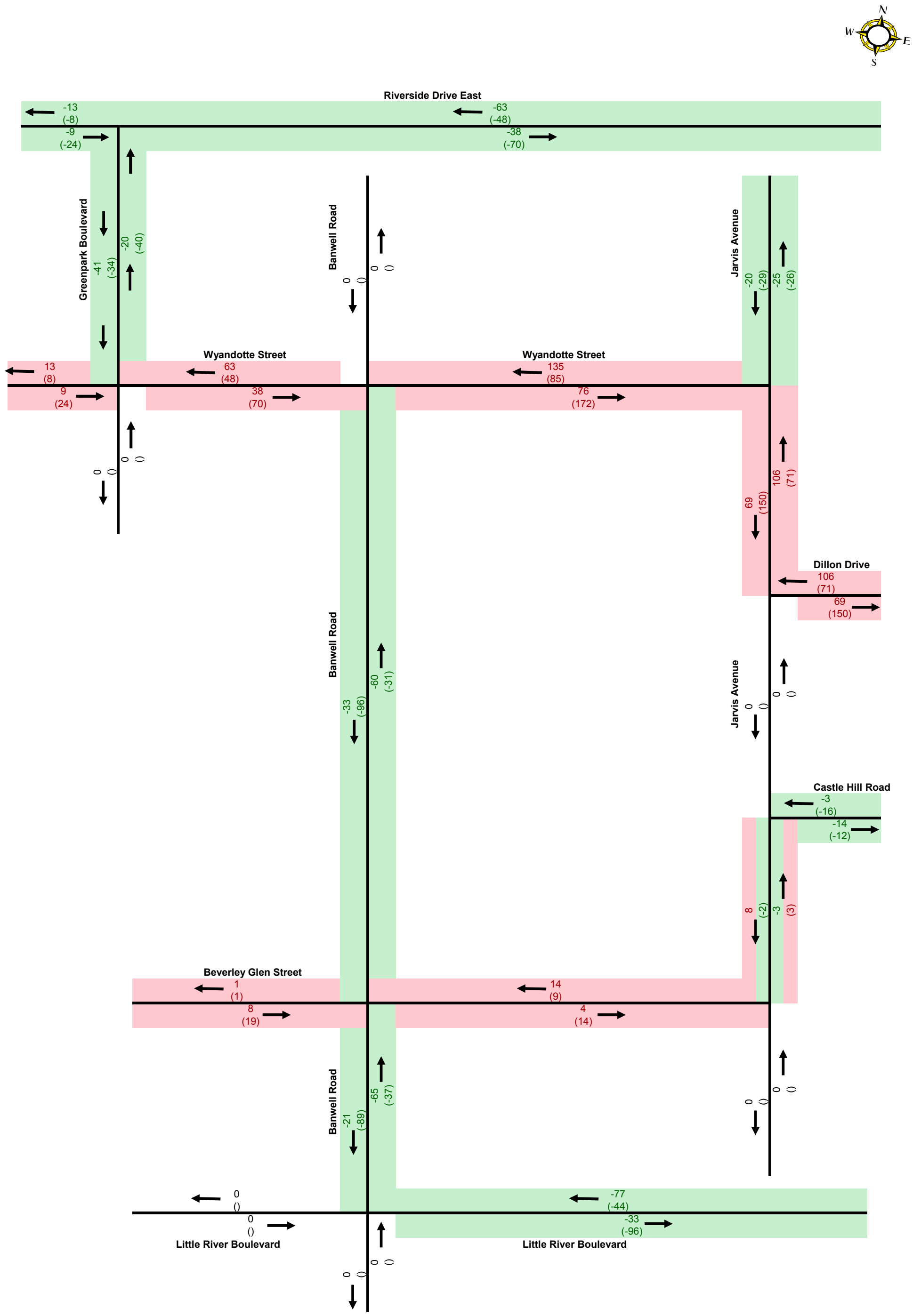
xx A.M. Peak Hour Link Volume Difference

(xx) P.M. Peak Hour Link Volume Difference

Decrease in Volume

Increase in Volume

Figure B 2-2
Link Volume Difference
(Scenario 2b - Scenario 1)
20-year Horizon



Legend

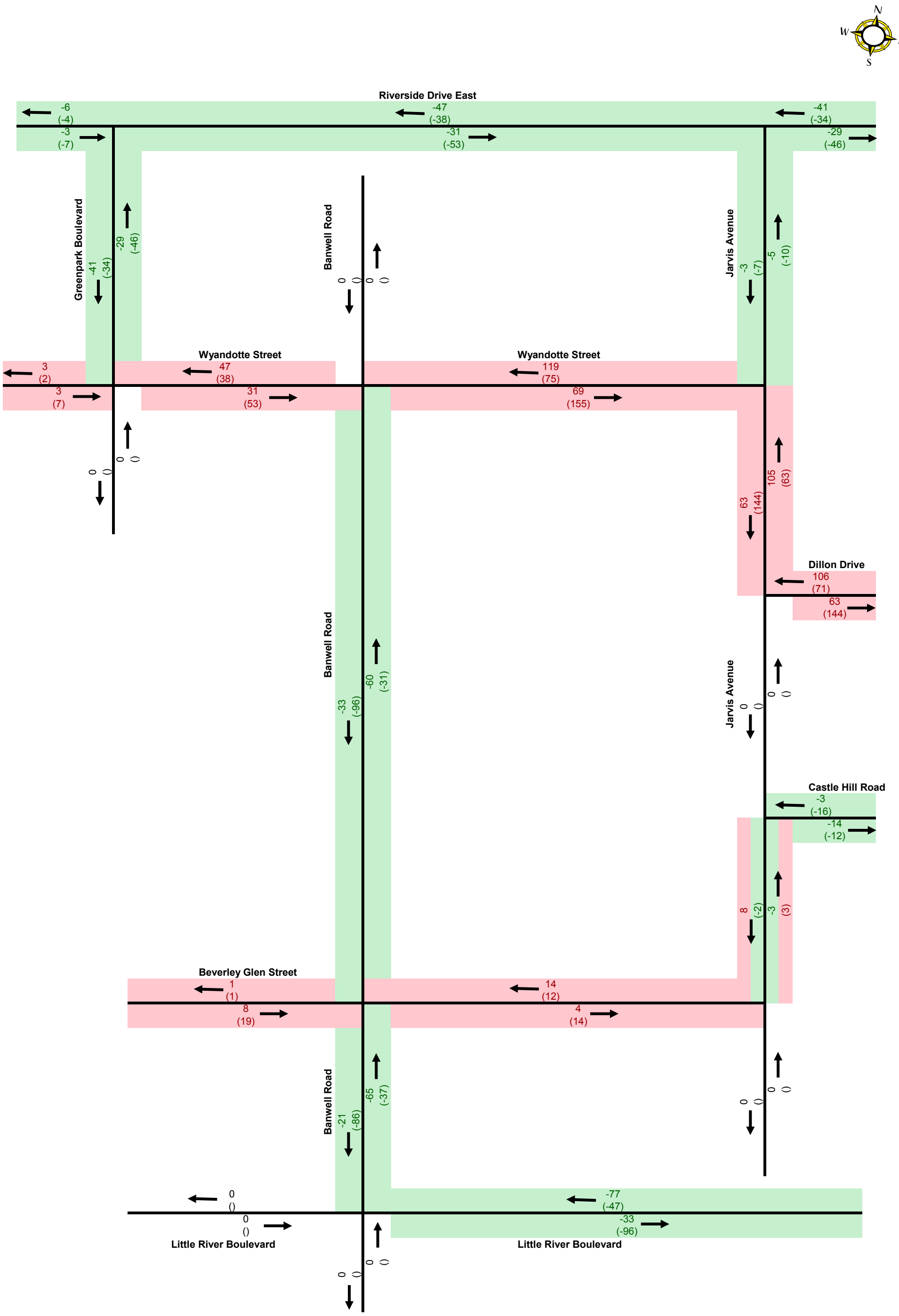
xx A.M. Peak Hour Link Volume Difference

(xx) P.M. Peak Hour Link Volume Difference

Decrease in Volume

Increase in Volume

Figure B 2-3
Link Volume Difference
(Scenario 3 - Scenario 1)
20-year Horizon



wsp

Legend

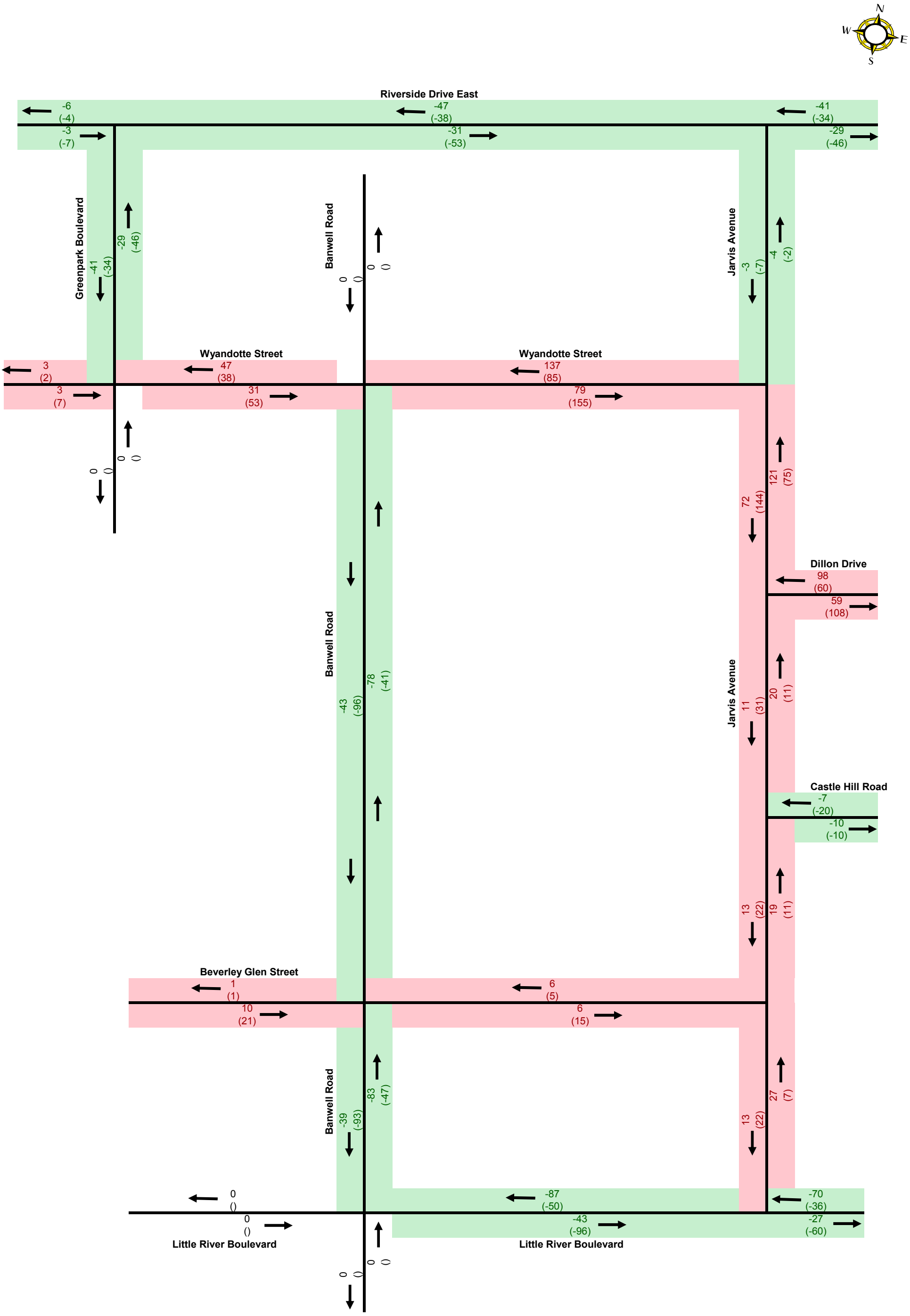
xx A.M. Peak Hour Link Volume Difference

(xx) P.M. Peak Hour Link Volume Difference

Decrease in Volume

Increase in Volume

Figure B 2-4
Link Volume Difference
(Scenario 4 - Scenario 1)
20-year Horizon



Legend

xx A.M. Peak Hour Link Volume Difference

(xx) P.M. Peak Hour Link Volume Difference

Decrease in Volume

Increase in Volume

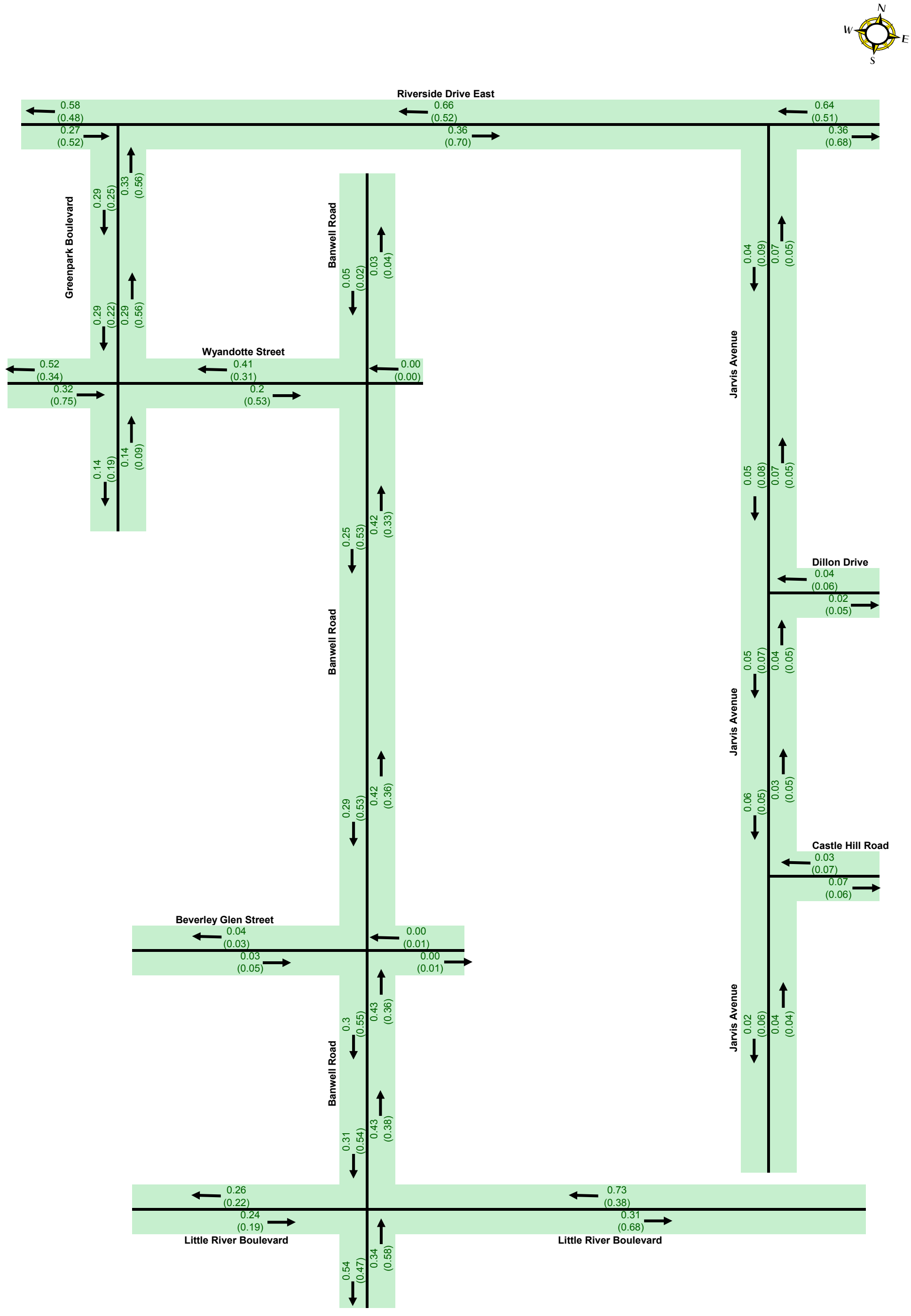
Figure B 2-5
Link Volume Difference
(Scenario 5 - Scenario 1)
20-year Horizon

APPENDIX

C LINK V/C RATIOS

APPENDIX

C-1 10-YEAR HORIZON LINK V/C RATIOS

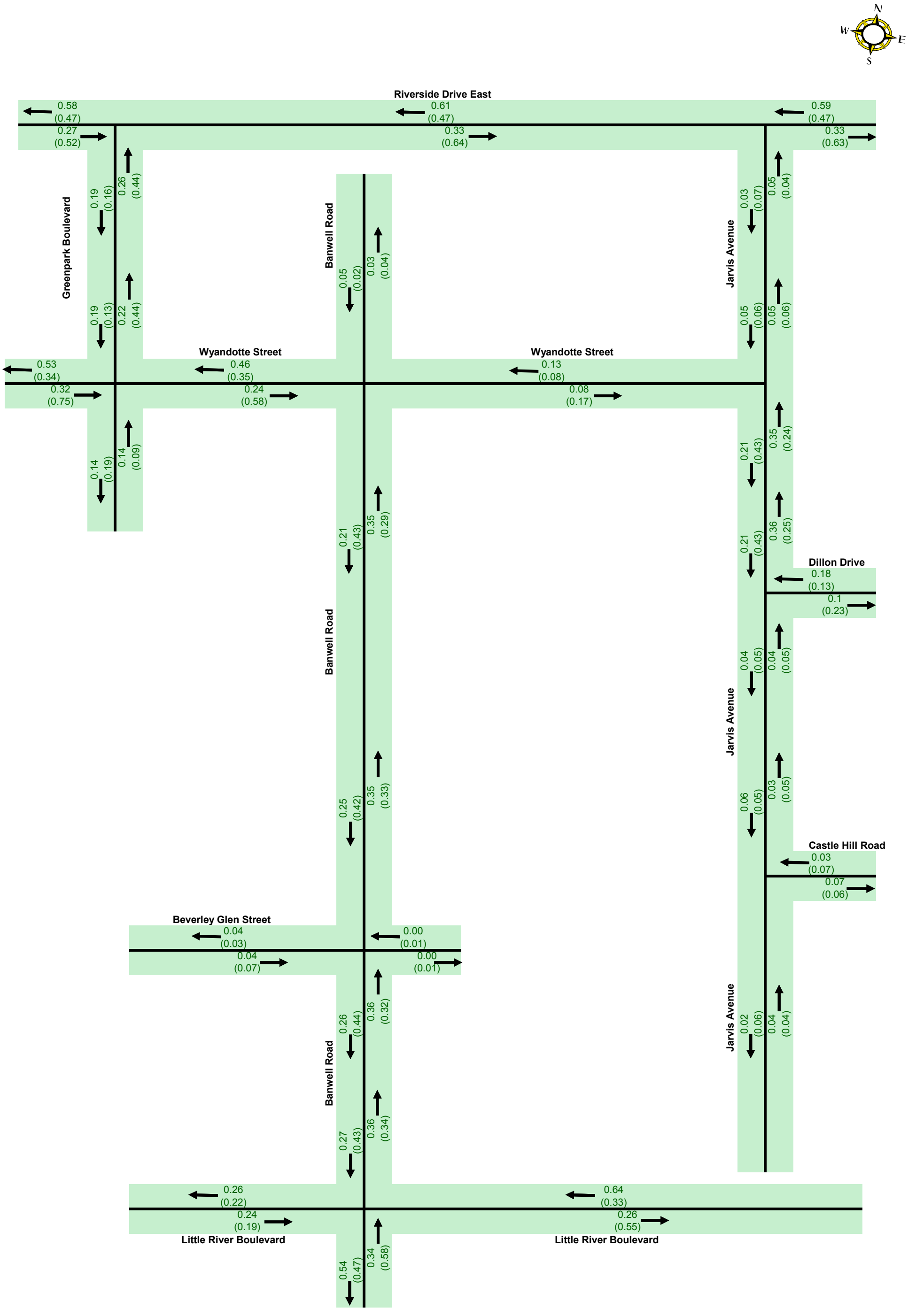


Legend

xx A.M. Peak Hour Link V/C Ratios

(xx) P.M. Peak Hour Link V/C Ratios

Figure C 1-1
Scenario 1
Volume-to-Capacity Ratios
10-year Horizon



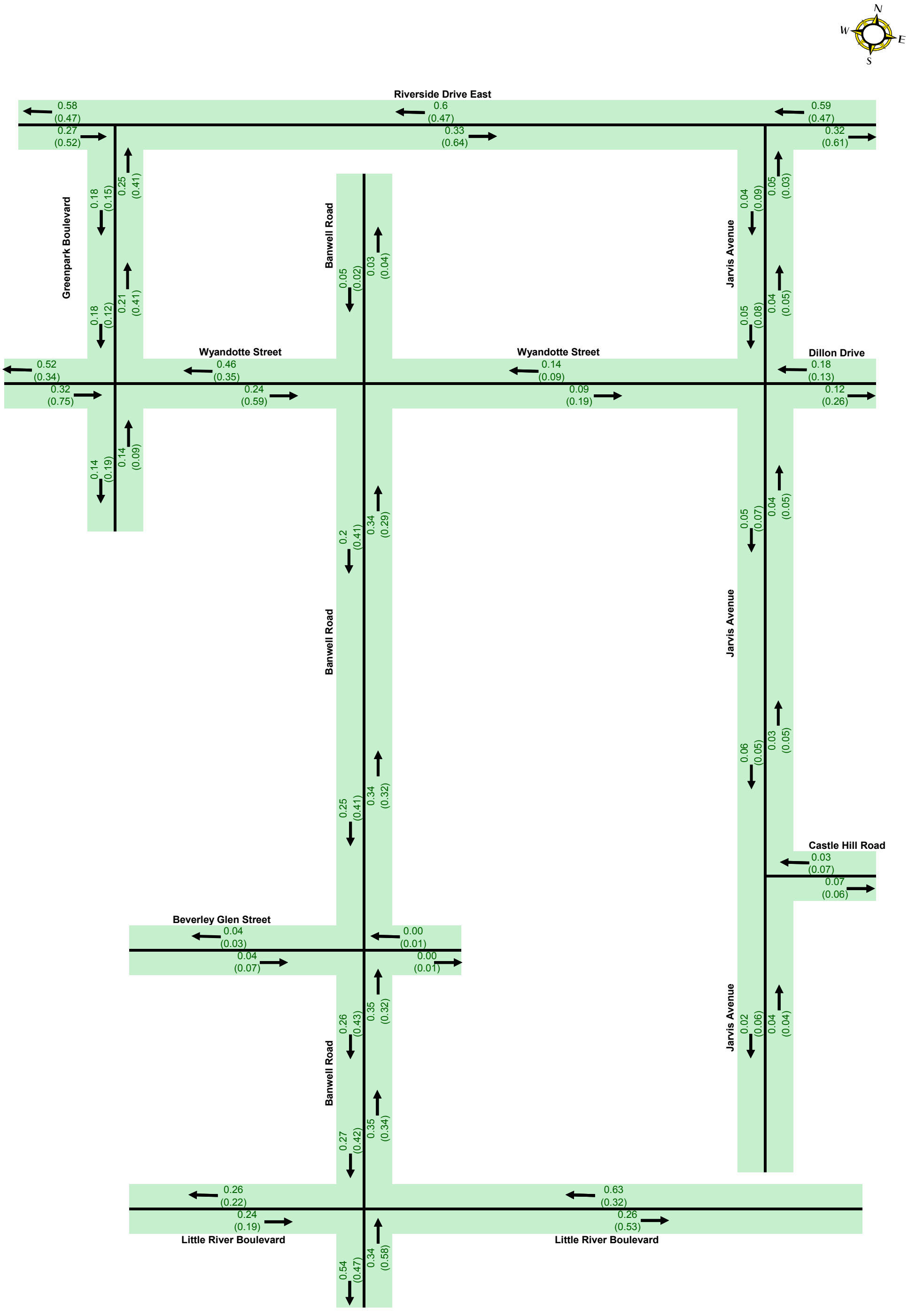
wsp

Legend

xx A.M. Peak Hour Link V/C Ratios

(xx) P.M. Peak Hour Link V/C Ratios

Figure C 1-2
Scenario 2a
Volume-to-Capacity Ratios
10-year Horizon

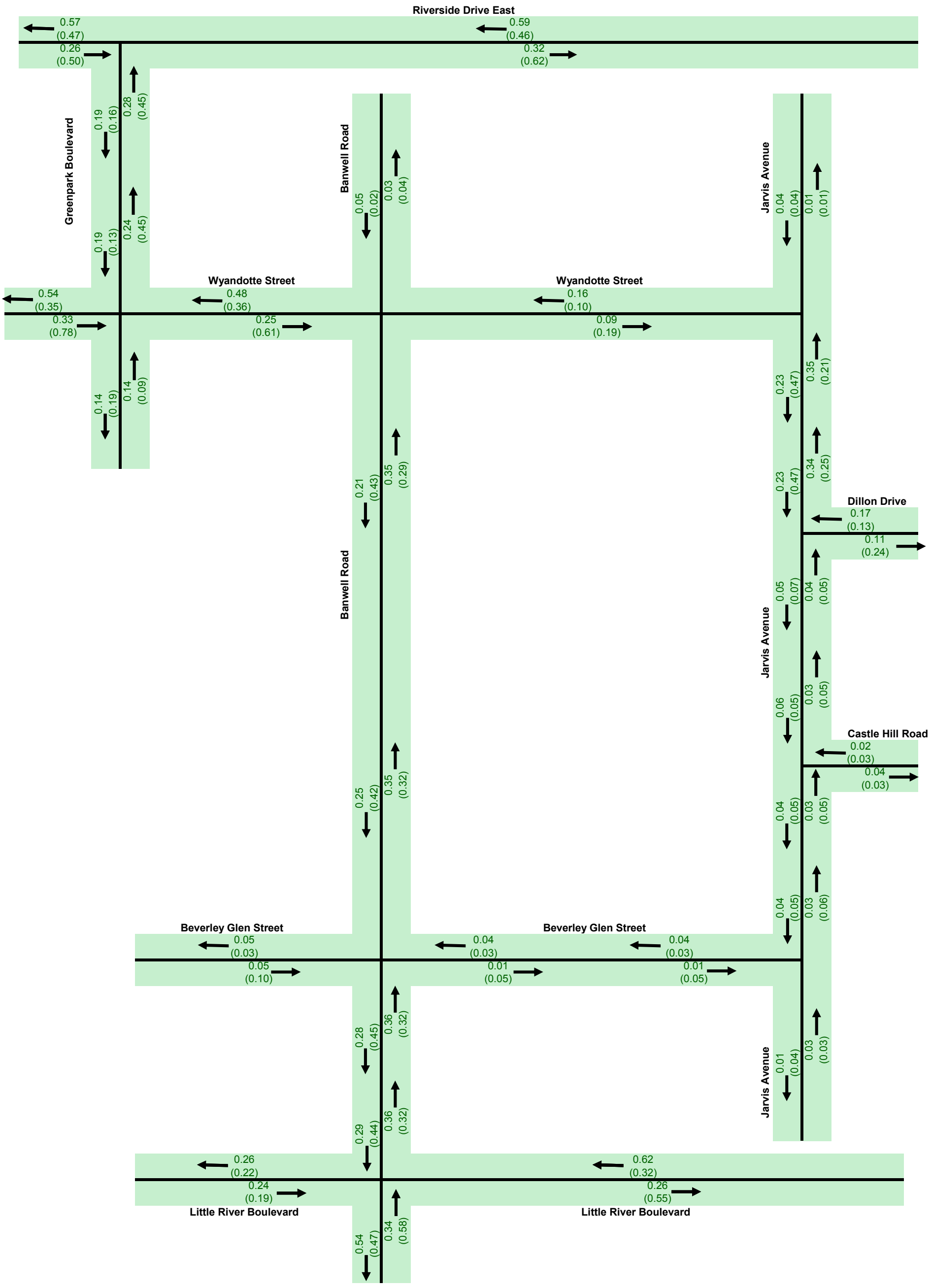


Legend

xx A.M. Peak Hour Link V/C Ratios

(xx) P.M. Peak Hour Link V/C Ratios

Figure C 1-3
Scenario 2b
Volume-to-Capacity Ratios
10-year Horizon



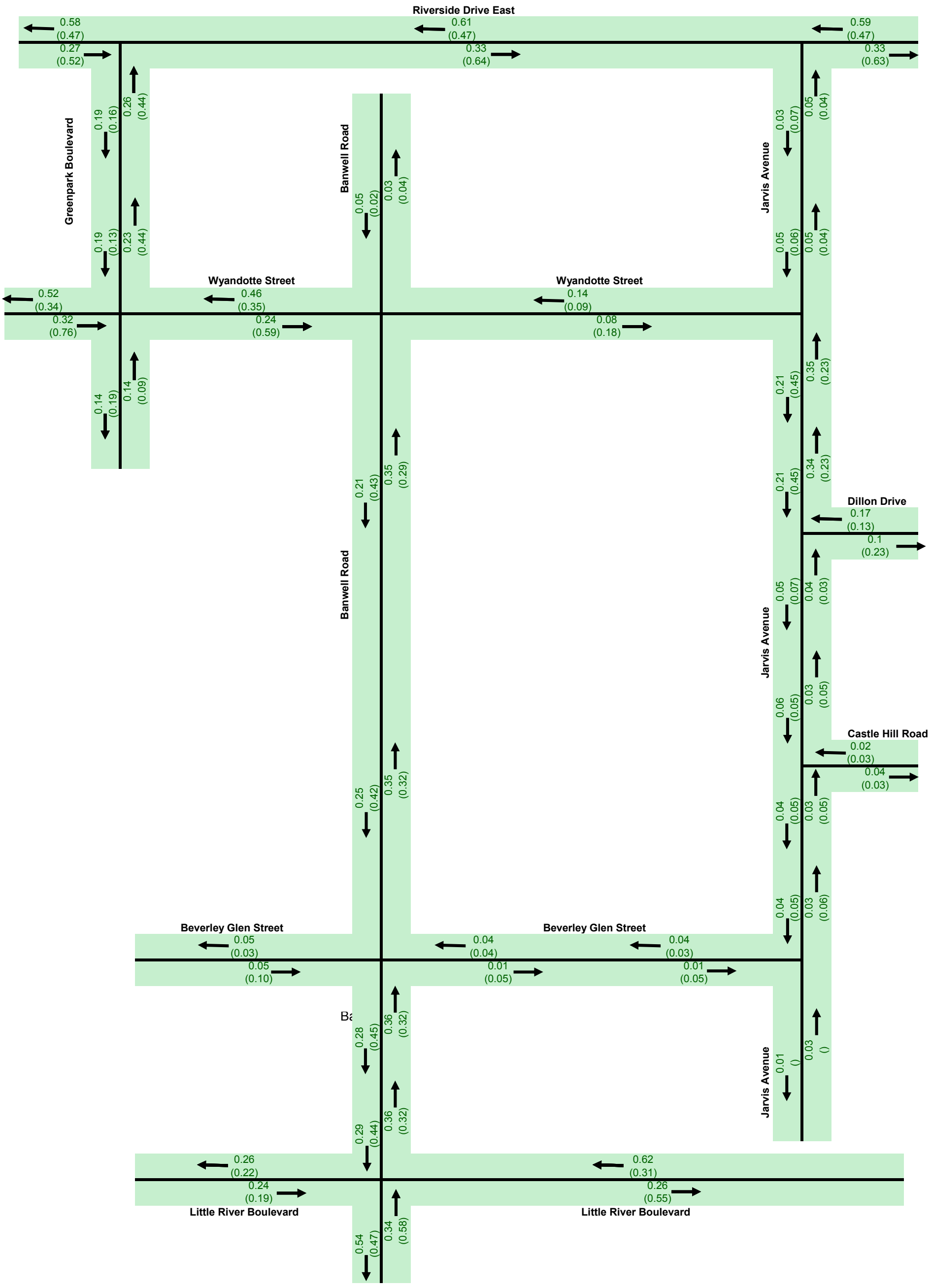
wsp

Legend

xx A.M. Peak Hour Link V/C Ratios

(xx) P.M. Peak Hour Link V/C Ratios

Figure C 1-4
Scenario 3
Volume-to-Capacity Ratios
10-year Horizon



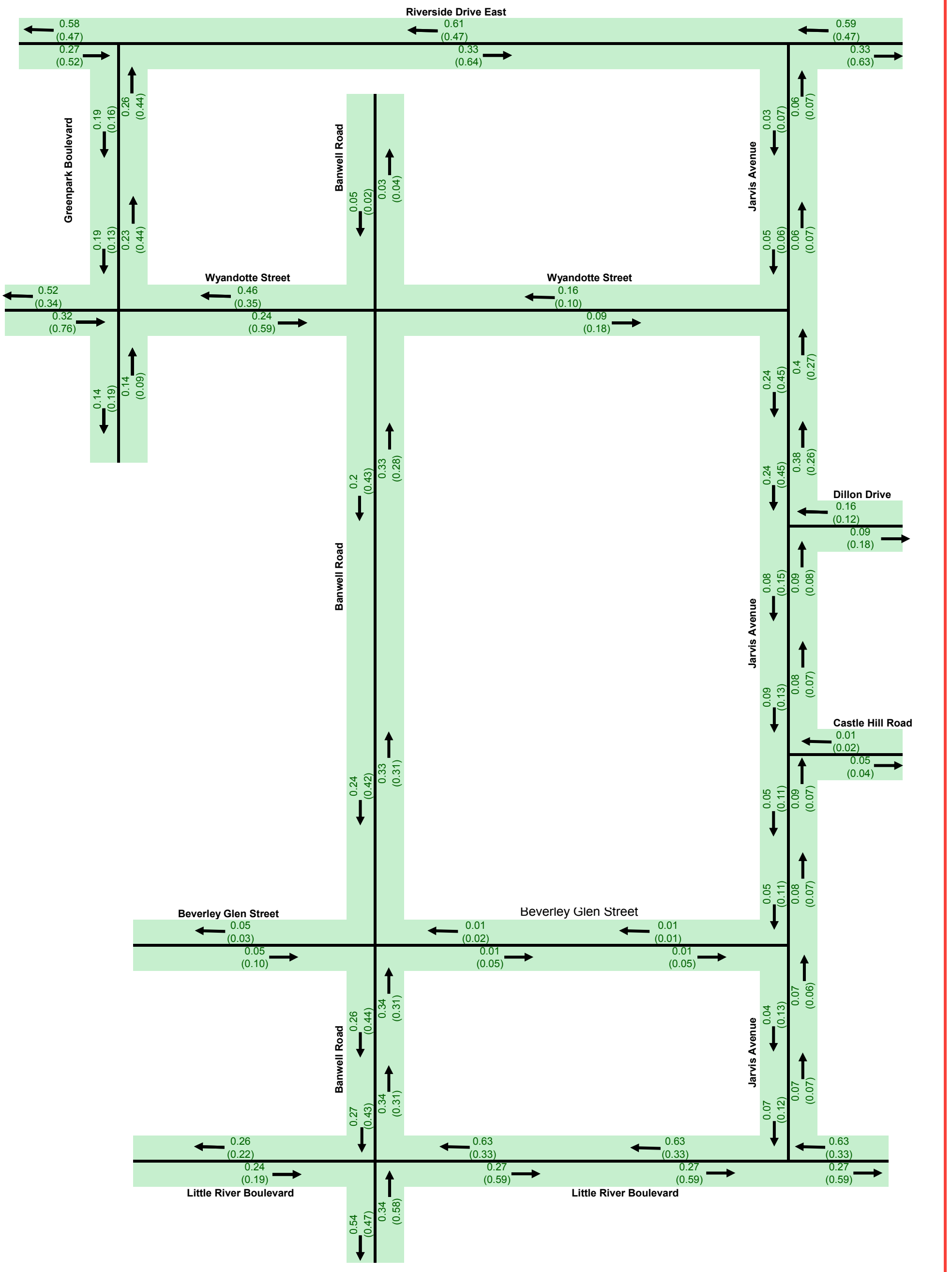
wsp

Legend

xx A.M. Peak Hour Link V/C Ratios

(xx) P.M. Peak Hour Link V/C Ratios

Figure C 1-5
Scenario 4
Volume-to-Capacity Ratios
10-year Horizon



Legend

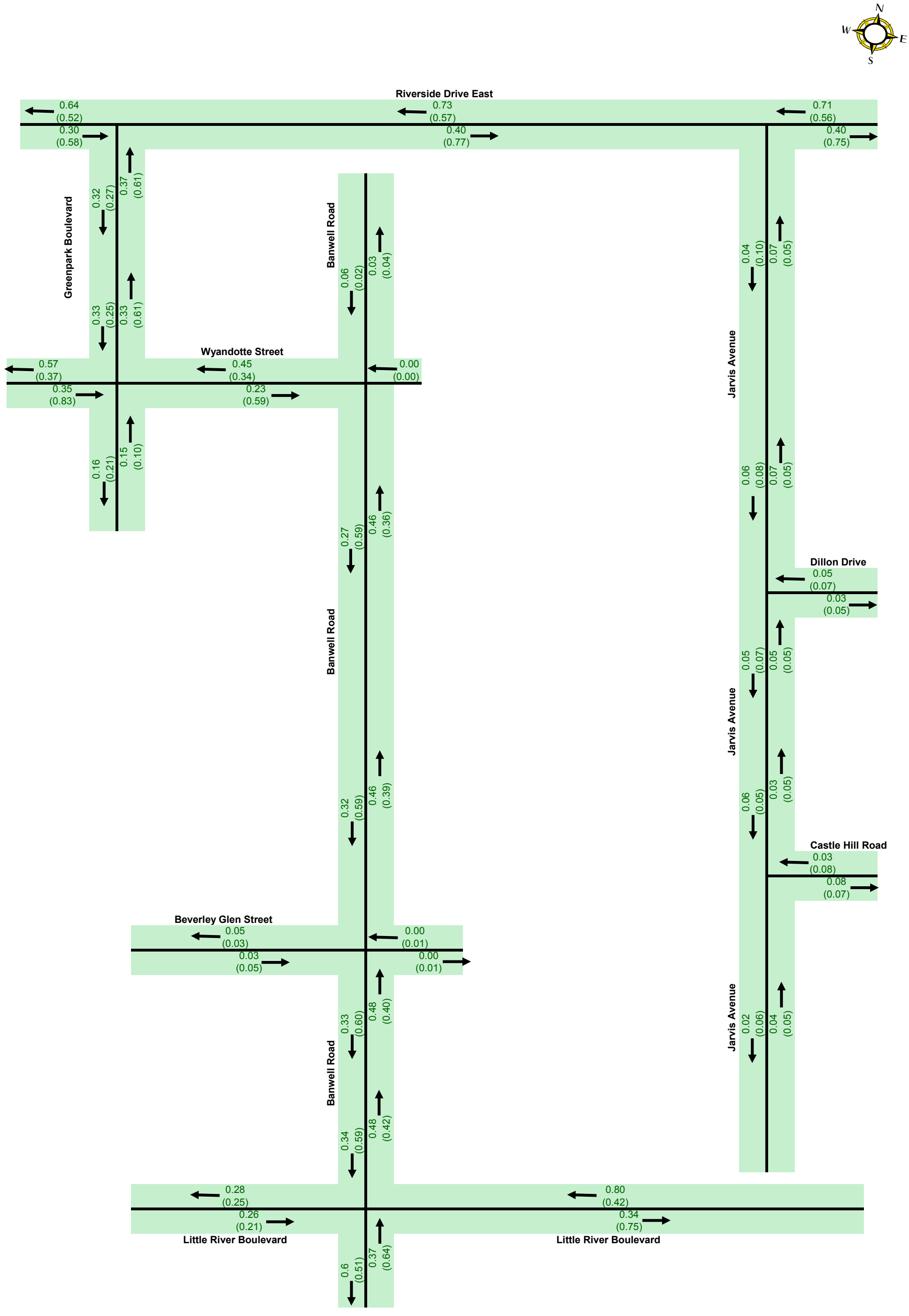
xx A.M. Peak Hour Link V/C Ratios

(xx) P.M. Peak Hour Link V/C Ratios

Figure C 1-6
Scenario 5
Volume-to-Capacity Ratios
10-year Horizon

APPENDIX

C-2 *20-YEAR HORIZON LINK V/C RATIOS*



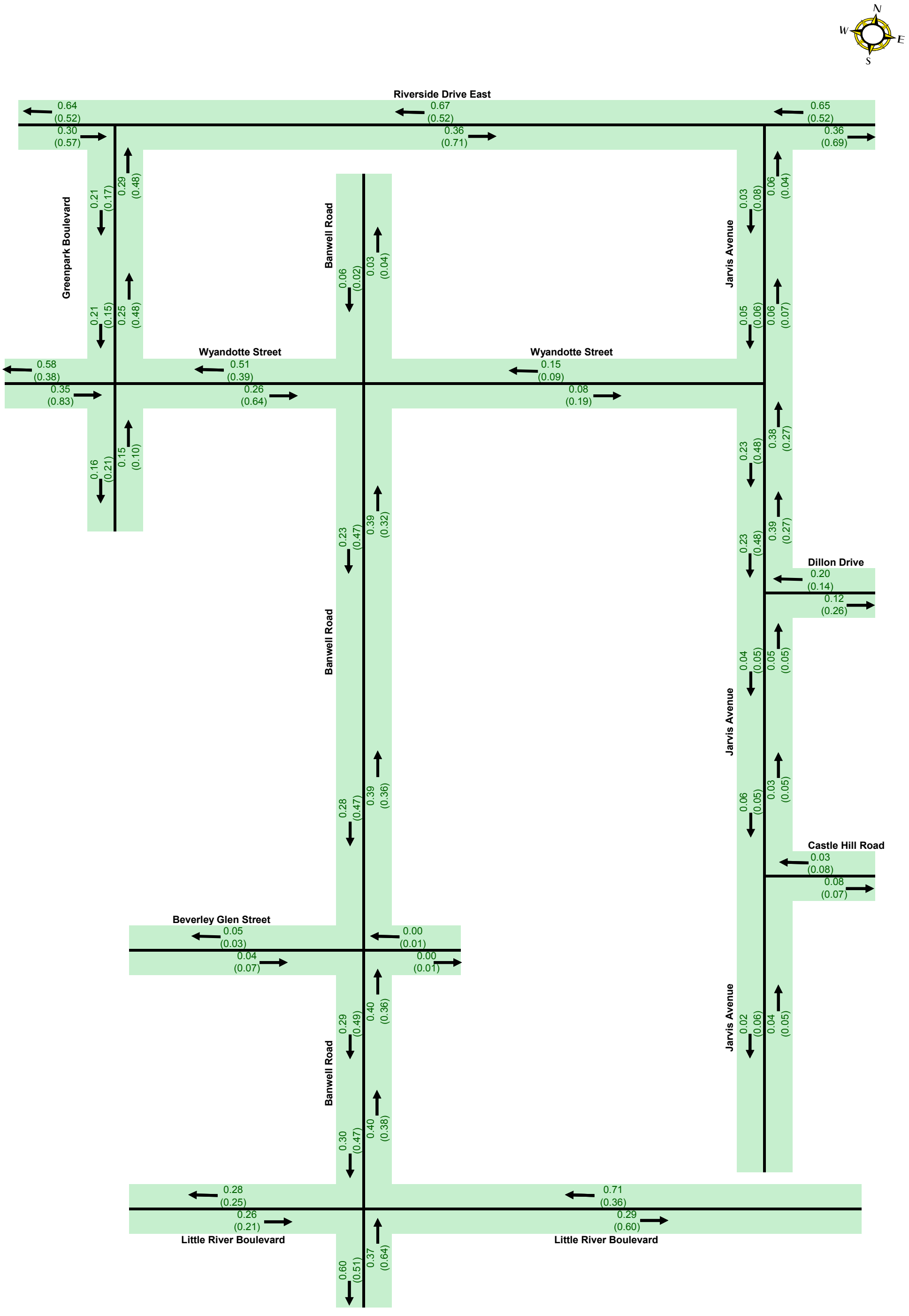
wsp

Legend

xx A.M. Peak Hour Link V/C Ratios

(xx) P.M. Peak Hour Link V/C Ratios

Figure C 2-1
Scenario 1
Volume-to-Capacity Ratios
20-year Horizon

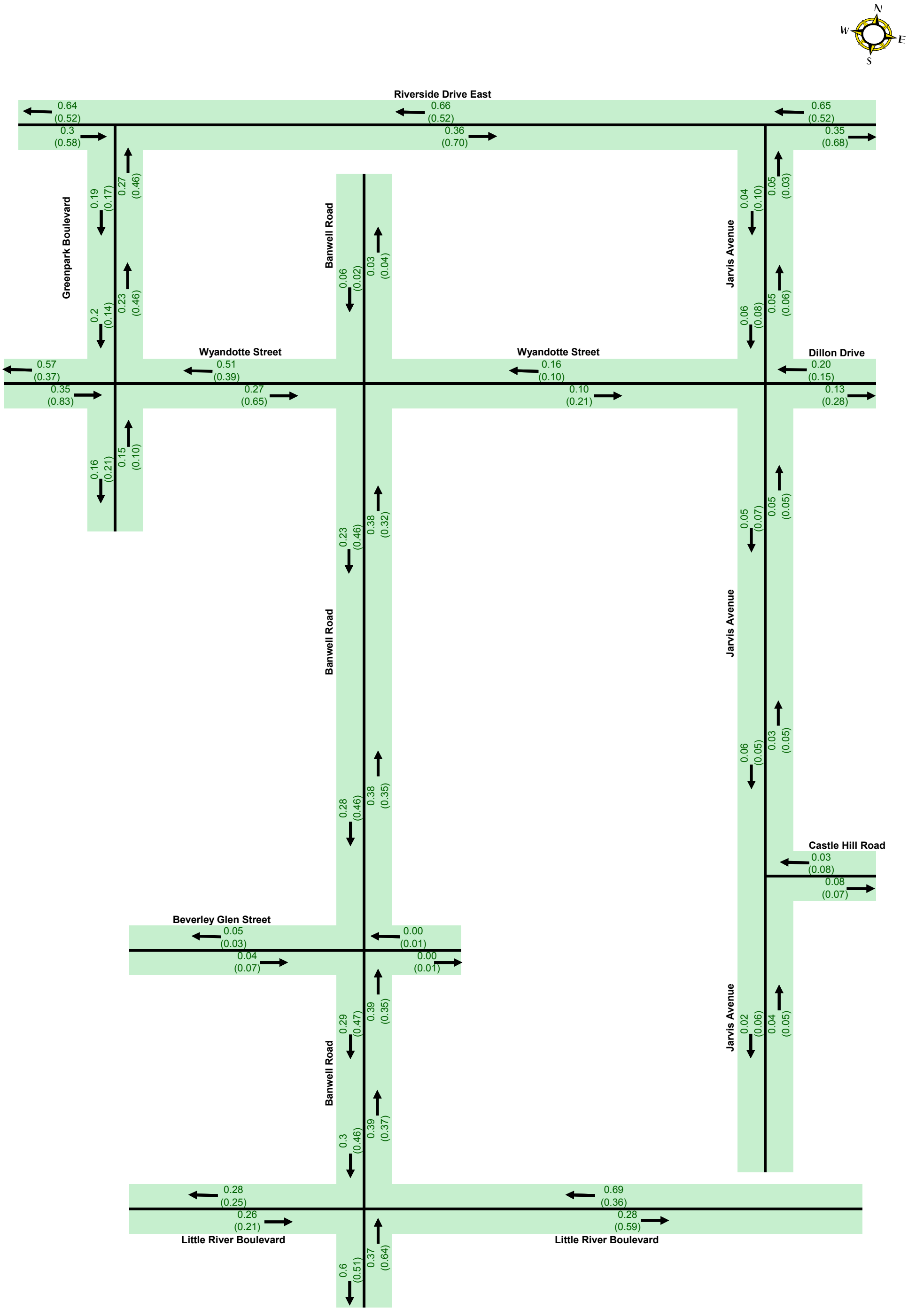


Legend

xx A.M. Peak Hour Link V/C Ratios

(xx) P.M. Peak Hour Link V/C Ratios

Figure C 2-2
Scenario 2a
Volume-to-Capacity Ratios
20-year Horizon

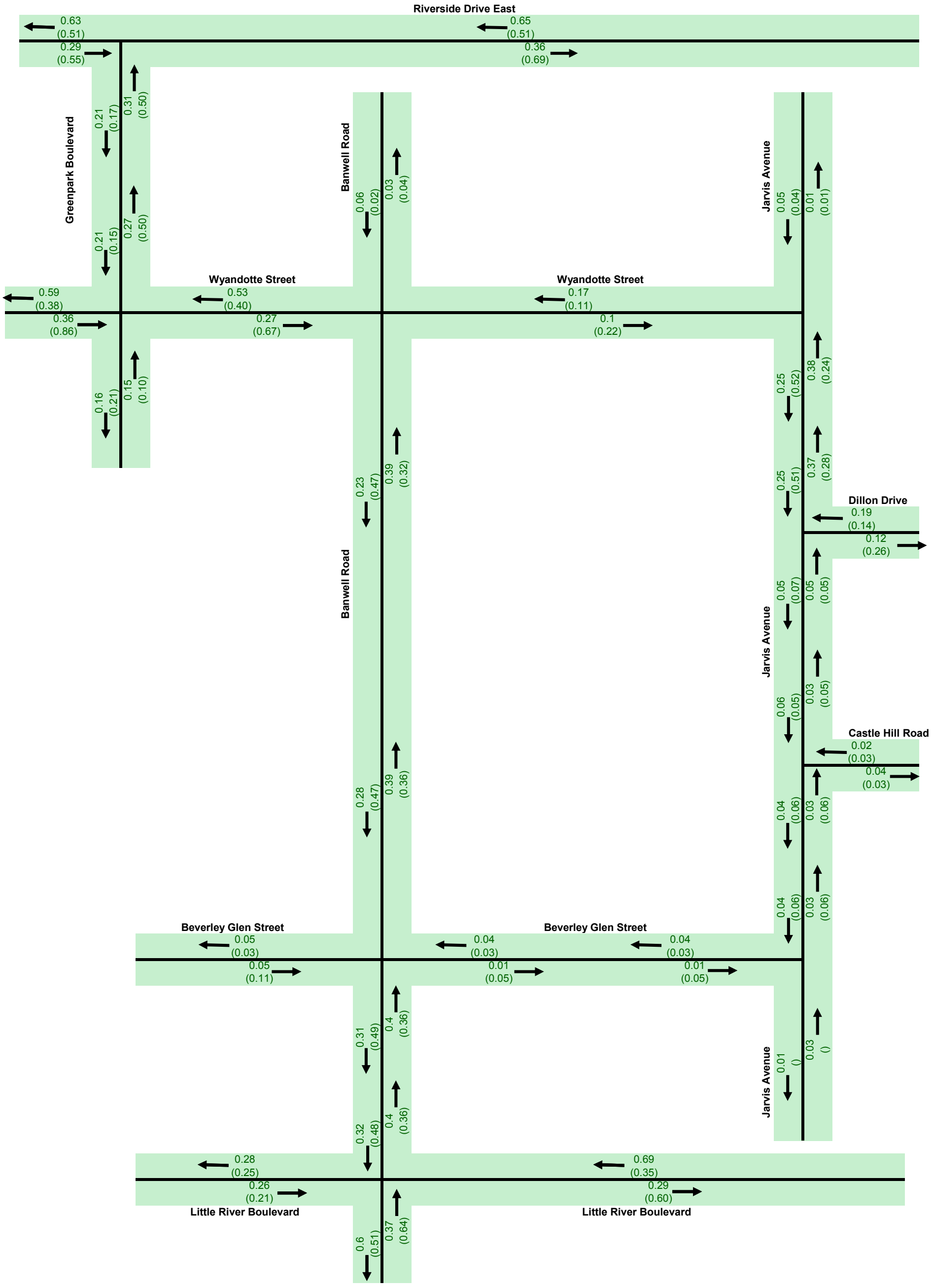


Legend

xx A.M. Peak Hour Link V/C Ratios

(xx) P.M. Peak Hour Link V/C Ratios

Figure C 2-3
Scenario 2b
Volume-to-Capacity Ratios
20-year Horizon

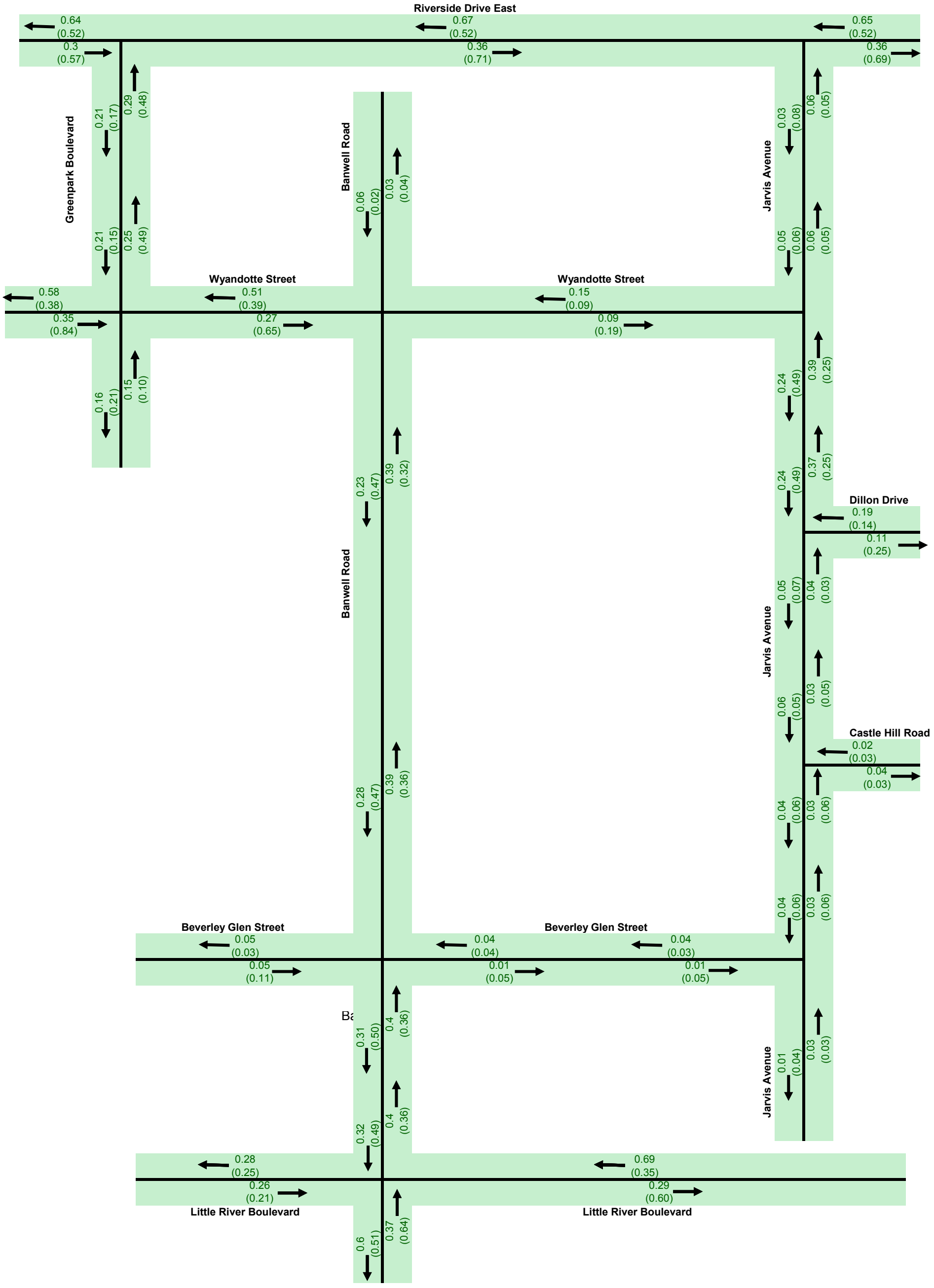


Legend

xx A.M. Peak Hour Link V/C Ratios

(xx) P.M. Peak Hour Link V/C Ratios

Figure C 2-4
Scenario 3
Volume-to-Capacity Ratios
20-year Horizon

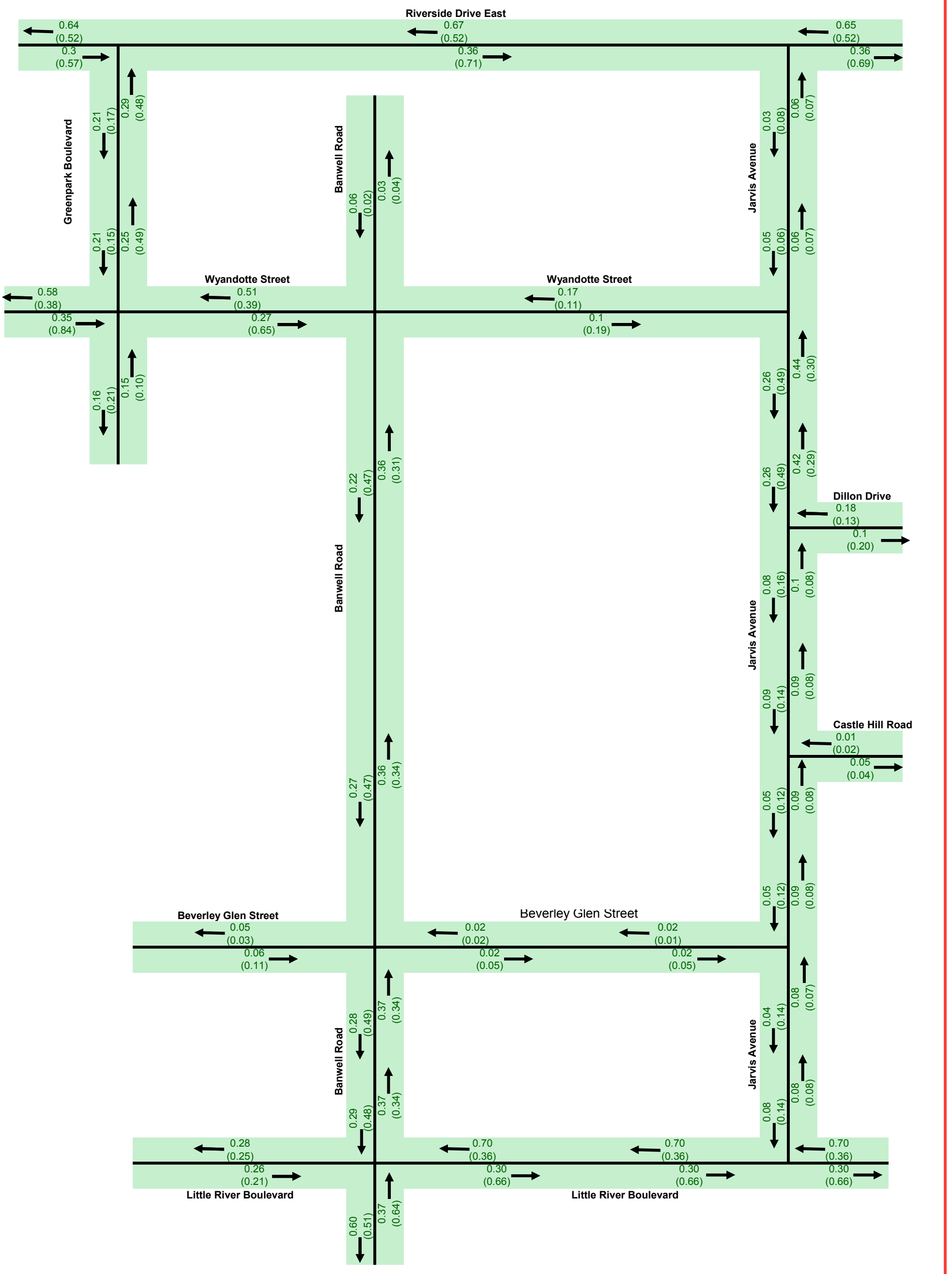


Legend

xx A.M. Peak Hour Link V/C Ratios

(xx) P.M. Peak Hour Link V/C Ratios

Figure C 2-5
Scenario 4
Volume-to-Capacity Ratios
20-year Horizon



Legend

xx A.M. Peak Hour Link V/C Ratios

(xx) P.M. Peak Hour Link V/C Ratios

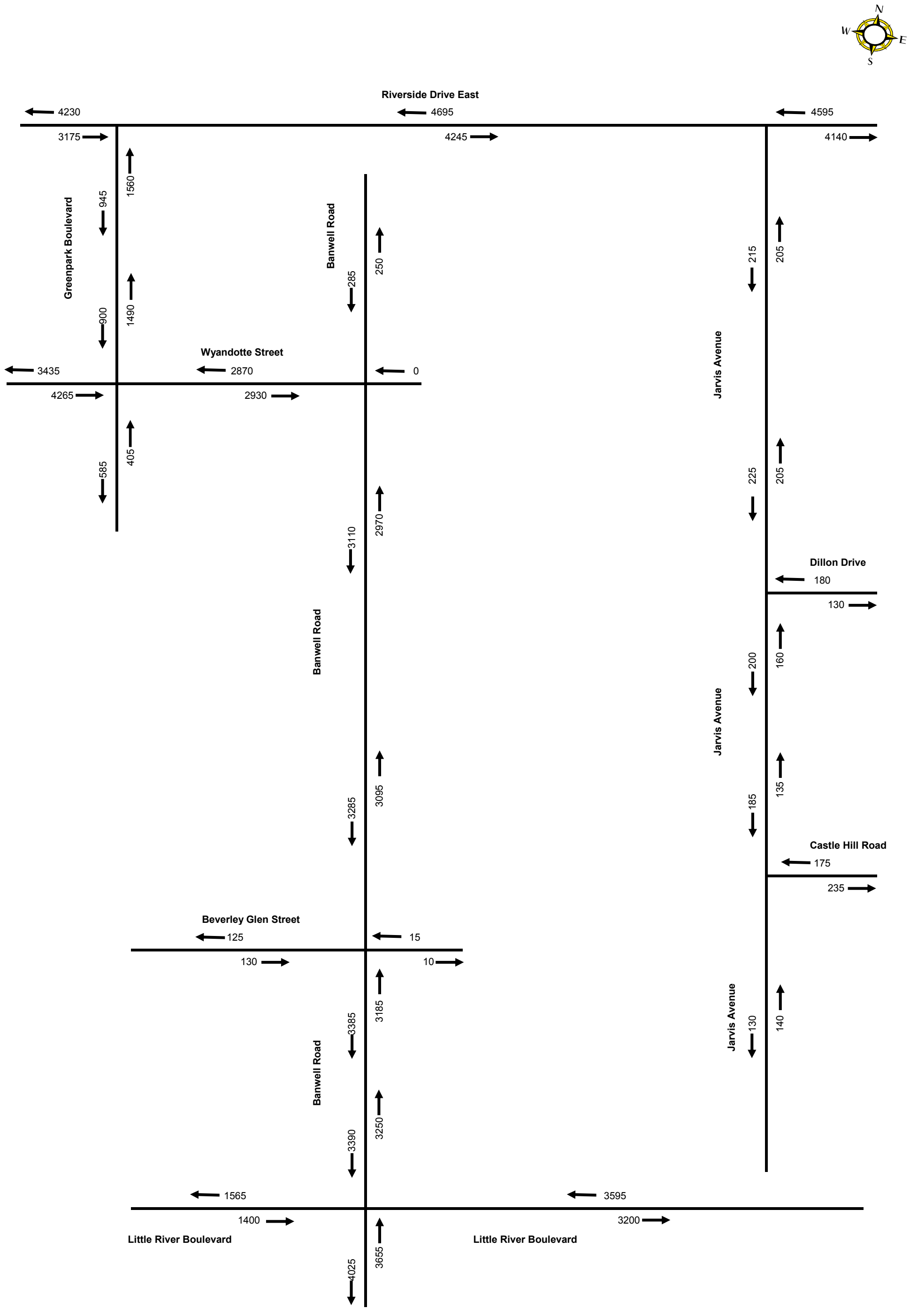
Figure C 2-6
Scenario 5
Volume-to-Capacity Ratios
20-year Horizon

APPENDIX

D FUTURE AVERAGE ANNUAL DAILY TRAFFIC (AADT)

APPENDIX

D-1 10-YEAR HORIZON AADT

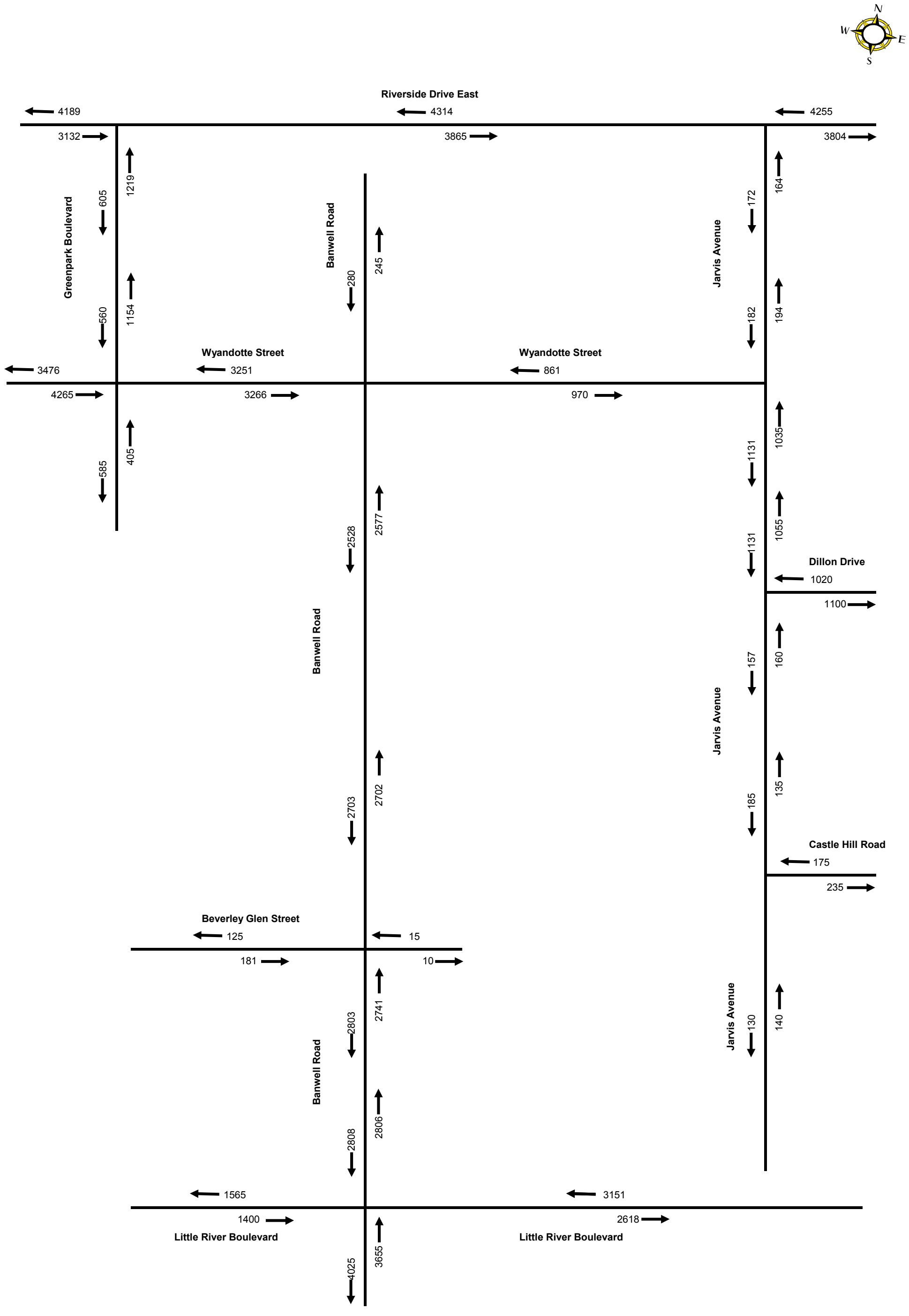


Legend

xx A.M. Peak Hour Link AADT

(xx) P.M. Peak Hour Link AADT

Figure D 1-1
Scenario 1
Link Annual Average Daily Traffic (AADT)
10-year Horizon



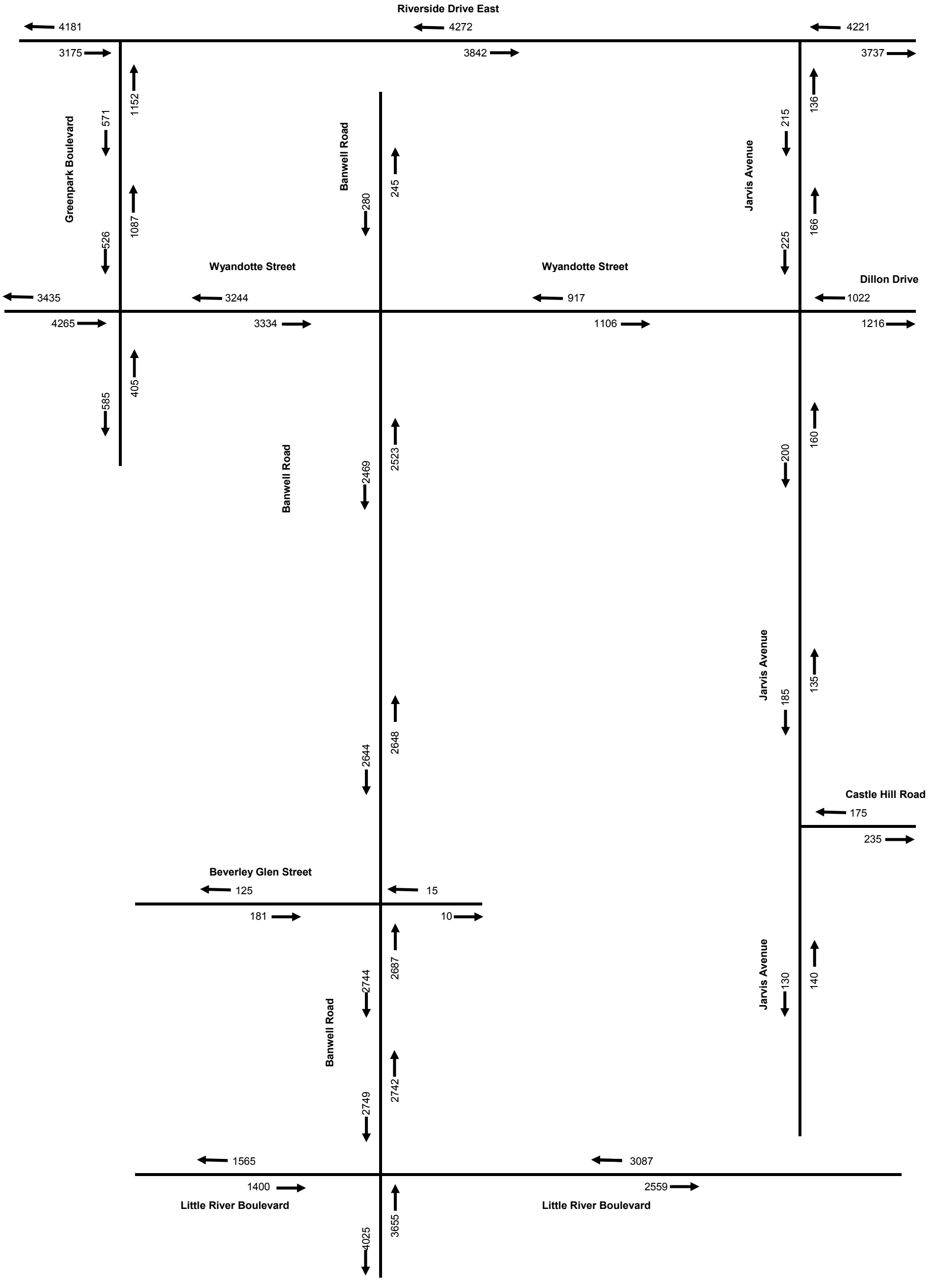
wsp

Legend

xx A.M. Peak Hour Link AADT

(xx) P.M. Peak Hour Link AADT

Figure D 1-2
Scenario 2a
Link Annual Average Daily Traffic (AADT)
10-year Horizon

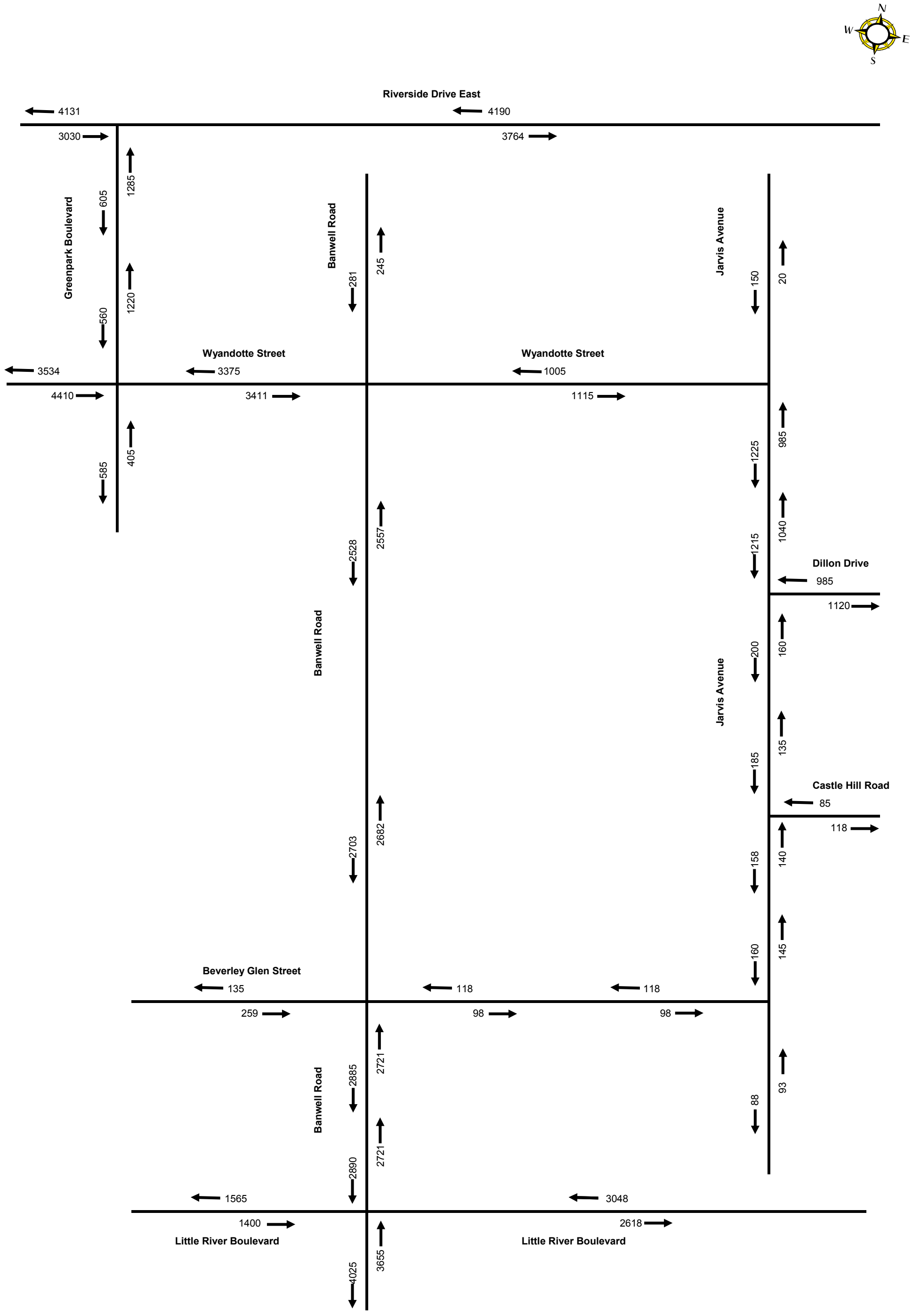


Legend

xx A.M. Peak Hour Link AADT

(xx) P.M. Peak Hour Link AADT

Figure D 1-3
Scenario 2b
Link Annual Average Daily Traffic (AADT)
10-year Horizon

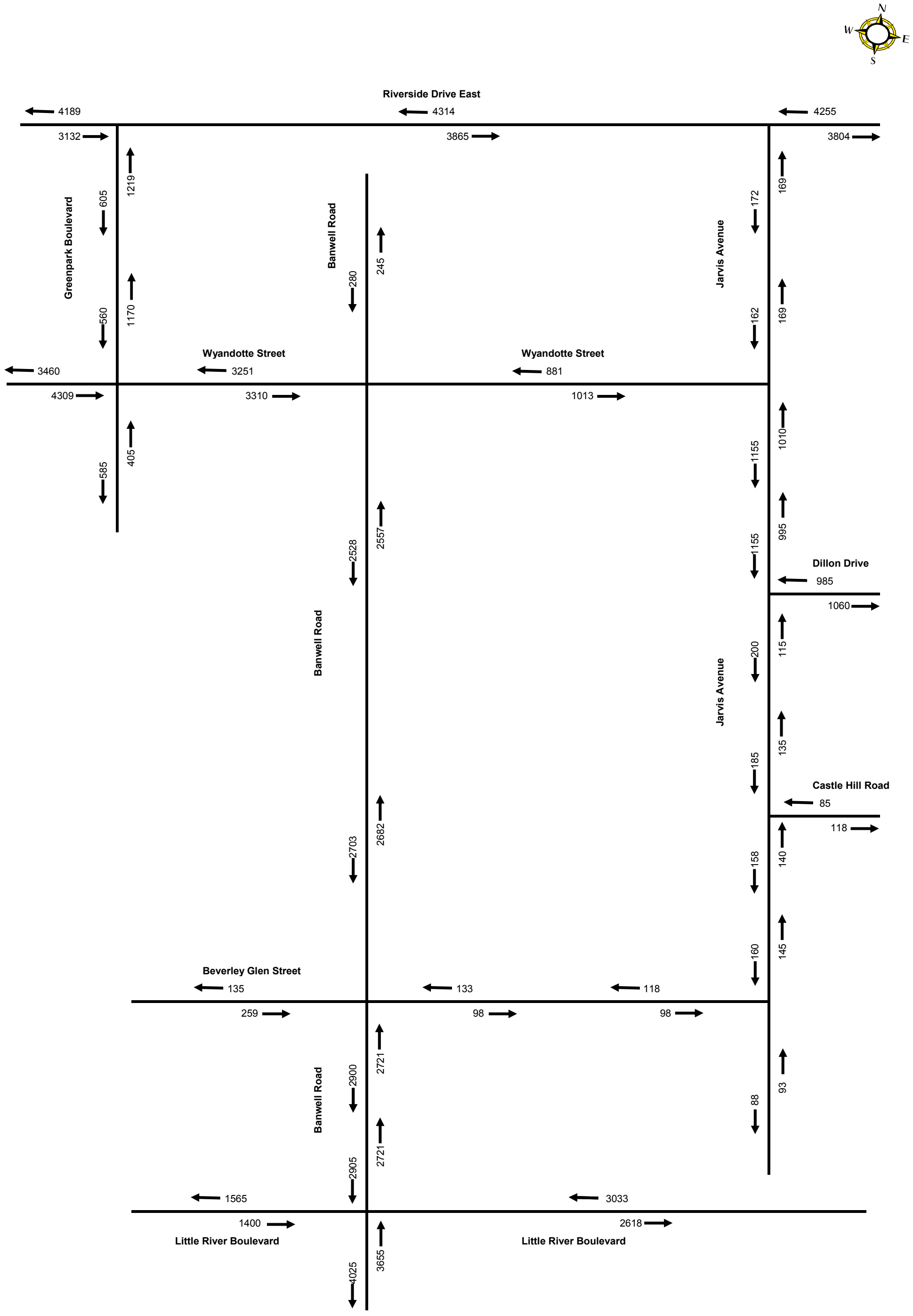


Legend

xx A.M. Peak Hour Link AADT

(xx) P.M. Peak Hour Link AADT

Figure D 1-4
Scenario 3
Link Annual Average Daily Traffic (AADT)
10-year Horizon

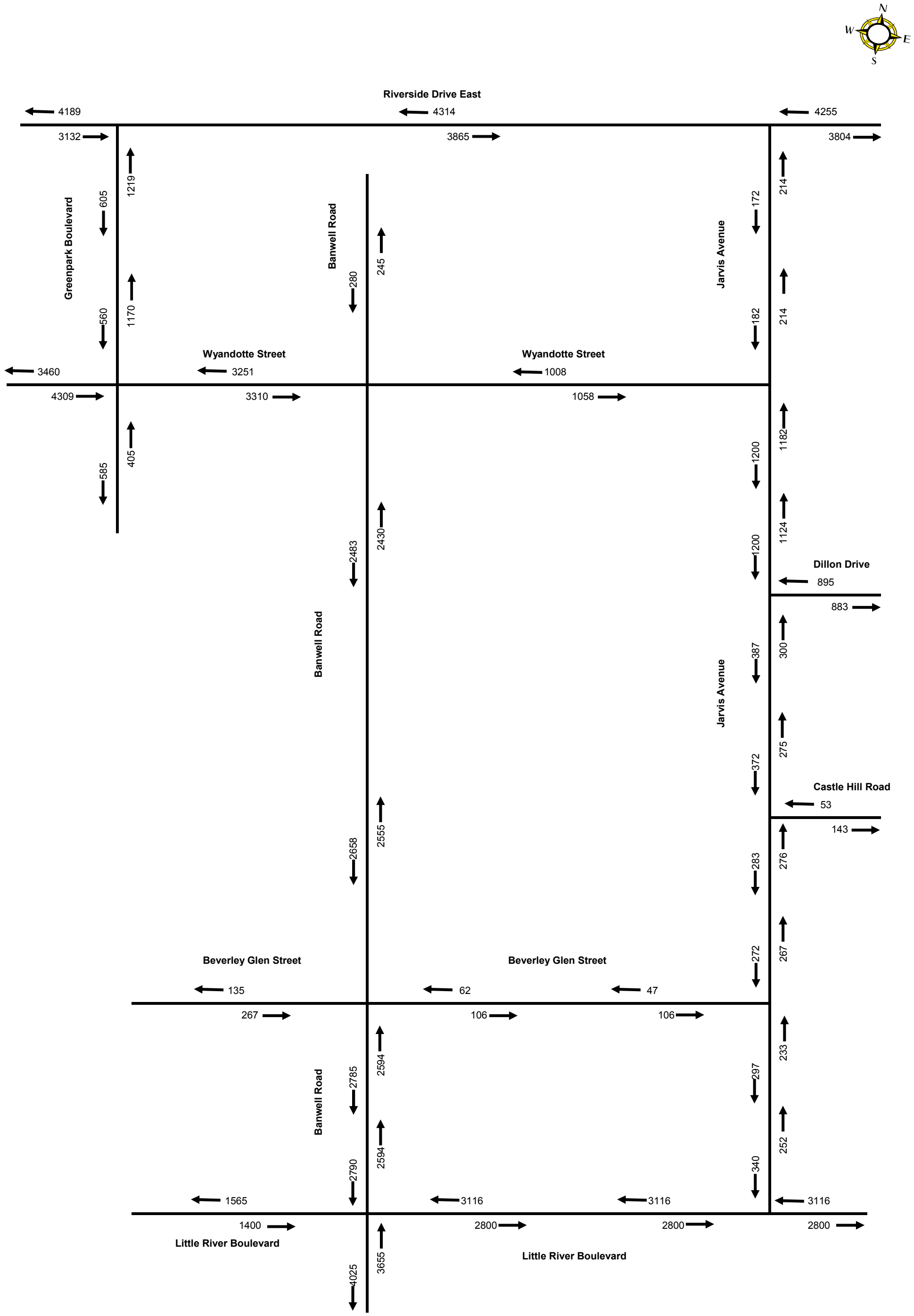


Legend

xx A.M. Peak Hour Link AADT

(xx) P.M. Peak Hour Link AADT

Figure D 1-5
Scenario 4
Link Annual Average Daily Traffic (AADT)
10-year Horizon



Legend

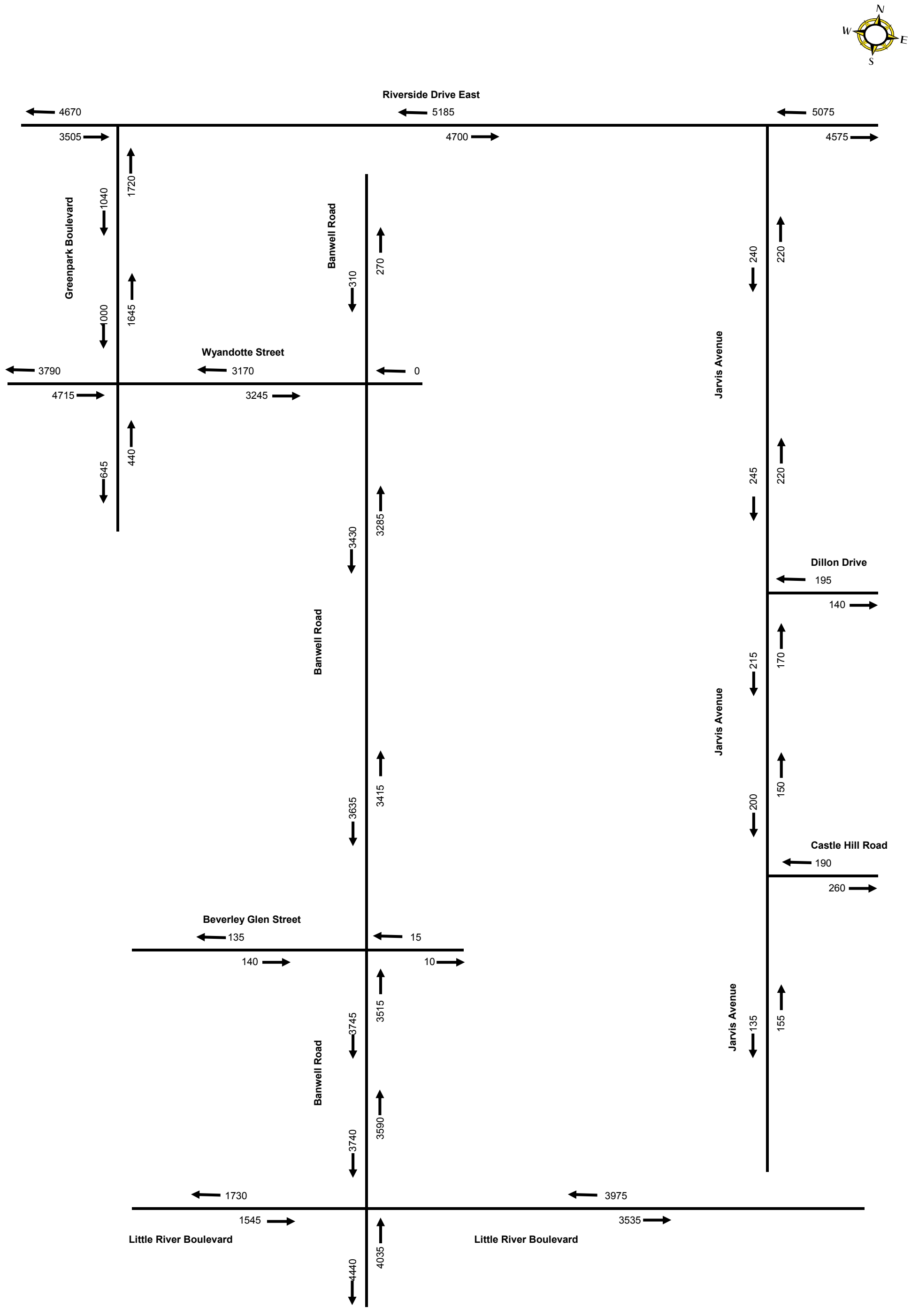
xx A.M. Peak Hour Link AADT

(xx) P.M. Peak Hour Link AADT

Figure D 1-6
Scenario 5
Link Annual Average Daily Traffic (AADT)
10-year Horizon

APPENDIX

D-2 20-YEAR HORIZON AADT



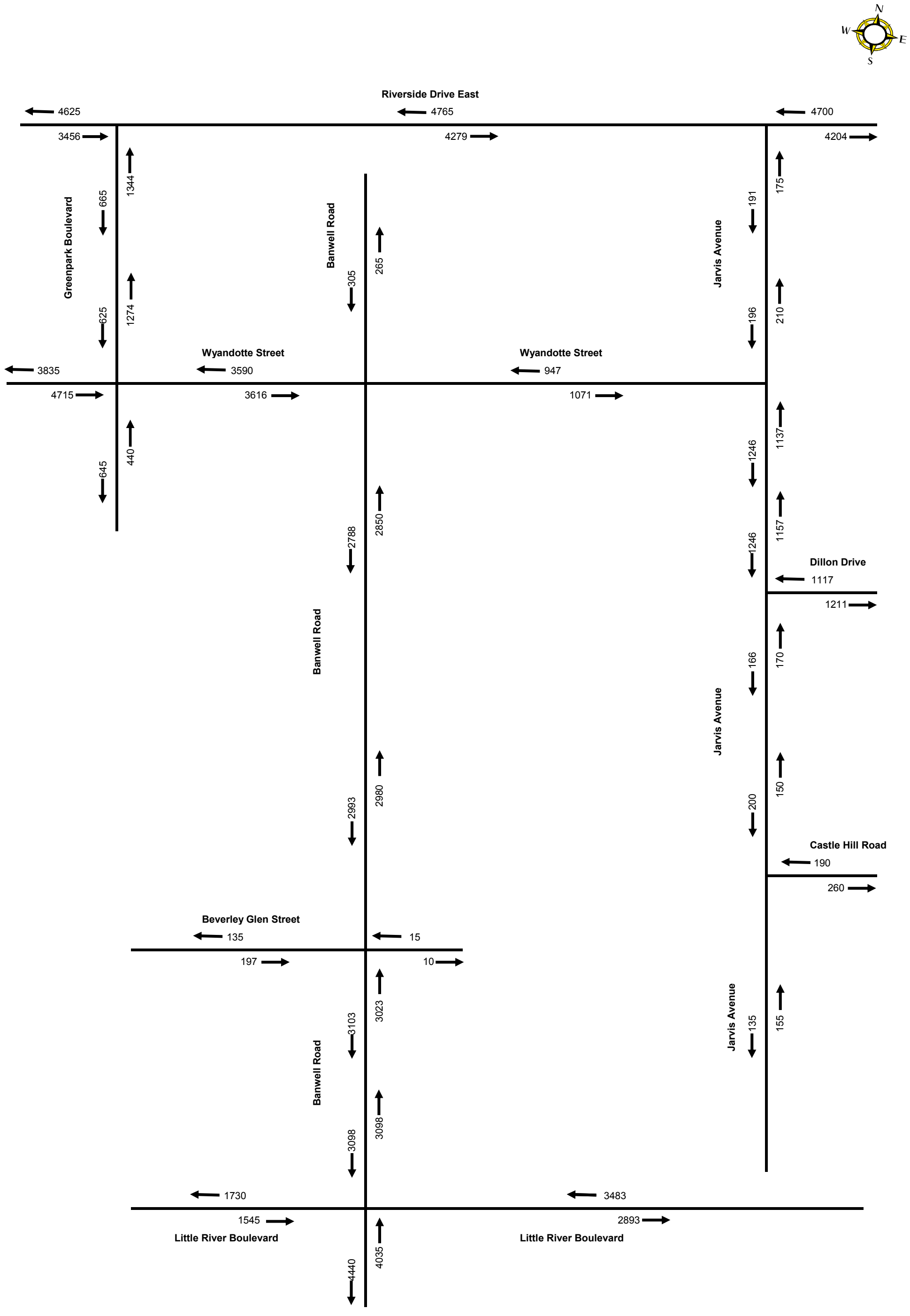
wsp

Legend

xx A.M. Peak Hour Link AADT

(xx) P.M. Peak Hour Link AADT

Figure D 2-1
Scenario 1
Link Annual Average Daily Traffic (AADT)
20-year Horizon

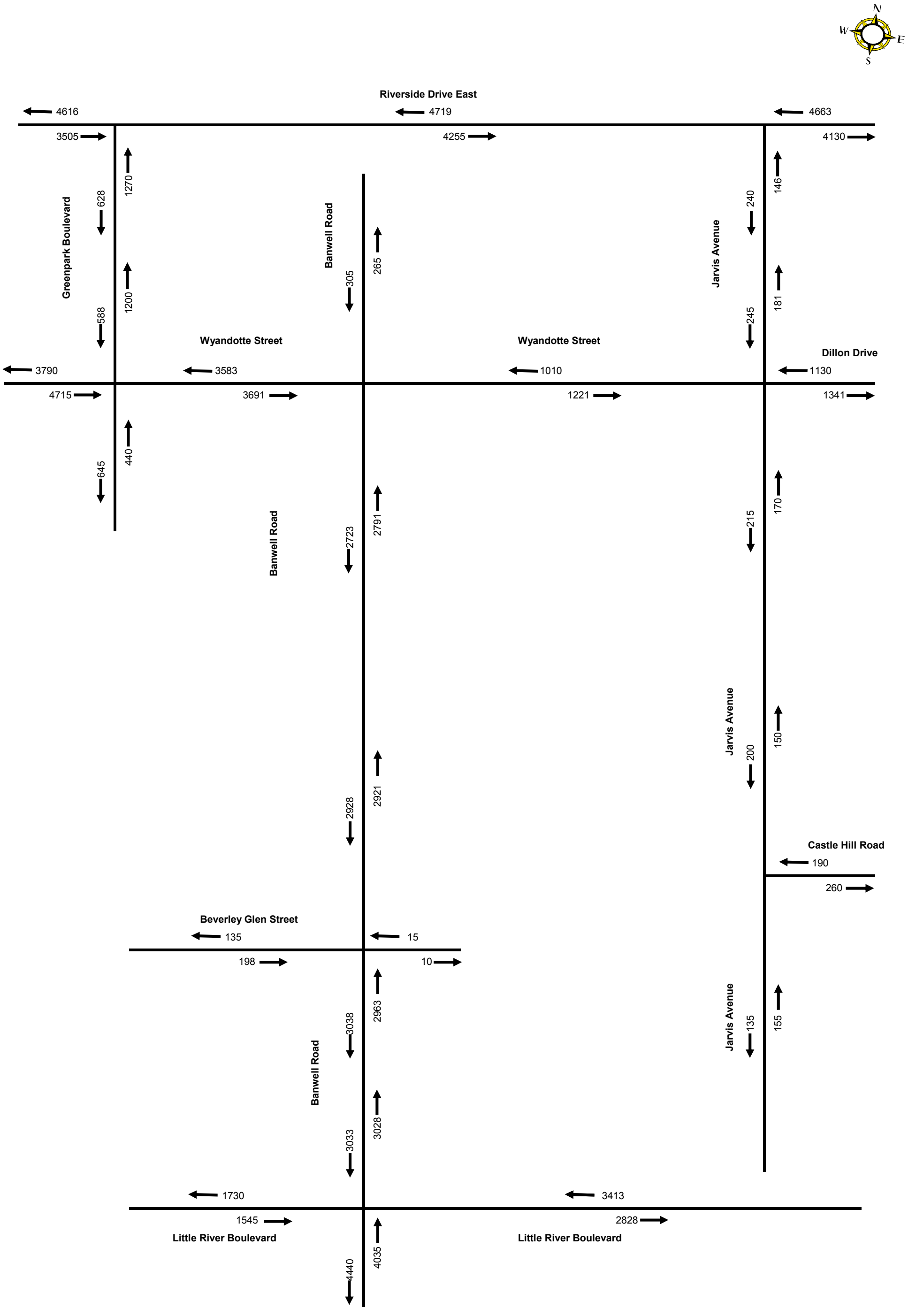


Legend

xx A.M. Peak Hour Link AADT

(xx) P.M. Peak Hour Link AADT

Figure D 2-2
Scenario 2a
Link Annual Average Daily Traffic (AADT)
20-year Horizon

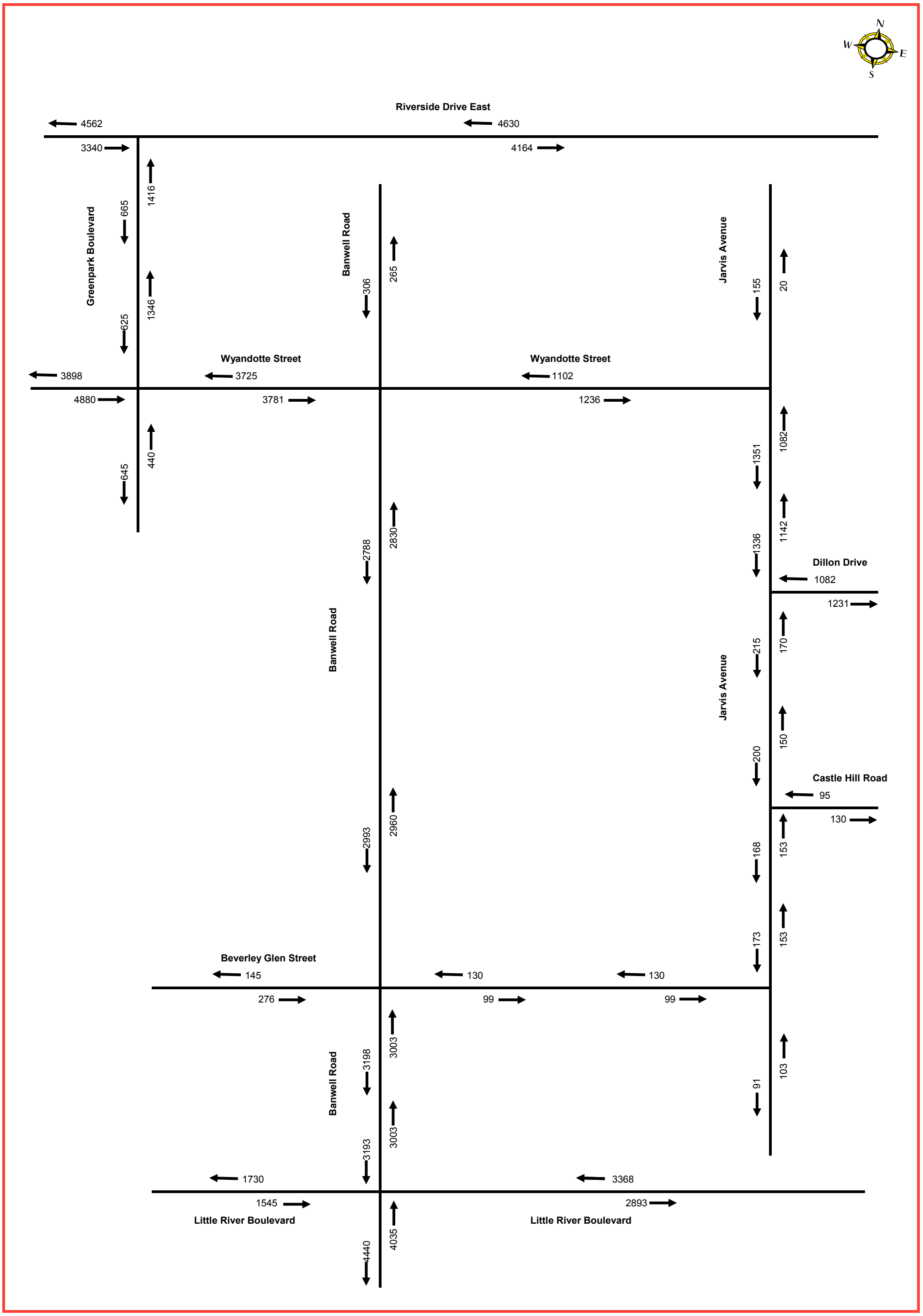


Legend

xx A.M. Peak Hour Link AADT

(xx) P.M. Peak Hour Link AADT

Figure D 2-3
Scenario 2b
Link Annual Average Daily Traffic (AADT)
20-year Horizon

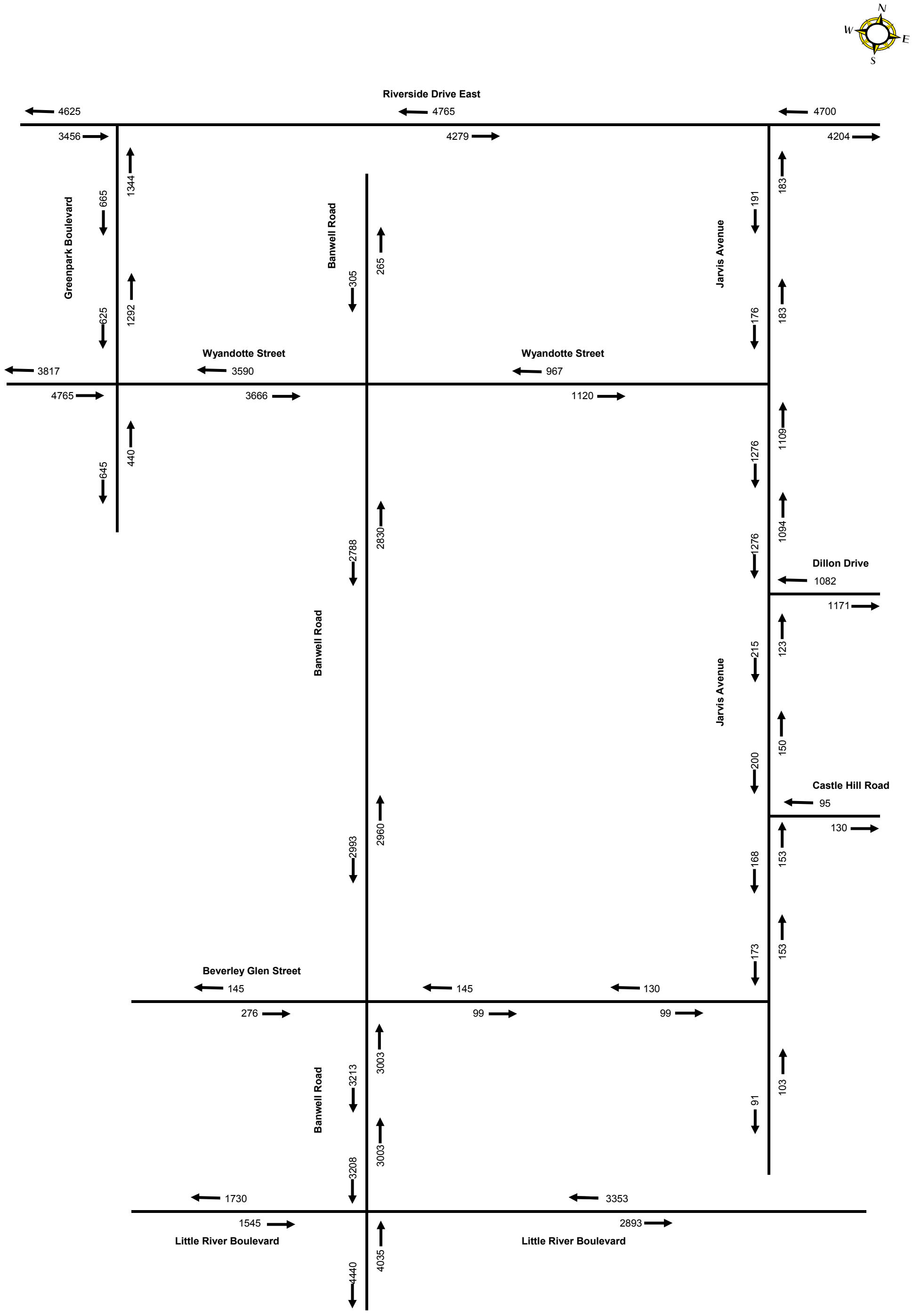


Legend

xx A.M. Peak Hour Link AADT

(xx) P.M. Peak Hour Link AADT

Figure D 2-4
Scenario 3
Link Annual Average Daily Traffic (AADT)
20-year Horizon

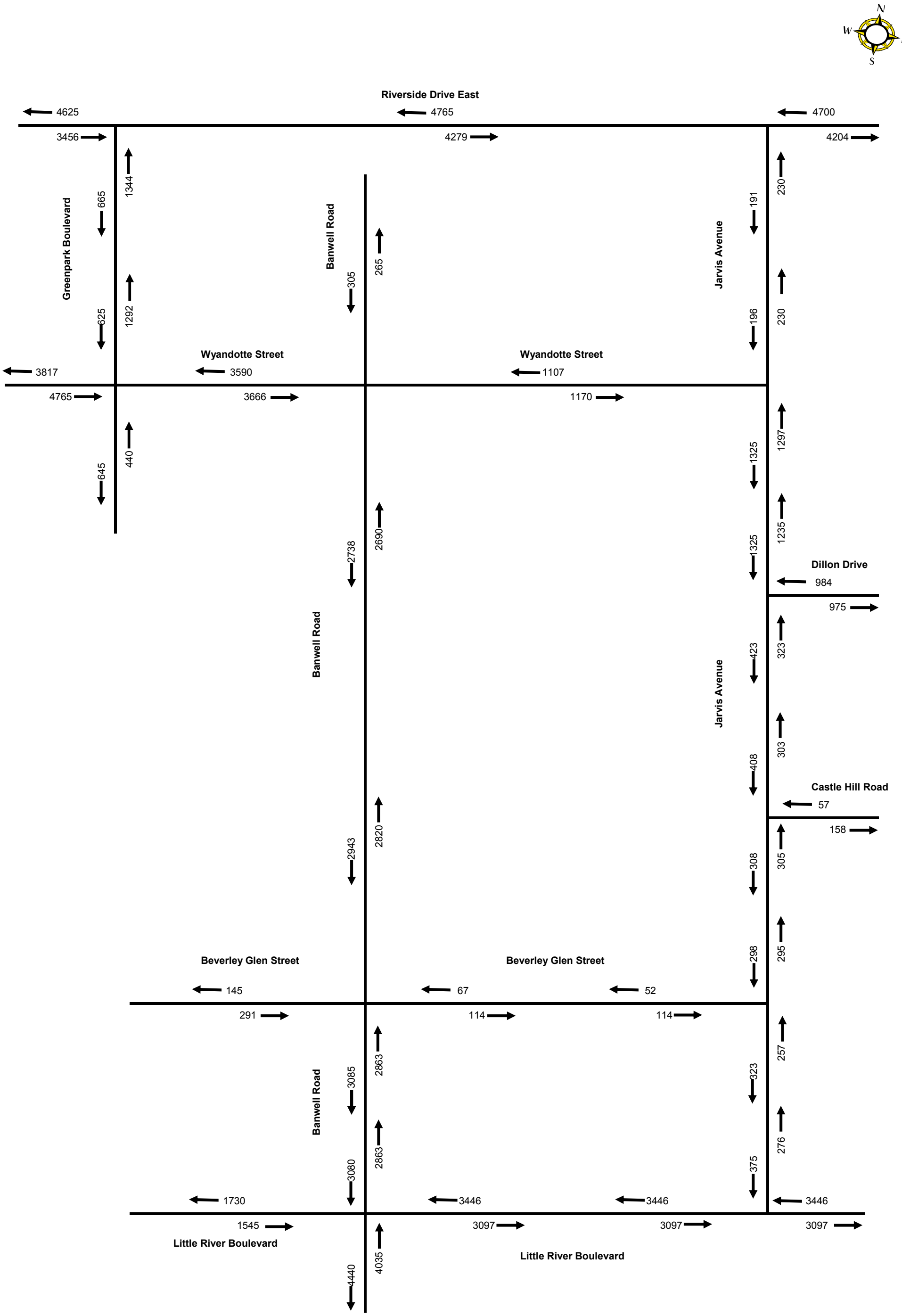


Legend

xx A.M. Peak Hour Link AADT

(xx) P.M. Peak Hour Link AADT

Figure D 2-5
Scenario 4
Link Annual Average Daily Traffic (AADT)
20-year Horizon



wsp

Legend

xx A.M. Peak Hour Link AADT

(xx) P.M. Peak Hour Link AADT

Figure D 2-6
Scenario 5
Link Annual Average Daily Traffic (AADT)
20-year Horizon

APPENDIX

E SYNCHRO RESULTS

APPENDIX

E-1 10-YEAR HORIZON SYNCHRO RESULTS

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	77	147	29	0	310	18	40	8	0	16	21	66
Future Volume (Veh/h)	77	147	29	0	310	18	40	8	0	16	21	66
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	86	163	32	0	344	20	44	9	0	18	23	73
Pedestrians								1			2	
Lane Width (m)								3.7			3.7	
Walking Speed (m/s)								1.1			1.1	
Percent Blockage								0			0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	366			196			790	718	180	712	724	356
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	366			196			790	718	180	712	724	356
tC, single (s)	4.1			4.1			7.1	6.8	6.2	7.1	6.5	6.3
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.3	3.3	3.5	4.0	3.4
p0 queue free %	93			100			82	97	100	94	93	89
cM capacity (veh/h)	1201			1375			247	301	862	322	328	676

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	281	364	53	114
Volume Left	86	0	44	18
Volume Right	32	20	0	73
cSH	1201	1375	255	487
Volume to Capacity	0.07	0.00	0.21	0.23
Queue Length 95th (m)	1.8	0.0	5.8	6.8
Control Delay (s)	3.0	0.0	22.8	14.6
Lane LOS	A		C	B
Approach Delay (s)	3.0	0.0	22.8	14.6
Approach LOS			C	B

Intersection Summary				
Average Delay	4.6			
Intersection Capacity Utilization	50.5%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Traffic Volume (veh/h)	4	0	160	2	0	5	322	12	0	0	34	6
Future Volume (Veh/h)	4	0	160	2	0	5	322	12	0	0	34	6
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	5	0	188	2	0	6	379	14	0	0	40	7
Pedestrians					15						14	
Lane Width (m)					3.7						3.7	
Walking Speed (m/s)					1.1						1.1	
Percent Blockage					1						1	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	20			188			138	128	109	147	219	17
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	20			188			138	128	109	147	219	17
tC, single (s)	4.1			4.7			7.1	6.7	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.8			3.5	4.2	3.3	3.5	4.0	3.3
p0 queue free %	100			100			51	98	100	100	94	99
cM capacity (veh/h)	1587			1095			776	718	931	775	663	1053

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	193	8	393	47
Volume Left	5	2	379	0
Volume Right	188	6	0	7
cSH	1587	1095	773	702
Volume to Capacity	0.00	0.00	0.51	0.07
Queue Length 95th (m)	0.1	0.0	22.2	1.6
Control Delay (s)	0.2	2.1	14.4	10.5
Lane LOS	A	A	B	B
Approach Delay (s)	0.2	2.1	14.4	10.5
Approach LOS			B	B

Intersection Summary				
Average Delay	9.7			
Intersection Capacity Utilization	42.1%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	5	10	13	2	6	12
Future Volume (Veh/h)	5	10	13	2	6	12
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80
Hourly flow rate (vph)	6	13	16	3	8	15
Pedestrians	2					
Lane Width (m)	3.7					
Walking Speed (m/s)	1.1					
Percent Blockage	0					
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	50	20			21	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	50	20			21	
tC, single (s)	6.6	6.3			4.1	
tC, 2 stage (s)						
tF (s)	3.7	3.4			2.2	
p0 queue free %	99	99			100	
cM capacity (veh/h)	897	1028			1605	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	19	19	23
Volume Left	6	0	8
Volume Right	13	3	0
cSH	983	1700	1605
Volume to Capacity	0.02	0.01	0.00
Queue Length 95th (m)	0.4	0.0	0.1
Control Delay (s)	8.7	0.0	2.5
Lane LOS	A		A
Approach Delay (s)	8.7	0.0	2.5
Approach LOS	A		

Intersection Summary			
Average Delay	3.7		
Intersection Capacity Utilization	15.9%	ICU Level of Service	A
Analysis Period (min)	15		

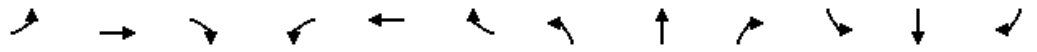
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↑	↱		↔	
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	19	71	66	188	122	163	36	164	68	60	179	9
Future Volume (vph)	19	71	66	188	122	163	36	164	68	60	179	9
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Hourly flow rate (vph)	22	83	77	219	142	190	42	191	79	70	208	10

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1
Volume Total (vph)	182	551	233	79	288
Volume Left (vph)	22	219	42	0	70
Volume Right (vph)	77	190	0	79	10
Hadj (s)	-0.14	-0.09	0.26	-0.70	0.08
Departure Headway (s)	7.5	6.5	8.2	7.2	7.6
Degree Utilization, x	0.38	1.00	0.53	0.16	0.61
Capacity (veh/h)	458	544	429	493	472
Control Delay (s)	15.0	62.4	18.7	10.3	21.6
Approach Delay (s)	15.0	62.4	16.6		21.6
Approach LOS	C	F	C		C

Intersection Summary				
Delay	36.4			
Level of Service	E			
Intersection Capacity Utilization	73.1%	ICU Level of Service	D	
Analysis Period (min)	15			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Right Turn Channelized												
Traffic Volume (veh/h)	19	71	66	188	122	163	36	164	68	60	179	9
Future Volume (veh/h)	19	71	66	188	122	163	36	164	68	60	179	9
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Hourly flow rate (vph)	22	83	77	219	142	190	42	191	79	70	208	10
Approach Volume (veh/h)		182			551			312			288	
Crossing Volume (veh/h)		497			255			175			403	
High Capacity (veh/h)		936			1134			1208			1008	
High v/c (veh/h)		0.19			0.49			0.26			0.29	
Low Capacity (veh/h)		756			934			1000			821	
Low v/c (veh/h)		0.24			0.59			0.31			0.35	

Intersection Summary					
Maximum v/c High	0.49				
Maximum v/c Low	0.59				
Intersection Capacity Utilization	73.1%	ICU Level of Service		D	



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	153	399	48	2	217	27	15	15	3	21	17	39
Future Volume (Veh/h)	153	399	48	2	217	27	15	15	3	21	17	39
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	165	429	52	2	233	29	16	16	3	23	18	42
Pedestrians		1						1			1	
Lane Width (m)		3.7						3.7			3.7	
Walking Speed (m/s)		1.1						1.1			1.1	
Percent Blockage		0						0			0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	263			482			1090	1053	456	1048	1064	250
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	263			482			1090	1053	456	1048	1064	250
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	87			100			90	92	100	87	91	95
cM capacity (veh/h)	1312			1090			154	199	608	175	196	785

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	646	264	35	83
Volume Left	165	2	16	23
Volume Right	52	29	3	42
cSH	1312	1090	185	299
Volume to Capacity	0.13	0.00	0.19	0.28
Queue Length 95th (m)	3.3	0.0	5.1	8.4
Control Delay (s)	3.1	0.1	29.0	21.6
Lane LOS	A	A	D	C
Approach Delay (s)	3.1	0.1	29.0	21.6
Approach LOS			D	C

Intersection Summary				
Average Delay	4.7			
Intersection Capacity Utilization	60.8%	ICU Level of Service	B	
Analysis Period (min)	15			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	11	0	413	0	0	0	242	18	0	0	13	4
Future Volume (Veh/h)	11	0	413	0	0	0	242	18	0	0	13	4
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Hourly flow rate (vph)	11	0	421	0	0	0	247	18	0	0	13	4
Pedestrians											1	
Lane Width (m)											3.7	
Walking Speed (m/s)											1.1	
Percent Blockage											0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	1			421			243	234	210	242	444	1
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1			421			243	234	210	242	444	1
tC, single (s)	4.1			5.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			3.1			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			100			64	97	100	100	97	100
cM capacity (veh/h)	1633			763			692	665	830	692	508	1088

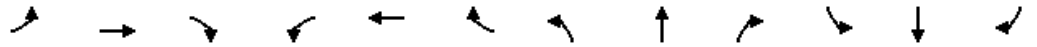
Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	432	0	265	17
Volume Left	11	0	247	0
Volume Right	421	0	0	4
cSH	1633	1700	691	580
Volume to Capacity	0.01	0.00	0.38	0.03
Queue Length 95th (m)	0.2	0.0	13.7	0.7
Control Delay (s)	0.2	0.0	13.4	11.4
Lane LOS	A		B	B
Approach Delay (s)	0.2	0.0	13.4	11.4
Approach LOS			B	B

Intersection Summary				
Average Delay	5.4			
Intersection Capacity Utilization	53.8%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	9	12	12	5	13	14
Future Volume (Veh/h)	9	12	12	5	13	14
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	11	14	14	6	15	16
Pedestrians	6					
Lane Width (m)	3.7					
Walking Speed (m/s)	1.1					
Percent Blockage	1					
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	69	23			26	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	69	23			26	
tC, single (s)	6.5	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.6	3.3			2.2	
p0 queue free %	99	99			99	
cM capacity (veh/h)	895	1053			1592	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	25	20	31
Volume Left	11	0	15
Volume Right	14	6	0
cSH	977	1700	1592
Volume to Capacity	0.03	0.01	0.01
Queue Length 95th (m)	0.6	0.0	0.2
Control Delay (s)	8.8	0.0	3.6
Lane LOS	A		A
Approach Delay (s)	8.8	0.0	3.6
Approach LOS	A		

Intersection Summary			
Average Delay	4.3		
Intersection Capacity Utilization	18.1%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	13	72	39	99	56	91	67	200	196	173	234	23
Future Volume (vph)	13	72	39	99	56	91	67	200	196	173	234	23
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Hourly flow rate (vph)	15	86	46	118	67	108	80	238	233	206	279	27

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1
Volume Total (vph)	147	293	318	233	512
Volume Left (vph)	15	118	80	0	206
Volume Right (vph)	46	108	0	233	27
Hadj (s)	-0.12	-0.08	0.16	-0.67	0.08
Departure Headway (s)	8.2	7.5	7.6	6.8	6.9
Degree Utilization, x	0.33	0.61	0.67	0.44	0.99
Capacity (veh/h)	411	470	466	528	515
Control Delay (s)	15.2	21.7	23.7	13.7	62.8
Approach Delay (s)	15.2	21.7	19.4		62.8
Approach LOS	C	C	C		F

Intersection Summary				
Delay	34.2			
Level of Service	D			
Intersection Capacity Utilization	68.4%	ICU Level of Service	C	
Analysis Period (min)	15			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Right Turn Channelized												
Traffic Volume (veh/h)	13	72	39	99	56	91	67	200	196	173	234	23
Future Volume (veh/h)	13	72	39	99	56	91	67	200	196	173	234	23
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Hourly flow rate (vph)	15	86	46	118	67	108	80	238	233	206	279	27
Approach Volume (veh/h)		147			293			551			512	
Crossing Volume (veh/h)		603			333			307			265	
High Capacity (veh/h)		859			1066			1088			1125	
High v/c (veh/h)		0.17			0.27			0.51			0.46	
Low Capacity (veh/h)		689			873			893			926	
Low v/c (veh/h)		0.21			0.34			0.62			0.55	

Intersection Summary					
Maximum v/c High	0.51				
Maximum v/c Low	0.62				
Intersection Capacity Utilization	68.4%	ICU Level of Service		C	

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	53	172	29	0	350	20	40	5	2	16	21	28
Future Volume (Veh/h)	53	172	29	0	350	20	40	5	2	16	21	28
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	59	191	32	0	389	22	44	6	2	18	23	31
Pedestrians								1			2	
Lane Width (m)								3.7			3.7	
Walking Speed (m/s)								1.1			1.1	
Percent Blockage								0			0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	413			224			768	739	208	732	744	402
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	413			224			768	739	208	732	744	402
tC, single (s)	4.1			4.1			7.1	6.9	6.2	7.1	6.5	6.4
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.4	3.3	3.5	4.0	3.4
p0 queue free %	95			100			84	98	100	94	93	95
cM capacity (veh/h)	1155			1343			276	288	837	319	327	618

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	282	411	52	72
Volume Left	59	0	44	18
Volume Right	32	22	2	31
cSH	1155	1343	285	407
Volume to Capacity	0.05	0.00	0.18	0.18
Queue Length 95th (m)	1.2	0.0	5.0	4.8
Control Delay (s)	2.1	0.0	20.4	15.7
Lane LOS	A		C	C
Approach Delay (s)	2.1	0.0	20.4	15.7
Approach LOS			C	C

Intersection Summary				
Average Delay	3.4			
Intersection Capacity Utilization	50.7%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	4	61	126	2	117	5	246	12	4	5	28	6
Future Volume (Veh/h)	4	61	126	2	117	5	246	12	4	5	28	6
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	5	72	148	2	138	6	289	14	5	6	33	7
Pedestrians					15						14	
Lane Width (m)					3.7						3.7	
Walking Speed (m/s)					1.1						1.1	
Percent Blockage					1						1	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	158			220			324	318	161	342	389	155
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	158			220			324	318	161	342	389	155
tC, single (s)	4.1			4.7			7.1	6.7	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.8			3.5	4.2	3.3	3.5	4.0	3.3
p0 queue free %	100			100			50	98	99	99	94	99
cM capacity (veh/h)	1414			1063			582	561	876	575	533	884

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	225	146	308	46
Volume Left	5	2	289	6
Volume Right	148	6	5	7
cSH	1414	1063	584	573
Volume to Capacity	0.00	0.00	0.53	0.08
Queue Length 95th (m)	0.1	0.0	23.4	2.0
Control Delay (s)	0.2	0.1	17.8	11.8
Lane LOS	A	A	C	B
Approach Delay (s)	0.2	0.1	17.8	11.8
Approach LOS			C	B

Intersection Summary				
Average Delay	8.4			
Intersection Capacity Utilization	41.2%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	2	101	31	2	59	24
Future Volume (Veh/h)	2	101	31	2	59	24
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80
Hourly flow rate (vph)	3	126	39	3	74	30
Pedestrians	2					
Lane Width (m)	3.7					
Walking Speed (m/s)	1.1					
Percent Blockage	0					
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	220	42			44	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	220	42			44	
tC, single (s)	6.9	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.9	3.3			2.2	
p0 queue free %	100	88			95	
cM capacity (veh/h)	641	1026			1574	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	129	42	104
Volume Left	3	0	74
Volume Right	126	3	0
cSH	1012	1700	1574
Volume to Capacity	0.13	0.02	0.05
Queue Length 95th (m)	3.3	0.0	1.1
Control Delay (s)	9.1	0.0	5.4
Lane LOS	A		A
Approach Delay (s)	9.1	0.0	5.4
Approach LOS	A		

Intersection Summary			
Average Delay	6.3		
Intersection Capacity Utilization	24.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	19	71	66	186	120	87	36	164	68	21	180	10
Future Volume (vph)	19	71	66	186	120	87	36	164	68	21	180	10
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Hourly flow rate (vph)	22	83	77	216	140	101	42	191	79	24	209	12

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1
Volume Total (vph)	182	457	233	79	245
Volume Left (vph)	22	216	42	0	24
Volume Right (vph)	77	101	0	79	12
Hadj (s)	-0.14	0.00	0.26	-0.70	0.05
Departure Headway (s)	6.7	6.2	7.4	6.4	6.9
Degree Utilization, x	0.34	0.78	0.48	0.14	0.47
Capacity (veh/h)	462	457	446	509	465
Control Delay (s)	13.1	28.0	15.9	9.3	15.9
Approach Delay (s)	13.1	28.0	14.2		15.9
Approach LOS	B	D	B		C

Intersection Summary				
Delay	19.7			
Level of Service	C			
Intersection Capacity Utilization	66.8%	ICU Level of Service	C	
Analysis Period (min)	15			

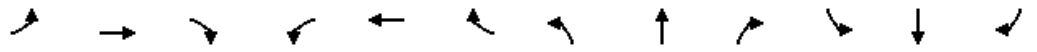
Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	2	69	122	18	13	2
Future Volume (Veh/h)	2	69	122	18	13	2
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	2	75	133	20	14	2
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	301	15	16			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	301	15	16			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	93	92			
cM capacity (veh/h)	638	1070	1615			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	77	153	16
Volume Left	2	133	0
Volume Right	75	0	2
cSH	1052	1615	1700
Volume to Capacity	0.07	0.08	0.01
Queue Length 95th (m)	1.8	2.0	0.0
Control Delay (s)	8.7	6.5	0.0
Lane LOS	A	A	
Approach Delay (s)	8.7	6.5	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	6.8		
Intersection Capacity Utilization	25.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Right Turn Channelized												
Traffic Volume (veh/h)	19	71	66	186	120	87	36	164	68	21	180	10
Future Volume (veh/h)	19	71	66	186	120	87	36	164	68	21	180	10
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Hourly flow rate (vph)	22	83	77	216	140	101	42	191	79	24	209	12
Approach Volume (veh/h)		182			457			312			245	
Crossing Volume (veh/h)		449			255			129			398	
High Capacity (veh/h)		972			1134			1252			1013	
High v/c (veh/h)		0.19			0.40			0.25			0.24	
Low Capacity (veh/h)		789			934			1041			825	
Low v/c (veh/h)		0.23			0.49			0.30			0.30	

Intersection Summary					
Maximum v/c High	0.40				
Maximum v/c Low	0.49				
Intersection Capacity Utilization	66.8%	ICU Level of Service		C	



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Traffic Volume (veh/h)	115	443	48	2	249	28	15	11	6	21	17	8
Future Volume (Veh/h)	115	443	48	2	249	28	15	11	6	21	17	8
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	124	476	52	2	268	30	16	12	6	23	18	9
Pedestrians		1						1			1	
Lane Width (m)		3.7						3.7			3.7	
Walking Speed (m/s)		1.1						1.1			1.1	
Percent Blockage		0						0			0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	299			529			1057	1054	503	1050	1065	285
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	299			529			1057	1054	503	1050	1065	285
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.3
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.4
p0 queue free %	90			100			91	94	99	87	91	99
cM capacity (veh/h)	1272			1047			174	205	572	180	202	725

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	652	300	34	50
Volume Left	124	2	16	23
Volume Right	52	30	6	9
cSH	1272	1047	211	218
Volume to Capacity	0.10	0.00	0.16	0.23
Queue Length 95th (m)	2.5	0.0	4.3	6.5
Control Delay (s)	2.5	0.1	25.3	26.3
Lane LOS	A	A	D	D
Approach Delay (s)	2.5	0.1	25.3	26.3
Approach LOS			D	D

Intersection Summary				
Average Delay	3.7			
Intersection Capacity Utilization	61.2%	ICU Level of Service	B	
Analysis Period (min)	15			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Traffic Volume (veh/h)	10	132	328	0	76	0	199	18	5	1	11	3
Future Volume (Veh/h)	10	132	328	0	76	0	199	18	5	1	11	3
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Hourly flow rate (vph)	10	135	335	0	78	0	203	18	5	1	11	3
Pedestrians											1	
Lane Width (m)											3.7	
Walking Speed (m/s)											1.1	
Percent Blockage											0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	79			470			409	402	302	416	569	79
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	79			470			409	402	302	416	569	79
tC, single (s)	4.1			4.7			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.8			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			100			62	97	99	100	97	100
cM capacity (veh/h)	1530			839			537	536	742	530	431	986

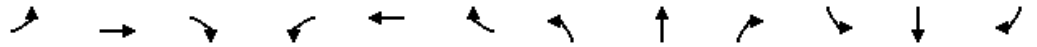
Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	480	78	226	15
Volume Left	10	0	203	1
Volume Right	335	0	5	3
cSH	1530	839	541	493
Volume to Capacity	0.01	0.00	0.42	0.03
Queue Length 95th (m)	0.1	0.0	15.6	0.7
Control Delay (s)	0.2	0.0	16.4	12.5
Lane LOS	A		C	B
Approach Delay (s)	0.2	0.0	16.4	12.5
Approach LOS			C	B

Intersection Summary				
Average Delay	5.0			
Intersection Capacity Utilization	59.9%	ICU Level of Service	B	
Analysis Period (min)	15			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	4	70	21	5	110	46
Future Volume (Veh/h)	4	70	21	5	110	46
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	5	82	25	6	129	54
Pedestrians	6					
Lane Width (m)	3.7					
Walking Speed (m/s)	1.1					
Percent Blockage	1					
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	346	34			37	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	346	34			37	
tC, single (s)	6.6	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.7	3.3			2.2	
p0 queue free %	99	92			92	
cM capacity (veh/h)	554	1039			1577	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	87	31	183
Volume Left	5	0	129
Volume Right	82	6	0
cSH	989	1700	1577
Volume to Capacity	0.09	0.02	0.08
Queue Length 95th (m)	2.2	0.0	2.0
Control Delay (s)	9.0	0.0	5.5
Lane LOS	A		A
Approach Delay (s)	9.0	0.0	5.5
Approach LOS	A		

Intersection Summary			
Average Delay	5.9		
Intersection Capacity Utilization	26.4%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	13	72	39	97	55	48	67	200	196	86	235	23
Future Volume (vph)	13	72	39	97	55	48	67	200	196	86	235	23
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Hourly flow rate (vph)	15	86	46	115	65	57	80	238	233	102	280	27

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1
Volume Total (vph)	147	237	318	233	409
Volume Left (vph)	15	115	80	0	102
Volume Right (vph)	46	57	0	233	27
Hadj (s)	-0.12	0.03	0.16	-0.67	0.05
Departure Headway (s)	7.2	7.0	6.8	6.0	6.4
Degree Utilization, x	0.29	0.46	0.60	0.39	0.72
Capacity (veh/h)	427	456	505	577	540
Control Delay (s)	13.1	15.8	18.5	11.5	24.3
Approach Delay (s)	13.1	15.8	15.5		24.3
Approach LOS	B	C	C		C

Intersection Summary				
Delay	18.0			
Level of Service	C			
Intersection Capacity Utilization	60.8%	ICU Level of Service		B
Analysis Period (min)	15			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	2	138	74	20	18	2
Future Volume (Veh/h)	2	138	74	20	18	2
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	2	150	80	22	20	2
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	203	21	22			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	203	21	22			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	86	95			
cM capacity (veh/h)	751	1062	1607			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	152	102	22
Volume Left	2	80	0
Volume Right	150	0	2
cSH	1057	1607	1700
Volume to Capacity	0.14	0.05	0.01
Queue Length 95th (m)	3.8	1.2	0.0
Control Delay (s)	9.0	5.9	0.0
Lane LOS	A	A	
Approach Delay (s)	9.0	5.9	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	7.1		
Intersection Capacity Utilization	27.1%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Right Turn Channelized												
Traffic Volume (veh/h)	13	72	39	97	55	48	67	200	196	86	235	23
Future Volume (veh/h)	13	72	39	97	55	48	67	200	196	86	235	23
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Hourly flow rate (vph)	15	86	46	115	65	57	80	238	233	102	280	27
Approach Volume (veh/h)		147			237			551			409	
Crossing Volume (veh/h)		497			333			203			260	
High Capacity (veh/h)		936			1066			1181			1129	
High v/c (veh/h)		0.16			0.22			0.47			0.36	
Low Capacity (veh/h)		756			873			977			930	
Low v/c (veh/h)		0.19			0.27			0.56			0.44	

Intersection Summary					
Maximum v/c High	0.47				
Maximum v/c Low	0.56				
Intersection Capacity Utilization	60.8%	ICU Level of Service		B	

APPENDIX

E-2 20-YEAR HORIZON SYNCHRO RESULTS

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (veh/h)	85	163	32	0	342	20	44	9	0	18	23	73
Future Volume (Veh/h)	85	163	32	0	342	20	44	9	0	18	23	73
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	94	181	36	0	380	22	49	10	0	20	26	81
Pedestrians								1			2	
Lane Width (m)								3.7			3.7	
Walking Speed (m/s)								1.1			1.1	
Percent Blockage								0			0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	404			218			873	792	200	785	799	393
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	404			218			873	792	200	785	799	393
tC, single (s)	4.1			4.1			7.1	6.8	6.2	7.1	6.5	6.3
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.3	3.3	3.5	4.0	3.4
p0 queue free %	92			100			76	96	100	93	91	87
cM capacity (veh/h)	1163			1350			208	269	840	284	294	644

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	311	402	59	127
Volume Left	94	0	49	20
Volume Right	36	22	0	81
cSH	1163	1350	216	446
Volume to Capacity	0.08	0.00	0.27	0.28
Queue Length 95th (m)	2.0	0.0	8.1	8.8
Control Delay (s)	3.1	0.0	27.8	16.2
Lane LOS	A		D	C
Approach Delay (s)	3.1	0.0	27.8	16.2
Approach LOS			D	C

Intersection Summary				
Average Delay	5.2			
Intersection Capacity Utilization	54.0%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Traffic Volume (veh/h)	4	0	177	2	0	5	356	13	0	0	37	7
Future Volume (Veh/h)	4	0	177	2	0	5	356	13	0	0	37	7
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	5	0	208	2	0	6	419	15	0	0	44	8
Pedestrians					15						14	
Lane Width (m)					3.7						3.7	
Walking Speed (m/s)					1.1						1.1	
Percent Blockage					1						1	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	20			208			151	138	119	158	239	17
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	20			208			151	138	119	158	239	17
tC, single (s)	4.1			4.7			7.1	6.7	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.8			3.5	4.2	3.3	3.5	4.0	3.3
p0 queue free %	100			100			45	98	100	100	93	99
cM capacity (veh/h)	1587			1075			755	709	919	762	646	1053

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	213	8	434	52
Volume Left	5	2	419	0
Volume Right	208	6	0	8
cSH	1587	1075	754	687
Volume to Capacity	0.00	0.00	0.58	0.08
Queue Length 95th (m)	0.1	0.0	28.3	1.9
Control Delay (s)	0.2	2.1	16.1	10.7
Lane LOS	A	A	C	B
Approach Delay (s)	0.2	2.1	16.1	10.7
Approach LOS			C	B

Intersection Summary				
Average Delay	10.7			
Intersection Capacity Utilization	45.1%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	5	11	14	2	7	13
Future Volume (Veh/h)	5	11	14	2	7	13
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80
Hourly flow rate (vph)	6	14	18	3	9	16
Pedestrians	2					
Lane Width (m)	3.7					
Walking Speed (m/s)	1.1					
Percent Blockage	0					
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	56	22			23	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	56	22			23	
tC, single (s)	6.6	6.3			4.1	
tC, 2 stage (s)						
tF (s)	3.7	3.4			2.2	
p0 queue free %	99	99			99	
cM capacity (veh/h)	891	1026			1602	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	20	21	25
Volume Left	6	0	9
Volume Right	14	3	0
cSH	981	1700	1602
Volume to Capacity	0.02	0.01	0.01
Queue Length 95th (m)	0.5	0.0	0.1
Control Delay (s)	8.7	0.0	2.6
Lane LOS	A		A
Approach Delay (s)	8.7	0.0	2.6
Approach LOS	A		

Intersection Summary			
Average Delay	3.7		
Intersection Capacity Utilization	16.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↔			↔			↑	↱		↔	
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	21	79	72	208	135	180	40	181	75	66	198	10
Future Volume (vph)	21	79	72	208	135	180	40	181	75	66	198	10
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Hourly flow rate (vph)	24	92	84	242	157	209	47	210	87	77	230	12

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1
Volume Total (vph)	200	608	257	87	319
Volume Left (vph)	24	242	47	0	77
Volume Right (vph)	84	209	0	87	12
Hadj (s)	-0.14	-0.09	0.27	-0.70	0.07
Departure Headway (s)	7.7	6.8	8.2	7.3	7.6
Degree Utilization, x	0.43	1.15	0.59	0.18	0.67
Capacity (veh/h)	426	516	420	477	451
Control Delay (s)	16.4	113.8	21.0	10.6	25.0
Approach Delay (s)	16.4	113.8	18.4		25.0
Approach LOS	C	F	C		C

Intersection Summary				
Delay	59.0			
Level of Service	F			
Intersection Capacity Utilization	79.3%	ICU Level of Service	D	
Analysis Period (min)	15			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Right Turn Channelized												
Traffic Volume (veh/h)	21	79	72	208	135	180	40	181	75	66	198	10
Future Volume (veh/h)	21	79	72	208	135	180	40	181	75	66	198	10
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Hourly flow rate (vph)	24	92	84	242	157	209	47	210	87	77	230	12
Approach Volume (veh/h)		200			608			344			319	
Crossing Volume (veh/h)		549			281			193			446	
High Capacity (veh/h)		898			1111			1191			975	
High v/c (veh/h)		0.22			0.55			0.29			0.33	
Low Capacity (veh/h)		723			913			985			791	
Low v/c (veh/h)		0.28			0.67			0.35			0.40	

Intersection Summary				
Maximum v/c High	0.55			
Maximum v/c Low	0.67			
Intersection Capacity Utilization	79.3%	ICU Level of Service	D	

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	169	441	53	2	240	30	16	16	3	24	19	43
Future Volume (Veh/h)	169	441	53	2	240	30	16	16	3	24	19	43
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	182	474	57	2	258	32	17	17	3	26	20	46
Pedestrians		1						1			1	
Lane Width (m)		3.7						3.7			3.7	
Walking Speed (m/s)		1.1						1.1			1.1	
Percent Blockage		0						0			0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	291			532			1202	1162	504	1157	1175	276
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	291			532			1202	1162	504	1157	1175	276
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	86			100			86	90	99	82	88	94
cM capacity (veh/h)	1281			1045			123	168	572	143	165	759

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	713	292	37	92
Volume Left	182	2	17	26
Volume Right	57	32	3	46
cSH	1281	1045	151	253
Volume to Capacity	0.14	0.00	0.24	0.36
Queue Length 95th (m)	3.8	0.0	6.9	12.1
Control Delay (s)	3.4	0.1	36.3	27.2
Lane LOS	A	A	E	D
Approach Delay (s)	3.4	0.1	36.3	27.2
Approach LOS			E	D

Intersection Summary				
Average Delay	5.5			
Intersection Capacity Utilization	66.2%	ICU Level of Service	C	
Analysis Period (min)	15			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Traffic Volume (veh/h)	12	0	456	0	0	0	268	20	0	0	14	4
Future Volume (Veh/h)	12	0	456	0	0	0	268	20	0	0	14	4
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Hourly flow rate (vph)	12	0	465	0	0	0	273	20	0	0	14	4
Pedestrians											1	
Lane Width (m)											3.7	
Walking Speed (m/s)											1.1	
Percent Blockage											0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	1			465			268	258	232	268	490	1
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	1			465			268	258	232	268	490	1
tC, single (s)	4.1			5.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			3.1			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			100			59	97	100	100	97	100
cM capacity (veh/h)	1633			729			665	645	807	664	478	1088

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	477	0	293	18
Volume Left	12	0	273	0
Volume Right	465	0	0	4
cSH	1633	1700	664	546
Volume to Capacity	0.01	0.00	0.44	0.03
Queue Length 95th (m)	0.2	0.0	17.2	0.8
Control Delay (s)	0.3	0.0	14.6	11.8
Lane LOS	A		B	B
Approach Delay (s)	0.3	0.0	14.6	11.8
Approach LOS			B	B

Intersection Summary				
Average Delay	5.9			
Intersection Capacity Utilization	58.1%	ICU Level of Service	B	
Analysis Period (min)	15			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	10	13	13	5	14	15
Future Volume (Veh/h)	10	13	13	5	14	15
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	12	15	15	6	16	18
Pedestrians	6					
Lane Width (m)	3.7					
Walking Speed (m/s)	1.1					
Percent Blockage	1					
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	74	24			27	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	74	24			27	
tC, single (s)	6.5	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.6	3.3			2.2	
p0 queue free %	99	99			99	
cM capacity (veh/h)	889	1052			1591	

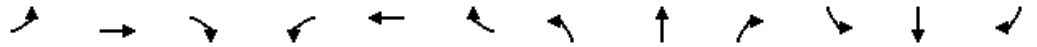
Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	27	21	34
Volume Left	12	0	16
Volume Right	15	6	0
cSH	973	1700	1591
Volume to Capacity	0.03	0.01	0.01
Queue Length 95th (m)	0.7	0.0	0.2
Control Delay (s)	8.8	0.0	3.5
Lane LOS	A		A
Approach Delay (s)	8.8	0.0	3.5
Approach LOS	A		

Intersection Summary			
Average Delay	4.3		
Intersection Capacity Utilization	18.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	14	80	43	109	62	101	74	221	216	191	258	25
Future Volume (vph)	14	80	43	109	62	101	74	221	216	191	258	25
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Hourly flow rate (vph)	17	95	51	130	74	120	88	263	257	227	307	30

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1
Volume Total (vph)	163	324	351	257	564
Volume Left (vph)	17	130	88	0	227
Volume Right (vph)	51	120	0	257	30
Hadj (s)	-0.12	-0.08	0.16	-0.67	0.08
Departure Headway (s)	8.3	7.6	7.8	7.0	7.3
Degree Utilization, x	0.38	0.69	0.76	0.50	1.15
Capacity (veh/h)	397	458	453	508	496
Control Delay (s)	16.3	25.6	30.1	15.4	113.5
Approach Delay (s)	16.3	25.6	23.9		113.5
Approach LOS	C	D	C		F

Intersection Summary				
Delay	54.0			
Level of Service	F			
Intersection Capacity Utilization	78.0%	ICU Level of Service	D	
Analysis Period (min)	15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Right Turn Channelized												
Traffic Volume (veh/h)	14	80	43	109	62	101	74	221	216	191	258	25
Future Volume (veh/h)	14	80	43	109	62	101	74	221	216	191	258	25
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Hourly flow rate (vph)	17	95	51	130	74	120	88	263	257	227	307	30
Approach Volume (veh/h)		163			324			608			564	
Crossing Volume (veh/h)		664			368			339			292	
High Capacity (veh/h)		818			1037			1061			1101	
High v/c (veh/h)		0.20			0.31			0.57			0.51	
Low Capacity (veh/h)		653			847			868			904	
Low v/c (veh/h)		0.25			0.38			0.70			0.62	

Intersection Summary					
Maximum v/c High	0.57				
Maximum v/c Low	0.70				
Intersection Capacity Utilization	78.0%	ICU Level of Service		D	

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Traffic Volume (veh/h)	59	188	32	0	388	20	44	6	2	18	23	32
Future Volume (Veh/h)	59	188	32	0	388	20	44	6	2	18	23	32
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	66	209	36	0	431	22	49	7	2	20	26	36
Pedestrians								1			2	
Lane Width (m)								3.7			3.7	
Walking Speed (m/s)								1.1			1.1	
Percent Blockage								0			0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	455			246			851	815	228	808	822	444
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	455			246			851	815	228	808	822	444
tC, single (s)	4.1			4.1			7.1	6.8	6.2	7.1	6.5	6.3
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.3	3.3	3.5	4.0	3.4
p0 queue free %	94			100			79	97	100	93	91	94
cM capacity (veh/h)	1114			1319			236	266	810	280	292	602

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	311	453	58	82
Volume Left	66	0	49	20
Volume Right	36	22	2	36
cSH	1114	1319	245	372
Volume to Capacity	0.06	0.00	0.24	0.22
Queue Length 95th (m)	1.4	0.0	6.8	6.3
Control Delay (s)	2.2	0.0	24.2	17.4
Lane LOS	A		C	C
Approach Delay (s)	2.2	0.0	24.2	17.4
Approach LOS			C	C

Intersection Summary				
Average Delay	3.9			
Intersection Capacity Utilization	54.8%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	4	55	149	2	109	5	293	13	5	5	31	7
Future Volume (Veh/h)	4	55	149	2	109	5	293	13	5	5	31	7
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	5	65	175	2	128	6	345	15	6	6	36	8
Pedestrians					15						14	
Lane Width (m)					3.7						3.7	
Walking Speed (m/s)					1.1						1.1	
Percent Blockage					1						1	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	148			240			324	314	168	340	399	145
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	148			240			324	314	168	340	399	145
tC, single (s)	4.1			4.7			7.1	6.7	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.8			3.5	4.2	3.3	3.5	4.0	3.3
p0 queue free %	100			100			41	97	99	99	93	99
cM capacity (veh/h)	1426			1043			581	563	864	572	526	895

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	245	136	366	50
Volume Left	5	2	345	6
Volume Right	175	6	6	8
cSH	1426	1043	583	569
Volume to Capacity	0.00	0.00	0.63	0.09
Queue Length 95th (m)	0.1	0.0	33.1	2.2
Control Delay (s)	0.2	0.1	21.0	11.9
Lane LOS	A	A	C	B
Approach Delay (s)	0.2	0.1	21.0	11.9
Approach LOS			C	B

Intersection Summary				
Average Delay	10.5			
Intersection Capacity Utilization	45.0%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	7	122	14	2	73	8
Future Volume (Veh/h)	7	122	14	2	73	8
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80
Hourly flow rate (vph)	9	153	18	3	91	10
Pedestrians	2					
Lane Width (m)	3.7					
Walking Speed (m/s)	1.1					
Percent Blockage	0					
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	214	22			23	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	214	22			23	
tC, single (s)	6.6	6.3			4.1	
tC, 2 stage (s)						
tF (s)	3.7	3.4			2.2	
p0 queue free %	99	85			94	
cM capacity (veh/h)	684	1026			1602	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	162	21	101
Volume Left	9	0	91
Volume Right	153	3	0
cSH	998	1700	1602
Volume to Capacity	0.16	0.01	0.06
Queue Length 95th (m)	4.4	0.0	1.4
Control Delay (s)	9.3	0.0	6.7
Lane LOS	A		A
Approach Delay (s)	9.3	0.0	6.7
Approach LOS	A		

Intersection Summary			
Average Delay	7.7		
Intersection Capacity Utilization	25.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	21	79	72	208	135	117	40	181	75	33	198	10
Future Volume (vph)	21	79	72	208	135	117	40	181	75	33	198	10
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Hourly flow rate (vph)	24	92	84	242	157	136	47	210	87	38	230	12

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1
Volume Total (vph)	200	535	257	87	280
Volume Left (vph)	24	242	47	0	38
Volume Right (vph)	84	136	0	87	12
Hadj (s)	-0.14	-0.03	0.27	-0.70	0.06
Departure Headway (s)	7.7	6.8	8.3	7.3	7.8
Degree Utilization, x	0.43	1.00	0.59	0.18	0.61
Capacity (veh/h)	450	524	427	488	461
Control Delay (s)	16.3	66.2	21.3	10.6	22.0
Approach Delay (s)	16.3	66.2	18.6		22.0
Approach LOS	C	F	C		C

Intersection Summary				
Delay	37.7			
Level of Service	E			
Intersection Capacity Utilization	73.7%	ICU Level of Service	D	
Analysis Period (min)	15			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	66	114	19	15	2
Future Volume (Veh/h)	0	66	114	19	15	2
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	72	124	21	16	2
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	286	17	18			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	286	17	18			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	93	92			
cM capacity (veh/h)	650	1062	1599			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	72	145	18
Volume Left	0	124	0
Volume Right	72	0	2
cSH	1062	1599	1700
Volume to Capacity	0.07	0.08	0.01
Queue Length 95th (m)	1.7	1.9	0.0
Control Delay (s)	8.6	6.4	0.0
Lane LOS	A	A	
Approach Delay (s)	8.6	6.4	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	6.6		
Intersection Capacity Utilization	24.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Traffic Volume (veh/h)	127	482	53	2	277	30	16	12	6	24	19	9
Future Volume (Veh/h)	127	482	53	2	277	30	16	12	6	24	19	9
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	137	518	57	2	298	32	17	13	6	26	20	10
Pedestrians		1						1			1	
Lane Width (m)		3.7						3.7			3.7	
Walking Speed (m/s)		1.1						1.1			1.1	
Percent Blockage		0						0			0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	331			576			1160	1156	548	1152	1169	316
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	331			576			1160	1156	548	1152	1169	316
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	89			100			88	93	99	83	88	99
cM capacity (veh/h)	1239			1006			143	176	540	150	173	721

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	712	332	36	56
Volume Left	137	2	17	26
Volume Right	57	32	6	10
cSH	1239	1006	176	185
Volume to Capacity	0.11	0.00	0.20	0.30
Queue Length 95th (m)	2.8	0.0	5.6	9.2
Control Delay (s)	2.7	0.1	30.6	32.7
Lane LOS	A	A	D	D
Approach Delay (s)	2.7	0.1	30.6	32.7
Approach LOS			D	D

Intersection Summary				
Average Delay	4.3			
Intersection Capacity Utilization	66.1%	ICU Level of Service	C	
Analysis Period (min)	15			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Traffic Volume (veh/h)	11	138	363	0	72	0	232	20	6	2	11	3
Future Volume (Veh/h)	11	138	363	0	72	0	232	20	6	2	11	3
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Hourly flow rate (vph)	11	141	370	0	73	0	237	20	6	2	11	3
Pedestrians											1	
Lane Width (m)											3.7	
Walking Speed (m/s)											1.1	
Percent Blockage											0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	74			511			430	422	326	438	607	74
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	74			511			430	422	326	438	607	74
tC, single (s)	4.1			4.7			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.8			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			100			55	96	99	100	97	100
cM capacity (veh/h)	1537			807			522	522	715	506	410	992

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	522	73	263	16
Volume Left	11	0	237	2
Volume Right	370	0	6	3
cSH	1537	807	525	473
Volume to Capacity	0.01	0.00	0.50	0.03
Queue Length 95th (m)	0.2	0.0	21.1	0.8
Control Delay (s)	0.2	0.0	18.5	12.9
Lane LOS	A		C	B
Approach Delay (s)	0.2	0.0	18.5	12.9
Approach LOS			C	B

Intersection Summary				
Average Delay	6.0			
Intersection Capacity Utilization	64.5%	ICU Level of Service	C	
Analysis Period (min)	15			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	12	82	13	5	161	5
Future Volume (Veh/h)	12	82	13	5	161	5
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	14	96	15	6	189	6
Pedestrians	6					
Lane Width (m)	3.7					
Walking Speed (m/s)	1.1					
Percent Blockage	1					
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	408	24			27	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	408	24			27	
tC, single (s)	6.5	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.6	3.3			2.2	
p0 queue free %	97	91			88	
cM capacity (veh/h)	507	1052			1591	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	110	21	195
Volume Left	14	0	189
Volume Right	96	6	0
cSH	925	1700	1591
Volume to Capacity	0.12	0.01	0.12
Queue Length 95th (m)	3.1	0.0	3.1
Control Delay (s)	9.4	0.0	7.4
Lane LOS	A		A
Approach Delay (s)	9.4	0.0	7.4
Approach LOS	A		

Intersection Summary			
Average Delay	7.6		
Intersection Capacity Utilization	28.2%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	14	80	43	109	62	65	74	221	216	95	258	25
Future Volume (vph)	14	80	43	109	62	65	74	221	216	95	258	25
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Hourly flow rate (vph)	17	95	51	130	74	77	88	263	257	113	307	30

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1
Volume Total (vph)	163	281	351	257	450
Volume Left (vph)	17	130	88	0	113
Volume Right (vph)	51	77	0	257	30
Hadj (s)	-0.12	-0.01	0.16	-0.67	0.05
Departure Headway (s)	7.9	7.5	7.5	6.6	7.0
Degree Utilization, x	0.36	0.59	0.73	0.47	0.87
Capacity (veh/h)	408	452	467	526	504
Control Delay (s)	15.3	20.7	26.7	14.2	40.9
Approach Delay (s)	15.3	20.7	21.4		40.9
Approach LOS	C	C	C		E

Intersection Summary				
Delay	26.5			
Level of Service	D			
Intersection Capacity Utilization	70.5%	ICU Level of Service	C	
Analysis Period (min)	15			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	0	147	70	22	19	2
Future Volume (Veh/h)	0	147	70	22	19	2
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	160	76	24	21	2
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	198	22	23			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	198	22	23			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	85	95			
cM capacity (veh/h)	753	1055	1592			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	160	100	23
Volume Left	0	76	0
Volume Right	160	0	2
cSH	1055	1592	1700
Volume to Capacity	0.15	0.05	0.01
Queue Length 95th (m)	4.1	1.1	0.0
Control Delay (s)	9.0	5.7	0.0
Lane LOS	A	A	
Approach Delay (s)	9.0	5.7	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	7.1		
Intersection Capacity Utilization	27.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Traffic Volume (veh/h)	54	193	32	0	387	20	44	5	3	18	23	27
Future Volume (Veh/h)	54	193	32	0	387	20	44	5	3	18	23	27
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	60	214	36	0	430	22	49	6	3	20	26	30
Pedestrians								1			2	
Lane Width (m)								3.7			3.7	
Walking Speed (m/s)								1.1			1.1	
Percent Blockage								0			0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	454			251			837	807	233	801	814	443
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	454			251			837	807	233	801	814	443
tC, single (s)	4.1			4.1			7.1	6.8	6.2	7.1	6.5	6.3
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.3	3.3	3.5	4.0	3.4
p0 queue free %	95			100			80	98	100	93	91	95
cM capacity (veh/h)	1115			1313			245	271	805	285	297	603

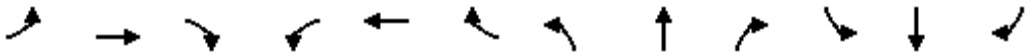
Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	310	452	58	76
Volume Left	60	0	49	20
Volume Right	36	22	3	30
cSH	1115	1313	256	366
Volume to Capacity	0.05	0.00	0.23	0.21
Queue Length 95th (m)	1.3	0.0	6.4	5.8
Control Delay (s)	2.1	0.0	23.1	17.4
Lane LOS	A		C	C
Approach Delay (s)	2.1	0.0	23.1	17.4
Approach LOS			C	C

Intersection Summary				
Average Delay	3.7			
Intersection Capacity Utilization	54.3%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Traffic Volume (veh/h)	4	64	146	2	117	5	284	13	6	6	30	7
Future Volume (Veh/h)	4	64	146	2	117	5	284	13	6	6	30	7
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	5	75	172	2	138	6	334	15	7	7	35	8
Pedestrians					15						14	
Lane Width (m)					3.7						3.7	
Walking Speed (m/s)					1.1						1.1	
Percent Blockage					1						1	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	158			247			342	333	176	360	416	155
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	158			247			342	333	176	360	416	155
tC, single (s)	4.1			4.7			7.1	6.7	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.8			3.5	4.2	3.3	3.5	4.0	3.3
p0 queue free %	100			100			41	97	99	99	93	99
cM capacity (veh/h)	1414			1036			565	550	854	554	514	884

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	252	146	356	50
Volume Left	5	2	334	7
Volume Right	172	6	7	8
cSH	1414	1036	568	557
Volume to Capacity	0.00	0.00	0.63	0.09
Queue Length 95th (m)	0.1	0.0	32.9	2.2
Control Delay (s)	0.2	0.1	21.3	12.1
Lane LOS	A	A	C	B
Approach Delay (s)	0.2	0.1	21.3	12.1
Approach LOS			C	B

Intersection Summary				
Average Delay	10.3			
Intersection Capacity Utilization	44.9%	ICU Level of Service	A	
Analysis Period (min)	15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	74	2	5	119	4	2	12	2	7	11	2
Future Volume (Veh/h)	0	74	2	5	119	4	2	12	2	7	11	2
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Hourly flow rate (vph)	0	93	3	6	149	5	3	15	3	9	14	3
Pedestrians					2							
Lane Width (m)					3.7							
Walking Speed (m/s)					1.1							
Percent Blockage					0							
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	154			96			268	260	96	270	260	152
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	154			96			268	260	96	270	260	152
tC, single (s)	4.1			4.3			7.1	6.6	6.2	7.1	6.6	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.4			3.5	4.1	3.3	3.5	4.1	3.3
p0 queue free %	100			100			100	98	100	99	98	100
cM capacity (veh/h)	1426			1365			668	630	963	668	629	895

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	96	160	21	26
Volume Left	0	6	3	9
Volume Right	3	5	3	3
cSH	1426	1365	668	665
Volume to Capacity	0.00	0.00	0.03	0.04
Queue Length 95th (m)	0.0	0.1	0.7	0.9
Control Delay (s)	0.0	0.3	10.6	10.6
Lane LOS		A	B	B
Approach Delay (s)	0.0	0.3	10.6	10.6
Approach LOS			B	B

Intersection Summary				
Average Delay	1.8			
Intersection Capacity Utilization	21.2%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	21	79	72	208	135	108	40	181	75	29	198	10
Future Volume (vph)	21	79	72	208	135	108	40	181	75	29	198	10
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Hourly flow rate (vph)	24	92	84	242	157	126	47	210	87	34	230	12

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1
Volume Total (vph)	200	525	257	87	276
Volume Left (vph)	24	242	47	0	34
Volume Right (vph)	84	126	0	87	12
Hadj (s)	-0.14	-0.02	0.27	-0.70	0.06
Departure Headway (s)	7.6	6.7	8.2	7.2	7.7
Degree Utilization, x	0.42	0.98	0.58	0.17	0.59
Capacity (veh/h)	452	525	429	490	461
Control Delay (s)	16.0	60.1	20.9	10.5	21.3
Approach Delay (s)	16.0	60.1	18.2		21.3
Approach LOS	C	F	C		C

Intersection Summary				
Delay	34.9			
Level of Service	D			
Intersection Capacity Utilization	73.0%	ICU Level of Service	D	
Analysis Period (min)	15			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		↕			↕			↕			↕	
Traffic Volume (veh/h)	118	491	53	2	277	30	16	11	7	24	19	5
Future Volume (Veh/h)	118	491	53	2	277	30	16	11	7	24	19	5
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	127	528	57	2	298	32	17	12	8	26	20	5
Pedestrians		1						1			1	
Lane Width (m)		3.7						3.7			3.7	
Walking Speed (m/s)		1.1						1.1			1.1	
Percent Blockage		0						0			0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	331			586			1146	1146	558	1144	1159	316
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	331			586			1146	1146	558	1144	1159	316
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	90			100			89	93	98	83	89	99
cM capacity (veh/h)	1239			998			148	180	533	153	177	721

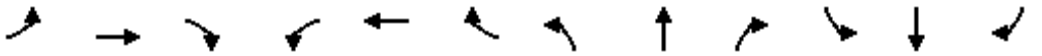
Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	712	332	37	51
Volume Left	127	2	17	26
Volume Right	57	32	8	5
cSH	1239	998	188	176
Volume to Capacity	0.10	0.00	0.20	0.29
Queue Length 95th (m)	2.6	0.0	5.4	8.7
Control Delay (s)	2.5	0.1	28.7	33.6
Lane LOS	A	A	D	D
Approach Delay (s)	2.5	0.1	28.7	33.6
Approach LOS			D	D

Intersection Summary				
Average Delay	4.1			
Intersection Capacity Utilization	65.8%	ICU Level of Service	C	
Analysis Period (min)	15			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	11	156	354	0	77	0	227	20	7	3	10	3
Future Volume (Veh/h)	11	156	354	0	77	0	227	20	7	3	10	3
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Hourly flow rate (vph)	11	159	361	0	79	0	232	20	7	3	10	3
Pedestrians											1	
Lane Width (m)											3.7	
Walking Speed (m/s)											1.1	
Percent Blockage											0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	80			520			448	442	340	458	622	80
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	80			520			448	442	340	458	622	80
tC, single (s)	4.1			4.7			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.8			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			100			54	96	99	99	98	100
cM capacity (veh/h)	1529			800			508	509	703	489	402	985

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	531	79	259	16
Volume Left	11	0	232	3
Volume Right	361	0	7	3
cSH	1529	800	512	470
Volume to Capacity	0.01	0.00	0.51	0.03
Queue Length 95th (m)	0.2	0.0	21.5	0.8
Control Delay (s)	0.2	0.0	19.0	12.9
Lane LOS	A		C	B
Approach Delay (s)	0.2	0.0	19.0	12.9
Approach LOS			C	B

Intersection Summary				
Average Delay	5.9			
Intersection Capacity Utilization	64.6%	ICU Level of Service	C	
Analysis Period (min)	15			



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	0	165	2	10	78	8	2	11	5	14	13	2
Future Volume (Veh/h)	0	165	2	10	78	8	2	11	5	14	13	2
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	0	194	2	12	92	9	2	13	6	16	15	2
Pedestrians					6							
Lane Width (m)					3.7							
Walking Speed (m/s)					1.1							
Percent Blockage					1							
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	101			196			325	320	201	334	316	96
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	101			196			325	320	201	334	316	96
tC, single (s)	4.1			4.2			7.1	6.5	6.5	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.3			3.5	4.0	3.5	3.5	4.0	3.3
p0 queue free %	100			99			100	98	99	97	97	100
cM capacity (veh/h)	1491			1314			610	595	780	601	597	960

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	196	113	21	33
Volume Left	0	12	2	16
Volume Right	2	9	6	2
cSH	1491	1314	640	613
Volume to Capacity	0.00	0.01	0.03	0.05
Queue Length 95th (m)	0.0	0.2	0.8	1.3
Control Delay (s)	0.0	0.9	10.8	11.2
Lane LOS		A	B	B
Approach Delay (s)	0.0	0.9	10.8	11.2
Approach LOS			B	B

Intersection Summary			
Average Delay	1.9		
Intersection Capacity Utilization	24.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	14	80	43	109	62	60	74	221	216	85	258	25
Future Volume (vph)	14	80	43	109	62	60	74	221	216	85	258	25
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Hourly flow rate (vph)	17	95	51	130	74	71	88	263	257	101	307	30

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1
Volume Total (vph)	163	275	351	257	438
Volume Left (vph)	17	130	88	0	101
Volume Right (vph)	51	71	0	257	30
Hadj (s)	-0.12	0.00	0.16	-0.67	0.04
Departure Headway (s)	7.8	7.5	7.4	6.5	6.9
Degree Utilization, x	0.35	0.57	0.72	0.47	0.84
Capacity (veh/h)	410	439	473	534	506
Control Delay (s)	15.1	19.8	25.8	13.9	36.5
Approach Delay (s)	15.1	19.8	20.8		36.5
Approach LOS	C	C	C		E

Intersection Summary				
Delay	24.6			
Level of Service	C			
Intersection Capacity Utilization	69.6%	ICU Level of Service	C	
Analysis Period (min)	15			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	59	197	32	0	396	28	44	6	2	18	23	32
Future Volume (Veh/h)	59	197	32	0	396	28	44	6	2	18	23	32
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	66	219	36	0	440	31	49	7	2	20	26	36
Pedestrians								1			2	
Lane Width (m)								3.7			3.7	
Walking Speed (m/s)								1.1			1.1	
Percent Blockage								0			0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	473			256			874	843	238	832	846	458
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	473			256			874	843	238	832	846	458
tC, single (s)	4.1			4.1			7.1	6.8	6.2	7.1	6.5	6.3
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.3	3.3	3.5	4.0	3.4
p0 queue free %	94			100			78	97	100	93	91	94
cM capacity (veh/h)	1097			1308			226	256	800	270	283	592

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	321	471	58	82
Volume Left	66	0	49	20
Volume Right	36	31	2	36
cSH	1097	1308	235	361
Volume to Capacity	0.06	0.00	0.25	0.23
Queue Length 95th (m)	1.5	0.0	7.2	6.5
Control Delay (s)	2.2	0.0	25.2	17.9
Lane LOS	A		D	C
Approach Delay (s)	2.2	0.0	25.2	17.9
Approach LOS			D	C

Intersection Summary				
Average Delay	3.9			
Intersection Capacity Utilization	56.2%	ICU Level of Service	B	
Analysis Period (min)	15			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Traffic Volume (veh/h)	4	64	149	2	128	5	291	13	5	5	31	7
Future Volume (Veh/h)	4	64	149	2	128	5	291	13	5	5	31	7
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	5	75	175	2	151	6	342	15	6	6	36	8
Pedestrians					15						14	
Lane Width (m)					3.7						3.7	
Walking Speed (m/s)					1.1						1.1	
Percent Blockage					1						1	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	171			250			356	348	178	373	432	168
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	171			250			356	348	178	373	432	168
tC, single (s)	4.1			4.7			7.1	6.7	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.8			3.5	4.2	3.3	3.5	4.0	3.3
p0 queue free %	100			100			38	97	99	99	93	99
cM capacity (veh/h)	1399			1033			551	539	853	544	504	869

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	255	159	363	50
Volume Left	5	2	342	6
Volume Right	175	6	6	8
cSH	1399	1033	554	545
Volume to Capacity	0.00	0.00	0.66	0.09
Queue Length 95th (m)	0.1	0.0	36.2	2.3
Control Delay (s)	0.2	0.1	23.0	12.3
Lane LOS	A	A	C	B
Approach Delay (s)	0.2	0.1	23.0	12.3
Approach LOS			C	B

Intersection Summary				
Average Delay	10.9			
Intersection Capacity Utilization	45.5%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	5	117	14	2	75	13
Future Volume (Veh/h)	5	117	14	2	75	13
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80
Hourly flow rate (vph)	6	146	18	3	94	16
Pedestrians	2					
Lane Width (m)	3.7					
Walking Speed (m/s)	1.1					
Percent Blockage	0					
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	226	22			23	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	226	22			23	
tC, single (s)	6.6	6.3			4.1	
tC, 2 stage (s)						
tF (s)	3.7	3.4			2.2	
p0 queue free %	99	86			94	
cM capacity (veh/h)	671	1026			1602	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	152	21	110
Volume Left	6	0	94
Volume Right	146	3	0
cSH	1005	1700	1602
Volume to Capacity	0.15	0.01	0.06
Queue Length 95th (m)	4.0	0.0	1.4
Control Delay (s)	9.2	0.0	6.4
Lane LOS	A		A
Approach Delay (s)	9.2	0.0	6.4
Approach LOS	A		

Intersection Summary			
Average Delay	7.4		
Intersection Capacity Utilization	25.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	21	79	72	200	130	115	40	181	75	33	205	14
Future Volume (vph)	21	79	72	200	130	115	40	181	75	33	205	14
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Hourly flow rate (vph)	24	92	84	233	151	134	47	210	87	38	238	16

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1
Volume Total (vph)	200	518	257	87	292
Volume Left (vph)	24	233	47	0	38
Volume Right (vph)	84	134	0	87	16
Hadj (s)	-0.14	-0.03	0.27	-0.70	0.05
Departure Headway (s)	7.7	6.8	8.2	7.2	7.7
Degree Utilization, x	0.43	0.98	0.59	0.17	0.63
Capacity (veh/h)	446	520	426	485	461
Control Delay (s)	16.3	59.6	21.1	10.6	22.7
Approach Delay (s)	16.3	59.6	18.5		22.7
Approach LOS	C	F	C		C

Intersection Summary				
Delay	34.8			
Level of Service	D			
Intersection Capacity Utilization	73.4%	ICU Level of Service	D	
Analysis Period (min)	15			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	2	73	133	0	14	2
Future Volume (Veh/h)	2	73	133	0	14	2
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	2	79	145	0	15	2
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	306	16	17			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	306	16	17			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	93	91			
cM capacity (veh/h)	624	1063	1600			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	81	145	17
Volume Left	2	145	0
Volume Right	79	0	2
cSH	1045	1600	1700
Volume to Capacity	0.08	0.09	0.01
Queue Length 95th (m)	1.9	2.3	0.0
Control Delay (s)	8.7	7.5	0.0
Lane LOS	A	A	
Approach Delay (s)	8.7	7.5	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	7.4		
Intersection Capacity Utilization	25.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Traffic Volume (veh/h)	127	506	53	2	282	35	16	12	6	24	19	9
Future Volume (Veh/h)	127	506	53	2	282	35	16	12	6	24	19	9
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	137	544	57	2	303	38	17	13	6	26	20	10
Pedestrians		1						1			1	
Lane Width (m)		3.7						3.7			3.7	
Walking Speed (m/s)		1.1						1.1			1.1	
Percent Blockage		0						0			0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	342			602			1194	1194	574	1186	1203	324
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	342			602			1194	1194	574	1186	1203	324
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	89			100			87	92	99	82	88	99
cM capacity (veh/h)	1227			984			134	167	522	142	164	713

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	738	343	36	56
Volume Left	137	2	17	26
Volume Right	57	38	6	10
cSH	1227	984	167	175
Volume to Capacity	0.11	0.00	0.22	0.32
Queue Length 95th (m)	2.9	0.0	6.0	9.8
Control Delay (s)	2.7	0.1	32.5	34.8
Lane LOS	A	A	D	D
Approach Delay (s)	2.7	0.1	32.5	34.8
Approach LOS			D	D

Intersection Summary				
Average Delay	4.4			
Intersection Capacity Utilization	67.9%	ICU Level of Service	C	
Analysis Period (min)	15			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Traffic Volume (veh/h)	11	162	363	0	85	0	230	20	6	2	11	3
Future Volume (Veh/h)	11	162	363	0	85	0	230	20	6	2	11	3
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Hourly flow rate (vph)	11	165	370	0	87	0	235	20	6	2	11	3
Pedestrians											1	
Lane Width (m)											3.7	
Walking Speed (m/s)											1.1	
Percent Blockage											0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	88			535			468	460	350	476	645	88
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	88			535			468	460	350	476	645	88
tC, single (s)	4.1			4.7			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.8			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			100			52	96	99	100	97	100
cM capacity (veh/h)	1519			789			492	497	693	476	390	975

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	546	87	261	16
Volume Left	11	0	235	2
Volume Right	370	0	6	3
cSH	1519	789	496	451
Volume to Capacity	0.01	0.00	0.53	0.04
Queue Length 95th (m)	0.2	0.0	23.0	0.8
Control Delay (s)	0.2	0.0	20.1	13.3
Lane LOS	A		C	B
Approach Delay (s)	0.2	0.0	20.1	13.3
Approach LOS			C	B

Intersection Summary				
Average Delay	6.1			
Intersection Capacity Utilization	65.6%	ICU Level of Service	C	
Analysis Period (min)	15			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	10	84	13	5	163	15
Future Volume (Veh/h)	10	84	13	5	163	15
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	12	99	15	6	192	18
Pedestrians	6					
Lane Width (m)	3.7					
Walking Speed (m/s)	1.1					
Percent Blockage	1					
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	426	24			27	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	426	24			27	
tC, single (s)	6.5	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.6	3.3			2.2	
p0 queue free %	98	91			88	
cM capacity (veh/h)	494	1052			1591	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	111	21	210
Volume Left	12	0	192
Volume Right	99	6	0
cSH	938	1700	1591
Volume to Capacity	0.12	0.01	0.12
Queue Length 95th (m)	3.1	0.0	3.1
Control Delay (s)	9.4	0.0	7.0
Lane LOS	A		A
Approach Delay (s)	9.4	0.0	7.0
Approach LOS	A		

Intersection Summary			
Average Delay	7.3		
Intersection Capacity Utilization	28.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	14	80	43	104	59	63	74	221	216	95	262	27
Future Volume (vph)	14	80	43	104	59	63	74	221	216	95	262	27
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Hourly flow rate (vph)	17	95	51	124	70	75	88	263	257	113	312	32

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1
Volume Total (vph)	163	269	351	257	457
Volume Left (vph)	17	124	88	0	113
Volume Right (vph)	51	75	0	257	32
Hadj (s)	-0.12	-0.02	0.16	-0.67	0.04
Departure Headway (s)	7.9	7.5	7.4	6.6	6.9
Degree Utilization, x	0.36	0.56	0.72	0.47	0.88
Capacity (veh/h)	412	451	471	531	510
Control Delay (s)	15.2	19.7	26.1	14.0	41.1
Approach Delay (s)	15.2	19.7	21.0		41.1
Approach LOS	C	C	C		E

Intersection Summary				
Delay	26.3			
Level of Service	D			
Intersection Capacity Utilization	70.3%	ICU Level of Service	C	
Analysis Period (min)	15			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	2	169	83	0	13	2
Future Volume (Veh/h)	2	169	83	0	13	2
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	2	184	90	0	14	2
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	195	15	16			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	195	15	16			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	83	94			
cM capacity (veh/h)	749	1065	1602			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	186	90	16
Volume Left	2	90	0
Volume Right	184	0	2
cSH	1060	1602	1700
Volume to Capacity	0.18	0.06	0.01
Queue Length 95th (m)	4.8	1.4	0.0
Control Delay (s)	9.1	7.4	0.0
Lane LOS	A	A	
Approach Delay (s)	9.1	7.4	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	8.1		
Intersection Capacity Utilization	28.5%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	59	191	32	0	386	22	44	6	2	18	23	32
Future Volume (Veh/h)	59	191	32	0	386	22	44	6	2	18	23	32
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	66	212	36	0	429	24	49	7	2	20	26	36
Pedestrians								1			2	
Lane Width (m)								3.7			3.7	
Walking Speed (m/s)								1.1			1.1	
Percent Blockage								0			0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	455			249			853	818	231	810	824	443
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	455			249			853	818	231	810	824	443
tC, single (s)	4.1			4.1			7.1	6.8	6.2	7.1	6.5	6.3
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.3	3.3	3.5	4.0	3.4
p0 queue free %	94			100			79	97	100	93	91	94
cM capacity (veh/h)	1114			1315			235	265	807	279	291	603

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	314	453	58	82
Volume Left	66	0	49	20
Volume Right	36	24	2	36
cSH	1114	1315	244	372
Volume to Capacity	0.06	0.00	0.24	0.22
Queue Length 95th (m)	1.4	0.0	6.8	6.3
Control Delay (s)	2.2	0.0	24.3	17.4
Lane LOS	A		C	C
Approach Delay (s)	2.2	0.0	24.3	17.4
Approach LOS			C	C

Intersection Summary				
Average Delay	3.9			
Intersection Capacity Utilization	55.0%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	4	58	149	2	111	5	291	13	5	5	31	7
Future Volume (Veh/h)	4	58	149	2	111	5	291	13	5	5	31	7
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	5	68	175	2	131	6	342	15	6	6	36	8
Pedestrians					15						14	
Lane Width (m)					3.7						3.7	
Walking Speed (m/s)					1.1						1.1	
Percent Blockage					1						1	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	151			243			330	320	170	346	405	148
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	151			243			330	320	170	346	405	148
tC, single (s)	4.1			4.7			7.1	6.7	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.8			3.5	4.2	3.3	3.5	4.0	3.3
p0 queue free %	100			100			41	97	99	99	93	99
cM capacity (veh/h)	1423			1040			575	559	860	567	522	892

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	248	139	363	50
Volume Left	5	2	342	6
Volume Right	175	6	6	8
cSH	1423	1040	578	564
Volume to Capacity	0.00	0.00	0.63	0.09
Queue Length 95th (m)	0.1	0.0	33.1	2.2
Control Delay (s)	0.2	0.1	21.2	12.0
Lane LOS	A	A	C	B
Approach Delay (s)	0.2	0.1	21.2	12.0
Approach LOS			C	B

Intersection Summary				
Average Delay	10.4			
Intersection Capacity Utilization	45.0%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	5	117	12	2	69	13
Future Volume (Veh/h)	5	117	12	2	69	13
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80
Hourly flow rate (vph)	6	146	15	3	86	16
Pedestrians	2					
Lane Width (m)	3.7					
Walking Speed (m/s)	1.1					
Percent Blockage	0					
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	206	18			20	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	206	18			20	
tC, single (s)	6.6	6.3			4.1	
tC, 2 stage (s)						
tF (s)	3.7	3.4			2.2	
p0 queue free %	99	86			95	
cM capacity (veh/h)	692	1030			1606	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	152	18	102
Volume Left	6	0	86
Volume Right	146	3	0
cSH	1010	1700	1606
Volume to Capacity	0.15	0.01	0.05
Queue Length 95th (m)	4.0	0.0	1.3
Control Delay (s)	9.2	0.0	6.3
Lane LOS	A		A
Approach Delay (s)	9.2	0.0	6.3
Approach LOS	A		

Intersection Summary			
Average Delay	7.5		
Intersection Capacity Utilization	25.4%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	21	79	72	200	130	115	40	181	75	33	205	14
Future Volume (vph)	21	79	72	200	130	115	40	181	75	33	205	14
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Hourly flow rate (vph)	24	92	84	233	151	134	47	210	87	38	238	16

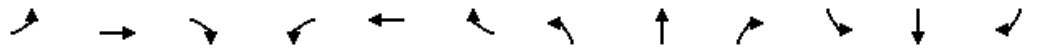
Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1
Volume Total (vph)	200	518	257	87	292
Volume Left (vph)	24	233	47	0	38
Volume Right (vph)	84	134	0	87	16
Hadj (s)	-0.14	-0.03	0.27	-0.70	0.05
Departure Headway (s)	7.7	6.8	8.2	7.2	7.7
Degree Utilization, x	0.43	0.98	0.59	0.17	0.63
Capacity (veh/h)	446	520	426	485	461
Control Delay (s)	16.3	59.6	21.1	10.6	22.7
Approach Delay (s)	16.3	59.6	18.5		22.7
Approach LOS	C	F	C		C

Intersection Summary				
Delay	34.8			
Level of Service	D			
Intersection Capacity Utilization	73.4%	ICU Level of Service	D	
Analysis Period (min)	15			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	2	67	116	18	15	2
Future Volume (Veh/h)	2	67	116	18	15	2
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	2	73	126	20	16	2
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	289	17	18			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	289	17	18			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	93	92			
cM capacity (veh/h)	646	1062	1599			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	75	146	18
Volume Left	2	126	0
Volume Right	73	0	2
cSH	1044	1599	1700
Volume to Capacity	0.07	0.08	0.01
Queue Length 95th (m)	1.8	1.9	0.0
Control Delay (s)	8.7	6.5	0.0
Lane LOS	A	A	
Approach Delay (s)	8.7	6.5	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	6.7		
Intersection Capacity Utilization	25.0%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	127	489	53	2	276	31	16	12	6	24	19	9
Future Volume (Veh/h)	127	489	53	2	276	31	16	12	6	24	19	9
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	137	526	57	2	297	33	17	13	6	26	20	10
Pedestrians		1						1			1	
Lane Width (m)		3.7						3.7			3.7	
Walking Speed (m/s)		1.1						1.1			1.1	
Percent Blockage		0						0			0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	331			584			1168	1164	556	1160	1176	316
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	331			584			1168	1164	556	1160	1176	316
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	89			100			88	93	99	82	88	99
cM capacity (veh/h)	1239			1000			141	174	534	148	171	721

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	720	332	36	56
Volume Left	137	2	17	26
Volume Right	57	33	6	10
cSH	1239	1000	174	183
Volume to Capacity	0.11	0.00	0.21	0.31
Queue Length 95th (m)	2.8	0.0	5.7	9.3
Control Delay (s)	2.7	0.1	31.0	33.2
Lane LOS	A	A	D	D
Approach Delay (s)	2.7	0.1	31.0	33.2
Approach LOS			D	D

Intersection Summary				
Average Delay	4.3			
Intersection Capacity Utilization	66.5%	ICU Level of Service	C	
Analysis Period (min)	15			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Traffic Volume (veh/h)	11	145	363	0	74	0	230	20	6	2	11	3
Future Volume (Veh/h)	11	145	363	0	74	0	230	20	6	2	11	3
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Hourly flow rate (vph)	11	148	370	0	76	0	235	20	6	2	11	3
Pedestrians											1	
Lane Width (m)											3.7	
Walking Speed (m/s)											1.1	
Percent Blockage											0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	77			518			440	432	333	448	617	77
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	77			518			440	432	333	448	617	77
tC, single (s)	4.1			4.7			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.8			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			100			54	96	99	100	97	100
cM capacity (veh/h)	1533			802			514	515	709	498	405	989

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	529	76	261	16
Volume Left	11	0	235	2
Volume Right	370	0	6	3
cSH	1533	802	517	467
Volume to Capacity	0.01	0.00	0.50	0.03
Queue Length 95th (m)	0.2	0.0	21.4	0.8
Control Delay (s)	0.2	0.0	18.8	13.0
Lane LOS	A		C	B
Approach Delay (s)	0.2	0.0	18.8	13.0
Approach LOS			C	B

Intersection Summary				
Average Delay	5.9			
Intersection Capacity Utilization	64.7%	ICU Level of Service	C	
Analysis Period (min)	15			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	10	84	5	5	157	15
Future Volume (Veh/h)	10	84	5	5	157	15
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	12	99	6	6	185	18
Pedestrians	6					
Lane Width (m)	3.7					
Walking Speed (m/s)	1.1					
Percent Blockage	1					
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	403	15			18	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	403	15			18	
tC, single (s)	6.5	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.6	3.3			2.2	
p0 queue free %	98	91			88	
cM capacity (veh/h)	512	1064			1603	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	111	12	203
Volume Left	12	0	185
Volume Right	99	6	0
cSH	953	1700	1603
Volume to Capacity	0.12	0.01	0.12
Queue Length 95th (m)	3.0	0.0	3.0
Control Delay (s)	9.3	0.0	6.9
Lane LOS	A		A
Approach Delay (s)	9.3	0.0	6.9
Approach LOS	A		

Intersection Summary			
Average Delay	7.5		
Intersection Capacity Utilization	28.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	14	80	43	102	58	63	74	221	216	95	264	28
Future Volume (vph)	14	80	43	102	58	63	74	221	216	95	264	28
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Hourly flow rate (vph)	17	95	51	121	69	75	88	263	257	113	314	33

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1
Volume Total (vph)	163	265	351	257	460
Volume Left (vph)	17	121	88	0	113
Volume Right (vph)	51	75	0	257	33
Hadj (s)	-0.12	-0.02	0.16	-0.67	0.04
Departure Headway (s)	7.9	7.5	7.4	6.5	6.9
Degree Utilization, x	0.36	0.55	0.72	0.47	0.88
Capacity (veh/h)	413	452	472	533	512
Control Delay (s)	15.2	19.4	25.9	13.9	41.4
Approach Delay (s)	15.2	19.4	20.9		41.4
Approach LOS	C	C	C		E

Intersection Summary				
Delay	26.3			
Level of Service	D			
Intersection Capacity Utilization	70.3%	ICU Level of Service	C	
Analysis Period (min)	15			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	2	152	72	14	19	2
Future Volume (Veh/h)	2	152	72	14	19	2
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	2	165	78	15	21	2
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	193	22	23			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	193	22	23			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	84	95			
cM capacity (veh/h)	757	1055	1592			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	167	93	23
Volume Left	2	78	0
Volume Right	165	0	2
cSH	1050	1592	1700
Volume to Capacity	0.16	0.05	0.01
Queue Length 95th (m)	4.3	1.2	0.0
Control Delay (s)	9.1	6.2	0.0
Lane LOS	A	A	
Approach Delay (s)	9.1	6.2	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	7.4		
Intersection Capacity Utilization	27.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	59	191	32	0	386	22	44	6	2	18	23	32
Future Volume (Veh/h)	59	191	32	0	386	22	44	6	2	18	23	32
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Hourly flow rate (vph)	66	212	36	0	429	24	49	7	2	20	26	36
Pedestrians								1			2	
Lane Width (m)								3.7			3.7	
Walking Speed (m/s)								1.1			1.1	
Percent Blockage								0			0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	455			249			853	818	231	810	824	443
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	455			249			853	818	231	810	824	443
tC, single (s)	4.1			4.1			7.1	6.9	6.2	7.1	6.5	6.4
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.4	3.3	3.5	4.0	3.4
p0 queue free %	94			100			79	97	100	93	91	94
cM capacity (veh/h)	1114			1315			234	255	812	279	291	585

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	314	453	58	82
Volume Left	66	0	49	20
Volume Right	36	24	2	36
cSH	1114	1315	243	369
Volume to Capacity	0.06	0.00	0.24	0.22
Queue Length 95th (m)	1.4	0.0	6.9	6.4
Control Delay (s)	2.2	0.0	24.4	17.5
Lane LOS	A		C	C
Approach Delay (s)	2.2	0.0	24.4	17.5
Approach LOS			C	C

Intersection Summary				
Average Delay	3.9			
Intersection Capacity Utilization	55.0%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations		✣			✣			✣			✣	
Traffic Volume (veh/h)	4	68	139	2	129	5	273	13	5	5	31	7
Future Volume (Veh/h)	4	68	139	2	129	5	273	13	5	5	31	7
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	5	80	164	2	152	6	321	15	6	6	36	8
Pedestrians					15						14	
Lane Width (m)					3.7						3.7	
Walking Speed (m/s)					1.1						1.1	
Percent Blockage					1						1	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	172			244			357	348	177	374	427	169
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	172			244			357	348	177	374	427	169
tC, single (s)	4.1			4.7			7.1	6.7	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.8			3.5	4.2	3.3	3.5	4.0	3.3
p0 queue free %	100			100			42	97	99	99	93	99
cM capacity (veh/h)	1398			1039			549	539	858	547	507	868

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	249	160	342	50
Volume Left	5	2	321	6
Volume Right	164	6	6	8
cSH	1398	1039	552	548
Volume to Capacity	0.00	0.00	0.62	0.09
Queue Length 95th (m)	0.1	0.0	32.0	2.3
Control Delay (s)	0.2	0.1	21.5	12.2
Lane LOS	A	A	C	B
Approach Delay (s)	0.2	0.1	21.5	12.2
Approach LOS			C	B

Intersection Summary				
Average Delay	10.0			
Intersection Capacity Utilization	44.0%	ICU Level of Service	A	
Analysis Period (min)	15			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	2	111	34	2	66	26
Future Volume (Veh/h)	2	111	34	2	66	26
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80
Hourly flow rate (vph)	3	139	43	3	83	33
Pedestrians	2					
Lane Width (m)	3.7					
Walking Speed (m/s)	1.1					
Percent Blockage	0					
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	246	46			48	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	246	46			48	
tC, single (s)	6.9	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.9	3.3			2.2	
p0 queue free %	100	86			95	
cM capacity (veh/h)	616	1021			1569	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	142	46	116
Volume Left	3	0	83
Volume Right	139	3	0
cSH	1007	1700	1569
Volume to Capacity	0.14	0.03	0.05
Queue Length 95th (m)	3.7	0.0	1.3
Control Delay (s)	9.2	0.0	5.4
Lane LOS	A		A
Approach Delay (s)	9.2	0.0	5.4
Approach LOS	A		

Intersection Summary			
Average Delay	6.3		
Intersection Capacity Utilization	25.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	21	79	72	205	133	97	40	181	75	23	200	11
Future Volume (vph)	21	79	72	205	133	97	40	181	75	23	200	11
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Hourly flow rate (vph)	24	92	84	238	155	113	47	210	87	27	233	13

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1
Volume Total (vph)	200	506	257	87	273
Volume Left (vph)	24	238	47	0	27
Volume Right (vph)	84	113	0	87	13
Hadj (s)	-0.14	0.00	0.27	-0.70	0.05
Departure Headway (s)	7.5	6.7	8.1	7.1	7.6
Degree Utilization, x	0.41	0.94	0.58	0.17	0.58
Capacity (veh/h)	453	524	429	491	461
Control Delay (s)	15.6	50.9	20.2	10.3	20.3
Approach Delay (s)	15.6	50.9	17.7		20.3
Approach LOS	C	F	C		C

Intersection Summary				
Delay	30.6			
Level of Service	D			
Intersection Capacity Utilization	72.0%	ICU Level of Service	C	
Analysis Period (min)	15			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	2	77	134	19	15	2
Future Volume (Veh/h)	2	77	134	19	15	2
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	2	84	146	21	16	2
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	330	17	18			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	330	17	18			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	92	91			
cM capacity (veh/h)	608	1068	1612			

Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	86	167	18
Volume Left	2	146	0
Volume Right	84	0	2
cSH	1049	1612	1700
Volume to Capacity	0.08	0.09	0.01
Queue Length 95th (m)	2.0	2.3	0.0
Control Delay (s)	8.7	6.6	0.0
Lane LOS	A	A	
Approach Delay (s)	8.7	6.6	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	6.8		
Intersection Capacity Utilization	26.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	3	174	427	25	18	8
Future Volume (Veh/h)	3	174	427	25	18	8
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	3	189	464	27	20	9
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	491				672	478
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	491				672	478
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				95	98
cM capacity (veh/h)	1083				423	592

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	192	491	29
Volume Left	3	0	20
Volume Right	0	27	9
cSH	1083	1700	464
Volume to Capacity	0.00	0.29	0.06
Queue Length 95th (m)	0.1	0.0	1.5
Control Delay (s)	0.2	0.0	13.3
Lane LOS	A		B
Approach Delay (s)	0.2	0.0	13.3
Approach LOS			B

Intersection Summary			
Average Delay	0.6		
Intersection Capacity Utilization	34.0%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Right Turn Channelized												
Traffic Volume (veh/h)	21	79	72	205	133	97	40	181	75	23	200	11
Future Volume (veh/h)	21	79	72	205	133	97	40	181	75	23	200	11
Peak Hour Factor	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Hourly flow rate (vph)	24	92	84	238	155	113	47	210	87	27	233	13
Approach Volume (veh/h)		200			506			344			273	
Crossing Volume (veh/h)		498			281			143			440	
High Capacity (veh/h)		935			1111			1238			979	
High v/c (veh/h)		0.21			0.46			0.28			0.28	
Low Capacity (veh/h)		756			913			1028			795	
Low v/c (veh/h)		0.26			0.55			0.33			0.34	

Intersection Summary				
Maximum v/c High	0.46			
Maximum v/c Low	0.55			
Intersection Capacity Utilization	72.0%	ICU Level of Service	C	

HCM Unsignalized Intersection Capacity Analysis
3: Greenpark Blvd & Wyandotte St E

06/11/2019

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	127	489	53	2	276	31	16	12	6	24	19	9
Future Volume (Veh/h)	127	489	53	2	276	31	16	12	6	24	19	9
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
Hourly flow rate (vph)	137	526	57	2	297	33	17	13	6	26	20	10
Pedestrians		1						1			1	
Lane Width (m)		3.7						3.7			3.7	
Walking Speed (m/s)		1.1						1.1			1.1	
Percent Blockage		0						0			0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	331			584			1168	1164	556	1160	1176	316
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	331			584			1168	1164	556	1160	1176	316
tC, single (s)	4.1			4.1			7.1	6.5	6.2	7.1	6.5	6.3
tC, 2 stage (s)												
tF (s)	2.2			2.2			3.5	4.0	3.3	3.5	4.0	3.4
p0 queue free %	89			100			88	93	99	82	88	99
cM capacity (veh/h)	1239			1000			141	174	534	148	171	697

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	720	332	36	56
Volume Left	137	2	17	26
Volume Right	57	33	6	10
cSH	1239	1000	174	182
Volume to Capacity	0.11	0.00	0.21	0.31
Queue Length 95th (m)	2.8	0.0	5.7	9.4
Control Delay (s)	2.7	0.1	31.0	33.2
Lane LOS	A	A	D	D
Approach Delay (s)	2.7	0.1	31.0	33.2
Approach LOS			D	D

Intersection Summary				
Average Delay	4.3			
Intersection Capacity Utilization	66.5%	ICU Level of Service	C	
Analysis Period (min)	15			

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	11	146	362	0	84	0	220	20	6	1	12	3
Future Volume (Veh/h)	11	146	362	0	84	0	220	20	6	1	12	3
Sign Control		Free			Free			Stop			Stop	
Grade		0%			0%			0%			0%	
Peak Hour Factor	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98
Hourly flow rate (vph)	11	149	369	0	86	0	224	20	6	1	12	3
Pedestrians											1	
Lane Width (m)											3.7	
Walking Speed (m/s)											1.1	
Percent Blockage											0	
Right turn flare (veh)												
Median type		None			None							
Median storage veh)												
Upstream signal (m)												
pX, platoon unblocked												
vC, conflicting volume	87			518			450	442	334	458	627	87
vC1, stage 1 conf vol												
vC2, stage 2 conf vol												
vCu, unblocked vol	87			518			450	442	334	458	627	87
tC, single (s)	4.1			4.7			7.1	6.5	6.2	7.1	6.5	6.2
tC, 2 stage (s)												
tF (s)	2.2			2.8			3.5	4.0	3.3	3.5	4.0	3.3
p0 queue free %	99			100			55	96	99	100	97	100
cM capacity (veh/h)	1520			802			502	508	713	493	400	976

Direction, Lane #	EB 1	WB 1	NB 1	SB 1
Volume Total	529	86	250	16
Volume Left	11	0	224	1
Volume Right	369	0	6	3
cSH	1520	802	506	455
Volume to Capacity	0.01	0.00	0.49	0.04
Queue Length 95th (m)	0.2	0.0	20.5	0.8
Control Delay (s)	0.2	0.0	18.8	13.2
Lane LOS	A		C	B
Approach Delay (s)	0.2	0.0	18.8	13.2
Approach LOS			C	B

Intersection Summary				
Average Delay	5.7			
Intersection Capacity Utilization	64.1%	ICU Level of Service	C	
Analysis Period (min)	15			

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Traffic Volume (veh/h)	5	77	23	5	121	50
Future Volume (Veh/h)	5	77	23	5	121	50
Sign Control	Stop		Free			Free
Grade	0%		0%			0%
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Hourly flow rate (vph)	6	91	27	6	142	59
Pedestrians	6					
Lane Width (m)	3.7					
Walking Speed (m/s)	1.1					
Percent Blockage	1					
Right turn flare (veh)						
Median type			None			None
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	379	36			39	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	379	36			39	
tC, single (s)	6.6	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.7	3.3			2.2	
p0 queue free %	99	91			91	
cM capacity (veh/h)	525	1036			1575	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	97	33	201
Volume Left	6	0	142
Volume Right	91	6	0
cSH	977	1700	1575
Volume to Capacity	0.10	0.02	0.09
Queue Length 95th (m)	2.5	0.0	2.3
Control Delay (s)	9.1	0.0	5.5
Lane LOS	A		A
Approach Delay (s)	9.1	0.0	5.5
Approach LOS	A		

Intersection Summary			
Average Delay	6.0		
Intersection Capacity Utilization	27.7%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Sign Control		Stop			Stop			Stop			Stop	
Traffic Volume (vph)	14	80	43	107	60	53	74	221	216	95	259	26
Future Volume (vph)	14	80	43	107	60	53	74	221	216	95	259	26
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Hourly flow rate (vph)	17	95	51	127	71	63	88	263	257	113	308	31

Direction, Lane #	EB 1	WB 1	NB 1	NB 2	SB 1
Volume Total (vph)	163	261	351	257	452
Volume Left (vph)	17	127	88	0	113
Volume Right (vph)	51	63	0	257	31
Hadj (s)	-0.12	0.03	0.16	-0.67	0.04
Departure Headway (s)	7.8	7.5	7.3	6.5	6.8
Degree Utilization, x	0.35	0.55	0.72	0.46	0.86
Capacity (veh/h)	414	449	475	537	512
Control Delay (s)	15.0	19.2	25.5	13.8	38.7
Approach Delay (s)	15.0	19.2	20.5		38.7
Approach LOS	C	C	C		E

Intersection Summary				
Delay	25.2			
Level of Service	D			
Intersection Capacity Utilization	69.7%	ICU Level of Service	C	
Analysis Period (min)	15			

Movement	EBL	EBR	NBL	NBT	SBT	SBR
Lane Configurations						
Traffic Volume (veh/h)	2	152	82	22	19	2
Future Volume (Veh/h)	2	152	82	22	19	2
Sign Control	Stop			Free	Free	
Grade	0%			0%	0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	2	165	89	24	21	2
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type				None	None	
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	224	22	23			
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	224	22	23			
tC, single (s)	6.4	6.2	4.1			
tC, 2 stage (s)						
tF (s)	3.5	3.3	2.2			
p0 queue free %	100	84	94			
cM capacity (veh/h)	726	1061	1605			

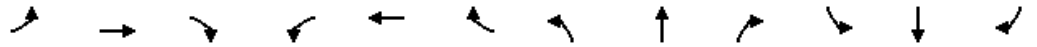
Direction, Lane #	EB 1	NB 1	SB 1
Volume Total	167	113	23
Volume Left	2	89	0
Volume Right	165	0	2
cSH	1055	1605	1700
Volume to Capacity	0.16	0.06	0.01
Queue Length 95th (m)	4.3	1.3	0.0
Control Delay (s)	9.1	5.9	0.0
Lane LOS	A	A	
Approach Delay (s)	9.1	5.9	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	7.2		
Intersection Capacity Utilization	28.6%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	3	388	212	24	38	9
Future Volume (Veh/h)	3	388	212	24	38	9
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	3	422	230	26	41	10
Pedestrians						
Lane Width (m)						
Walking Speed (m/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (m)						
pX, platoon unblocked						
vC, conflicting volume	256				671	243
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	256				671	243
tC, single (s)	4.1				6.4	6.2
tC, 2 stage (s)						
tF (s)	2.2				3.5	3.3
p0 queue free %	100				90	99
cM capacity (veh/h)	1321				424	801

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	425	256	51
Volume Left	3	0	41
Volume Right	0	26	10
cSH	1321	1700	467
Volume to Capacity	0.00	0.15	0.11
Queue Length 95th (m)	0.1	0.0	2.8
Control Delay (s)	0.1	0.0	13.7
Lane LOS	A		B
Approach Delay (s)	0.1	0.0	13.7
Approach LOS			B

Intersection Summary			
Average Delay	1.0		
Intersection Capacity Utilization	32.8%	ICU Level of Service	A
Analysis Period (min)	15		



Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Right Turn Channelized												
Traffic Volume (veh/h)	14	80	43	107	60	53	74	221	216	95	259	26
Future Volume (veh/h)	14	80	43	107	60	53	74	221	216	95	259	26
Peak Hour Factor	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84	0.84
Hourly flow rate (vph)	17	95	51	127	71	63	88	263	257	113	308	31
Approach Volume (veh/h)		163			261			608			452	
Crossing Volume (veh/h)		548			368			225			286	
High Capacity (veh/h)		898			1037			1161			1106	
High v/c (veh/h)		0.18			0.25			0.52			0.41	
Low Capacity (veh/h)		723			847			958			909	
Low v/c (veh/h)		0.23			0.31			0.63			0.50	

Intersection Summary					
Maximum v/c High	0.52				
Maximum v/c Low	0.63				
Intersection Capacity Utilization	69.7%	ICU Level of Service		C	

APPENDIX

E-3 SCENARIO 3 20-YEAR HORIZON SIMTRAFFIC RESULTS

Intersection: 1: Greenpark Blvd & Riverside Dr E

Movement	WB	NB
Directions Served	LT	LR
Maximum Queue (m)	21.1	19.3
Average Queue (m)	3.2	10.4
95th Queue (m)	13.2	17.0
Link Distance (m)	340.8	292.2
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 3: Greenpark Blvd & Wyandotte St E

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (m)	20.0	0.4	18.9	21.9
Average Queue (m)	4.8	0.0	7.6	9.4
95th Queue (m)	13.7	0.4	15.0	17.0
Link Distance (m)	76.4	85.2	167.6	292.2
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 4: Banwell Road & Wyandotte St E

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (m)	5.5	6.8	41.6	14.8
Average Queue (m)	0.2	0.4	20.6	6.8
95th Queue (m)	2.4	3.3	33.0	13.4
Link Distance (m)	85.2	229.1	421.7	186.9
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 5: Jarvis Ave & Dillon Dr

Movement	WB	SB
Directions Served	LR	LT
Maximum Queue (m)	26.4	7.9
Average Queue (m)	13.4	0.4
95th Queue (m)	23.1	3.7
Link Distance (m)	98.4	48.5
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 6: Jarvis Ave & Castle Hill Rd

Movement	WB	SB
Directions Served	LR	LT
Maximum Queue (m)	9.2	1.8
Average Queue (m)	1.6	0.1
95th Queue (m)	7.4	1.3
Link Distance (m)	96.4	254.2
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 7: Banwell Road & Beverly Glen St

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (m)	15.9	5.6	19.1	0.7
Average Queue (m)	3.1	1.5	1.2	0.0
95th Queue (m)	10.8	5.0	8.7	1.0
Link Distance (m)	232.4	236.8	254.1	421.7
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 8: Banwell Road & Little River Blvd

Movement	EB	WB	NB	NB	SB
Directions Served	LTR	LTR	LT	R	LTR
Maximum Queue (m)	27.4	52.4	35.4	14.6	33.3
Average Queue (m)	14.2	23.7	17.8	8.3	17.6
95th Queue (m)	23.4	40.8	29.0	12.9	26.9
Link Distance (m)	256.1	445.4	168.3	168.3	254.1
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (m)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 101: Jarvis Ave & Wyandotte St E

Movement	EB	NB
Directions Served	LR	LT
Maximum Queue (m)	14.4	10.3
Average Queue (m)	5.7	0.9
95th Queue (m)	10.4	5.6
Link Distance (m)	229.1	48.5
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 102: Jarvis Ave & Beverly Glen St

Movement	EB
Directions Served	LR
Maximum Queue (m)	9.1
Average Queue (m)	0.9
95th Queue (m)	5.5
Link Distance (m)	236.8
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (m)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Network Summary

Network wide Queuing Penalty: 0

Intersection: 1: Greenpark Blvd & Riverside Dr E

Movement	WB	NB
Directions Served	LT	LR
Maximum Queue (m)	20.6	22.1
Average Queue (m)	3.2	10.4
95th Queue (m)	13.2	18.7
Link Distance (m)	340.8	292.2
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 3: Greenpark Blvd & Wyandotte St E

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (m)	40.8	13.6	16.2	18.0
Average Queue (m)	10.5	0.6	6.6	8.4
95th Queue (m)	28.0	5.9	14.0	15.7
Link Distance (m)	76.4	85.2	167.6	292.2
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 4: Banwell Road & Wyandotte St E

Movement	EB	NB	SB
Directions Served	LTR	LTR	LTR
Maximum Queue (m)	9.0	39.7	12.5
Average Queue (m)	0.5	18.0	3.0
95th Queue (m)	4.1	30.0	9.9
Link Distance (m)	85.2	421.7	186.9
Upstream Blk Time (%)			
Queuing Penalty (veh)			
Storage Bay Dist (m)			
Storage Blk Time (%)			
Queuing Penalty (veh)			

Intersection: 5: Jarvis Ave & Dillon Dr

Movement	WB	SB
Directions Served	LR	LT
Maximum Queue (m)	17.4	11.1
Average Queue (m)	9.8	1.2
95th Queue (m)	14.8	6.5
Link Distance (m)	98.4	48.5
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 6: Jarvis Ave & Castle Hill Rd

Movement	WB	SB
Directions Served	LR	LT
Maximum Queue (m)	9.2	0.9
Average Queue (m)	1.4	0.1
95th Queue (m)	6.9	1.3
Link Distance (m)	96.4	254.2
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 7: Banwell Road & Beverly Glen St

Movement	EB	WB	NB	SB
Directions Served	LTR	LTR	LTR	LTR
Maximum Queue (m)	13.7	5.6	17.4	2.7
Average Queue (m)	3.3	1.5	1.6	0.1
95th Queue (m)	10.3	4.8	8.8	1.7
Link Distance (m)	232.4	236.8	254.1	421.7
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (m)				
Storage Blk Time (%)				
Queuing Penalty (veh)				

Intersection: 8: Banwell Road & Little River Blvd

Movement	EB	WB	NB	NB	SB
Directions Served	LTR	LTR	LT	R	LTR
Maximum Queue (m)	24.4	32.7	34.4	27.6	47.6
Average Queue (m)	12.4	15.9	16.9	13.8	23.6
95th Queue (m)	20.2	26.5	27.6	23.0	38.7
Link Distance (m)	256.1	445.4	168.3	168.3	254.1
Upstream Blk Time (%)					
Queuing Penalty (veh)					
Storage Bay Dist (m)					
Storage Blk Time (%)					
Queuing Penalty (veh)					

Intersection: 101: Jarvis Ave & Wyandotte St E

Movement	EB	NB
Directions Served	LR	LT
Maximum Queue (m)	17.6	7.3
Average Queue (m)	8.5	0.4
95th Queue (m)	14.9	3.3
Link Distance (m)	229.1	48.5
Upstream Blk Time (%)		
Queuing Penalty (veh)		
Storage Bay Dist (m)		
Storage Blk Time (%)		
Queuing Penalty (veh)		

Intersection: 102: Jarvis Ave & Beverly Glen St

Movement	EB
Directions Served	LR
Maximum Queue (m)	8.2
Average Queue (m)	1.0
95th Queue (m)	5.6
Link Distance (m)	236.8
Upstream Blk Time (%)	
Queuing Penalty (veh)	
Storage Bay Dist (m)	
Storage Blk Time (%)	
Queuing Penalty (veh)	

Network Summary

Network wide Queuing Penalty: 0

APPENDIX

F SIGNAL WARRANT ANALYSIS

TRAFFIC SIGNAL WARRANTS - JUSTIFICATION 7 (PROJECTED VOLUMES)

GENERAL INFORMATION **FUTURE WEEKDAY PEAK HOUR**

Analyst	Placeholder	**Jurisdiction**	City of Windsor
Agency or Company	WSP Canada Inc.		
Analysis Period	2039 (20-year horizon) - Scenario 5	**East-West Street**	Little River Boulevard
		North-South Street	Banwell Road
Flow Conditions	Restricted flow (urban)	**Major Street**	North-South
'T' Intersection	No	**Approach lanes per direction**	1 Major Street
Existing Intersection	Yes	**Approach lanes per direction**	1 Minor Street
Additional Comments			

TRAFFIC & PEDESTRIAN VOLUMES

Hour Ending	Main Road Approaches							Minor Road Approaches							Pedestrian Crossing Major Road	Pedestrian Crossing Minor Road
	Northbound			Southbound			Total	Eastbound			Westbound			Total		
	LT	TH	RT	LT	TH	RT		LT	TH	RT	LT	TH	RT			
AM Peak Hour	40	181	75	66	198	10	**570**	21	79	72	208	135	180	**695**	1	10
PM Peak Hour	74	221	216	191	258	25	**985**	14	80	43	109	62	101	**409**	5	13
Total	**114**	**402**	**291**	**257**	**456**	**35**	**1555**	**35**	**159**	**115**	**317**	**197**	**281**	**1104**	**6**	**23**

Parameter	AM	PM	Average Hourly Volume (AHV)
Vehicle volume, all approaches	1265	1394	665
Vehicle volume, along minor street	695	409	276
Vehicle volume, along major street	570	985	389
Combined vehicle and pedestrian volume crossing from minor streets	365	208	143

NOTES

1. The traffic control signal justification was done as per criteria defined in Ontario Traffic Manual, Book: 12 (March 2012) Justification 7 - Projected Volumes.

	AM	PM
2. Traffic crossing MAJOR street defined as:		
a. Left turns from both minor street approaches	229	123
b. The heaviest through volume from the minor street	135	80
c. 50% of the heavier left turn movement from the major street when both of the following are met:	0	0
1. the left turn volume > 120	No	Yes
2. the left turn volume + opposing volume > 720	No	No
d. Pedestrians crossing the major street	1	5

3. Justifications 1 and 2 are required to be met to 120% in the case of an existing intersection and 150% in the case of a new intersection
4. For 'T' intersection, the threshold values to be increased by 50%

TRAFFIC SIGNAL WARRANTS - JUSTIFICATION 7 (PROJECTED VOLUMES)

GENERAL INFORMATION **FUTURE WEEKDAY PEAK HOUR**

Analyst	Placeholder		**Jurisdiction**	City of Windsor	
Agency or Company	WSP Canada Inc.		**Date**		
Analysis Period	2039 (20-year horizon)	Scenario 1	**East-West Street**	Little River Boulevard	
			North-South Street	Banwell Road	
Flow Conditions	Restricted flow (urban)		**Major Street**	North-South	
'T' Intersection	No		**Approach lanes per direction**	1	Major Street
Existing Intersection	Yes		**Approach lanes per direction**	1	Minor Street
Additional Comments					

Justification 1: Minimum Vehicle Volumes **JUSTIFIED** **No**

Justification	Guidance Approach Lanes				Compliance			120%
	1 Lanes		2 or More Lanes		Sectional		Entire %	Satisfied
Flow Conditions	Free Flow	Restricted Flow	Free Flow	Restricted Flow	Average Hourly Volumes	%		
A. Vehicle volume, all approaches		720			**665**	92%	92%	No
B. Vehicle volume, along minor streets		170			**276**	162%	162%	Yes

Justification 2: Delay To Cross Traffic **JUSTIFIED** **No**

Justification	Guidance Approach Lanes				Compliance			120%
	1 Lanes		2 or More Lanes [1]		Sectional		Entire %	Satisfied
Flow Conditions	Free Flow	Restricted Flow	Free Flow	Restricted Flow	Average Hourly Volumes	%		
A. Vehicle volume, major street		720			**389**	54%	54%	No
B. Combined vehicle and pedestrian volume crossing artery from minor streets		75			**143**	191%	191%	Yes

CONCLUSION

The results of the calculations show that justifications are not met.
Therefore traffic control signal is not justified at this intersection for the horizon year 2039 (20-year horizon)

Note: 1. The minimum volumes were corrected from 120 vehicles and 170 vehicles in OTM, March 2012 to 50 vehicles and 70 vehicles to match Justification 2B.