State Route (SR) 30, SR 303L to SR 202L

FINAL TRAFFIC REPORT

Maricopa County, Arizona

Federal-aid Project No. NH-801-B(ARG)

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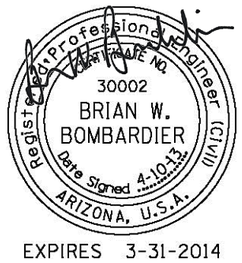

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ABBREVIATIONS AND ACRONYMS

202L	Loop 202
303L	Loop 303
ADOT	Arizona Department of Transportation
ADT	average daily traffic
AM	morning
CDI	compact diamond interchange
EA	environmental assessment
EN	eastbound-to-northbound
ES	eastbound-to-southbound
HCM	*Highway Capacity Manual*
HCS	Highway Capacity Software
HOV	high occupancy vehicle
I-10	Interstate 10
L/DCR	location/design concept report
LOS	level of service
MAG	Maricopa Association of Governments
MC 85	Maricopa County Route 85
mph	miles per hour
NA	North Alternative
NE	northbound-to-eastbound
NW	northbound-to-westbound
OD	origin-destination
PIR	Phoenix International Raceway
PM	evening
RTP	*Regional Transportation Plan*
SE	southbound-to-eastbound
SR	State Route
SS	Southern-Sunland
SW	southbound-to-westbound
TI	traffic interchange
V/C	volume to capacity ratio
WN	westbound-to-northbound
WS	westbound-to-southbound

1. INTRODUCTION

1.1 Project Description

This traffic report describes the development and operational analysis of alternatives for the proposed State Route (SR) 30 in the western Phoenix metropolitan area, located between the proposed Loop 303 (SR 303L) on the west and the proposed Loop 202 (SR 202L, South Mountain Freeway) on the east. This document precedes the location/design concept report (L/DCR) and the environmental assessment (EA), which will incorporate elements of this document. This report describes a detailed traffic operational analysis of each alternative in support of the above documents. The Study Team consists of representatives from the Arizona Department of Transportation (ADOT), Federal Highway Administration, and Maricopa Association of Governments (MAG). The Study Team will decide on the preferred alternative based on findings provided in this report and in the L/DCR and EA.

1.2 Project Location

The Study Area for the proposed SR 30 freeway is located southwest of downtown Phoenix and falls entirely within Maricopa County in south-central Arizona. The area encompasses the municipalities of Buckeye, Goodyear, Avondale, and Phoenix, along with unincorporated Maricopa County land. The Study Area is bounded generally by Jackrabbit Trail on the west, Lower Buckeye Road on the north, 51st Avenue on the east, and the northern banks of the Gila and Salt Rivers on the south (see Figure 1.1). At the SR 30 connection with SR 202L, the Study Area extends north along SR 202L nearly to Interstate 10 (I-10, Papago Freeway) and extends south nearly to Elliot Road.

The proposed freeway would run east-to-west, parallel to and south of I-10, for about 14 miles. The western terminus of SR 30 would be located at the proposed SR 303L, near Citrus Road. The eastern terminus would be located at the proposed SR 202L, near 59th Avenue. The Study Area is in ADOT's Phoenix District.

1.3 Background

In November 2004, the voters of Maricopa County approved Proposition 400, a 20-year extension of a ½-cent sales tax to pay for improvements to the existing regional transportation system, including the construction of new freeways. The improvements are identified in the *Regional Transportation Plan* (RTP) (MAG 2010), administered by MAG. The recommended improvements were developed by the Regional Public Transportation Authority, MAG, and ADOT to be consistent with regional freeway, high occupancy vehicle (HOV), and transit system studies. The RTP calls for the construction of a reliever route for I-10 in the southwestern Phoenix metropolitan area. This reliever route is the proposed SR 30 freeway. The new facility would ease traffic congestion and provide a supplemental transportation link for the existing I-10 facility.

ADOT and the Federal Highway Administration began the SR 30 study for the eastern segment of the freeway (between SR 303L and SR 202L) in the fall of 2005.[1] At that time, the route was known as SR 801, but it has been renamed to SR 30. The alternatives developed through the study process—and their traffic operational analysis and performance—are presented in this report. The SR 30 study includes the evaluation of a no-build alternative.

Construction of the proposed freeway has been deferred beyond the current MAG RTP funding horizon, which will expire in 2025. However, the SR 30 route selection continues to identify right-of-way requirements early, with the goal of minimizing disruptions to residents and businesses in the Study Area if a build alternative is chosen.

By selecting a planned freeway route early, ADOT and local governments can plan accordingly to set aside right-of-way for the freeway (preventing development that would later be in the path of the freeway). Local governments may also modify zoning along the transportation corridor to make adjacent land uses more compatible with a freeway.

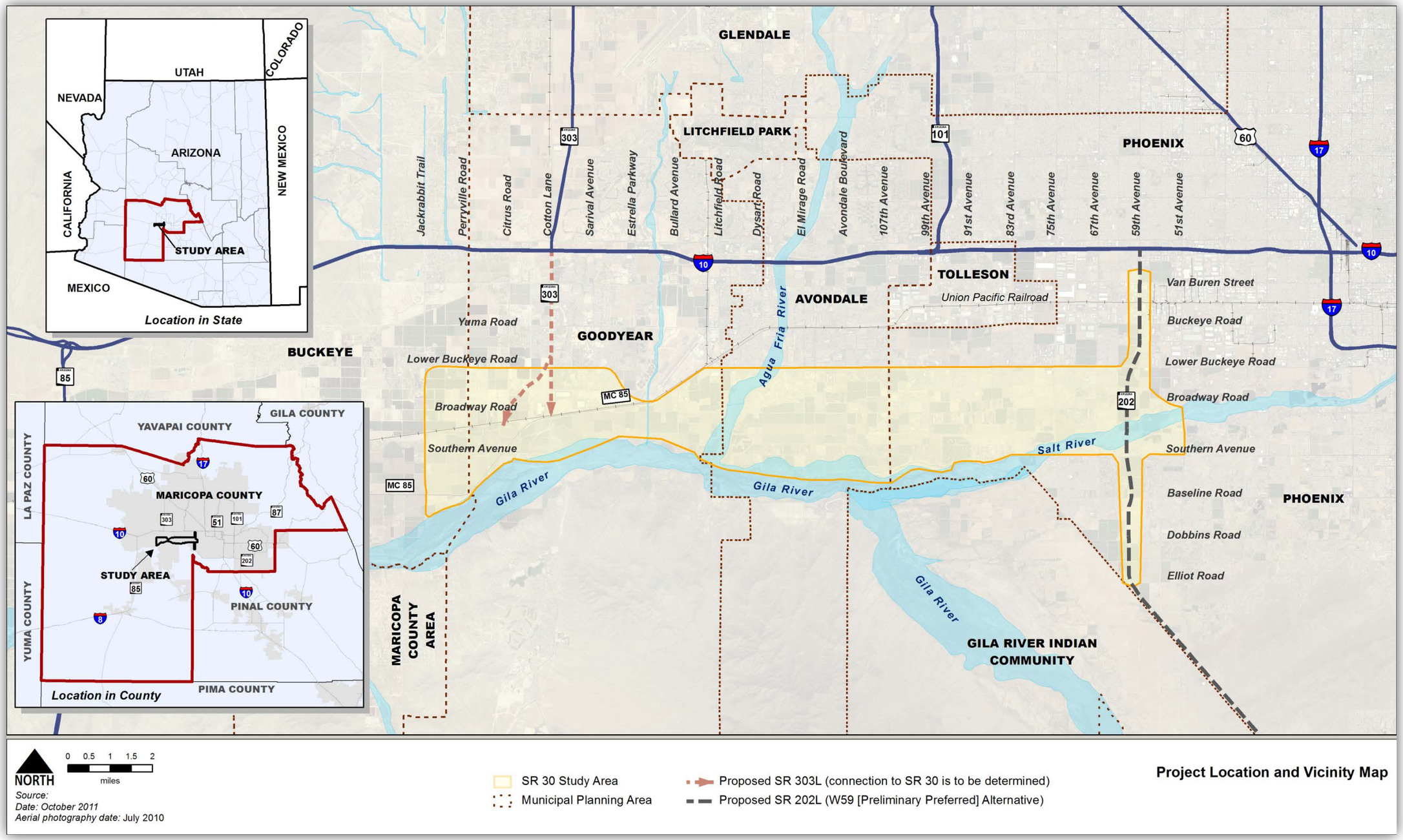
1.4 Project Purpose and Need

The Study Area has large, open tracts of agricultural land. These agricultural areas would slowly transition to residential and commercial uses until build out. I-10 is the only existing freeway serving the east-to-west travel needs of the western Phoenix metropolitan area. A new corridor is needed to meet travel demand until build out. The purpose of and need for a new transportation corridor in the Study Area was presented in detail in the *SR 30, SR 303L to SR 202L, Purpose and Need Report* (ADOT 2012a) and can be described as follows:

- Project need
  - To relieve traffic congestion on I-10
  - To support optimal performance of the region's overall transportation network
- Project purpose
  - To meet increasing travel demand in the western Phoenix metropolitan area that is being driven by changes in land use and the resulting urbanization
  - To provide a second major east-to-west transportation corridor in the western Phoenix metropolitan area
  - To complement land use plans and growth objectives of regional and local governments

[1] The western segment of SR 30, between SR 85 and SR 303L, will be discussed in future documents.

Figure 1.1 – Project Location and Vicinity Map



2. SR 30 FREEWAY CORRIDOR

This section discusses the alternatives carried forward from the *SR 801, SR 303L to SR 202L, Alternatives Selection Report* (ADOT 2007a), as well as additional alternatives developed during the preliminary design phase.

2.1 SR 30 Freeway Alternatives

The *Alternatives Selection Report* concluded that both the North and South Alternatives should be carried forward into the L/DCR and EA for further study. During the detailed engineering study of these two alternatives, two more options emerged that would meet the needs and visions of the local municipal governments' updated general plans. The two options introduced during this phase were called the Center and Southern-Sunland (SS) Hybrid Alternatives. The four alternatives are presented in Figure 2.1. Following are noteworthy elements of the four alternatives:

- The SR 30 corridor was divided into three segments: Segment 1 is between SR 303L and Bullard Avenue; Segment 2 is between Bullard and 91st Avenues; and Segment 3 is between 91st Avenue and SR 202L.
- In Segments 1 and 3, the corridor alignment is the same for the four alternatives. In Segment 2, all four alternatives have different alignments.
- The Segment 2 alignments of the four alternatives differ as follows:
  - The North Alternative runs parallel to—and just south of—Broadway Road.
  - The South Alternative parallels the northern bank of the Gila River.
  - The Center Alternative closely follows the half-mile section between Broadway Road and Southern Avenue.
  - The SS Hybrid Alternative is same as the Center Alternative between Avondale Boulevard and 91st Avenue but deviates toward the south at Avondale Boulevard, following the Southern Avenue alignment between Dysart Road and Avondale Boulevard.

The proposed SR 30 freeway would initially be a six-lane facility with a 50-foot-wide median with cable barrier. This median would accommodate another general purpose lane and HOV lane in each direction in the future. When built out, it would have 12-foot-wide lanes with 12-foot-wide shoulders on both sides and a median concrete barrier. The service traffic interchanges (TIs) would be located at a minimum of 1-mile spacing, along with 12-foot-wide auxiliary lanes where warranted. The freeway would cross over the existing major crossroads, leaving the arterial streets at grade.

2.2 Service Traffic Interchange Evaluation

During the initial alternative development process, service TIs were assumed at every major arterial street to generate the most conservative right-of-way footprint for evaluation in the EA. During the preliminary design phase, all the crossroad locations were evaluated to determine the need for service TIs. Of the thirteen major crossroads along the SR 30 corridor, Cotton Lane, Estrella Parkway, Bullard Avenue, Dysart Road, Avondale Boulevard, and 107th Avenue are listed as major arterial streets within the general plans of the Cities of Goodyear, Avondale, and Phoenix. These arterial streets play a vital role in north-to-south traffic movements and attract significant amounts of traffic compared with other arterial streets in the Study Area.

The southern boundary of the Study Area is the northern banks of the Gila and Salt Rivers. A substantial amount of developed and/or developable land is located south of these rivers. This land would be connected to the north along most of the previously mentioned arterial streets with a river crossing. Bridge crossings over the rivers are currently located at Cotton Lane, Estrella Parkway, Bullard Avenue, and Avondale Boulevard. According to the general plans of the cities within the Study Area, Dysart Road and 91st Avenue would also cross the river with future bridge crossings. 91st Avenue is the only major arterial street with access to the City of Phoenix 91st Avenue Wastewater Treatment Plant, which serves many cities within the Phoenix metropolitan area. In Avondale, Dysart Road would be the major arterial street connecting to the south of the Gila River.

Phoenix International Raceway (PIR) is located at the confluence of the Gila and Salt Rivers. This venue attracts significant amounts of traffic during racing events. The major arterial streets that currently provide access to PIR are Avondale Boulevard, El Mirage Road, Bullard Avenue, and, to a lesser degree, Estrella Parkway.

Based on the preceding discussion, service TIs at Cotton Lane, Bullard Avenue, Estrella Parkway, Dysart Road, Avondale Boulevard, 107th Avenue, and 91st Avenue are justified—based on regional mobility needs—and would be provided along SR 30 for all four alternatives.

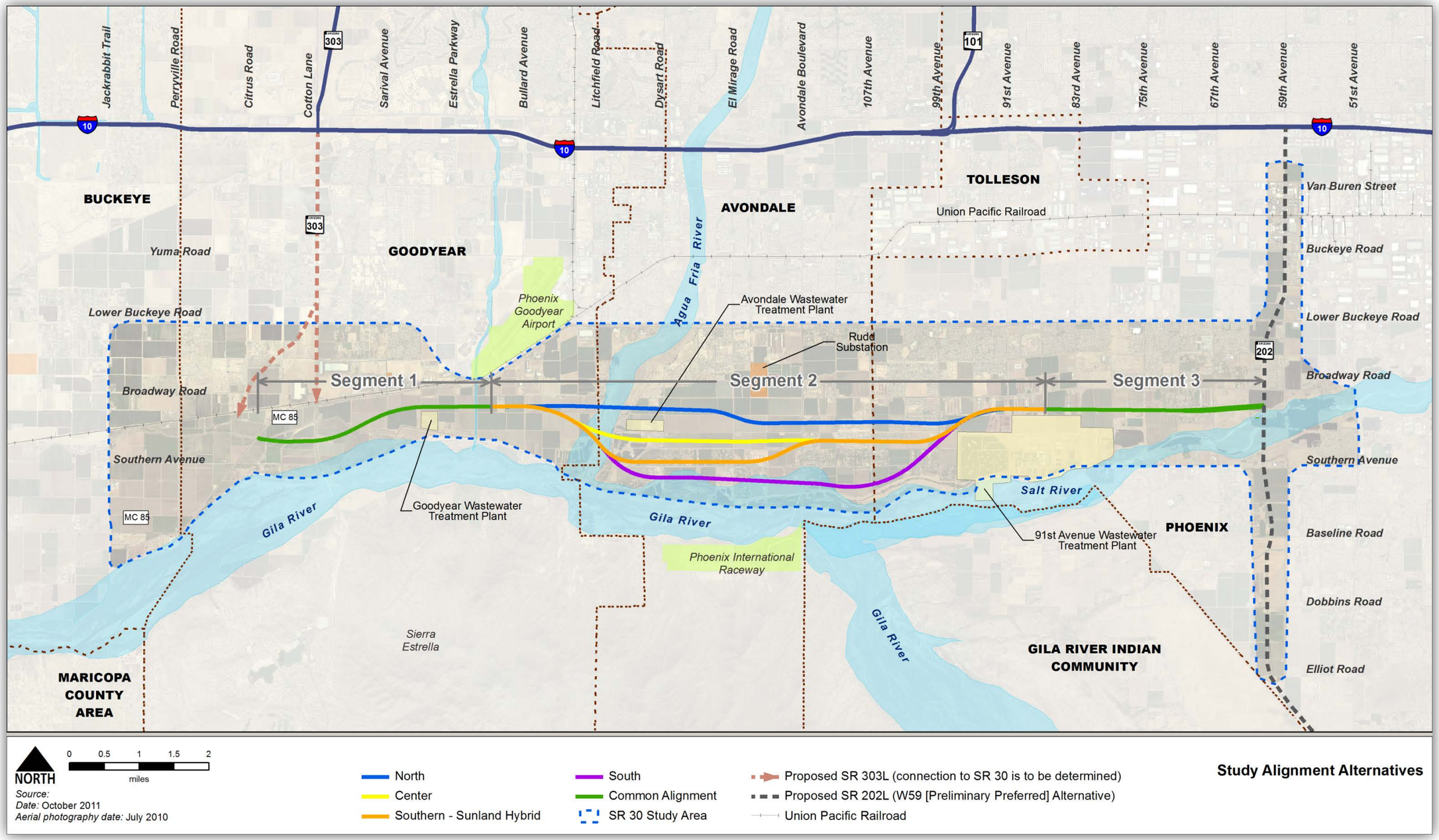
With the modified SR 202L local access to accommodate the SR 30 and SR 202L system TI, traffic from Baseline Road, Southern Avenue, Broadway Road, and Lower Buckeye Road would not be able to directly access SR 30. The closest service TI for these vehicles to access SR 30 would be at 67th Avenue. This service TI would have westbound on-ramps and eastbound off-ramps during initial construction because SR 30 would not extend farther east. These ramps would attract very high traffic volumes and, therefore, would need to be provided.

The remaining five arterial streets—Sarival Avenue, El Mirage Road, 99th Avenue, 83rd Avenue, and 75th Avenue—were analyzed on a case-by-case basis to justify providing a service traffic interchange. These locations were evaluated individually based on average daily traffic (ADT), distribution of traffic onto adjacent interchange ramps, the arterial street network, ADOT's goal to have service TIs no more than 2 miles apart on freeways in the Phoenix metropolitan area, and impacts that would occur without the interchange.

Traffic projections from MAG's 2030 travel demand model formed the basis for evaluation of individual service TIs because only 2030 traffic data were available from MAG during this phase. The North and Center Alternatives would have the same traffic projections—there is no difference in traffic assignment since the freeway facility would be located between the same major crossroads.

The SS Hybrid and Center Alternatives are very similar in alignment except for a minor deviation between El Mirage and Dysart Roads. Consequently, for the service TI evaluation, it was assumed that the SS Hybrid Alternative would have the same traffic projections as the North and Center Alternatives. The South Alternative traffic projections were unique compared with the other three alternatives and, therefore, each potential South Alternative service TI location was analyzed based on South Alternative traffic projections.

Figure 2.1 – Study Alignment Alternatives



Service Traffic Interchange at Sarival Avenue

Sarival Avenue is located between Cotton Lane on the west and Estrella Parkway on the east. Both of these adjacent arterial streets cross the Gila River and attract very significant ADT. Figures 2.2 and 2.3 illustrate the traffic and operational performance of the Sarival Avenue service TI and adjacent interchanges with and without the Sarival Avenue service TI for the North/Center/SS Hybrid and South Alternatives. Of particular note, the Cotton Lane service TI east-side ramps would have very high ADT and peak hour volumes that would result in a very poor level of service (LOS) at the ramp and crossroad junctions. Similarly, the east-side ramps of the Estrella Parkway service TI would have significant volumes, and any additional traffic would result in a poor LOS.

The Sarival Avenue west-side ramps would have very low ADT, while the east-side ramps would attract very high ADT, probably because the complementary ramps at Cotton Lane and Estrella Parkway would already be overloaded. Removal of the Sarival Avenue service TI would cause most of the traffic entering or exiting the freeway to use the arterial street network. The adjacent interchanges at Estrella Parkway and Cotton Lane could not handle this additional traffic if the east-side Sarival Avenue ramps were not constructed. The west-side Sarival Avenue ramps would serve little-to-no traffic and are, therefore, not recommended. Because the east-side ramps at the Sarival Avenue interchange would be the only ramps with high demand, it is proposed that a half-diamond interchange be constructed at this location to serve the travel demand. Moreover, the potential weaving of traffic with ramps from the SR 30 and SR 303L system TI directional ramps would be avoided with a half diamond interchange.

Service Traffic Interchange at El Mirage Road

El Mirage Road is located between Dysart Road on the west and Avondale Boulevard on the east. It is envisioned as a low-flow crossing through the Gila River, according to the City of Avondale *General Plan.* The west-side ramps of the El Mirage Road interchange would have very low ADT, while the east-side ramps would have significant volumes for the North/Center/SS Hybrid and South Alternatives, as shown in Figures 2.2 and 2.3. Most of the traffic from these ramps is redistributed to the adjacent Avondale Boulevard and Dysart Road interchange ramps in the absence of an El Mirage Road interchange. With this added volume, these adjacent interchange ramps still operate at acceptable LOS. The east-side ramps of the Avondale Boulevard interchange would attract the majority of the El Mirage Road traffic. Therefore, not including the El Mirage Road interchange on all the SR 30 alternatives would not result in any adverse impact on the adjacent interchanges.

Service Traffic Interchange at 99th Avenue

99th Avenue is located between 107th Avenue on the west and 91st Avenue on the east. The west-side 99th Avenue ramps would attract relatively low traffic volumes, while the east-side ramps would experience only moderate volumes for the North/Center/SS Hybrid Alternatives, as shown in Figure 2.2. The adjacent 107th Avenue and 91st Avenue ramps also would have moderate volumes with the 99th Avenue interchange.

With removal of the 99th Avenue interchange, however, most of the traffic would be redistributed to the adjacent 107th Avenue and 91st Avenue ramps. Therefore, these ramps would be more effectively used and no significant reduction in operational performance would occur. With no planned river crossing or significant activity around 99th Avenue, it is proposed to not include a service traffic interchange at this location for North/Center/SS Hybrid Alternatives.

The service TI at the 99th Avenue was not considered for the South Alternative during the initial alternative study process because the proposed SR 30 freeway would be highly skewed at this location. It would not be economical to construct an interchange at such a large skew angle.

Service Traffic Interchange at 83rd Avenue

83rd Avenue is located between 91st and 75th Avenues. With the elimination of the 75th Avenue interchange (see discussion below); the interchange at 83rd Avenue would be 2 miles away from the nearest interchange east of 67th Avenue. To meet ADOT's goal of having interchanges no more than 2 miles apart, the 83rd Avenue interchange should be constructed for all four alternatives.

Service Traffic Interchange at 75th Avenue

75th Avenue is located between 83rd Avenue on the west and 67th Avenue on the east. It is close to the SR 30 and SR 202L system TI located immediately east of 67th Avenue. Maricopa County has envisioned that 75th Avenue would cross the Salt River with a bridge in the future. The ADT on the 75th Avenue interchange ramps and on the adjacent interchange ramps at 67th and 83rd Avenues (without the 75th Avenue interchange) for the North/Center/SS Hybrid and South Alternatives are shown in Figures 2.2 and 2.3. The west-side 75th Avenue ramps would not attract high volumes, while the east-side ramps would have some demand. With no ramps at 75th Avenue, the operational performance of the adjacent 67th Avenue and 83rd Avenue ramps would still be acceptable.

The proximity of the 75th Avenue and 67th Avenue interchanges to ramps from the SR 30 and SR 202L system TI would result in a failing weave condition between the 75th Avenue and 67th Avenue interchanges, while also creating an unacceptable operational condition on the system TI. This would be very similar to the existing weave condition between 35th Avenue and ramps from the I-10 and Interstate 17 system TI, which has failed. Therefore, it is proposed to not include the 75th Avenue interchange—even with a future bridge crossing planned—because omitting the interchange would greatly enhance the operational performance of the system TI without major impacts on adjacent service TIs.

Figure 2.2 – SR 30 North/Center/SS Hybrid Alternatives Service Traffic Interchange Evaluation

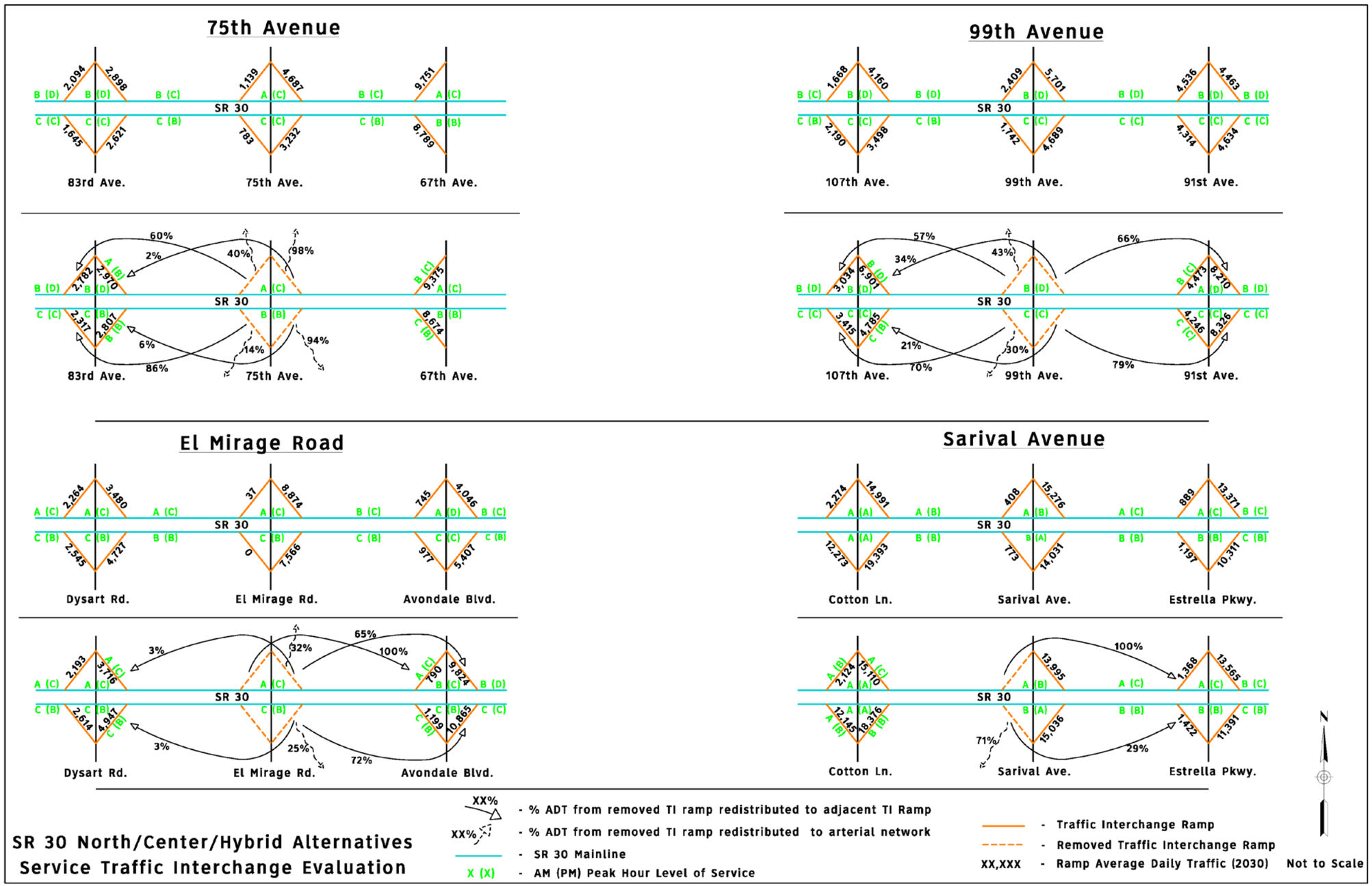
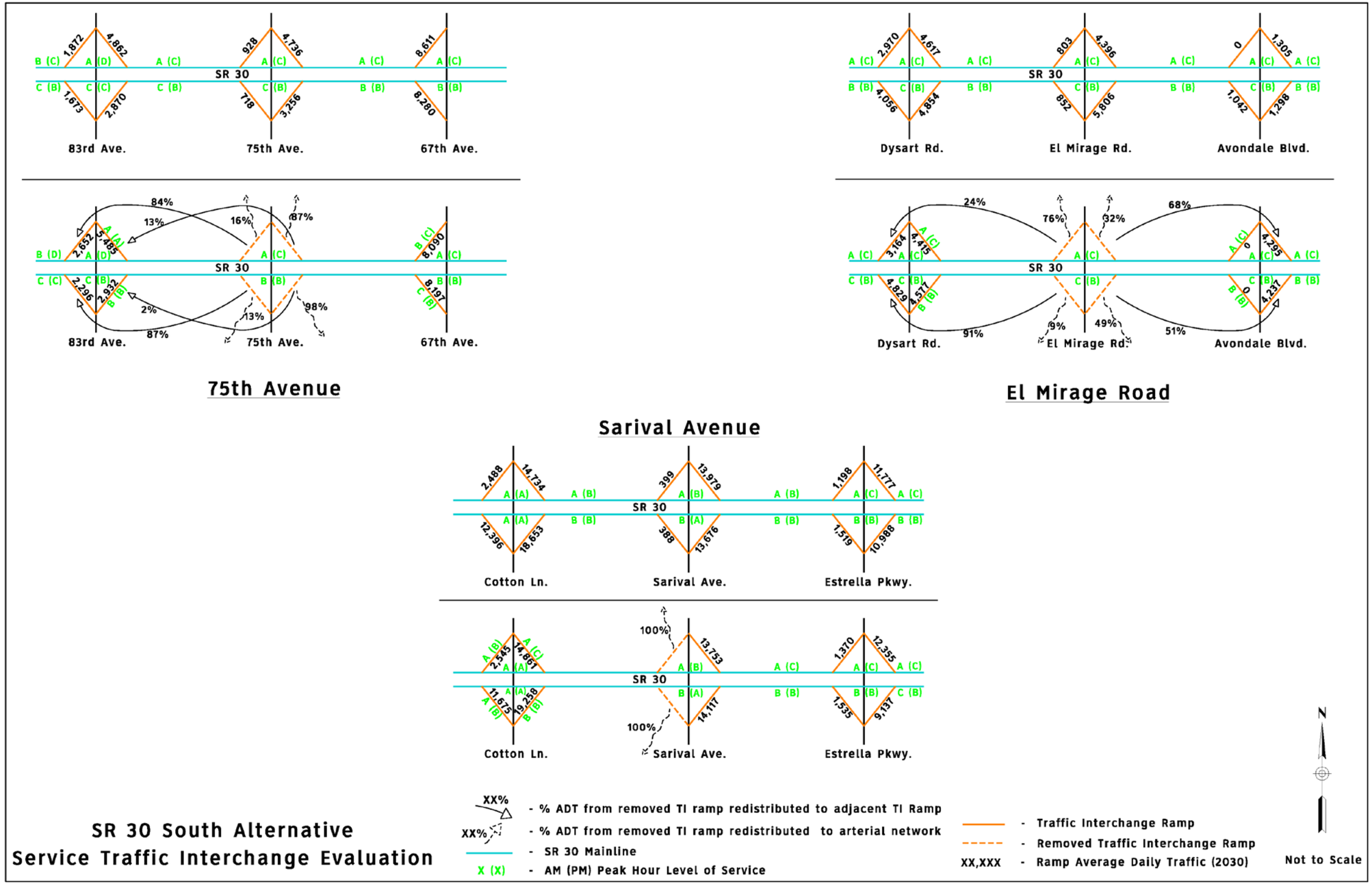


Figure 2.3 – SR 30 South Alternative Service Traffic Interchange Evaluation



2.3 SR 30 and SR 202L System Traffic Interchange

The proposed system TI between SR 30 and SR 202L is located in Phoenix between Broadway Road and Southern Avenue, along the proposed SR 202L. The proposed SR 30 freeway would connect to the proposed SR 202L as a three-legged system TI during initial construction. Provisions have been made to connect SR 30 to the Avenida Rio Salado project east of SR 202L as a fourth interchange leg in the future.

SR 202L is a proposed eight-lane freeway facility with three general purpose lanes and one HOV lane in each direction. It would have service TIs at every mile that would be connected with auxiliary lanes within the influence area of the SR 30 and SR 202L system TI. The Avenida Rio Salado project is a proposed new high-capacity east-to-west arterial roadway between 67th Avenue and 7th Street. It is envisioned that a minimum of two through lanes in each direction would connect to SR 30 from the Avenida Rio Salado project in the future, forming the fourth leg of the SR 30 and SR 202L system TI. The development and evaluation of various system TI configurations was presented in the *SR 801/SR 202L System Traffic Interchange, Final Interchange Selection Report* (ADOT 2010), which provides a recommended configuration.

The core of the system TI would lie between Broadway Road on north, Southern Avenue on south, 67th Avenue on west, and 59th Avenue on east. The northbound-to-westbound (NW), eastbound-to-northbound (EN), southbound-to-westbound (SW), and eastbound-to-southbound (ES) system ramps would be two-lane ramps. The future westbound-to-northbound (WN), westbound-to-southbound (WS), northbound-to-eastbound (NE), and southbound-to-eastbound (SE) system ramps are proposed as one-lane ramps. A direct HOV connector ramp would be provided in the NW and ES directions; however, NE and WS or EN and SW direct HOV ramps would also be possible geometrically. Provisions for multiple direct HOV connections have been made because these ramps would attract very low (insignificant) volumes during the opening year and the travel demand direction could not be determined.

The east, west, and south legs of the system TI would have a dual exit/entry system ramp configuration, while the north leg would have single exit/entry system ramp configuration to lessen the impact on the residential neighborhood north of Broadway Road.

The system TI area of influence along SR 202L extends between Buckeye Road to the north and Dobbins Road to the south because of the system ramp run-outs for the three-legged system TI configuration. The influence area would extend farther south to Elliot Road when the fourth (east) leg is constructed. The influence area along SR 30 would extend west to 83rd Avenue for the three-legged system TI configuration—it would extend to 99th Avenue on the west and 51st Avenue on the east when the fourth leg is added.

The SR 202L project features proposed diamond interchanges at Baseline Road, Southern Avenue, Broadway Road, and Lower Buckeye Road. However, with the introduction of the SR 30 system TI ramps, the roadway geometry, and the traffic operational performance of weave segments along SR 202L in the system TI influence area would be affected. The connections between SR 202L and crossroads would have to be modified to geometrically fit the system ramps as well as to maintain an acceptable LOS. Two solutions would maintain this local access (termed as the local access options along SR 202L). One of the local access options between Baseline and Lower Buckeye Roads along SR 202L is the addition of collector/distributor roads combined with access roads (Option 3B-1) while the other would involve adding access roads with a braided ramp configuration (Option 3B-2). Option 3B-2 was not documented in *SR 801/SR 202L System Traffic Interchange, Final Interchange Selection Report* because the option was not viable when the report was completed because of the assumption that a single point urban interchange would be constructed at Baseline Road. With the introduction of a diamond interchange at Baseline Road along SR 202L, Option 3B-2 was considered. Figures 2.10 to 2.13 show the two local access options along SR 202L for the SR 30 and SR 202L system TI.

2.4 SR 30 and SR 303L System Traffic Interchange

The proposed SR 30 and SR 303L system TI would be located near the municipal boundary between Goodyear and Buckeye. A study to determine the final location and configuration of the proposed system TI is currently in progress. SR 303L would be a six-lane facility initially, with a 50-foot-wide median to accommodate another general purpose lane and a HOV lane in each direction. It would have 12-foot-wide lanes with 12-foot-wide shoulders on both sides with median concrete barrier when built out. The SR 30 (SR 85 to SR 303L) project would extend SR 30 west of SR 303L and would have the same lane configuration as SR 30 between SR 303L to SR 202L. SR 30 would connect to SR 303L with direct WN and SE system ramps during the initial construction. The final configuration of the SR 30 and SR 303L system TI would depend on the geometric, traffic, and environmental conditions at the location and is not yet available.

2.5 SR 30 Construction Phases

The SR 30 freeway would be a six-lane facility during the initial construction, but would have two more lanes in each direction for the ultimate build out. Similarly, the SR 30 and SR 202L system TI would be a three-legged configuration during initial construction. A fourth leg (on the east) would be added in the future, representing its ultimate construction. During the initial construction, SR 303L would connect to SR 30 with directional system ramps. The final configuration of this connection is currently under study. Figures 2.4 to 2.13 schematically show the construction phases for the SR 30 freeway and its system TIs with SR 202L and SR 303L on either end.

Figure 2.4 – SR 30 North/Center Alternatives Construction Phases (Western Section)

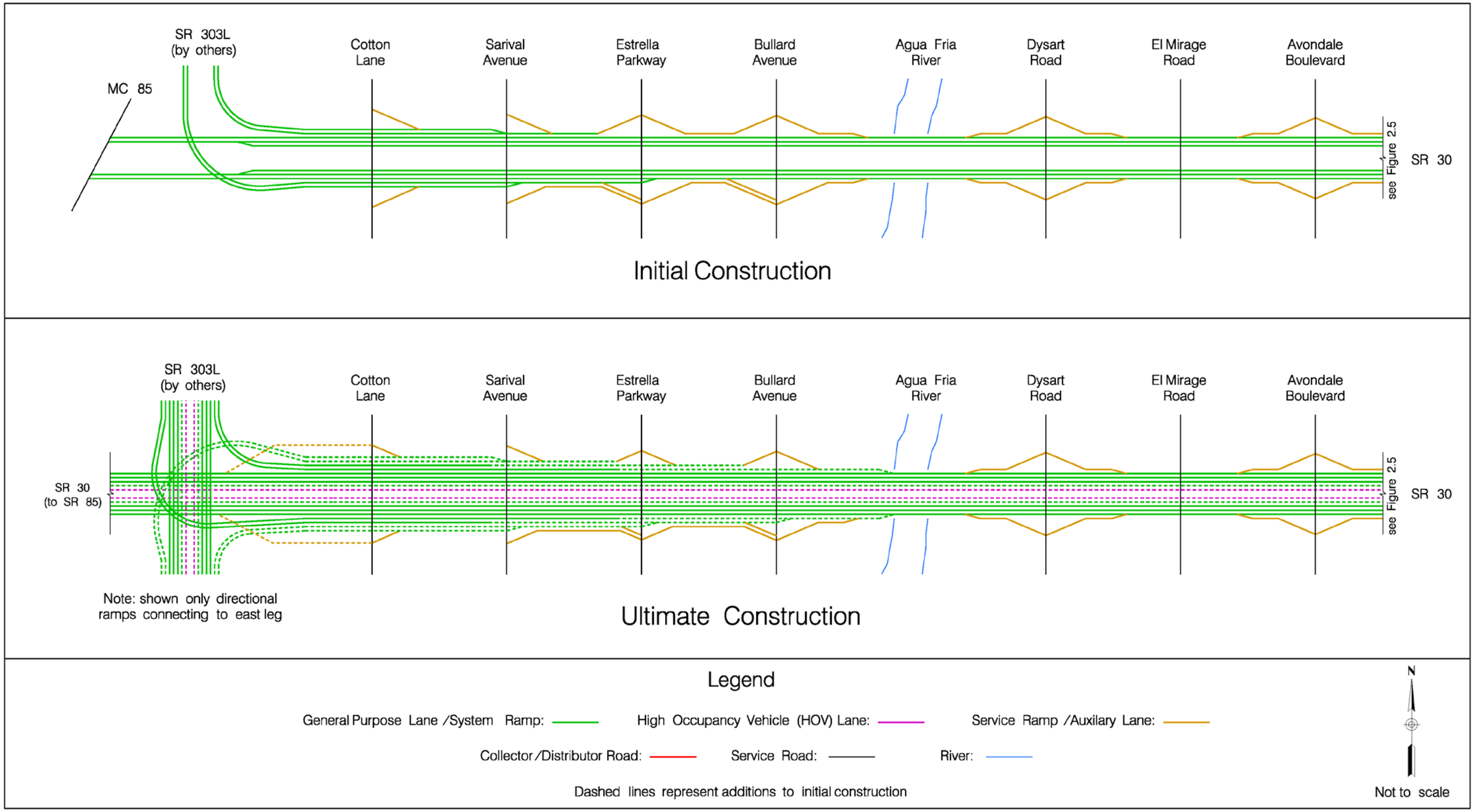


Figure 2.5 – SR 30 North/Center Alternatives Construction Phases (Eastern Section)

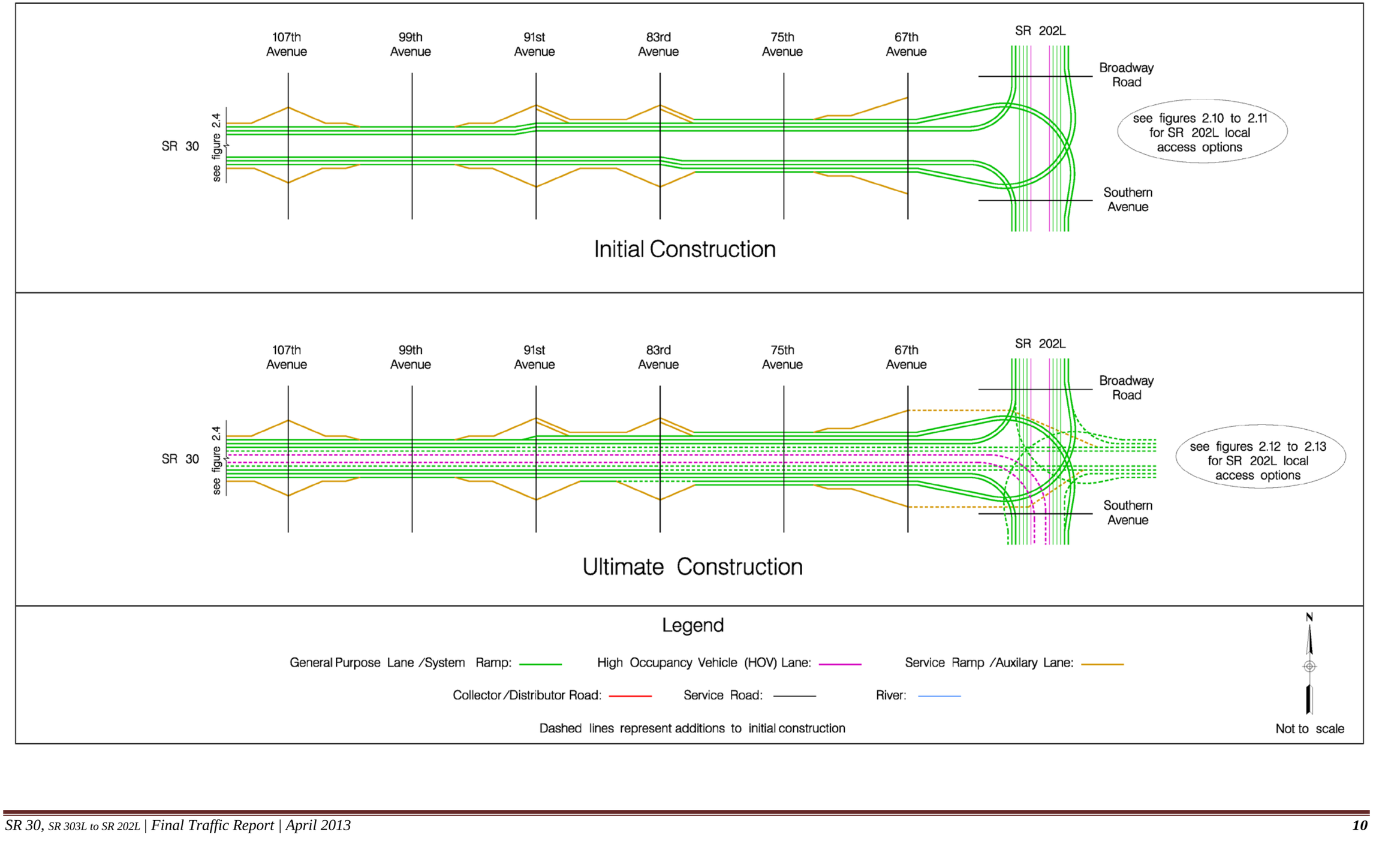


Figure 2.6 – SR 30 SS Hybrid Alternative Construction Phases (Western Section)

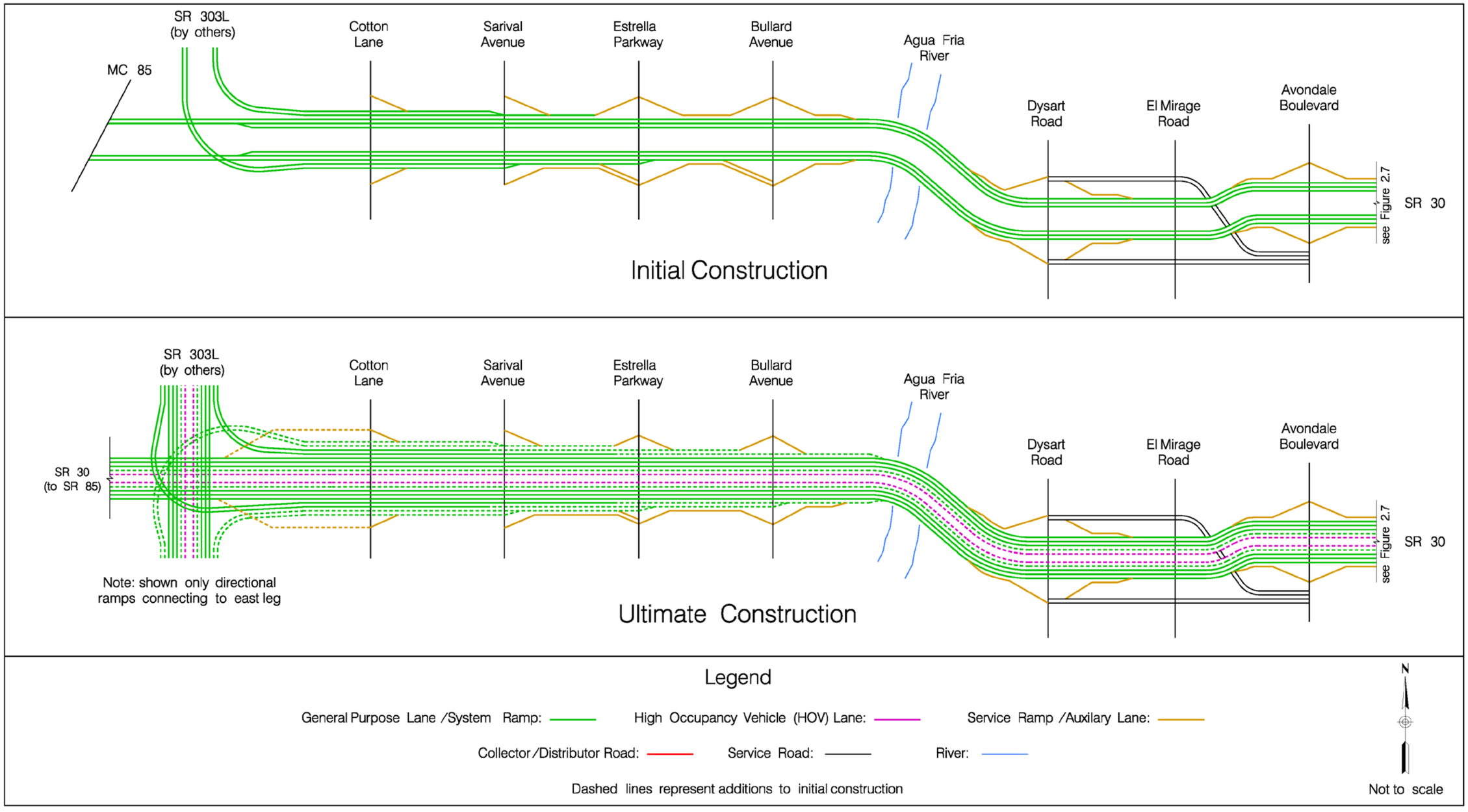


Figure 2.7 – SR 30 SS Hybrid Alternative Construction Phases (Eastern Section)

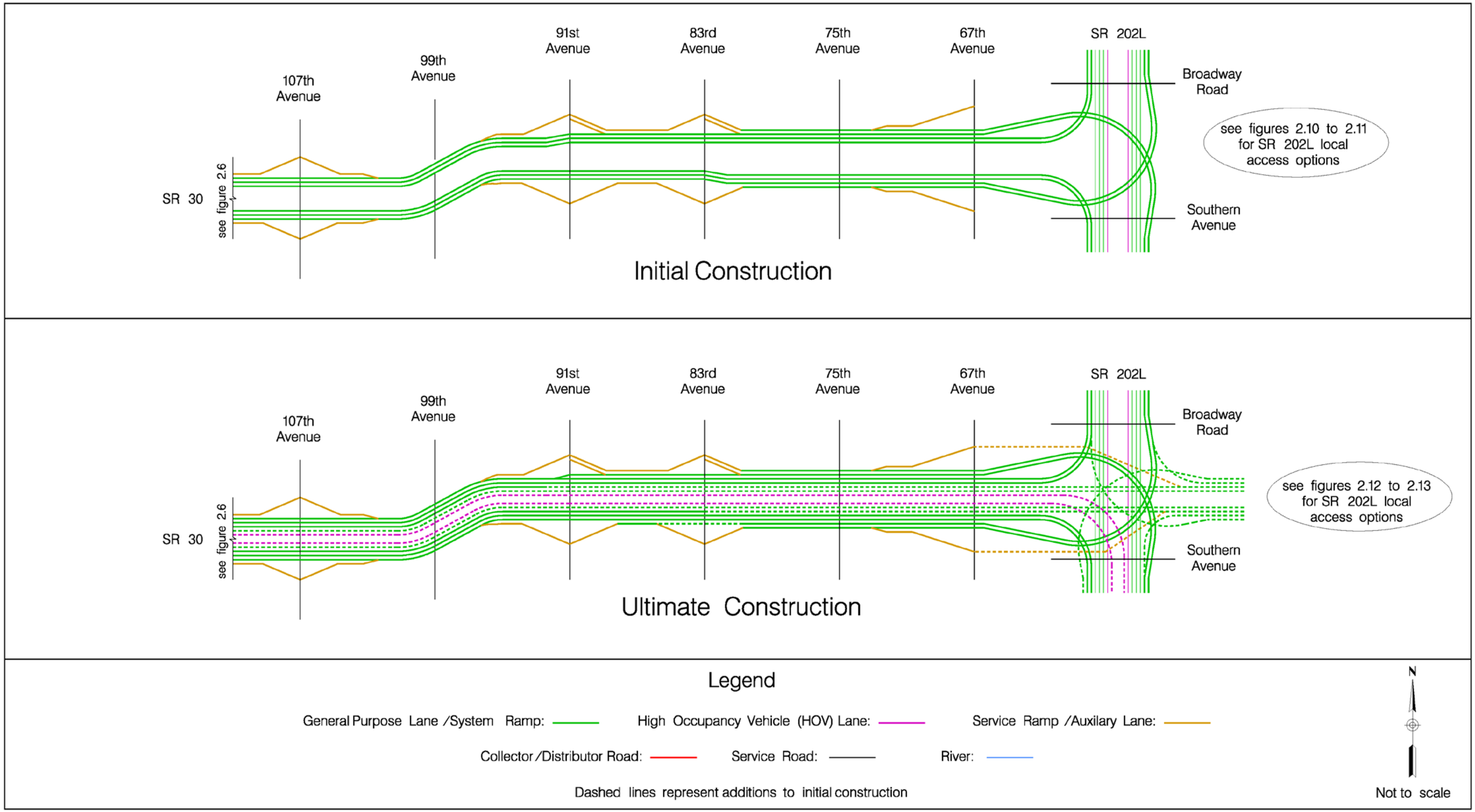


Figure 2.8 – SR 30 South Alternative Construction Phases (Western Section)

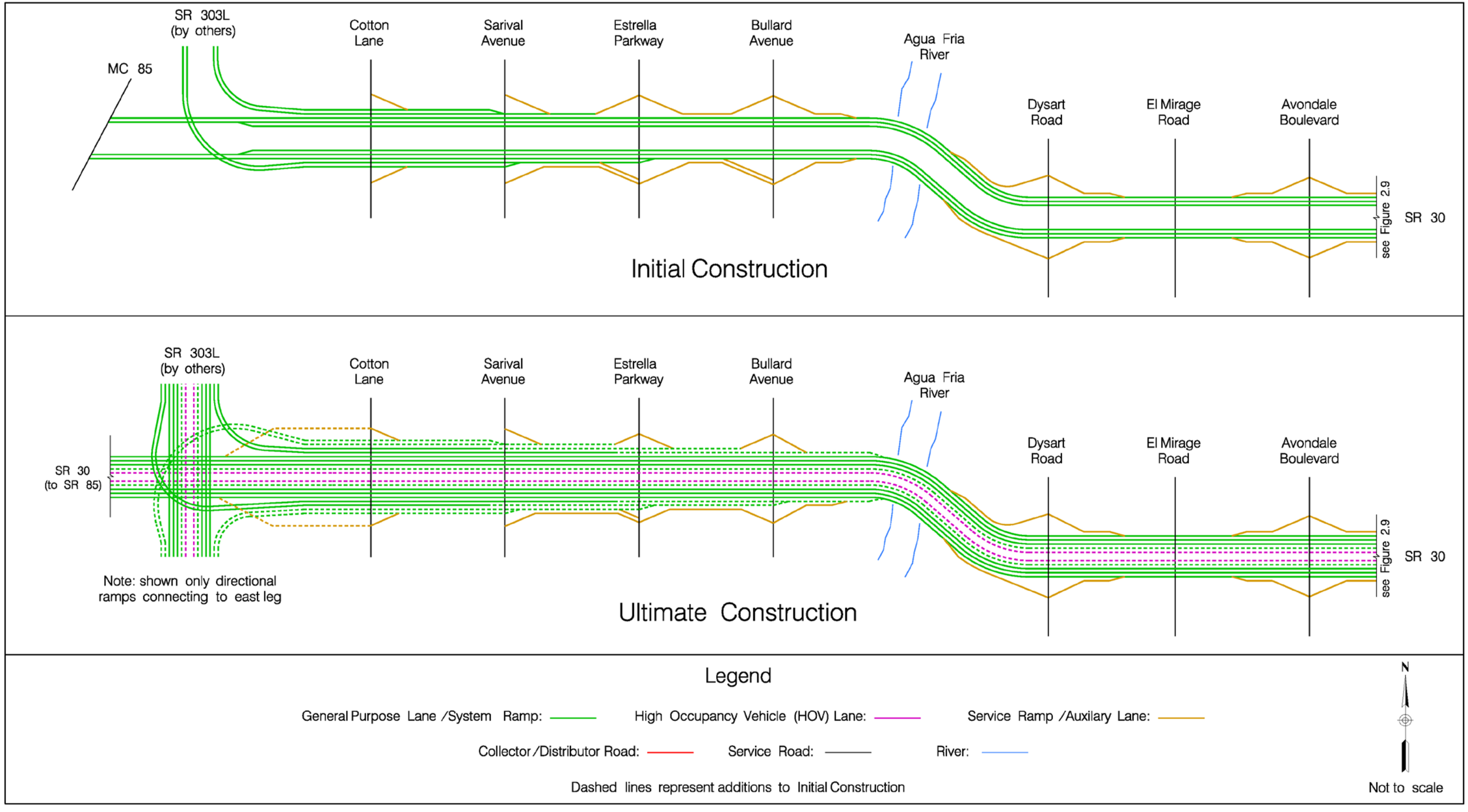


Figure 2.9 – SR 30 South Alternative Construction Phases (Eastern Section)

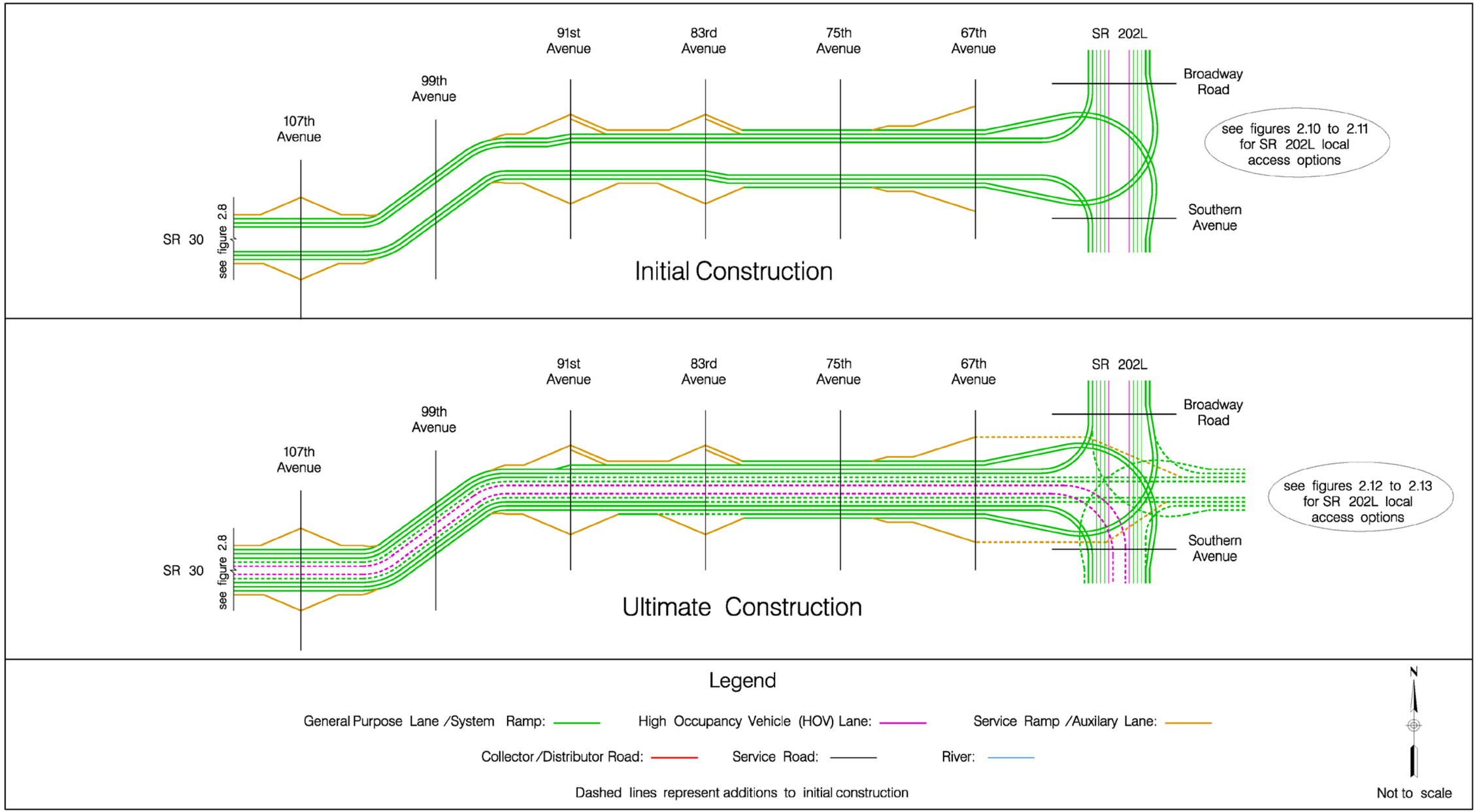


Figure 2.10 – SR 30 and SR 202L System Traffic Interchange Initial Construction (Option 3B-1)

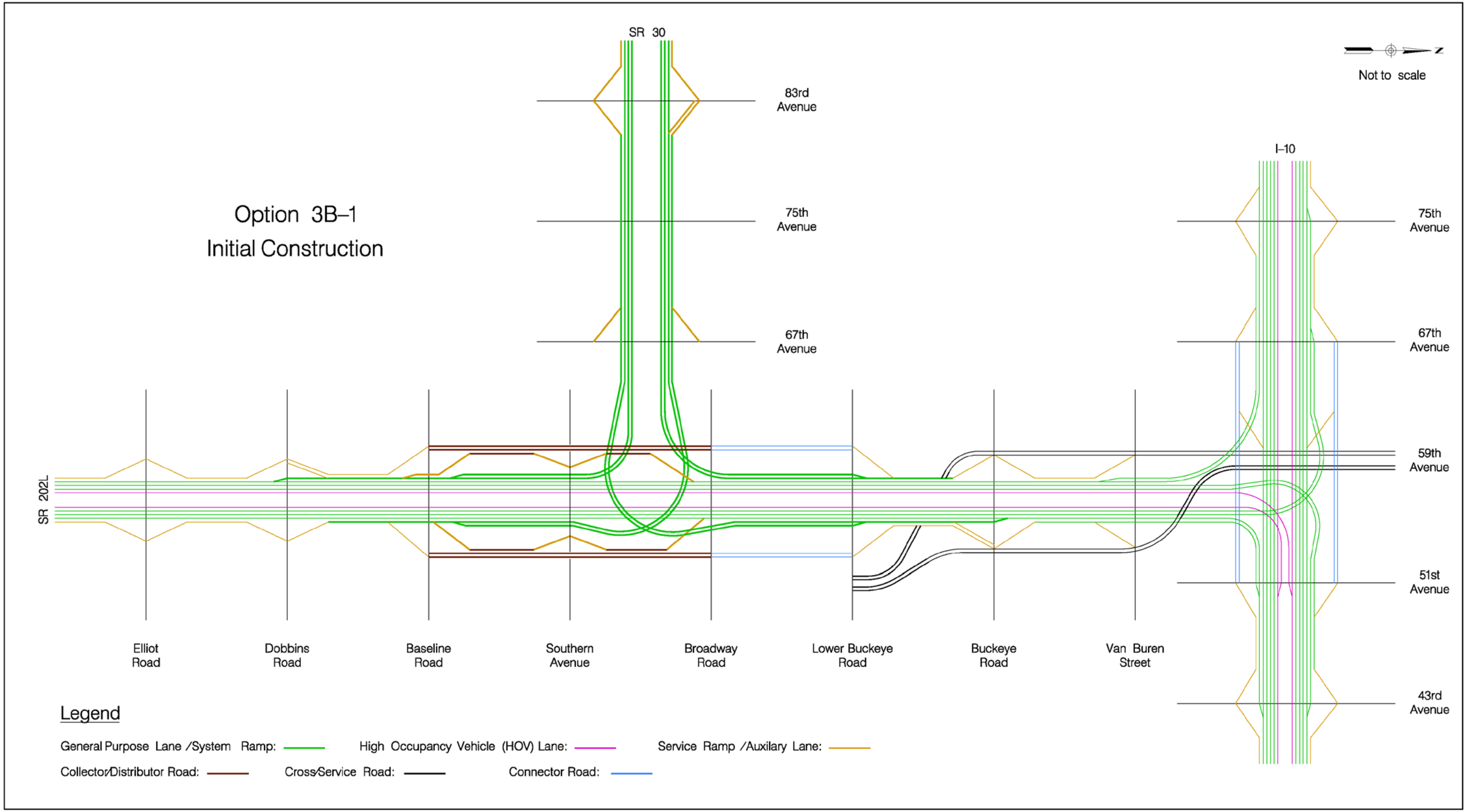


Figure 2.11 – SR 30 and SR 202L System Traffic Interchange Ultimate Construction (Option 3B-1)

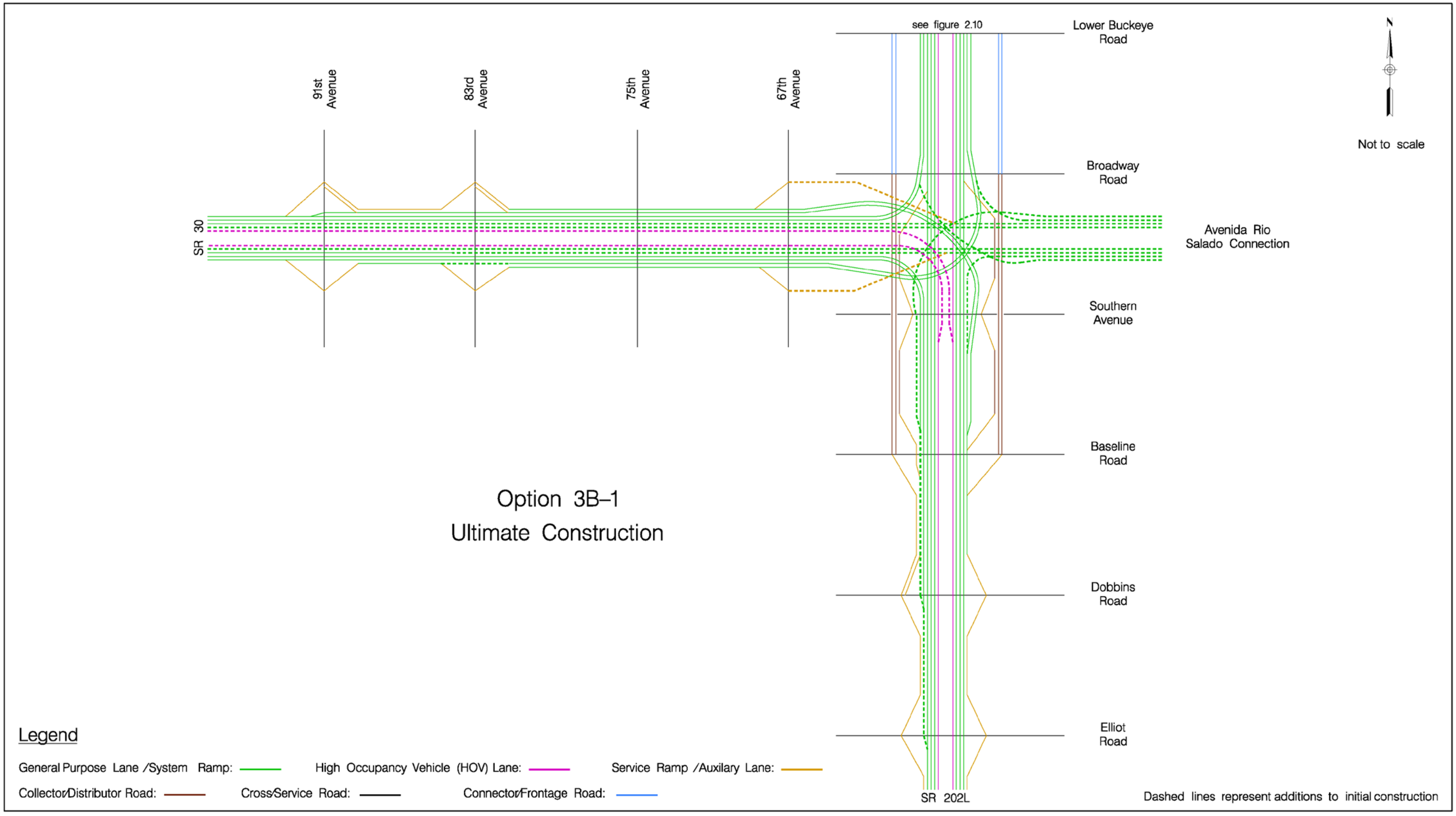


Figure 2.12 – SR 30 and SR 202L System Traffic Interchange Initial Construction (Option 3B-2)

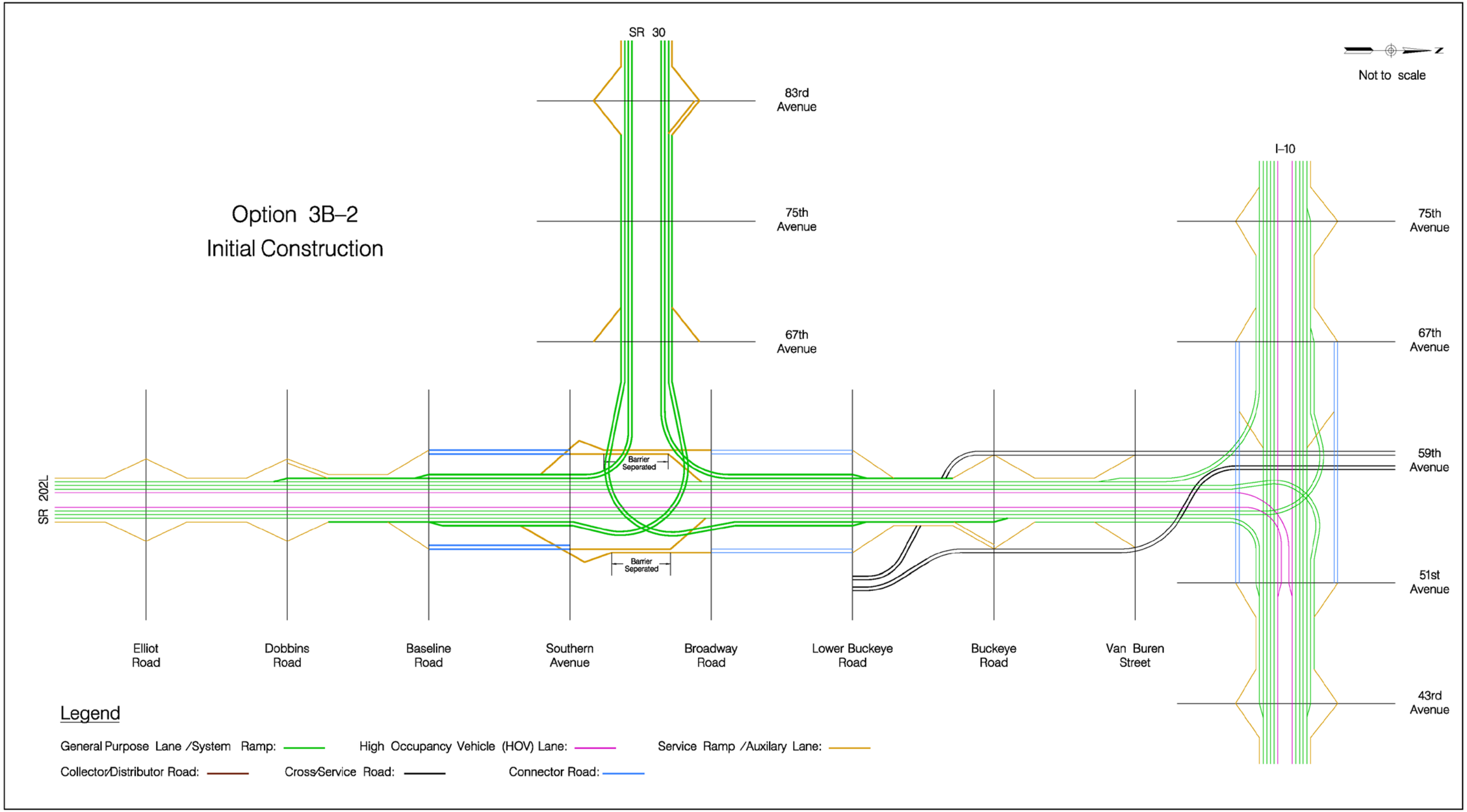
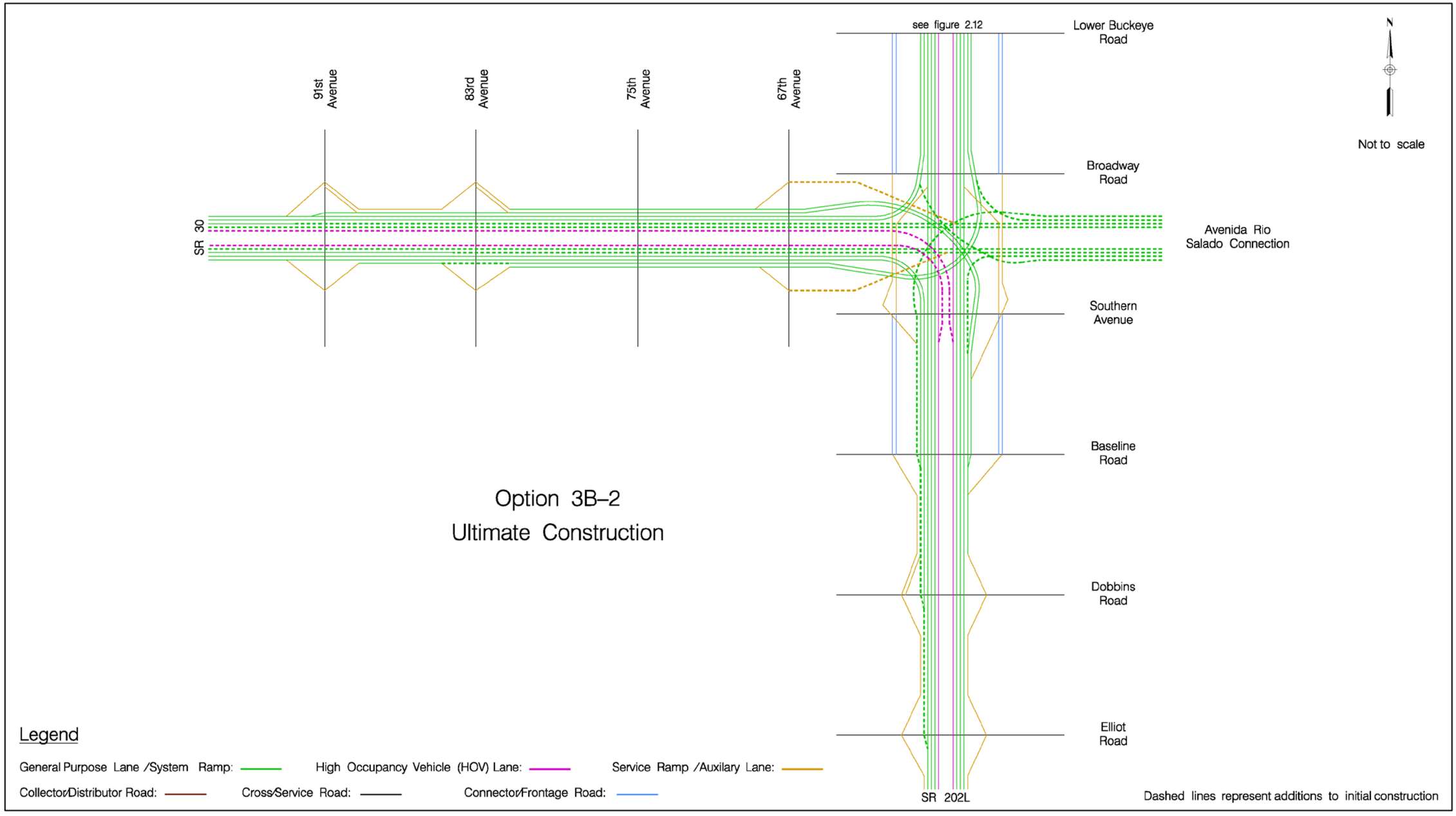


Figure 2.13 – SR 30 and SR 202L System Traffic Interchange Ultimate Construction (Option 3B-2)



3. TRAVEL DEMAND OVERVIEW

This section discusses travel demand and socioeconomic projections within the western Phoenix metropolitan area. The traffic distribution on the regional freeway system and arterial street network with and without the proposed SR 30 freeway corridor, and other special event traffic, are also presented.

3.1 Regional Growth

Maricopa County has been one of the fastest-growing regions in the United States, with a growth of 24.2 percent between 2000 and 2010. In 2007, Maricopa County added about 102,000 people, which was the nation's largest increase in population for any county. It is estimated that Maricopa County will grow from a population of 4.2 million in 2010 to 6.5 million by 2035. Build out is expected with a population of around 8 million, occurring between 2050 and 2060, depending on economic conditions. With the regional growth in population, employment, and housing comes regional mobility needs. Growth in the Phoenix metropolitan area has occurred, in succession, in the northeastern, northwestern, southeastern, and central areas. According to MAG projections (2007 and 2009), about 50 percent of the projected growth in population, employment, and housing between 2000 and 2035 would occur in the southern and southwestern portions of the Phoenix metropolitan area, which would be directly served by the proposed freeway.

3.1.1 Future Land Use

Land use changes are expected to drive travel demand in the Study Area during the next 20 years. Most of the land at present is agricultural and would convert to residential and commercial uses as developers start implementing their approved plans when the economy recovers. With 57 planned residential and commercial developments covering about half the Study Area, there is a need for additional transportation capacity to handle regional mobility needs.

MAG projections estimate that about 64 percent of the Study Area land would become residential use, 17 percent would be employment use, and the remaining 14 percent is categorized as open space and public/quasi-public uses when built out. Between 2010 and 2035, population density within the Study Area is projected to more than double, from about 2,096 people per square mile to 5,403 people per square mile. Within 3 miles of the Study Area boundaries, more than 180 residential and commercial developments are planned. The travel demand would be higher compared with actual growth in population and employment within the Study Area because of major developments outside the boundaries of the Study Area.

3.1.2 Future Population and Employment

Projected travel demand is driven by the growing population and the availability of employment opportunities in the immediate area. The Study Area is expected to experience substantial population growth by 2035, increasing from 88,887 to 228,531, a 157 percent increase. It would experience a 3.9 percent compounded annual growth rate in population, while Phoenix would experience only a 1.9 percent compounded annual growth rate during the same period. To the west, Buckeye is estimated to experience a 9.6 percent compounded annual growth rate from a 2010 population of 50,876 to a projected 2035 population of 504,043—an overall increase of 891 percent.

The Study Area would experience a 170 percent growth in employment, from 32,047 in 2010 to 86,388 in 2035. It would be an equivalent of 4.1 percent compounded annual growth rate in employment in the Study Area versus only a 1.7 percent compounded annual growth rate for Phoenix during the same period. Buckeye is estimated to have an 8.7 percent compounded annual growth rate from a 2010 base of 22,400 to a projected 2035 employment level of 182,082—an overall increase of 713 percent.

The population and employment growth within the Phoenix metropolitan area is presented in Figure 3.1. The Study Area would attract many more trips with this anticipated growth compared with present-day conditions. When considering travel demand in the Study Area by 2035, it is important to note that Buckeye and Goodyear are projected to have a combined population more than three times the population of the Study Area.

3.1.3 Build Out Conditions

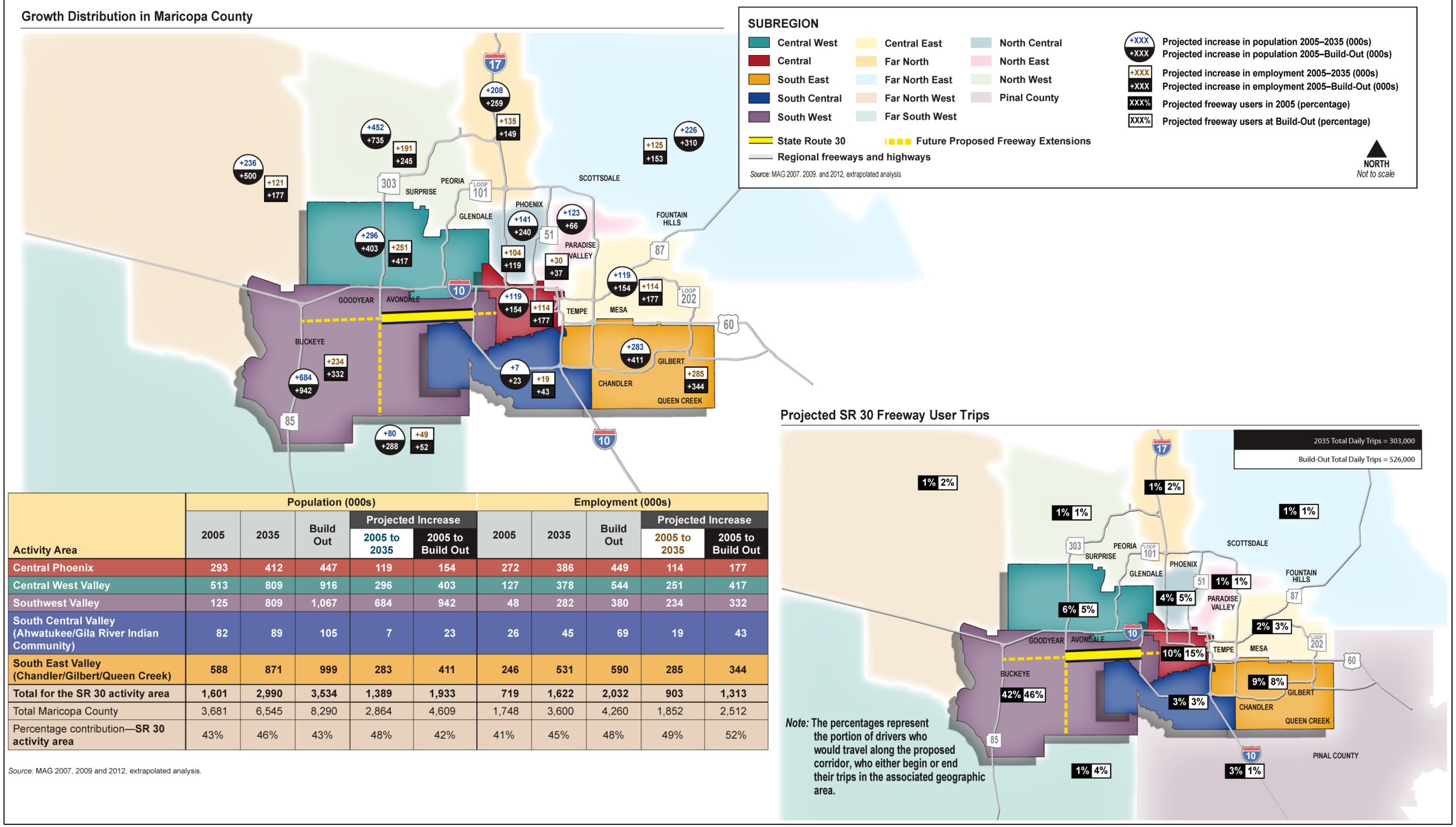
Traffic congestion on I-10 during the build out condition will severely limit regional mobility and also restrict the main goal of serving true Interstate traffic. Build out represents the condition when all land within the Study Area and its adjacent area is fully developed as envisioned in the municipalities' general plans. Avondale and Goodyear would reach build out around 2025 and 2050, respectively. I-10 is the only major east-to-west freeway corridor within this area and will be unable to address this additional build out demand. Therefore, additional transportation facilities are essential to handle the unmet future travel demand and to meet the future growth challenges of municipalities. To address these needs beyond 2030 and at build out, MAG initiated the *Interstate 10/Hassayampa Valley Roadway Framework Study* (2008). The study area for this framework study covered around 1,400 square miles, generally bounded by the Gila River on the south, SR 74 on the north, the 459th Avenue section line on the west, and SR 303L on the east. The important socioeconomic build out estimates developed through the framework study are:

- Population = 2.778 million (2005 = 131,000)
- Employment = 1.047 million (2005 = 57,000)
- Dwelling units = 1.094 million (2005 = 55,000)
- Total daily trips = approximately 6 million

At least 100 master planned communities are located within the framework study area boundaries. With this projected increase in population, employment, and housing, I-10 will no longer meet the needs of this region. The framework study concluded that the proposed SR 30 freeway between SR 85 and SR 202L is an essential part of the regional freeway system, along with other new freeways and parkways, to serve regional travel needs.

A more in depth analysis of the socioeconomic data was presented in *SR 30, SR 303L to SR 202L, Socioeconomic Report* (ADOT 2012b).

Figure 3.1 – Projected Regional Growth and SR 30 Freeway Users



Activity Area	Population (000s)					Employment (000s)				
	2005	2035	Build Out	Projected Increase 2005 to 2035	Projected Increase 2005 to Build Out	2005	2035	Build Out	Projected Increase 2005 to 2035	Projected Increase 2005 to Build Out
Central Phoenix	293	412	447	119	154	272	386	449	114	177
Central West Valley	513	809	916	296	403	127	378	544	251	417
Southwest Valley	125	809	1,067	684	942	48	282	380	234	332
South Central Valley (Ahwatukee/Gila River Indian Community)	82	89	105	7	23	26	45	69	19	43
South East Valley (Chandler/Gilbert/Queen Creek)	588	871	999	283	411	246	531	590	285	344
Total for the SR 30 activity area	**1,601**	**2,990**	**3,534**	**1,389**	**1,933**	**719**	**1,622**	**2,032**	**903**	**1,313**
Total Maricopa County	3,681	6,545	8,290	2,864	4,609	1,748	3,600	4,260	1,852	2,512
Percentage contribution—**SR 30 activity area**	43%	46%	43%	48%	42%	41%	45%	48%	49%	52%

Source: MAG 2007, 2009 and 2012, extrapolated analysis.

3.2 SR 30 Travel Demand Models

The travel demand models for the SR 30 freeway corridor study were provided by MAG based on the analysis period socioeconomic data, alignment choice, and planned roadway network improvements during that period. The socioeconomic data were developed by MAG in coordination with municipalities and other agencies in the region. The 2035 travel demand models formed the basis for an opening year traffic analysis, while the "8 million population" travel demand model was used to provide an understanding of how travel demand would change between 2035 and build out, which may represent conditions during the design year of 2055 or beyond.

It was assumed that the 2035 travel demand model represented the opening day initial construction of the SR 30 alignment with a three-legged SR 30 and SR 202L system TI at the eastern terminus and the SE and WN direct connections of SR 30 and SR 303L at the western terminus. The 8 million population model represents the ultimate lane configuration of the SR 30, SR 303L, and SR 85 freeways, along with the corresponding system and service TIs.

Figure 3.1 shows the growth distribution and projected SR 30 freeway users in the study area and vicinity. The data represent the socioeconomic data obtained from MAG for population and employment growth in the regions surrounding the Study Area. The figure also shows the location of projected SR 30 freeway users. As shown in Figure 3.1, the SR 30 (between SR 303L and SR 202L) activity area (which includes areas in Central Phoenix, Central West Valley, Southwest Valley, South Central Valley, and South East Valley) contribute 42 and 52 percent of total population and employment growth in Maricopa County for the years between 2005 and build out. A significant number of freeway users would use the proposed SR 30 freeway. About 70 percent of the trips using the new facility have their origin or destination in the SR 30 activity area, with the Southwest Valley generating the majority of trips (about 42 percent in 2035) followed by the Central Phoenix and South East Valley regions.

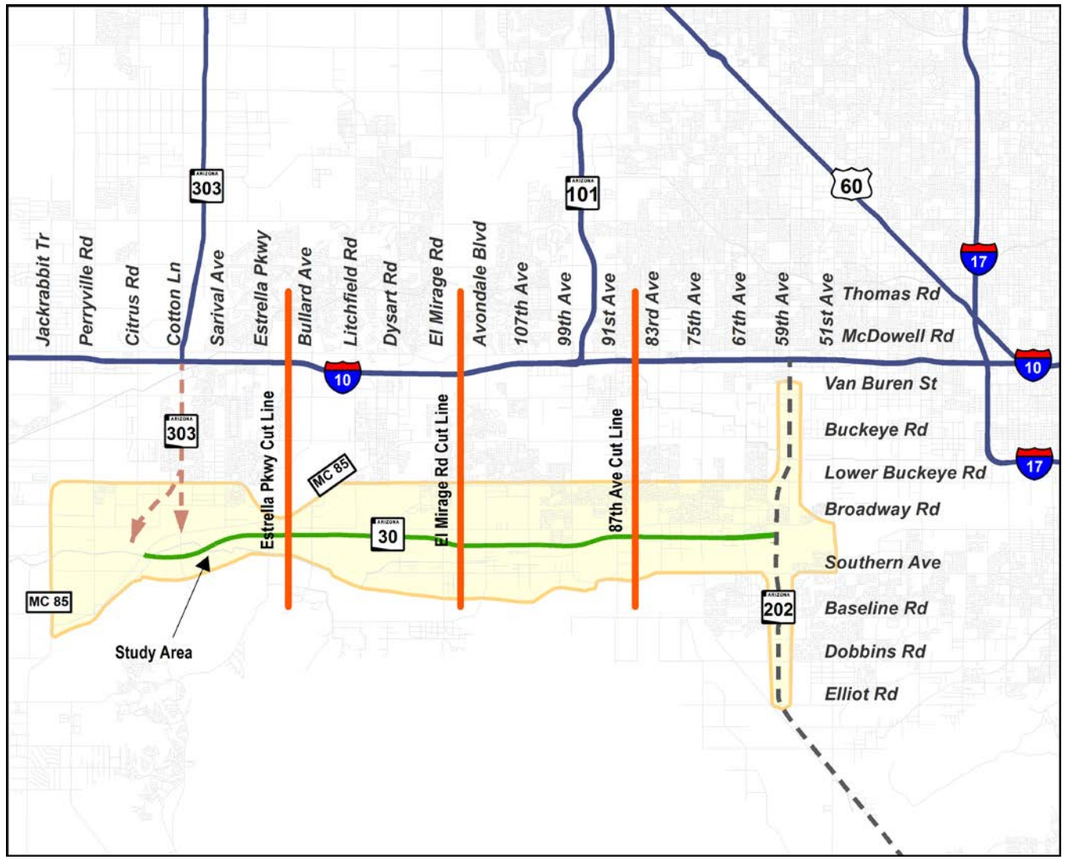
3.3 Traffic Distribution on Regional Roadway Network (with and without SR 30)

One of the objectives of the proposed SR 30 freeway corridor is to improve traffic conditions in the southwest region of the Phoenix metropolitan area by acting as an alternative east-to-west route to I-10, thus reducing congestion on I-10 as well as local arterial streets. It is also generally desired to route more traffic onto freeways compared with arterial streets, which improves the arterial streets' operations. With the use of a cut-line analysis, the traffic distribution on the regional street network with and without the proposed SR 30 freeway can be demonstrated, illustrating the benefits of the new freeway.

A cut line is an imaginary line placed over the road network that crosses a number of parallel roads in a given geographic area. It is drawn perpendicular to the set of parallel roads. It is a tool to measure the amount of traffic distributed among freeways and arterial streets that exist under the cut line for different conditions.

To assess the distribution of existing (2011), 2035, and build out (8 million population) eastbound and westbound traffic on I-10 and on arterial streets north and south of I-10, the Study Team conducted a cut-line analysis by drawing three imaginary north-to-south lines extending from Southern Avenue to Thomas Road.

Figure 3.2 – Cut Line Locations



The length of the three cut lines was selected based on the assumption that the major east-to-west arterial streets crossing the three cut lines (Broadway Road, Lower Buckeye Road, Buckeye Road, Van Buren Street, McDowell Road, and Thomas Road) would generally be used as alternate routes for I-10 and SR 30.

The Study Team placed the Estrella Parkway cut line between Estrella Parkway and Bullard Avenue, the El Mirage Road cut line between El Mirage Road and Avondale Boulevard, and the 87th Avenue cut line between 91st and 83rd Avenues (see Figure 3.2). The cut-line analysis was performed for the existing (2011) condition and the 2035 condition with and without the proposed SR 30 freeway (initial construction). The SR 30 North Alternative was considered for the analysis because it attracts higher traffic volumes compared with other alternatives. I-10 widening attributable to the SR 202L and SR 303L system TIs was also included in the 2035 condition. In addition, the build out condition with the proposed SR 30 freeway from SR 202L to SR 85—and SR 303L extended south of SR 30 (ultimate construction)—were modeled. Table 3.1 shows the distribution of daily traffic along the cut lines for these different conditions along the freeways and east-to-west arterial streets.

Table 3.1 – Traffic Distribution on Regional Street Network along Cut Lines

Cut Line	Year/Condition	Daily Traffic Volume (Reserved Capacity) in 000's			Distribution (%)		Volume Over Capacity		
		Total	Freeways	Arterial streets	Freeways	Arterial streets	Total	Freeways	Arterial streets
Estrella Parkway	2011/existing	199 (510)	165 (271)	34 (239)	83	17	0.39	0.61	0.14
	2035/without SR 30	480 (790)	287 (407)	193 (383)	60	40	0.61	0.71	0.50
	2035/with SR 30 (NA[a])	530 (980)	396 (597)	134 (383)	75	25	0.54	0.66	0.35
	Build Out/with SR 30	710 (1,207)	571 (824)	139 (383)	80	20	0.59	0.69	0.36
El Mirage Road	2011/existing	238 (454)	175 (283)	63 (171)	74	26	0.52	0.62	0.37
	2035/without SR 30	449 (646)	283 (283)	166 (363)	63	37	0.70	1.00	0.46
	2035/with SR 30 (NA)	516 (821)	405 (498)	111 (323)	78	22	0.63	0.81	0.34
	Build Out/with SR 30	674 (921)	533 (598)	141 (323)	79	21	0.73	0.89	0.44
87th Avenue	2011/existing	321 (535)	228 (283)	93 (252)	71	29	0.60	0.81	0.37
	2035/without SR 30	494 (606)	338 (345)	156 (261)	68	32	0.82	0.98	0.60
	2035/with SR 30 (NA)	576 (792)	465 (531)	111 (261)	81	19	0.73	0.88	0.43
	Build Out/with SR 30	700 (950)	585 (689)	115 (261)	84	16	0.74	0.85	0.44

[a] North Alternative

Estrella Parkway Cut Line: This cut line is on the western end of the SR 30 corridor, where the existing population density is relatively low. In the existing condition, 83 percent of daily traffic uses I-10. As this area grows between now and 2035, the importance of the additional alternate route (SR 30) becomes evident. Without SR 30, the freeway allocation drops to 60 percent, while the arterial streets increase to 40 percent. With SR 30, the freeways continue to attract a significant 75 percent of the volume. The 2035 daily traffic attraction on arterial streets is around 25 percent with SR 30 compared to 40 percent without SR 30. At build out conditions, I-10 and SR 30 would continue to attract a high percentage (80 percent) of the daily traffic.

The east-to-west arterial streets would have sufficient capacity to handle the additional traffic even without SR 30 in 2035. The net increase in freeway volumes would be around 109,000 when compared with and without SR 30, while the arterial street volume would be reduced by only 59,000 with SR 30 compared to without SR 30 in 2035. Moreover, these arterial streets may be significantly constrained operationally without the proposed SR 30 at build out. Therefore, SR 30 is filling the need of attracting regional trips and relieving demand on arterial streets.

El Mirage Road Cut Line: This cut line is located near the middle of the SR 30 corridor. The existing population and employment densities are relatively low for this region. In 2035, the distribution of 63 and 79 percent of the daily traffic on freeways with and without SR 30, respectively, indicates the necessity to have the proposed SR 30 freeway as an alternate route. This same trend of 79 percent daily traffic distributed on freeways (I-10 and SR 30) would continue as traffic increases from 2035 to build out conditions. The 2035 daily traffic on arterial streets would be reduced from 37 percent to 21 percent when comparing conditions without and with SR 30.

As discussed above, the east-to-west arterial streets would be able to operate within the acceptable level without SR 30 in 2035. But, the significant attraction of additional users onto the freeway network in 2035 and beyond would be beneficial to the transportation system as a whole.

87th Avenue Cut Line: This cut line lies on the eastern end of the SR 30 corridor at 87th Avenue. The existing land use for most of this area is relatively built out. For 2035, the daily traffic distribution would be around 68 and 81 percent on freeways with and without SR 30, respectively. The additional attraction of traffic onto freeways from arterial streets with SR 30 illustrates how it would serve as an alternate route and help meet the travel demand within the region. Under build out conditions, both I-10 and SR 30 would attract a similar portion of traffic (84 percent).

It is evident that the demand on existing freeways would reach capacity in 2035 without SR 30. The east-to-west arterial streets would have to handle any additional traffic generated between 2035 and build out and would start experiencing operational issues when the volume to capacity ratio (V/C) reaches around 0.9. With the proposed SR 30, most of the demand would be shifted to freeways, resulting in better operations on the arterial street network.

3.4 Operational Performance of I-10 with and without SR 30

As mentioned earlier, I-10 is the only major existing freeway serving the needs of east-to-west travel within the western Phoenix metropolitan area. With the projected growth for this region in 2035 and beyond, the effectiveness of I-10 as an Interstate transportation corridor as well as a regional route becomes vital. The SR 30 freeway is proposed as an alternate route to I-10 to meet this additional travel demand. Therefore, it is very important to understand the operational performance of I-10 with and without this new freeway corridor. A basic V/C analysis was performed to understand the operational performance defined by LOS as well as the duration of congestion based on predefined V/C thresholds. The detailed results are presented in Appendix A.

LOS is defined with a letter grade system from A through F. LOS A is the best traffic condition, representing free flow conditions with no delays. LOS F is the worst condition, with severe congestion and delays. Delay is noticeable at LOS D, but is considered acceptable during peak hours. More discussion on LOS is presented in Section 4.2.1. The duration of congestion refers to the number of hours that congestion would last for each segment. The LOS and duration of congestion on I-10 for every 1-mile segment between Perryville Road and 51st Avenue were calculated with and without SR 30 in 2035.This analysis was performed for peak directions only during the morning and evening commutes. The eastbound and westbound I-10 are the morning and evening peak directions respectively. The results of the analysis are presented in Table 3.2.

Notable observations from the analysis include:

Without SR 30, the 12-mile section of I-10 between Bullard and 51st Avenues (both eastbound and westbound) would operate at LOS E or F during peak hours in 2035. Most of the segments would have 3 or more hours of congestion. With SR 30, most of the segments of eastbound I-10 would still operate at LOS E or F during peak hours, but with reduced hours of congestion when compared to conditions without SR 30. The LOS and duration of congestion on the westbound segments of I-10 do not vary much without or with SR 30. This is attributable to the shift of traffic from the arterial street network to I-10, filling up the relieved capacity made available on I-10 with the introduction of SR 30.

3.5 Special Event Traffic at Phoenix International Raceway

PIR is a major racetrack located just west of Avondale Boulevard and south of the Gila River. The racing events that generally occur throughout the year at this location attract around 10,000 to 60,000 visitors. Two major multiday NASCAR events are generally conducted in March and November each year. PIR holds other events during the year which generates significant traffic although not nearly the volume of the actual NASCAR events. The raceway has parking space for around 40,000 vehicles and 4,000 motor homes.

PIR is one of the special traffic-generating events that occur near the Study Area, and I-10 is the only major freeway serving the traffic needs. The service TIs at Avondale Boulevard, Litchfield Road, and Estrella Parkway along I-10 are the major exit and entry points, according to the PIR traffic management plan. Moreover, Avondale Boulevard, El Mirage Road, Bullard Avenue, and Estrella Parkway are the primary arterial street routes for ingress and egress of PIR traffic during the major events.

The proposed SR 30 freeway corridor would become the new primary route for PIR traffic because it would be located within two miles north of PIR. Therefore, SR 30 would relieve much of PIR's traffic from the arterial street grid as well as reduce travel delay during special events. Minor adjustments in lane configurations at the proposed SR 30 service TIs at Avondale Boulevard, Bullard Avenue, Estrella Parkway, and Dysart Road would greatly enhance the operational performance of the roadway network during these special events.

Table 3.2 – Operational Performance of I-10 with and without SR 30, SR 303L to SR 202L (2035)

	I-10 Segment	I-10 Eastbound (2035 AM Peak Hour)				I-10 Westbound (2035 PM Peak Hour)			
		Without SR 30		With SR 30		Without SR 30		With SR 30	
		Level of Service	Duration of Congestion (Hours)	Level of Service	Duration of Congestion (Hours)	Level of Service	Duration of Congestion (Hours)	Level of Service	Duration of Congestion (Hours)
	Perryville Road to Citrus Road	D	N/A	D	N/A	D	N/A	D	N/A
	Citrus Road to Cotton Lane	D	N/A	D	N/A	C	N/A	C	N/A
SR 30 (SR 303L to SR 202L) Limits	Cotton Lane to Sarival Avenue	C	N/A	C	N/A	D	N/A	C	N/A
	Sarival Avenue to Estrella Parkway	D	N/A	C	N/A	D	N/A	C	N/A
	Estrella Parkway to Bullard Avenue	D	N/A	C	N/A	D	N/A	D	N/A
	Bullard Avenue to Litchfield Road	E/F	<1	D	N/A	E/F	1-2	E/F	<1
	Litchfield Road to Dysart Road	E/F	>3	E/F	1-2	E/F	>3	E/F	>3
	Dysart Road to El Mirage Road	E/F	>3	E/F	2-3	E/F	>3	E/F	>3
	El Mirage Road to Avondale Boulevard	E/F	>3	E/F	2-3	E/F	>3	E/F	>3
	Avondale Boulevard to 107th Avenue	E/F	1-2	D	N/A	E/F	>3	E/F	>3
	107th Avenue to 99th Avenue	E/F	1-2	D	N/A	E/F	>3	E/F	>3
	99th Avenue to 91st Avenue	E/F	2-3	E/F	<1	E/F	>3	D	N/A
	91st Avenue to 83rd Avenue	E/F	>3	E/F	1-2	E/F	>3	E/F	2-3
	83rd Avenue to 75th Avenue	E/F	>3	E/F	1-2	E/F	>3	E/F	>3
	75th Avenue to 67th Avenue	E/F	>3	E/F	>3	E/F	>3	E/F	>3
	67th Avenue to 59th Avenue	E/F	<1	D	N/A	E/F	<1	D	N/A
	59th Avenue to 51st Avenue	E/F	<1	E/F	<1	E/F	<1	E/F	1-2

Note: Analysis was performed for peak directions only during morning and evening commutes. Eastbound and Westbound directions are the AM and PM peak directions, respectively, along I-10.

4. TRAFFIC ANALYSIS METHODOLOGY AND TOOLS

4.1 Assumptions and Methodology

It is assumed that the proposed SR 30 freeway would be open to traffic around 2035 and would have a design life of 20 years from opening day. Typical section details of the proposed SR 30, SR 202L, and SR 303L and details of the system TIs for the interim and ultimate construction conditions are discussed in Section 2. Freeway and signalized intersection traffic analysis methodologies as described in the Transportation Research Board's *Highway Capacity Manual* (HCM) (2000) were used to evaluate the operational performance of the proposed SR 30 freeway and the system and service TIs along SR 30.

4.2 Traffic Analysis Tools

4.2.1 Freeway Main Line: HCS Analysis

The freeway traffic operational analysis, as described in the HCM, introduces the LOS concept. It is a letter grading system, from A to F, that defines the traffic operations in a qualitative manner based on traffic flow and other roadway characteristics. LOS A depicts free flow conditions with little or no delay and with free flow speeds, while LOS F represents the worst condition, with unacceptable congestion, long queues, and delays. LOS A, B, and C are considered to be acceptable and free flow speeds are maintained. Congestion becomes more noticeable at LOS D, with reduced speeds and freedom to maneuver. Most agencies aim for LOS D to balance mobility and economics. LOS E occurs when demand has reached the capacity of the facility and maneuverability within the traffic stream is extremely limited. Figure 4.1 illustrates the LOS A to F concept based on flow condition.

The freeway main line operational analysis, based on HCM methodology, splits the freeway into three segments:

- Weaving segment: Weaving segments are formed when an auxiliary lane is used to connect adjacent on- and off-ramps spaced less than 1.5 miles apart. A lane change is required for all the traffic that is either joining or leaving the freeway main line.
- Ramp junction: The ramp junction (or merge and diverge) analysis is used in locations where a ramp enters or exits a freeway main line and is not coupled with a weaving area.
- Basic freeway segment: The basic freeway segments are all other segments that are outside of the weaving or ramp junction influence areas. This generally occurs between the successive off- and on-ramps. The basic freeway segment analysis is also used to analyze the body of the system TI ramps.

The HCM LOS criteria for freeway segments are presented in Table 4.1 based on the lane density ranges for each. The freeway operations analysis—which includes basic segments, weaving segments, and exit and entry ramps—is performed using the Highway Capacity Software (HCS+ version 5.4), which uses the methodology defined in HCM.

Figure 4.1 – Level of Service

Level of Service A | Level of Service B | Level of Service C

Level of Service D | Level of Service E | Level of Service F

Table 4.1 – *H*ighway *Capacity Manual* Level of Service Criteria for Freeway Segments

Level of Service	Density Range (pc/mi/ln)		
	Freeway Segment Type		
	Basic	Weaving	Merge and Diverge
A	≤11	≤10	≤10
B	11–18	10–20	10–20
C	18–26	20–28	20–28
D	26–35	28–35	28–35
E	35–45	35–43	>35
F	>45	>43	Demand exceeds capacity

Source: Transportation Research Board, *Highway Capacity Manual*, 2000

HCS uses the morning and evening peak hour volumes and a number of roadway and driver characteristics to determine LOS. Some of the inputs that are constant along the corridor include:

- peak hour factor of 0.95
- truck factor of 12 percent
- driver population factor of 1.0
- free flow speed based on the type of roadway:
  - freeway – 65 miles per hour (mph)
  - system ramp – 55 mph
  - service TI on-ramp – 55 mph
  - service TI off-ramp – 60 mph

4.2.2 Service Traffic Interchanges: Synchro Analysis

The service TI signal traffic analysis was performed using the Synchro simulation analysis package (Version 7, Build Series 773, Revision 8) developed by Trafficware, Inc. Synchro is a widely used traffic analysis tool that evaluates intersection delays and congestion based on procedures similar to those described in the 2000 HCM (Chapters 16 and 17). It is often used for localized intersection analyses, signal coordination, and traffic study work. It was used to evaluate the ramp intersection performance. Major adjacent street intersections were included within the Synchro network to account for the effect of queues spilling back to the ramp terminal intersections.

Basic inputs to Synchro include traffic volumes, lane geometry, signal control, and signal timing and phasing. Synchro was used to optimize the signal cycle length and phasing during the analysis.

HCM evaluates the LOS of individual lane groups and of the entire signalized intersection based on the control delay. It states that:

> *Control delay is a measure of driver discomfort, frustration, fuel consumption, and increased travel time. The delay experienced by a motorist is made up of a number of factors that relate to control, geometrics, traffic, and incidents. Total delay is the difference between the travel time actually experienced and the reference travel time that would result during base conditions…*
>
> *Delay is a complex measure and depends on a number of variables, including the quality of progression, the cycle length, the green ratio, and the v/c ratio for the lane group.*

The HCM LOS grade and associated range of intersection control delay for signalized and unsignalized intersections are presented in Table 4.2.

Table 4.2 – Highway Capacity Manual Level of Service Criteria for Signalized and Unsignalized Intersections

Level of Service	Average Control Delay (seconds per vehicle)	
	Signalized	Unsignalized
A	≤10	≤10
B	10–20	10–15
C	20–35	15–25
D	35–55	25–35
E	55–80	35–50
F	>80	>50

Source: Transportation Research Board, *Highway Capacity Manual*, 2000

4.2.3 System Traffic Interchanges: VISSIM Analysis

VISSIM (Version 5.30-09) is a microscopic, behavior-based multipurpose traffic simulation program used to optimize complex transportation systems. VISSIM is based on car following and lane change logic, which can analyze vehicular traffic operations based on various driver behavior patterns and lane configurations, including HOV lanes and ramp metering.

VISSIM was used to evaluate traffic operations on the freeway main line of SR 30, SR 202L, and I-10 along with the access roads, TIs, and adjacent arterial street intersections. The analysis evaluated both morning (AM) and evening (PM) peak hour conditions on an average weekday for the opening year 2035 for the Option 3B-1 and Option 3B-2 configurations of the SR 30 and SR 202L system TI. LOS on freeway segments and intersections are the primary measure of effectiveness used to evaluate the operational performance of the Study Area network.

Because most of the modeled network is nonexistent today, the VISSIM model was calibrated to anticipate traffic conditions using driving behavior and vehicle parameters coded in previous studies for I-10 and SR 202L.

5. TRAFFIC PROJECTIONS REVIEW

This section discusses the traffic projections used to analyze the operational performance of the proposed SR 30 corridor. The main objective of this section is to explain the various traffic projections obtained from regional travel demand models and the evaluation's conformity to generally accepted values within the Phoenix metropolitan area.

As mentioned earlier, among the four SR 30 alternatives, the North and Center Alternatives will have the same traffic projections, while the traffic projections for the South and SS Hybrid Alternatives will be unique. Therefore, three alternatives (i.e., North/Center, SS Hybrid, and South) were analyzed for traffic operational performance. It is anticipated that SR 30 would be open for public use around 2035, which represents the opening year condition.

5.1 Opening Year Projections (2035)

The opening year traffic projections were obtained from the MAG regional travel demand models, with 2035 socioeconomic data and a roadway network with desired lane and functional configurations. These traffic projections were used to analyze the operational performance of the SR 30 freeway main line and system and service TI ramps and ramp intersections. The types of data available from this MAG travel demand model include:

- ADT volumes for each roadway segment
- AM and PM peak period (3-hour) traffic volumes for each roadway segment
- AM and PM peak period (3-hour) turning movement volumes at service TI ramp intersections
- truck percentages along freeway segments

Traffic data collected from the 2035 travel demand models were reviewed. This included the ADT, directional split of peak traffic (D-factor) and peak volume factor (K-factor) for all freeway main line segments, and directional system ramps (to verify their appropriateness with similar facilities within the Valley).

5.1.1 Freeway Main Line

The 2035 traffic projections for ADT were reviewed for the three alternatives, and these volumes vary from segment to segment. ADT varies—with an average of 145,000, 143,000, and 139,000 vehicles per day for similar segments along the North/Center, SS Hybrid, and South Alternatives, respectively. The highest ADT occurs between 67th and 83rd Avenues for all the alternatives and is around 164,000, 164,000, and 160,000 vehicles per day for North/Center, SS Hybrid, and South Alternatives, respectively.

The 2035 AM and PM peak hour traffic volumes were reviewed for the D factor and K factor for all alternatives; they were within the expected range when compared with existing regional freeway facilities. The D factor during the AM peak period is projected to be around 60 percent in the eastbound direction and 40 percent in the westbound direction, while it is around 60 percent in the westbound direction and 40 percent in the eastbound direction during the PM peak period. The K factor in the peak directions for all alternatives varies between 7 and 9 percent for both peak hours.

5.1.2 System Traffic Interchange Ramps

The 2035 travel demand projections for daily traffic were reviewed at the SR 30 and SR 202L system TI directional ramps for all alternatives and were within the appropriate range when compared with similar regional facilities. The NW and ES system TI ramps (opposing flows) would attract the highest daily traffic, at around 42,000 and 41,000 vehicles per day, respectively. The SW and EN system TI ramps (opposing flows) were projected to have daily traffic of 23,000 vehicles per day each. The K factor for the ramps varied between 7 and 11.5 percent, and the EN and SW opposing flows have a peak hour factor of 11.5 percent during the AM and PM peak hours, respectively.

5.1.3 Service Traffic Interchange Ramps

The 2035 projections for daily traffic were reviewed along the SR 30 service TI ramps and were found to be appropriate based on the importance of the arterial streets, adjacent development, and comparison with other similar regional facilities. Some of the highest projected daily traffic volumes were observed at 67th Avenue, Estrella Parkway, and Cotton Lane. The 67th Avenue ramps were projected to attract high volumes because all of the traffic along the east-to-west crossroads between Baseline and Lower Buckeye Roads to the east of SR 202L would have to use these ramps to access SR 30. Estrella Parkway and Cotton Lane ramp volumes were comparatively higher because these two arterial streets would provide access to major developments south of the Gila River.

5.1.4 Turning Movement Volumes

The traffic analysis of arterial streets and service TI ramp intersections required AM and PM peak hour turning movement volumes obtained from the 2035 MAG travel demand model. These volumes were reviewed for their appropriateness based on the existing and projected travel patterns and engineering judgment. Some of these turning movement volumes were manually adjusted when zero vehicles were projected from the travel demand model and when approach hourly volumes needed to be balanced.

6. SR 30 FREEWAY MAIN LINE ANALYSIS

The freeway main line analysis evaluated the traffic operational performance of the freeway and ramp junctions based on the proposed lane configuration and projected traffic volumes. The main line analysis was conducted using HCS+ Version 5.4, using methodologies from the 2000 HCM, as described in Section 4.2.1.

6.1 Opening Year (2035) Analysis

The opening year analysis represents the condition when SR 30 would first open to the public. It uses traffic volumes generated from the 2035 MAG travel demand model to analyze the LOS of various segments of the freeway main line. The three SR 30 alternatives evaluated are North/Center, SS Hybrid, and South.

6.1.1 SR 30 North/Center Alternatives

The 2035 projected ADT volumes and peak hour volumes used for the analysis of the North/Center Alternatives' main line are presented in Figures 6.1 and 6.2 respectively. Notable observations from the figures include:

- Maximum daily traffic of 164,000 vehicles per day is projected between 67th and 83rd Avenues.
- The ADT projection along the freeway segments is estimated to be 145,000 vehicles per day.
- The system ramps connecting SR 30 and SR 303L have an estimated daily traffic of 28,000 vehicles per day.
- The directional split of AM peak traffic at the SR 30 and SR 202L system TI is around 56 percent going from east to north and south of SR 202L and 44 percent going to the west from north and south of SR 202L.
- The directional split of PM peak traffic at the SR 30 and SR 202L system TI is around 59 percent going west from north and south of SR 202L and 41 percent going from east to north and south of SR 202L.

The AM and PM peak hour LOS results of the SR 30 North/Center Alternatives main line analysis are presented in Figures 6.3 and 6.4 and Tables 6.1 and 6.2. Detailed HCS reports are provided in Appendix B.

Notable observations from the freeway main line analysis are as follows:

Morning (AM) Peak Hour

- Eastbound SR 30 in the AM peak hour direction: The basic main line segments at the Agua Fria River, El Mirage Road, and 99th Avenue would operate at LOS E, which does not meet ADOT's desirable design of LOS D or better.
- Because HCS provides localized analysis, it should be noted that poor operations at a downstream segment can affect the operations at an upstream segment (resulting from the shockwave effect), and these are not addressed with the HCS analysis.
- All three sections having LOS E are basic segments with three general purpose lanes and with no auxiliary lane.

To improve the overall performance of the freeway main line in the eastbound direction, ADOT would need to add a through lane between 91st Avenue and Bullard Avenue, which would achieve an acceptable LOS.

Evening (PM) Peak Hour

- The PM peak hour operations along the SR 30 westbound direction are worse compared with the AM peak conditions. Nine locations are projected to have LOS E, while three locations would have LOS F.
- The westbound freeway section between the 91st Avenue and 107th Avenue ramps is the most congested, with LOS F, indicating demand exceeds capacity.
- Most of the sections operating with LOS E or F during the PM peak hour are basic freeway segments and ramp junctions.

To improve the overall performance of the freeway main line in the westbound direction, ADOT would need to add a through lane between 83rd Avenue and Bullard Avenue to meet the travel demand and to achieve acceptable LOS.

Figure 6.1 – SR 30 North/Center Alternatives Average Daily Traffic (2035)

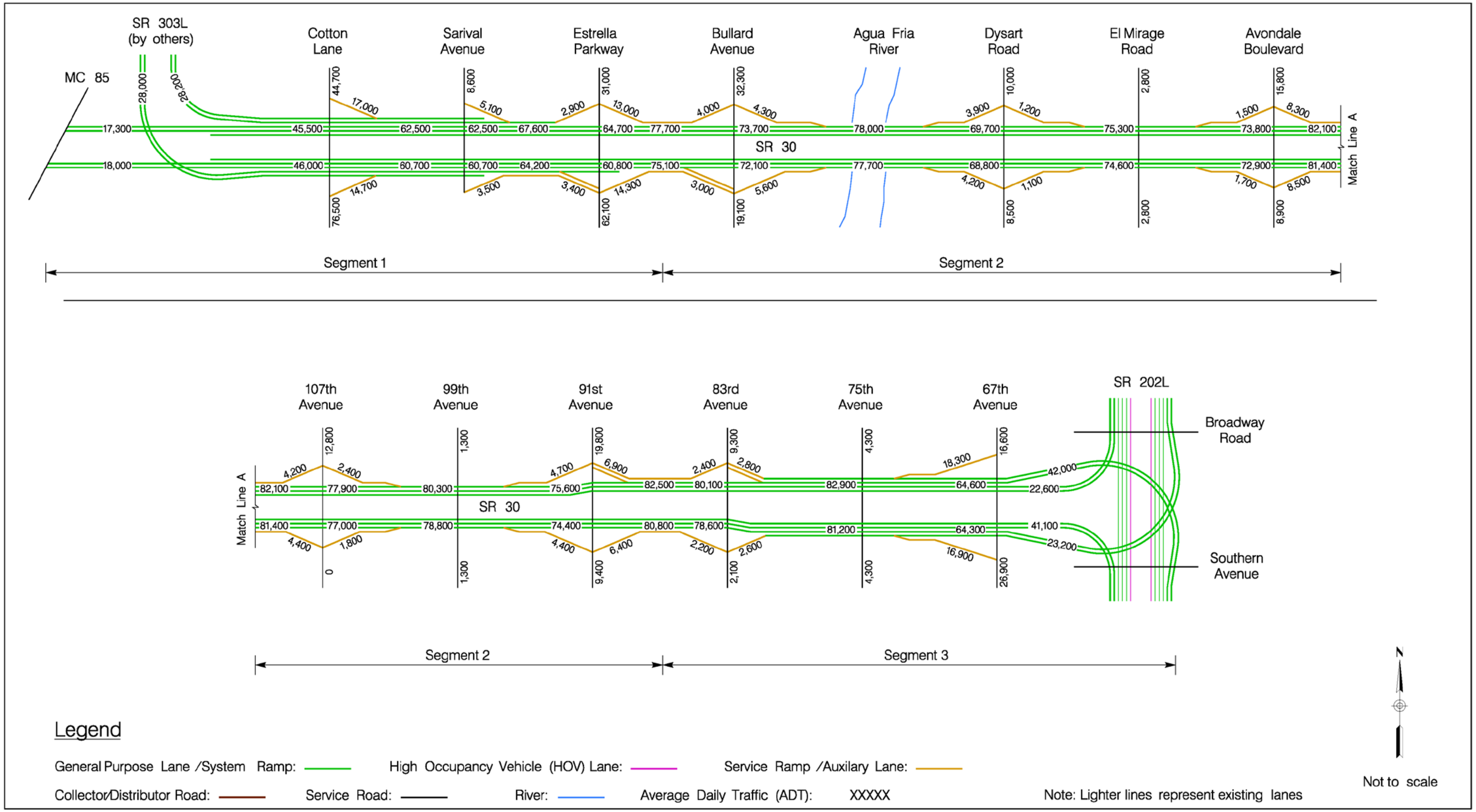


Figure 6.2 – SR 30 North/Center Alternatives AM/PM Peak Hour Traffic (2035)

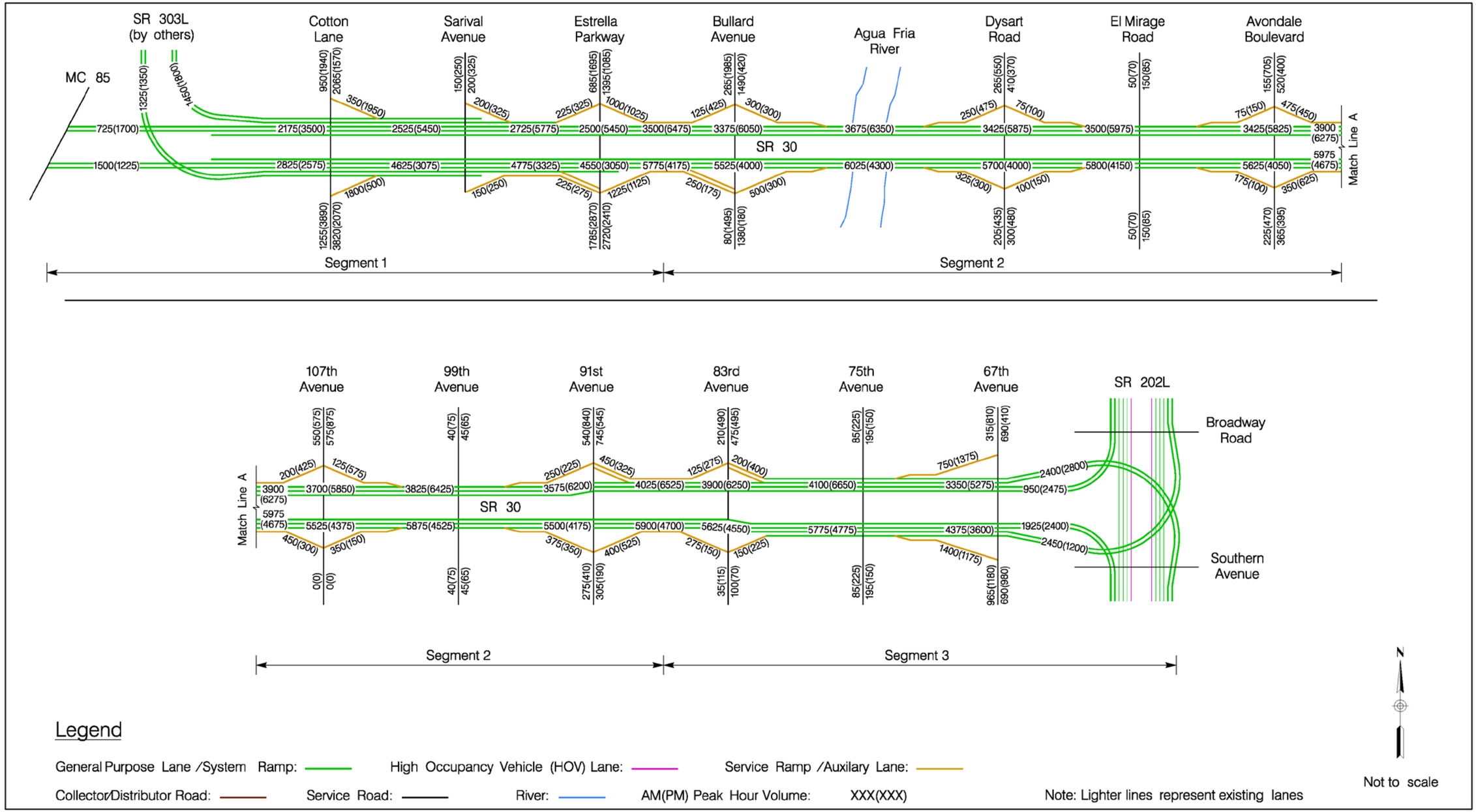


Figure 6.3 – SR 30 North/Center Alternatives AM Peak Hour Level of Service (2035)

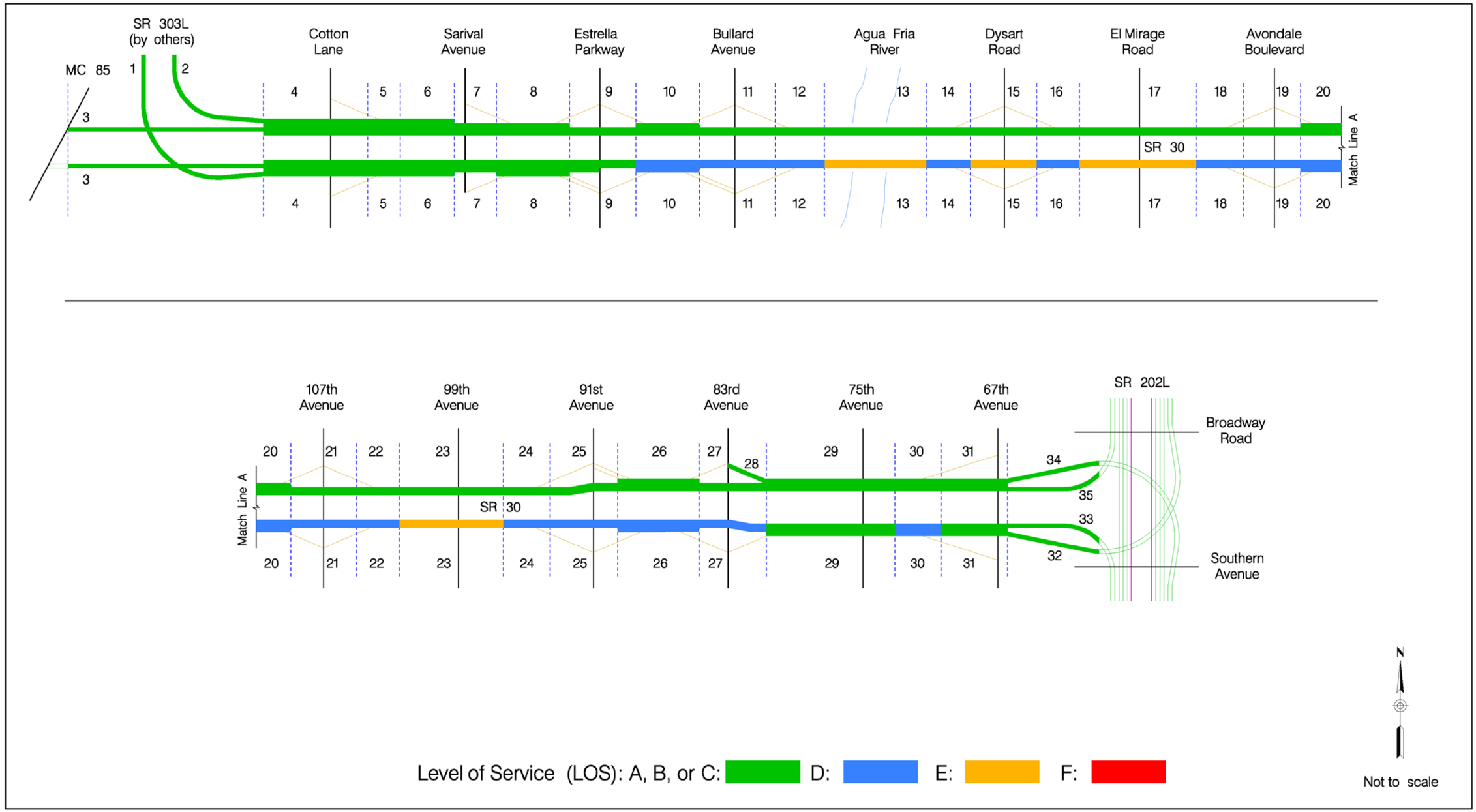


Figure 6.4 – SR 30 North/Center Alternatives PM Peak Hour Level of Service (2035)

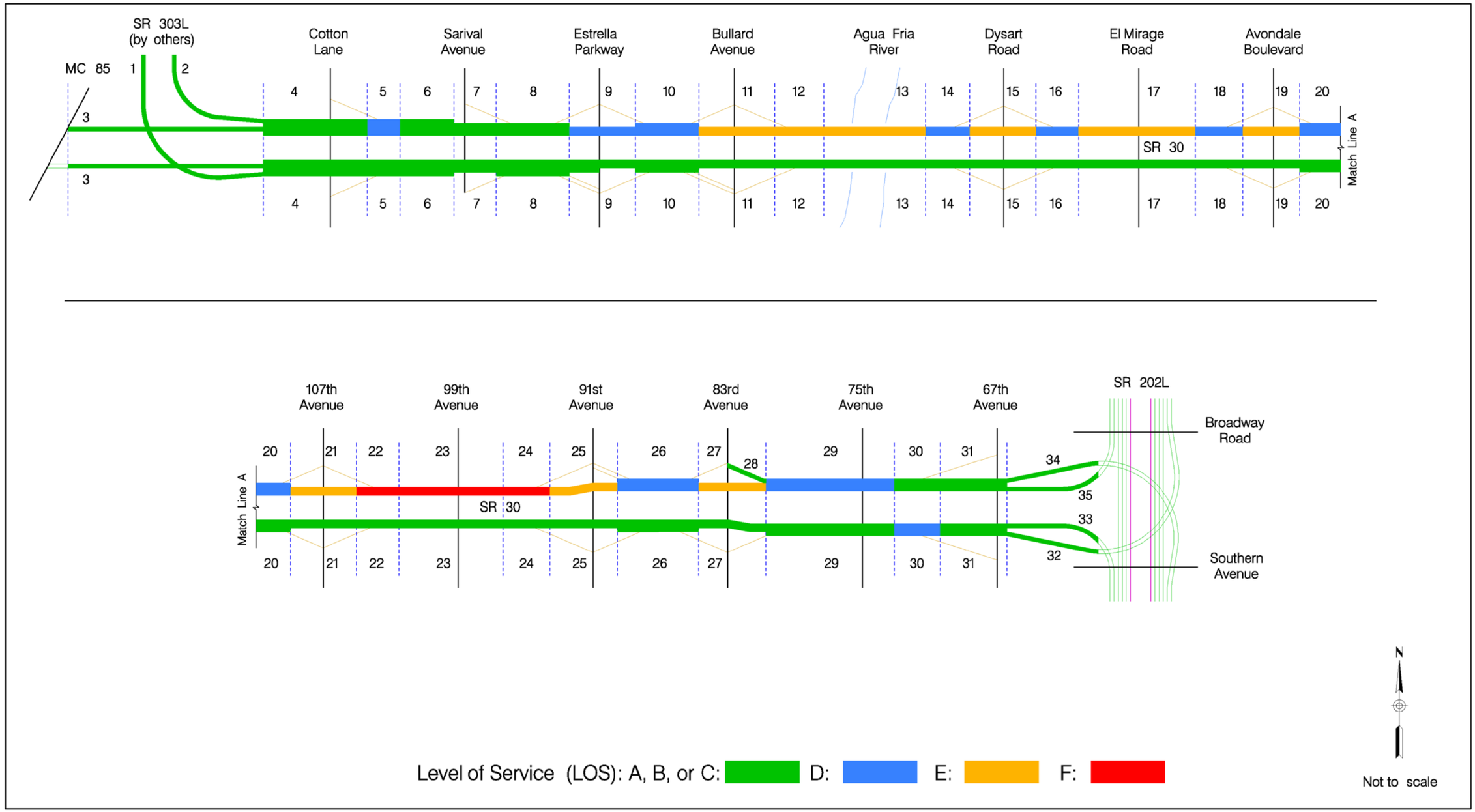


Table 6.1 – SR 30 North/Center Alternatives Main Line Analysis, Eastbound Direction (2035)

Section ID	Section	Type	Direction	Time Period	Level Of Service (LOS)	DATA INPUT										
						Number of Lanes	Main line Peak Hour Volume	Weaving Lanes	Peak Hour Volume	On Ramp Peak Hour Volume	Off Ramp Peak Hour Volume	Volume AC*	Volume BD*	Volume AD*	Volume BC*	Weave Length
1	System Ramp: southbound to eastbound	Basic	Eastbound	AM	B	2	1,325	Not Applicable								
				PM	B		1,350									
3	Mainline: West of SR 303L Ramps	Basic	Eastbound	AM	B	2	1,500	Not Applicable								
				PM	A		1,225									
4	Mainline: At Cotton Lane	Basic	Eastbound	AM	A	5	2,825	Not Applicable								
				PM	A		2,575									
5	On Ramp: Cotton Lane	Merge	Eastbound	AM	B	5	2,825			1800						
				PM	A		2,575			500						
6	Mainline: Cotton Lane to Sarival Ave	Basic	Eastbound	AM	B	5	4,625	Not Applicable								
				PM	A		3,075									
7	Mainline: At Sarival Avenue	Basic	Eastbound	AM	C	4	4,625	Not Applicable								
				PM	B		3,075									
8	Between Sarival Avenue and Estrella Parkway	Weave	Eastbound	AM	B	5	4,625	5	4,625	150	225	4,400	0	225	150	2,200
				PM	B		3,075		3,075	250	275	2,800	0	275	250	
9	Mainline: At Estrella Parkway	Basic	Eastbound	AM	C	3	4,550	Not Applicable								
				PM	B		3,050									
10	Between Estrella Parkway and Bullard Avenue	Weave	Eastbound	AM	D	4	4,550	4	4,550	1,225	250	4,300	0	250	1,225	2,100
				PM	C		3,050		3,050	1,125	175	2,875	0	175	1,125	
11	Mainline: At Bullard Avenue	Basic	Eastbound	AM	D	3	5,525	Not Applicable								
				PM	C		4,000									
12	On Ramp: Bullard Avenue	Merge	Eastbound	AM	D	3	5,525			500						
				PM	C		4,000			300						
13	Mainline: At Agua Fria River	Basic	Eastbound	AM	E	3	6,025	Not Applicable								
				PM	C		4,300									
14	Off Ramp: Dysart Road	Diverge	Eastbound	AM	D	3	6,025				325					
				PM	C		4,300				300					
15	Mainline: At Dysart Road	Basic	Eastbound	AM	E	3	5,700	Not Applicable								
				PM	C		4,000									
16	On Ramp: Dysart Road	Merge	Eastbound	AM	D	3	5,700			100						
				PM	B		4,000			150						
17	Mainline: At El Mirage Road	Basic	Eastbound	AM	E	3	5,800	Not Applicable								
				PM	C		4,150									
18	Off Ramp: Avondale Boulevard	Diverge	Eastbound	AM	D	3	5,800				175					
				PM	C		4,150				100					

Note: * - As per Highway Capacity Manual, 2000 Exhibit 13-7

Table 6.1 – SR 30 North/Center Alternatives Main Line Analysis, Eastbound Direction (2035) (continued)

Section ID	Section	Type	Direction	Time Period	Level Of Service (LOS)	DATA INPUT										
						Number of Lanes	Main line Peak Hour Volume	Weaving Lanes	Peak Hour Volume	On Ramp Peak Hour Volume	Off Ramp Peak Hour Volume	Volume AC*	Volume BD*	Volume AD*	Volume BC*	Weave Length
19	Mainline: At Avondale Boulevard	Basic	Eastbound	AM	D	3	5,625	Not Applicable								
				PM	C		4,050									
20	Between Avondale Boulevard and 107th Avenue	Weave	Eastbound	AM	D	4	5,625	4	5,625	350	450	5,175	0	450	350	2,000
				PM	C		4,050		4,050	625	300	3,750	0	300	625	
21	Mainline: At 107th Avenue	Basic	Eastbound	AM	D	3	5,525	Not Applicable								
				PM	C		4,375									
22	On Ramp: 107th Avenue	Merge	Eastbound	AM	D	3	5,525			350						
				PM	C		4,375			150						
23	Mainline: At 99th Avenue	Basic	Eastbound	AM	E	3	5,875	Not Applicable								
				PM	C		4,525									
24	Off Ramp: 91st Avenue	Diverge	Eastbound	AM	D	3	5,875				375					
				PM	C		4,525				350					
25	Mainline: At 91st Avenue	Basic	Eastbound	AM	D	3	5,500	Not Applicable								
				PM	C		4,175									
26	Between 91st Avenue and 83rd Avenue	Weave	Eastbound	AM	D	4	5,500	4	5,500	400	275	5,225	0	275	400	2,100
				PM	C		4,175		4,175	525	150	4,025	0	150	525	
27	Mainline: At 83rd Avenue	Basic	Eastbound	AM	D	3	5,625	Not Applicable								
				PM	C		4,550									
29	Mainline: 75th Avenue	Basic	Eastbound	AM	C	4	5,775	Not Applicable								
				PM	C		4,775									
30	Off Ramp: 67th Avenue	Diverge	Eastbound	AM	D	4	5,775				1,400					
				PM	D		4,775				1,175					
31	Mainline: At 67th Avenue	Basic	Eastbound	AM	C	4	4,375	Not Applicable								
				PM	B		3,600									
32	System Ramp: eastbound to northbound	Basic	Eastbound	AM	C	2	2,450	Not Applicable								
				PM	A		1,200									
33	System Ramp: eastbound to southbound	Basic	Eastbound	AM	B	2	1,925	Not Applicable								
				PM	C		2,400									

Note: * - As per Highway Capacity Manual, 2000 Exhibit 13-7

Table 6.2 – SR 30 North/Center Alternatives Main Line Analysis, Westbound Direction (2035)

Section ID	Section	Type	Direction	Time Period	Level Of Service (LOS)	DATA INPUT										
						Number of Lanes	Main line Peak Hour Volume	Weaving Lanes	Peak Hour Volume	On Ramp Peak Hour Volume	Off Ramp Peak Hour Volume	Volume AC*	Volume BD*	Volume AD*	Volume BC*	Weave Length
2	System Ramp: WB to NB	Basic	Westbound	AM	B	2	1,450	Not Applicable								
				PM	B		1,800									
3	Mainline: West of SR 303L Ramps	Basic	Westbound	AM	A	2	725	Not Applicable								
				PM	B		1,700									
4	Mainline: At Cotton Lane	Basic	Westbound	AM	A	5	2,175	Not Applicable								
				PM	B		3,500									
5	Off Ramp: Cotton Lane	Diverge	Westbound	AM	B	5	2,525				350					
				PM	D		5,450				1,950					
6	Mainline: Cotton Lane to Sarival Ave	Basic	Westbound	AM	A	5	2,525	Not Applicable								
				PM	C		5,450									
7	Mainline: At Sarival Avenue	Basic	Westbound	AM	A	4	2,525	Not Applicable								
				PM	C		5,450									
8	Between Sarival Avenue and Estrella Parkway	Weave	Westbound	AM	B	4	2,500	4	2,500	225	200	2,300	0	200	225	2,200
				PM	C		5,450		5,450	325	325	5,125	0	325	325	
9	Mainline: At Estrella Parkway	Basic	Westbound	AM	B	3	2,500	Not Applicable								
				PM	D		5,450									
10	Between Estrella Parkway and Bullard Avenue	Weave	Westbound	AM	B	4	3,375	4	3,375	125	1,000	2,375	0	1,000	125	2,100
				PM	D		6,050		6,050	425	1,025	5,025	0	1,025	425	
11	Mainline: At Bullard Avenue	Basic	Westbound	AM	C	3	3,375	Not Applicable								
				PM	E		6,050									
12	Off Ramp: Bullard Avenue	Diverge	Westbound	AM	C	3	3,675				300					
				PM	E		6,350				300					
13	Mainline: At Agua Fria River	Basic	Westbound	AM	C	3	3,675	Not Applicable								
				PM	E		6,350									
14	On Ramp: Dysart Road	Merge	Westbound	AM	B	3	3,425			250						
				PM	D		5,875			475						
15	Mainline: At Dysart Road	Basic	Westbound	AM	C	3	3,425	Not Applicable								
				PM	E		5,875									
16	Off Ramp: Dysart Road	Diverge	Westbound	AM	C	3	3,500				75					
				PM	D		5,975				100					
17	Mainline: At El Mirage Road	Basic	Westbound	AM	C	3	3,500	Not Applicable								
				PM	E		5,975									
18	On Ramp: Avondale Boulevard	Merge	Westbound	AM	B	3	3,425			75						
				PM	D		5,825			150						

Note: * - As per Highway Capacity Manual, 2000 Exhibit 13-7

Table 6.2 – SR 30 North/Center Alternatives Main Line Analysis, Westbound Direction (2035) (continued)

Section ID	Section	Type	Direction	Time Period	Level Of Service (LOS)	DATA INPUT										
						Number of Lanes	Main line Peak Hour Volume	Weaving Lanes	Peak Hour Volume	On Ramp Peak Hour Volume	Off Ramp Peak Hour Volume	Volume AC*	Volume BD*	Volume AD*	Volume BC*	Weave Length
19	Mainline: At Avondale Boulevard	Basic	Westbound	AM	C	3	3,425	Not Applicable								
				PM	E		5,825									
20	Between Avondale Boulevard and 107th Avenue	Weave	Westbound	AM	B	4	3,700	4	3,700	200	475	3,225	0	475	200	2,100
				PM	D		5,850		5,850	425	450	5,400	0	450	425	
21	Mainline: At 107th Avenue	Basic	Westbound	AM	C	3	3,700	Not Applicable								
				PM	E		5,850									
22	Off Ramp: 107th Avenue	Diverge	Westbound	AM	C	3	3,825				125					
				PM	F		6,425				575					
23	Mainline: At 99th Avenue	Basic	Westbound	AM	C	3	3,825	Not Applicable								
				PM	F		6,425									
24	On Ramp: 91st Avenue	Merge	Westbound	AM	B	3	3,575			250						
				PM	F		6,200			225						
25	Mainline: At 91st Avenue	Basic	Westbound	AM	C	3	3,575	Not Applicable								
				PM	E		6,200									
26	Between 91st Avenue and 83rd Avenue	Weave	Westbound	AM	B	4	3,900	4	3,900	125	450	3,450	0	450	125	2,200
				PM	D		6,250		6,250	275	325	5,925	0	325	275	
27	Mainline: At 83rd Avenue	Basic	Westbound	AM	C	3	3,900	Not Applicable								
				PM	E		6,250									
28	Off Ramp: 83rd Avenue	Major Diverge	Westbound	AM	A	2	200	Not Applicable								
				PM	A		400									
29	Mainline: 75th Avenue	Basic	Westbound	AM	B	4	4,100	Not Applicable								
				PM	D		6,650									
30	On Ramp: 67th Avenue	Merge	Westbound	AM	B	4	3,350			750						
				PM	C		5,275			1375						
31	Mainline: At 67th Avenue	Basic	Westbound	AM	B	4	3,350	Not Applicable								
				PM	C		5,275									
34	System Ramp: NB to WB	Basic	Westbound	AM	C	2	2,400	Not Applicable								
				PM	C		2,800									
35	System Ramp: SB to WB	Basic	Westbound	AM	A	2	950	Not Applicable								
				PM	C		2,475									

Note: * - As per Highway Capacity Manual, 2000 Exhibit 13-7

6.1.2 SR 30 SS Hybrid Alternative

The 2035 projected ADT and peak hour volumes used for the analysis of the SS Hybrid Alternative main line are presented in Figures 6.5 and 6.6, respectively. Notable observations from the figures are:

- Maximum daily traffic of 164,000 vehicles per day is projected between 67th and 83rd Avenues.
- The ADT projections along the freeway segments are estimated to be 143,000 vehicles per day, which are 2,000 less than for the North/Center Alternatives.
- The system ramps connecting SR 30 and SR 303L have an estimated daily traffic of 28,000 vehicles per day.
- The directional split of morning peak traffic at the SR 30 and SR 202L system TI is around 56 percent going from east to north and south of SR 202L and 44 percent going to the west from north and south of SR 202L.
- The directional split of evening peak traffic at the SR 30 and SR 202L system TI is around 59 percent going west from north and south of SR 202L and 41 percent going from east to north and south of SR 202L.

The AM and PM peak hour LOS results of the SR 30 SS Hybrid Alternative main line analysis are presented in Figures 6.7 and 6.8 and Tables 6.3 and 6.4. Detailed HCS reports are provided in Appendix B.

Important observations from the freeway main line analysis are:

Morning (AM) Peak Hour

- Two basic segments at 99th Avenue and the Agua Fria River in the eastbound (peak) direction would operate at LOS E, which does not meet ADOT's desired LOS of D or better.

To improve the operational performance of the two basic segments, an additional through lane would need to be added, which would result in an acceptable LOS D.

Evening (PM) Peak Hour

- The PM peak hour operations along the SR 30 westbound (peak) direction are worse compared with the AM peak conditions. Eight sections are projected to have LOS E.
- Because HCS provides localized analysis, it should be noted that poor operations at a downstream segment can affect the operations at an upstream segment (resulting from the shockwave effect), and these are not addressed with the HCS analysis.
- All of the sections operating with LOS E during the PM peak hour are basic freeway segments.

To improve the overall performance of the freeway main line in the westbound direction, ADOT would need to add a through lane between 83rd and Bullard Avenues, which would result in an acceptable LOS D.

Figure 6.5 – SR 30 SS Hybrid Alternative Average Daily Traffic (2035)

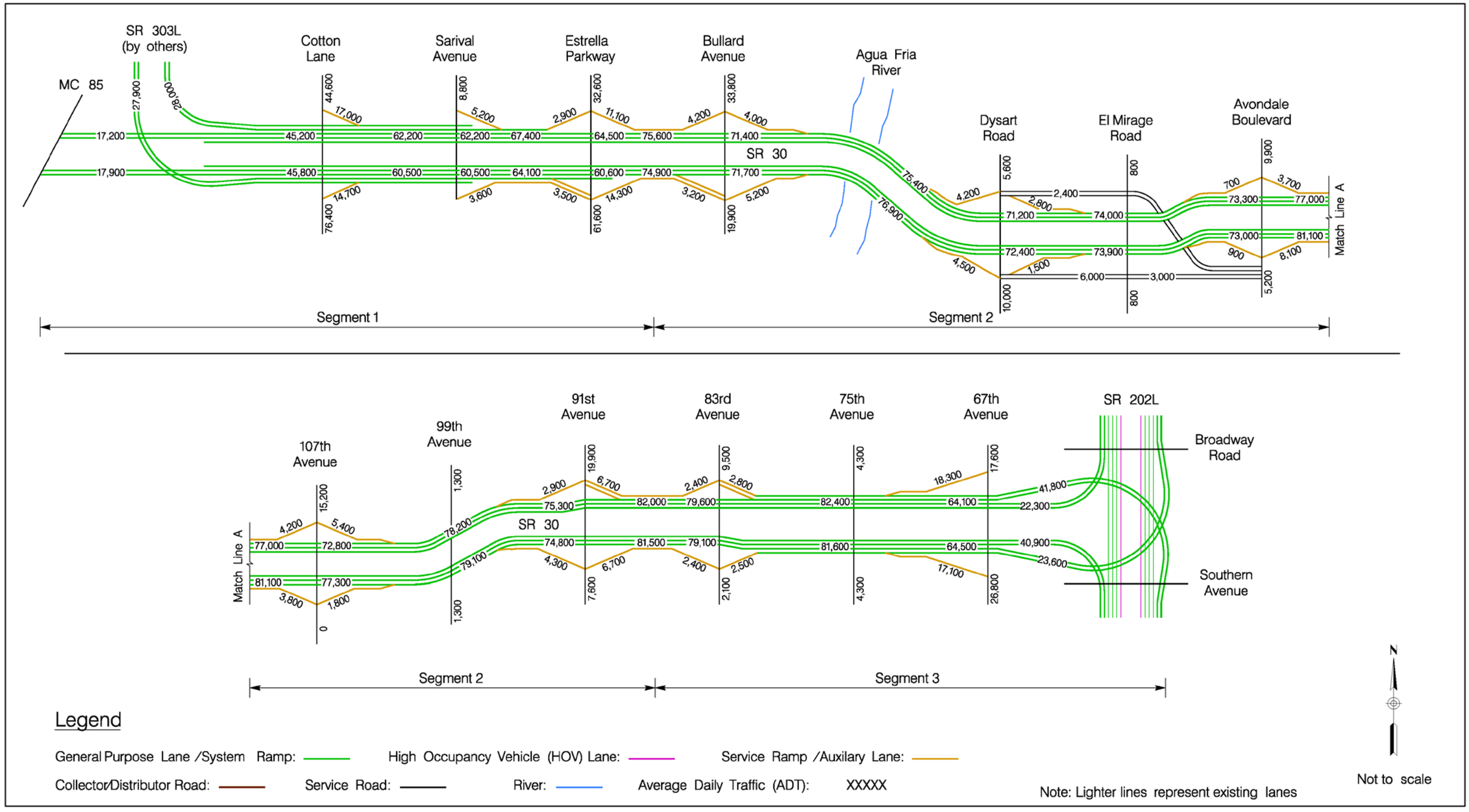


Figure 6.6 – SR 30 SS Hybrid Alternative AM/PM Peak Hour Traffic (2035)

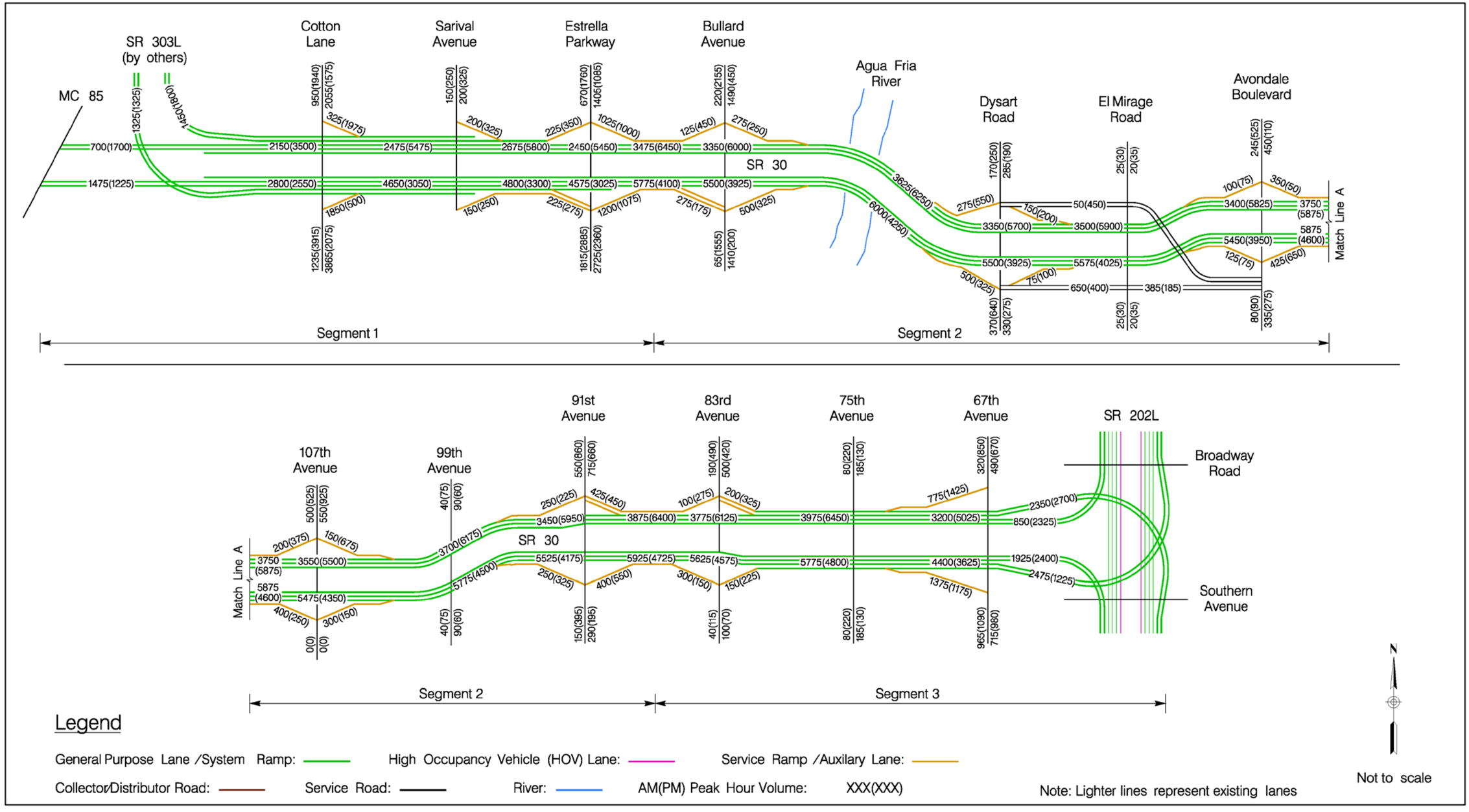


Figure 6.7 – SR 30 SS Hybrid Alternative AM Peak Hour Level of Service (2035)

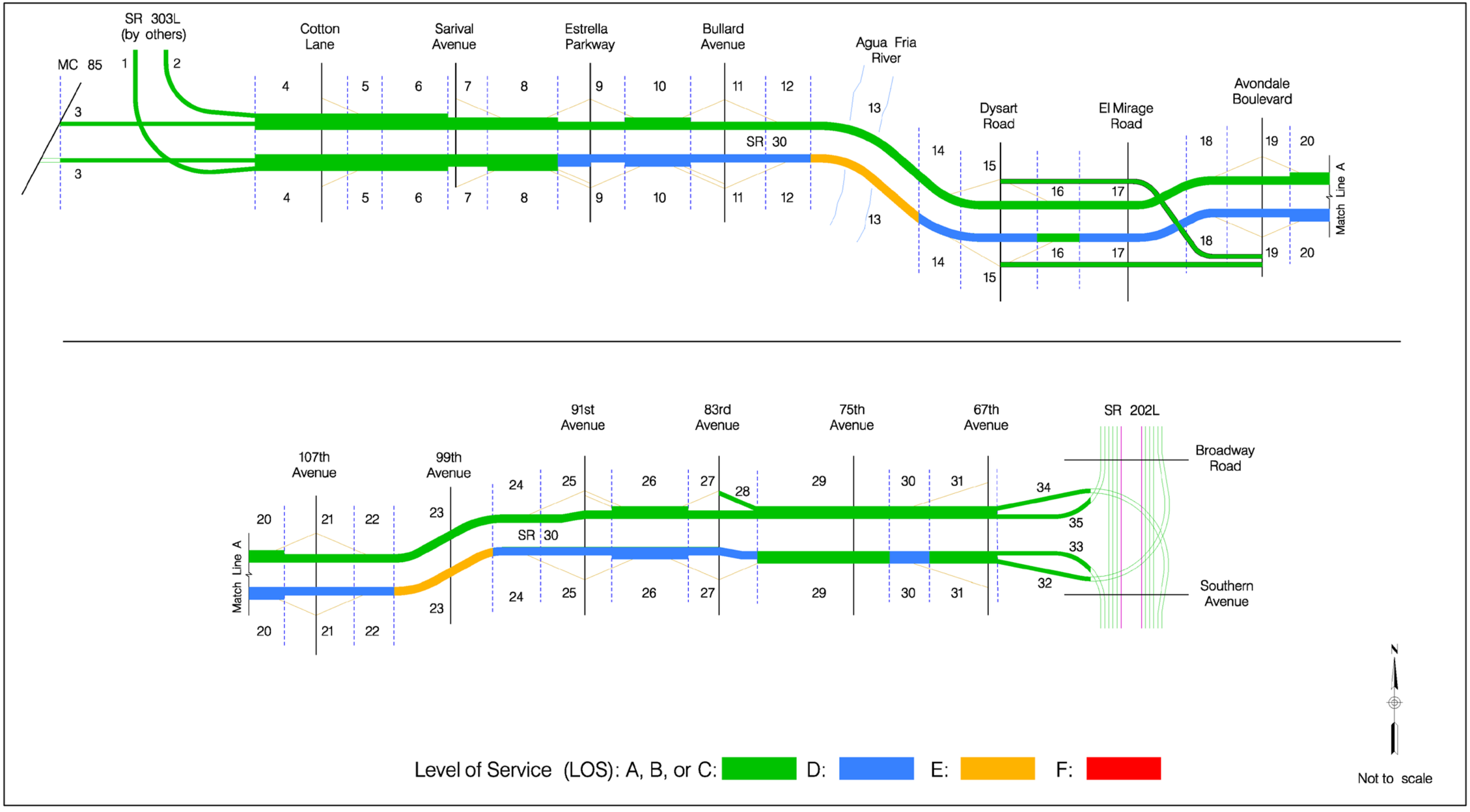


Figure 6.8 – SR 30 SS Hybrid Alternative PM Peak Hour Level of Service (2035)

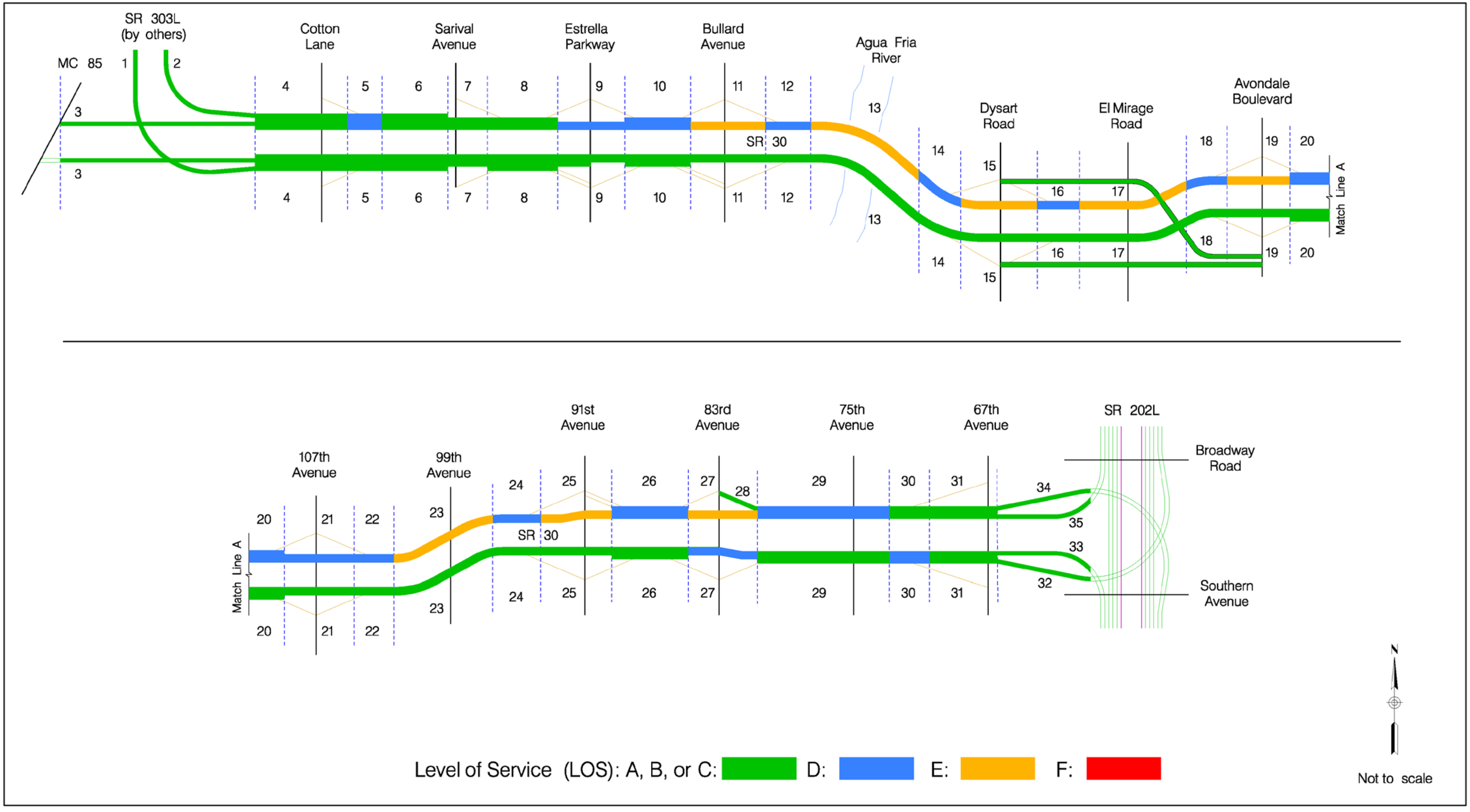


Table 6.3 – SR 30 SS Hybrid Alternative Main Line Analysis, Eastbound Direction (2035)

Section ID	Section	Type	Direction	Time Period	Level Of Service (LOS)	DATA INPUT										
						Number of Lanes	Main line Peak Hour Volume	Weaving Lanes	Peak Hour Volume	On Ramp Peak Hour Volume	Off Ramp Peak Hour Volume	Volume AC*	Volume BD*	Volume AD*	Volume BC*	Weave Length
1	System Ramp: southbound to eastbound	Basic	Eastbound	AM	B	2	1,325	Not Applicable								
				PM	B		1,325									
3	Mainline: West of SR 303L Ramps	Basic	Eastbound	AM	B	2	1,475	Not Applicable								
				PM	A		1,225									
4	Mainline: At Cotton Lane	Basic	Eastbound	AM	A	5	2,800	Not Applicable								
				PM	A		2,550									
5	On Ramp: Cotton Lane	Merge	Eastbound	AM	B	5	2,800			1850						
				PM	A		2,550			500						
6	Mainline: Cotton Lane to Sarival Ave	Basic	Eastbound	AM	B	5	4,650	Not Applicable								
				PM	A		3,050									
7	Mainline: At Sarival Avenue	Basic	Eastbound	AM	C	4	4,650	Not Applicable								
				PM	B		3,050									
8	Between Sarival Avenue and Estrella Parkway	Weave	Eastbound	AM	B	5	4,650	5	4,650	150	225	4,425	0	225	150	2,200
				PM	B		3,050		3,050	250	275	2,775	0	275	250	
9	Mainline: At Estrella Parkway	Basic	Eastbound	AM	D	3	4,575	Not Applicable								
				PM	B		3,025									
10	Between Estrella Parkway and Bullard Avenue	Weave	Eastbound	AM	D	4	4,575	4	4,575	1,200	275	4,300	0	275	1,200	2,100
				PM	C		3,025		3,025	1,075	175	2,850	0	175	1,075	
11	Mainline: At Bullard Avenue	Basic	Eastbound	AM	D	3	5,500	Not Applicable								
				PM	C		3,925									
12	On Ramp: Bullard Avenue	Merge	Eastbound	AM	D	3	5,500			500						
				PM	C		3,925			325						
13	Mainline: At Agua Fria River	Basic	Eastbound	AM	E	3	6,000	Not Applicable								
				PM	C		4,250									
14	Off Ramp: Dysart Road	Diverge	Eastbound	AM	D	3	6,000				500					
				PM	C		4,250				325					
15	Mainline: At Dysart Road	Basic	Eastbound	AM	D	3	5,500	Not Applicable								
				PM	C		3,925									
16	On Ramp: Dysart Road	Merge	Eastbound	AM	C	3	5,500			75						
				PM	B		3,925			100						
17	Mainline: At El Mirage Road	Basic	Eastbound	AM	D	3	5,575	Not Applicable								
				PM	C		4,025									
18	Off Ramp: Avondale Boulevard	Diverge	Eastbound	AM	D	3	5,575				125					
				PM	C		4,025				75					

Note: * - As per Highway Capacity Manual, 2000 Exhibit 13-7

Table 6.3 – SR 30 SS Hybrid Alternative Main Line Analysis, Eastbound Direction (2035) (continued)

Section ID	Section	Type	Direction	Time Period	Level Of Service (LOS)	DATA INPUT										
						Number of Lanes	Main line Peak Hour Volume	Weaving Lanes	Peak Hour Volume	On Ramp Peak Hour Volume	Off Ramp Peak Hour Volume	Volume AC*	Volume BD*	Volume AD*	Volume BC*	Weave Length
19	Mainline: At Avondale Boulevard	Basic	Eastbound	AM	D	3	5,450	Not Applicable								
				PM	C		3,950									
20	Between Avondale Boulevard and 107th Avenue	Weave	Eastbound	AM	D	4	5,450	4	5,450	425	400	5,050	0	400	425	2,000
				PM	C		3,950		3,950	650	250	3,700	0	250	650	
21	Mainline: At 107th Avenue	Basic	Eastbound	AM	D	3	5,475	Not Applicable								
				PM	C		4,350									
22	On Ramp: 107th Avenue	Merge	Eastbound	AM	D	3	5,475			300						
				PM	C		4,350			150						
23	Mainline: At 99th Avenue	Basic	Eastbound	AM	E	3	5,775	Not Applicable								
				PM	C		4,500									
24	Off Ramp: 91st Avenue	Diverge	Eastbound	AM	D	3	5,775				250					
				PM	C		4,500				325					
25	Mainline: At 91st Avenue	Basic	Eastbound	AM	D	3	5,525	Not Applicable								
				PM	C		4,175									
26	Between 91st Avenue and 83rd Avenue	Weave	Eastbound	AM	D	4	5,525	4	5,525	400	300	5,225	0	300	400	2,100
				PM	C		4,175		4,175	550	150	4,025	0	150	550	
27	Mainline: At 83rd Avenue	Basic	Eastbound	AM	D	3	5,625	Not Applicable								
				PM	D		4,575									
29	Mainline: 75th Avenue	Basic	Eastbound	AM	C	4	5,775	Not Applicable								
				PM	C		4,800									
30	Off Ramp: 67th Avenue	Diverge	Eastbound	AM	D	4	5,775				1,375					
				PM	D		4,800				1,175					
31	Mainline: At 67th Avenue	Basic	Eastbound	AM	C	4	4,400	Not Applicable								
				PM	B		3,625									
32	System Ramp: eastbound to northbound	Basic	Eastbound	AM	C	2	2,475	Not Applicable								
				PM	A		1,225									
33	System Ramp: eastbound to southbound	Basic	Eastbound	AM	B	2	1,925	Not Applicable								
				PM	C		2,400									

Note: * - As per Highway Capacity Manual, 2000 Exhibit 13-7

Table 6.4 – SR 30 SS Hybrid Alternative Main Line Analysis, Westbound Direction (2035)

Section ID	Section	Type	Direction	Time Period	Level Of Service (LOS)	DATA INPUT										
						Number of Lanes	Main line Peak Hour Volume	Weaving Lanes	Peak Hour Volume	On Ramp Peak Hour Volume	Off Ramp Peak Hour Volume	Volume AC*	Volume BD*	Volume AD*	Volume BC*	Weave Length
2	System Ramp: WB to NB	Basic	Westbound	AM	B	2	1,450	Not Applicable								
				PM	B		1,800									
3	Mainline: West of SR 303L Ramps	Basic	Westbound	AM	A	2	700	Not Applicable								
				PM	B		1,700									
4	Mainline: At Cotton Lane	Basic	Westbound	AM	A	5	2,150	Not Applicable								
				PM	B		3,500									
5	Off Ramp: Cotton Lane	Diverge	Westbound	AM	B	5	2,475				325					
				PM	D		5,475				1,800					
6	Mainline: Cotton Lane to Sarival Ave	Basic	Westbound	AM	A	5	2,475	Not Applicable								
				PM	C		5,475									
7	Mainline: At Sarival Avenue	Basic	Westbound	AM	A	4	2,475	Not Applicable								
				PM	C		5,475									
8	Between Sarival Avenue and Estrella Parkway	Weave	Westbound	AM	B	4	2,450	4	2,450	225	200	2,250	0	200	225	2,200
				PM	C		5,450		5,450	350	325	5,125	0	325	350	
9	Mainline: At Estrella Parkway	Basic	Westbound	AM	B	3	2,450	Not Applicable								
				PM	D		5,450									
10	Between Estrella Parkway and Bullard Avenue	Weave	Westbound	AM	B	4	3,350	4	3,350	125	1,025	2,325	0	1,025	125	2,100
				PM	D		6,000		6,000	450	1,000	5,000	0	1,000	450	
11	Mainline: At Bullard Avenue	Basic	Westbound	AM	C	3	3,350	Not Applicable								
				PM	E		6,000									
12	Off Ramp: Bullard Avenue	Diverge	Westbound	AM	C	3	3,625				275					
				PM	D		6,250				250					
13	Mainline: At Agua Fria River	Basic	Westbound	AM	C	3	3,625	Not Applicable								
				PM	E		6,250									
14	On Ramp: Dysart Road	Merge	Westbound	AM	B	3	3,350			275						
				PM	D		5,700			550						
15	Mainline: At Dysart Road	Basic	Westbound	AM	C	3	3,350	Not Applicable								
				PM	E		5,700									
16	Off Ramp: Dysart Road	Diverge	Westbound	AM	C	3	3,500				150					
				PM	D		5,900				200					
17	Mainline: At El Mirage Road	Basic	Westbound	AM	C	3	3,500	Not Applicable								
				PM	E		5,900									
18	On Ramp: Avondale Boulevard	Merge	Westbound	AM	B	3	3,400			100						
				PM	D		5,825			75						

Note: * - As per Highway Capacity Manual, 2000 Exhibit 13-7

Table 6.4 – SR 30 SS Hybrid Alternative Main Line Analysis, Westbound Direction (2035) (continued)

Section ID	Section	Type	Direction	Time Period	Level Of Service (LOS)	DATA INPUT										
						Number of Lanes	Main line Peak Hour Volume	Weaving Lanes	Peak Hour Volume	On Ramp Peak Hour Volume	Off Ramp Peak Hour Volume	Volume AC*	Volume BD*	Volume AD*	Volume BC*	Weave Length
19	Mainline: At Avondale Boulevard	Basic	Westbound	AM	C	3	3,400	Not Applicable								
				PM	E		5,825									
20	Between Avondale Boulevard and 107th Avenue	Weave	Westbound	AM	B	4	3,550	4	3,550	200	350	3,200	0	350	200	2,100
				PM	D		5,500		5,500	375	50	5,450	0	50	375	
21	Mainline: At 107th Avenue	Basic	Westbound	AM	C	3	3,550	Not Applicable								
				PM	D		5,500									
22	Off Ramp: 107th Avenue	Diverge	Westbound	AM	C	3	3,700				150					
				PM	D		6,175				675					
23	Mainline: At 99th Avenue	Basic	Westbound	AM	C	3	3,700	Not Applicable								
				PM	E		6,175									
24	On Ramp: 91st Avenue	Merge	Westbound	AM	B	3	3,450			250						
				PM	D		5,950			225						
25	Mainline: At 91st Avenue	Basic	Westbound	AM	C	3	3,450	Not Applicable								
				PM	E		5,950									
26	Between 91st Avenue and 83rd Avenue	Weave	Westbound	AM	B	4	3,775	4	3,775	100	425	3,350	0	425	100	2,200
				PM	D		6,125		6,125	275	450	5,675	0	450	275	
27	Mainline: At 83rd Avenue	Basic	Westbound	AM	C	3	3,775	Not Applicable								
				PM	E		6,125									
28	Off Ramp: 83rd Avenue	Major Diverge	Westbound	AM	A	2	200	Not Applicable								
				PM	A		325									
29	Mainline: 75th Avenue	Basic	Westbound	AM	B	4	3,975	Not Applicable								
				PM	D		6,450									
30	On Ramp: 67th Avenue	Merge	Westbound	AM	B	4	3,200			775						
				PM	C		5,025			1425						
31	Mainline: At 67th Avenue	Basic	Westbound	AM	B	4	3,200	Not Applicable								
				PM	C		5,025									
34	System Ramp: NB to WB	Basic	Westbound	AM	C	2	2,350	Not Applicable								
				PM	C		2,700									
35	System Ramp: SB to WB	Basic	Westbound	AM	A	2	850	Not Applicable								
				PM	C		2,325									

Note: * - As per Highway Capacity Manual, 2000 Exhibit 13-7

6.1.3 SR 30 South Alternative

The 2035 projected ADT volumes and peak hour volumes used for the main line analysis of the South Alternative are presented in Figures 6.9 and 6.10, respectively. Notable observations from the figures are:

- Maximum daily traffic of 160,000 vehicles per day is projected between 67th and 83rd Avenues.
- The ADT projection along the freeway segments is estimated to be 139,000 vehicles per day, which is 6,000 and 4,000 less when compared with the North/Center and SS Hybrid Alternatives, respectively.
- The system ramps connecting SR 30 and SR 303L have an estimated daily traffic of 28,000 vehicles per day.
- The directional split of AM peak traffic at the SR 30 and SR 202L system TI is around 56 percent going from east to north and south of SR 202L and 44 percent going to the west from north and south of SR 202L.
- The directional split of PM peak traffic at the SR 30 and SR 202L system TI is around 59 percent going west from to north and south of SR 202L and 41 percent going from east to north and south of SR 202L.

The AM and PM peak hour LOS results of the SR 30 South Alternative main line analysis are presented in Figures 6.11 and 6.12 and Tables 6.5 and 6.6. Detailed HCS reports are provided in Appendix B.

Notable observations from the freeway main line analysis are:

Morning (AM) Peak Hour

All the sections of the freeway operate at LOS D or better during the AM peak period, which meets ADOT's desirable design LOS of D or better. The South Alternative would attract slightly lower volumes compared with the North, Center, and SS Hybrid Alternatives and, therefore, it would operate better.

Evening (PM) Peak Hour

- The PM peak hour operations along the SR 30 westbound (peak) direction are worse compared with the AM peak conditions. Nine sections would operate at LOS E.
- All the sections operating with LOS E during the PM peak hour are basic freeway segments and—to improve the operations of these sections—an additional through lane would need to be added.

To improve the overall performance of the freeway main line in the westbound direction, ADOT would need to add a through lane between 83rd and Bullard Avenues to achieve an acceptable LOS.

6.2 Conclusions

General observations from the SR 30 main line 2035 analysis for all alternatives are as follows:

AM Commute: All four alternatives exhibit an acceptable LOS in the off-peak westbound direction. The eastbound direction represents the peak direction during the morning commute. The South Alternative would have no segments that would operate at LOS E, while the SS Hybrid Alternative would have two segments that would operate at LOS E. The North/Center Alternative would experience LOS E on many of its segments. Adding a general purpose lane would result in an acceptable LOS on those segments.

PM Commute: The westbound direction represents the peak direction during the PM commute. All four alternatives exhibit an acceptable LOS in the off-peak eastbound direction. Many of the segments in the westbound direction experience LOS E for all alternatives. The addition of a general purpose lane in the westbound direction would improve the operational performance to LOS D on those segments.

Figure 6.9 – SR 30 South Alternative Average Daily Traffic (2035)

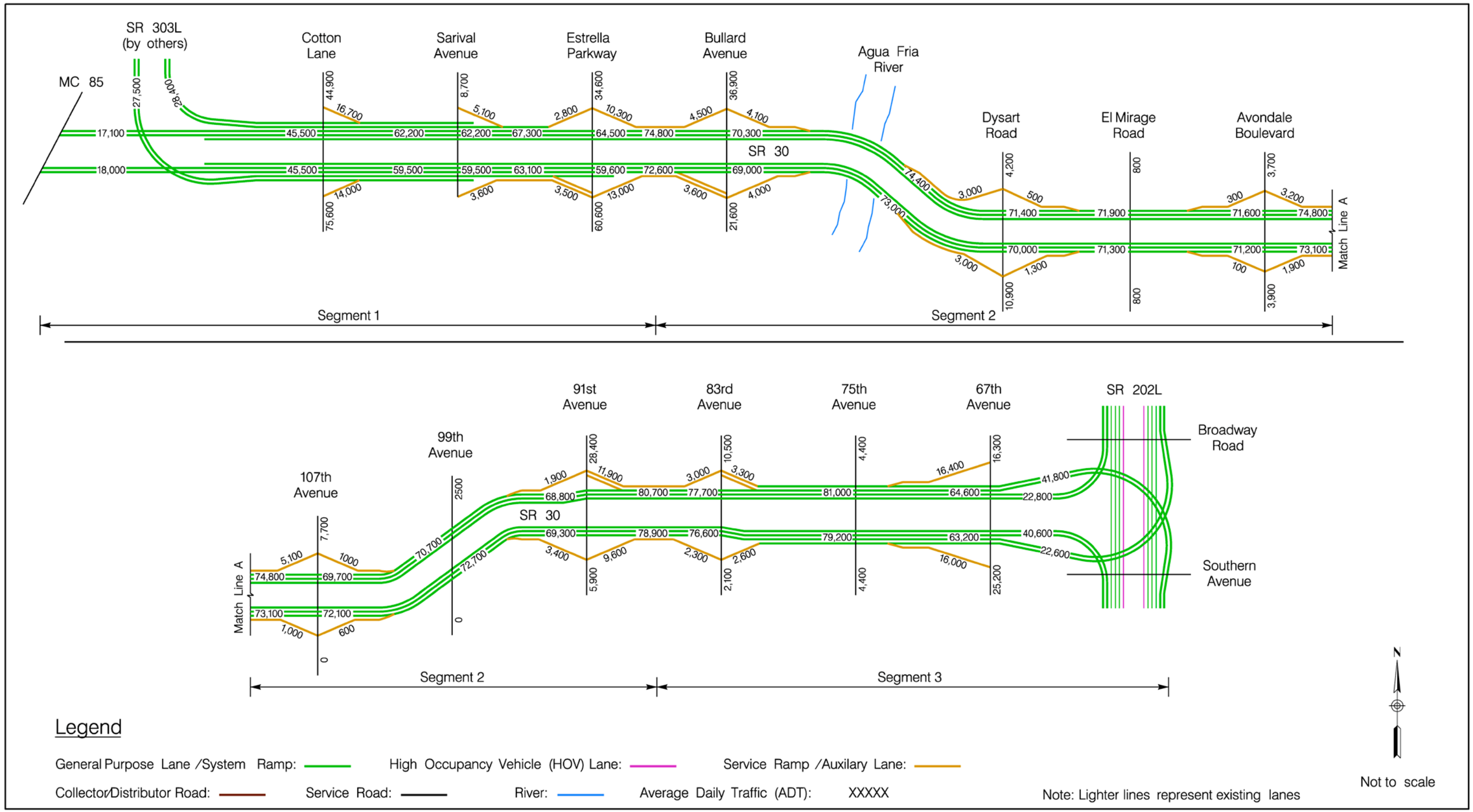


Figure 6.10 – SR 30 South Alternative AM/PM Peak Hour Traffic (2035)

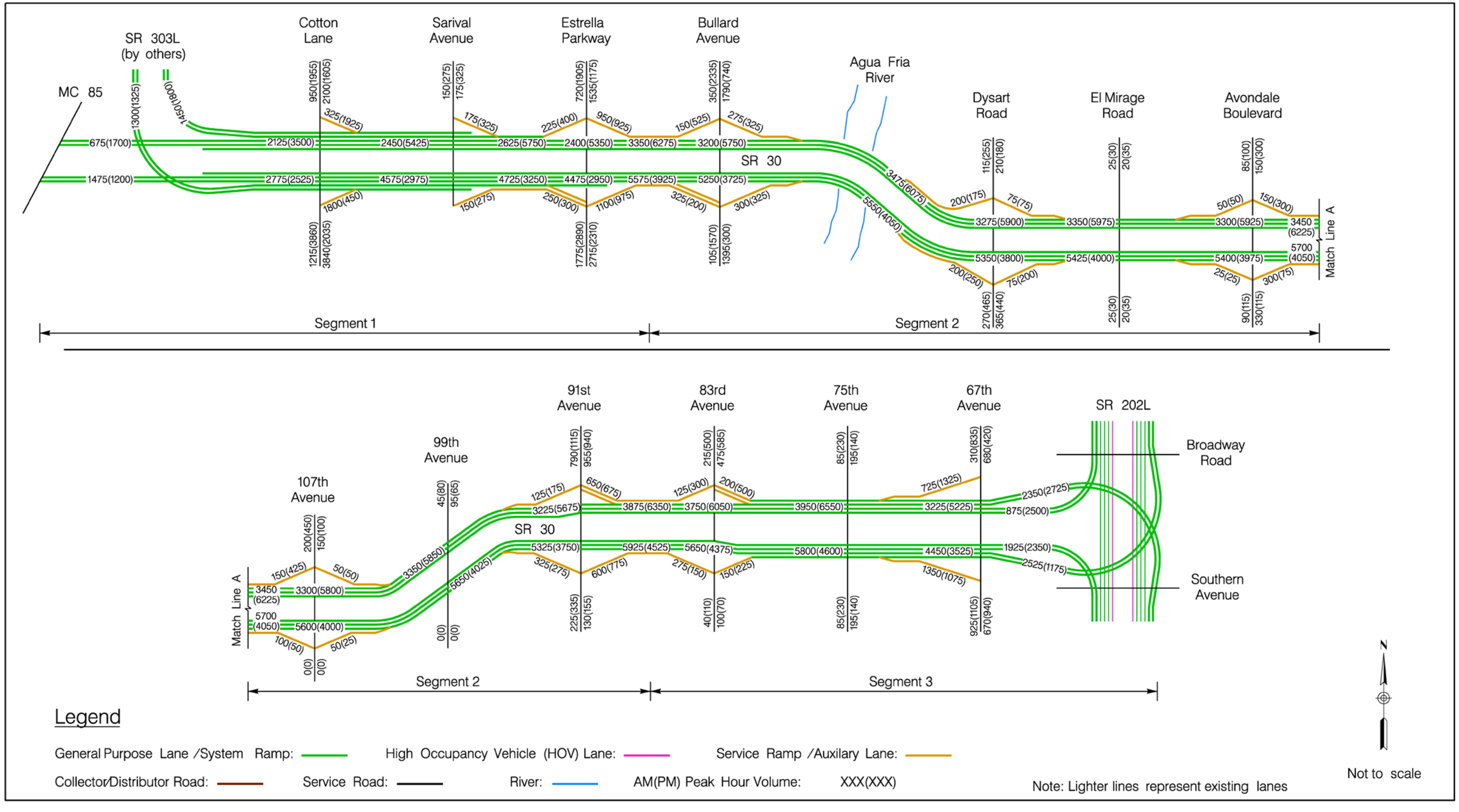


Figure 6.11 – SR 30 South Alternative AM Peak Hour Level of Service (2035)

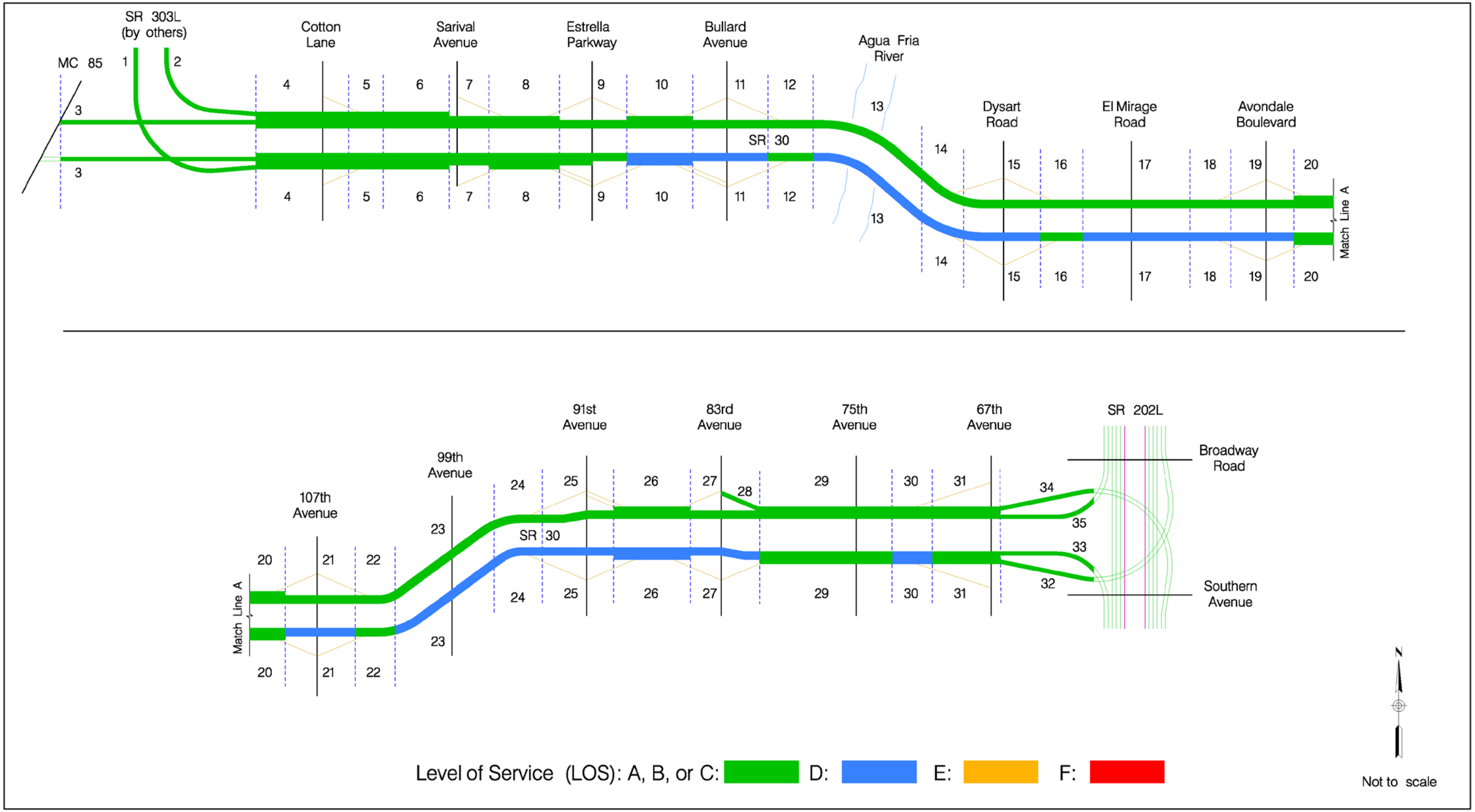


Figure 6.12 – SR 30 South Alternative PM Peak Hour Level of Service (2035)

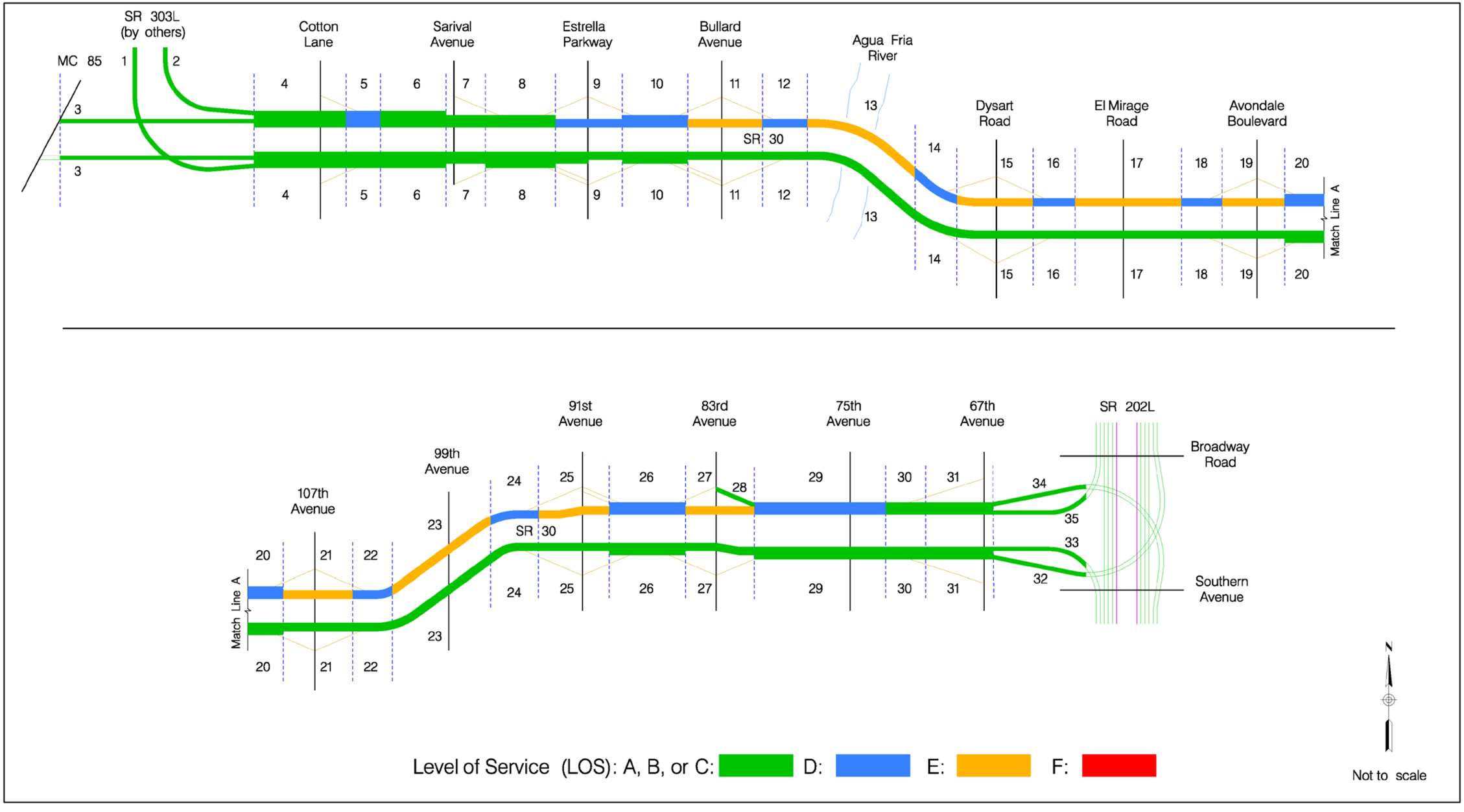


Table 6.5 – SR 30 South Alternative Main Line Analysis, Eastbound Direction (2035)

Section ID	Section	Type	Direction	Time Period	Level Of Service (LOS)	DATA INPUT										
						Number of Lanes	Main line Peak Hour Volume	Weaving Lanes	Peak Hour Volume	On Ramp Peak Hour Volume	Off Ramp Peak Hour Volume	Volume AC*	Volume BD*	Volume AD*	Volume BC*	Weave Length
1	System Ramp: southbound to eastbound	Basic	Eastbound	AM	B	2	1,300	Not Applicable								
				PM	B		1,325									
3	Mainline: West of SR 303L Ramps	Basic	Eastbound	AM	B	2	1,475	Not Applicable								
				PM	A		1,200									
4	Mainline: At Cotton Lane	Basic	Eastbound	AM	A	5	2,775	Not Applicable								
				PM	A		2,525									
5	On Ramp: Cotton Lane	Merge	Eastbound	AM	B	5	2,775			1800						
				PM	A		2,525			450						
6	Mainline: Cotton Lane to Sarival Ave	Basic	Eastbound	AM	B	5	4,575	Not Applicable								
				PM	A		2,975									
7	Mainline: At Sarival Avenue	Basic	Eastbound	AM	C	4	4,575	Not Applicable								
				PM	B		2,975									
8	Between Sarival Avenue and Estrella Parkway	Weave	Eastbound	AM	B	5	4,575	5	4,575	150	250	4,325	0	250	150	2,200
				PM	B		2,975		2,975	275	300	2,675	0	300	275	
9	Mainline: At Estrella Parkway	Basic	Eastbound	AM	C	3	4,475	Not Applicable								
				PM	B		2,950									
10	Between Estrella Parkway and Bullard Avenue	Weave	Eastbound	AM	D	4	4,475	4	4,475	1,100	325	4,150	0	325	1,100	2,100
				PM	C		2,950		2,950	975	200	2,750	0	200	975	
11	Mainline: At Bullard Avenue	Basic	Eastbound	AM	D	3	5,250	Not Applicable								
				PM	C		3,725									
12	On Ramp: Bullard Avenue	Merge	Eastbound	AM	C	3	5,250			300						
				PM	B		3,725			325						
13	Mainline: At Agua Fria River	Basic	Eastbound	AM	D	3	5,550	Not Applicable								
				PM	C		4,050									
14	Off Ramp: Dysart Road	Diverge	Eastbound	AM	D	3	5,550				200					
				PM	C		4,050				250					
15	Mainline: At Dysart Road	Basic	Eastbound	AM	D	3	5,350	Not Applicable								
				PM	C		3,800									
16	On Ramp: Dysart Road	Merge	Eastbound	AM	C	3	5,350			75						
				PM	B		3,800			200						
17	Mainline: At El Mirage Road	Basic	Eastbound	AM	D	3	5,425	Not Applicable								
				PM	C		4,000									
18	Off Ramp: Avondale Boulevard	Diverge	Eastbound	AM	D	3	5,425				25					
				PM	C		4,000				25					

Note: * - As per Highway Capacity Manual, 2000 Exhibit 13-7

Table 6.5 – SR 30 South Alternative Main Line Analysis, Eastbound Direction (2035) (continued)

Section ID	Section	Type	Direction	Time Period	Level Of Service (LOS)	DATA INPUT										
						Number of Lanes	Main line Peak Hour Volume	Weaving Lanes	Peak Hour Volume	On Ramp Peak Hour Volume	Off Ramp Peak Hour Volume	Volume AC*	Volume BD*	Volume AD*	Volume BC*	Weave Length
19	Mainline: At Avondale Boulevard	Basic	Eastbound	AM	D	3	5,400	Not Applicable								
				PM	C		3,975									
20	Between Avondale Boulevard and 107th Avenue	Weave	Eastbound	AM	C	4	5,400	4	5,400	300	100	5,300	0	100	300	2,000
				PM	B		3,975		3,975	75	50	3,925	0	50	75	
21	Mainline: At 107th Avenue	Basic	Eastbound	AM	D	3	5,600	Not Applicable								
				PM	C		4,000									
22	On Ramp: 107th Avenue	Merge	Eastbound	AM	C	3	5,600			50						
				PM	B		4,000			25						
23	Mainline: At 99th Avenue	Basic	Eastbound	AM	D	3	5,650	Not Applicable								
				PM	C		4,025									
24	Off Ramp: 91st Avenue	Diverge	Eastbound	AM	D	3	5,650				325					
				PM	C		4,025				275					
25	Mainline: At 91st Avenue	Basic	Eastbound	AM	D	3	5,325	Not Applicable								
				PM	C		3,750									
26	Between 91st Avenue and 83rd Avenue	Weave	Eastbound	AM	D	4	5,325	4	5,325	600	275	5,050	0	275	600	2,100
				PM	C		3,750		3,750	775	150	3,600	0	150	775	
27	Mainline: At 83rd Avenue	Basic	Eastbound	AM	D	3	5,650	Not Applicable								
				PM	C		4,375									
29	Mainline: 75th Avenue	Basic	Eastbound	AM	C	4	5,800	Not Applicable								
				PM	C		4,600									
30	Off Ramp: 67th Avenue	Diverge	Eastbound	AM	D	4	5,800				1,350					
				PM	C		4,600				1,075					
31	Mainline: At 67th Avenue	Basic	Eastbound	AM	C	4	4,450	Not Applicable								
				PM	B		3,525									
32	System Ramp: eastbound to northbound	Basic	Eastbound	AM	C	2	2,525	Not Applicable								
				PM	A		1,175									
33	System Ramp: eastbound to southbound	Basic	Eastbound	AM	B	2	1,925	Not Applicable								
				PM	C		2,350									

Note: * - As per Highway Capacity Manual, 2000 Exhibit 13-7

Table 6.6 – SR 30 South Alternative Main Line Analysis, Westbound Direction (2035)

Section ID	Section	Type	Direction	Time Period	Level Of Service (LOS)	DATA INPUT										
						Number of Lanes	Main line Peak Hour Volume	Weaving Lanes	Peak Hour Volume	On Ramp Peak Hour Volume	Off Ramp Peak Hour Volume	Volume AC*	Volume BD*	Volume AD*	Volume BC*	Weave Length
2	System Ramp: westbound to northbound	Basic	Westbound	AM	B	2	1,450	Not Applicable								
				PM	B		1,800									
3	Mainline: West of SR 303L Ramps	Basic	Westbound	AM	A	2	675	Not Applicable								
				PM	B		1,700									
4	Mainline: At Cotton Lane	Basic	Westbound	AM	A	5	2,125	Not Applicable								
				PM	B		3,500									
5	Off Ramp: Cotton Lane	Diverge	Westbound	AM	B	5	2,450				325					
				PM	D		5,425				1,925					
6	Mainline: Cotton Lane to Sarival Ave	Basic	Westbound	AM	A	5	2,450	Not Applicable								
				PM	C		5,425									
7	Mainline: At Sarival Avenue	Basic	Westbound	AM	A	4	2,450	Not Applicable								
				PM	C		5,425									
8	Between Sarival Avenue and Estrella Parkway	Weave	Westbound	AM	B	4	2,400	4	2,400	225	175	2,225	0	175	225	2,200
				PM	C		5,350		5,350	400	325	5,025	0	325	400	
9	Mainline: At Estrella Parkway	Basic	Westbound	AM	B	3	2,400	Not Applicable								
				PM	D		5,350									
10	Between Estrella Parkway and Bullard Avenue	Weave	Westbound	AM	B	4	3,200	4	3,200	150	950	2,250	0	950	150	2,100
				PM	D		5,750		5,750	525	925	4,825	0	925	525	
11	Mainline: At Bullard Avenue	Basic	Westbound	AM	C	3	3,200	Not Applicable								
				PM	E		5,750									
12	Off Ramp: Bullard Avenue	Diverge	Westbound	AM	C	3	3,475				275					
				PM	D		6,075				325					
13	Mainline: At Agua Fria River	Basic	Westbound	AM	C	3	3,475	Not Applicable								
				PM	E		6,075									
14	On Ramp: Dysart Road	Merge	Westbound	AM	B	3	3,275			200						
				PM	D		5,900			175						
15	Mainline: At Dysart Road	Basic	Westbound	AM	C	3	3,275	Not Applicable								
				PM	E		5,900									
16	Off Ramp: Dysart Road	Diverge	Westbound	AM	B	3	3,350				75					
				PM	D		5,975				75					
17	Mainline: At El Mirage Road	Basic	Westbound	AM	C	3	3,350	Not Applicable								
				PM	E		5,975									
18	On Ramp: Avondale Boulevard	Merge	Westbound	AM	B	3	3,300			50						
				PM	D		5,925			50						

Note: * - As per Highway Capacity Manual, 2000 Exhibit 13-7

Table 6.6 – SR 30 South Alternative Main Line Analysis, Westbound Direction (2035) (continued)

Section ID	Section	Type	Direction	Time Period	Level Of Service (LOS)	DATA INPUT										
						Number of Lanes	Main line Peak Hour Volume	Weaving Lanes	Peak Hour Volume	On Ramp Peak Hour Volume	Off Ramp Peak Hour Volume	Volume AC*	Volume BD*	Volume AD*	Volume BC*	Weave Length
19	Mainline: At Avondale Boulevard	Basic	Westbound	AM	C	3	3,300	Not Applicable								
				PM	E		5,925									
20	Between Avondale Boulevard and 107th Avenue	Weave	Westbound	AM	B	4	3,300	4	3,300	150	150	3,150	0	150	150	2,300
				PM	D		5,800		5,800	425	300	5,500	0	300	425	
21	Mainline: At 107th Avenue	Basic	Westbound	AM	C	3	3,300	Not Applicable								
				PM	E		5,800									
22	Off Ramp: 107th Avenue	Diverge	Westbound	AM	B	3	3,350				50					
				PM	D		5,850				50					
23	Mainline: At 99th Avenue	Basic	Westbound	AM	C	3	3,350	Not Applicable								
				PM	E		5,850									
24	On Ramp: 91st Avenue	Merge	Westbound	AM	B	3	3,225			125						
				PM	D		5,675			175						
25	Mainline: At 91st Avenue	Basic	Westbound	AM	C	3	3,225	Not Applicable								
				PM	E		5,675									
26	Between 91st Avenue and 83rd Avenue	Weave	Westbound	AM	B	4	3,750	4	3,750	125	650	3,100	0	650	125	2,200
				PM	D		6,050		6,050	300	675	5,375	0	675	300	
27	Mainline: At 83rd Avenue	Basic	Westbound	AM	C	3	3,750	Not Applicable								
				PM	E		6,050									
28	Off Ramp: 83rd Avenue	Major Diverge	Westbound	AM	A	2	200	Not Applicable								
				PM	A		500									
29	Mainline: 75th Avenue	Basic	Westbound	AM	B	4	3,950	Not Applicable								
				PM	D		6,550									
30	On Ramp: 67th Avenue	Merge	Westbound	AM	B	4	3,225			725						
				PM	C		5,225			1325						
31	Mainline: At 67th Avenue	Basic	Westbound	AM	B	4	3,225	Not Applicable								
				PM	C		5,225									
34	System Ramp: northbound to westbound	Basic	Westbound	AM	C	2	2,350	Not Applicable								
				PM	C		2,725									
35	System Ramp: southbound to westbound	Basic	Westbound	AM	A	2	875	Not Applicable								
				PM	C		2,500									

Note: * - As per Highway Capacity Manual, 2000 Exhibit 13-7

7. SR 30 SERVICE TRAFFIC INTERCHANGE ANALYSIS

7.1 Background

The interchange analyses evaluated and recommended the service TI lane configuration, geometry, and type at each location based on the traffic turning movement projections for 2035. These analyses focused on three scenarios representing the four alternatives: North/Center Alternatives, SS Hybrid Alternative, and South Alternative.

Based on the service TI evaluation discussion in Section 2.2, 10 service TIs were proposed for each alternative. These interchanges were assumed to be full compact diamond interchange (CDI) types with the exception of Sarival and 67th Avenues, where a half-CDI type of interchange was evaluated. The Cotton Lane interchange is currently proposed as a half CDI for this project, but is assumed to be expanded to a full CDI when SR 30 is extended west into Buckeye and/or when the SR 30 and SR 303L system TI is constructed. From west to east, the TI locations are as follows: Cotton Lane, Sarival Avenue, Estrella Parkway, Bullard Avenue, Dysart Road, Avondale Boulevard, 107th Avenue, 91st Avenue, 83rd Avenue, and 67th Avenue.

The assumptions, approach, and results for all alternatives are discussed in the following sections. The methodology is discussed in detail in Section 4.2.2.

7.2 Arterial Street Lane Configurations

SR 30 would traverse Goodyear (Maricopa County Route 85 [MC 85] to Agua Fria River), Avondale (Agua Fria River to 107th Avenue), and Phoenix (107th Avenue to the east). The lane configurations for the arterial streets approaching the interchanges were based on local and regional transportation planning documents. Assumptions were also made that the number of through lanes would be driven by demand, regional significance, and connectivity with major facilities. A summary of planned lane configurations is provided in Table 7.1.

The basic number of lanes on the crossroad was assumed to pass through the interchange. The ADOT *Lessons Learned Document on Traffic Volume Projections and Operational Analysis* (2005) states that "the minimum number of turning lanes necessary to achieve an intersection approach and overall interchange LOS of D" should be the basis for ADOT plans. Any additional turn lanes could be added at the request of a local agency, but would require the local agency to share the additional cost with ADOT.

Another source of guidance for providing additional turn lanes is the *ADOT Roadway Design Guidelines* (2007b). Its recommendations include:

- A right-turn lane should be provided if the right-turn volume is greater than 300 vehicles per hour.
- A left-turn lane should be provided at all appropriate locations, and a second left-turn lane should be provided when the volume is greater than 300 vehicles per hour.

Table 7.1 – 2035 Lane Configurations for Arterial Streets Approaching Service Traffic Interchanges

Road	Local Jurisdiction	Street Classification	Right-of-way Width (in feet)	Number of lanes in each direction
Cotton Lane	Goodyear	Parkway	200	3
Sarival Avenue	Goodyear	Arterial	110	1
Estrella Parkway	Goodyear	Scenic Arterial	150	3
Bullard Avenue	Goodyear	Major Arterial	130	2
Dysart Road	Avondale	Major Arterial	130	3
Avondale Boulevard	Avondale	Major Arterial	130	3
107th Avenue	Avondale	Major Arterial	130	2
91st Avenue	Phoenix	Arterial	130	3
83rd Avenue	Phoenix	Arterial	130	2
67th Avenue	Phoenix	Arterial	130	3

Sources: City of Goodyear *General Plan Update*, 2003–2013; City of Avondale *Transportation Plan*, 2006; City of Phoenix *Street Classification Map*, 2010

An iterative process was undertaken to determine the final lane configurations at each TI location. The analysis began with the basic lane configuration (without any additional turn lanes) and evolved through traffic operational analysis and use of the guidelines above to develop a lane configuration that would provide desirable traffic operations based on projected 2035 travel demand. Identical lane configurations at the TIs for all four alternatives were used to conduct the traffic operational analysis. Because of the proximity of PIR, turn lanes were configured to accommodate special event traffic at the TIs at Avondale Boulevard, Dysart Road, Estrella Parkway, and Bullard Avenue. Special event traffic was not accounted for while conducting the traffic operational analysis.

7.3 Interchange Type

The service TI analysis included an evaluation of a CDI at each service TI location. The draft *MAG Freeway System Interchange Enhancement Policy* (ADOT 2008) has been established to guide the analysis process and resultant cost-sharing agreements. It states:

> *ADOT's design policy for a service interchange is to provide LOS D or better for the 20 year design year. This design process provides results for a compact diamond interchange configuration. ADOT performs a sensitivity analysis by increasing peak hour values 10–30 percent to assure the interchange won't degrade to less than LOS D, should the traffic modeling yield low volumes from unanticipated development.*
>
> *Should local governments choose to upgrade or enhance the geometrics of an interchange to provide an improved LOS with increased through levels, dual turn lanes, free right turn bays, or even a different type of interchange, they would be responsible for 50 percent of the cost increase for those upgrades.*
>
> *The Life Cycle Program would fund the remaining 50 percent as there is a system benefit for improved LOS for improved operational characteristics, reduced congestion, improved air quality, and less cost for future intersection upgrades.*

Recent comparisons between diamond and urban interchange type construction revealed that urban interchanges cost approximately $2 million to $3 million more than diamond interchanges. Similar cost comparisons would be performed if enhancements were requested by ADOT and/or other agencies along this freeway.

Sensitivity analysis for the service TIs was not performed in accordance with the above discussion because of the unavailability of design year peak hour volumes. The information and analysis presented in the following sections used only the opening year (2035) peak hour volumes.

7.4 Signal Timing

Numerous signal timing and phasing designs can be used to coordinate the two signals at a CDI. The Synchro analysis presented in this report assumed a single controller for both TI signals. Phasing and timing were optimized to improve the traffic flow at intersections and progression along the crossroad.

7.5 Service Traffic Interchange Analysis (Synchro Analysis)

Each of the following sections includes a review of each crossroad's characteristics, traffic volumes, Synchro analysis results, and recommendations for lane configurations for each alternative. However, the SR 30, from SR 303L to SR 202L, corridor is envisioned to be open for public around 2035 and the arterial lane configurations used in this report may change during this period because cities update their general plans at regular intervals based on then available socio-economic and traffic demand forecast data. It is important to note that this analysis needs to be reevaluated during the final design phase of the project based on then available arterial lane configurations from the general plans. Detailed Synchro reports for each TI are provided in Appendix C.

7.5.1 Cotton Lane

Cotton Lane is a four-lane arterial street located in Goodyear. Surrounding land mostly consists of agricultural land and vacant parcels. By 2035, most of the agricultural and vacant land would be converted to residential and commercial uses. It has an existing bridge crossing over the Gila River. A half CDI (eastbound on-, westbound off-ramps) is proposed between the Buckeye Canal and Gila River. The CDI would include signalized intersections. Cotton Lane is planned to be widened to six lanes, with three lanes in each travel direction, by 2035. This TI will serve the heavy development south of the Gila River. Cotton Lane is envisioned to be a full TI when SR 30 is extended farther to the west and the SR 30 and SR 303L system TI is constructed.

The recommended lane configuration, traffic volumes during the peak period, and LOS results are presented in Figure 7.1. The Synchro analysis results for all alternatives are presented in Table 7.2. The proposed TI geometry is the same for all the alternatives. This recommendation is supported by the following:

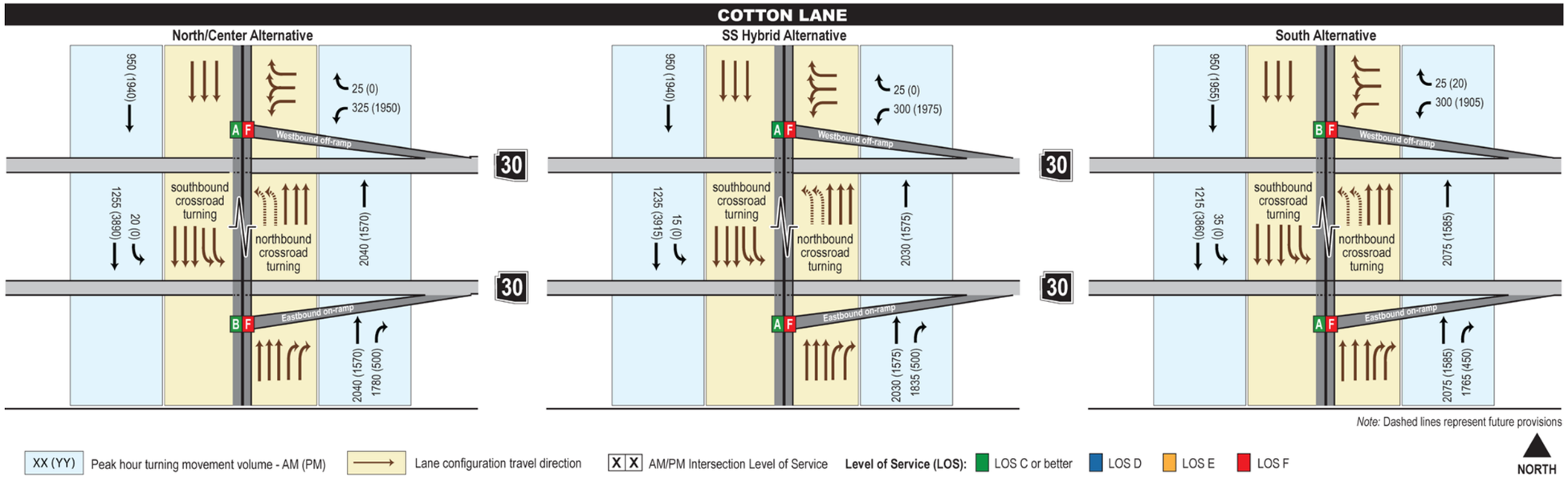
- The traffic analysis showed that the half CDI would perform at an acceptable LOS during the AM peak period for all study alignment geometric configurations.
- The traffic analysis showed that the half CDI would perform at a LOS F during the PM peak period for all alignment geometric configurations. This is attributable to the westbound off-ramp volumes being high because of heavy development south of the Gila River. Once SR 30 is extended to the west and SR 303L is built south of SR 30, it is anticipated that some of this westbound to southbound traffic would shift to SR 303L.

Table 7.2 – Cotton Lane Service Traffic Interchange Analysis Results (2035)

SR 30 Alternative	Signal	Optimized Cycle Length (seconds)	AM Peak Hour		PM Peak Hour	
			LOS	Delay (seconds/vehicle)	LOS	Delay (seconds/vehicle)
North/Center	North	70/120[a]	A	8.2	F	121.2
	South		B	10.9	F	210.8
South	North	70	B	10.3	F	106.7
	South		A	9.9	F	242
SS Hybrid	North	70/120[a]	A	9.2	F	119.7
	South		A	9.4	F	222

[a] AM/PM

Figure 7.1 – Cotton Lane, Turning Movement Volume, Lane Configuration, and AM and PM Level of Service (2035)



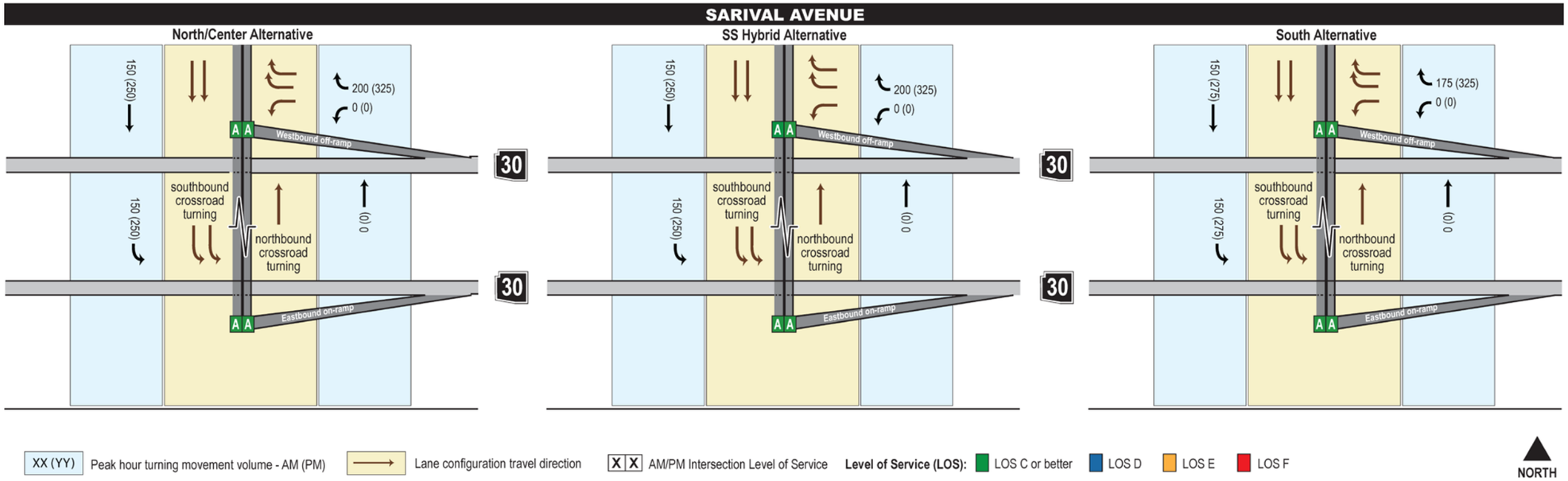
7.5.2 Sarival Avenue

Sarival Avenue is currently a dirt road south of MC 85. A half CDI (eastbound on-ramps, westbound off-ramps) is proposed between MC 85 and the Buckeye Canal. All four corners contain undeveloped agricultural land. Sarival Avenue would be a two-lane facility with one lane in each direction and would end at the proposed TI with no crossing over the Gila River by 2035.

The CDI at this location would have unsignalized intersections (STOP control for left turns and YIELD control for right turns). All other movements would be free flow at the TI. This is a dead-end intersection.

The recommended lane configuration and traffic volumes during the peak period are presented in Figure 7.2.

Figure 7.2 – Sarival Avenue, Turning Movement Volume, Lane Configuration, and AM and PM Level of Service (2035)



7.5.3 Estrella Parkway

Presently, Estrella Parkway is a two-lane arterial street south of Broadway Road that widens to four lanes north of Broadway Road. The TI is proposed south of Broadway Road. Surrounding land use mostly consists of agricultural land and vacant parcels. Most of the land would be converted to residential and commercial purposes around 2035. MC 85 is located just to the north, while the Gila River is located south of this proposed TI. Estrella Parkway will be widened to six lanes by 2035, with three travel lanes in each direction. A CDI with signalized intersections is proposed at this location.

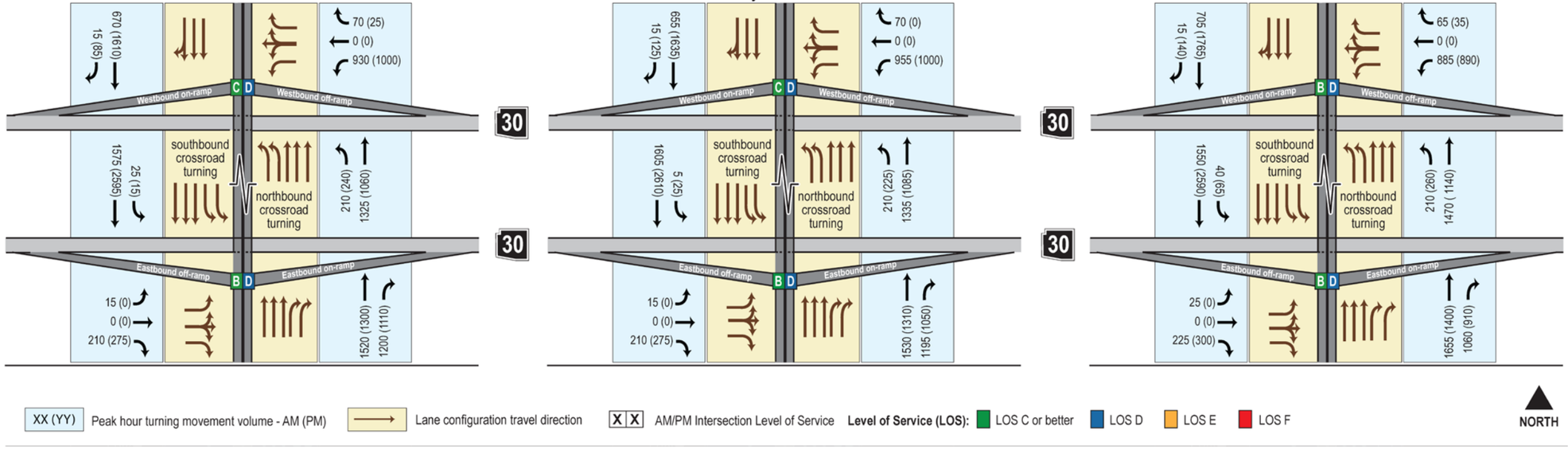
The recommended lane configuration, traffic volumes during the peak period, and LOS results are presented in Figure 7.3. The Synchro analysis results for all the alternatives are presented in Table 7.3.

Table 7.3 – Estrella Parkway Service Traffic Interchange Analysis Results (2035)

SR 30 Alternative	Signal	Optimized Cycle Length (seconds)	AM Peak Hour		PM Peak Hour	
			LOS	Delay (seconds/vehicle)	LOS	Delay (seconds/vehicle)
North/Center	North	70/120[a]	C	20.4	D	44.7
	South		B	18.1	D	47.5
South	North	70/120[a]	B	19.6	D	41.1
	South		B	18.5	D	36.2
SS Hybrid	North	70/120[a]	C	21.4	D	42.3
	South		B	18.2	D	49.8

[a] AM/PM

Figure 7.3 – Estrella Parkway, Turning Movement Volume, Lane Configuration, and AM and PM Level of Service (2035)



7.5.4 Bullard Avenue

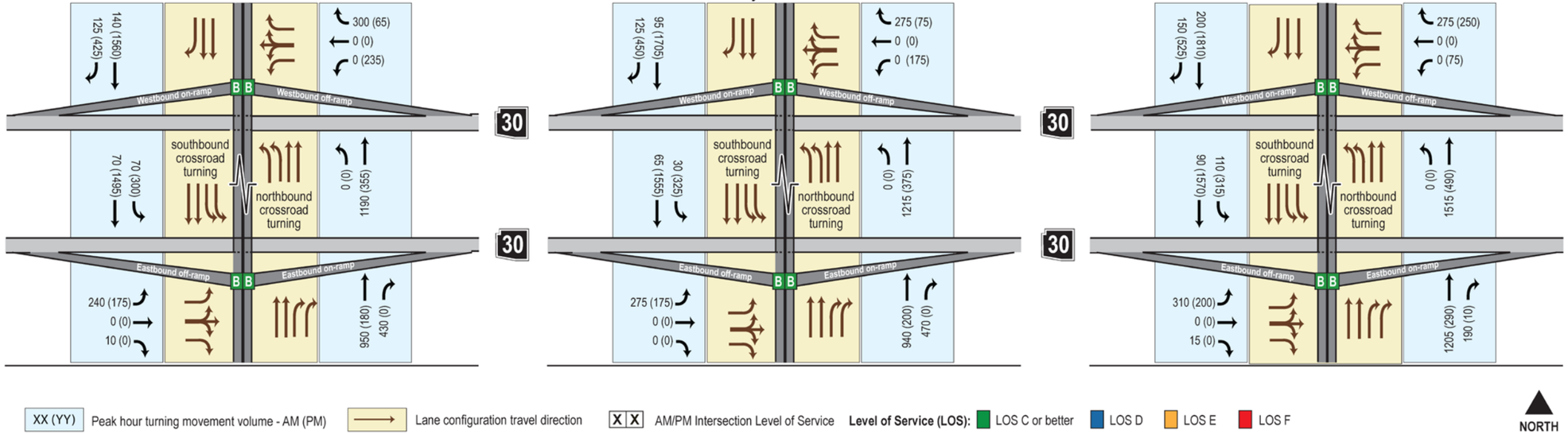
Bullard Avenue is a two-lane arterial street located in Goodyear. The TI is proposed south of Broadway Road. The north side of this proposed TI has light industrial land use along Broadway Road. Surrounding land uses mostly consist of agricultural land and vacant parcels. By 2035, most of the agricultural and vacant land would be converted to residential and industrial uses. Bullard Avenue will be a four-lane arterial street with two travel lanes in each direction in 2035. It has an existing bridge crossing over the Gila River. A CDI is proposed at this location with signalized intersections.

The recommended lane configuration, traffic volumes during the peak period, and LOS results are presented in Figure 7.4. The Synchro analysis results for all the alternatives are presented in Table 7.4.

Table 7.4 – Bullard Avenue Service Traffic Interchange Analysis Results (2035)

SR 30 Alternative	Signal	Optimized Cycle Length (seconds)	AM Peak Hour		PM Peak Hour	
			LOS	Delay (seconds/vehicle)	LOS	Delay (seconds/vehicle)
North/Center	North	90	B	15	B	15.3
	South		B	14.8	B	10.7
South	North	90	B	18.8	B	10.8
	South		B	17.2	B	15.8
SS Hybrid	North	90	B	14.1	B	13.3
	South		B	12.8	B	15.4

Figure 7.4 – Bullard Avenue, Turning Movement Volume, Lane Configuration, and AM and PM Level of Service (2035)



7.5.5 Dysart Road

Dysart Road is a two-lane arterial street in Avondale. The TI for the North/Center Alternatives is proposed south of Broadway Road. For the SS Hybrid Alternative, it is proposed north of Southern Avenue. With the South Alternative, the TI would be located south of Southern Avenue.

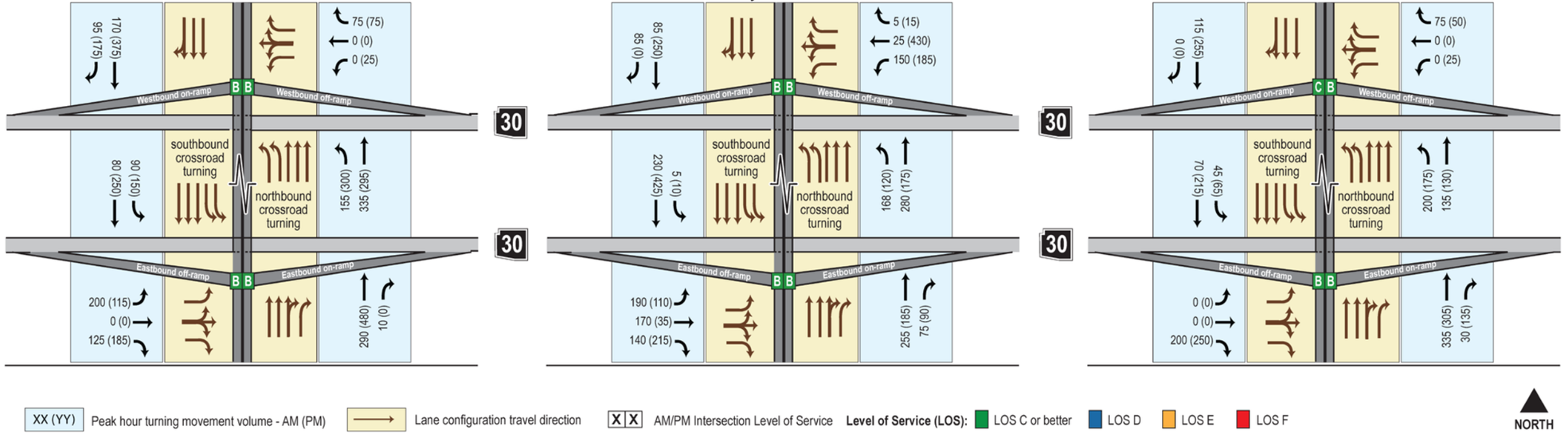
The Gila River is located immediately south of the TI. Dysart Road is planned to be a six-lane arterial street, having three lanes in each direction in 2035. Currently, Dysart Road ends at Southern Avenue. In the proposed configuration, the southern leg of the TI south of Southern Avenue is assumed to exist by 2035 and would have six lanes across the Gila River (according to the 2006 City of Avondale *Transportation Plan*). It would be a significant road in the future because it is the only road that connects to the farthest extents of Avondale. A CDI is proposed at this location with signalized intersections.

The recommended lane configuration, traffic volumes during the peak period, and LOS results are presented in Figure 7.5. The Synchro analysis results for all the alternatives are presented in Table 7.5.

Table 7.5 – Dysart Road Service Traffic Interchange Analysis Results (2035)

SR 30 Alternative	Signal	Optimized Cycle Length (seconds)	AM Peak Hour		PM Peak Hour	
			LOS	Delay (seconds/vehicle)	LOS	Delay (seconds/vehicle)
North/Center	North	70	B	13.1	B	16.1
	South		B	18.3	B	15.7
South	North	70	C	20.5	B	16.8
	South		B	13.7	B	12.9
SS Hybrid	North	70	B	16.9	B	16.6
	South		B	12.1	B	12.4

Figure 7.5 – Dysart Road, Turning Movement Volume, Lane Configuration, and AM and PM Level of Service (2035)



7.5.6 Avondale Boulevard (115th Avenue)

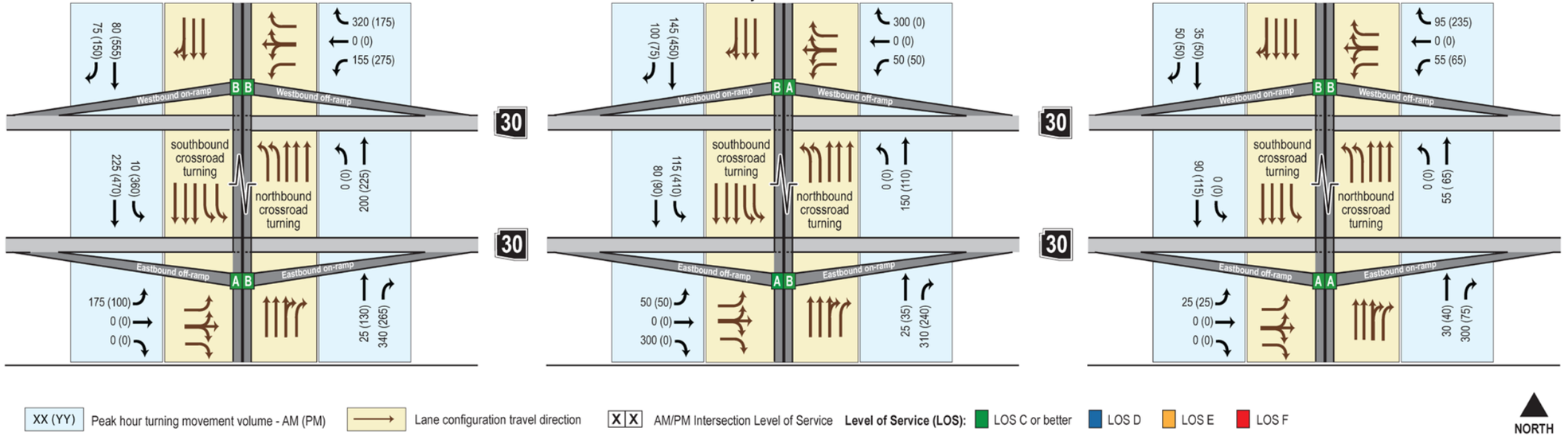
Avondale Boulevard (115th Avenue) is currently a four-lane arterial street located in Avondale. Surrounding land use mostly consists of residential developments, agricultural land, and vacant parcels. By 2035, most of the agricultural and vacant land would be converted to residential and commercial uses. PIR is located just south of the proposed TI south of the Gila River. It will be widened to six lanes, having three travel lanes in each direction by 2035. A CDI is proposed at this location with signalized intersections. This arterial street has an existing bridge crossing over the Gila River.

The recommended lane configuration, traffic volumes during the peak period, and LOS results are presented in Figure 7.6. The Synchro analysis results for all the alternatives are presented in Table 7.6.

Table 7.6 – Avondale Boulevard Service Traffic Interchange Analysis Results (2035)

SR 30 Alternative	Signal	Optimized Cycle Length (seconds)	AM Peak Hour		PM Peak Hour	
			LOS	Delay (seconds/vehicle)	LOS	Delay (seconds/vehicle)
North/Center	North	60	B	14.6	B	11.8
	South		A	9.6	B	12.5
South	North	60	B	13.2	B	15.9
	South		A	3.6	A	4.4
SS Hybrid	North	60	B	13.6	A	6.4
	South		A	9.5	B	13.6

Figure 7.6 – Avondale Boulevard, Turning Movement Volume, Lane Configuration, and AM and PM Level of Service (2035)



7.5.7 107th Avenue

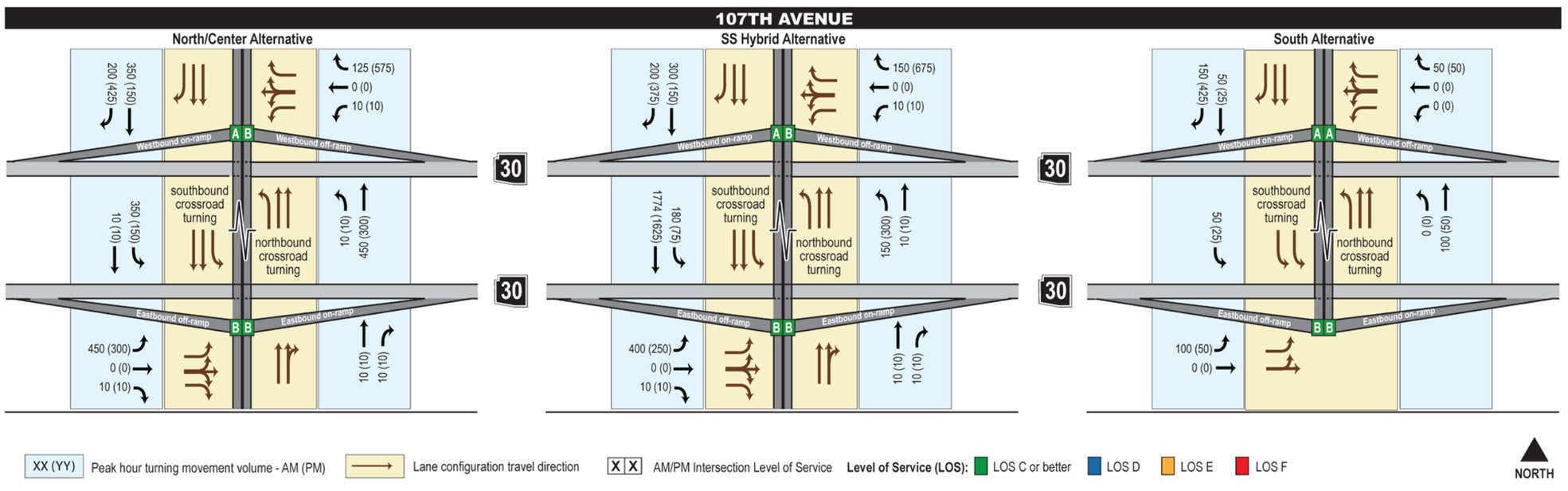
107th Avenue is currently a two-lane arterial street located at the boundary between Avondale and Phoenix. The surrounding land uses consist of residential, agricultural, and vacant lands. By 2035, most of the agricultural and vacant land would be converted to residential and commercial uses. The Gila River is located south of the proposed TI. It will be widened to four lanes, having two travel lanes in each direction by 2035. A CDI is proposed at this location with signalized intersections. The recommended lane configuration, traffic volumes during the peak period, and LOS results are presented in Figure 7.7. The Synchro analysis results for all the alignment alternatives are presented in Table 7.7.

The North, Center/SS Hybrid, and South Alternatives have different locations at 107th Avenue. As a result, different geometries are proposed for this TI. The South Alternative TI location would be immediately north of the Gila River and would not have a southern leg at the south TI intersection.

Table 7.7 – 107th Avenue Service Traffic Interchange Analysis Results (2035)

SR 30 Alternative	Signal	Optimized Cycle Length (seconds)	AM Peak Hour		PM Peak Hour	
			LOS	Delay (seconds/vehicle)	LOS	Delay (seconds/vehicle)
North/Center	North	60	A	8.1	B	11.2
	South		B	13.7	B	15
South	North	60	A	5.3	A	4.7
	South		B	16.7	B	17.7
SS Hybrid	North	60	A	7.8	B	12.3
	South		B	14	B	14.2

Figure 7.7 – 107th Avenue, Turning Movement Volume, Lane Configuration, and AM and PM Level of Service (2035)



7.5.8 91st Avenue

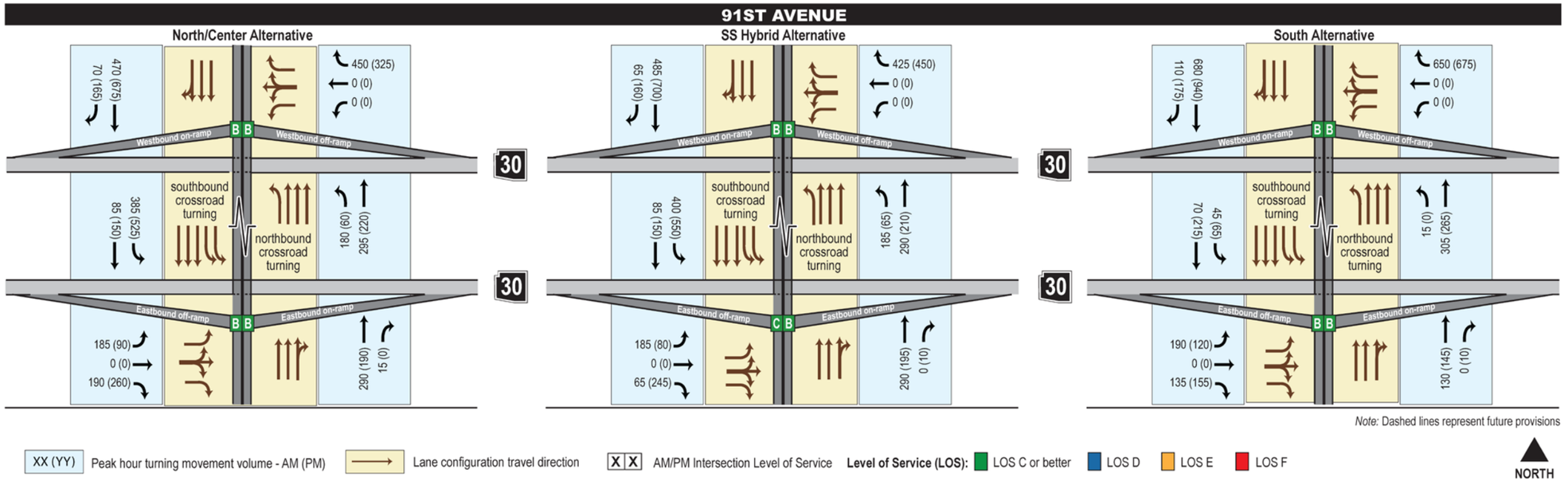
91st Avenue is currently a two-lane arterial street maintained by the City of Phoenix. Surrounding land uses within the Study Area feature residential developments, a wastewater treatment plant, and agricultural land. Most of the land would be converted from agricultural to residential and commercial use by 2035. A CDI is proposed at this location. 91st Avenue is planned to be widened to four lanes by 2035. This TI will be signalized.

The 2035 AM and PM peak hour turning movement volumes, recommended lane configurations, and LOS results are shown in Figure 7.8. The Synchro analysis results for all the alternatives are presented in Table 7.8.

Table 7.8 – 91st Avenue Service Traffic Interchange Analysis Results (2035)

SR 30 Alternative	Signal	Optimized Cycle Length (seconds)	AM Peak Hour		PM Peak Hour	
			LOS	Delay (seconds/vehicle)	LOS	Delay (seconds/vehicle)
North/Center	North	70	B	13.4	B	18.1
	South		B	17	B	17.1
South	North	70	B	12.2	B	11.4
	South		B	19.5	B	16.5
SS Hybrid	North	70	B	11.4	B	12.1
	South		C	21.7	B	16.7

Figure 7.8 – 91st Avenue, Turning Movement Volume, Lane Configuration, and AM and PM Level of Service (2035)



7.5.9 83rd Avenue

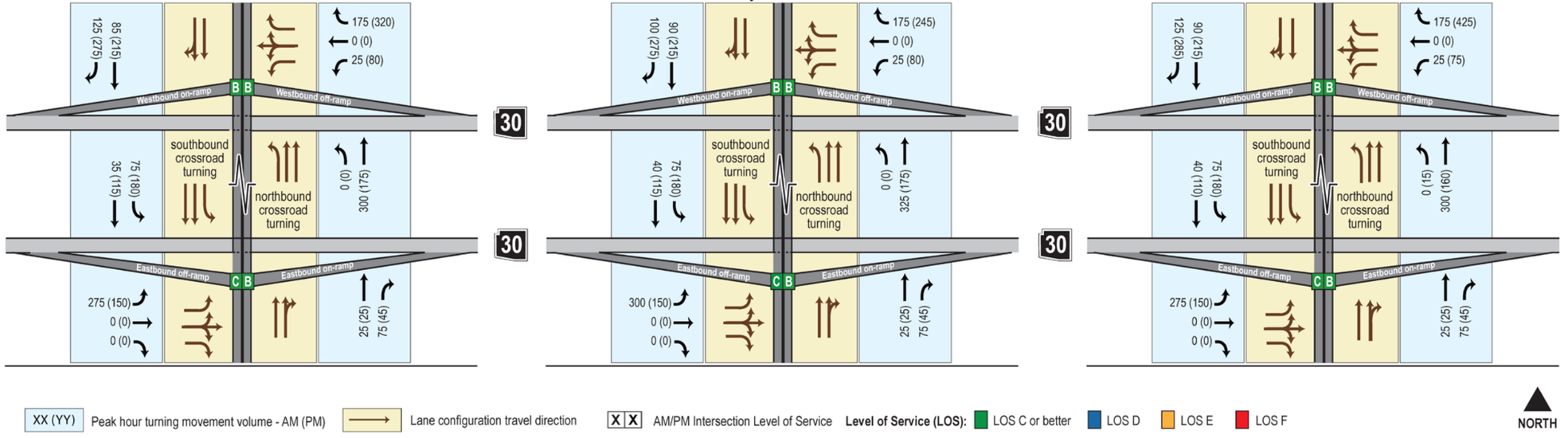
83rd Avenue is currently a two-lane road. Surrounding land uses are mostly agricultural. Most of this land would be converted to residential and commercial use around 2035. A CDI is proposed at this location with traffic signals at the intersections. This roadway is planned to be widened to four lanes by 2035.

The 2035 AM and PM peak hour turning movement volumes, recommended lane configurations, and LOS are shown in Figure 7.9. The Synchro analysis results for all the alternatives are presented in Table 7.9.

Table 7.9 – 83rd Avenue Service Traffic Interchange Analysis Results (2035)

SR 30 Alternative	Signal	Optimized Cycle Length (seconds)	AM Peak Hour		PM Peak Hour	
			LOS	Delay (seconds/vehicle)	LOS	Delay (seconds/vehicle)
North/Center	North	90	B	15.1	B	17.3
	South		C	24.9	B	16
South	North	90	B	15.1	B	18.8
	South		C	24.7	B	16
SS Hybrid	North	90	B	15.4	B	15.8
	South		C	25.3	B	15.9

Figure 7.9 – 83rd Avenue, Turning Movement Volume, Lane Configuration, and AM and PM Level of Service (2035)



7.5.10 67th Avenue

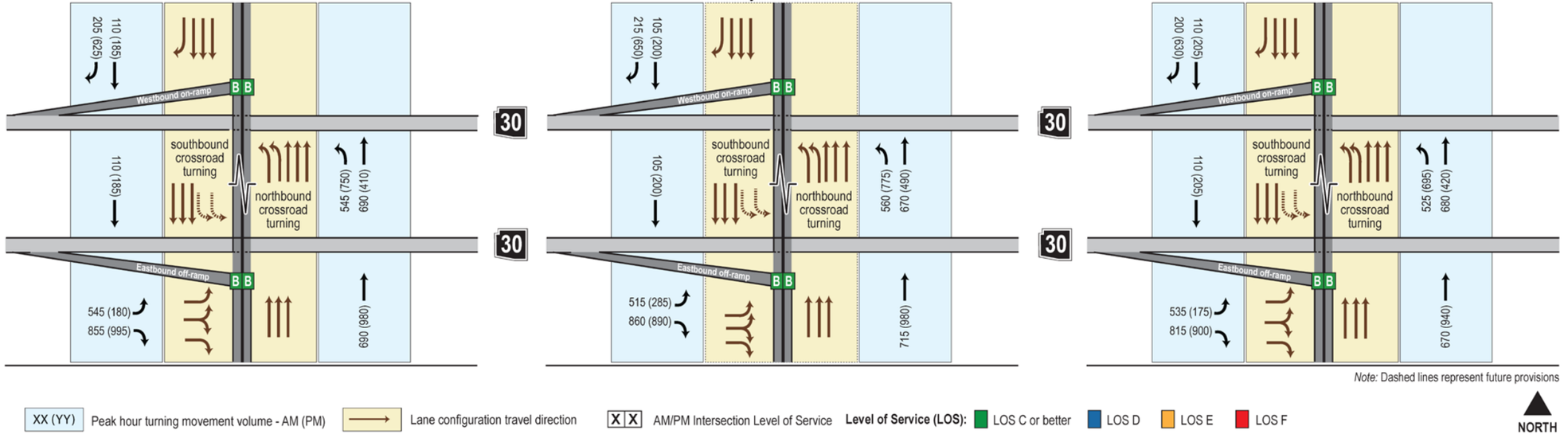
The 67th Avenue TI would be located at the eastern end of the proposed SR 30 freeway. Today, the surrounding area is primarily residential with some scattered agricultural properties. Most of this agricultural land would convert to residential and commercial uses around 2035. 67th Avenue is currently a two-lane arterial street located in Phoenix. By 2035, 67th Avenue is planned to be widened to six lanes, with three lanes in each travel direction. A half CDI (westbound on-ramp, eastbound off-ramp) is proposed at this location with signalized intersections. It is envisioned that this could become a full diamond TI if or when SR 30 is extended east of SR 202L. Provisions are proposed in the 67th Avenue typical section to easily accommodate this.

The 2035 AM and PM peak hour turning movement volumes and the proposed lane configurations used in the LOS analysis are presented in the Figure 7.10. The Synchro analysis results for all the alternatives are presented in Table 7.10.

Table 7.10 – 67th Avenue Service Traffic Interchange Analysis Results (2035)

SR 30 Alternative	Signal	Optimized Cycle Length (seconds)	AM Peak Hour		PM Peak Hour	
			LOS	Delay (seconds/vehicle)	LOS	Delay (seconds/vehicle)
North/Center	North	70	B	15.7	B	18.1
	South		B	16.7	B	15.2
South	North	70	B	15.7	B	17.7
	South		B	16.5	B	14.6
SS Hybrid	North	70	B	15.7	B	18.5
	South		B	16.8	B	16.3

Figure 7.10 – 67th Avenue, Turning Movement Volume, Lane Configuration, and AM and PM Level of Service (2035)



7.6 Turning Movement Storage Length

The minimum storage lengths for turning movements were determined using the methodology presented in the ADOT *Lessons Learned Document on Traffic Volume Projections and Operational Analysis* (2005). The methodology compares the queue lengths from the sources listed below and uses engineering judgment based on this comparison to determine an appropriate storage length.

- Synchro 50 and 95 percentile queue length from intersection report
- ADOT *Traffic Engineering Policies, Guides, and Procedures* section 430, Turn Lane Design
- ADOT Phoenix Construction District memorandum (February 2000) stating "The default storage length for left turn lanes and right turn lanes shall be 300 and 250 feet, respectively."
- any known outside factors that could affect storage

The minimum storage lengths proposed for the crossroad and ramp turning lanes are presented in Table 7.11. In almost all cases, the controlling criteria were more than the minimum 300 feet for left-turn lanes and 250 feet for right-turn lanes.

Table 7.11 – Turn Lane Minimum Storage Lengths (feet)

Turn Lane	Cotton Lane	Sarival Avenue	Estrella Parkway	Bullard Avenue	Dysart Road	El Mirage Road	Avondale Boulevard	107th Avenue	99th Avenue	91st Avenue	83rd Avenue	75th Avenue	67th Avenue
North Intersection													
Eastbound left	300/300/300	300/300/300	300/300/300	300/300/300	300/300/300	300/300/300	300/300/300	300/300/300	300/300/300	300/300/300	300/300/300	300/300/300	300/300/300
Eastbound right	250/250/250	250/250/250	250/250/250	250/250/250	250/250/250	250/250/250	250/250/250	250/250/250	250/250/250	250/250/250	250/250/250	250/250/250	250/250/250
Westbound left	300/300/300	**350/350/350**	300/300/300	300/300/300	300/300/300	300/300/300	**350/350/350**	**350/350/350**	300/300/300	**350/350/350**	**350/350/350**	300/300/300	300/300/300
Westbound right	**350/350/350**	250/250/250	**350/350/350**	**350/350/350**	**350/350**/250	250/250/250	**350/350/350**	250/250/250	250/250/250	**350/350/350**	250/250/250	250/250/250	250/250/250
Northbound left	300/300/300	300/300/300	300/300/300	**450**/300/300	**450**/300/300	300/300/300	**450**/300/300	**450**/300/**450**	300/300/300	300/300/300	300/300/300	300/300/300	300/300/300
Northbound right	250/250/250	250/250/250	250/250/250	250/250/250	250/250/250	250/250/250	250/250/250	250/250/250	250/250/250	250/250/250	250/250/250	250/250/250	250/250/250
Southbound left	300/300/300	300/300/300	300/300/300	300/300/300	300/300/300	300/300/300	300/300/300	300/300/300	300/300/300	300/300/300	300/300/300	300/300/300	300/300/300
Southbound right	250/250/250	250/250/250	250/250/250	250/250/250	250/250/250	250/250/250	250/250/250	250/250/250	250/250/250	250/250/250	250/250/250	250/250/250	250/250/250
South Intersection													
Eastbound left	300/300/300	300/300/300	**350/350/350**	300/300/300	300/300/300	300/300/300	300/300/300	300/300/300	300/300/300	**350/350/350**	**350/350/350**	300/300/300	**350/350/350**
Eastbound right	250/250/250	250/250/250	**350/350/350**	**350/350/350**	**350/350**/250	250/250/250	**350/350/350**	**350**/250/**350**	250/250/250	**350/350/350**	250/250/250	250/250/250	250/250/250
Westbound left	300/300/300	300/300/300	300/300/300	300/300/300	300/300/300	300/300/300	300/300/300	300/300/300	300/300/300	300/300/300	300/300/300	300/300/300	300/300/300
Westbound right	250/250/250	250/250/250	250/250/250	250/250/250	250/250/250	250/250/250	250/250/250	250/250/250	250/250/250	250/250/250	250/250/250	250/250/250	250/250/250
Northbound left	300/300/300	300/300/300	300/300/300	300/300/300	300/300/300	300/300/300	300/300/300	300/300/300	300/300/300	300/300/300	300/300/300	300/300/300	300/300/300
Northbound right	250/250/250	250/250/250	250/250/250	250/250/250	250/250/250	250/250/250	250/250/250	250/250/250	250/250/250	250/250/250	250/250/250	250/250/250	250/250/250
Southbound left	300/300/300	300/300/300	300/300/300	300/300/300	300/300/300	300/300/300	300/300/300	300/300/300	300/300/300	300/300/300	300/300/300	300/300/300	300/300/300
Southbound right	250/250/250	250/250/250	250/250/250	250/250/250	250/250/250	250/250/250	250/250/250	250/250/250	250/250/250	250/250/250	250/250/250	250/250/250	250/250/250

Notes: x/x/x = North and Center/South/SS Hybrid Alternatives;

8. SR 30 AND SR 202L SYSTEM TRAFFIC INTERCHANGE ANALYSIS

8.1 Background

This section discusses the traffic operational analysis at the SR 30 and SR 202 L system TI conducted using the VISSIM micro simulation analysis tool.

The operational analysis of the system TI at SR 30 and SR 202L required a comprehensive study of the network, because of its unique configuration, which included the adjacent arterial street network and the nearby I-10 and SR 202L system TI. VISSIM micro simulation software version 5.30-09, developed by PTV AG, Germany, was used to analyze the traffic operations in 2035 for the system TI Options 3B-1 and 3B-2 as described in section 2.3.

8.2 Interchange Operational Influence Area

The study area for the evaluation of the traffic operations at the SR 30 and SR 202L system TI extended from the Elliot Road and SR 202L service TI in the south to the I-10 and SR 202L system TI in the north. The area also included the I-10 main line from 75th Avenue to 43rd Avenue and the proposed SR 30 freeway segment west to the 91st Avenue service TI. Figure 8.1 shows the study area modeled in VISSIM to evaluate the traffic operational performance of the SR 30 and SR 202L system TI. The North Alternative for the proposed SR 30 freeway was assumed because of its projected high volumes among all alternatives.

8.3 VISSIM Model Development

The VISSIM model developed for the study consists of five basic components: (1) roadway network (links and connectors), (2) volume data, (3) vehicle routes, (4) traffic control, and (5) model parameters. The following sections describe in detail the development of each of these components.

8.3.1 Roadway Network (Geometrics)

The roadway geometry for the SR 30 and SR 202L system TI was coded for the respective scenarios (Options 3B-1 and 3B-2) based on the preliminary design layout developed as part of the L/DCR. These included the elevations, horizontal curvature, and lane configurations. The roadway network for the SR 202L and I-10 system TI were coded based on the preliminary preferred (W59 Alternative) option for the South Mountain Freeway, with the exclusion of HOV direct connector ramps. The HOV direct connector ramps between I-10 and SR 202L were included in the ultimate phase. In addition, these ramps did not attract much traffic. The cross street intersections were coded according to the number of lanes approaching the intersection and with the desired turn lane configuration. The intersections along McDowell Road were coded in accordance with the model used in the SR 202L study. Figures 2.10 and 2.12 show the number of lanes coded in the modeled network for Option 3B-1 and Option 3B-2, respectively.

Figure 8.1 – SR 30 and SR 202L System Traffic Interchange – VISSIM Model Study Area Network

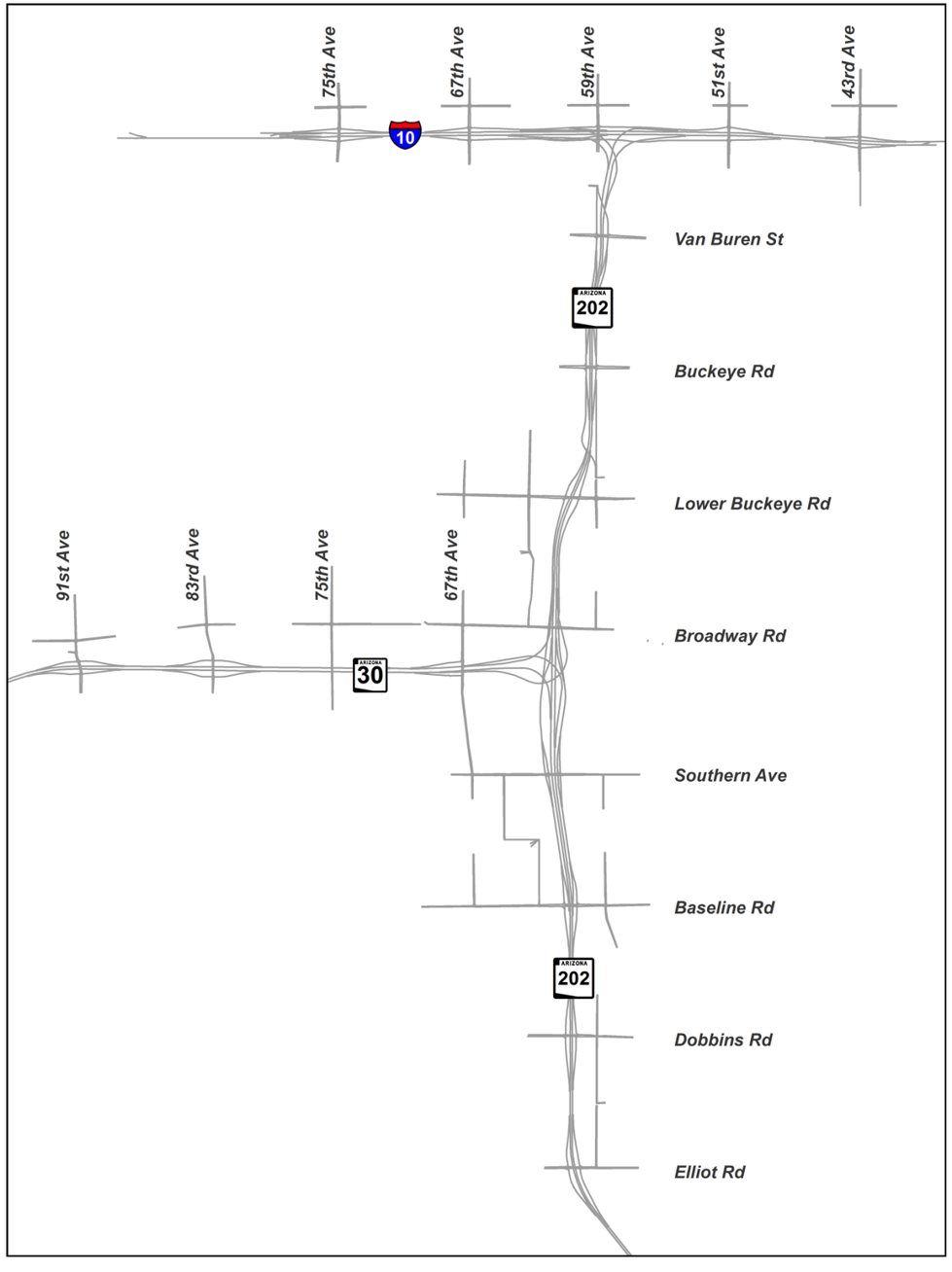
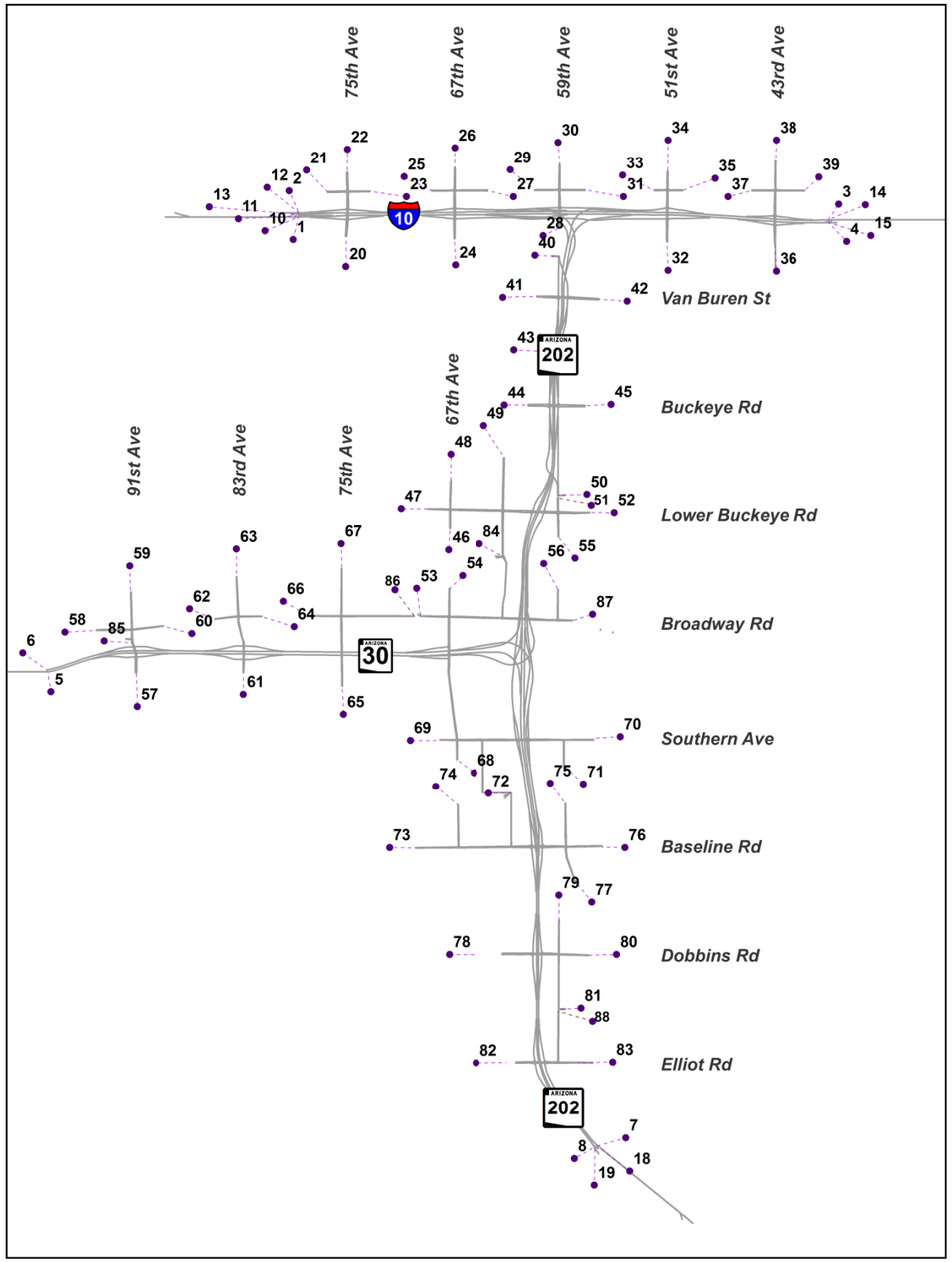


Figure 8.2 – Origin and Destination Nodes of the Sub Area Network



8.3.2 Traffic Data

MAG provided 2035 traffic volume projections for the entire study area network. These traffic projections included daily AM and PM peak period volumes. The 3-hour AM and PM peak period volumes were subdivided into individual peak hourly volumes in the proportions of 0.33, 0.35, and 0.32 for hour 1, hour 2, and hour 3, respectively. These three peak hours, termed as Peak Hours 1, 2, and 3 of the corresponding peak period (AM or PM) were modeled in VISSIM for analysis along with a 0.5-hour seeding interval, which is estimated as 75 percent of the Hour 2 (highest of the three peak hours) volume. MAG also provided the Study Team with origin-destination (OD) matrices for AM and PM peak hour peak volumes for a sub area network that was extracted from the 2035 MAG travel demand model network. The sub area network reflected the study area network that was developed in VISSIM. Figure 8.2 shows the OD nodes and the sub area model network. There are 85 OD nodes with an 85 x 85 OD matrix.

8.3.3 Vehicle Routes

VISSIM simulates the traffic through the network using paths defined for each OD pair. These paths are called routes in VISSIM. In general, there are as many numbers of routes as there are non-zero OD pairs in an OD matrix. There were approximately 1,207 and 1,260 non-zero OD pairs for the AM and PM peak periods, respectively. But for the study, the number of routes coded has been reduced by selecting OD pairs that have only five or more trips. The selected non-zero OD pair volumes were also rounded to the nearest 5. The modeled routes thus coded in the model ended up being 713 routes for the AM peak hour and 768 routes for the PM peak hour. The routes were coded such that the vehicle traverses the most direct path between a particular OD pair.

8.3.4 Traffic Control

All the study area intersections were coded as signalized intersections with actuated signal timing. The signal timing was optimized and coordinated for the assigned traffic flows using Synchro software. The timing was then imported into the VISSIM models.

8.3.5 Model Parameters

The traffic flow model used by VISSIM is a discreet, stochastic, time step based microscopic model, with driver and vehicle-units as single entities. The model contains a psycho-physical car following model for longitudinal vehicle movement and a rule-based algorithm for lateral movements (lane changing). Various driving, vehicle, and lane changing behavior parameters are used to emulate this traffic flow model. Usual practice for modeling is to use the parameters that are present as defaults in the software program. However, certain driving behavior parameters are changed in the current model. These specific changes to driving behavior parameters were taken from the VISSIM models developed for the South Mountain Freeway study. Speed distribution and vehicle composition were also adopted from the South Mountain Freeway VISSIM models. This, in effect, reflected general driving behavior and driving conditions that are currently observed on the existing adjacent freeway network on I-10 in the new model.

8.4 VISSIM Model Calibration

Because this is a future planned freeway network, the model was not calibrated to any existing conditions; however, use of model parameters from the South Mountain Freeway study has ensured that the general driving behavior and

driving conditions observed on the existing adjacent freeway network, i.e., on I-10, is modeled on the planned SR 30 and SR 202L freeway network.

8.5 Measures of Effectiveness

Operational performance is expressed in terms of measures of effectiveness, which include average vehicle speed, delay, miles of travel, travel time, and vehicle density. While the VISSIM model provides a variety of measures of effectiveness, only LOS for freeway segments and intersections based on vehicle density and average vehicle delays were used for this project.

8.5.1 Freeway Level of Service

For freeways, VISSIM reports densities (and speeds) on a per-link basis, and does not typically distinguish between "main line," "ramp junction," and "weave section" (as HCM does) in calculating measures of effectiveness. VISSIM segmentation is typically based on the characteristics of the link (speed, number of lanes) or locations where interruptions/changes occur (ramp junction, lane drop, etc.). For the purposes of this study, density was extracted for each segment in the VISSIM model, and the HCM freeway main line density-LOS correlation was used to evaluate all segments. The LOS letter designation derived using VISSIM-reported densities is approximate, since the densities from VISSIM are not reported in terms of passenger car per mile per lane, but are rather reported as number of vehicles per mile per lane. Table 4.1 shows the LOS by density for freeway segments.

8.5.2 Intersection Level of Service

Using procedures in the HCM and the measures of effectiveness reported by VISSIM, LOS was determined for interchanges and intersections within the Study Area network (refer to Table 4.2 for LOS criteria).

8.6 VISSIM Model Results

The Figures 8.3 to 8.14 present the LOS for freeway segments and interchanges, along with intersections, on adjacent cross streets. To account for inherent variability in traffic flow and operations, 10 runs were performed for each model scenario and the average results were reported.

8.7 Micro Simulation Analysis Findings

To evaluate the traffic operational performance differences between Options 3B-1 and 3B-2, the LOS of freeway segments as well as intersection LOS at the TIs and adjacent cross street intersections were evaluated. Micro simulation analysis results for the two options during the morning and evening peak periods are presented in Figures 8.3 through 8.14. Notable observations from the micro simulation analysis include:

- The overall projected operations on SR 30 and SR 202L in the vicinity of SR 30 and SR 202L system TI are acceptable, with LOS D or better for both the AM and PM peak periods. This is especially true for the first 2 hours of the simulation, indicating that the roadways would have adequate capacities and would operate at desired LOS.
- Traffic operations on the existing I-10 corridor are responsible for some of the congestion issues that are observed near the SR 30 and SR 202L system TI. Congested conditions are observed on I-10 in the eastbound direction in the AM peak period and on the westbound direction in the PM peak period.
- The backup caused in the I-10 eastbound direction in the AM peak period spills onto the NE system ramp of SR 202L at I-10, which in turn results in congestion on northbound SR 202L and eventually affects the EN system ramp of the SR 30 and SR 202L system TI. The EN system ramp operates at LOS E and F in Hour 3 for both the options studied in the AM peak period.
- Traffic operations on the freeway segments and intersections between Option 3B-1 and Option 3B-2 are mostly similar, except for intersection LOS differences along cross street intersections of 67th Avenue at the SR 30 and SR 202L freeways (67th Avenue and Broadway Road, 67th Avenue and SR 30, and 67th Avenue and Southern Avenue).
- The 67th Avenue westbound on-ramp performed at LOS E in the PM peak hour analysis period.
- In general, the operational performance near the SR 202L and SR 30 system TI is better in the PM peak period than in the AM peak period.
- The intersections of 67th Avenue and Broadway Road and 67th Avenue and Southern Avenue operate at LOS E in peak Hour 2 of the AM peak period. The intersections operate at LOS E and F in peak Hour 3 of the same AM peak period. The operations at these intersections can be improved by designing the intersections with appropriate lane configurations and, in general, are not influenced by freeway operations.

Figure 8.3 – SR 30 and SR 202L System Traffic Interchange Option 3B-1, AM Peak Hour 1 Level of Service (2035)

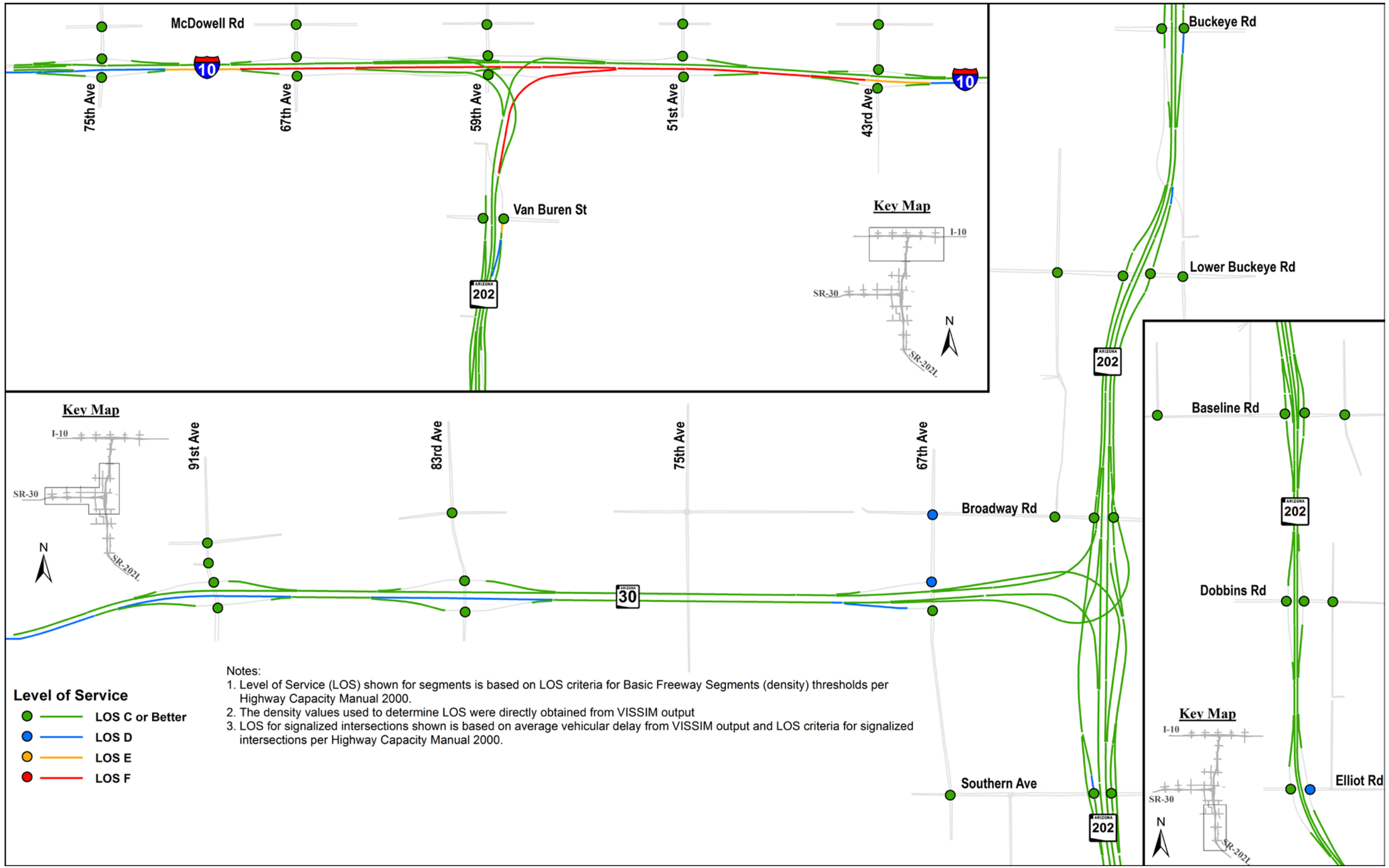


Figure 8.4 – SR 30 and SR 202L System Traffic Interchange Option 3B-1, AM Peak Hour 2 Level of Service (2035)

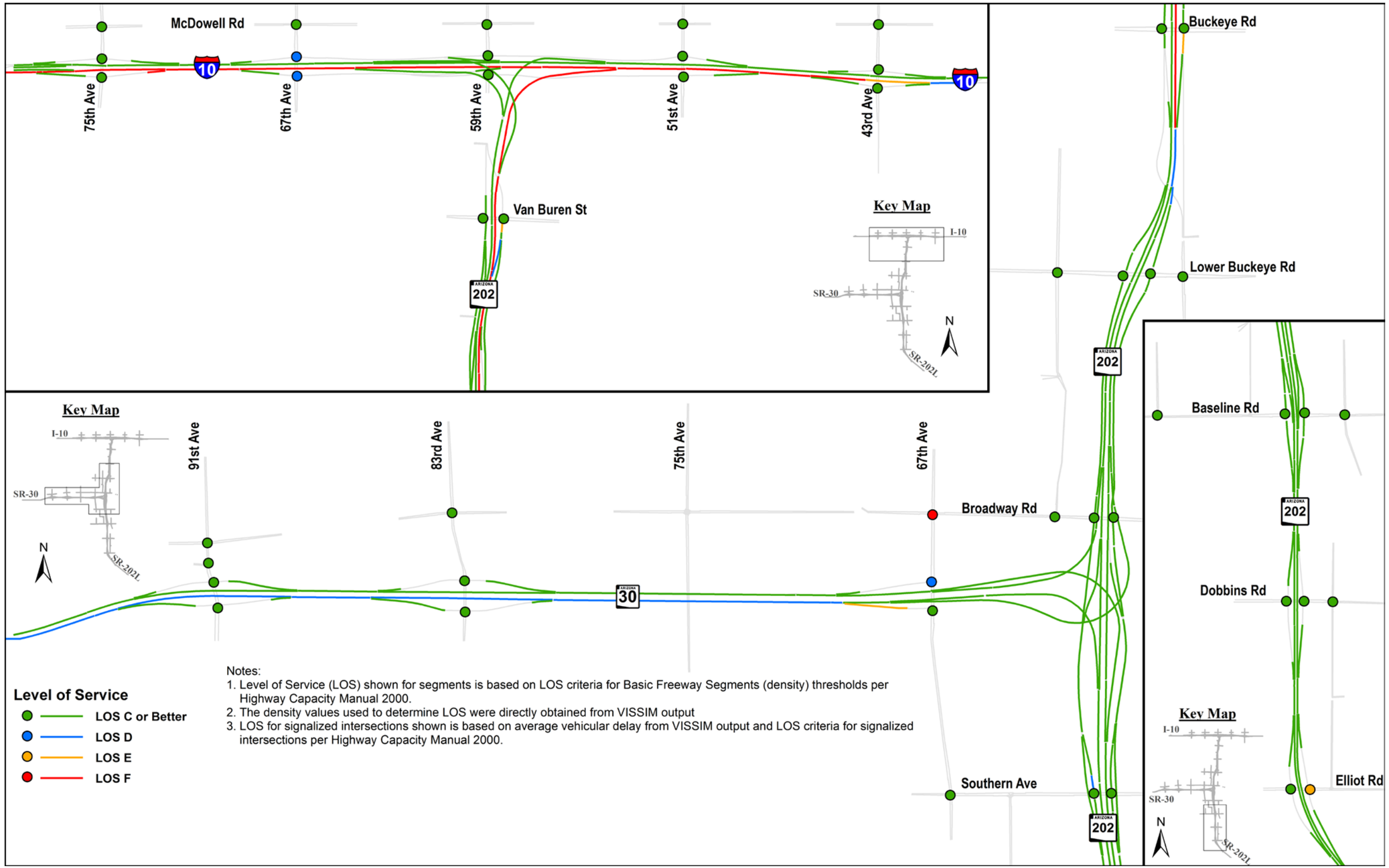


Figure 8.5 – SR 30 and SR 202L System Traffic Interchange Option 3B-1, AM Peak Hour 3 Level of Service (2035)

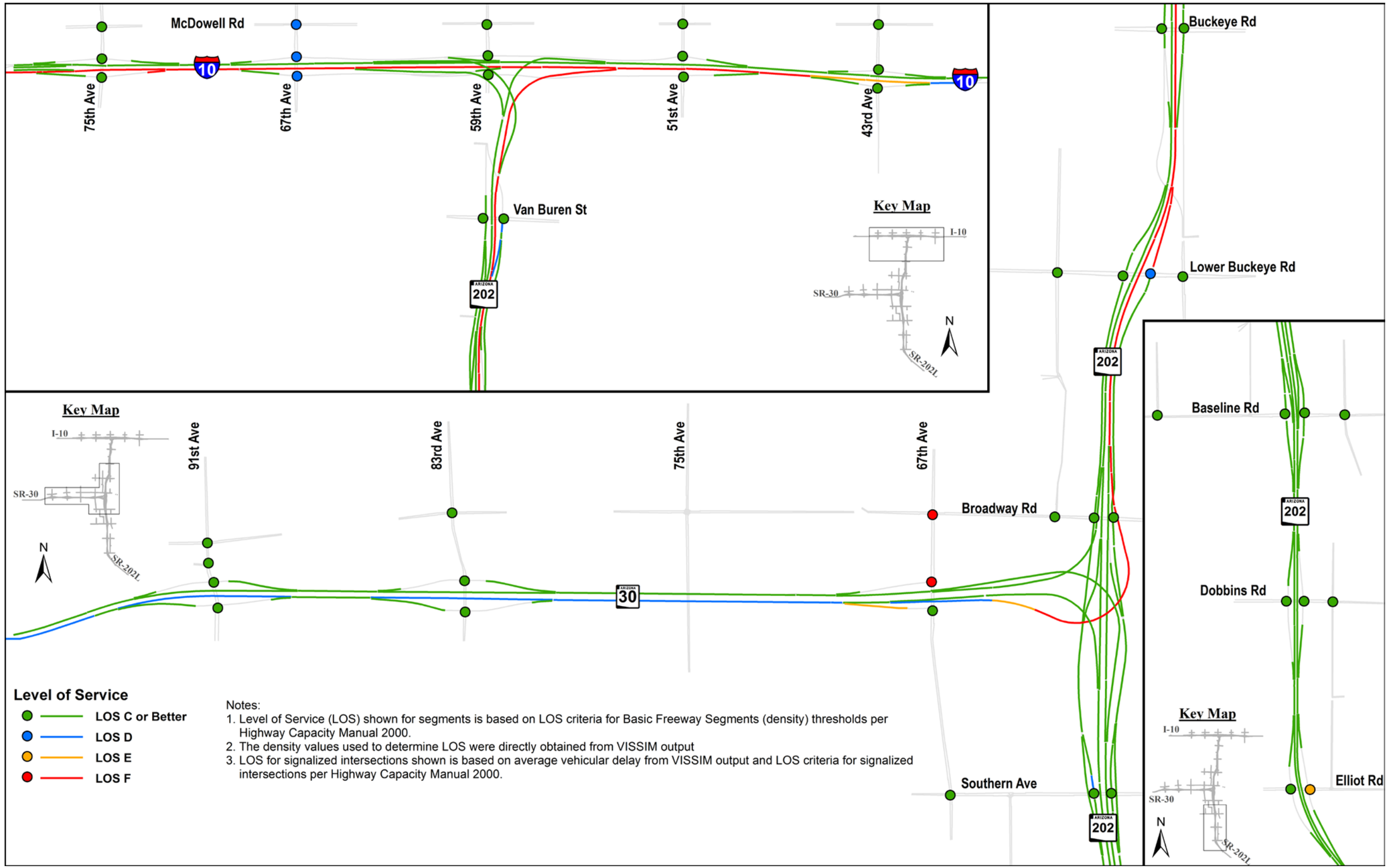


Figure 8.6 – SR 30 and SR 202L System Traffic Interchange Option 3B-1, PM Peak Hour 1 Level of Service (2035)

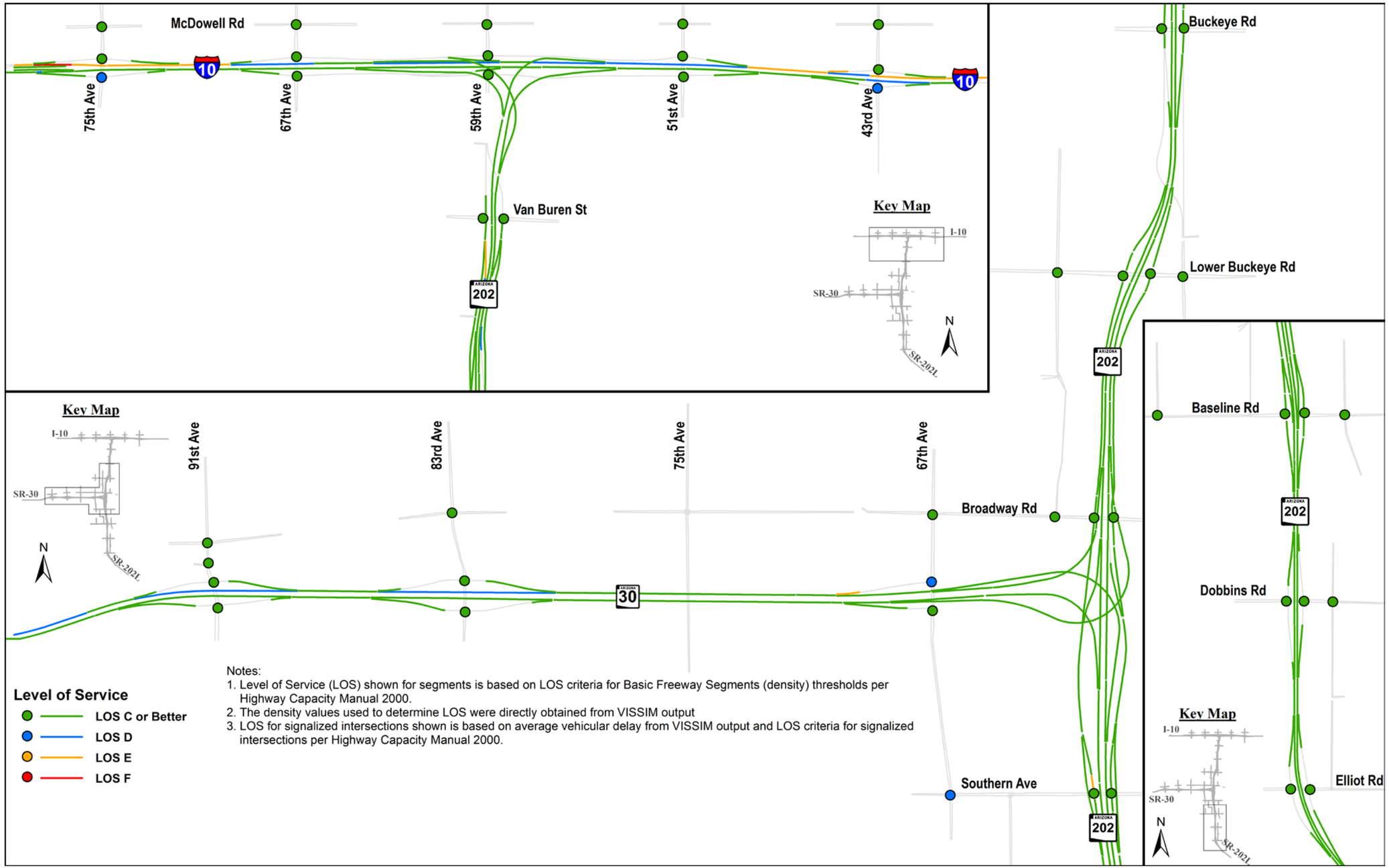


Figure 8.7 – SR 30 and SR 202L System Traffic Interchange Option 3B-1, PM Peak Hour 2 Level of Service (2035)

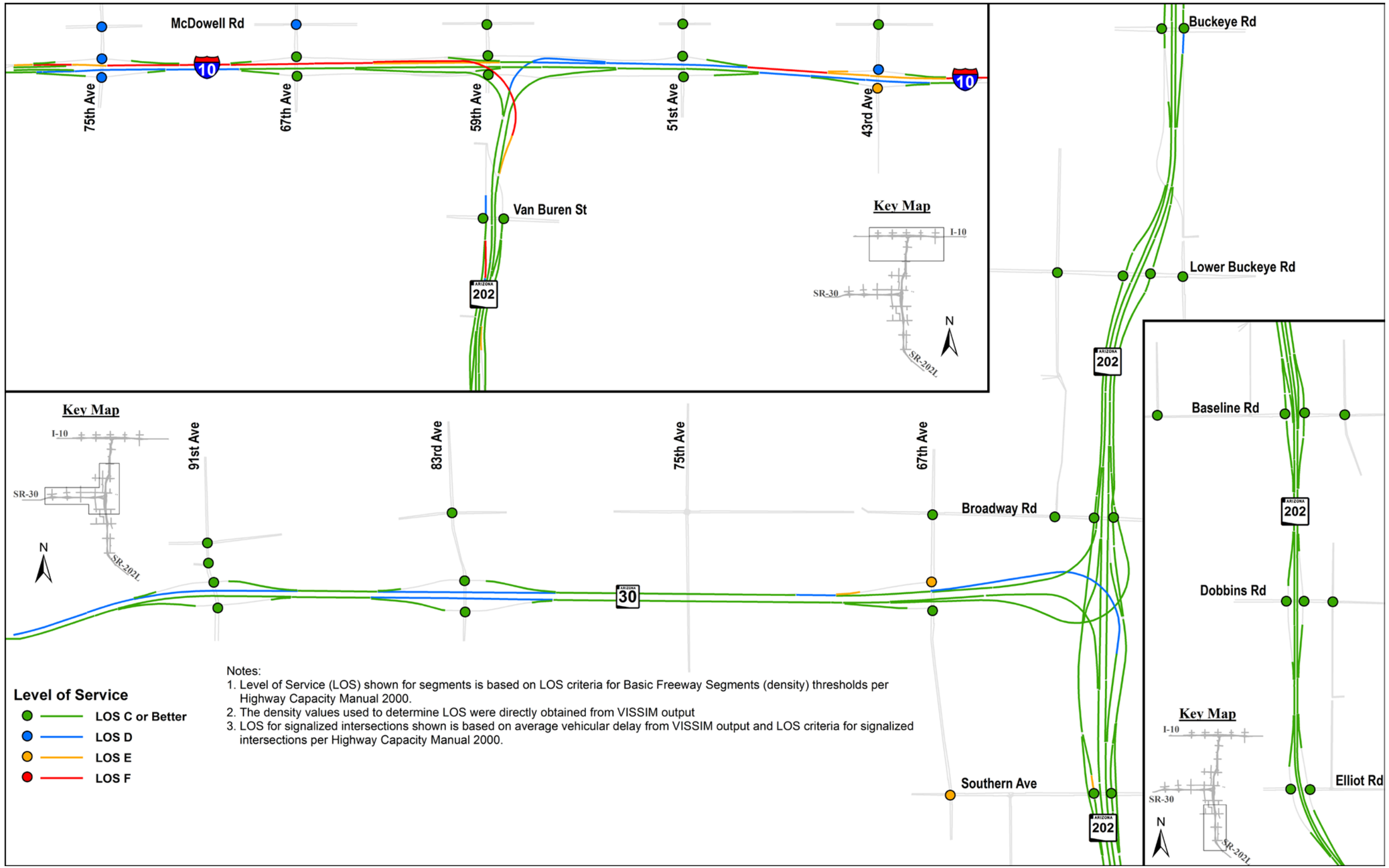


Figure 8.8 – SR 30 and SR 202L System Traffic Interchange Option 3B-1, PM Peak Hour 3 Level of Service (2035)

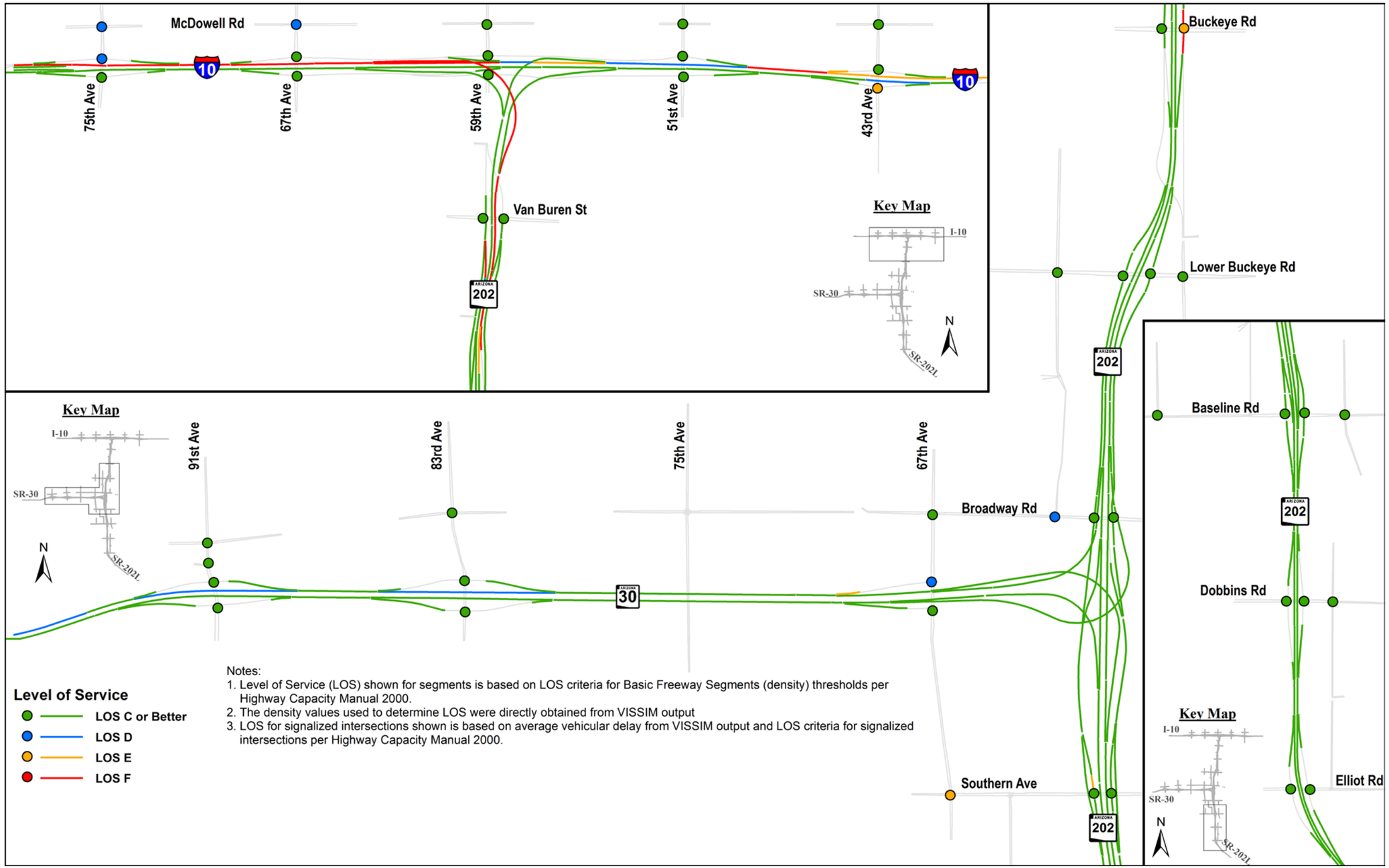


Figure 8.9 – SR 30 and SR 202L System Traffic Interchange Option 3B-2, AM Peak Hour 1 Level of Service (2035)

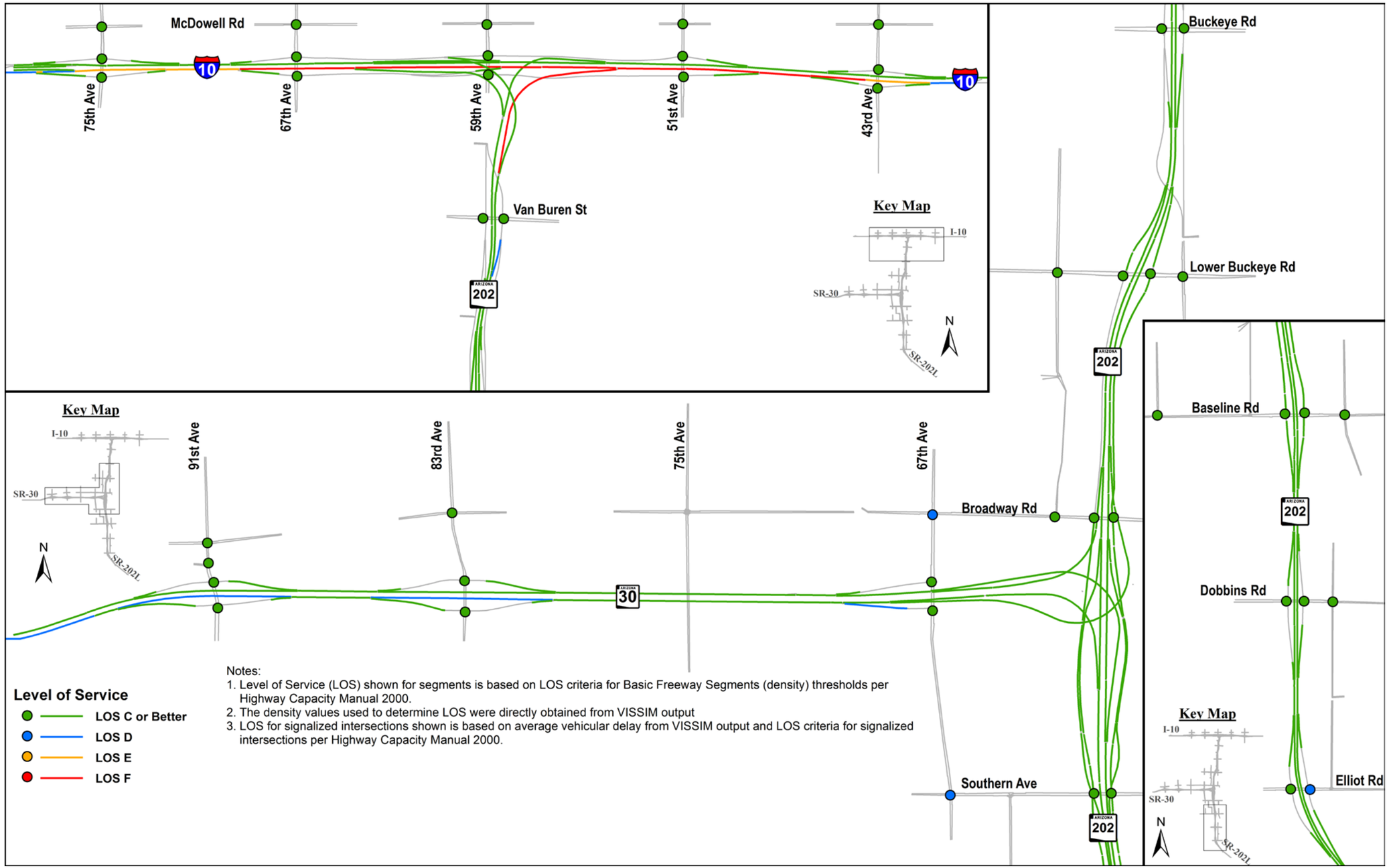


Figure 8.10 – SR 30 and SR 202L System Traffic Interchange Option 3B-2, AM Peak Hour 2 Level of Service (2035)

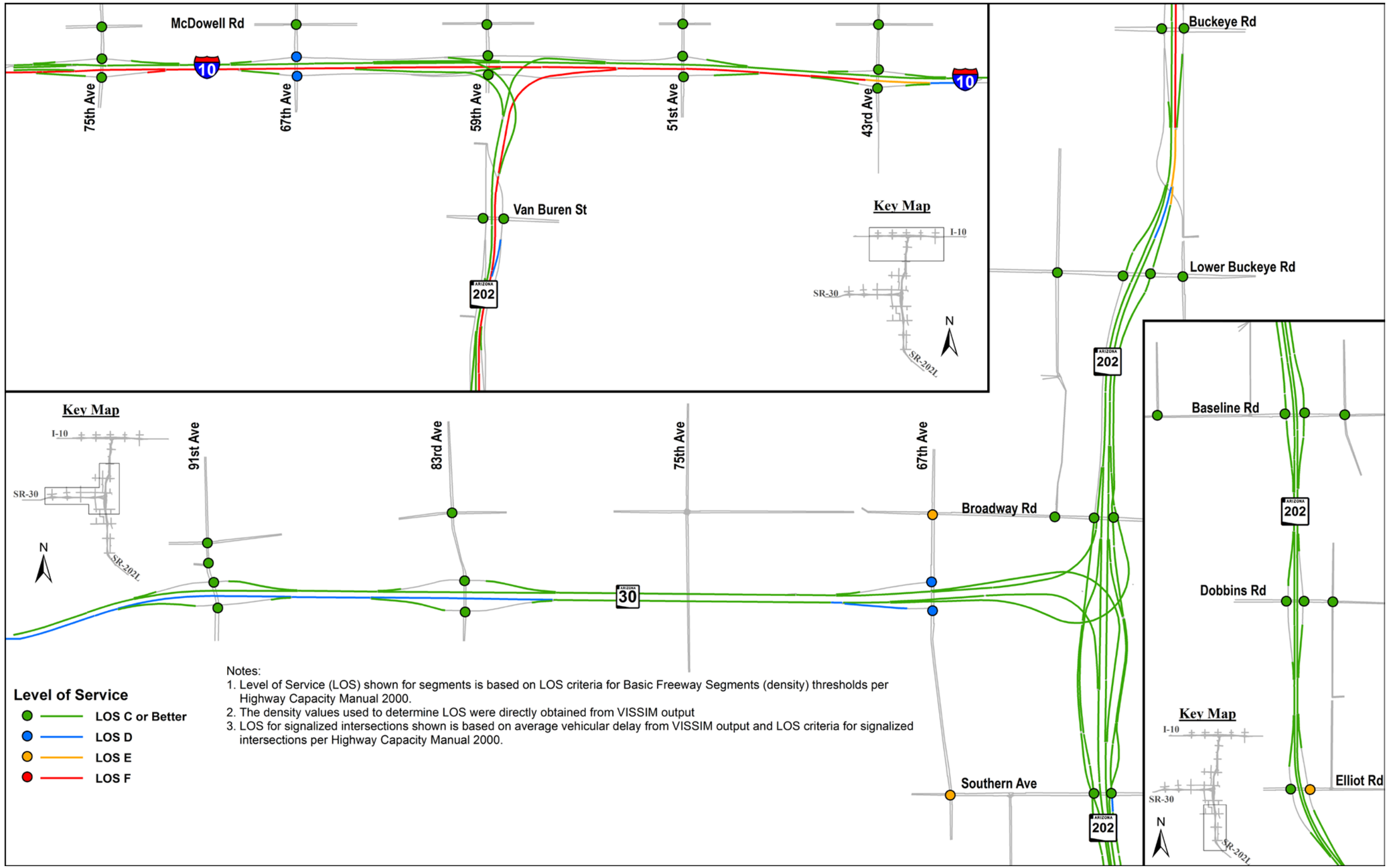


Figure 8.11 – SR 30 and SR 202L System Traffic Interchange Option 3B-2, AM Peak Hour 3 Level of Service (2035)

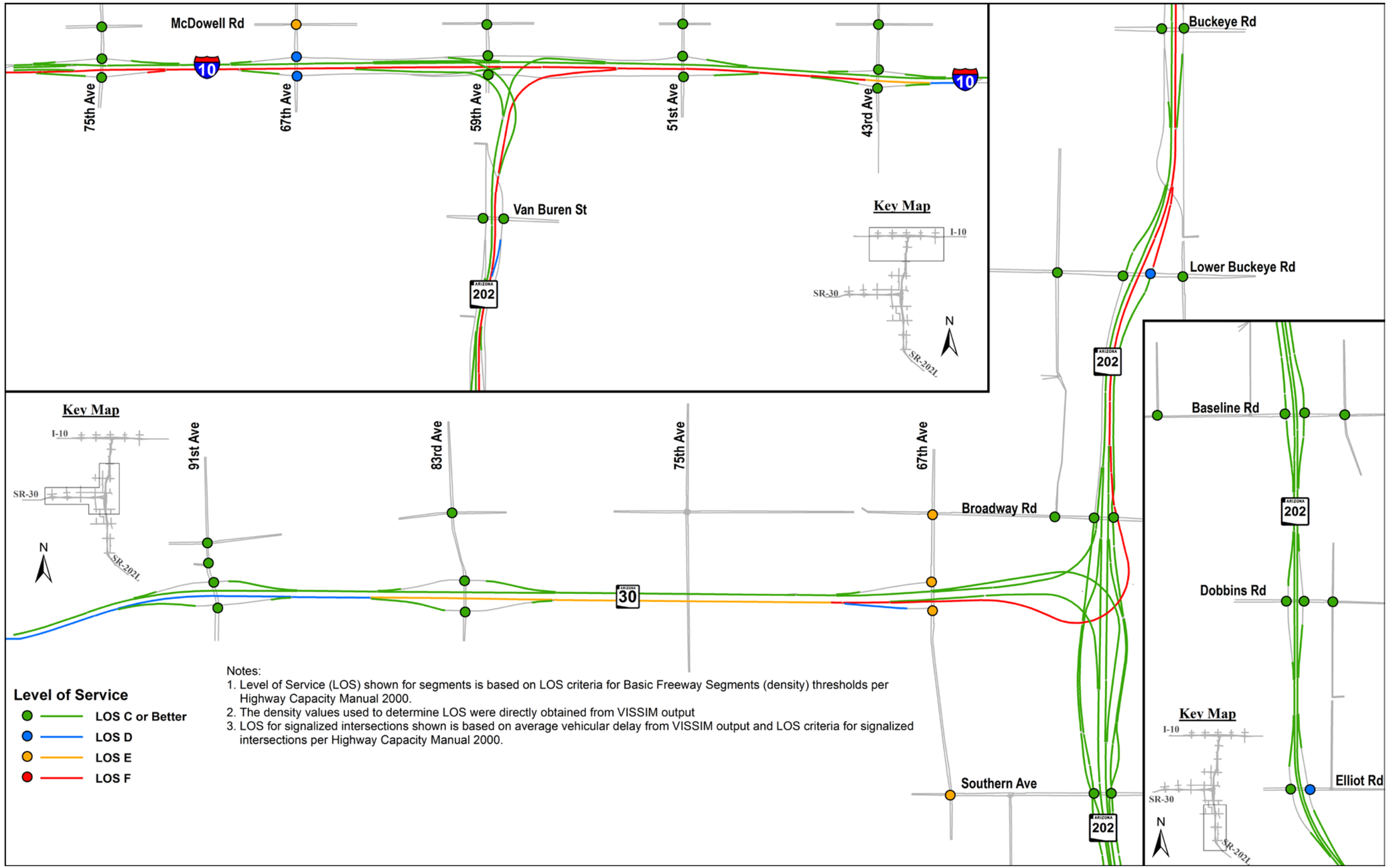


Figure 8.12 – SR 30 and SR 202L System Traffic Interchange Option 3B-2, PM Peak Hour 1 Level of Service (2035)

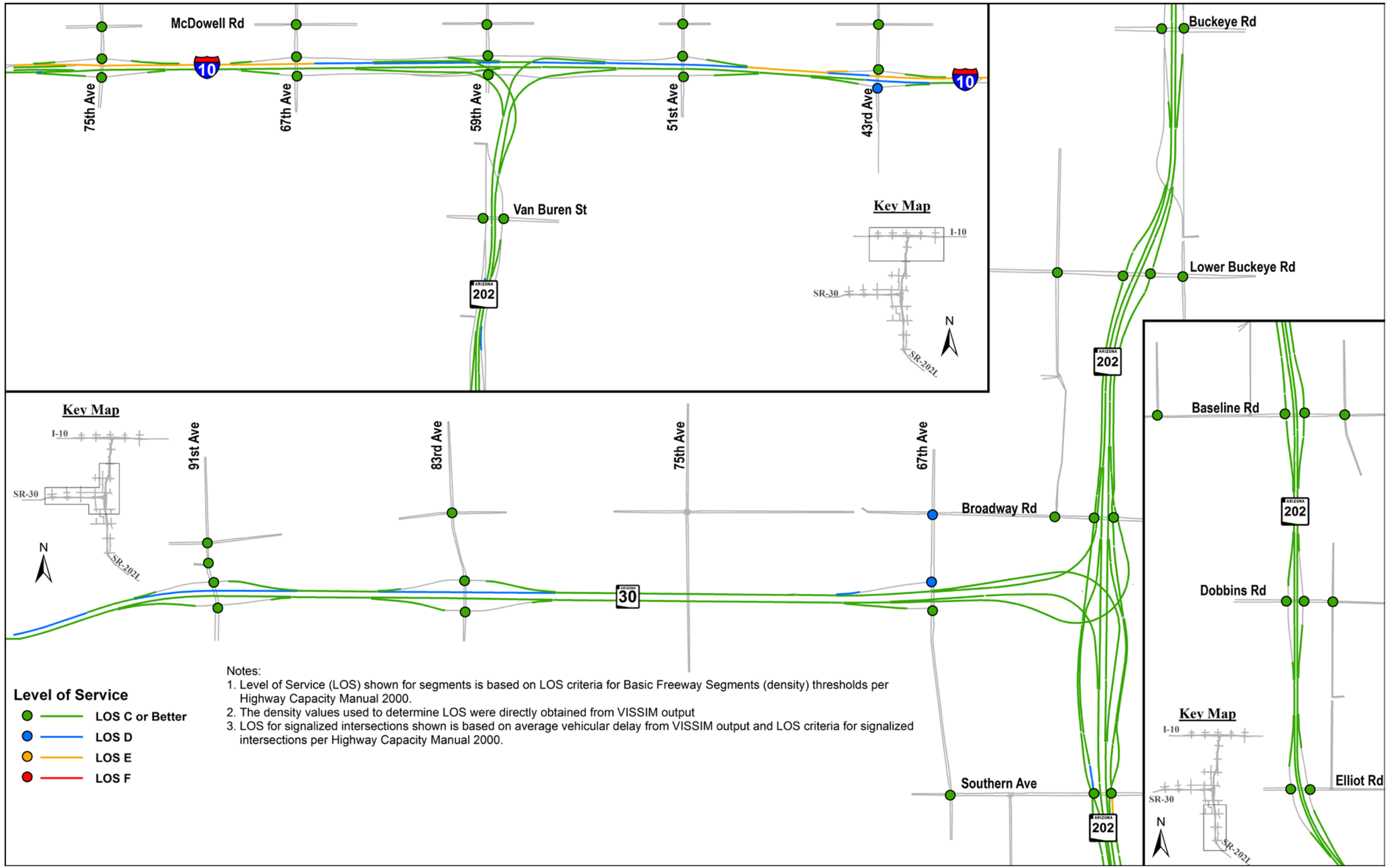


Figure 8.13 – SR 30 and SR 202L System Traffic Interchange Option 3B-2, PM Peak Hour 2 Level of Service (2035)

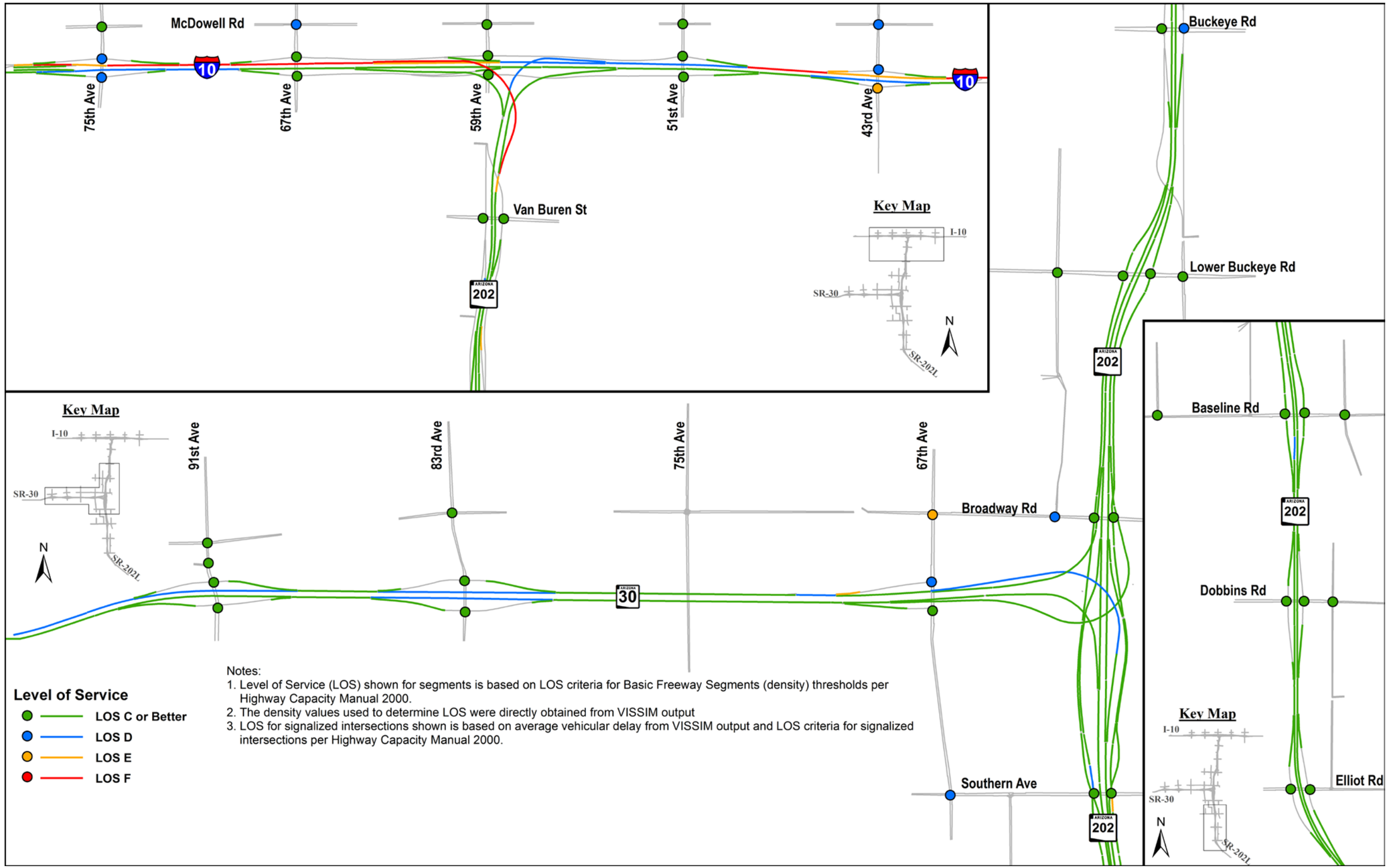
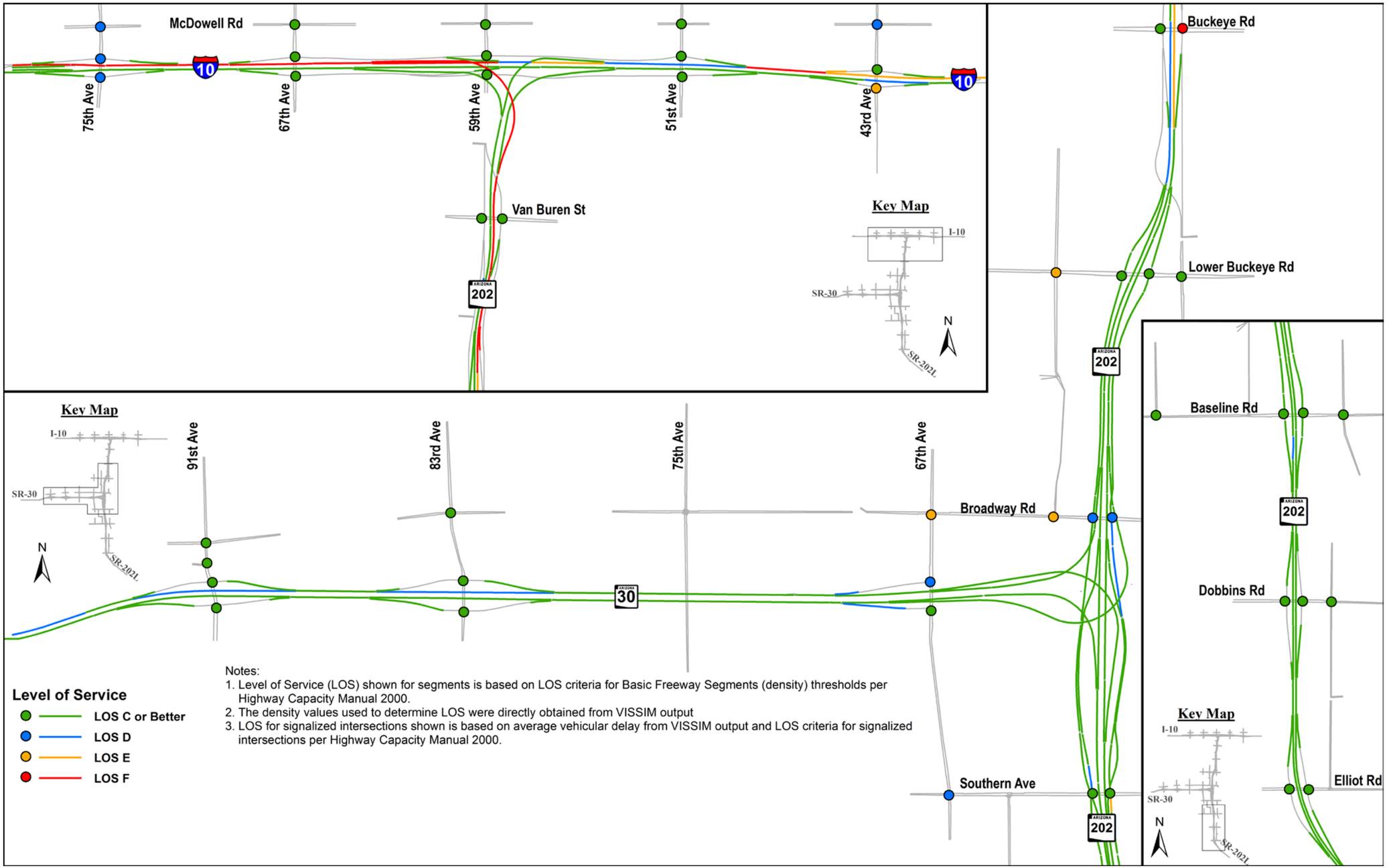


Figure 8.14 – SR 30 and SR 202L System Traffic Interchange Option 3B-2, PM Peak Hour 3 Level of Service (2035)



9. BUILD OUT CONDITIONS

ADOT typically desires that a new freeway continue to operate at an acceptable LOS for 20 years. As discussed earlier, the proposed SR 30 freeway would be open to the public around 2035 and with a design life of 20 years; it would be expected to operate at an acceptable LOS until 2055. It is not possible to determine the operational performance of the freeway in 2055 because the detailed traffic projections needed to perform such an analysis are not readily available from MAG. However, MAG has recently developed a build out model considering the growth potential in the south and southwest regions of the Phoenix metropolitan area. With the lack of traffic projections for 2055, the build out model may provide an indication about the expected performance of SR 30 at that time.

Build out represents the condition when all of the Study Area and its surrounding areas are fully developed, i.e., when most of the land is converted from agricultural use to residential and commercial uses. These conditions are estimated to occur around 2030 and 2035 for the cities of Avondale and Goodyear, while Buckeye may reach build out around 2060 or later. Under these conditions, the SR 30 freeway would attract more traffic from far south and southwest. This additional increase in traffic will create more congestion on SR 30 and will further degrade operations.

The build out socioeconomic projections were developed as part of ongoing MAG studies, and the travel demand model developed based on this information is generally referred to as the “8 million population” model. This model information was obtained from MAG based on the desired roadway network and functional classification and is used to present the expected operational performance of SR 30 in 2055 or beyond. The SR 30 North/Center Alternative was the only alternative used for the build out travel demand model because it would attract higher volumes compared with the other alternatives—representing the worst-case scenario—and also due to the high-level long-range planning forecasts (50 to 60 years out from the present). The 8 million population model network is coded with SR 30 extended west to SR 85, SR 303L extended south into Rainbow Valley south of SR 30, SR 85 as a full freeway, I-10 widened, and all planned arterial street widenings accomplished during that period. It is assumed that an additional general purpose lane and HOV lane would be added to SR 30 well before 2055. It is also assumed that the fourth leg of the SR 30 and SR 202L system TI would be connected to the proposed Avenida Rio Salado parkway project in Phoenix. MAG provided ADT projections from the 8 million population model.

The daily volumes along SR 30 from the 2035 and 8 million population travel demand models are presented in Figures 9.1 and 9.2. At build out, ADT is projected to be in the range of 236,000 to 250,000 vehicles per day along the four-lane section between 91st Avenue and the Agua Fria River. The basic segments of the SR 30 freeway at crossroads are compared between the two models to estimate traffic growth from 2035 to build out; these results are presented in Table 9.1. An average growth of 65 percent is estimated in daily volumes along the SR 30 main line segments between the 2035 and build out conditions. The additional general purpose lane would share some of this traffic. The SW and EN system ramps at the SR 30 and SR 202L system TI are estimated to see a growth of 80 and 57 percent, respectively, while NW and ES ramps are expected to remain the same from 2035 to build out.

9.1 Projected SR 30 Hourly Volume Distribution and Level of Service (2035 and Build Out)

The operational performance of the proposed SR 30 freeway at the end of the design life (2055) is very important to understand its longevity. SR 30 would have a lane configuration of four general purpose lanes along with an HOV lane in each direction by 2055. Segments of SR 30 near SR 202L and SR 303L would have additional lanes due to directional ramp lane runouts. This discussion considers a basic segment with four general purpose lanes in each direction only because it is the critical segment in terms of operational performance.

MAG provided the ADT and peak hour volumes from the 8 million population (build out) model. These build out traffic projections are at least 50 to 60 years farther out from the present year (2012). The peak hour volumes are projected at around 11,000 to 12,000 vehicles per day in the eastbound and westbound directions during the AM and PM peak periods, respectively. The typical capacity of a basic four-lane segment with standard roadway and driver characteristics is estimated to be around 8,400 vehicles per hour (2,100 vehicles per hour per lane) at LOS F. Therefore, the projected peak hour volumes are much higher than the capacity. Further operational analysis was not conducted because these far exceed the available capacity at LOS F. If these volumes occur as projected, SR 30 would experience gridlock well before build out is complete.

Therefore, a new approach was used to present the operational conditions expected on SR 30 during the opening year (2035) and design year (2055) or beyond based on the projected daily volumes. This approach projected the hourly volume distribution on SR 30 based on the existing hourly volume distribution on similar freeway segments within the Phoenix metropolitan area. The existing hourly volume distribution on a basic segment of US 60 (Superstition Freeway) at Country Club Drive in Mesa was used because it closely matched the volume distribution on SR 30 during the opening year. Similarly, the existing I-10 volume distribution at 32nd Street was observed to experience peak volumes in each direction during both AM and PM commutes. This was assumed to represent the peak period volume distribution expected on SR 30 at build out. The hourly volume distribution on SR 30 during the build out condition was developed manually with a preset upper volume threshold of 2,000 vehicles per hour per lane. The LOS criteria for basic segments has been defined based on volume criteria along with the consideration of standard roadway and driver characteristics discussed earlier in Section 4.2.1.

Hourly volume distributions and corresponding LOS for the eastbound and westbound SR 30 basic segments are presented in Figure 9.3 for 2035 (three lanes in each direction) and build out (four lanes in each direction) conditions.

Notable observations from the build out analysis are:

- The eastbound and westbound directions represent the AM and PM peak directions respectively during the opening year (2035).
- During the opening year, the eastbound direction is expected to have LOS E for about 2 hours (in the morning) over the course of the day.
- Similarly, the westbound direction is expected to have LOS E for about 3.5 hours (in the evening) during the opening year.
- During build out, the SR 30 basic segments in both the eastbound and westbound directions are estimated to operate at LOS E for a period of 6 hours in a day. This volume distribution can vary significantly based on changes to the regional roadway network, socioeconomic data, and other factors affecting the travel demand model.
- The build out conditions may not occur around the design year (2055), and the duration of failure LOS may vary depending on the timing of the build out conditions.
- Operational analysis of SR 30 for the design year should be revisited as more refined and reliable traffic forecasts become available in the future.

9.2 Conclusions

With the anticipated growth in the Study Area and its surroundings between 2035 and Build-Out, the ultimate four lane SR 30 freeway is not expected to handle the peak period traffic demand for the corridor much beyond 2045. ADOT and MAG has concluded that it is not economically prudent or feasible to add additional general purpose lane to the SR 30 corridor to meet this unmet travel demand because the surrounding freeway network is equally constrained during the peak periods. To address the unmet demand, it was decided that the SR 30 footprint should include a future use 50-foot wide corridor that can be utilized at some point in the future for whatever mode of transportation is deemed prudent at that time. It was agreed that the 50-foot corridor geometry should be flexible enough to accommodate any reasonable and foreseeable mode of transportation, including high speed rail. As such, this 50-foot wide corridor has been incorporated into the footprint of the proposed SR 30 freeway corridor.

Figure 9.1 – SR 30 North/Center Alternatives, Western Section, Average Daily Traffic (2035 and Build Out)

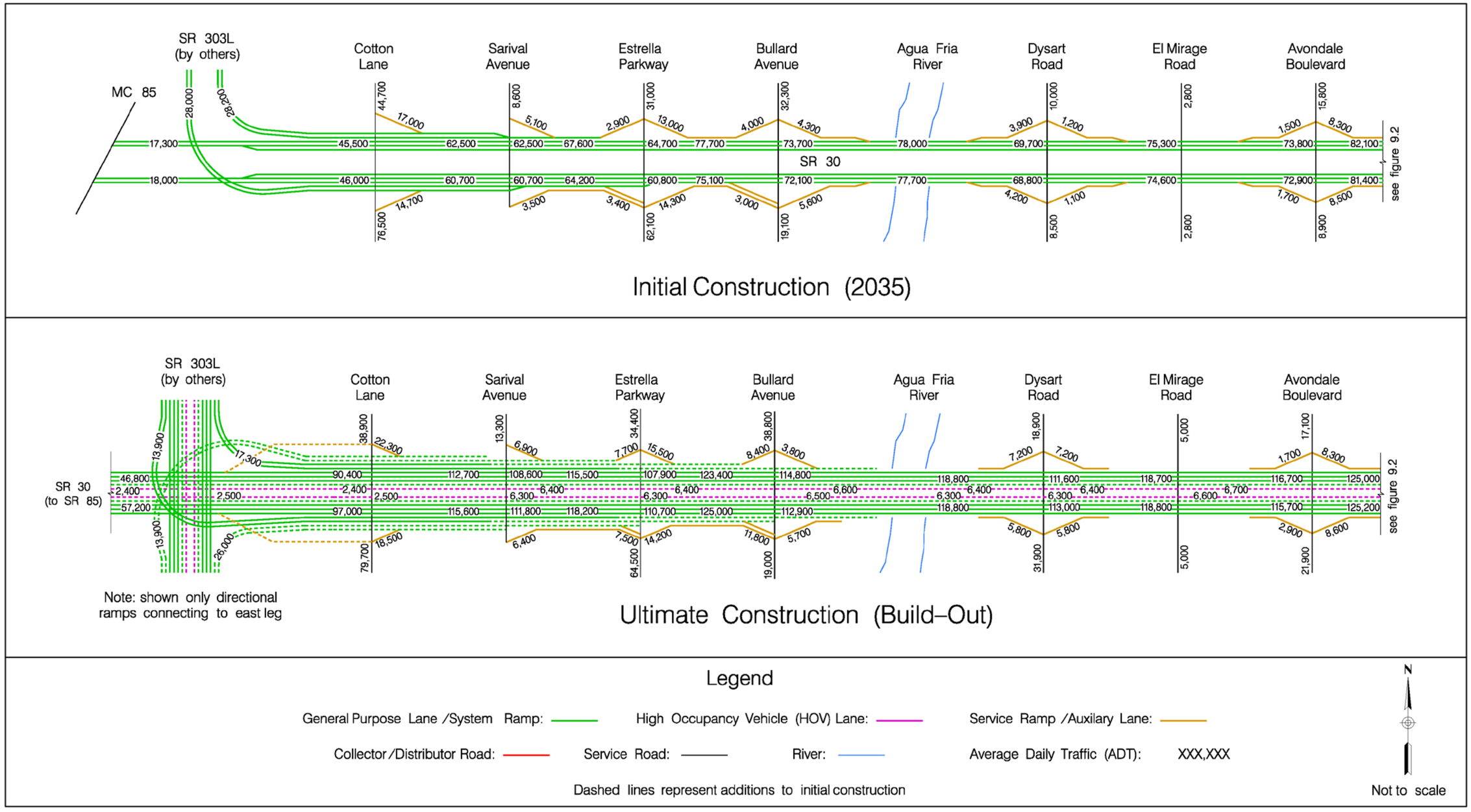


Figure 9.2 – SR 30 North/Center Alternatives, Eastern Section, Average Daily Traffic (2035 and Build Out)

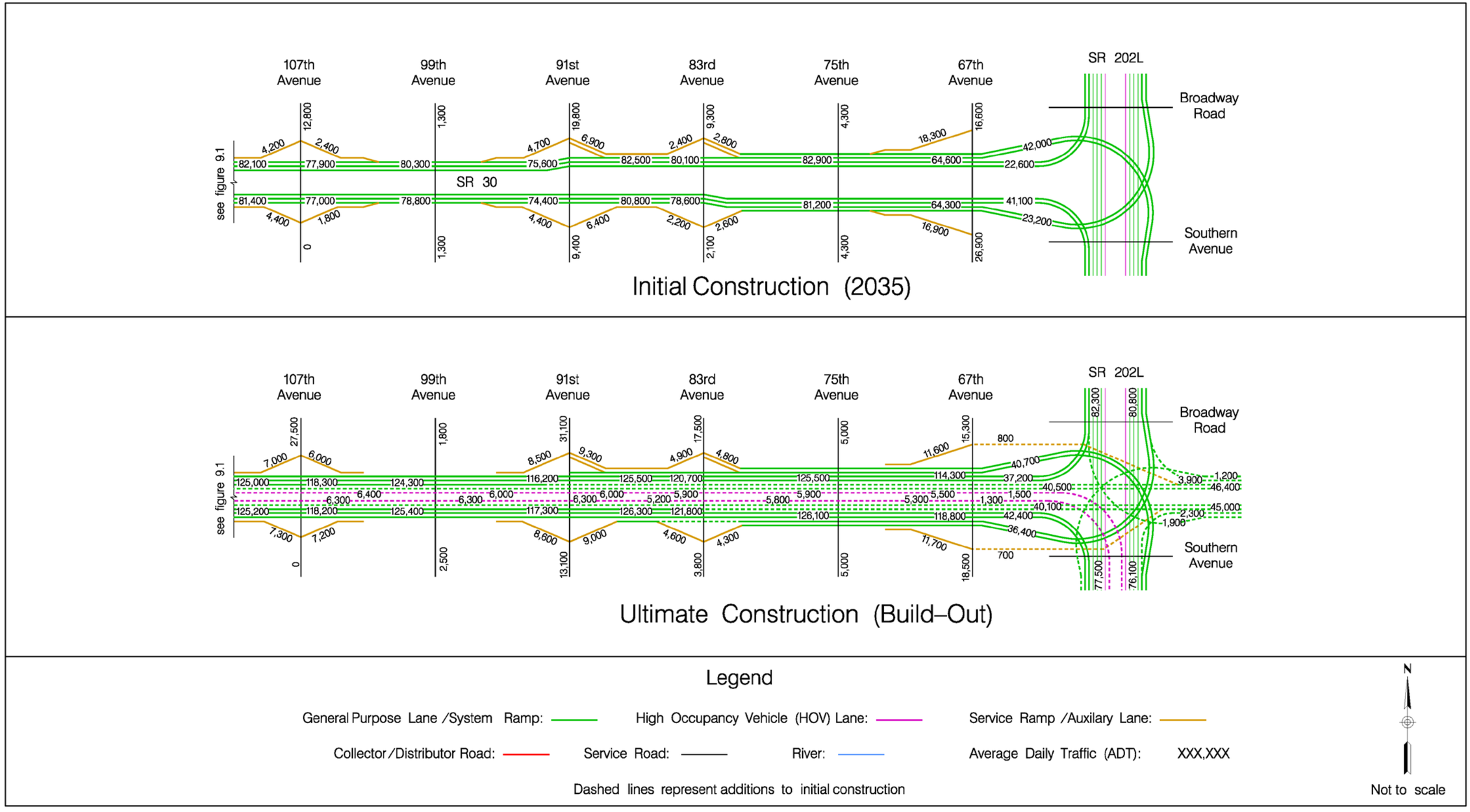
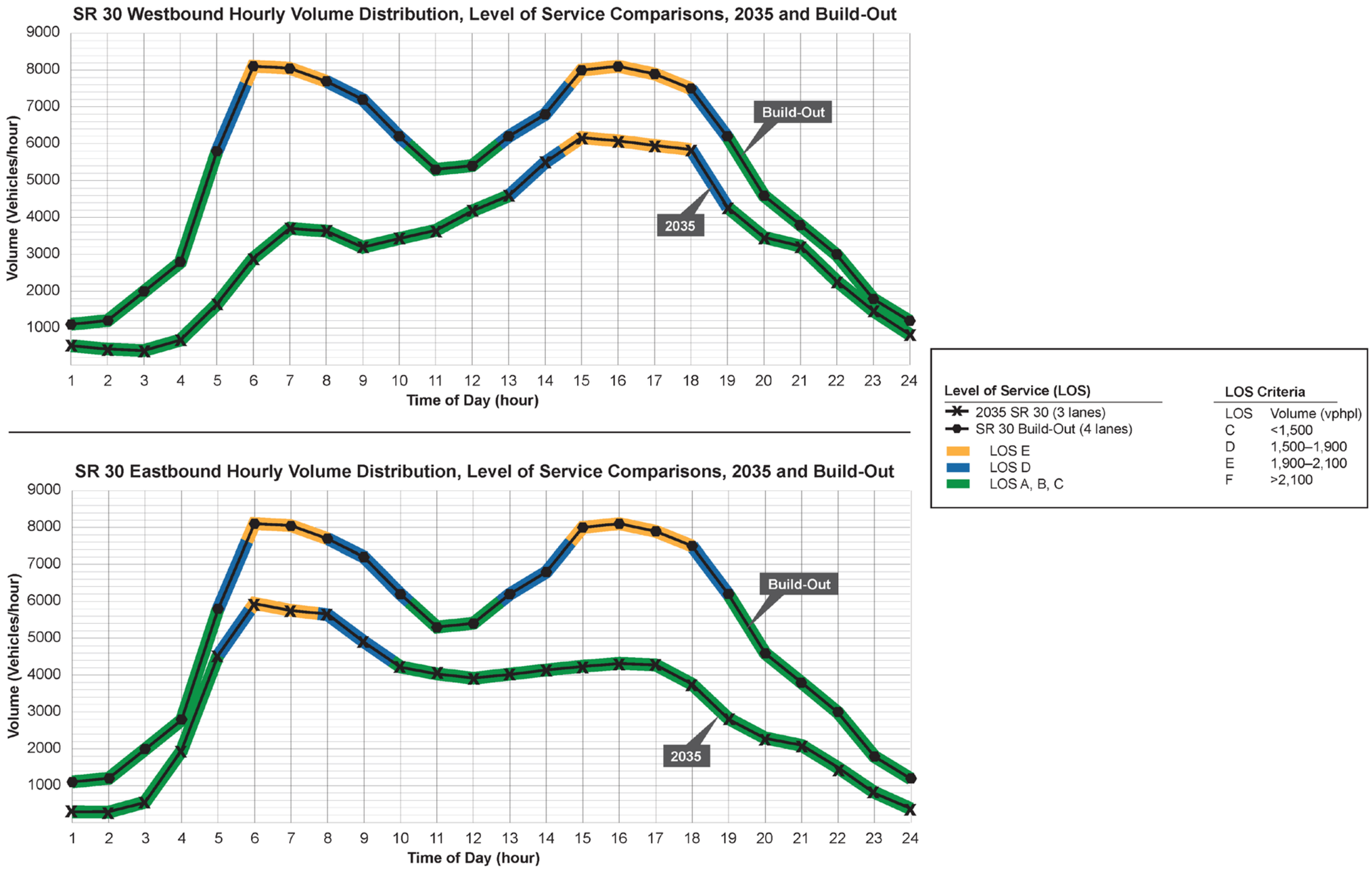


Table 9.1 – SR 30 North/Center Alternatives Average Daily Traffic Comparisons between 2035 and Build Out

Segment	Location	Initial Construction (2035)					Ultimate Construction (Build Out)					Growth (%)
		Eastbound		Westbound		Total Volume	Eastbound		Westbound		Total Volume	
		No. of Lanes	Volume	No. of Lanes	Volume		No. of Lanes	Volume	No. of Lanes	Volume		
SR 30 and SR 202L System TI	NW Ramp	—	—	2	42,000	42,000	—	—	2	37,200	37,200	-11
	SW Ramp	—	—	2	22,600	22,600	—	—	2	40,700	40,700	80
	ES Ramp	2	41,100	—	—	41,100	2	42,400	—	—	42,400	3
	EN Ramp	2	23,200	—	—	23,200	2	36,400	—	—	36,400	57
					Total	**128,900**				**Total**	**156,700**	
SR 30 Main Line	67th Avenue	4	64,300	4	64,600	128,900	6	118,800	6	114,300	233,100	81
	75th Avenue	4	81,200	4	82,900	164,100	6	126,100	6	125,500	251,600	53
	83rd Avenue	4	80,800	4	82,500	163,300	6	126,300	6	125,500	251,800	54
	91st Avenue	3	74,400	3	75,600	150,000	4	125,900	4	124,700	250,600	67
	99th Avenue	3	78,800	3	80,300	159,100	4	125,400	4	124,300	249,700	57
	107th Avenue	4	81,400	4	82,100	163,500	5	125,200	5	125,000	250,200	53
	Avondale Boulevard	3	72,900	3	73,800	146,700	4	118,500	4	118,400	236,900	61
	El Mirage Road	3	74,600	3	75,300	149,900	4	118,800	4	118,700	237,500	58
	Dysart Road	3	77,700	3	78,000	155,700	4	118,800	4	118,800	237,600	53
	Bullard Avenue	4	75,100	4	77,700	152,800	7	125,000	6	123,400	248,400	63
	Estrella Parkway	5	64,200	4	67,600	131,800	8	118,200	7	115,500	233,700	77
	Sarival Avenue	5	60,700	5	62,500	123,200	8	115,600	8	112,700	228,300	85
	Cotton Lane	5	46,000	5	45,500	91,500	8	97,000	8	90,400	187,400	105
					Total	**1,880,500**				**Total**	**3,096,800**	
										Main line average growth		**65**

Note: No. of Lanes excludes HOV lanes.

Figure 9.3 – SR 30 Eastbound and Westbound Hourly Volume Distributions, Level of Service Comparisons between 2035 and Build Out



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APPENDIX A

I-10 OPERATIONAL PERFORMANCE WITH AND WITHOUT SR 30 – ANALYSIS RESULTS

Table A1 – Level of Service and Duration of Congestion Based on Volume to Capacity Ratio

V/C Ratio	LOS
0.3	A
0.31–0.5	B
0.51–0.71	C
0.72–0.89	D
>0.9	E and F

V/C Ratio	Duration of Congestion (Hours)
0 – <=0.86	N/A
0.86 – <=0.95	<1
0.95 – <=1.01	1–2
1.01 – <=1.06	2–3
>1.06	>3

Table A2 – Eastbound AM Peak Level of Service and Duration of Congestion on I-10 (2035 without SR 30)

I-10 Segment	No. of Lanes	VDF	Capacity (C)	Flow (V)	V/C Ratio	Level of Service	Duration of Congestion (Hours)
Perryville Rd. to Citrus Rd.	6	31	36,510	28,300	0.78	D	N/A
Citrus Rd. to Cotton Lane	6	31	36,510	26,367	0.72	D	N/A
Cotton Lane to Sarival Ave.	7	31	42,595	28,507	0.67	C	N/A
Sarival Ave. to Estrella Pkwy.	7	31	42,595	30,754	0.72	D	N/A
Estrella Pkwy. to Bullard Ave.	6	31	36,510	29,815	0.82	D	N/A
Bullard Ave. to Litchfield Rd.	5	31	30,425	27,780	0.91	E–F	<1
Litchfield Rd. to Dysart Rd.	4	31	24,340	26,997	1.11	E–F	>3
Dysart Rd. to El Mirage Rd.	4	31	24,340	28,344	1.16	E–F	>3
El Mirage Rd. to Avondale Blvd.	4	31	24,340	27,620	1.13	E–F	>3
Avondale Blvd. to 107th Ave.	5	31	30,425	30,299	1.00	E–F	1 to 2
107th Ave. to 99th Ave.	5	31	30,425	29,954	0.98	E–F	1 to 2
99th Ave. to 91st Ave.	5	31	30,425	31,558	1.04	E–F	2 to 3
91st Ave. to 83rd Ave.	5	31	30,425	33,599	1.10	E–F	>3
83rd Ave. to 75th Ave.	5	31	30,425	33,277	1.09	E–F	>3
75th Ave. to 67th Ave.	5	21	28,740	33,995	1.18	E–F	>3
67th Ave. to 59th Ave.	6	21	34,488	32,206	0.93	E–F	<1
59th Ave. to 51st Ave.	6	21	34,488	30,754	0.89	E–F	<1

Table A3 – Westbound PM Peak Level of Service and Duration of Congestion on I-10 (2035 without SR 30)

I-10 Segment	No. of Lanes	VDF	Capacity (C)	Flow (V)	V/C Ratio	Level of Service	Duration of Congestion (Hours)
Perryville Rd. to Citrus Rd.	7	31	40,593	31,502	0.78	D	N/A
Citrus Rd. to Cotton Lane	8	31	46,392	29,084	0.63	C	N/A
Cotton Lane to Sarival Ave.	7	31	40,593	29,235	0.72	D	N/A
Sarival Ave. to Estrella Pkwy.	7	31	40,593	31,258	0.77	D	N/A
Estrella Pkwy. to Bullard Ave.	6	31	34,794	30,377	0.87	D	N/A
Bullard Ave. to Litchfield Rd.	5	31	28,995	28,021	0.97	E–F	1 to 2
Litchfield Rd. to Dysart Rd.	4	31	23,196	27,066	1.17	E–F	>3
Dysart Rd. to El Mirage Rd.	4	31	23,196	28,232	1.22	E–F	>3
El Mirage Rd. to Avondale Blvd.	4	31	23,196	27,467	1.18	E–F	>3
Avondale Blvd. to 107th Ave.	4	31	23,196	29,808	1.29	E–F	>3
107th Ave. to 99th Ave.	5	31	23,196	29,158	1.01	E–F	1 to 2
99th Ave. to 91st Ave.	5	31	23,196	30,528	1.05	E–F	2 to 3
91st Ave. to 83rd Ave.	5	31	28,995	32,378	1.12	E–F	>3
83rd Ave. to 75th Ave.	4	31	23,196	31,155	1.34	E–F	>3
75th Ave. to 67th Ave.	5	21	27,655	32,627	1.18	E–F	>3
67th Ave. to 59th Ave.	6	21	33,186	31,407	0.95	E–F	<1
59th Ave. to 51st Ave.	6	21	33,186	29,856	0.90	E–F	<1

Table A4 – Eastbound AM Peak Level of Service and Duration of Congestion on I-10 (2035 with SR 30 NA[a])

I-10 Segment	No. of Lanes	VDF	Capacity (C)	Flow (V)	V/C Ratio	Level of Service	Duration of Congestion (Hours)
Perryville Rd. to Citrus Rd.	6	31	36,510	27,875	0.76	D	N/A
Citrus Rd. to Cotton Lane	6	31	36,510	25,930	0.71	D	N/A
Cotton Lane to Sarival Ave.	7	31	42,595	22,689	0.53	C	N/A
Sarival Ave. to Estrella Pkwy.	7	31	42,595	25,606	0.60	C	N/A
Estrella Pkwy. to Bullard Ave.	6	31	36,510	25,550	0.70	C	N/A
Bullard Ave. to Litchfield Rd.	5	31	30,425	24,579	0.81	D	N/A
Litchfield Rd. to Dysart Rd.	4	31	24,340	23,733	0.98	E–F	1 to 2
Dysart Rd. to El Mirage Rd.	4	31	24,340	25,280	1.04	E–F	2 to 3
El Mirage Rd. to Avondale Blvd.	4	31	24,340	25,070	1.03	E–F	2 to 3
Avondale Blvd. to 107th Ave.	5	31	30,425	27,004	0.89	D	N/A
107th Ave. to 99th Ave.	5	31	30,425	26,422	0.87	D	N/A
99th Ave. to 91st Ave.	5	31	30,425	27,702	0.91	E–F	<1
91st Ave. to 83rd Ave.	5	31	30,425	29,541	0.97	E–F	1 to 2
83rd Ave. to 75th Ave.	5	31	30,425	29,455	0.97	E–F	1 to 2
75th Ave. to 67th Ave.	5	21	28,740	30,516	1.06	E–F	>3
67th Ave. to 59th Ave.	6	21	34,488	28,299	0.82	D	N/A
59th Ave. to 51st Ave.	6	21	34,488	32,571	0.94	E–F	<1

[a] North Alternative

Table A5 – Westbound PM Peak Level of Service and Duration of Congestion on I-10
(2035 with SR 30 NA[a])

I-10 Segment	No. of Lanes	VDF	Capacity (C)	Flow (V)	V/C Ratio	Level of Service	Duration of Congestion (Hours)
Perryville Rd. to Citrus Rd.	7	31	40,593	31,553	0.78	D	N/A
Citrus Rd. to Cotton Lane	8	31	46,392	29,275	0.63	C	N/A
Cotton Lane to Sarival Ave.	7	31	40,593	24,963	0.61	C	N/A
Sarival Ave. to Estrella Pkwy.	7	31	40,593	27,966	0.69	C	N/A
Estrella Pkwy. to Bullard Ave.	6	31	34,794	27,666	0.80	D	N/A
Bullard Ave. to Litchfield Rd.	5	31	28,995	25,819	0.89	E–F	<1
Litchfield Rd. to Dysart Rd.	4	31	23,196	25,067	1.08	E–F	>3
Dysart Rd. to El Mirage Rd.	4	31	23,196	26,188	1.13	E–F	>3
El Mirage Rd. to Avondale Blvd.	4	31	23,196	25,406	1.10	E–F	>3
Avondale Blvd. to 107th Ave.	4	31	23,196	27,536	1.19	E–F	>3
107th Ave. to 99th Ave.	4	31	23,196	27,171	1.17	E–F	>3
99th Ave. to 91st Ave.	4	31	23,196	19,481	0.84	D	N/A
91st Ave. to 83rd Ave.	5	31	28,995	29,796	1.03	E–F	2 to 3
83rd Ave. to 75th Ave.	4	31	23,196	28,828	1.24	E–F	>3
75th Ave. to 67th Ave.	5	21	27,655	30,058	1.09	E–F	>3
67th Ave. to 59th Ave.	6	21	33,186	28,276	0.85	D	N/A
59th Ave. to 51st Ave.	6	21	33,186	31,826	0.96	E–F	1 to 2

[a] North Alternative

APPENDIX B

HCS FREEWAY ANALYSIS REPORTS
(SEE ATTACHED CD)

APPENDIX C

SYNCHRO ANALYSIS REPORTS
(SEE ATTACHED CD)