Technical Memorandum

To: Jeff Lerud, PE. NDOT

Date: June 17, 2019

From: Jack Sjostrom, PE. CA Group

Subject: I-15 Tropicana Improvement Project: Transportation System Performance Report

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1. INTRODUCTION

The I-15 Tropicana Improvement Project was initiated by the Nevada Department of Transportation (NDOT) to complete the necessary documentation of the technical studies and outreach to meet the National Environmental Policy Act (NEPA) requirements for the:

- Interstate 15 at Tropicana Avenue Interchange Reconstruction
- Harmon Avenue HOV Direct Access Ramps to/from Interstate 15

The existing I-15 at Tropicana Avenue Interchange was originally constructed in 1966 as the main interstate connection to the McCarran International Airport. Commuter and corridor trips are expected to significantly increase as more development is planned in the interchange vicinity. Consequently, NDOT desires to complete the necessary NEPA and design studies to determine appropriate measures to reconstruct the interchange to accommodate future travel demands. The Project will also develop up to a thirty percent (30%) level design for the Preferred Alternative and other associated improvements.

During the Feasibility Study phase of this Project, construction of HOV direct-access ramps to and from Interstate 15 at both Harmon and Hacienda Avenue were considered as part of the No-Action Alternative and were anticipated to be constructed via a different project by NDOT. During the time between the Feasibility Study completion and this Project's development, NDOT decided to bring the HOV direct-access ramps forward and include them with the Tropicana Avenue Interchange improvements. The Project initially included all three interchange improvements, with HOV access at both Harmon Avenue and Hacienda Avenue as a split HOV interchange. During public and stakeholder outreach conducted for this Project, NDOT received feedback that adjacent property owners and community stakeholders did not support the HOV direct-access ramp at Hacienda Avenue. NDOT postponed the further development of the project and initiated a re-evaluation of the Southern Nevada HOV Plan Update. The re-evaluation considered feedback from the I-15 Tropicana, Harmon, Hacienda NEPA project's stakeholders, and public outreach, and traffic evaluations of the Southern Nevada Traffic Study (SNTS) and included them in updating the HOV Plan's recommendations. Changes to the proposed HOV Plan were made and adopted by NDOT that included the elimination of the Hacienda Avenue HOV access completely and changing the direction of HOV access at Harmon Avenue. Previous discussion or inclusion of HOV access at Hacienda Avenue is superseded and will not be part of this Project.

As part of NEPA process, several memorandums/reports listed below have been submitted to NDOT and were approved.

- Traffic Forecasting Methodology Memorandum
- Traffic Operations Methodology Memorandum
- Aimsun Next Base Model Development and Calibration Report
- Traffic Operations Screening Methodology Memorandum
- Traffic Forecasting Memorandum

This memorandum mainly documents the findings from the traffic analysis for the overall transportation system for the 2017 (existing year), 2020, and 2040 future years, without considering any improvements being made, also called the No-Action condition. NDOT, along with FHWA, decided that the traffic operations analysis was to be performed during the period when the Project's roadway has the highest traffic volume. A review of historical traffic pattern reveals that the PM peak period represents the highest traffic volumes and a four-hour critical peak period was used for operations and design analysis.

2. EXISTING CONDITIONS

2.1. SOCIOECONOMIC AND LAND USE

The study area is located within the Winchester/Paradise Planning area of Clark County, shown in Figure 1. The study area is bordered by Flamingo Road on the north, Las Vegas Boulevard on the east, Russell Road on the south, and Valley View Boulevard on the west.

The demographics of the study area based on the 2013-2017 American Community Survey (ACS) data has a very small residential population and is dominated by commercial and manufacturing uses. The total population within the demographic study area is 10,422 people, while the total population of the Las Vegas Census County Division is 1,902,867. The population within the demographic study area represents approximately 1 percent of total population within the Las Vegas metropolitan area. The minority population within the demographic study area is consistent with the overall minority population within the Las Vegas Census County Division. The majority of the population is Caucasian (56 percent), with 12 percent Black or African American, 9 percent Asian, 16 percent other race and 5 percent two or more races.

Existing land uses west of I-15 consist of light manufacturing, hotels, casinos, commercial businesses, and high-rise residential condominiums. The new Raiders Football Stadium is currently under construction within the southern limits of the study area between Russell Road and Hacienda Avenue. The land uses between Hacienda Avenue and Tropicana Avenue consist of non-casino hotels, automotive commercial businesses, and public utilities. Between Tropicana Avenue and Harmon Avenue, the land use consists of non-casino hotels and retail commercial businesses (Las Vegas Golf and Tennis Superstore). More detail information regarding land use, planning, and socioeconomic characteristics can be found in Chapter 3 of the project's EA document.

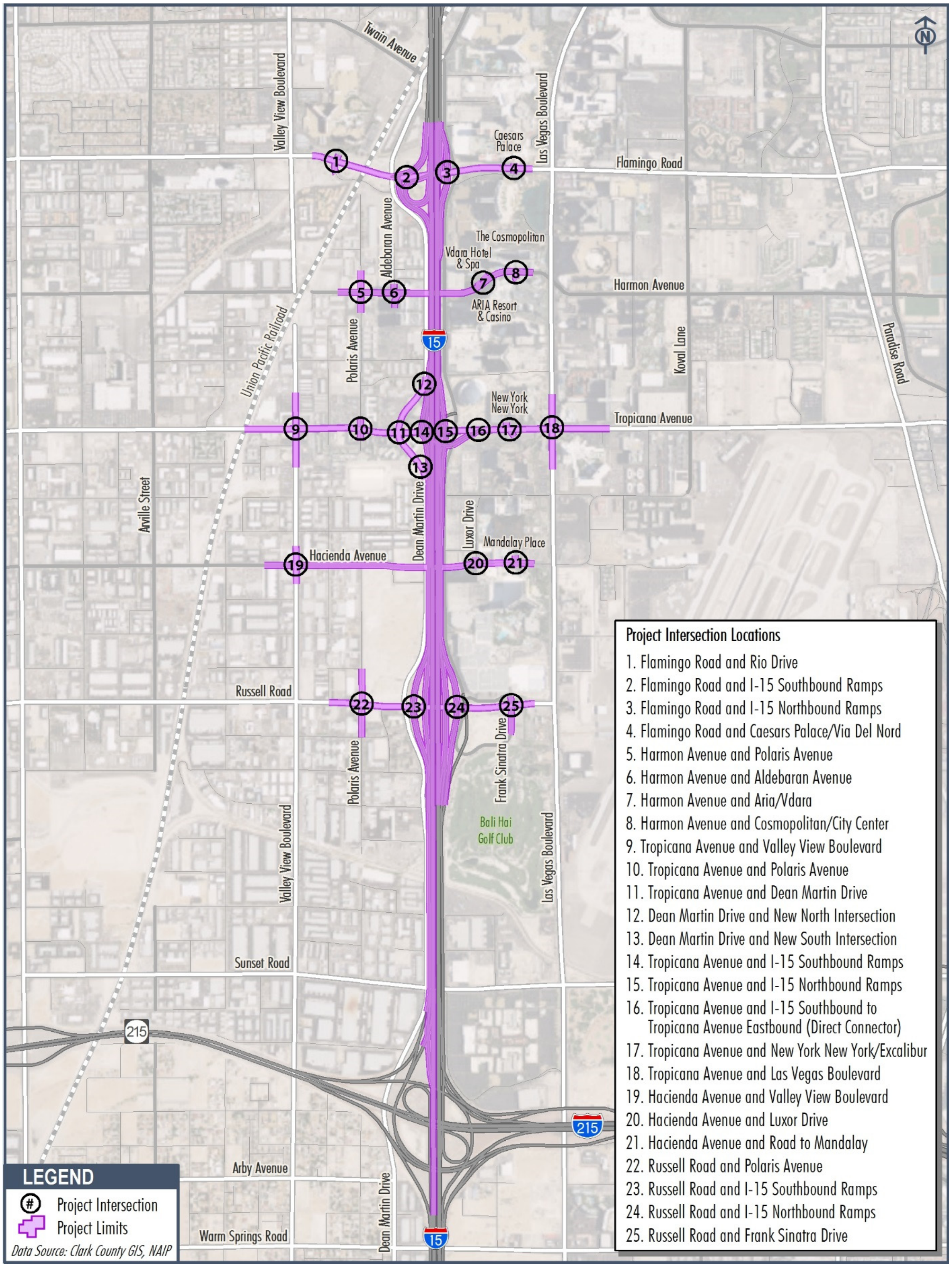

Figure 1: Project Study Area

2.2. ROADWAY CONDITIONS

The I-15/Tropicana Avenue interchange exists as a tight diamond interchange (TDI) with a southbound (SB) to eastbound (EB) ramp flyover. I-15 is functionally classified as the "Principal Arterial Interstate" and Tropicana Avenue as the "Urban Principal Arterial-Other". The posted speed limits are 65 mph on I-15 and 35 mph on Tropicana Avenue.

2.2.1 Freeway

The I-15 Freeway is a ten-lane divided highway with two lanes designated as express lanes in each direction. The express lanes were converted to one HOV and one GP lane as of May 20, 2019 as part of Project NEON. The corridor also contains three-lane collector-distributor (CD) roads in each direction south of the Tropicana Avenue interchange. The lane widths are 12 feet and the shoulder widths vary from 1 foot to 10 feet within the study area. I-15 includes interchanges at Russell Road, Tropicana Avenue, and Flamingo Road within the study area.

2.2.2 Interchanges

The Tropicana Interchange consists of two-lane exit ramps in both directions with ramp meters on both entrance ramps. The SB exit splits into EB and westbound (WB), with EB drivers directed over the flyover to merge with Tropicana Avenue EB through traffic. The northbound (NB) exit from the NB CD road splits to Frank Sinatra Drive and Tropicana Avenue traffic. The SB entrance ramp feeds traffic directly onto the SB CD road, which enters I-15 approximately 2.5 miles south at the CC-215 and I-15 interchange. The NB entrance ramp is a two-lane entrance onto I-15 that becomes an auxiliary lane to Flamingo Road and Spring Mountain Road interchanges.

Russell Road and Flamingo Road interchanges are also TDIs. Traffic from Russell Road enters and exits from the CD roads and does not directly interact with I-15 traffic. The Flamingo Road interchange is similar to Tropicana's with two exit ramps from I-15 in the SB direction, one for the EB direction (loop ramp) and the other in WB direction.

2.2.3 Arterial Roads

Tropicana Avenue is a six-lane arterial with raised median and numerous dedicated right and left turn lanes along the study limits. It has three through lanes in each direction from Valley View Boulevard to the New York New York signalized driveway, and four through lanes east to Las Vegas Boulevard. The intersections at Valley View Boulevard, Polaris Avenue, Dean Martin Drive, both I-15 ramp terminals, New York New York and Las Vegas Boulevard are signalized. Lane widths are generally 12 feet. There are two access driveways east of I-15; one on the north and one on the south. There are numerous access driveways west of I-15 on both north and south sides of Tropicana Avenue.

Russell Road and Flamingo Road are two major east-west urban arterials that consist of six lane facilities. Both are grade separated over Dean Martin Drive and Frank Sinatra Drive.

Harmon Avenue is an urban collector that provides an east-west connection over I-15 within the study limits. Harmon Avenue is a six-lane facility that belongs to Clark County and serves as an entrance conduit to MGM's City Center development east of I-15 and continues west to the Clark County's proposed Harmon Avenue and Valley View Boulevard connector project. Lane widths correspond to Clark County standard with a single sidewalk over I-15 on the north side of Harmon Avenue.

Frank Sinatra Drive is a four-lane roadway that has an access ramp from the NB CD road near Tropicana Avenue's exit. Dean Martin Drive is a four-lane roadway that has an at grade intersection with Tropicana Avenue just west of the I-15 SB ramp terminal. Both Frank Sinatra Drive and Dean Martin Drive belong to Clark County.

2.3. TRAFFIC

Traffic analysis was performed in two parts; Operation Analysis and Crash Analysis. The operation analysis was performed using Aimsun Next. The I-15 Tropicana Avenue sub-area Aimsun Next model was obtained from NDOT for the specific project limits. Crash analysis was performed using the NDOT crash data. Detailed information is included in the *Crash Analysis Report* and its *Critical Crash Rate* addendum, which were previously reviewed and approved by NDOT.

Detailed descriptions of the traffic modeling, operations, calibration, and forecasting are included in the memorandums and reports listed on page 2 of this report and are available separately. Below are the results and findings from the Aimsun Next traffic analysis for the 2017 existing, 2020 No-Action, and 2040 No-Action conditions.

Intersection delays and densities observed from Aimsun Next microsimulation software are not comparable to HCM thresholds. Delays and queues reported do not include delays occurred due to vehicles that could not enter the network due to congestion (In Aimsun Next terminology, these are called Virtual Delay and Virtual Queues).

2.3.1 Existing Traffic Operations

Traffic operations analysis was performed using Aimsun Next to identify the performance of the roadway network using various measures of effectiveness (MOEs). The key MOEs are based on a network wide evaluation and their definitions are listed below.

- Latent Vehicles/Latent Demand: The number of vehicles that are expected to be contained in the traffic simulation but are not simulated because of the limited physical capacity of the model network to process vehicles. The vehicles are outside the model not always because the entire system is saturated. It could also be because operations at bottleneck locations near the boundaries of the model do not allow vehicles to go freely beyond those locations and in the absence of alternative routes, vehicles are backed up outside the model perimeter and unable to enter the network. If the bottleneck conditions were removed, the volume of the latent vehicles will see a significant reduction.

Example: Similar to a water distribution system where all the pipes are full, but there's still water in the reservoir trying to get into the pipe network for a given time-period. The remaining water in the reservoir that should be in the pipes, but is unable to enter due to inadequate capacity of the pipes, and no alternate line is available for the flow would be the latent vehicles (also known as latent demand).

- Latent Delay Time: The amount of time latent vehicles must wait to enter the network. In our water example, this would be how long the water in the reservoir would take to enter the pipe system.
- Total Network Delay: This measures the amount of time each vehicle is delayed in the simulation and sums them all into a single delay time. The better the network operates, the lower the total network delay.
- Average Network Delay: This measures the average delay experienced by every vehicle in the simulation. The better the network operates, the lower the average network delay.

In addition, travel time (along Tropicana Avenue), intersection delay, approach queues (Tropicana Avenue), density (I-15, CD), and speed (I-15, CD) were also extracted. Network wide MOEs are reported for the entire PM peak period of four hours, while the other MOEs are reported for the PM peak-hour within the peak period. All the traffic volume exhibits included in this report are derived from the Aimsun Next static assignment.

Figures 2 and 3 show the 2017 PM peak-hour volumes for the mainline, ramps, and the intersection turning movements.

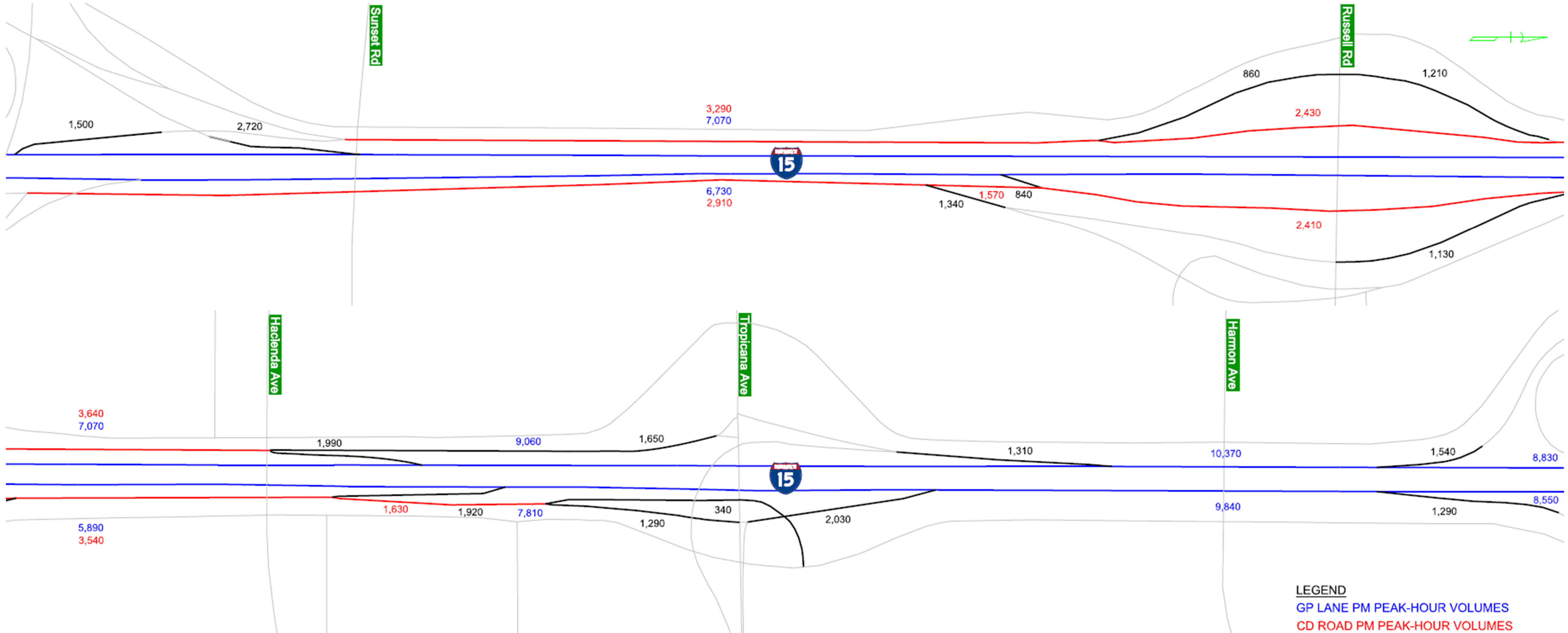

Figure 2: 2017 Peak-Hour Volumes

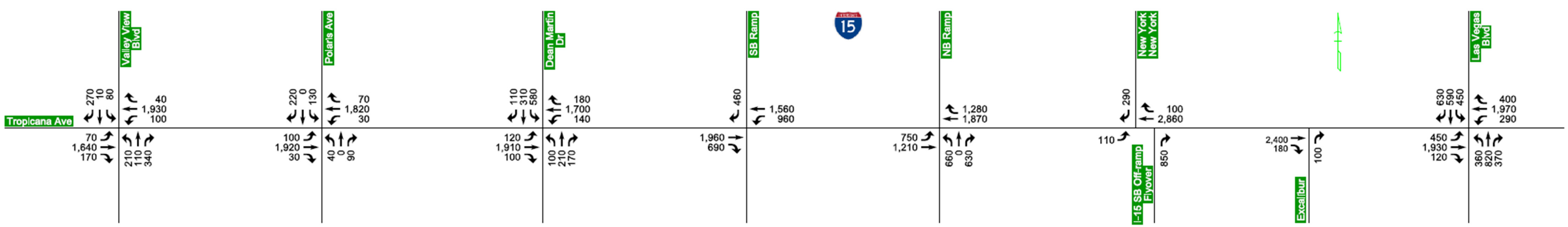

Figure 3: 2017 Peak-Hour Intersection Turning Movement Volumes

Network wide results for the 2017 PM peak period from the Aimsun Next model are shown in Table 1. Latent vehicles and average network delay are the key parameters indicating network performance. As the number of latent vehicles are low, it indicates that at the network level, the sub-area is minimally congested and operating well. The average network delay for vehicles within the network is approximately 3 minutes from their origin to destination.

Table 1: 2017 Network Wide Results

Parameter	2017 Existing Conditions
Total Travel Time, VHT (hr)	13,704
Total Travelled Distance, VMT (mi)	434,593
Delay Time (sec/mi)	75.4
Total Delay Time (hr)	9,097
Total Network Vehicles (veh)	**185,693**
Latent Vehicles (veh)	**109**
Latent Delay Time (hr)	25
Number of Arrived Vehicles	183,463
Number of Active Vehicles	2,121
Total Network Delay (hr)	**9,123**
Average Network Delay (sec/veh)	**177**

For 2017 existing conditions, the average travel time on Tropicana Avenue was evaluated for three critical segments (listed below). The first two segments capture vehicles traveling on Tropicana Avenue through the interchange, while the third segment captures the I-15 NB off-ramp traffic passing through the interchange. The I-15 SB off-ramp segment was not considered due to the segment being a direct connector/flyover.

- Tropicana Avenue EB: Polaris Avenue to Excalibur Way
- Tropicana Avenue WB: New York New York Driveway to Polaris Avenue
- I-15 NB off-ramp (left-turn) to Polaris Avenue

Figure 4 provides a graphical representation of travel times for all three segments. Longer travel times are currently experienced in the WB direction, primarily due to weaving and the close spacing of the ramp terminals and Dean Martin Drive intersections. I-15 NB off-ramp experiences the longer travel time compared to the Tropicana Avenue EB and WB.

Table 2 shows the average intersection delay for each of the network intersections. Tropicana Avenue at Dean Martin Drive (>3 minutes) and I-15 NB ramp terminal (> 1 minute) experiences the highest delay compared to all other intersections, which can be attributed to the higher ramp volumes along with closely spaced signalized intersections. Detailed Aimsun Next output is included in Appendix A. Table 3 shows the maximum queue for each approach. The I-15 NB off-ramp has the longest queue compared to all other approaches. Detailed Aimsun Next output for queues is included in Appendix A.

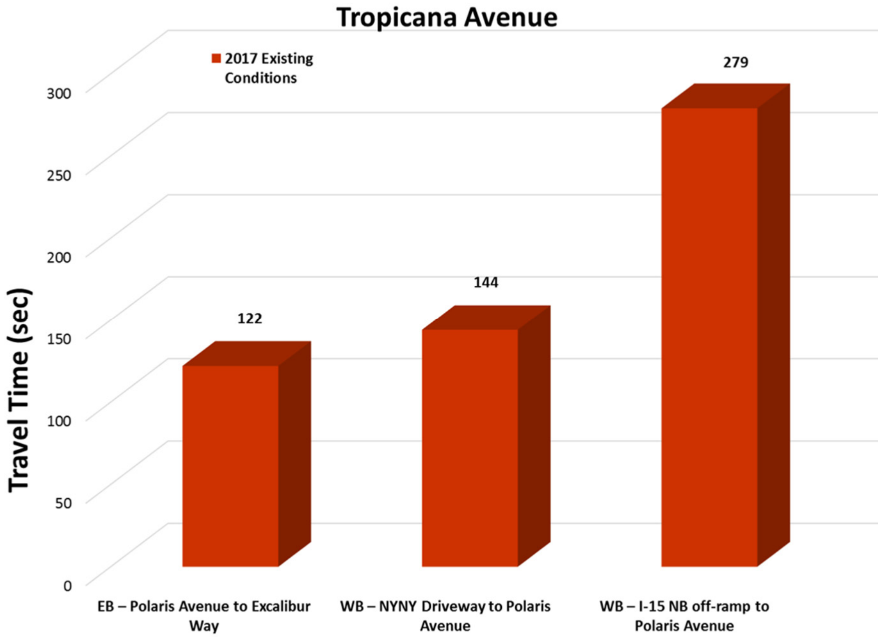

Figure 4: 2017 Peak-Hour Travel Time

Table 2: 2017 Peak-Hour Average Intersection Delay

Intersection	Delay (s/veh)
Tropicana Avenue and Valley View Boulevard	28.9
Tropicana Avenue and Polaris Avenue	31.7
Tropicana Avenue and Dean Martin Drive	190.9
Tropicana Avenue and I-15 SB Ramps	28.1
Tropicana Avenue and I-15 NB Ramps	76.6
Tropicana Avenue and Excalibur/New York New York	11.2
Tropicana Avenue and Las Vegas Boulevard	60.8

Table 3: 2017 Peak-Hour Maximum Queue

Intersection	Approach	Max Queue
Tropicana Avenue and Dean Martin Drive	EB	575’
	NB	200’
	WB	150’
	SB	>1,000’
Tropicana Avenue and I-15 SB Ramps	EB	425’
	WB	225’
	SB	275’
Tropicana Avenue and I-15 NB Ramps	EB	150’
	NB	>1,000’
	WB	575’

The NB I-15 segment results are shown in Table 4. The segments within the project study (NB CD on-ramp to Flamingo Road off-ramp) operate at a density less than 30 veh/mile with speeds greater than 55 mph. Even though the NB CD on-ramp shows the speeds (59 mph) close to the posted speed limit, congestion was observed during simulation. Similarly, weaving was observed between the Tropicana Avenue on-ramp and Flamingo Road off-ramp during simulation, even though the results show higher speeds.

The SB I-15 segment results are shown in Table 5. The segments within the project study (Flamingo Road on-ramp to SB CD off-ramp) operate at a density less than 35 veh/mile with speeds greater than 53 mph. The weaving segment between the Flamingo Road on-ramp and the Tropicana Avenue off-ramp also operates at higher speed, indicating less weaving. Detailed Aimsun Next output is included in Appendix B.

Table 4: 2017 Peak-Hour I-15 Northbound Results

I-15 NORTHBOUND			
Segment		Density (veh/mile/ln)	Speed (mph)
From	To		
I-215 WB on-ramp	I-15 to CD (near Russell Road)	42.8	52
I-15 to NB CD (near Russell Road)	NB CD on-ramp	17.9	65
NB CD on-ramp	Tropicana Avenue on-ramp	26.8	59
Tropicana Avenue on-ramp	Flamingo Road off-ramp	25.5	57
Flamingo Road off-ramp	Spring Mountain Road off-ramp	28.5	53
Spring Mountain Road off-ramp	Flamingo Road on-ramp	18.3	67
Flamingo Road on-ramp	Spring Mountain Road EB on-ramp	16.0	68

Table 5: 2017 Peak-Hour I-15 Southbound Results

I-15 SOUTHBOUND			
Segment		Density (veh/mile/ln)	Speed (mph)
From	To		
Spring Mountain Road on-ramp	Flamingo Road WB off-ramp	24.5	66
Flamingo Road WB off-ramp	Flamingo Road EB off-ramp	30.5	57
Flamingo Road EB off-ramp	Flamingo Road on-ramp	30.2	60
Flamingo Road on-ramp	Tropicana Avenue off-ramp	33.8	53
Tropicana Avenue off-ramp	I-15 to SB CD	30.9	58
I-15 to SB CD	I-215 off-ramp	20.6	64
I-215 off-ramp	SB CD to I-15 SB	15.2	69
SB CD to I-15 SB	Blue Diamond Road off-ramp	17.1	68

The NB CD is a two-lane roadway that begins near the I-215/CC-215 interchange and ends near Tropicana Avenue. Traffic analysis results for the NB CD segments are shown in Table 6. NB CD segments starting from the I-15 to CD ramp (south of Russell Road) to the NB CD on-ramp have more congestion due to high volumes from various entry/exit traffic. The average speeds are less than 20 mph within these two segments. Traffic from the Russell Road on-ramp, I-15 to Russell Road/Tropicana Avenue/Frank Sinatra Drive movements, CC-215 to Russell Road/I-15/Tropicana Avenue/Frank Sinatra Drive exits, and I-215 to Tropicana Avenue/Frank Sinatra Drive adds to the congestion on the NB CD. Even though the posted speed limit on the NB CD is 65 mph, traffic can barely reach that speed due to various merge, diverge and weaving actions. Major weaving is observed on the NB CD between the Russell Road on-ramp and the NB CD on-ramp/Tropicana Avenue/Frank Sinatra Drive off-ramp. The high volume (1,920 vph) from the NB CD on-ramp to I-15 merge with I-15 traffic, magnifying the congestion near the I-15 gore with long queues on the NB CD that have been observed to extend to and south beyond Russell Road.

The SB CD is a two-lane roadway that begins south of Tropicana Avenue and ends near I-215/CC-215. Traffic analysis results for the SB CD segments are shown in Table 7. All segments operate with a density less than 40 veh/mile. The weaving segment between the Tropicana Avenue on-ramp and the Russell Road off-ramp has lower speeds due to the ramp's traffic interacting with each other. The model results for segments downstream of Russell Road operate close to the posted speed limit of 65 mph. Note, the CC-215 interchange is not included in the model, so possible congestion related to issues of the CC-215 interchange are not manifesting in the approved Aimsun Next model. It is not expected that these issues will impact the operation of the Tropicana Avenue interchange. Detailed Aimsun Next output is included in Appendix C.

Table 6: 2017 Peak-Hour NB CD Results

NORTHBOUND CD			
Segment		Density (veh/mile/ln)	Speed (mph)
From	To		
I-215 WB on-ramp	Russell Road off-ramp	20.2	61
Russell Road off-ramp	I-15 to CD (near Russell Road)	31.2	47
I-15 to CD (near Russell Road)	Russell Road on-ramp	125.7	16
Russell Road on-ramp	NB CD on-ramp	96.7	13
NB CD on-ramp	Tropicana Avenue off-ramp	42.0	36

Table 7: 2017 Peak-Hour SB CD Results

SOUTHBOUND CD			
Segment		Density (veh/mile/ln)	Speed (mph)
From	To		
Tropicana Avenue on-ramp	I-15 to SB CD	34.8	36
I-15 to SB CD	Russell Road off-ramp	37.7	35
Russell Road off-ramp	Russell Road on-ramp	19.0	62
Russell Road on-ramp	I-215/CC-215 off-ramp	28.1	54
I-215/CC-215 off-ramp	SB CD to I-15 SB	10.8	65

2.4. OTHER TRANSPORTATION MODES

2.4.1 Pedestrian Access

Pedestrians predominantly use Tropicana Avenue as a means of accessing multiple destinations. Five-foot sidewalks exist on both the north and south sides of Tropicana Avenue from Valley View Boulevard to Dean Martin Drive. At Dean Martin Drive, pedestrians are encouraged to use the south sidewalk as the north sidewalk ends. From Dean Martin Drive through the interchange ramp intersections, and over the Frank Sinatra Drive underpass, a sidewalk is available on the south side of Tropicana Avenue until the entrance of the southbound to EB flyover ramp. There are portions of existing sidewalk in this stretch along the north side of Tropicana Avenue on the bridge over I-15, and then again from Frank Sinatra Drive, ramping up to meet at Tropicana Avenue. However, both are inaccessible without jaywalking. At the EB flyover ramp entrance, the sidewalk loops down under the flyover and backs up on the east side of the entrance. This maintains a continuous path along the south side of Tropicana Avenue. From there, the sidewalk continues to the pedestrian bridge crossing at Las Vegas Boulevard. There is no sidewalk on the northern side of this stretch.

2.4.2 Bicycle Access

The Regional Transportation Commission's (RTC) Bike Map (May 2018) identifies only one route in the project study area, along Dean Martin Drive. High vehicle volumes and limited roadway width make Tropicana Avenue undesirable as a travel route for cyclists, though they are not precluded. Cyclists have been observed utilizing sidewalks as well as the outside lane along Tropicana Avenue.

Figure 5: Existing Bicycle Routes at I-15 and Tropicana Avenue Interchange

2.4.3 Transit System

The RTC operates multiple transit routes along I-15 and Tropicana Avenue. The RTC's Transit Guide and System Map, December 2, 2018, shows Tropicana as Frequent Service Route 201, and is combined with the Westcliff Airport Express (WAX) route that utilizes I-15.

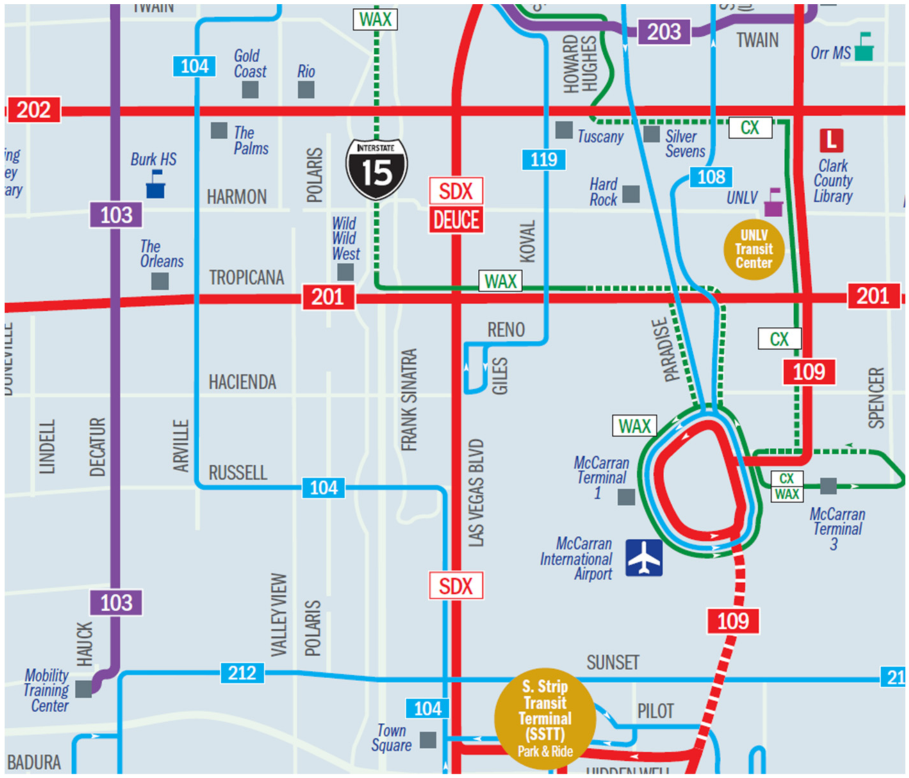

Figure 6: Existing Transit Routes at I-15 and Tropicana Avenue Interchange

3. FUTURE TRAFFIC OPERATIONS

3.1. 2020 No-Action

The opening year for this project was assumed to be 2020. Traffic forecasting and operation analysis were performed for a 2020 No-Action condition to determine the performance without the project improvements. Figure 7 and Figure 8 show the 2020 No-Action PM peak-hour volumes.

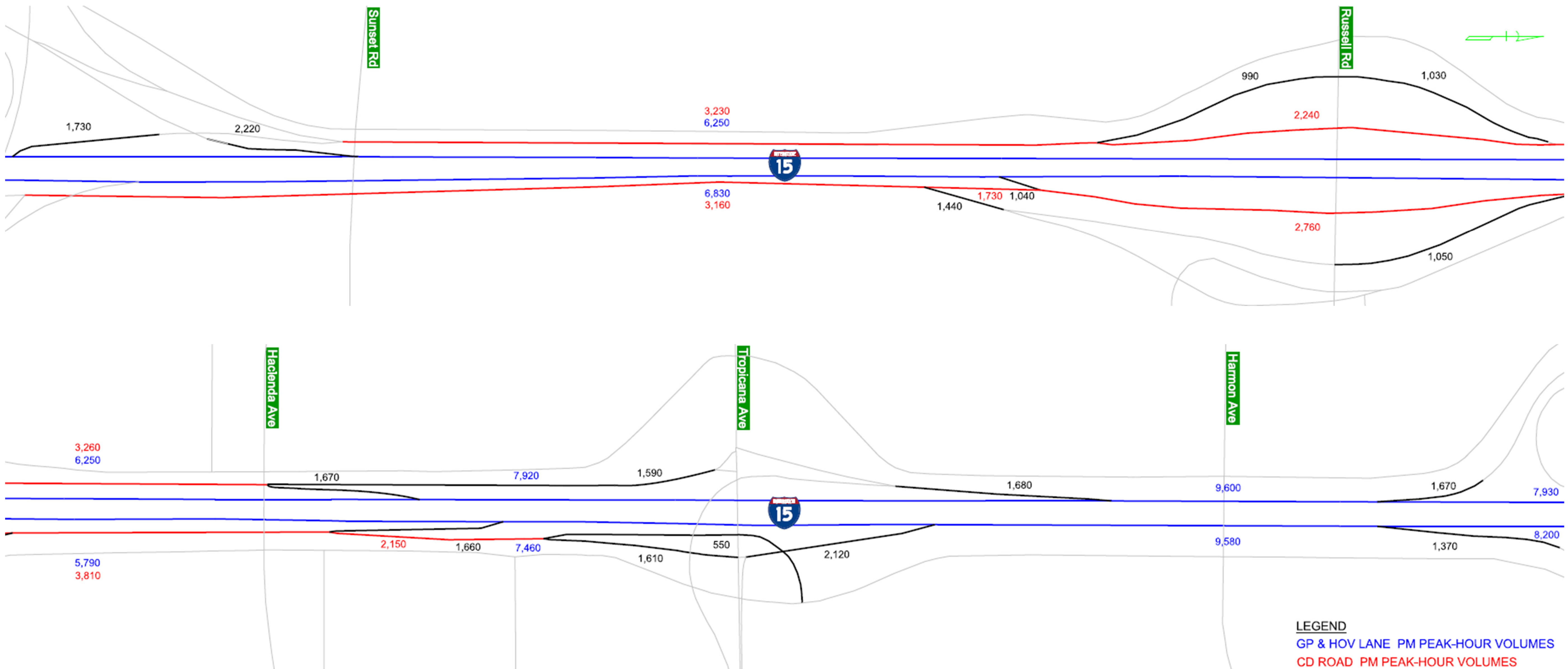

Figure 7: 2020 No-Action Peak-Hour Volumes

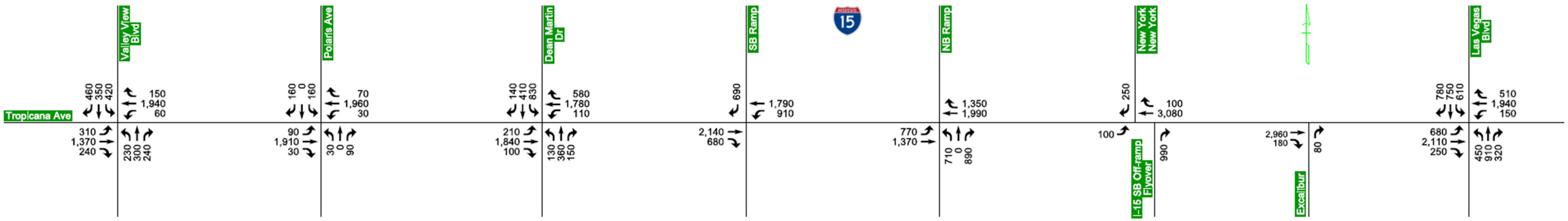

Figure 8: 2020 No-Action Peak-Hour Intersection Turning Movement Volumes

2020 No-Action network wide results for the PM peak period from the Aimsun next model are shown in Table 8. It can be observed that a dramatic increase in latent vehicles and average network delay has occurred compared to the 2017 results, indicating much higher congestion in the roadway network. This could be attributed to the increase in the traffic demand and may indicate roadway capacity and safety issues.

Table 8: 2020 No-Action Network Wide Results

Parameter	2020 No-Action
Total Travel Time, VHT (hr)	19,828
Total Travelled Distance, VMT (mi)	415,894
Delay Time (sec/mi)	129.0
Total Delay Time (hr)	14,898
Total Network Vehicles (veh)	**199,467**
Latent Vehicles (veh)	**9,397**
Latent Delay Time (hr)	2,144
Number of Arrived Vehicles	185,734
Number of Active Vehicles	4,335
Total Network Delay (hr)	**17,043**
Average Network Delay (sec/veh)	**308**

As expected, segment travel times in the 2020 No-Action condition increased considerably on all three segments. Two of the segments travel times nearly doubled compared to 2017 travel times, as the increase in traffic demand results in lower speeds and longer delays. Figure 9 shows the travel time for all three segments. Intersection delay also increased in the 2020 No-Action condition, which was anticipated. Waiting times at the signals (intersection delay) produced longer queues shown in Tables 9 and 10, respectively. Some of the intersections experience more than 5 minutes of delay for each vehicle on average, which is not acceptable from a traffic perspective. As mentioned earlier, the close proximity of the signalized intersection at Dean Martin Drive to the I-15 ramp terminals magnifies the delay for all vehicles that are already experiencing high delays in 2017. Queues extend to unrealistically long distances along some approaches, reaching more than a mile. Traffic signal timings that are already set to maximum cycle lengths in 2017 were also optimized for better operations. But as the congestion is already close to saturation, the optimized splits barely made an improvement to any delays at the three intersections. Detailed Aimsun Next output for intersection delay and queues are included in Appendix D.

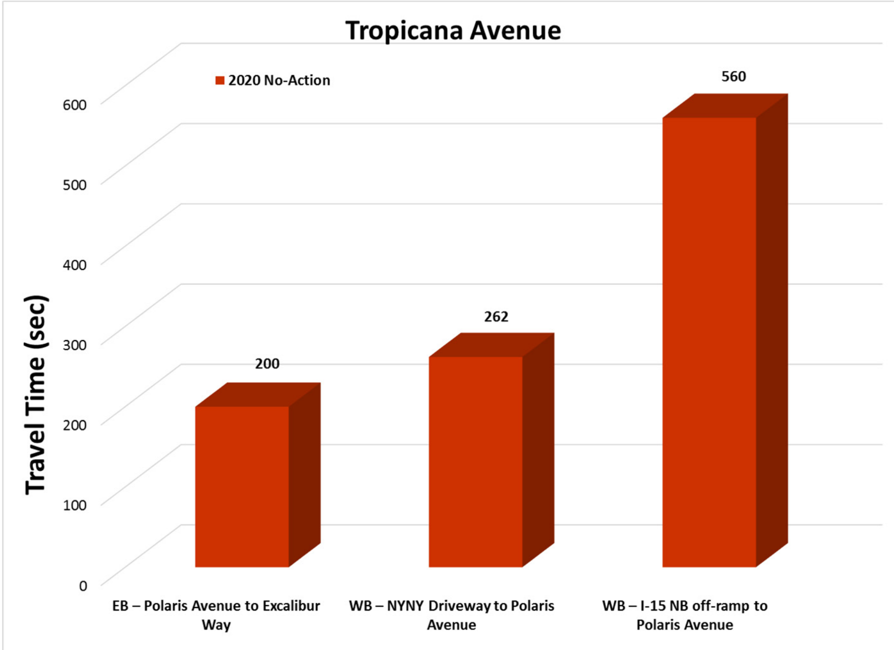

Figure 9: 2020 No-Action Peak-Hour Travel Time

Table 9: 2020 No-Action Peak-Hour Average Intersection Delay

Intersection	Delay (s/veh)
Tropicana Avenue and Valley View Boulevard	121.0
Tropicana Avenue and Polaris Avenue	106.4
Tropicana Avenue and Dean Martin Drive	234.8
Tropicana Avenue and I-15 SB Ramps	37.4
Tropicana Avenue and I-15 NB Ramps	199.0
Tropicana Avenue and Excalibur/New York New York	80.2
Tropicana Avenue and Las Vegas Boulevard	251.7

Table 10: 2020 No-Action Peak-Hour Maximum Queue

Intersection	Approach	Max Queue
Tropicana Avenue and Dean Martin Drive	EB	625’
	NB	>1,000’
	WB	225’
	SB	>1,000’
Tropicana Avenue and I-15 SB Ramps	EB	425’
	WB	325’
	SB	350’
Tropicana Avenue and I-15 NB Ramps	EB	100’
	NB	>1,000’
	WB	850’

I-15 NB segment results for 2020 No-Action are shown in Table 11. Extremely long queues were observed at the south leg of the I-15 NB/Tropicana Avenue ramp terminal intersection. These queues spillback onto NB CD road and extend south to the I-15/I-215/CC-215 interchange. Queues also spillback onto the I-15 NB mainline through the ramp from the mainline to the CD road south of Russell Road. This results in the higher density observed for the I-15 NB segment between I-215 WB on-ramp and the ramp from I-15 to the CD road (near Russell Road). This also limits/meters the number of vehicles flowing along I-15 NB mainline and masks the downstream issues along the freeway, resulting in lower densities and higher speeds (compared to year 2017) in these downstream segments.

Table 12 shows the 2020 No-Action I-15 SB segment results. Similar to 2017, all of the I-15 SB segments operate at a density less than 35 veh/mile with speeds greater than 50 mph. The weaving segment between the Flamingo Road on-ramp and the Tropicana Avenue off-ramp also operates at higher speeds, indicating less weaving. Detailed Aimsun Next output is included in Appendix E.

Table 11: 2020 No-Action Peak-Hour I-15 Northbound Results

I-15 NORTHBOUND			
Segment		Density	Speed
From	To	(veh/mile/ln)	(mph)
I-215 WB on-ramp	I-15 to CD (near Russell Road)	155.6	11
I-15 to NB CD (near Russell Road)	NB CD on-ramp	13.2	67
NB CD on-ramp	Tropicana Avenue on-ramp	18.3	65
Tropicana Avenue on-ramp	Flamingo Road off-ramp	17.0	63
Flamingo Road off-ramp	Spring Mountain Road off-ramp	16.6	63
Spring Mountain Road off-ramp	Flamingo Road on-ramp	13.6	69
Flamingo Road on-ramp	Spring Mountain Road EB on-ramp	12.9	68

Table 12: 2020 No-Action Peak-Hour I-15 Southbound Results

I-15 SOUTHBOUND			
Segment		Density	Speed
From	To	(veh/mile/ln)	(mph)
Spring Mountain Road on-ramp	Flamingo Road WB off-ramp	23.6	66
Flamingo Road WB off-ramp	Flamingo Road EB off-ramp	28.0	57
Flamingo Road EB off-ramp	Flamingo Road on-ramp	30.4	56
Flamingo Road on-ramp	Tropicana Avenue off-ramp	35.1	50
Tropicana Avenue off-ramp	I-15 to SB CD	25.6	61
I-15 to SB CD	I-215 off-ramp	18.1	66
I-215 off-ramp	SB CD to I-15 SB	17.4	61
SB CD to I-15 SB	Blue Diamond Road off-ramp	17.1	66

2020 No-Action traffic analysis results for NB CD segments are shown in Table 13. The NB CD segments have congestion issues with average speeds less than 10 mph. The shown increase in traffic demand coupled with the congestion stemming from the I-15 NB/Tropicana Avenue ramp terminal intersection will completely degrade the performance of the overall NB CD.

Traffic analysis results for the SB CD segments are shown in Table 14. The increase in traffic volumes in the future year compared to the existing conditions, results in bottlenecks upstream of the I-15 SB CD road. These bottlenecks limit/meter the number of vehicles reaching the I-15 SB CD road. Consequently, the number of vehicles processed by the CD road segments during the PM peak period in year 2020 No-Action Alternative is lower than year 2017. Fewer vehicles on these segments result in lower densities (compared to year 2017). Furthermore, minor changes in traffic patterns (between year 2017 and the future year) on the I-15 SB CD road (weaving vs. non-weaving vehicles) might also have some impact on the densities. Local, segment-specific results are sometimes counter-intuitive; the network-wide results therefore provide a better overall picture in terms of the changes in operations in the study area. Detailed Aimsun Next output is included in Appendix F.

Table 13: 2020 No-Action Peak-Hour NB CD Results

NORTHBOUND CD			
Segment		Density (veh/mile/ln)	Speed (mph)
From	To		
I-215 WB on-ramp	Russell Road off-ramp	71.2	34
Russell Road off-ramp	I-15 to CD (near Russell Road)	180.6	6
I-15 to CD (near Russell Road)	Russell Road on-ramp	175.5	6
Russell Road on-ramp	NB CD on-ramp	129.5	9
NB CD on-ramp	Tropicana Avenue off-ramp	172.9	5

Table 14: 2020 No-Action Peak-Hour SB CD Results

SOUTHBOUND CD			
Segment		Density (veh/mile/ln)	Speed (mph)
From	To		
Tropicana Avenue on-ramp	I-15 to SB CD	25.3	42
I-15 to SB CD	Russell Road off-ramp	18.3	59
Russell Road off-ramp	Russell Road on-ramp	16.2	66
Russell Road on-ramp	I-215/CC-215 off-ramp	21.6	61
I-215/CC-215 off-ramp	SB CD to I-15 SB	12.1	65

3.2. 2040 No-Action

The design year for this project is 2040. Traffic forecasting and operation analysis was performed for a 2040 No-Action configuration to evaluate the traffic performance without this project's improvements. Figure 10 and Figure 11 show the project's 2040 No-Action PM peak-hour volumes.

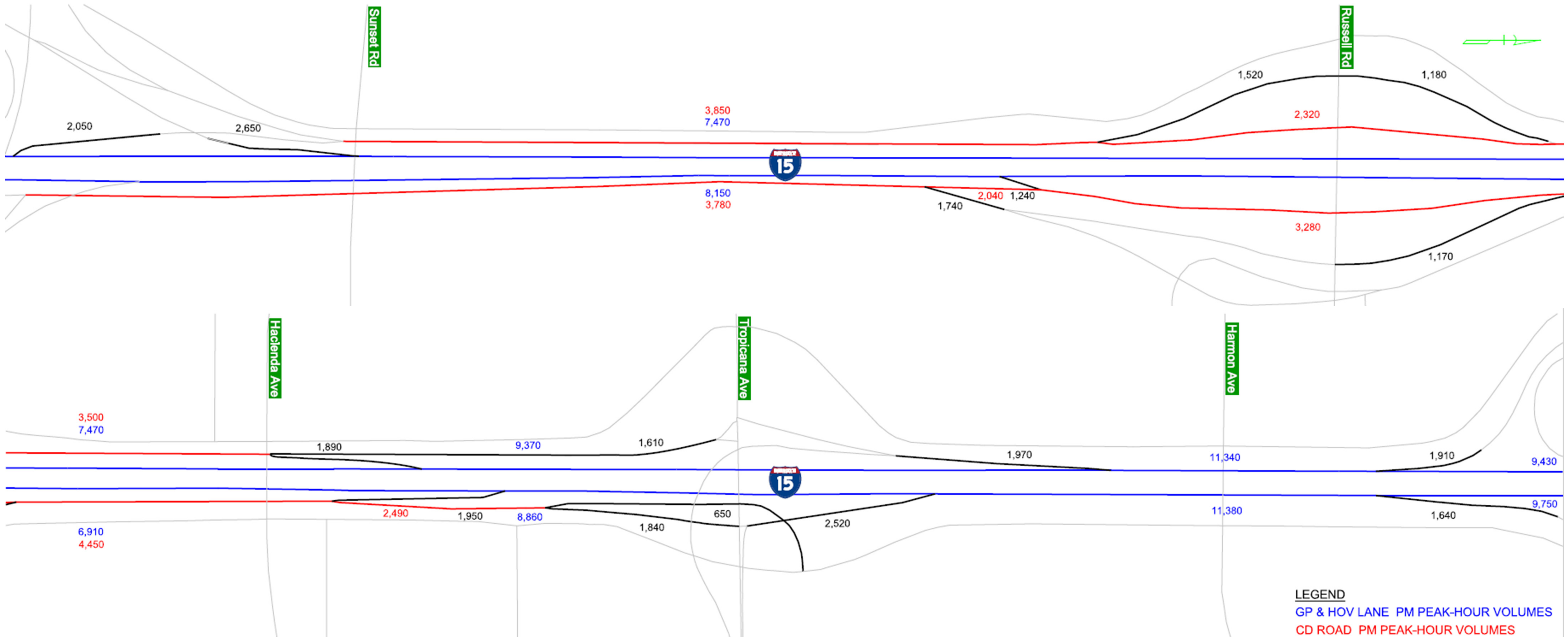

Figure 10: 2040 No-Action Peak-Hour Volumes

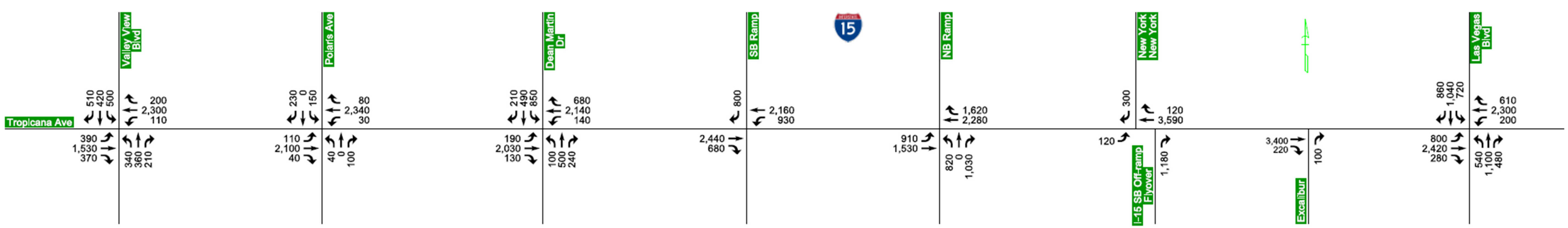

Figure 11: 2040 No-Action Peak-Hour Intersection Turning Movement Volumes

2040 No-Action network wide results for the PM peak period from the Aimsun next model are shown in Table 15. The number of latent vehicles observed was more than 3 times greater than the 2020 No-Action model results, and average network delay was close to 500 sec/veh, indicating worsening congestion along the roadway network. This would create major safety and capacity concerns.

Table 15: 2040 No-Action Network Wide Results

Parameter	2040 No-Action
Total Travel Time, VHT (hr)	29,212
Total Travelled Distance, VMT (mi)	442,261
Delay Time (sec/mi)	205.6
Total Delay Time (hr)	25,257
Total Network Vehicles (veh)	238,456
Latent Vehicles (veh)	29,956
Latent Delay Time (hr)	6,987
Number of Arrived Vehicles	200,152
Number of Active Vehicles	8,348
Total Network Delay (hr)	32,244
Average Network Delay (sec/veh)	487

Travel times in the 2040 No-Action condition increased considerably on all three segments due to the increase in traffic demand. This results in lower speeds and longer delays. Figure 12 shows the travel time for all three segments. Intersection delays also increased in the 2040 No-Action condition. This results in increased intersection delays at the signals with longer queues as shown in Table 16 and Table 17, respectively. Significant capacity issues were observed at Tropicana Avenue/Valley View Boulevard, Tropicana Avenue/Dean Martin Drive, and I-15/Tropicana Avenue ramp terminals, and Tropicana Avenue/Las Vegas Boulevard intersections. Extremely long queues were observed at the intersection of Tropicana Avenue at Dean Martin Drive for NB and SB, and at I-15 NB Ramps for NB directions. Detailed Aimsun Next output for intersection delay and queues are included in Appendix G.

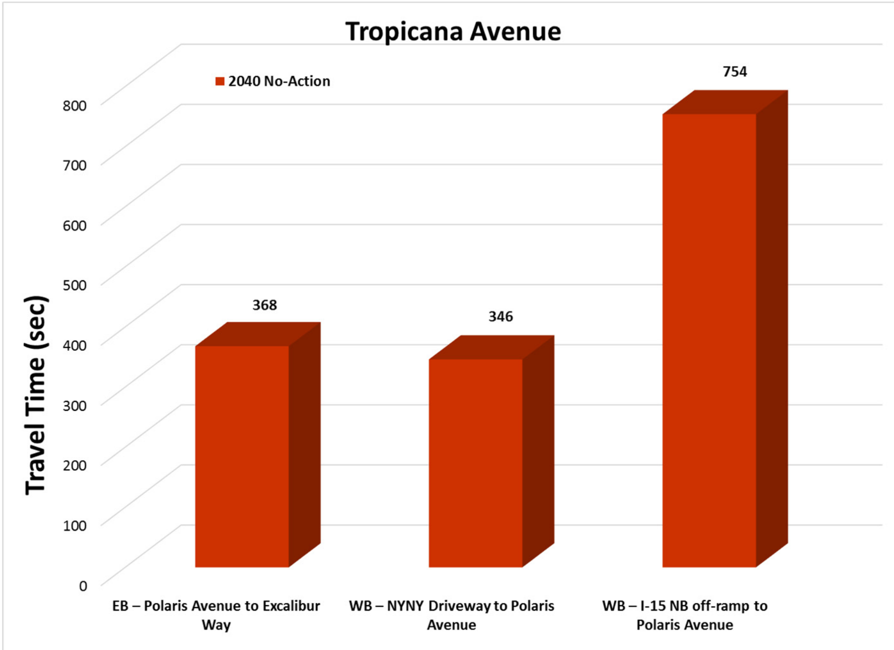

Figure 12: 2040 No-Action Peak-Hour Travel Time

Table 16: 2040 No-Action Peak-Hour Average Intersection Delay

Intersection	Delay (s/veh)
Tropicana Avenue and Valley View Boulevard	472.3
Tropicana Avenue and Polaris Avenue	143.5
Tropicana Avenue and Dean Martin Drive	533.7
Tropicana Avenue and I-15 SB Ramps	93.4
Tropicana Avenue and I-15 NB Ramps	222.3
Tropicana Avenue and Excalibur/New York New York	51.0
Tropicana Avenue and Las Vegas Boulevard	235.5

Table 17: 2040 No-Action Peak-Hour Maximum Queue

Intersection	Approach	Max Queue
Tropicana Avenue and Dean Martin Drive	EB	600’
	NB	>1,000’
	WB	275’
	SB	>1,000’
Tropicana Avenue and I-15 SB Ramps	EB	525’
	WB	325’
	SB	900’
Tropicana Avenue and I-15 NB Ramps	EB	150’
	NB	>1,000’
	WB	900’

I-15 NB segment results for 2040 No-Action are shown in Table 18. Similar to the 2020 No-Action condition, extremely long queues were observed at the south leg of the I-15 NB/Tropicana Avenue ramp terminal intersection. These queues spillback onto NB CD road and extend south to the I-15/I-215/CC-215 interchange. Queues also spillback onto the I-15 NB mainline through the ramp from the mainline to the CD road south of Russell Road. This results in the higher density observed for the I-15 NB segment between I-215 WB on-ramp and the ramp from I-15 to the CD road (near Russell Road). This also limits/meters the number of vehicles flowing along I-15 NB mainline and masks the downstream issues along the freeway, resulting in lower densities and higher speeds (compared to year 2017) in these downstream segments.

Table 18 shows the I-15 SB segment results for 2040 No-Action. Lower speeds with higher densities were observed along the weaving segment between the Flamingo Road on-ramp and the Tropicana Avenue off-ramp. Due to this traffic gridlock, segments upstream will have a domino effect with higher densities and lower speeds. Detailed Aimsun Next output is included in Appendix H.

Table 18: 2040 No-Action Peak-Hour I-15 Northbound Results

I-15 NORTHBOUND			
Segment		Density (veh/mile/ln)	Speed (mph)
From	To		
I-215 WB on-ramp	I-15 to CD (near Russell Road)	165.7	10
I-15 to NB CD (near Russell Road)	NB CD on-ramp	12.5	67
NB CD on-ramp	Tropicana Avenue on-ramp	16.7	65
Tropicana Avenue on-ramp	Flamingo Road off-ramp	15.9	64
Flamingo Road off-ramp	Spring Mountain Road off-ramp	15.5	63
Spring Mountain Road off-ramp	Flamingo Road on-ramp	12.9	69
Flamingo Road on-ramp	Spring Mountain Road EB on-ramp	12.6	68

Table 19: 2040 No-Action Peak-Hour I-15 Southbound Results

I-15 SOUTHBOUND			
Segment		Density (veh/mile/ln)	Speed (mph)
From	To		
Spring Mountain Road on-ramp	Flamingo Road WB off-ramp	56.3	42
Flamingo Road WB off-ramp	Flamingo Road EB off-ramp	64.8	33
Flamingo Road EB off-ramp	Flamingo Road on-ramp	74.2	31
Flamingo Road on-ramp	Tropicana Avenue off-ramp	50.0	40
Tropicana Avenue off-ramp	I-15 to SB CD	32.3	56
I-15 to SB CD	I-215 off-ramp	21.6	64
I-215 off-ramp	SB CD to I-15 SB	20.4	60
SB CD to I-15 SB	Blue Diamond Road off-ramp	19.3	66

2040 No-Action traffic analysis results for the NB CD segments are shown in Table 20. The NB CD segments display excessive unrealistic congestion with average speeds less than 5 mph and densities as high as 200 veh/mile. The NB CD results in what is practically a parking lot with traffic at a standstill and queues extending for more than a mile that worsen the entire model's overall performance.

Traffic analysis results for the SB CD segments are shown in Table 21. The increase in traffic volumes in the future year compared to the existing conditions, results in bottlenecks upstream of the I-15 SB CD road. These bottlenecks limit/meter the number of vehicles reaching the I-15 SB CD road. Consequently, the number of vehicles processed by the CD road segments during the PM peak period in year 2040 No-Action Alternative is lower than year 2017. Fewer vehicles on these segments result in lower densities (compared to year 2017). Furthermore, minor changes in traffic patterns (between year 2017 and the future year) on the I-15 SB CD road (weaving vs. non-weaving vehicles) might also have some impact on the densities. Local, segment-specific results are sometimes counter-intuitive; the network-wide results therefore provide a better overall picture in terms of the changes in operations in the study area. Detailed Aimsun Next output is included in Appendix I.

Table 20: 2040 No-Action Peak-Hour NB CD Results

NORTHBOUND CD			
Segment		Density (veh/mile/ln)	Speed (mph)
From	To		
I-215 WB on-ramp	Russell Road off-ramp	151.7	10
Russell Road off-ramp	I-15 to CD (near Russell Road)	201.1	4
I-15 to CD (near Russell Road)	Russell Road on-ramp	196.8	4
Russell Road on-ramp	NB CD on-ramp	149.8	7
NB CD on-ramp	Tropicana Avenue off-ramp	188.3	4

Table 21: 2040 No-Action Peak-Hour SB CD Results

SOUTHBOUND CD			
Segment		Density (veh/mile/ln)	Speed (mph)
From	To		
Tropicana Avenue on-ramp	I-15 to SB CD	20.0	43
I-15 to SB CD	Russell Road off-ramp	17.9	59
Russell Road off-ramp	Russell Road on-ramp	15.2	66
Russell Road on-ramp	I-215/CC-215 off-ramp	24.0	58
I-215/CC-215 off-ramp	SB CD to I-15 SB	12.6	65

3.3. HARMON AVENUE

Harmon Avenue was also analyzed for the 2017, 2020 No-Action and 2040 No-Action conditions in the Aimsun Next roadway network. Harmon Avenue over I-15 is a free flow street without any intersections for all the above conditions. As a result, delay or MOEs were not observed in the traffic analysis. Figures 13 through 15 show the peak-hour volumes on Harmon Avenue for various years.

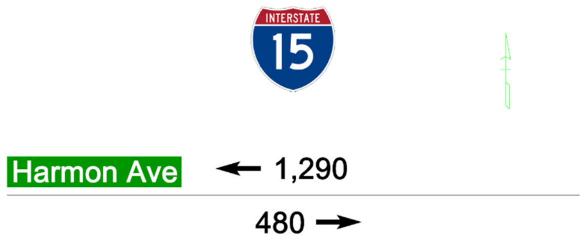

Figure 13: Harmon Avenue 2017 Peak-Hour Volumes

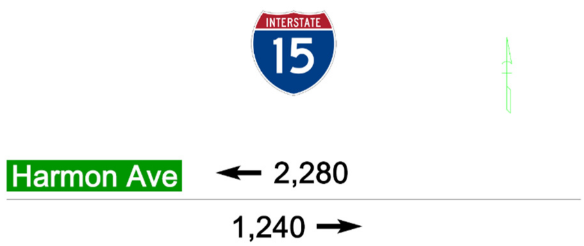

Figure 14: Harmon Avenue 2020 No-Action Peak-Hour Volumes

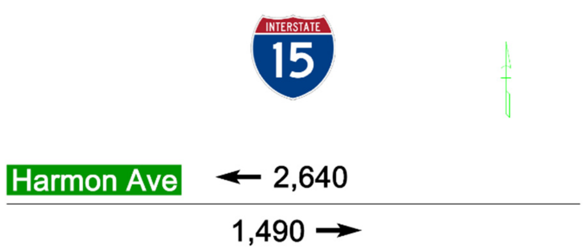

Figure 15: Harmon Avenue 2040 No-Action Peak-Hour Volumes

4. SUMMARY AND CONCLUSIONS

Below are the key observations from the traffic analysis that should be compared against the results of a build alternative.

- 2017 Existing Conditions
  - Network wide results show approximately **100** latent vehicles with an average delay of approximately **3 min/veh**
  - The travel time for Tropicana Avenue WB is longer due to congestion from weaving and closely spaced intersections. Average intersection delay at Tropicana Avenue and Dean Martin Drive is greater than **3 min/veh**. Queues at the I-15 NB exit ramp and Dean Martin Drive SB direction are greater than 1,000 feet
  - I-15 model results show no major congestion, but field observation indicate major congestion at the NB CD on-ramp. Weaving issues were also observed in the field between the Tropicana Avenue on-ramp and the Flamingo Road off-ramp
  - The NB CD has major congestion and weaving issues from Russell Road to Tropicana Avenue. As the CC-215 interchange is not included in the model, SB CD did not show any possible congestion

- 2020 No-Action
  - Network wide results show more than **9,000** latent vehicles, a massive increase from 2017. An average delay of **5 min/veh** represents a near **75% increase** compared to 2017's average delay
  - Travel time for all 3 model segments increased from 2017. Tropicana Avenue's WB travel time **increased by 100%** compared to that of 2017. The average intersection delay on Tropicana Avenue at Dean Martin Drive and the I-15 NB Ramps **increased by 100%** from 2017. Queues remain greater than 1,000 feet
  - I-15 results show major congestion at the I-15 NB traffic exiting to the NB CD with queues spilling back on to mainline. The queues from the Tropicana Avenue NB off-ramp terminal were observed to back up on to the NB CD
  - The NB CD continues to increase in congestion and weaving issues from Russell Road to Tropicana Avenue. The NB CD will have major safety and capacity issues in all its segments

- 2040 No-Action
  - Network wide results show around **30,000** latent vehicles. An average delay of over **8 min/veh** represents a near **175% increase** compared to that of 2017
  - Travel time for all 3 model segments more than **doubled** from 2017. Tropicana Avenue EB travel time **increased by 200%,** and WB **by 170%** compared to 2017. Average intersection delay on Tropicana Avenue at Dean Martin Drive, I-15 SB and I-15 NB Ramps **increased by more than 170%** from 2017. Queues continue to be longer than 1,000 feet
  - I-15 results show major congestion and degraded operations on I-15. Weaving issues were observed on I-15 SB between Flamingo Road and Tropicana Avenue
  - The NB CD segments show unrealistic congestion levels with average speeds less than 5 mph, which will result in major safety and capacity issues

Traffic analysis revealed that the existing roadway network in the study area would experience significant degradation in future traffic operations without any capacity or operational improvements.

5. LIST OF APPENDICES

Appendix A – 2017 Aimsun Next Output for Intersection Delay and Queues

Appendix B – 2017 Aimsun Next Output for I-15

Appendix C – 2017 Aimsun Next Output for CD Roads

Appendix D – 2020 No-Action Aimsun Next Output for Intersection Delay and Queues

Appendix E – 2020 No-Action Aimsun Next Output for I-15

Appendix F – 2020 No-Action Aimsun Next Output for CD Roads

Appendix G – 2040 No-Action Aimsun Next Output for Intersection Delay and Queues

Appendix H – 2040 No-Action Aimsun Next Output for I-15

Appendix I – 2040 No-Action Aimsun Next Output for CD Roads

APPENDIX A
2017 Aimsun Next Output for Intersection Delay and Queues

2017 Aimsun Output for Intersection Delay and Queues

Intersection	Approach	4:00 PM to 4:15 PM				4:15 PM to 4:30 PM				4:30 PM to 4:45 PM				4:45 PM to 5:00 PM			
		Approach Summary			Intersection Summary	Approach Summary			Intersection Summary	Approach Summary			Intersection Summary	Approach Summary			Intersection Summary
		Delay (s/veh)	Vehicles	Max Queue (feet)	Delay (s/veh)	Delay (s/veh)	Vehicles	Max Queue (feet)	Delay (s/veh)	Delay (s/veh)	Vehicles	Max Queue (feet)	Delay (s/veh)	Delay (s/veh)	Vehicles	Max Queue (feet)	Delay (s/veh)
Tropicana Avenue and Valley View Boulevard	EB	25.3	523	325	25.4	41.4	471	425	30.0	34.0	503	375	26.6	58.7	465	575	37.3
	NB	48.8	203	200		53.8	182	150		37.7	178	150		55.4	158	150	
	WB	13.6	489	150		11.4	549	150		14.0	519	150		12.4	514	150	
	SB	37.6	84	125		36.7	77	125		37.3	79	125		37.7	98	150	
Tropicana Avenue and Polaris Avenue	EB	15.7	534	275	14.0	67.2	523	450	37.1	36.8	504	425	23.0	89.9	537	575	49.4
	NB	35.3	29	75		37.6	34	100		35.6	26	75		44.7	30	75	
	WB	5.5	444	75		4.6	526	75		5.5	492	75		5.0	477	75	
	SB	38.4	92	200		53.8	83	200		40.2	77	200		44.1	84	175	
Tropicana Avenue and Dean Martin Drive	EB	50.8	488	550	95.9	71.9	591	525	162.7	61.8	499	550	173.7	83.4	539	575	190.8
	NB	98.5	132	225		96.4	126	225		79.3	118	175		98.0	130	225	
	WB	18.6	494	175		15.4	557	175		16.1	547	150		15.1	498	150	
	SB	301.4	291	1875		869.7	204	3200		908.3	209	4125		920.0	216	4750	
Tropicana Avenue and I-15 SB Ramps	EB	22.2	624	375	29.8	19.7	702	400	26.2	24.9	603	425	29.1	21.6	668	400	29.7
	WB	31.7	602	225		26.3	610	225		25.2	639	225		31.3	617	225	
	SB	39.4	385	300		39.6	337	275		42.5	373	275		43.2	326	250	
Tropicana Avenue and I-15 NB Ramps	EB	12.3	475	125	63.5	13.8	564	125	55.1	20.8	425	150	66.6	14.1	554	150	76.8
	NB	89.8	361	500		87.2	363	525		133.9	412	900		205.6	371	1150	
	WB	83.4	745	625		69.4	809	650		56.7	821	525		60.6	801	575	
Tropicana Avenue and NY NY/Excalibur	EB	3.1	649	75	21.6	3.7	651	75	15.9	4.5	644	100	12.8	4.0	673	100	10.0
	NB	26.2	19	100		23.2	26	125		28.7	19	100		26.6	20	100	
	WB	30.9	699	225		20.4	763	175		14.7	727	150		11.1	772	125	
	SB	86.3	84	400		82.7	64	300		64.0	72	225		56.8	61	200	
Tropicana Avenue and Las Vegas Boulevard	EB	37.9	600	300	71.0	44.9	603	300	69.8	44.5	591	275	63.3	44.6	621	300	57.1
	NB	63.7	357	350		51.0	361	300		50.5	356	300		51.2	395	325	
	WB	105.6	689	650		109.1	752	725		96.5	676	525		78.8	692	425	
	SB	67.2	395	350		49.4	378	300		46.7	417	350		45.7	422	325	

Intersection	Approach	5:00 PM to 5:15 PM				5:15 PM to 5:30 PM				5:30 PM to 5:45 PM				5:45 PM to 6:00 PM			
		Approach Summary			Intersection Summary	Approach Summary			Intersection Summary	Approach Summary			Intersection Summary	Approach Summary			Intersection Summary
		Delay (s/veh)	Vehicles	Max Queue (feet)	Delay (s/veh)	Delay (s/veh)	Vehicles	Max Queue (feet)	Delay (s/veh)	Delay (s/veh)	Vehicles	Max Queue (feet)	Delay (s/veh)	Delay (s/veh)	Vehicles	Max Queue (feet)	Delay (s/veh)
Tropicana Avenue and Valley View Boulevard	EB	36.0	489	400	27.6	26.8	442	275	25.3	23.5	426	250	22.0	25.6	432	250	20.9
	NB	41.9	169	125		47.6	161	125		50.3	138	100		40.8	112	100	
	WB	13.8	539	175		14.1	464	150		10.4	505	125		11.6	537	125	
	SB	37.8	86	150		34.5	95	125		37.5	84	125		32.5	66	100	
Tropicana Avenue and Polaris Avenue	EB	65.1	528	375	36.3	24.5	464	275	18.2	14.6	485	175	12.8	8.3	447	100	9.5
	NB	34.3	31	75		33.4	33	75		28.0	32	75		23.8	25	50	
	WB	4.3	488	75		5.4	422	75		4.5	472	75		4.9	508	100	
	SB	40.9	91	200		39.2	95	200		42.9	86	200		42.0	79	175	
Tropicana Avenue and Dean Martin Drive	EB	62.5	579	475	193.5	46.6	514	450	223.8	28.9	505	325	224.3	23.2	490	225	189.5
	NB	83.6	115	200		92.3	124	200		77.7	123	175		76.3	121	175	
	WB	14.3	528	150		15.7	474	125		13.7	491	125		15.4	543	150	
	SB	1051.7	213	6075		1123.0	229	7200		1123.6	245	7600		964.6	245	6900	
Tropicana Avenue and I-15 SB Ramps	EB	20.2	673	400	27.3	18.7	617	400	26.4	14.9	620	350	27.2	14.0	589	350	25.4
	WB	27.2	630	225		27.2	633	225		31.5	626	225		27.2	653	225	
	SB	41.3	340	225		39.5	325	200		41.3	352	225		41.2	354	225	
Tropicana Avenue and I-15 NB Ramps	EB	14.9	524	125	82.6	13.1	458	125	80.2	11.1	502	125	85.0	9.9	428	100	78.4
	NB	224.3	377	1175		206.4	344	1075		173.8	383	900		172.8	380	950	
	WB	60.8	817	525		64.7	822	575		88.9	797	675		70.0	779	600	
Tropicana Avenue and NY NY/Excalibur	EB	4.4	705	75	11.3	3.8	696	75	11.2	4.0	687	75	13.8	4.5	674	75	10.3
	NB	29.9	25	125		24.6	27	125		27.1	23	125		27.7	20	100	
	WB	12.9	747	175		13.0	774	125		17.5	753	175		11.5	692	100	
	SB	53.0	76	225		53.2	80	250		70.6	63	225		69.9	45	150	
Tropicana Avenue and Las Vegas Boulevard	EB	40.5	651	300	63.4	41.4	659	300	59.7	41.9	641	300	62.0	35.9	622	250	61.9
	NB	54.7	366	325		53.5	416	325		52.8	338	275		53.9	317	250	
	WB	96.3	646	475		90.2	689	450		95.6	660	450		102.1	597	425	
	SB	55.5	412	350		44.1	408	325		46.0	384	325		46.4	343	275	

The queues reported here correspond to the approaches and not specific movements/storage bays.

APPENDIX B

2017 Aimsun Next Output for I-15

2017 Aimsun Next Output for I-15

I-15 Northbound		4:00 PM to 4:15 PM			4:15 PM to 4:30 PM			4:30 PM to 4:45 PM			4:45 PM to 5:00 PM			5:00 PM to 5:15 PM			5:15 PM to 5:30 PM			5:30 PM to 5:45 PM			5:45 PM to 6:00 PM		
Section from	Section to	Vehicles	Density (veh/mile)	Speed (mph)	Vehicles	Density (veh/mile)	Speed (mph)	Vehicles	Density (veh/mile)	Speed (mph)	Vehicles	Density (veh/mile)	Speed (mph)	Vehicles	Density (veh/mile)	Speed (mph)	Vehicles	Density (veh/mile)	Speed (mph)	Vehicles	Density (veh/mile)	Speed (mph)	Vehicles	Density (veh/mile)	Speed (mph)
I-215 WB on-ramp	I-15 to CD (near Russell Road)	1637	16.7	64.6	1755	18.5	63.1	1647	22.3	60.3	1581	40.7	52.2	1586	47.6	50.1	1665	60.6	43.4	1542	74.4	39.0	1657	63.8	38.6
I-15 to CD (near Russell Road)	NB CD on-ramp	1416	17.6	65.0	1513	19.0	64.4	1431	18.3	63.6	1407	18.4	62.4	1412	18.6	62.1	1486	19.7	61.7	1386	18.4	61.5	1503	20.2	60.8
		1418	16.7	68.4	1513	18.1	67.8	1432	17.0	68.1	1406	16.9	67.5	1412	16.9	67.5	1489	17.9	67.3	1387	16.6	67.6	1501	18.1	67.0
		1413	17.1	67.3	1509	19.1	65.4	1438	17.6	66.6	1409	17.4	66.3	1406	17.2	66.9	1491	18.6	66.0	1387	16.7	67.5	1498	18.4	66.4
NB CD on-ramp	Tropicana Avenue on-ramp	1880	26.0	59.5	1954	32.8	55.2	1916	26.9	58.4	1872	26.2	58.9	1884	26.1	59.2	1959	27.8	58.4	1879	25.9	59.3	1966	27.6	58.4
Tropicana Avenue on-ramp	Flamingo Road off-ramp	2331	30.4	52.1	2539	41.3	48.9	2434	26.5	55.4	2435	25.5	56.8	2342	24.2	57.5	2486	25.8	57.0	2329	22.7	60.0	2364	23.2	59.7
Flamingo Road off-ramp	Spring Mountain Road off-ramp	1926	33.7	46.0	2232	31.2	53.5	2037	30.7	49.7	2171	27.4	56.0	2025	27.9	52.7	2183	28.2	54.9	1993	22.8	59.8	2008	22.6	60.5
Spring Mountain Road off-ramp	Flamingo Road on-ramp	1093	12.8	68.2	1774	21.7	66.4	1314	15.7	67.4	1706	20.6	66.9	1355	16.1	67.5	1633	19.7	67.1	1565	18.7	67.5	1615	19.4	67.3
Flamingo Road on-ramp	Spring Mountain Road EB on-ramp	1314	11.7	68.6	2048	19.2	66.5	1568	14.3	67.7	1960	18.0	67.3	1603	14.7	67.5	1834	16.7	68.0	1825	16.7	67.5	1848	17.0	67.5

I-15 Southbound		4:00 PM to 4:15 PM			4:15 PM to 4:30 PM			4:30 PM to 4:45 PM			4:45 PM to 5:00 PM			5:00 PM to 5:15 PM			5:15 PM to 5:30 PM			5:30 PM to 5:45 PM			5:45 PM to 6:00 PM		
Section from	Section to	Vehicles	Density (veh/mile)	Speed (mph)	Vehicles	Density (veh/mile)	Speed (mph)	Vehicles	Density (veh/mile)	Speed (mph)	Vehicles	Density (veh/mile)	Speed (mph)	Vehicles	Density (veh/mile)	Speed (mph)	Vehicles	Density (veh/mile)	Speed (mph)	Vehicles	Density (veh/mile)	Speed (mph)	Vehicles	Density (veh/mile)	Speed (mph)
Spring Mountain Road on-ramp	Flamingo Road WB off-ramp	2311	21.8	67.2	2523	24.1	66.1	2547	24.4	66.1	2473	23.5	66.5	2533	24.2	66.3	2664	25.8	65.5	2474	23.5	66.5	2334	21.9	67.2
Flamingo Road WB off-ramp	Flamingo Road EB off-ramp	2183	24.6	61.0	2392	29.4	57.5	2432	30.1	57.0	2340	28.4	57.9	2403	29.5	57.5	2505	34.0	54.1	2355	28.9	57.4	2211	25.2	60.6
Flamingo Road EB off-ramp	Flamingo Road on-ramp	1949	25.2	62.9	2172	29.0	61.3	2199	29.8	60.5	2148	28.5	61.6	2172	28.9	61.3	2346	33.4	58.2	2184	29.4	60.6	2030	26.4	62.5
Flamingo Road on-ramp	Tropicana Avenue off-ramp	2364	29.4	55.6	2549	32.0	54.8	2561	32.8	53.8	2490	30.6	56.0	2588	33.4	53.5	2767	37.9	50.4	2583	33.3	53.3	2382	28.3	57.5
Tropicana Avenue off-ramp	I-15 to SB CD	1976	30.4	54.7	2215	32.3	57.3	2188	31.8	56.3	2163	30.1	58.6	2248	33.1	55.6	2440	35.6	55.8	2232	32.7	55.9	2030	27.5	59.9
		1954	40.7	48.5	2238	34.5	56.8	2181	35.3	53.8	2171	30.3	59.3	2239	36.2	53.3	2439	35.7	56.4	2231	35.5	54.1	2048	27.8	60.6
		1959	23.0	59.6	2238	25.0	62.2	2179	25.2	60.4	2173	23.8	63.1	2232	25.6	60.7	2439	27.4	61.5	2235	25.6	60.8	2057	22.1	64.1
I-15 to SB CD	I-215 off-ramp	1350	15.5	68.7	1782	21.6	67.4	1634	19.2	67.9	1741	20.8	67.7	1668	19.7	68.0	1973	24.1	66.5	1720	20.3	67.6	1634	19.4	68.3
		1396	15.2	61.7	1742	19.4	62.3	1644	18.0	62.3	1734	19.1	62.2	1669	18.4	62.1	1942	24.0	57.7	1756	20.4	59.5	1630	17.7	63.1
I-215 off-ramp	SB CD to I-15 SB	637	8.7	69.1	1101	15.6	67.9	1030	14.2	68.7	1094	15.2	68.9	1017	14.0	68.9	1203	16.9	68.1	1138	16.0	68.0	1049	14.5	69.0
SB CD to I-15 SB	Blue Diamond Road off-ramp	1027	11.9	67.9	1373	16.8	67.7	1337	15.5	68.3	1390	16.5	68.3	1408	16.7	67.4	1581	19.3	66.7	1508	17.7	67.6	1373	16.4	68.0

Note: Aimsun Next MOEs presented here do not necessarily match the Highway Capacity Manual's (HCM) definition/calculation of these MOEs. Therefore, these Aimsun Next results are not to be compared with HCM thresholds/results.

APPENDIX C

2017 Aimsun Next Output for CD Roads

2017 Aimsun Next Output for CD Roads

I-15 Northbound CD Road		4:00 PM to 4:15 PM			4:15 PM to 4:30 PM			4:30 PM to 4:45 PM			4:45 PM to 5:00 PM			5:00 PM to 5:15 PM			5:15 PM to 5:30 PM			5:30 PM to 5:45 PM			5:45 PM to 6:00 PM		
Section from	Section to	Vehicles	Density (veh/mile)	Speed (mph)	Vehicles	Density (veh/mile)	Speed (mph)	Vehicles	Density (veh/mile)	Speed (mph)	Vehicles	Density (veh/mile)	Speed (mph)	Vehicles	Density (veh/mile)	Speed (mph)	Vehicles	Density (veh/mile)	Speed (mph)	Vehicles	Density (veh/mile)	Speed (mph)	Vehicles	Density (veh/mile)	Speed (mph)
I-215 WB on-ramp	Russell Road off-ramp	802	26.2	59.0	703	21.5	61.7	706	22.6	60.5	812	26.7	58.4	689	21.3	61.1	686	21.2	61.9	887	31.2	55.3	821	28.5	56.2
		803	19.1	61.9	704	16.4	62.9	705	16.8	61.9	812	19.9	60.4	690	16.2	62.4	687	16.1	62.9	881	28.7	56.4	824	30.1	54.4
Russell Road off-ramp	I-15 to CD (near Russell Road)	469	14.2	66.6	360	12.9	61.3	343	21.7	53.6	427	35.6	49.3	390	29.5	44.4	367	36.8	41.1	486	85.4	25.0	483	109.8	18.5
I-15 to CD (near Russell Road)	Russell Road on-ramp	630	33.1	53.3	531	127.7	14.3	594	113.4	18.1	574	109.0	21.8	545	133.8	13.9	524	149.4	9.6	632	154.3	8.3	642	154.7	8.3
Russell Road on-ramp	NB CD on-ramp	835	66.6	29.6	823	104.9	11.5	878	90.5	15.3	852	94.2	14.0	839	98.6	12.8	821	104.1	11.4	866	101.1	12.6	852	99.7	12.7
NB CD on-ramp	Tropicana Avenue off-ramp	361	14.8	49.5	363	15.4	48.3	412	23.6	44.6	371	45.3	34.8	377	53.6	28.6	344	47.9	34.1	383	26.3	41.8	380	20.7	44.4

I-15 Southbound CD Road		4:00 PM to 4:15 PM			4:15 PM to 4:30 PM			4:30 PM to 4:45 PM			4:45 PM to 5:00 PM			5:00 PM to 5:15 PM			5:15 PM to 5:30 PM			5:30 PM to 5:45 PM			5:45 PM to 6:00 PM		
Section from	Section to	Vehicles	Density (veh/mile)	Speed (mph)	Vehicles	Density (veh/mile)	Speed (mph)	Vehicles	Density (veh/mile)	Speed (mph)	Vehicles	Density (veh/mile)	Speed (mph)	Vehicles	Density (veh/mile)	Speed (mph)	Vehicles	Density (veh/mile)	Speed (mph)	Vehicles	Density (veh/mile)	Speed (mph)	Vehicles	Density (veh/mile)	Speed (mph)
Tropicana Avenue on-ramp	I-15 to SB CD	392	60.0	20.2	381	47.9	25.9	363	49.4	21.5	381	31.0	30.5	393	28.2	32.3	388	26.2	33.5	388	32.7	29.4	393	38.0	27.8
		392	38.6	41.5	387	37.1	42.0	357	34.1	42.6	379	36.0	42.6	396	37.6	42.3	389	36.9	42.5	390	37.2	42.2	389	37.4	42.3
I-15 to SB CD	Russell Road off-ramp	1015	52.3	30.3	835	38.3	33.2	902	38.9	35.5	822	34.8	34.9	945	42.8	33.9	844	33.3	37.8	929	45.3	31.2	812	34.1	35.5
Russell Road off-ramp	Russell Road on-ramp	717	24.0	60.6	515	19.3	57.5	584	19.3	61.8	483	15.6	61.9	660	22.1	60.8	558	18.0	62.1	610	20.4	60.6	488	15.8	62.0
Russell Road on-ramp	I-215/CC-215 off-ramp	925	30.3	54.0	719	45.1	38.5	763	18.9	62.6	658	16.0	63.2	906	24.0	59.4	784	21.3	58.9	773	19.3	62.0	649	15.8	63.0
		833	56.0	38.3	819	64.8	28.4	737	29.4	51.6	685	24.4	54.8	842	42.1	45.1	840	44.2	41.6	767	28.2	54.3	665	22.5	57.4
I-215/CC-215 off-ramp	SB CD to I-15 SB	346	10.6	65.6	334	10.5	64.7	281	8.6	66.0	320	9.7	65.9	368	11.5	65.2	403	12.6	64.3	339	10.4	65.6	339	10.3	65.8

Note: Aimsun Next MOEs presented here do not necessarily match the Highway Capacity Manual's (HCM) definition/calculation of these MOEs. Therefore, these Aimsun Next results are not to be compared with HCM thresholds/results.

APPENDIX D

2020 No-Action Aimsun Next Output for Intersection Delay and Queues

2020 No-Action Aimsun Next Output for Intersection Delay and Queues

Intersection	Approach	4:00 PM to 4:15 PM				4:15 PM to 4:30 PM				4:30 PM to 4:45 PM				4:45 PM to 5:00 PM				5:00 PM to 5:15 PM				5:15 PM to 5:30 PM				5:30 PM to 5:45 PM				5:45 PM to 6:00 PM			
		Approach Summary			Intersection Summary	Approach Summary			Intersection Summary	Approach Summary			Intersection Summary	Approach Summary			Intersection Summary	Approach Summary			Intersection Summary	Approach Summary			Intersection Summary	Approach Summary			Intersection Summary	Approach Summary			Intersection Summary
		Delay (s/veh)	Vehicles	Max Queue (feet)	Delay (s/veh)	Delay (s/veh)	Vehicles	Max Queue (feet)	Delay (s/veh)	Delay (s/veh)	Vehicles	Max Queue (feet)	Delay (s/veh)	Delay (s/veh)	Vehicles	Max Queue (feet)	Delay (s/veh)	Delay (s/veh)	Vehicles	Max Queue (feet)	Delay (s/veh)	Delay (s/veh)	Vehicles	Max Queue (feet)	Delay (s/veh)	Delay (s/veh)	Vehicles	Max Queue (feet)	Delay (s/veh)	Delay (s/veh)	Vehicles	Max Queue (feet)	Delay (s/veh)
Tropicana Avenue and Valley View Boulevard	EB	34.3	489	225	46.4	53.8	459	350	58.2	96.7	458	500	80.8	150.5	430	775	108.0	202.5	436	975	131.5	254.8	434	1150	163.7	261.5	428	1150	165.5	248.9	441	1100	163.3
	NB	71.2	187	225		74.4	187	200		96.0	181	325		109.8	188	375		122.9	176	425		124.5	195	425		125.4	185	350		130.7	168	325	
	WB	30.5	416	175		27.0	454	175		28.1	438	175		25.4	403	150		27.4	446	150		28.5	409	175		26.0	418	175		25.4	441	150	
	SB	85.3	203	250		127.2	191	325		143.8	207	350		179.6	204	450		220.9	190	550		284.0	196	600		290.9	196	625		321.7	180	650	
Tropicana Avenue and Polaris Avenue	EB	115.8	482	650	63.8	171.3	479	875	88.8	190.0	483	875	97.9	198.9	484	875	106.9	212.7	466	950	106.9	220.5	463	925	114.2	217.7	481	925	114.9	219.9	478	950	112.1
	NB	42.5	28	75		44.3	30	75		44.2	27	75		42.3	30	75		44.0	30	75		43.2	26	75		41.9	31	75		48.6	23	75	
	WB	3.6	382	50		3.1	414	50		3.5	416	25		3.4	366	50		3.3	419	25		3.7	388	50		3.6	378	50		2.7	416	25	
	SB	46.8	85	150		56.1	82	175		46.2	74	150		43.8	76	125		54.2	76	175		60.0	84	175		50.2	80	150		40.7	64	125	
Tropicana Avenue and Dean Martin Drive	EB	103.2	475	650	201.7	99.5	541	625	201.0	98.9	525	625	210.8	105.4	471	625	245.1	98.6	528	625	233.6	99.6	494	600	249.8	99.7	499	625	275.0	98.1	514	625	266.3
	NB	854.3	121	1550		979.3	125	1725		1036.8	131	1975		1194.4	130	2250		1325.6	127	2475		1490.9	117	2825		1716.4	122	3025		1820.1	117	3075	
	WB	26.2	529	225		23.3	536	200		27.1	576	225		27.3	497	200		23.5	555	200		27.1	533	200		25.7	500	200		25.4	561	200	
	SB	448.0	247	1300		439.4	222	1325		438.4	248	1325		452.8	243	1375		446.2	233	1350		444.1	245	1325		426.1	241	1300		426.4	248	1250	
Tropicana Avenue and I-15 SB Ramps	EB	34.2	560	425	36.8	34.3	583	425	37.7	32.7	594	425	37.8	35.6	552	425	38.9	31.9	561	425	36.4	32.8	567	425	36.5	34.8	554	425	39.6	29.5	568	375	35.0
	WB	38.2	536	325		37.8	571	325		41.9	555	325		40.7	515	300		38.3	570	300		41.2	525	325		40.4	542	325		39.0	570	300	
	SB	38.5	471	350		41.5	486	350		39.4	487	350		40.8	484	350		39.3	483	350		35.9	495	350		44.4	462	350		36.8	443	325	
Tropicana Avenue and I-15 NB Ramps	EB	15.1	457	100	184.0	14.9	451	100	185.3	13.1	438	100	198.2	14.3	447	100	201.7	14.0	400	100	194.8	12.4	450	75	201.3	13.6	435	100	197.1	13.4	423	100	194.8
	NB	425.9	420	2375		419.5	387	2400		427.4	416	2400		436.8	410	2450		415.5	388	2425		419.1	436	2425		424.7	405	2425		422.2	406	2450	
	WB	150.2	725	850		164.3	662	825		175.7	640	850		180.5	597	825		173.7	634	825		185.2	623	850		177.1	618	825		170.9	650	825	
Tropicana Avenue and NY NY/Excalibur	EB	15.0	742	75	62.8	16.7	739	75	69.5	20.6	725	100	77.2	21.2	748	100	77.6	25.4	723	125	80.3	28.3	739	150	85.5	34.5	720	175	88.7	33.0	712	200	82.3
	NB	154.9	16	125		74.4	20	150		101.1	16	150		28.1	11	150		32.8	9	150		210.7	13	150		286.0	8	150		131.9	14	150	
	WB	110.3	681	625		129.6	599	650		141.6	600	675		147.0	566	675		146.8	577	650		155.2	546	675		150.4	565	650		137.0	611	650	
	SB	88.5	63	200		113.5	65	200		112.0	57	200		130.1	67	200		111.1	56	200		121.5	72	200		130.0	64	200		103.5	52	200	
Tropicana Avenue and Las Vegas Boulevard	EB	87.9	691	450	120.1	88.7	693	450	172.9	95.5	684	450	231.4	100.0	684	475	253.4	109.1	670	525	256.6	110.6	681	500	265.2	116.7	667	500	283.4	111.2	674	500	257.1
	NB	63.1	392	325		53.5	387	350		59.2	420	325		64.9	393	350		56.9	419	375		70.2	409	375		63.6	402	400		61.6	385	350	
	WB	236.7	551	1025		505.6	439	1600		783.1	408	1725		877.5	394	1725		926.9	372	1725		949.0	362	1725		979.6	389	1725		855.8	407	1725	
	SB	80.4	498	400		88.8	494	425		109.3	489	500		110.9	471	525		122.1	497	550		141.2	502	625		137.3	486	600		113.2	487	550	

Note: The queues reported here correspond to the approaches and not specific movements/storage bays.

APPENDIX E

2020 No-Action Aimsun Next Output for I-15

2020 No-Action Aimsun Next Output for I-15

I-15 Northbound		Aimsun Next Section ID	4:00 PM to 4:15 PM			4:15 PM to 4:30 PM			4:30 PM to 4:45 PM			4:45 PM to 5:00 PM			5:00 PM to 5:15 PM			5:15 PM to 5:30 PM			5:30 PM to 5:45 PM			5:45 PM to 6:00 PM		
Section from	Section to		Vehicles	Density (veh/mile)	Speed (mph)	Vehicles	Density (veh/mile)	Speed (mph)	Vehicles	Density (veh/mile)	Speed (mph)	Vehicles	Density (veh/mile)	Speed (mph)	Vehicles	Density (veh/mile)	Speed (mph)	Vehicles	Density (veh/mile)	Speed (mph)	Vehicles	Density (veh/mile)	Speed (mph)	Vehicles	Density (veh/mile)	Speed (mph)
			5	5	5	6	6	6	7	7	7	8	8	8	9	9	9	10	10	10	11	11	11	12	12	12
I-215 WB on-ramp	I-15 to NB CD (near Russell Road)	500021904	1226	141.2	15.3	1176	157.1	11.3	1248	151.7	12.0	1219	153.7	11.6	1195	160.0	9.9	1170	157.2	10.7	1221	156.8	10.1	1216	158.5	10.3
I-15 to NB CD (near Russell Road)	NB CD on-ramp	500021881	1108	15.1	60.1	1051	14.2	60.7	1119	15.0	60.9	1099	14.7	60.8	1066	14.6	59.7	1040	13.9	61.0	1097	14.8	60.7	1083	14.7	60.2
		500021878	1098	13.0	68.5	1060	12.3	69.0	1120	13.1	68.9	1106	12.9	69.0	1058	12.5	68.6	1040	12.1	69.2	1102	12.8	69.0	1071	12.6	68.9
		500021882	1100	13.1	67.5	1059	12.6	67.6	1122	13.4	67.5	1107	13.2	67.6	1055	12.6	67.6	1041	12.4	67.8	1103	13.1	67.7	1068	12.7	67.7
		500021875	1103	12.9	68.8	1056	12.3	69.2	1126	13.1	69.0	1111	12.9	69.1	1048	12.3	68.9	1046	12.1	69.4	1106	12.9	69.2	1060	12.4	69.2
NB CD on-ramp	Tropicana Avenue on-ramp	500021891	1479	17.9	65.4	1446	17.5	65.3	1530	19.0	64.2	1506	18.5	64.6	1460	18.0	64.3	1466	17.7	65.1	1517	18.5	65.0	1461	17.9	64.8
Tropicana Avenue on-ramp	Flamingo Road off-ramp	500021886	1912	17.7	62.6	1821	16.9	62.9	1909	17.7	62.7	1856	17.1	63.2	1800	16.5	63.3	1822	16.6	63.6	1855	17.0	63.4	1831	16.8	63.2
Flamingo Road off-ramp	Spring Mountain Road off-ramp	500021899	1586	17.4	62.0	1501	16.3	62.7	1587	17.4	62.0	1535	16.6	62.6	1485	16.1	62.8	1509	16.3	62.9	1532	16.7	62.4	1515	16.6	62.5
Spring Mountain Road off-ramp	Flamingo Road on-ramp	500021900	1218	14.4	68.2	1148	13.5	68.5	1193	14.1	68.4	1166	13.8	68.5	1138	13.4	68.5	1133	13.3	68.6	1160	13.7	68.4	1139	13.4	68.5
Flamingo Road on-ramp	Spring Mountain Road EB on-ramp	500021901	1461	13.3	68.1	1379	12.3	68.6	1464	13.3	68.0	1398	12.7	68.3	1410	12.7	68.3	1403	12.8	68.0	1382	12.5	68.6	1382	12.4	68.4

I-15 Southbound		Aimsun Next Section ID	4:00 PM to 4:15 PM			4:15 PM to 4:30 PM			4:30 PM to 4:45 PM			4:45 PM to 5:00 PM			5:00 PM to 5:15 PM			5:15 PM to 5:30 PM			5:30 PM to 5:45 PM			5:45 PM to 6:00 PM		
Section from	Section to		Vehicles	Density (veh/mile)	Speed (mph)	Vehicles	Density (veh/mile)	Speed (mph)	Vehicles	Density (veh/mile)	Speed (mph)	Vehicles	Density (veh/mile)	Speed (mph)	Vehicles	Density (veh/mile)	Speed (mph)	Vehicles	Density (veh/mile)	Speed (mph)	Vehicles	Density (veh/mile)	Speed (mph)	Vehicles	Density (veh/mile)	Speed (mph)
Spring Mountain Road on-ramp	Flamingo Road WB off-ramp	500021896	2300	23.0	66.4	2319	23.2	66.2	2312	23.2	66.2	2318	23.2	66.3	2364	23.8	66.1	2394	24.2	65.8	2200	21.9	66.7	2068	20.3	67.4
Flamingo Road WB off-ramp	Flamingo Road EB off-ramp	500021897	2187	26.3	58.2	2200	27.1	57.3	2203	27.0	57.2	2209	27.5	56.8	2244	28.4	56.2	2278	29.0	55.8	2106	25.3	58.2	1971	22.2	61.0
Flamingo Road EB off-ramp	Flamingo Road on-ramp	500021898	1974	27.9	58.8	1991	28.3	58.1	1995	29.7	56.6	1998	29.1	57.3	2027	30.3	56.5	2057	32.4	54.5	1916	26.8	59.0	1785	23.5	62.0
Flamingo Road on-ramp	Tropicana Avenue off-ramp	500021885	2404	31.9	52.6	2479	33.9	50.7	2458	34.8	49.5	2470	34.3	50.2	2491	35.1	49.7	2537	36.3	48.9	2382	32.1	51.7	2236	27.8	55.5
Tropicana Avenue off-ramp	I-15 to SB CD	500021887	1931	26.5	59.3	1994	27.8	58.3	1970	27.3	58.6	1984	27.6	58.5	2012	28.0	58.4	2041	28.5	58.3	1920	26.5	59.0	1794	24.2	60.2
		500021890	1927	25.6	61.2	1995	27.3	59.9	1966	26.6	60.4	1987	27.2	59.8	2012	27.4	60.0	2042	27.9	59.8	1923	25.9	60.6	1794	23.4	62.4
		500021892	1923	20.5	64.7	1990	21.6	63.8	1973	21.1	64.1	1981	21.5	63.8	2012	21.7	64.0	2044	22.1	63.8	1923	20.7	64.1	1795	18.9	65.5
I-15 to SB CD	I-215 off-ramp	500021883	1516	18.1	67.7	1563	18.7	67.4	1537	18.4	67.5	1544	18.4	67.6	1578	18.9	67.4	1604	19.2	67.4	1507	18.0	67.6	1408	16.7	68.0
		500021874	1513	18.0	68.0	1567	18.6	67.7	1532	18.3	67.7	1544	18.4	67.7	1582	18.8	67.7	1601	19.1	67.4	1516	18.0	67.8	1411	16.6	68.5
		500021903	1509	16.0	64.0	1568	16.9	63.4	1532	16.4	63.5	1546	16.7	63.3	1567	17.0	63.3	1606	17.3	63.1	1535	16.4	63.4	1406	14.8	64.8
I-215 off-ramp	SB CD to I-15 SB	500021906	966	16.3	61.8	1019	18.0	60.1	1000	17.1	60.9	1001	16.9	61.6	1010	17.5	60.7	1036	17.9	60.5	994	16.8	61.5	903	15.0	62.3
SB CD to I-15 SB	Blue Diamond Road off-ramp	500021908	1348	16.5	66.5	1397	16.9	66.7	1388	16.8	66.3	1392	17.1	66.4	1406	17.0	66.5	1436	17.5	66.2	1387	16.9	66.5	1277	15.3	66.9

Note: Aimsun Next MOEs presented here do not necessarily match the Highway Capacity Manual's (HCM) definition/calculation of these MOEs. Therefore, these Aimsun Next results are not to be compared with HCM thresholds/results.

APPENDIX F

2020 No-Action Aimsun Next Output for CD Roads

2020 No-Action Aimsun Next Output for CD Roads

I-15 Northbound CD Road		4:00 PM to 4:15 PM			4:15 PM to 4:30 PM			4:30 PM to 4:45 PM			4:45 PM to 5:00 PM			5:00 PM to 5:15 PM			5:15 PM to 5:30 PM			5:30 PM to 5:45 PM			5:45 PM to 6:00 PM		
Section from	Section to	Vehicles	Density (veh/mile)	Speed (mph)	Vehicles	Density (veh/mile)	Speed (mph)	Vehicles	Density (veh/mile)	Speed (mph)	Vehicles	Density (veh/mile)	Speed (mph)	Vehicles	Density (veh/mile)	Speed (mph)	Vehicles	Density (veh/mile)	Speed (mph)	Vehicles	Density (veh/mile)	Speed (mph)	Vehicles	Density (veh/mile)	Speed (mph)
I-215 WB on-ramp	Russell Road off-ramp	785	26.0	58.7	780	28.9	56.2	770	33.9	51.5	761	37.1	48.7	758	55.4	37.6	746	73.3	30.6	755	81.1	24.7	770	68.5	29.7
		772	25.7	57.4	775	46.5	45.6	768	64.6	38.8	748	82.4	29.0	751	107.0	21.5	743	117.7	17.3	753	114.7	18.6	788	98.3	25.3
Russell Road off-ramp	I-15 to CD (near Russell Road)	387	141.4	8.5	419	169.3	7.0	423	170.6	6.1	416	182.2	5.7	414	184.3	5.4	412	185.6	5.4	424	183.5	5.6	446	169.4	7.2
I-15 to CD (near Russell Road)	Russell Road on-ramp	505	178.3	5.4	538	173.3	6.2	553	174.4	6.0	526	177.9	5.9	555	173.6	6.0	537	176.2	5.9	546	174.8	6.1	591	170.7	6.5
Russell Road on-ramp	NB CD on-ramp	753	133.0	8.7	828	130.9	9.1	810	128.3	9.4	790	133.0	8.9	844	127.7	9.7	803	129.1	9.4	837	128.4	9.4	817	131.4	9.4
NB CD on-ramp	Tropicana Avenue off-ramp	420	171.5	4.9	387	172.0	5.1	416	172.0	5.0	410	178.6	4.7	388	170.5	5.2	436	170.3	5.1	405	174.9	5.0	406	171.9	5.2

I-15 Southbound CD Road		4:00 PM to 4:15 PM			4:15 PM to 4:30 PM			4:30 PM to 4:45 PM			4:45 PM to 5:00 PM			5:00 PM to 5:15 PM			5:15 PM to 5:30 PM			5:30 PM to 5:45 PM			5:45 PM to 6:00 PM		
Section from	Section to	Vehicles	Density (veh/mile)	Speed (mph)	Vehicles	Density (veh/mile)	Speed (mph)	Vehicles	Density (veh/mile)	Speed (mph)	Vehicles	Density (veh/mile)	Speed (mph)	Vehicles	Density (veh/mile)	Speed (mph)	Vehicles	Density (veh/mile)	Speed (mph)	Vehicles	Density (veh/mile)	Speed (mph)	Vehicles	Density (veh/mile)	Speed (mph)
Tropicana Avenue on-ramp	Ramp from I-15 Mainline to CD road (near Tropicana Avenue)	347	17.8	40.3	357	18.3	40.3	340	17.1	41.2	355	19.2	39.2	360	18.5	40.5	348	18.1	39.9	354	18.9	39.6	345	17.7	41.0
		353	32.4	43.8	354	32.8	43.7	347	31.6	44.1	348	32.5	43.4	354	32.7	43.9	355	32.7	43.6	358	33.1	43.5	334	30.6	44.3
Ramp from I-15 Mainline to CD road (near Tropicana Avenue)	Russell Road off-ramp	753	17.1	60.0	783	18.3	58.7	784	18.2	58.8	787	18.4	58.7	782	18.2	58.9	797	18.5	59.0	778	18.1	58.9	727	16.5	59.9
Russell Road off-ramp	Russell Road on-ramp	517	15.6	66.5	527	16.1	66.2	528	16.1	66.2	534	16.2	66.1	525	15.9	66.1	538	16.4	66.2	529	16.1	66.3	503	15.2	66.4
Russell Road on-ramp	I-215/CC-215 off-ramp	724	17.6	63.5	736	18.0	63.0	746	18.4	62.9	740	18.3	62.8	757	18.4	63.1	757	18.8	62.7	727	17.8	62.9	710	17.2	63.6
		719	23.5	59.8	742	24.4	59.2	742	24.6	58.9	744	24.6	58.7	759	25.1	59.0	751	25.1	58.6	737	24.1	59.2	704	23.0	59.9
I-215/CC-215 off-ramp	Ramp from CD road to I-15 Mainline (near I-215)	384	11.8	65.0	391	12.2	65.0	377	11.7	65.3	397	12.2	64.8	400	12.5	64.9	388	12.0	65.0	397	12.3	64.8	365	11.4	65.5

Note: Aimsun Next MOEs presented here do not necessarily match the Highway Capacity Manual's (HCM) definition/calculation of these MOEs. Therefore, these Aimsun Next results are not to be compared with HCM thresholds/results.

APPENDIX G

2040 No-Action Aimsun Next Output for Intersection Delay and Queues

2040 No-Action Aimsun Next Output for Intersection Delay and Queues

Intersection	Approach	4:00 PM to 4:15 PM				4:15 PM to 4:30 PM				4:30 PM to 4:45 PM				4:45 PM to 5:00 PM			
		Approach Summary			Intersection Summary	Approach Summary			Intersection Summary	Approach Summary			Intersection Summary	Approach Summary			Intersection Summary
		Delay (s/veh)	Vehicles	Max Queue (feet)	Delay (s/veh)	Delay (s/veh)	Vehicles	Max Queue (feet)	Delay (s/veh)	Delay (s/veh)	Vehicles	Max Queue (feet)	Delay (s/veh)	Delay (s/veh)	Vehicles	Max Queue (feet)	Delay (s/veh)
Tropicana Avenue and Valley View Boulevard	EB	526.1	281	1350	394.9	505.8	275	1375	467.2	539.2	278	1325	474.6	526.0	290	1350	447.1
	NB	61.0	214	275		65.4	228	300		59.6	214	250		72.6	224	325	
	WB	36.4	522	200		38.8	456	175		35.3	507	175		37.6	502	225	
	SB	2085.8	131	3450		2380.9	144	3725		2403.1	152	3800		2530.7	128	3775	
Tropicana Avenue and Polaris Avenue	EB	389.0	311	1000	140.1	387.2	304	1025	146.2	379.5	318	1000	142.2	396.1	300	1025	142.3
	NB	43.6	33	75		46.5	39	100		45.5	35	75		45.7	34	100	
	WB	2.8	471	25		3.4	415	50		2.7	445	25		2.7	451	25	
	SB	32.7	89	150		37.5	94	150		36.5	95	150		34.5	92	150	
Tropicana Avenue and Dean Martin Drive	EB	183.0	360	600	494.0	182.3	317	600	512.0	177.3	343	575	518.2	186.6	343	600	513.4
	NB	1980.0	107	3150		2180.7	100	3125		2129.3	100	3150		2365.0	84	3100	
	WB	30.0	619	250		33.2	574	275		28.7	571	250		31.0	611	275	
	SB	1670.9	205	4275		1543.1	206	4425		1709.0	198	4525		1802.0	195	4750	
Tropicana Avenue and I-15 SB Ramps	EB	101.7	378	500	84.3	104.4	323	500	91.2	103.7	375	525	87.6	109.9	351	500	90.5
	WB	61.3	579	325		67.0	546	325		59.7	586	325		63.1	580	325	
	SB	97.3	523	650		107.7	539	700		107.3	525	700		107.1	546	700	
Tropicana Avenue and I-15 NB Ramps	EB	16.0	283	150	216.0	15.3	242	125	220.9	15.7	285	125	214.5	13.0	266	150	227.2
	NB	619.5	328	2450		637.8	291	2450		620.4	312	2450		622.1	325	2450	
	WB	121.8	804	875		125.1	747	900		126.7	799	875		128.5	724	875	
Tropicana Avenue and NY NY/Excalibur	EB	7.7	623	75	41.2	7.9	616	50	42.7	8.0	624	50	49.3	7.7	635	75	48.1
	NB	25.3	23	100		23.7	24	100		28.1	26	125		26.7	26	100	
	WB	67.9	732	625		69.9	730	600		86.6	676	625		83.6	700	575	
	SB	66.0	69	200		67.1	79	200		63.9	79	200		69.1	65	200	
Tropicana Avenue and Las Vegas Boulevard	EB	34.9	592	275	185.9	31.8	578	275	198.7	34.4	597	250	224.0	33.6	593	300	223.1
	NB	91.7	493	550		90.5	529	525		119.1	501	550		133.2	505	625	
	WB	442.5	547	1800		506.8	486	1800		527.9	525	1775		570.3	454	1800	
	SB	178.4	594	975		205.0	636	1125		234.8	583	1225		223.4	616	1225	

Intersection	Approach	5:00 PM to 5:15 PM				5:15 PM to 5:30 PM				5:30 PM to 5:45 PM				5:45 PM to 6:00 PM			
		Approach Summary			Intersection Summary	Approach Summary			Intersection Summary	Approach Summary			Intersection Summary	Approach Summary			Intersection Summary
		Delay (s/veh)	Vehicles	Max Queue (feet)	Delay (s/veh)	Delay (s/veh)	Vehicles	Max Queue (feet)	Delay (s/veh)	Delay (s/veh)	Vehicles	Max Queue (feet)	Delay (s/veh)	Delay (s/veh)	Vehicles	Max Queue (feet)	Delay (s/veh)
Tropicana Avenue and Valley View Boulevard	EB	488.1	278	1350	496.7	526.9	284	1350	470.9	522.9	278	1350	494.4	518.6	262	1375	468.3
	NB	66.5	217	300		68.9	221	325		63.5	211	275		69.4	194	300	
	WB	35.5	449	175		36.2	509	200		40.8	477	225		31.6	461	150	
	SB	2544.8	148	3775		2466.7	147	3775		2551.8	146	3800		2530.0	129	3775	
Tropicana Avenue and Polaris Avenue	EB	366.7	330	1025	149.0	389.7	304	1000	140.3	377.8	305	1000	139.1	392.5	310	1000	153.9
	NB	46.4	36	75		44.5	36	75		41.6	35	75		49.4	32	75	
	WB	3.1	390	25		2.4	457	25		3.2	437	50		2.4	402	25	
	SB	36.0	99	150		35.8	90	150		37.8	97	150		40.1	85	125	
Tropicana Avenue and Dean Martin Drive	EB	175.9	339	600	582.8	185.9	345	575	520.6	182.8	321	600	539.4	184.5	339	575	544.6
	NB	2503.5	92	3150		2455.8	90	3125		2320.8	93	3125		2346.2	88	3075	
	WB	32.0	532	250		29.5	602	250		31.1	593	250		29.8	545	250	
	SB	1779.3	212	4675		1637.6	213	4650		1707.6	214	4800		1732.4	206	4700	
Tropicana Avenue and I-15 SB Ramps	EB	97.8	349	500	93.3	104.9	381	525	102.1	107.5	343	500	104.0	100.6	354	525	98.9
	WB	67.0	534	325		61.3	565	325		65.4	561	325		64.4	566	325	
	SB	116.7	536	750		143.8	525	900		141.4	546	925		136.6	503	850	
Tropicana Avenue and I-15 NB Ramps	EB	18.4	265	150	219.9	17.1	281	125	227.5	15.8	270	150	225.5	17.5	255	150	235.8
	NB	657.1	279	2475		619.4	329	2450		717.7	264	2450		649.9	312	2425	
	WB	129.0	755	900		136.0	766	900		126.4	738	925		137.4	745	900	
Tropicana Avenue and NY NY/Excalibur	EB	8.1	605	75	50.9	8.8	631	75	55.5	7.8	594	50	50.0	8.6	606	75	56.0
	NB	25.0	26	100		25.6	26	100		23.8	24	100		20.9	21	75	
	WB	86.5	710	650		100.8	643	675		83.7	733	650		99.2	665	675	
	SB	67.5	77	200		70.8	75	200		64.6	68	200		66.0	73	200	
Tropicana Avenue and Las Vegas Boulevard	EB	29.8	588	250	232.3	36.8	594	275	262.8	30.8	568	275	261.0	32.9	570	275	278.1
	NB	156.4	489	725		227.2	497	825		270.6	487	925		288.9	445	925	
	WB	516.5	504	1775		545.0	482	1750		536.1	467	1775		547.6	474	1800	
	SB	254.0	595	1300		290.9	565	1475		257.5	668	1500		290.7	567	1400	

Note: The queues reported here correspond to the approaches and not specific movements/storage bays.

APPENDIX H

2040 No-Action Aimsun Next Output for I-15

2040 No-Action Aimsun Next Output for I-15

I-15 Northbound		4:00 PM to 4:15 PM			4:15 PM to 4:30 PM			4:30 PM to 4:45 PM			4:45 PM to 5:00 PM			5:00 PM to 5:15 PM			5:15 PM to 5:30 PM			5:30 PM to 5:45 PM			5:45 PM to 6:00 PM		
Section from	Section to	Vehicles	Density (veh/mile)	Speed (mph)	Vehicles	Density (veh/mile)	Speed (mph)	Vehicles	Density (veh/mile)	Speed (mph)	Vehicles	Density (veh/mile)	Speed (mph)	Vehicles	Density (veh/mile)	Speed (mph)	Vehicles	Density (veh/mile)	Speed (mph)	Vehicles	Density (veh/mile)	Speed (mph)	Vehicles	Density (veh/mile)	Speed (mph)
		5	5	5	6	6	6	7	7	7	8	8	8	9	9	9	10	10	10	11	11	11	12	12	12
I-215 WB on-ramp	I-15 to CD (near Russell Road)	1175	161.9	10.7	1128	165.7	10.0	1074	168.0	9.5	1199	163.4	10.0	1152	163.0	10.8	1049	169.0	9.6	1188	162.2	9.7	1062	167.3	10.2
I-15 to CD (near Russell Road)	NB CD road on-ramp	1071	14.6	60.1	1029	14.1	59.7	984	13.3	60.6	1099	14.8	60.6	1056	14.4	59.9	954	13.0	60.3	1102	14.9	60.5	973	13.0	61.2
		1065	12.5	68.9	1022	12.0	69.0	985	11.4	69.4	1096	12.8	69.4	1064	12.4	69.0	948	11.0	69.4	1108	12.9	69.2	966	11.2	69.8
		1063	12.7	67.6	1020	12.1	67.8	985	11.7	68.0	1095	13.0	67.8	1067	12.7	67.7	948	11.2	68.0	1107	13.2	67.7	966	11.4	68.1
		1059	12.4	69.0	1018	11.8	69.4	986	11.4	69.7	1088	12.7	69.4	1077	12.5	69.2	944	11.0	69.4	1107	12.8	69.4	965	11.1	69.9
NB CD road on-ramp	Tropicana Avenue on-ramp	1432	17.5	65.0	1350	15.9	66.2	1332	16.0	66.2	1448	17.7	65.4	1433	17.4	64.8	1304	15.7	65.6	1394	16.5	66.4	1296	15.5	66.4
Tropicana Avenue on-ramp	Flamingo Road off-ramp	1832	16.9	62.8	1738	16.0	63.3	1703	15.4	64.0	1798	16.3	63.9	1818	16.8	63.0	1663	15.1	63.8	1776	16.3	63.4	1649	14.9	64.5
Flamingo Road off-ramp	Spring Mountain Road off-ramp	1514	16.5	62.4	1425	15.3	63.3	1406	15.0	63.3	1479	16.0	63.0	1482	16.0	62.9	1379	14.7	63.4	1453	15.6	63.2	1343	14.2	64.0
Spring Mountain Road off-ramp	Flamingo Road on-ramp	1160	13.7	68.4	1099	12.9	68.6	1084	12.7	68.8	1118	13.1	68.8	1137	13.3	68.6	1052	12.3	68.9	1104	12.9	68.7	1027	12.0	69.1
Flamingo Road on-ramp	Spring Mountain Road EB on-ramp	1440	13.0	68.2	1405	13.0	67.4	1355	12.4	67.9	1421	13.0	67.6	1426	13.0	67.9	1312	11.9	68.3	1369	12.5	68.1	1299	11.8	68.3

I-15 Southbound		4:00 PM to 4:15 PM			4:15 PM to 4:30 PM			4:30 PM to 4:45 PM			4:45 PM to 5:00 PM			5:00 PM to 5:15 PM			5:15 PM to 5:30 PM			5:30 PM to 5:45 PM			5:45 PM to 6:00 PM		
Section from	Section to	Vehicles	Density (veh/mile)	Speed (mph)	Vehicles	Density (veh/mile)	Speed (mph)	Vehicles	Density (veh/mile)	Speed (mph)	Vehicles	Density (veh/mile)	Speed (mph)	Vehicles	Density (veh/mile)	Speed (mph)	Vehicles	Density (veh/mile)	Speed (mph)	Vehicles	Density (veh/mile)	Speed (mph)	Vehicles	Density (veh/mile)	Speed (mph)
Spring Mountain Road on-ramp	Flamingo Road WB off-ramp	2726	30.2	61.1	2746	33.3	57.6	2739	42.0	51.3	2753	47.2	47.0	2806	58.0	40.7	2799	77.6	30.2	2694	72.8	32.6	2444	44.7	52.8
Flamingo Road WB off-ramp	Flamingo Road EB off-ramp	2540	39.4	48.1	2555	47.0	42.8	2547	56.2	37.6	2589	61.1	34.8	2606	66.5	32.3	2615	74.9	28.0	2557	74.2	28.0	2335	52.6	40.9
Flamingo Road EB off-ramp	Flamingo Road on-ramp	2273	52.4	41.7	2287	63.3	36.0	2303	69.9	32.5	2320	71.9	31.7	2349	75.1	30.4	2355	79.8	28.7	2313	80.1	28.4	2147	65.9	34.8
Flamingo Road on-ramp	Tropicana Avenue off-ramp	2783	45.1	43.3	2804	46.8	41.7	2806	48.1	40.8	2827	49.8	40.1	2855	49.2	40.5	2845	52.7	39.0	2812	53.7	38.4	2667	52.5	38.8
Tropicana Avenue off-ramp	I-15 to SB CD	2257	33.4	55.3	2269	33.8	54.8	2270	34.2	54.3	2292	35.0	53.7	2315	35.1	54.1	2302	35.4	53.4	2283	35.6	52.8	2158	32.8	54.1
		2253	32.9	56.5	2269	34.5	54.7	2270	34.9	54.2	2289	36.1	53.3	2321	35.4	54.4	2298	35.3	54.2	2285	35.4	53.9	2162	31.5	56.6
		2250	25.3	61.4	2269	26.1	60.1	2268	26.1	60.2	2285	26.7	59.4	2328	26.7	60.2	2297	26.5	60.0	2286	26.6	59.8	2167	24.3	61.5
I-15 to SB CD	I-215 off-ramp	1792	21.7	66.6	1788	21.7	66.4	1784	21.6	66.4	1804	21.9	66.3	1844	22.4	66.3	1820	22.0	66.4	1801	21.9	66.3	1710	20.6	66.8
		1791	21.7	66.3	1781	21.7	66.3	1783	21.7	66.3	1807	22.0	66.2	1836	22.4	66.2	1828	22.2	66.2	1803	21.9	66.3	1709	20.7	66.7
		1789	20.0	61.3	1778	20.0	61.0	1789	20.4	60.1	1804	20.8	60.0	1830	20.8	60.5	1835	21.3	59.5	1802	20.7	60.1	1717	19.5	60.5
I-215 off-ramp	SB CD to I-15 SB	1147	20.1	60.0	1160	20.7	59.3	1156	20.3	59.9	1170	20.1	60.7	1184	21.0	59.6	1179	20.2	60.6	1163	20.8	59.5	1099	18.9	60.6
SB CD to I-15 SB	Blue Diamond Road off-ramp	1573	19.2	66.1	1579	19.5	65.7	1581	19.5	65.7	1576	19.2	66.0	1584	19.5	66.0	1559	19.0	66.2	1540	18.7	66.4	1482	18.2	66.3

Note: Aimsun Next MOEs presented here do not necessarily match the Highway Capacity Manual's (HCM) definition/calculation of these MOEs. Therefore, these Aimsun Next results are not to be compared with HCM thresholds/results.

APPENDIX I

2040 No-Action Aimsun Next Output for CD Roads

2040 No-Action Aimsun Next Output for CD Roads

I-15 Northbound CD Road		4:00 PM to 4:15 PM			4:15 PM to 4:30 PM			4:30 PM to 4:45 PM			4:45 PM to 5:00 PM			5:00 PM to 5:15 PM			5:15 PM to 5:30 PM			5:30 PM to 5:45 PM			5:45 PM to 6:00 PM		
Section from	Section to	Vehicles	Density (veh/mile)	Speed (mph)	Vehicles	Density (veh/mile)	Speed (mph)	Vehicles	Density (veh/mile)	Speed (mph)	Vehicles	Density (veh/mile)	Speed (mph)	Vehicles	Density (veh/mile)	Speed (mph)	Vehicles	Density (veh/mile)	Speed (mph)	Vehicles	Density (veh/mile)	Speed (mph)	Vehicles	Density (veh/mile)	Speed (mph)
I-215 WB on-ramp	Russell Road off-ramp	593	156.6	8.2	609	159.0	7.7	550	164.6	7.1	610	158.2	7.8	594	158.9	7.7	579	162.2	6.9	520	167.8	6.9	523	170.5	6.1
		595	140.2	13.4	603	142.3	12.9	554	145.8	12.7	609	140.1	13.5	595	141.8	13.3	578	143.0	12.5	516	146.8	11.8	527	148.4	12.0
Russell Road off-ramp	I-15 to CD (near Russell Road)	322	199.9	3.8	313	201.9	3.6	296	205.6	3.5	330	197.9	3.8	313	202.0	3.7	314	199.5	3.6	278	206.7	3.3	282	206.1	3.2
I-15 to CD (near Russell Road)	Russell Road on-ramp	427	194.3	4.3	393	196.7	4.1	399	200.2	4.0	430	192.5	4.2	398	197.9	4.1	421	197.0	4.0	344	205.8	3.6	390	200.7	3.6
Russell Road on-ramp	NB CD on-ramp	676	143.8	7.8	641	155.1	6.8	659	152.5	7.1	685	145.1	7.8	645	152.9	6.9	664	149.2	7.2	554	165.6	6.1	662	151.9	6.7
NB CD on-ramp	Tropicana Avenue off-ramp	328	188.3	3.6	291	190.2	3.4	312	186.1	3.7	325	193.5	3.5	279	186.8	3.5	329	186.5	3.7	264	197.9	3.1	312	183.9	3.6

I-15 Southbound CD Road		4:00 PM to 4:15 PM			4:15 PM to 4:30 PM			4:30 PM to 4:45 PM			4:45 PM to 5:00 PM			5:00 PM to 5:15 PM			5:15 PM to 5:30 PM			5:30 PM to 5:45 PM			5:45 PM to 6:00 PM		
Section from	Section to	Vehicles	Density (veh/mile)	Speed (mph)	Vehicles	Density (veh/mile)	Speed (mph)	Vehicles	Density (veh/mile)	Speed (mph)	Vehicles	Density (veh/mile)	Speed (mph)	Vehicles	Density (veh/mile)	Speed (mph)	Vehicles	Density (veh/mile)	Speed (mph)	Vehicles	Density (veh/mile)	Speed (mph)	Vehicles	Density (veh/mile)	Speed (mph)
Tropicana Avenue on-ramp	I-15 to SB CD	289	13.8	42.3	291	14.1	41.8	285	14.0	41.8	269	13.8	41.3	293	14.3	41.7	282	13.6	42.0	273	13.3	41.9	277	13.8	41.9
		279	26.0	43.9	295	27.0	43.9	291	26.6	43.7	267	24.6	43.8	286	26.5	44.0	283	26.2	43.6	281	25.5	43.8	276	25.3	43.8
I-15 to SB CD	Russell Road off-ramp	739	17.2	58.9	768	17.9	59.1	775	18.3	58.2	753	17.4	58.9	771	18.0	58.6	756	17.7	59.1	767	17.9	58.6	740	17.3	58.7
Russell Road off-ramp	Russell Road on-ramp	489	14.8	66.1	512	15.5	66.2	503	15.5	65.9	481	14.6	66.2	512	15.6	66.1	493	15.0	66.1	504	15.4	66.2	490	15.0	66.1
Russell Road on-ramp	I-215/CC-215 off-ramp	799	20.4	61.0	824	21.3	60.8	806	20.6	60.6	779	19.9	61.2	784	20.2	61.0	767	19.5	60.9	767	19.9	60.5	752	19.6	60.6
		795	27.6	56.8	814	28.9	55.7	822	29.0	55.4	770	27.3	56.2	791	27.9	55.2	764	26.7	56.5	757	26.9	56.1	771	26.8	55.8
I-215/CC-215 off-ramp	SB CD road to I-15 SB	421	13.0	64.9	422	13.4	64.1	430	13.5	64.4	398	12.3	65.0	405	12.6	64.5	376	11.6	65.2	368	11.4	65.2	399	12.3	64.7

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