I-15 Flamingo to Sahara Feasibility Study

BENEFIT-COST ANALYSIS

NDOT Agreement No.: P384-18-015

June 2021

Parametrix

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Executive Summary

As part of the ongoing investments the Nevada Department of Transportation (NDOT) has been making to improve I-15, the I-15 Flamingo to Sahara Feasibility Study is evaluating alternatives, primarily focusing on improving safety and traffic operations, to accommodate future demand served by the I-15 corridor and adjacent streets in this 4.5-mile segment.

A benefit-cost analysis (BCA) quantifies and monetizes a project's estimated benefits and costs over a specified period. The BCA for the I-15 from Flamingo to Sahara Feasibility Study was conducted per the *Benefit-Cost Analysis Guidance for Discretionary Grant Programs*[1] and based on discussions with NDOT Performance Management Division regarding certain costs and benefits calculation assumptions as per the *2020 Performance Management Report*[2].

Project cost estimates and historical crash data used to complete this BCA were provided by NDOT. A computer traffic model (AIMSUM) was used to provide vehicle-miles-traveled (VMT) and vehicle-hours-traveled (VHT) under No Build and four Build scenarios for baseline (2017) and future (2040) conditions. Build Alternatives include two main alternatives (Build Alternative 1 and Build Alternative 2) and two modifications of these alternatives (Build Alternative 1-Shift and Build Alternative 2-Shift) to accommodate the Martin Luther King Boulevard Extension Project (Oakey Boulevard to Desert Inn Road). The analysis assumes a 13-year analysis period with construction commencing in 2025, and operations starting in 2028. A 7-percent real discount rate was applied to all costs and benefits calculated in 2019 dollars.

The following table shows the results of the analyses and the BCA ratios for all build alternatives.

Table E-1. I-15 Flamingo to Sahara Feasibility Study - Benefit/Cost Summary (2019$ - Discounted at 7% Rate)

ITEM		ALT1	ALT1-SHIFT	ALT2	ALT2-SHIFT
Benefits	Travel time savings	$170,902,694	$170,902,694	$149,565,928	$149,565,928
	Operation costs savings	($16,531,505)	($16,531,505)	($9,060,355)	($9,060,355)
	Crash cost savings	$3,918,139	$3,918,139	$8,920,305	$8,920,305
	Emissions cost savings	$12,421,813	$12,421,813	$16,495,479	$16,495,479
	Residual Value	$38,704,054	$50,705,727	$81,241,211	$98,735,092
	Total Benefits	**$209,415,195**	**$221,416,868**	**$247,162,567**	**$264,656,449**
Costs	Construction Costs	$156,183,394	$209,460,832	$247,419,280	$300,696,718
	Road and Bridge O&M	$1,118,773	$1,118,773	$2,222,953	$2,222,953
	Total Costs	**$157,302,167**	**$210,579,604**	**$249,642,233**	**$302,919,670**
Metric	**Net Benefits**	**$51,743,097**	**$10,837,264**	**($2,479,666)**	**($38,263,221)**
	Benefit/Cost Ratio	**1.33**	**1.05**	**0.99**	**0.87**

[1] Available at: https://www.transportation.gov/sites/dot.gov/files/2021-02/Benefit%20Cost%20Analysis%20Guidance%202021.pdf
[2] Available at: https://www.dot.nv.gov/home/showpublisheddocument?id=17402

1. INTRODUCTION

1.1. Overview

Interstate-15 (I-15) is a major Interstate Highway in the western United States, running through Southern California and the Intermountain West. I-15 begins near the Mexico–US border in San Diego County and stretches north to Alberta, Canada, passing through the states of California, Nevada, Arizona, Utah, Idaho, and Montana. The Interstate serves the cities of San Diego, Las Vegas, Salt Lake City, Idaho Falls, and Great Falls. As part of the ongoing investments the Nevada Department of Transportation (NDOT) has been making to improve I-15, the I-15 Flamingo to Sahara Feasibility Study is evaluating alternatives, primarily focusing on improving safety and traffic operations, to accommodate future demand served by the I-15 corridor and adjacent streets.

Figure 1. Benefit Cost Analysis Study Area

1.2. Study Area

The limits of the study area, shown in Figure 1, were defined for traffic modeling purposes. The I-15 corridor between Flamingo Road and Sahara Avenue is the last section of the corridor to be upgraded adjacent to the Las Vegas Strip. This section currently can only accommodate five through lanes in each direction, while further improvements are expected to be needed to align capacity needs with recently completed projects such as Project NEON and the I-15 South Design Build. This Benefit-Cost Analysis (BCA) Memorandum quantifies benefits and costs for four Build Alternatives. Such an analysis will help evaluate possible improvements and modifications to I-15 in this 4.5-mile segment.

1.3. Purpose

This Benefit-Cost Analysis (BCA) serves as a systematic process for evaluating and comparing the economic advantages (benefits) and disadvantages (costs) for the Build Alternatives for I-15 corridor improvements between Flamingo Road and Sahara Avenue. The objective of a BCA is to translate the effects of an investment into monetary terms and to account for the fact that benefits generally accrue over a long period of time while capital costs are incurred primarily in the initial years. The primary transportation-related elements that can be monetized are travel time costs, vehicle operating costs, safety costs, ongoing maintenance costs, and remaining capital value (a combination of capital expenditure and salvage value).

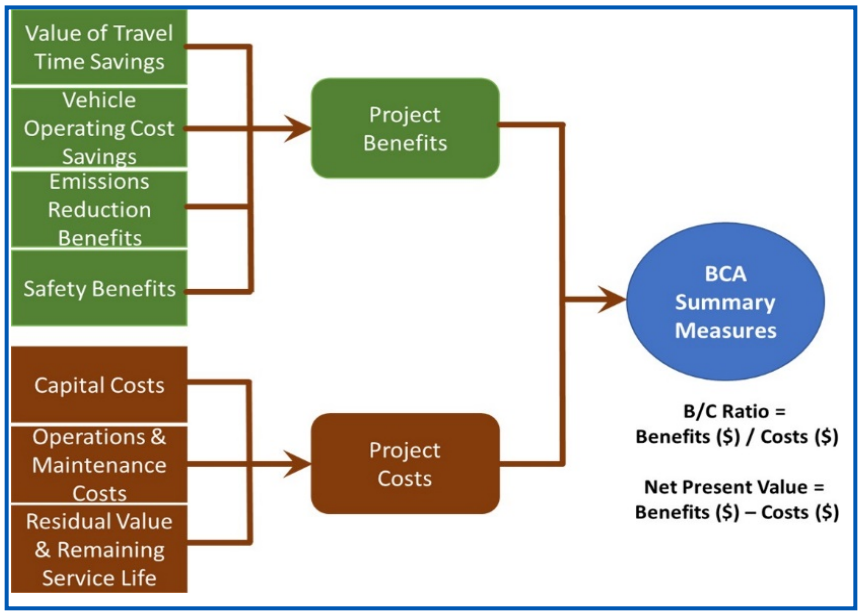
BCA's have been used as a tool to help evaluate preliminary concepts during early planning/feasibility studies, to evaluate alternatives and select a Preferred Alternative as part of project environmental documentation, and to evaluate potential design and construction staging options as part of detailed design and/or construction.

Although the BCA always attempts to answer the question, "From an economic perspective, are the benefits worth the investment?" for the purposes of this feasibility study, the BCA is not intended to evaluate the sole merits of each Build Alternative and whether or not a specific alternative is worth the investment. Instead, the purpose is to compare the four Alternatives against each other from economic benefits versus costs perspectives of each alternative. This memorandum documents the BCA methodologies and calculations for the four Build Alternatives (Alternative 1, Alternative 1-Shift, Alternative 2, and, Alternative 2-Shift) to achieve this objective.

2. METHODOLOGY

A BCA quantifies and monetizes a project's estimated advantages (i.e., benefits) and disadvantages (i.e., costs) over a specified period. Results of a BCA can be utilized to assess project feasibility by considering construction costs, safety benefits, useful service life, and other project parameters. The BCA performed for this application was conducted per the *Benefit-Cost Analysis Guidance for Discretionary Grant Programs*[3] and based on discussions with NDOT Performance Management Division regarding certain costs and benefits calculation assumptions as per the *2020 Performance Management Report*[4].

Figure 2. BCA Methodology



The BCA performed for this project aligns with a study period spanning from 2020 to 2040, and assumes a construction start date in 2025 with a targeted operational date in 2028. The analysis includes output from AIMSUN (Advanced Interactive Microscopic Simulator for Urban and Non-Urban Networks) traffic microsimulation model. The traffic analysis was performed for No-Action (or No-Build) and the four Build Alternatives for horizon year 2040.

[3] Available at: https://www.transportation.gov/sites/dot.gov/files/2021-02/Benefit%20Cost%20Analysis%20Guidance%202021.pdf
[4] Available at: https://www.dot.nv.gov/home/showpublisheddocument?id=17402

2.1. Alternatives

2.1.1. No-Build Alternative

The 2040 No-Build Alternative consists of the existing roadway configuration and assumes the completion of the I-15 Tropicana Avenue Interchange project and the final phase of Project NEON.

2.1.2. Build Alternative 1

The lane configuration for both directions on I-15 for Alternative 1 was determined by matching the improvements made as part of Project NEON to the north and the I-15 South Design-Build project to the south. South of Flamingo Road, southbound I-15 would have 1 HOV lane and 4 GP lanes, and 2 HOV lanes and 4 GP lanes north of Flamingo Road. Northbound I-15 would have 1 HOV lane and 4 GP lanes south of Twain Avenue and 2 HOV lanes and 4 GP lanes north of Twain Avenue. This configuration would provide the minimum level of improvement required to match future conditions at the north and south ends of the study area.

Under Alternative 1, the I-15/Flamingo Road interchange would be modified to a typical tight diamond interchange (TDI). The I-15/Spring Mountain interchange would remain in its current configuration, but reconstruction of the southbound I-15 to eastbound Spring Mountain Road flyover is needed. The flyover would be reconstructed to accommodate additional lanes on I-15.

Alternative 1 also proposes that the southbound Sahara Avenue on-ramp (parallel entrance) would merge onto southbound I-15 just north of Meade Avenue. The following ramps would be braided: southbound Flamingo Road off-ramp with southbound Spring Mountain Road on-ramp, and southbound Tropicana Avenue off-ramp with southbound Flamingo Road on-ramp. An auxiliary lane would be added between the southbound Spring Mountain Road on-ramp and the southbound Tropicana Avenue off-ramp, and between the southbound Flamingo Road on-ramp and the southbound CD road exit. Future single-lane HOV connections in each direction would be accommodated by leaving adequate space in the median of I-15 to Meade Avenue.

2.1.3. Build Alternative 2

As described for Alternative 1, the lane configuration for both directions on I-15 for Alternative 2 was determined by matching the improvements made as part of Project NEON to the north and the I-15 South Design-Build project to the south. South of Flamingo Road, southbound I-15 would have 1 HOV lane and 4 GP lanes, and 2 HOV lanes and 4 GP lanes north of Flamingo Road. Northbound I-15 would have 1 HOV lane and 4 GP lanes south of Twain Avenue and 2 HOV lanes and 4 GP lanes north of Twain Avenue. This configuration would provide the minimum level of improvement required to match future conditions at the north and south ends of the study area.

Under Alternative 2, the I-15/Flamingo Road interchange would be modified to a typical tight diamond interchange (TDI). The I-15/Spring Mountain interchange would remain in its current configuration, but reconstruction of the southbound I-15 to eastbound Spring Mountain Road flyover is needed. The flyover would be reconstructed to accommodate additional lanes on I-15.

Alternative 2 proposes to add a slip-ramp on the northbound CD road, from eastbound CC-215 to northbound I-15 at Sunset Road. The following ramps would be braided: northbound Russell Road on-ramp (as a full auxiliary lane to Flamingo Road off-ramp) with the northbound CD Road/southbound Tropicana Avenue off-ramp, and northbound Tropicana Avenue on-ramp with the northbound Flamingo Road off-ramp. Auxiliary lanes would be added between the northbound Russell Road on-ramp and the northbound Flamingo Road off-ramp and the northbound Tropicana Avenue on-ramp and the northbound Spring Mountain Road off-ramp. Future single-lane

HOV connections in each direction would be accommodated by leaving adequate space in the median of I-15 to Meade Avenue.

2.1.4. Shift Alternatives

In order to accommodate the Martin Luther King Boulevard Extension Project (Oakey Boulevard to Desert Inn Road), I-15 will need to be shifted to the east between Flamingo Road and Desert Inn Road in both alternatives 1 and 2. Alternative 1 and Alterative 2 described in previous section are also reevaluated to incorporate alignment changes that would accommodate the MLK Extension Project as requested by the City of Las Vegas. Major improvements for Alternative 1 Shift and Alternative 2 Shift that would be required to accommodate the MLK Extension Project include:

- Reconstruct the I-15 median between Flamingo Road and Desert Inn Road and reconstruct portions of I-15 to adjust the I-15 cross slope (superelevation) between Flamingo Road and Desert Inn Road.
- Reconstruct the northbound (NB) off-ramp to Spring Mountain Road and reconstruct the NB on-ramp/loop ramp from eastbound (EB) Spring Mountain Road to NB I-15.
- Reconstruct the NB and southbound (SB) I-15 bridge over Twain Avenue.
- Reconstruct the NB and SB I-15 bridges over Spring Mountain Road.
- Demolish the I-15 bridge over Sammy Davis Jr. Drive/Industrial Road and reconstruct I-15 with mechanically stabilized earth (MSE) and retaining walls.

Retaining wall locations and heights would be determined during detailed design. In addition to cast-in-place or MSE walls for new or widened bridges, MSE retaining walls are anticipated to accommodate grade differentials where there is insufficient space to allow for sloping embankments. There are no new additional right-of-way impacts. The I-15 shift occurs within existing NDOT rights-of-way.

Overall, this memorandum documents BCA for the total of four alternatives including Build Alternative 1, Build Alternative 1–Shift (with MLK Extension Project), Build Alternative 2, and, Build Alternative 2–Shift (with MLK Extension Project).

2.2. Discounting

The BCA applied a 7-percent real discount rate to costs and benefits that were adjusted to 2019 dollars. Each category of benefits and costs is discounted separately for each year in the analysis period.

2.3. Sensitivity Analysis

In addition to performing BCA considering a 7-percent discount rate, the Benefit Cost Ratio (BCR) is also calculated using a 3-percent discount rate for sensitivity testing.

3. BENEFIT-COST ANALYSIS

3.1. Project Costs

3.1.1. Capital Costs

Table 1 shows the estimated capital costs associated with the Build Alternatives. This cost estimate consists of future project costs for final design, right-of-way, environmental clearance, and construction. The construction schedule is expected to be about 3 years (2025-2027) for Build Alternatives. The study period is from 2020 to 2040 which is in conformance with the RTC's regional travel demand model horizon year of 2040 at the time of this analysis. The **capital costs (in 2019 dollars) for Alt. 1 and Alt. 2 are estimated at about $250.4 million and $396.7 million**, respectively. As expected, **capital costs for Alt. 1-shift and Alt. 2-shift are higher and estimated at about $335.8 million and $482.1 million**, respectively.

Capital costs were discounted annually at a rate of 7 percent, with a resulting **discounted capital costs of $156.1 million for Alt. 1, $209.5 million for Alt. 1-shift, 247.4 for Alt. 2, and $300.7 million for Alt. 2-shift**.

Table 1. Capital Costs for Build Alternatives ($2019)

COST ITEM	ALT1	ALT1-SHIFT	ALT2	ALT2-SHIFT
Roadway Construction	$25,336,828	$30,069,831	$39,588,391	$39,588,391
Bridges	$18,196,388	$16,307,458	$30,054,868	$30,054,868
Walls	$4,355,934	$6,554,412	$5,236,372	$5,236,372
Signal Systems at Intersections	$792,000	$814,000	$1,122,000	$1,122,000
Demolition	$1,964,460	$5,855,611	$2,011,314	$2,011,314
Additional Items	$37,392,243	$64,619,466	$70,724,330	$70,724,330
SUBTOTAL	**$88,037,853**	**$124,220,779**	**$148,737,275**	**$148,737,275**
Standard Percentage Adders	$22,176,735	$31,291,214	$76,569,801	$76,569,801
TOTAL CONSTRUCTION COST	**$177,445,487**	**$250,374,308**	**$299,788,754**	**$299,788,754**
Engineering / Administration / Legal Costs	$18,631,776	$26,289,302	$31,477,819	$116,899,347
Right of Way Costs	$40,162,500	$40,162,500	$42,974,700	$42,974,700
TOTAL CONSTRUCTION & ENGINEERING	**$236,239,763**	**$316,826,110**	**$374,241,273**	**$459,662,801**
Hydraulics / Storm Water Costs	$7,087,193	$9,504,783	$11,227,238	$11,227,238
Environmental Consideration Costs	$7,087,193	$9,504,783	$11,227,238	$11,227,238
TOTAL CAPITAL COSTS	**$250,414,149**	**$335,835,677**	**$396,695,749**	**$482,117,277**
DISCOUNTED CAPITAL COSTS (7%)	**$156,183,394**	**$209,460,832**	**$247,419,280**	**$300,696,718**

3.1.2. Operations and Maintenance Costs

The estimated operations and maintenance (O&M) costs for each facility type are provided in Table 2. The O&M costs are based on information provided by NDOT and are discounted annually at a rate of 7 percent, with a resulting **discounted O&M cost of $1,118,773 for Alt. 1 and Alt. 1-shift, and $2,222,953 for Alt. 2 and Alt. 2-shift over a 13-year operation period (2028-2040)**.

Table 2. Operations and Maintenance Costs for Build Alternatives ($2019)

COST ITEM	ALT1	ALT1-SHIFT	ALT2	ALT2-SHIFT
Roadways: Asphalt Pavement (Per Year)	$200,000	$200,000	$375,000	$375,000
Concrete Bridges (Per Year)	$20,000	$20,000	$29,000	$29,000
Steel Bridges (Per Year)	$10,000	$10,000	$53,000	$53,000
O&M COST (PER YEAR)	$230,000	$230,000	$457,000	$457,000
TOTAL O&M COSTS (2028-2040)	$2,990,000	$2,990,000	$5,941,000	$5,941,000
DISCOUNTED O&M COSTS (7%)	$1,118,773	$1,118,773	$2,222,953	$2,222,953

3.2. Quantitative Benefits

3.2.1. Traffic Volume Forecasts

The traffic volumes for existing (2017), No-Build (2040) and Build scenarios were obtained from the AIMSUN model developed for the I-15 Flamingo to Sahara Feasibility Study. Traffic counts collected in 2017 from eight NDOT Count Stations in the area (Count stations 0030052, 0030061, 0030068, 0030266, 0030286, 0031064, 0031500, 0031598) are used to estimate temporal distributions of traffic and to calculate AADT (please see Appendix A: Traffic Volumes Workbook). Temporal distributions were used to calculate Vehicle Hours Traveled (VHT) and Vehicle Miles Traveled (VMT) values. The values of VHT and VMT between 2017 and 2040 were estimated by assuming a straight-line interpolation. Average daily estimates of VHT and VMT were annualized using an annualization factor of 365, reflecting travel on all days of the year.

3.2.2. Travel Time Savings

Value of travel time savings (VTTS) calculations were performed in accordance with USDOT and NDOT guidelines. Daily vehicle travel time values were obtained by dividing daily VHT by daily AADT. (VHT and AADT values used for daily travel time calculations are consistent with the values obtained from methodologies discussed in the previous section, i.e., Traffic Volume Forecasts)

Improvements in daily travel time values were determined by calculating differences in No Build and Build scenarios. Daily vehicle travel time improvement values were then converted to annual vehicle travel time improvements. The RTC's occupancy value (1.51 passengers per vehicle) was then applied to annual travel time improvements to obtain annual passenger travel time improvements.

These values were then converted to personal and business savings, by using NDOT's recommended hourly time costs of $11.16 and $33.48, respectively, and RTC's composition splits of 88.20 percent and 11.80 percent for personal travel and business travel. Table 3 shows the 7 percent discounted values of travel time savings are nearly $171 million for Alt. 1 and Alt.1-shift, and 149 million for Alt. 2 and Alt.2-shift. Please see Appendix B to Appendix E for more details and calculations for each build alternative.

Table 3. Value of Travel Time Savings ($2019)

	ALT1	ALT1-SHIFT	ALT2	ALT2-SHIFT
Total Travel Time Savings	$459,842,364	$459,842,364	$402,432,186	$402,432,186
DISCOUNTED TRAVEL TIME SAVINGS (7%)	$170,902,694	$170,902,694	$149,565,928	$149,565,928

3.2.3. Vehicle Operating Cost Savings

Build scenarios have higher vehicle operating costs compared to No-Build scenario. The value of vehicle operating cost savings was calculated in accordance with USDOT and NDOT guidelines, which used annual interpolated VMT for both cars and truck, applying NDOT's vehicle operation costs of $0.31 per mile for automobiles, and $0.59 per mile for truck. The per-mile vehicle operating cost estimates were multiplied by the

difference between the annualized VMT under the No Build and Build Alternatives. Table 4 shows the vehicle operation cost increase for build alternatives. The **7-percent discounted values are approximately -$16 million for Alt. 1 and Alt. 1-shift, and -$9 million for Alt. 2 and Alt. 2-shift vehicle operation savings**.

Table 4. Value of Vehicle Operation Savings ($2019)

	ALT1	ALT1-SHIFT	ALT2	ALT2-SHIFT
Total Vehicle Operation Savings	($44,525,553)	($44,525,553)	($24,402,939)	($24,402,939)
DISCOUNTED VEHICLE OPERATION SAVINGS (7%)	**($16,531,505)**	**($16,531,505)**	**($9,060,355)**	**($9,060,355)**

3.2.4. Crash Cost Savings

Appendix F provides a detailed safety performance evaluation to assess the impacts associated with Build Alternatives. The safety performance evaluation study was conducted using the AASHTO HSM predictive methods that can be used to evaluate the impact of design alternatives on crash frequency, diagnose safety issues, and assess future safety conditions.

Table 5 provides a summary of the crash data for 2040 No-Build and Build Alternatives based on the HSM predictive methods, and the total costs for each crash type. Safety performance evaluation analysis results show reduction of $855,841 and $1,945,611 for 2040 Alt. 1 and 2040 Alt. 2, respectively.

Table 5. Project Vicinity Crash Data Summary and Costs ($2019)

KABCO Level	Monetized Value ($2019)	2040 No-Build		2040 Build Alt1 (Alt1-Shift)		2040 Build Alt2 (Alt2-Shift)	
		Incidents	$2019	Incidents	$2019	Incidents	$2019
PDO-O - No Injury	$4,500	929	$4,182,516	920	$4,137,831	907	$4,080,932
C - Possible Injury	$65,100	405	$26,359,875	401	$26,078,253	395	$25,719,653
B - Non-incapacitating	$127,300	58	$7,363,643	57	$7,284,972	56	$7,184,797
A - Incapacitating	$467,400	8	$3,674,886	8	$3,635,624	8	$3,585,631
K - Killed	$9,800,000	4	$38,525,760	4	$38,114,160	4	$37,590,056
	TOTAL	**1,404**	**$80,106,680**	**1,389**	**$79,250,840**	**1,370**	**$78,161,069**
			IMPROVEMENT		**$855,841**		**$1,945,611**

Estimated annual VMT improvement are used to estimate crash savings benefits for years earlier than 2040. Table 6 shows the total and discounted values for crash reduction benefits based on the reduced VMT. **Discounted values of crash reduction savings are approximately $4 million for Alt. 1 and Alt. 1-shift, and $9 million for Alt. 2 and Alt. 2-shift**.

Table 6. Crash Reduction Benefits ($2019)

	ALT1	ALT1-SHIFT	ALT2	ALT2-SHIFT
Crash Reduction Savings	$10,558,401	$10,558,401	$24,033,127	$24,033,127
DISCOUNTED CRASH REDUCTION SAVINGS (7%)	**$3,918,139**	**$3,918,139**	**$8,920,305**	**$8,920,305**

3.2.5. Emission Savings

Emission savings are calculated in accordance with USDOT and NDOT guidelines. The calculated annual growth rate of AADT and NDOT's recommended monetized values for pollutant emissions are used to estimate the annual amount of reduction for each emission type and the correlated savings. Table 7 provides a summary of Emission savings for build alternatives. **Discounted (7%) values of emission savings are nearly $12.5 million for Alt. 1 and Alt. 1-shift, and $16.5 million for Alt. 2 and Alt. 2-shift**.

Table 7. Emission Savings ($2019)

	ALT1	ALT1-SHIFT	ALT2	ALT2-SHIFT
Emissions CO2 Savings	$451,125	$451,125	$626,237	$626,237
Emissions NOX Savings	$125,528	$125,528	$173,025	$173,025
Emissions PM Savings	$32,249,717	$32,249,717	$42,903,083	$42,903,083
Emissions VOC Savings	$773,334	$773,334	$911,439	$911,439
Total Emission Savings	**$33,599,704**	**$33,599,704**	**$44,613,784**	**$44,613,784**
DISCOUNTED EMISSION SAVINGS (7%)	**$12,421,813**	**$12,421,813**	**$16,495,479**	**$16,495,479**

3.2.6. Residual Value

Residual values for the BCA were calculated in accordance with USDOT guidance (Project Study Period / Project Life x Capital Costs). Residual value is the estimated value of the project at the end of the study period and represents a depreciated value of the assets that are expected to continue to provide benefits beyond the study period. Residual value is estimated at the end of the study period and is included as a benefit.

Because the project has bridge and pavement components, residual values were calculated independently for each component, and then added together for a total project residual value for each alternative. This calculation considered analysis years starting in 2028 to 2040.

NDOT's 2019 Nevada State Highway Preservation Report states that the useful service life of newly constructed bridges is 75 years. NDOT's 2019 Road Design Guide states that capacity projects should be designed with a useful service life of 20 years. Table 8 shows total residual values and discounted total residual values for this project. The estimated **discounted residual value in 2040 is approximately $38.3 million for Alt. 1, $50.7 million for Alt. 1-shift, $81.2 million for Alt. 2, and $98.7 million for Alt. 2-shift**.

Table 8. Residual Value – Bridge and Pavement ($2019)

	ALT1	ALT1-SHIFT	ALT2	ALT2-SHIFT
Residual Value for Roadway	$46,930,053	$65,592,493	$158,678,299	$192,846,910
Residual Value for Bridge Structure	$111,794,773	$144,357,733	$177,705,999	$215,971,896
Total Residual Value	**$158,724,827**	**$209,950,226**	**$336,384,299**	**$408,818,808**
DISCOUNTED RESIDUAL VALUE (7%)	**$38,334,123**	**$50,705,727**	**$81,241,210**	**$98,735,092**

4. BCA RESULTS

The BCA for the I-15 Flamingo to Sahara project used methodologies in compliance with USDOT's 2021 Benefit-Cost Analysis Guidance for Discretionary Grant Programs and recommended values based on assumptions documented within NDOT's discussion of the calculations of costs and benefits in the *2020 Performance Management Report* document. Tables 9 and 10 summarize the associated discounted cumulative benefits and costs of Build Alternatives.

Table 9. Total Discounted Benefits ($2019)

BENEFIT CATEGORY	ALT1	ALT1-SHIFT	ALT2	ALT2-SHIFT
Travel Time Savings	$170,902,694	$170,902,694	$149,565,928	$149,565,928
Vehicle Operation Savings	($16,531,505)	($16,531,505)	($9,060,355)	($9,060,355)
Crash Reduction Savings	$3,918,139	$3,918,139	$8,920,305	$8,920,305
Emission Cost Savings	$12,421,813	$12,421,813	$16,495,479	$16,495,479
Residual Value	$38,334,123	$50,705,727	$81,241,210	$98,735,092
TOTAL BENEFITS (7%)	**$209,415,195**	**$221,416,868**	**$237,230,815**	**$247,162,568**

Table 10. Total Discounted Costs ($2019)

COST ITEM	ALT1	ALT1-SHIFT	ALT2	ALT2-SHIFT
Capital Costs	$156,183,394	$209,460,832	$247,419,280	$300,696,718
O&M Costs	$1,118,773	$1,118,773	$2,222,953	$2,222,953
TOTAL COSTS (7%)	**$157,302,167**	**$210,579,604**	**$249,642,233**	**$302,919,670**

The project's net benefits are the difference between the total benefits and total costs. Table 11 summarizes the net benefits and the resulting Benefit Cost Ratios for Alternatives 1 and 2. The discount calculation takes the initial cost of the project and the projected benefits over the study period and discounts these costs and revenues at the 7 percent discount rate, which reduces the value of future costs and benefits by the time value of money (discount rate).

Table 11. Benefit Cost Ratios (Discounted at 7% - $2019)

METRIC	ALT1	ALT1-SHIFT	ALT2	ALT2-SHIFT
Total Discounted Benefits	$209,415,195	$221,416,868	$247,162,567	$264,656,449
Total Discounted Costs	$157,302,167	$210,579,604	$249,642,233	$302,919,670
Net Benefits	**$51,743,097**	**$10,837,264**	**($2,479,666)**	**($38,263,221)**
BENEFIT-COST RATIO	**1.33**	**1.05**	**0.99**	**0.87**

Net benefits reveal **total net benefit of over $51.7 million for Alt. 1 and $10.8 million for Alt. 1-shift.** Also the results show **total disbenefit of over 2.4 for Alt. 2, and a disbenefit of nearly $38.3 million for Alt. 2-shift**. The calculated **Benefit-Cost Ratios are 1.33, 1.05, 0.99 and 0.87 for Alt. 1, Alt. 1-shift, Alt. 2, and Alt. 2-shift, respectively**. These results show Build Alternative 1-shift is more financially feasible compared to other Build scenarios.

The **associated Excel Workbooks (Appendix B to E)** provide the details of the 7 percent discount calculations and year-to-year discounted values for costs benefits. The Workbooks also provide detailed results of the sensitivity analysis. Table 12 provides Benefit Cost Ratio Sensitivity Analysis summary, i.e., benefit-cost ratios calculated using a 3-percent discount rate.

Table 12. Sensitivity Analysis (Discounted at 3% - $2019)

METRIC	ALT1	ALT1-SHIFT	ALT2	ALT2-SHIFT
Total Discounted Benefits	$381,948,719	$408,661,518	$468,360,013	$507,297,131
Total Discounted Costs	$205,599,849	$275,075,598	$326,480,560	$395,956,309
Net Benefits	**$175,525,493**	**$133,585,920**	**$141,879,453**	**$111,340,822**
BENEFIT-COST RATIO	**1.85**	**1.49**	**1.43**	**1.28**

Appendix A: Traffic Volumes Workbook

Traffic Volume Analysis used in Distributing VMT and VHT for Daily and Annual Traffic

Count Station:	0030052		0030061		0030068		0030266		0030286		0031064		0031500		0031598	
Location:	I-15 S of Tropicana		I-15 S of Flamingo		Spring Mountain Rd		Tropicana Ave		Sahara Ave		Flamingo Rd		Dean Martin Dr		Frank Sinatra Dr	
Time	Hourly Volumes	Percent of Peak Hour	Hourly Volumes	Percent of Peak Hour	Hourly Volumes	Percent of Peak Hour	Hourly Volumes	Percent of Peak Hour	Hourly Volumes	Percent of Peak Hour	Hourly Volumes	Percent of Peak Hour	Hourly Volumes	Percent of Peak Hour	Hourly Volumes	Percent of Peak Hour
00:00	3,861	36.34%	7,197	41.86%	1,936	64.04%	1,835	51.84%	1,675	46.03%	1,485	51.51%	704	64.64%	745	54.39%
01:00	2,711	25.51%	5,027	29.24%	1,373	45.41%	1,219	34.43%	1,125	30.91%	1,044	36.23%	467	42.84%	484	35.32%
02:00	2,115	19.90%	4,211	24.49%	1,115	36.87%	992	28.03%	866	23.80%	910	31.57%	344	31.61%	398	29.06%
03:00	2,075	19.53%	4,618	26.86%	1,353	44.75%	1,119	31.61%	800	21.98%	897	31.12%	324	29.71%	507	37.04%
04:00	2,595	24.42%	5,607	32.61%	1,226	40.55%	1,503	42.47%	879	24.15%	974	33.79%	371	34.07%	478	34.88%
05:00	4,669	43.94%	9,690	56.36%	1,452	48.04%	1,901	53.70%	1,574	43.24%	1,189	41.24%	427	39.17%	618	45.09%
06:00	7,899	74.34%	14,056	81.75%	1,833	60.62%	2,166	61.19%	2,315	63.63%	1,688	58.57%	581	53.35%	845	61.71%
07:00	10,190	95.91%	16,857	98.04%	2,468	81.65%	2,884	81.48%	3,143	86.36%	2,417	83.85%	893	81.96%	1,370	100.00%
08:00	10,326	97.18%	16,652	96.85%	2,716	89.83%	3,136	88.57%	3,426	94.15%	2,546	88.35%	967	88.77%	1,266	92.38%
09:00	10,106	95.11%	16,098	93.63%	2,519	83.33%	3,198	90.35%	3,285	90.27%	2,649	91.91%	862	79.12%	1,075	78.44%
10:00	10,170	95.71%	16,341	95.04%	2,584	85.47%	3,331	94.10%	3,432	94.30%	2,676	92.84%	941	86.40%	1,023	74.65%
11:00	10,625	100.00%	17,194	100.00%	3,023	100.00%	3,540	100.00%	3,639	100.00%	2,882	100.00%	1,089	100.00%	1,277	93.23%
12:00	10,839	85.94%	17,112	88.34%	3,092	79.87%	3,511	87.06%	3,716	93.54%	2,793	98.32%	1,101	65.63%	1,252	64.71%
13:00	11,183	88.67%	17,949	92.67%	3,187	82.31%	3,526	87.44%	3,861	97.20%	2,682	94.40%	1,170	69.69%	1,470	75.99%
14:00	11,659	92.45%	18,875	97.45%	3,549	91.65%	3,896	96.62%	3,973	100.00%	2,841	100.00%	1,340	79.85%	1,848	95.52%
15:00	12,051	95.55%	18,961	97.89%	3,664	94.63%	3,979	98.67%	3,931	98.95%	2,818	99.20%	1,413	84.16%	1,897	98.05%
16:00	12,612	100.00%	19,370	100.00%	3,872	100.00%	4,032	100.00%	3,971	99.95%	2,804	98.69%	1,678	93.28%	1,935	100.00%
17:00	12,467	98.85%	18,714	96.62%	3,806	98.29%	3,948	97.90%	3,857	97.07%	2,794	98.36%	1,678	100.00%	1,778	91.90%
18:00	10,368	82.21%	16,229	83.79%	3,335	86.12%	3,383	83.89%	3,609	90.85%	2,565	90.28%	1,191	70.95%	1,483	76.64%
19:00	8,930	70.80%	14,603	75.39%	3,216	83.06%	3,076	76.28%	3,261	82.07%	2,525	88.88%	942	56.14%	1,332	68.85%
20:00	8,039	63.74%	13,012	67.18%	2,907	75.07%	3,017	74.81%	2,906	73.14%	2,317	81.57%	878	52.32%	1,058	54.67%
21:00	7,272	57.66%	12,189	62.93%	2,704	69.84%	3,013	74.73%	2,682	67.50%	2,294	80.77%	853	50.80%	971	50.19%
22:00	6,302	49.97%	11,142	57.52%	2,639	68.15%	2,913	72.23%	2,485	62.54%	2,201	77.49%	858	51.10%	1,149	59.41%
23:00	5,260	41.71%	9,957	51.41%	2,620	67.66%	2,513	62.32%	2,161	54.40%	1,965	69.15%	850	50.66%	1,137	58.78%
Volume	194,327		321,660		62,188		67,633		66,497		51,956		21,809		27,395	

Time	Combined Volumes: Total Hourly Volumes	Percent of Peak Hour
00:00	19,439	44.92%
01:00	13,450	31.08%
02:00	10,951	25.31%
03:00	11,693	27.02%
04:00	13,633	31.51%
05:00	21,519	49.73%
06:00	31,385	72.53%
07:00	40,223	92.96%
08:00	41,035	94.83%
09:00	39,793	91.96%
10:00	40,498	93.59%
11:00	43,270	100.00%
12:00	43,416	86.68%
13:00	45,028	89.90%
14:00	47,981	95.80%
15:00	48,713	97.26%
16:00	50,085	100.00%
17:00	49,042	97.92%
18:00	42,162	84.18%
19:00	37,885	75.64%
20:00	34,133	68.15%
21:00	31,979	63.85%
22:00	29,688	59.28%
23:00	26,464	52.84%
	813,464	

Calculations for factor to be applied to the 3-hour VMT and VHT to establish a peak hour VMT and VHT for daily and annual distribution

Note: The project AIMSUM traffic analyses used 2-hour AM and PM analysis times due to extended peaks, plus 1/2 hour traffic buildup and 1/2 hour traffic dissipation periods.

AM Peak Hour used in AIMSUM Analysis

1/2 hour =	15,692	13.43%		Queue build up
	40,223	34.42%		Peak Period
	41,035	35.12%	VMT&VHT factor	Peak Period
1/2 hour =	19,896	17.03%		Queue dissipation

PM Peak Hour used in AIMSUM Analysis

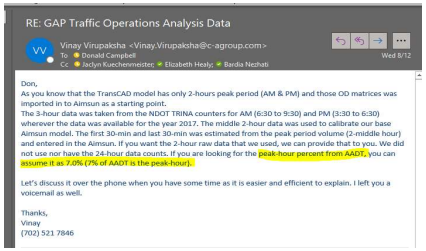
1/2 hour =	24,357	16.85%		Queue build up
	50,085	34.65%	VMT&VHT factor	Peak Period
	49,042	33.92%		Peak Period
1/2 hour =	21,081	14.58%		Queue dissipation

Seeding interval

Seeding interval

VMT

VHT



Count Station:	0030052		0030061		0030068		0030266		0030286		0031064		0031500		0031598	
Location:	I-15 S of Tropicana		I-15 S of Flamingo		Spring Mountain Rd		Tropicana Ave		Sahara Ave		Flamingo Rd		Dean Martin Dr		Frank Sinatra Dr	
Time	ADT	Percent of Station Total	ADT	Percent of Station Total	ADT	Percent of Station Total	ADT	Percent of Station Total	ADT	Percent of Station Total	ADT	Percent of Station Total	ADT	Percent of Station Total	ADT	Percent of Station Total
00:00	3,861	1.99%	7,197	2.24%	1,936	3.11%	1,835	2.71%	1,675	2.52%	1,485	2.86%	704	3.23%	745	2.72%
01:00	2,711	1.40%	5,027	1.56%	1,373	2.21%	1,219	1.80%	1,125	1.69%	1,044	2.01%	467	2.14%	484	1.77%
02:00	2,115	1.09%	4,211	1.31%	1,115	1.79%	992	1.47%	866	1.30%	910	1.75%	344	1.58%	398	1.45%
03:00	2,075	1.07%	4,618	1.44%	1,353	2.18%	1,119	1.65%	800	1.20%	897	1.73%	324	1.48%	507	1.85%
04:00	2,595	1.34%	5,607	1.74%	1,226	1.97%	1,503	2.22%	879	1.32%	974	1.87%	371	1.70%	478	1.74%
05:00	4,669	2.40%	9,690	3.01%	1,452	2.34%	1,901	2.81%	1,574	2.37%	1,189	2.29%	427	1.96%	618	2.25%
06:00	7,899	4.06%	14,056	4.37%	1,833	2.95%	2,166	3.20%	2,315	3.48%	1,688	3.25%	581	2.66%	845	3.09%
07:00	10,190	5.24%	16,857	5.24%	2,468	3.97%	2,884	4.26%	3,143	4.73%	2,417	4.65%	893	4.09%	1,370	5.00%
08:00	10,326	5.31%	16,652	5.18%	2,716	4.37%	3,136	4.64%	3,426	5.15%	2,546	4.90%	967	4.43%	1,266	4.62%
09:00	10,106	5.20%	16,098	5.00%	2,519	4.05%	3,198	4.73%	3,285	4.94%	2,649	5.10%	862	3.95%	1,075	3.92%
10:00	10,170	5.23%	16,341	5.08%	2,584	4.16%	3,331	4.93%	3,432	5.16%	2,676	5.15%	941	4.32%	1,023	3.73%
11:00	10,625	5.47%	17,194	5.35%	3,023	4.86%	3,540	5.23%	3,639	5.47%	2,882	5.55%	1,089	4.99%	1,277	4.66%
12:00	10,839	5.58%	17,112	5.32%	3,092	4.97%	3,511	5.19%	3,716	5.59%	2,793	5.38%	1,101	5.05%	1,252	4.57%
13:00	11,183	5.75%	17,949	5.58%	3,187	5.13%	3,526	5.21%	3,861	5.81%	2,682	5.16%	1,170	5.36%	1,470	5.37%
14:00	11,659	6.00%	18,875	5.87%	3,549	5.71%	3,896	5.76%	3,973	5.97%	2,841	5.47%	1,340	6.15%	1,848	6.75%
15:00	12,051	6.20%	18,961	5.89%	3,664	5.89%	3,979	5.88%	3,931	5.91%	2,818	5.42%	1,413	6.48%	1,897	6.92%
16:00	12,612	6.49%	19,370	6.02%	3,872	6.23%	4,032	5.96%	3,895	5.86%	2,804	5.40%	1,566	7.18%	1,935	7.06%
17:00	12,467	6.42%	18,714	5.82%	3,806	6.12%	3,948	5.84%	3,857	5.80%	2,794	5.38%	1,678	7.70%	1,778	6.49%
18:00	10,368	5.34%	16,229	5.05%	3,335	5.36%	3,383	5.00%	3,609	5.43%	2,565	4.94%	1,191	5.46%	1,483	5.41%
19:00	8,930	4.60%	14,603	4.54%	3,216	5.17%	3,076	4.55%	3,261	4.90%	2,525	4.86%	942	4.32%	1,332	4.86%
20:00	8,039	4.14%	13,012	4.05%	2,907	4.67%	3,017	4.46%	2,906	4.37%	2,317	4.46%	878	4.03%	1,058	3.86%
21:00	7,272	3.74%	12,189	3.79%	2,704	4.35%	3,013	4.46%	2,682	4.03%	2,294	4.42%	853	3.91%	971	3.54%
22:00	6,302	3.24%	11,142	3.46%	2,639	4.24%	2,913	4.31%	2,485	3.74%	2,201	4.24%	858	3.93%	1,149	4.20%
23:00	5,260	2.71%	9,957	3.10%	2,620	4.21%	2,513	3.72%	2,161	3.25%	1,965	3.78%	850	3.90%	1,137	4.15%
Volume	194,327		321,660		62,188		67,633		66,497		51,956		21,809		27,395	

Time	Combined Volumes: Total	Percent of Station Total
00:00	19,439	2.39%
01:00	13,450	1.65%
02:00	10,951	1.35%
03:00	11,693	1.44%
04:00	13,633	1.68%
05:00	21,519	2.65%
06:00	31,385	3.86%
07:00	40,223	4.94%
08:00	41,035	5.04%
09:00	39,793	4.89%
10:00	40,498	4.98%
11:00	43,270	5.32%
12:00	43,416	5.34%
13:00	45,028	5.54%
14:00	47,981	5.90%
15:00	48,713	5.99%
16:00	50,085	6.16%
17:00	49,042	6.03%
18:00	42,162	5.18%
19:00	37,885	4.66%
20:00	34,133	4.20%
21:00	31,979	3.93%
22:00	29,688	3.65%
23:00	26,464	3.25%
	813,464	

2019 Vol

	Time	Hourly Vol	Adjusted Vol	% of Analysis Interval
Seeding (1/2 hour)	06:00	~~21,385~~	15,692	13.43%
	07:00	40,223	40,223	34.42%
	08:00	~~41,035~~	41,035	35.12%
Dissipation (1/2 hour)	09:00	~~39,793~~	19,896	17.03%
Total			116,846	

	Time	Hourly Vol	Adjusted Vol	% of Analysis Interval
Seeding (1/2 hour)	15:00	~~48,713~~	24,357	16.85%
	16:00	50,085	50,085	34.65%
	17:00	49,042	49,042	33.92%
Dissipation (1/2 hour)	18:00	~~42,162~~	21,081	14.58%
Total			144,565	

VMT & VHT								
Parameter	2017		2040					
	Existing Conditions		No-Action		Alternative-1		Alternative-2	
	AM	PM	AM	PM	AM	PM	AM	PM
Total Travel Time, VHT (hr)	8,689	12,501	10,963	14,173	10,213	13,400	10,129	13,642
Total Traveled Distance, VMT (mi)	375,215	375,146	453,019	454,471	455,763	461,154	453,249	459,170

AM represent 3-hour data (6:30 to 9:30)

PM represent 3-hour data (3:30 to 6:30)

	AM	PM
Truck Percentage	4.10%	6.60%

All scenarios (2017 & 2040)

Parameter	2017		2040					
	Existing Conditions		No-Action		Alternative-1		Alternative-2	
	AM	PM	AM	PM	AM	PM	AM	PM
Total Travel Time, VHT (hr)	8,689	12,501	10,963	14,173	10,213	13,400	10,129	13,642
Total Traveled Distance, VMT (mi)	375,215	375,146	453,019	454,471	455,763	461,154	453,249	459,170

AM represent 3-hour data (6:30 to 9:30)

PM represent 3-hour data (3:30 to 6:30)

	AM	PM
Truck Percentage	4.10%	6.60%

All scenarios (2017 & 2040)

Table 1: 2017 Existing Condition Network Wide Results

Parameter	AM	PM
Total Travel Time, VHT (hr)	8,689	12,501
Total Travelled Distance, VMT (mi)	375,215	375,146
Delay Time (sec/mi)	41	124
Total Delay Time (hr)	4,239	12,879
Total Network Vehicles (veh)	**107,590**	**126,359**
Latent Vehicles (veh)	**183**	**2,294**
Latent Delay Time (hr)	34	433
Number of Arrived Vehicles	104,024	119,111
Number of Active Vehicles	3,384	4,954
Total Network Delay (hr)	**4,273**	**13,312**
Average Network Delay (sec/veh)	**143**	**379**

Table 7: 2040 No-Action Network Wide Results

Parameter	AM	PM
Total Travel Time, VHT (hr)	10,416	13,915
Total Travelled Distance, VMT (mi)	453,464	455,852
Delay Time (sec/mi)	53	118
Total Delay Time (hr)	6,735	14,958
Total Network Vehicles (veh)	**141,907**	**172,367**
Latent Vehicles (veh)	**1030**	**2,781**
Latent Delay Time (hr)	211	491
Number of Arrived Vehicles	137,542	165,147
Number of Active Vehicles	3,335	4,439
Total Network Delay (hr)	**6,946**	**15,449**
Average Network Delay (sec/veh)	**176**	**323**

Table 16. 2040 Conceptual Alternative 1 Network Wide Results

Parameter	Conceptual Alternative 1	
	AM	PM
Total Travel Time, VHT (hr)	9,899	12,744
Total Travelled Distance, VMT (mi)	454,413	462,847
Delay Time (sec/mi)	51	109
Total Delay Time (hr)	6,468	14,011
Total Network Vehicles (veh)	**141,201**	**172,038**
Latent Vehicles (veh)	**516**	**730**
Latent Delay Time (hr)	82	111
Number of Arrived Vehicles	137,487	167,344
Number of Active Vehicles	3,199	3,965
Total Network Delay (hr)	**6,550**	**14,122**
Average Network Delay (sec/veh)	**167**	**296**

Table 22. 2040 Conceptual Alternative 2 Network Wide Results

Parameter	Conceptual Alternative-2	
	AM	PM
Total Travel Time, VHT (hr)	9,842	12,522
Total Travelled Distance, VMT (mi)	451,793	461,613
Delay Time (sec/mi)	54	107
Total Delay Time (hr)	6,737	13,673
Total Network Vehicles (veh)	**140,629**	**171,841**
Latent Vehicles (veh)	**614**	**711**
Latent Delay Time (hr)	105	109
Number of Arrived Vehicles	136,804	167,227
Number of Active Vehicles	3,211	3,902
Total Network Delay (hr)	**6,842**	**13,782**
Average Network Delay (sec/veh)	**175**	**289**

		Analysis AADT (2017)	Proportion of Analysis Hour (Based on AADT and count locations)	Estimated AADT / Hour	Percent of Peak Hour (based on AADT proportions)	Estimated AADT / Hour (2017)	Estimated AADT / Hour (2040 No Action)	Estimated AADT / Hour (2040 Alternative 1)	Estimated AADT / Hour (2040 Alternative 2)
	0:00				44.92%	17,899	23,608	23,491	23,395
	1:00				31.08%	12,384	16,334	16,253	16,187
	2:00				25.31%	10,084	13,300	13,234	13,180
	3:00				27.02%	10,766	14,200	14,130	14,073
	4:00				31.51%	12,553	16,557	16,475	16,408
	5:00				49.73%	19,814	26,134	26,004	25,899
AM analysis peak begins at 6:30	***6:00**		13.43%	14,449	72.53%	28,899	38,116	37,927	37,773
	7:00	**107,590**	34.42%	37,036	92.96%	37,036	48,850	48,607	48,410
	8:00		**35.12%**	**37,784**	**94.83%**	**37,784**	**49,836**	**49,588**	**49,387**
AM analysis peak ends at 9:30	***9:00**		17.03%	18,320	91.96%	36,640	48,327	48,087	47,892
	10:00				93.59%	37,290	49,184	48,939	48,741
	11:00				**100.00%**	**39,843**	**52,551**	**52,290**	**52,078**
	12:00				86.68%	37,949	51,766	51,667	51,608
	13:00				89.90%	39,357	53,687	53,585	53,524
	14:00				95.80%	41,938	57,208	57,099	57,034
PM analysis peak begins at 15:30	***15:00**		16.85%	21,289	97.26%	42,579	58,082	57,971	57,904
	16:00	**126,359**	**34.65%**	**43,778**	**100.00%**	**43,778**	**59,717**	**59,604**	**59,535**
	17:00		33.92%	42,866	97.92%	42,866	58,474	58,362	58,295
PM analysis peak ends at 18:30	***18:00**		14.58%	18,426	84.18%	36,852	50,270	50,174	50,116
	19:00				75.64%	33,113	45,170	45,084	45,032
	20:00				68.15%	29,834	40,697	40,619	40,573
	21:00				63.85%	27,951	38,128	38,056	38,012
	22:00				59.28%	25,949	35,398	35,330	35,290
	23:00				52.84%	23,131	31,553	31,493	31,456
		Totals				**726,290**	**977,148**	**974,066**	**971,803**
					AM CHECK	107,590	141,907	141,201	140,629
						107,590	141,907	141,201	140,629
						OKAY	OKAY	OKAY	OKAY
					PM CHECK	126,359	172,367	172,038	171,841
						126,359	172,367	172,038	171,841
						OKAY	OKAY	OKAY	OKAY

Hourly Forecasts								
2017 (Existing Conditions)		2040 (No-Action)		2040 (Alternative 1)		2040 (Alternative 2)	
VHT	VMT	VHT	VMT	VHT	VMT	VHT	VMT
1,446	62,422	1,824	75,366	1,699	75,822	1,685	75,404
1,000	43,190	1,262	52,146	1,176	52,461	1,166	52,172
814	35,166	1,027	42,458	957	42,715	949	42,479
869	37,547	1,097	45,333	1,022	45,607	1,014	45,356
1,014	43,778	1,279	52,856	1,192	53,176	1,182	52,883
1,600	69,102	2,019	83,431	1,881	83,936	1,865	83,473
2,334	100,783	2,945	121,681	2,743	122,418	2,721	121,743
2,991	129,163	3,774	155,946	3,516	156,890	3,487	156,025
3,051	**131,770**	**3,850**	**159,094**	**3,587**	**160,057**	**3,557**	**159,174**
2,959	127,782	3,734	154,278	3,478	155,213	3,449	154,357
3,012	130,046	3,800	157,012	3,540	157,963	3,511	157,092
3,218	**138,950**	**4,060**	**167,762**	**3,782**	**168,778**	**3,751**	**167,847**
3,754	112,665	4,256	136,488	4,024	138,496	4,097	137,900
3,894	116,847	4,414	141,555	4,174	143,636	4,249	143,018
4,149	124,510	4,704	150,838	4,447	153,056	4,528	152,398
4,212	126,411	4,776	153,141	4,515	155,393	4,597	154,724
4,331	**129,971**	**4,910**	**157,454**	**4,643**	**159,769**	**4,726**	**159,082**
4,241	127,264	4,808	154,175	4,546	156,442	4,628	155,769
3,646	109,409	4,133	132,544	3,908	134,493	3,979	133,914
3,276	98,310	3,714	119,098	3,512	120,849	3,575	120,329
2,952	88,575	3,346	107,304	3,164	108,882	3,221	108,414
2,765	82,984	3,135	100,531	2,964	102,010	3,018	101,571
2,567	77,041	2,911	93,331	2,752	94,704	2,802	94,296
2,288	68,673	2,594	83,194	2,453	84,417	2,497	84,054
66,384	**2,312,360**	**78,373**	**2,797,015**	**73,673**	**2,827,185**	**74,253**	**2,813,474**
AM CHECK	8,689	375,215	10,963	453,019	10,213	455,763	10,129	453,249
	8,689	375,215	10,963	453,019	10,213	455,763	10,129	453,249
	OKAY	OKAY	OKAY	OKAY	OKAY	OKAY	OKAY	OKAY
PM CHECK	12,501	375,146	14,173	454,471	13,400	461,154	13,642	459,170
	12,501	375,146	14,173	454,471	13,400	461,154	13,642	459,170
	OKAY	OKAY	OKAY	OKAY	OKAY	OKAY	OKAY	OKAY

	Hour	Analysis AADT (2017)	Proportion of Analysis Hour (Based on AADT and count locations)	Estimated AADT / Hour	Percent of Peak Hour (based on AADT proportions)	Estimated AADT / Hour (2017)	Estimated AADT / Hour (2040 No Action)	Estimated AADT / Hour (2040 Alternative 1)	Estimated AADT / Hour (2040 Alternative 2)
	0:00				44.92%	17,899	23,608	23,491	23,395
	1:00				31.08%	12,384	16,334	16,253	16,187
	2:00				25.31%	10,084	13,300	13,234	13,180
	3:00				27.02%	10,766	14,200	14,130	14,073
	4:00				31.51%	12,553	16,557	16,475	16,408
	5:00				49.73%	19,814	26,134	26,004	25,899
AM analysis peak begins at 6:30	*6:00		13.43%	14,449	72.53%	28,899	38,116	37,927	37,773
	7:00	107,590	34.42%	37,036	92.96%	37,036	48,850	48,607	48,410
	8:00		**35.12%**	**37,784**	**94.83%**	**37,784**	**49,836**	**49,588**	**49,387**
AM analysis peak ends at 9:30	*9:00		17.03%	18,320	91.96%	36,640	48,327	48,087	47,892
	10:00				93.59%	37,290	49,184	48,939	48,741
	11:00				**100.00%**	**39,843**	**52,551**	**52,290**	**52,078**
	12:00				86.68%	37,949	51,766	51,667	51,608
	13:00				89.90%	39,357	53,687	53,585	53,524
	14:00				95.80%	41,938	57,208	57,099	57,034
PM analysis peak begins at 15:30	*15:00		16.85%	21,289	97.26%	42,579	58,082	57,971	57,904
	16:00	126,359	**34.65%**	**43,778**	**100.00%**	**43,778**	**59,717**	**59,604**	**59,535**
	17:00		33.92%	42,866	97.92%	42,866	58,474	58,362	58,295
PM analysis peak ends at 18:30	*18:00		14.58%	18,426	84.18%	36,852	50,270	50,174	50,116
	19:00				75.64%	33,113	45,170	45,084	45,032
	20:00				68.15%	29,834	40,697	40,619	40,573
	21:00				63.85%	27,951	38,128	38,056	38,012
	22:00				59.28%	25,949	35,398	35,330	35,290
	23:00				52.84%	23,131	31,553	31,493	31,456
						726,290	**977,148**	**974,066**	**971,803**
					AM CHECK	107,590	141,907	141,201	140,629
						107,590	141,907	141,201	140,629
						OKAY	OKAY	OKAY	OKAY
					PM CHECK	126,359	172,367	172,038	171,841
						126,359	172,367	172,038	171,841
						OKAY	OKAY	OKAY	OKAY

Hourly Forecasts									
Hour	2017 (Existing Conditions)		2040 (No-Action)		2040 (Alternative 1)		2040 (Alternative 2)		
	VHT	VMT	VHT	VMT	VHT	VMT	VHT	VMT	
0:00	1,446	62,422	1,824	75,366	1,699	75,822	1,685	75,404	
1:00	1,000	43,190	1,262	52,146	1,176	52,461	1,166	52,172	
2:00	814	35,166	1,027	42,458	957	42,715	949	42,479	
3:00	869	37,547	1,097	45,333	1,022	45,607	1,014	45,356	
4:00	1,014	43,778	1,279	52,856	1,192	53,176	1,182	52,883	
5:00	1,600	69,102	2,019	83,431	1,881	83,936	1,865	83,473	
*6:00	2,334	100,783	2,945	121,681	2,743	122,418	2,721	121,743	
7:00	2,991	129,163	3,774	155,946	3,516	156,890	3,487	156,025	
8:00	**3,051**	**131,770**	**3,850**	**159,094**	**3,587**	**160,057**	**3,557**	**159,174**	
*9:00	2,959	127,782	3,734	154,278	3,478	155,213	3,449	154,357	
10:00	3,012	130,046	3,800	157,012	3,540	157,963	3,511	157,092	
11:00	**3,218**	**138,950**	**4,060**	**167,762**	**3,782**	**168,778**	**3,751**	**167,847**	
12:00	3,754	112,665	4,256	136,488	4,024	138,496	4,097	137,900	
13:00	3,894	116,847	4,414	141,555	4,174	143,636	4,249	143,018	
14:00	4,149	124,510	4,704	150,838	4,447	153,056	4,528	152,398	
*15:00	4,212	126,411	4,776	153,141	4,515	155,393	4,597	154,724	
16:00	**4,331**	**129,971**	**4,910**	**157,454**	**4,643**	**159,769**	**4,726**	**159,082**	
17:00	4,241	127,264	4,808	154,175	4,546	156,442	4,628	155,769	
*18:00	3,646	109,409	4,133	132,544	3,908	134,493	3,979	133,914	
19:00	3,276	98,310	3,714	119,098	3,512	120,849	3,575	120,329	
20:00	2,952	88,575	3,346	107,304	3,164	108,882	3,221	108,414	
21:00	2,765	82,984	3,135	100,531	2,964	102,010	3,018	101,571	
22:00	2,567	77,041	2,911	93,331	2,752	94,704	2,802	94,296	
23:00	2,288	68,673	2,594	83,194	2,453	84,417	2,497	84,054	
	66,384	**2,312,360**	**78,373**	**2,797,015**	**73,673**	**2,827,185**	**74,253**	**2,813,474**	
AM CHECK	8,689	375,215	10,963	453,019	10,213	455,763	10,129	453,249	
	8,689	375,215	10,963	453,019	10,213	455,763	10,129	453,249	
	OKAY	OKAY	OKAY	OKAY	OKAY	OKAY	OKAY	OKAY	
PM CHECK	12,501	375,146	14,173	454,471	13,400	461,154	13,642	459,170	
	12,501	375,146	14,173	454,471	13,400	461,154	13,642	459,170	
	OKAY	OKAY	OKAY	OKAY	OKAY	OKAY	OKAY	OKAY	

Hourly Forecasts (Trucks)														
Hour	TOD Truck Percentages	Estimated Truck AADT / Hour (2017)	Estimated Truck AADT / Hour (2040 No Action)	Estimated Truck AADT / Hour (2040 Alternative 1)	Estimated Truck AADT / Hour (2040 Alternative 2)	2017 (Existing Conditions)		2040 (No-Action)		2040 (Alternative 1)		2040 (Alternative 2)		
						VHT	VMT	VHT	VMT	VHT	VMT	VHT	VMT	
0:00	4.10%	734	968	963	959	59	2,559	75	3,090	70	3,109	69	3,092	
1:00	4.10%	508	670	666	664	41	1,771	52	2,138	48	2,151	48	2,139	
2:00	4.10%	413	545	543	540	33	1,442	42	1,741	39	1,751	39	1,742	
3:00	4.10%	441	582	579	577	36	1,539	45	1,859	42	1,870	42	1,860	
4:00	4.10%	515	679	675	673	42	1,795	52	2,167	49	2,180	48	2,168	
5:00	4.10%	812	1,072	1,066	1,062	66	2,833	83	3,421	77	3,441	76	3,422	
*6:00	4.10%	1,185	1,563	1,555	1,549	96	4,132	121	4,989	112	5,019	112	4,991	
7:00	4.10%	1,518	2,003	1,993	1,985	123	5,296	155	6,394	144	6,432	143	6,397	
8:00	**4.10%**	**1,549**	**2,043**	**2,033**	**2,025**	**125**	**5,403**	**158**	**6,523**	**147**	**6,562**	**146**	**6,526**	
*9:00	4.10%	1,502	1,981	1,972	1,964	121	5,239	153	6,325	143	6,364	141	6,329	
10:00	4.10%	1,529	2,017	2,006	1,998	123	5,332	156	6,438	145	6,476	144	6,441	
11:00	**4.10%**	**1,634**	**2,155**	**2,144**	**2,135**	132	5,697	166	6,878	155	6,920	154	6,882	
12:00	6.60%	2,505	3,417	3,410	3,406	248	7,436	281	9,008	266	9,141	270	9,101	
13:00	6.60%	2,598	3,543	3,537	3,533	257	7,712	291	9,343	275	9,480	280	9,439	
14:00	6.60%	2,768	3,776	3,769	3,764	274	8,218	310	9,955	294	10,102	299	10,058	
*15:00	6.60%	2,810	3,833	3,826	3,822	278	8,343	315	10,107	298	10,256	303	10,212	
16:00	**6.60%**	**2,889**	**3,941**	**3,934**	**3,929**	**286**	**8,578**	**324**	**10,392**	**306**	**10,545**	**312**	**10,499**	
17:00	6.60%	2,829	3,859	3,852	3,847	280	8,399	317	10,176	300	10,325	305	10,281	
*18:00	6.60%	2,432	3,318	3,311	3,308	241	7,221	273	8,748	258	8,877	263	8,838	
19:00	6.60%	2,185	2,981	2,976	2,972	216	6,488	245	7,860	232	7,976	236	7,942	
20:00	6.60%	1,969	2,686	2,681	2,678	195	5,846	221	7,082	209	7,186	213	7,155	
21:00	6.60%	1,845	2,516	2,512	2,509	183	5,477	207	6,635	196	6,733	199	6,704	
22:00	6.60%	1,713	2,336	2,332	2,329	169	5,085	192	6,160	182	6,250	185	6,224	
23:00	6.60%	1,527	2,082	2,079	2,076	151	4,532	171	5,491	162	5,572	165	5,548	
	Totals	**40,410**	**54,567**	**54,413**	**54,303**	**3,774**	**126,373**	**4,406**	**152,919**	**4,148**	**154,718**	**4,192**	**153,989**	

Hourly Forecasts (Automobiles)													
Hour	Estimated Automobile AADT / Hour (2017)	Estimated Automobile AADT / Hour (2040 No Action)	Estimated Automobile AADT / Hour (2040 Alternative 1)	Estimated Automobile AADT / Hour (2040 Alternative 2)	2017 (Existing Conditions)		2040 (No-Action)		2040 (Alternative 1)		2040 (Alternative 2)		
					VHT	VMT	VHT	VMT	VHT	VMT	VHT	VMT	
0:00	17,165	22,640	22,528	22,436	1,386	59,863	1,749	72,276	1,629	72,713	1,616	72,312	
1:00	11,877	15,665	15,587	15,524	959	41,419	1,210	50,008	1,127	50,310	1,118	50,033	
2:00	9,670	12,755	12,691	12,640	781	33,724	985	40,717	918	40,964	910	40,738	
3:00	10,325	13,618	13,550	13,496	834	36,008	1,052	43,474	980	43,738	972	43,496	
4:00	12,038	15,878	15,799	15,735	972	41,983	1,227	50,689	1,143	50,996	1,133	50,715	
5:00	19,002	25,063	24,938	24,837	1,535	66,269	1,936	80,010	1,804	80,495	1,789	80,051	
*6:00	27,714	36,554	36,372	36,224	2,238	96,651	2,824	116,692	2,631	117,399	2,609	116,751	
7:00	35,518	46,847	46,614	46,425	2,868	123,867	3,619	149,552	3,372	150,458	3,344	149,628	
8:00	**36,235**	**47,792**	**47,555**	**47,362**	**2,926**	**126,367**	**3,692**	**152,571**	**3,440**	**153,495**	**3,411**	**152,648**	
*9:00	35,138	46,346	46,115	45,928	2,838	122,543	3,580	147,953	3,335	148,849	3,308	148,028	
10:00	35,761	47,167	46,932	46,742	2,888	124,714	3,644	150,575	3,395	151,487	3,367	150,651	
11:00	38,209	50,396	50,146	49,943	3,086	133,253	3,893	160,884	3,627	161,858	3,597	160,965	
12:00	35,444	48,349	48,257	48,202	3,507	105,229	3,976	127,480	3,759	129,355	3,827	128,798	
13:00	36,760	50,144	50,048	49,991	3,637	109,135	4,123	132,212	3,898	134,156	3,969	133,579	
14:00	39,170	53,433	53,331	53,270	3,875	116,293	4,394	140,883	4,154	142,955	4,229	142,340	
*15:00	39,768	54,248	54,145	54,083	3,934	118,068	4,461	143,034	4,217	145,137	4,293	144,512	
16:00	**40,888**	**55,776**	**55,670**	**55,606**	**4,045**	**121,393**	**4,586**	**147,062**	**4,336**	**149,225**	**4,414**	**148,583**	
17:00	40,037	54,614	54,510	54,448	3,961	118,865	4,491	143,999	4,246	146,117	4,322	145,488	
*18:00	34,420	46,952	46,862	46,809	3,405	102,188	3,861	123,796	3,650	125,616	3,716	125,076	
19:00	30,928	42,189	42,108	42,060	3,060	91,822	3,469	111,237	3,280	112,873	3,339	112,387	
20:00	27,865	38,011	37,939	37,895	2,757	82,729	3,125	100,222	2,955	101,696	3,008	101,258	
21:00	26,106	35,612	35,544	35,503	2,583	77,507	2,928	93,896	2,769	95,277	2,819	94,867	
22:00	24,237	33,062	32,998	32,961	2,398	71,956	2,719	87,172	2,570	88,453	2,617	88,073	
23:00	21,604	29,470	29,414	29,380	2,137	64,140	2,423	77,703	2,291	78,845	2,332	78,506	
	685,880	**922,582**	**919,653**	**917,499**	**62,610**	**2,185,986**	**73,967**	**2,644,096**	**69,525**	**2,672,466**	**70,061**	**2,659,485**	

Appendix B: Build Alt. 1 BCA Workbook

I-15 Flamingo to Sahara Feasibility Study

General Economic Parameters

Year of Current Dollars for Model	2019	
Economic Update Factor (Using GDP Deflator)	1.0152	1
Real Discount Rate	7.0%	2

Value of Travel Time Savings (2019)

	Value	Units	
Truck Drivers			
Hourly Value	$ 33.48	$/hr	3
Value of Time			
Personal	$ 11.16	$/hr/per	4
Business	$ 33.48	$/hr/veh	4

Vehicle Occupancies

Passenger Vehicles	1.51	per vehicle	5
Trucks	1.00	per vehicle	5

Vehicle Operating Costs (2019)

Operating Costs			
Automobile (regular unleaded)	$ 0.31	$/mile	6
Truck (diesel)	$ 0.59	$/mile	6

Crash Costs

Cost of a Fatality (2019)	$ 6,200,000	$/event	7
Cost of an Injury (2019)			
Level A (Incapacitating)	$ 330,600	$/event	7
Level B (Non-incapacitating)	$ 120,700	$/event	7
Level C (Possibly Injured)	$ 67,900	$/event	7
Cost of Property Damage (2019)	$ 11,000	$/event	7
Cost of Highway Accident (2019)			
Fatal Crash	$ 9,800,000	$/accident	8
Injury A Crash	$ 467,400	$/accident	8
Injury B Crash	$ 127,300	$/accident	8
Injury C Crash	$ 65,100	$/accident	8
PDO Crash	$ 4,500	$/accident	8

1 2012-2020 GDP Deflator Annual Increase
2 Nevada DOT Guidance for BCAs
3 Nevada DOT Guidance for BCAs
4 Nevada DOT Guidance for BCAs
5 Nevada DOT Guidance for BCAs
6 Nevada DOT Guidance for BCAs
7 Nevada DOT Guidance for BCAs
8 Nevada DOT Guidance for BCAs

I-15 Flamingo to Sahara Feasibility Study Alt. 1 Benefit /Cost Summary (Discounted at 7% Rate)	
Benefits and Costs	**Present Value (2019$)**
Benefits	
Travel time savings	$170,902,694
Operation costs savings	($16,531,505)
Crash cost savings	$3,918,139
Emissions cost savings	$12,421,813
Residual Value	$38,334,123
Total Benefits	**$209,045,263**
Costs	
Construction Costs	$156,183,394
Road and Bridge O&M	$1,118,773
Total Costs	**$157,302,167**
Net Benefits	**$51,743,097**
Benefit/Cost Ratio	**1.33**

I-15 Flamingo to Sahara Feasibility Study Alt. 1 Benefit /Cost Sensitivity Summary (Discounted at 3% Rate)	
Benefits and Costs	**Present Value (2019$)**
Benefits	
Travel time savings	$296,081,503
Operation costs savings	($28,656,243)
Crash cost savings	$6,793,767
Emissions cost savings	$21,583,900
Residual Value	$85,322,416
Total Benefits	**$381,125,342**
Costs	
Construction Costs	$203,668,923
Road and Bridge O&M	$1,930,926
Total Costs	**$205,599,849**
Net Benefits	**$175,525,493**
Benefit/Cost Ratio	**1.85**

Costs and Benefits I-15 Flamingo to Sahara Feasibility Study

Benefits and Costs by Year, 2019$

Year	Travel Time Savings	Operation Costs Savings	Crash Reduction Savings	Emissions CO_2 Savings	Emissions NO_x Savings	Emissions PM Savings	Emissions VOC Savings	Design and Construction Costs	O&M Costs	Residual Value
2019	N/A	N/A	N/A	$0	$0	N/A	N/A	N/A	N/A	N/A
2025	$0	$0	$0	$0	$0	$0	$0	$83,471,383	$0	$0
2026	$0	$0	$0	$0	$0	$0	$0	$83,471,383	$0	$0
2027	$0	$0	$0	$0	$0	$0	$0	$83,471,383	$0	$0
2028	$33,864,130	($5,257,600)	$769,917	$32,069	$8,176	$2,295,263	$55,039	$0	$230,000	$0
2029	$34,108,916	($5,284,665)	$776,736	$32,487	$8,411	$2,324,743	$55,746	$0	$230,000	$0
2030	$34,355,472	($5,311,955)	$783,614	$32,911	$8,649	$2,354,602	$56,462	$0	$230,000	$0
2031	$34,603,811	($5,339,472)	$790,554	$33,340	$8,891	$2,384,844	$57,187	$0	$230,000	$0
2032	$34,853,944	($5,367,218)	$797,554	$33,775	$9,135	$2,415,475	$57,922	$0	$230,000	$0
2033	$35,105,886	($5,395,193)	$804,617	$34,215	$9,382	$2,446,499	$58,666	$0	$230,000	$0
2034	$35,359,648	($5,423,402)	$811,743	$34,661	$9,633	$2,477,921	$59,419	$0	$230,000	$0
2035	$35,615,245	($5,451,845)	$818,931	$35,113	$9,887	$2,509,748	$60,183	$0	$230,000	$0
2036	$35,872,689	($5,480,524)	$826,184	$35,571	$10,144	$2,541,983	$60,956	$0	$230,000	$0
2037	$36,131,995	($5,509,441)	$833,500	$36,035	$10,405	$2,574,632	$61,739	$0	$230,000	$0
2038	$36,393,174	($5,538,598)	$840,881	$36,505	$10,669	$2,607,700	$62,531	$0	$230,000	$0
2039	$36,656,242	($5,567,998)	$848,328	$36,981	$10,937	$2,641,193	$63,335	$0	$230,000	$0
2040	$36,921,211	($5,597,642)	$855,841	$37,463	$11,208	$2,675,116	$64,148	$0	$230,000	$158,724,827
Totals	**$459,842,364**	**($44,525,553)**	**$10,558,401**	**$451,125**	**$125,528**	**$32,249,717**	**$773,334**	**$250,414,149**	**$2,990,000**	**$158,724,827**
									Total Benefits	$618,199,742

Present Value of Benefits and Costs by Year

Discount Rate = 7.00%

Year	Travel Time Savings	Operation Costs Savings	Crash Reduction Savings	Emissions CO_2 Savings	Emissions NO_x Savings	Emissions PM Savings	Emissions VOC Savings	Design and Construction Costs	O&M Costs	Residual Value
2019	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2025	$0	$0	$0	$0	$0	$0	$0	$55,620,507	$0	$0
2026	$0	$0	$0	$0	$0	$0	$0	$51,981,782	$0	$0
2027	$0	$0	$0	$0	$0	$0	$0	$48,581,105	$0	$0
2028	$18,419,843	($1,771,919)	$418,784	$17,443	$4,447	$1,248,471	$29,938	$0	$125,105	$0
2029	$17,339,243	($1,669,757)	$394,853	$16,515	$4,276	$1,181,781	$28,339	$0	$116,920	$0
2030	$16,322,037	($1,573,486)	$372,289	$15,636	$4,109	$1,118,654	$26,825	$0	$109,271	$0
2031	$15,364,506	($1,482,766)	$351,015	$14,803	$3,948	$1,058,899	$25,392	$0	$102,123	$0
2032	$14,463,148	($1,397,276)	$330,957	$14,015	$3,791	$1,002,336	$24,036	$0	$95,442	$0
2033	$13,614,668	($1,316,715)	$312,045	$13,269	$3,639	$948,794	$22,752	$0	$89,198	$0
2034	$12,815,964	($1,240,798)	$294,213	$12,563	$3,492	$898,113	$21,536	$0	$83,363	$0
2035	$12,064,116	($1,169,259)	$277,400	$11,894	$3,349	$850,138	$20,386	$0	$77,909	$0
2036	$11,356,375	($1,101,845)	$261,549	$11,261	$3,211	$804,727	$19,297	$0	$72,812	$0
2037	$10,690,153	($1,038,317)	$246,603	$10,661	$3,078	$761,741	$18,266	$0	$68,049	$0
2038	$10,063,016	($978,452)	$232,511	$10,094	$2,950	$721,051	$17,290	$0	$63,597	$0
2039	$9,472,670	($922,039)	$219,224	$9,557	$2,826	$682,534	$16,367	$0	$59,436	$0
2040	$8,916,956	($868,878)	$206,697	$9,048	$2,707	$646,076	$15,493	$0	$55,548	$38,334,123
Totals	**$170,902,694**	**($16,531,505)**	**$3,918,139**	**$166,759**	**$45,823**	**$11,923,315**	**$285,916**	**$156,183,394**	**$1,118,773**	**$38,334,123**
								Total Discounted Benefits		$209,045,263

Costs and Benefits I-15 Flamingo to Sahara Feasibility Study Sensitivity Analysis @ 3.0% Discount Rate

Present Value of Benefits and Costs by Year

Discount Rate = 3.00%

Year	Travel Time Savings	Operation Costs Savings	Crash Reduction Savings	Emissions CO_2 Savings	Emissions NO_x Savings	Emissions PM Savings	Emissions VOC Savings	Design and Construction Costs	O&M Costs	Residual Value
2019	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2025	$0	$0	$0	$0	$0	$0	$0	$69,905,969	$0	$0
2026	$0	$0	$0	$0	$0	$0	$0	$67,869,873	$0	$0
2027	$0	$0	$0	$0	$0	$0	$0	$65,893,081	$0	$0
2028	$25,954,036	$2,496,679	$590,078	$24,578	$6,266	$1,759,128	$42,183	$0	$176,276	$0
2029	$25,380,237	$2,444,099	$577,964	$24,173	$6,259	$1,729,827	$41,480	$0	$171,142	$0
2030	$24,819,124	$2,392,627	$566,099	$23,775	$6,249	$1,701,014	$40,790	$0	$166,157	$0
2031	$24,270,417	$2,342,239	$554,478	$23,384	$6,236	$1,672,681	$40,110	$0	$161,317	$0
2032	$23,733,840	$2,292,911	$543,096	$22,999	$6,220	$1,644,821	$39,442	$0	$156,619	$0
2033	$23,209,126	$2,244,623	$531,947	$22,620	$6,203	$1,617,424	$38,785	$0	$152,057	$0
2034	$22,696,013	$2,197,351	$521,027	$22,248	$6,183	$1,590,483	$38,139	$0	$147,628	$0
2035	$22,194,243	$2,151,075	$510,331	$21,881	$6,161	$1,563,992	$37,504	$0	$143,328	$0
2036	$21,703,567	$2,105,774	$499,855	$21,521	$6,138	$1,537,941	$36,879	$0	$139,154	$0
2037	$21,223,739	$2,061,427	$489,594	$21,167	$6,112	$1,512,325	$36,265	$0	$135,101	$0
2038	$20,754,519	$2,018,013	$479,543	$20,818	$6,084	$1,487,135	$35,661	$0	$131,166	$0
2039	$20,295,672	$1,975,514	$469,699	$20,475	$6,055	$1,462,365	$35,067	$0	$127,345	$0
2040	$19,846,970	$1,933,910	$460,056	$20,138	$6,025	$1,438,007	$34,483	$0	$123,636	$85,322,416
Totals	**$296,081,503**	**($28,656,243)**	**$6,793,767**	**$289,778**	**$80,191**	**$20,717,143**	**$496,788**	**$203,668,923**	**$1,930,926**	**$85,322,416**
									Total Discounted Benefits	$381,125,342

Abbreviation Legend and Notes	
N/A	No Application
TRK	Truck Trips
AM Peak	7:00 AM to 9:00 AM, PST
HPMS	Highway Performance Monitoring System
PCE	Passenger Car Equivalent
TDM	Travel Demand Model
AADT	Annual Average Daily Traffic
VHT	Vehicle Hours Travelled
VMT	Vehicle Miles Travelled
PHT	Person Hours Travelled

PCE Travel Demand Model	
TRK	1.63

Average Vehicle Occupancies Travel Demand Model	
Automobile	1.51
TRK	1.00

All Vehicle Volumes			
	2017	2040 No-Build	2040 Alt1
AM (7-9) Peak Traffic	74,820	98,685	98,194
PM (4-6) Peak Traffic	86,644	118,191	117,966
Average Daily Speed			
AADT	726,290	977,148	974,066
Daily VMT	2,312,360	2,797,015	2,827,185
Daily VHT	66,384	78,373	73,673

Car Volumes			
	2017	2040 No-Build	2040 Alt1
AM (7-9) Peak Traffic	71,753	94,639	94,168
PM (4-6) Peak Traffic	80,925	110,391	110,180
Average Daily Speed			
AADT	685,880	922,582	919,653
Daily VMT	2,185,986	2,644,096	2,672,466
Daily VHT	62,610	73,967	69,525

Truck Volumes			
	2017	2040 No-Build	2040 Alt1
AM (7-9) Peak Traffic	3,068	4,046	4,026
PM (4-6) Peak Traffic	5,718	7,801	7,786
Average Daily Speed			
AADT	40,410	54,567	54,413
Daily VMT	126,373	152,919	154,718
Daily VHT	3,774	4,406	4,148

Annual Growth Rates (2017 and 2040-No Build)			
	2017	2040 No-Build	Annual Growth
AADT	726,290	977,148	1.30%
VMT	2,312,360	2,797,015	0.83%
VHT	66,384	78,373	0.72%

Annual Growth Rates (2017 and 2040 Build)			
	2017	2040 Build	Annual Growth
AADT	726,290	974,066	1.28%
VMT	2,312,360	2,827,185	0.88%
VHT	66,384	73,673	0.45%

Annual Growth Rates (Automobile)			
	2017	2040 No-Build	Annual Growth
AADT	685,880	922,582	1.30%
VMT	2,185,986	2,644,096	0.83%
VHT	62,610	73,967	0.73%

Annual Growth Rates (Truck)			
	2017	2040 No-Build	Annual Growth
AADT	40,410	54,567	1.31%
VMT	126,373	152,919	0.83%
VHT	3,774	4,406	0.68%

Daily Traffic Values in Study Area 2023 to 2040 (All Vehicles)

Year	No-Build			Build (Alt 1)			Improvement		
	AADT	Daily VMT	Daily VHT	AADT	Daily VMT	Daily VHT	ADT	Daily VMT	Daily VHT
2017	726,290	2,312,360	66,384	N/A	N/A	N/A	N/A	N/A	N/A
2022	774,678	2,410,019	68,824	N/A	N/A	N/A	N/A	N/A	N/A
2023	784,736	2,430,040	69,322	782,260	2,456,252	65,165	2,475	-26,212	4,157
2024	794,924	2,450,228	69,825	792,416	2,476,657	65,637	2,508	-26,430	4,187
2025	805,244	2,470,583	70,330	802,704	2,497,232	66,113	2,540	-26,649	4,218
2026	815,699	2,491,108	70,840	813,126	2,517,978	66,592	2,573	-26,870	4,248
2027	826,289	2,511,803	71,353	823,683	2,538,896	67,074	2,607	-27,094	4,279
2028	837,017	2,532,670	71,870	834,377	2,559,988	67,560	2,640	-27,319	4,310
2029	847,884	2,553,710	72,391	845,209	2,581,256	68,050	2,675	-27,546	4,341
2030	858,892	2,574,925	72,915	856,183	2,602,700	68,543	2,709	-27,775	4,373
2031	870,043	2,596,316	73,443	867,299	2,624,322	69,039	2,745	-28,005	4,404
2032	881,339	2,617,885	73,976	878,559	2,646,123	69,539	2,780	-28,238	4,436
2033	892,782	2,639,633	74,511	889,965	2,668,106	70,043	2,816	-28,473	4,468
2034	904,373	2,661,562	75,051	901,520	2,690,271	70,551	2,853	-28,709	4,501
2035	916,114	2,683,673	75,595	913,224	2,712,621	71,062	2,890	-28,948	4,533
2036	928,008	2,705,968	76,143	925,081	2,735,156	71,576	2,927	-29,188	4,566
2037	940,057	2,728,448	76,694	937,091	2,757,879	72,095	2,965	-29,431	4,599
2038	952,261	2,751,115	77,250	949,257	2,780,790	72,617	3,004	-29,675	4,633
2039	964,625	2,773,970	77,810	961,582	2,803,891	73,143	3,043	-29,922	4,666
2040	977,148	2,797,015	78,373	974,066	2,827,185	73,673	3,082	-30,170	4,700

Annual Traffic Values in Study Area 2023 to 2040 (All Vehicles)

Year	No-Build			Build (Alt 1)			Improvement			
	Annual Traffic	Annual VMT	Annual VHT	Annual Traffic	Annual VMT	Annual VHT	Annual Traffic	Annual VMT	Annual VHT	% VMT
2017	265,095,969	844,011,282	24,230,151	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2022	282,757,447	879,656,921	25,120,663	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2023	286,428,506	886,964,705	25,302,655	285,524,959	896,531,998	23,785,287	903,547	-9,567,293	1,517,368	-1.08%
2024	290,147,226	894,333,199	25,485,965	289,231,948	903,979,973	23,957,604	915,278	-9,646,774	1,528,361	-1.08%
2025	293,914,227	901,762,907	25,670,603	292,987,066	911,489,822	24,131,170	927,161	-9,726,915	1,539,433	-1.08%
2026	297,730,135	909,254,338	25,856,579	296,790,936	919,062,059	24,305,993	939,198	-9,807,721	1,550,586	-1.08%
2027	301,595,585	916,808,004	26,043,902	300,644,193	926,697,203	24,482,083	951,392	-9,889,199	1,561,820	-1.08%
2028	305,511,220	924,424,422	26,232,583	304,547,476	934,395,777	24,659,448	963,744	-9,971,354	1,573,135	-1.08%
2029	309,477,693	932,104,114	26,422,630	308,501,436	942,158,306	24,838,098	976,256	-10,054,192	1,584,531	-1.08%
2030	313,495,662	939,847,606	26,614,054	312,506,731	949,985,323	25,018,043	988,931	-10,137,717	1,596,011	-1.08%
2031	317,565,797	947,655,427	26,806,865	316,564,027	957,877,363	25,199,292	1,001,770	-10,221,937	1,607,574	-1.08%
2032	321,688,775	955,528,111	27,001,073	320,673,998	965,834,967	25,381,853	1,014,777	-10,306,856	1,619,220	-1.08%
2033	325,865,282	963,466,198	27,196,688	324,837,330	973,858,679	25,565,737	1,027,951	-10,392,480	1,630,951	-1.08%
2034	330,096,012	971,470,231	27,393,720	329,054,715	981,949,048	25,750,953	1,041,297	-10,478,816	1,642,767	-1.08%
2035	334,381,671	979,540,758	27,592,179	333,326,854	990,106,628	25,937,511	1,054,817	-10,565,870	1,654,668	-1.08%
2036	338,722,970	987,678,332	27,792,076	337,654,459	998,331,978	26,125,421	1,068,511	-10,653,646	1,666,655	-1.08%
2037	343,120,633	995,883,508	27,993,422	342,038,249	1,006,625,660	26,314,692	1,082,384	-10,742,152	1,678,730	-1.08%
2038	347,575,391	1,004,156,849	28,196,226	346,478,954	1,014,988,242	26,505,334	1,096,437	-10,831,392	1,690,892	-1.08%
2039	352,087,985	1,012,498,922	28,400,499	350,977,313	1,023,420,296	26,697,357	1,110,672	-10,921,375	1,703,142	-1.08%
2040	356,659,167	1,020,910,296	28,606,252	355,534,075	1,031,922,400	26,890,772	1,125,092	-11,012,104	1,715,481	-1.08%

Daily Automobile Traffic Values in Study Area 2023 to 2040

Year	No-Build			Build (Alt 1)			Improvement		
	ADT	Daily VMT	Daily VHT	ADT	Daily VMT	Daily VHT	ADT	Daily VMT	Daily VHT
2017	685,880	2,185,986	62,610	N/A	N/A	N/A	N/A	N/A	N/A
2022	731,541	2,278,297	64,921	N/A	N/A	N/A	N/A	N/A	N/A
2023	741,032	2,297,222	65,393	738,680	2,321,871	61,466	2,352	-24,649	3,927
2024	750,646	2,316,304	65,869	748,263	2,341,158	61,913	2,383	-24,854	3,956
2025	760,384	2,335,545	66,348	757,971	2,360,605	62,363	2,414	-25,060	3,985
2026	770,249	2,354,945	66,830	767,804	2,380,214	62,817	2,445	-25,268	4,014
2027	780,242	2,374,507	67,317	777,765	2,399,985	63,274	2,477	-25,478	4,043
2028	790,364	2,394,231	67,806	787,856	2,419,921	63,734	2,509	-25,690	4,072
2029	800,618	2,414,119	68,299	798,077	2,440,022	64,198	2,541	-25,903	4,102
2030	811,005	2,434,172	68,796	808,431	2,460,290	64,665	2,574	-26,118	4,132
2031	821,527	2,454,391	69,297	818,919	2,480,727	65,135	2,608	-26,335	4,162
2032	832,185	2,474,779	69,801	829,543	2,501,333	65,609	2,641	-26,554	4,192
2033	842,981	2,495,336	70,308	840,306	2,522,110	66,086	2,676	-26,775	4,222
2034	853,918	2,516,063	70,820	851,207	2,543,060	66,567	2,710	-26,997	4,253
2035	864,996	2,536,963	71,335	862,251	2,564,185	67,051	2,746	-27,221	4,284
2036	876,218	2,558,037	71,854	873,437	2,585,484	67,539	2,781	-27,447	4,315
2037	887,586	2,579,285	72,377	884,769	2,606,961	68,030	2,817	-27,675	4,347
2038	899,101	2,600,710	72,903	896,247	2,628,616	68,525	2,854	-27,905	4,378
2039	910,766	2,622,313	73,433	907,875	2,650,450	69,023	2,891	-28,137	4,410
2040	922,582	2,644,096	73,967	919,653	2,672,466	69,525	2,928	-28,371	4,442

Annual Automobile Traffic Values in Study Area 2023 to 2040

Year	No-Build			Build (Alt 1)			Improvement			
	Annual Traffic	Annual VMT	Annual VHT	Annual Traffic	Annual VMT	Annual VHT	Annual Traffic	Annual VMT	Annual VHT	% VMT
2017	250,346,194	797,885,029	22,852,774	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2022	267,012,483	831,578,581	23,696,097	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2023	270,476,589	838,486,144	23,868,460	269,618,065	847,483,001	22,435,010	858,524	-8,996,857	1,433,450	-1.07%
2024	273,985,636	845,451,085	24,042,077	273,115,974	854,522,675	22,598,200	869,662	-9,071,590	1,443,877	-1.07%
2025	277,540,208	852,473,881	24,216,957	276,659,264	861,620,825	22,762,577	880,944	-9,146,944	1,454,380	-1.07%
2026	281,140,896	859,555,012	24,393,108	280,248,523	868,777,936	22,928,150	892,373	-9,222,924	1,464,959	-1.07%
2027	284,788,297	866,694,963	24,570,541	283,884,347	875,994,498	23,094,927	903,951	-9,299,535	1,475,615	-1.07%
2028	288,483,018	873,894,223	24,749,265	287,567,340	883,271,005	23,262,917	915,678	-9,376,782	1,486,348	-1.07%
2029	292,225,673	881,153,284	24,929,288	291,298,116	890,607,954	23,432,129	927,558	-9,454,671	1,497,160	-1.07%
2030	296,016,884	888,472,642	25,110,621	295,077,293	898,005,849	23,602,572	939,591	-9,533,207	1,508,050	-1.07%
2031	299,857,280	895,852,799	25,293,273	298,905,499	905,465,194	23,774,254	951,781	-9,612,395	1,519,019	-1.07%
2032	303,747,500	903,294,261	25,477,254	302,783,371	912,986,501	23,947,186	964,129	-9,692,241	1,530,068	-1.07%
2033	307,688,190	910,797,535	25,662,573	306,711,552	920,570,285	24,121,375	976,637	-9,772,750	1,541,198	-1.07%
2034	311,680,004	918,363,135	25,849,240	310,690,696	928,217,063	24,296,832	989,308	-9,853,928	1,552,408	-1.07%
2035	315,723,607	925,991,580	26,037,265	314,721,464	935,927,360	24,473,564	1,002,143	-9,935,780	1,563,700	-1.07%
2036	319,819,670	933,683,391	26,226,657	318,804,525	943,701,704	24,651,582	1,015,144	-10,018,313	1,575,075	-1.07%
2037	323,968,873	941,439,094	26,417,427	322,940,559	951,540,625	24,830,895	1,028,314	-10,101,530	1,586,532	-1.07%
2038	328,171,906	949,259,221	26,609,585	327,130,251	959,444,661	25,011,513	1,041,655	-10,185,439	1,598,072	-1.07%
2039	332,429,468	957,144,306	26,803,140	331,374,299	967,414,352	25,193,444	1,055,169	-10,270,045	1,609,696	-1.07%
2040	336,742,265	965,094,889	26,998,103	335,673,407	975,450,244	25,376,698	1,068,858	-10,355,354	1,621,405	-1.07%

Daily Truck Traffic Values in Study Area 2023 to 2040

Year	No-Build			Build (Alt 1)			Improvement		
	ADT	Daily VMT	Daily VHT	ADT	Daily VMT	Daily VHT	ADT	Daily VMT	Daily VHT
2017	40,410	126,373	3,774	N/A	N/A	N/A	N/A	N/A	N/A
2022	43,137	131,721	3,903	N/A	N/A	N/A	N/A	N/A	N/A
2023	43,704	132,818	3,929	43,581	134,381	3,699	123	-1,563	230
2024	44,278	133,924	3,956	44,153	135,499	3,724	125	-1,576	231
2025	44,860	135,038	3,983	44,734	136,627	3,750	127	-1,589	233
2026	45,450	136,163	4,010	45,322	137,765	3,775	128	-1,602	235
2027	46,047	137,296	4,037	45,917	138,912	3,800	130	-1,616	236
2028	46,653	138,439	4,064	46,521	140,068	3,826	132	-1,629	238
2029	47,266	139,591	4,091	47,132	141,234	3,852	133	-1,643	239
2030	47,887	140,753	4,119	47,752	142,410	3,878	135	-1,656	241
2031	48,516	141,925	4,147	48,380	143,595	3,904	137	-1,670	243
2032	49,154	143,106	4,175	49,015	144,790	3,931	139	-1,684	244
2033	49,800	144,298	4,203	49,660	145,996	3,957	141	-1,698	246
2034	50,455	145,499	4,231	50,312	147,211	3,984	142	-1,712	248
2035	51,118	146,710	4,260	50,974	148,436	4,011	144	-1,726	249
2036	51,790	147,931	4,289	51,644	149,672	4,038	146	-1,741	251
2037	52,471	149,163	4,318	52,322	150,918	4,065	148	-1,755	253
2038	53,160	150,404	4,347	53,010	152,174	4,093	150	-1,770	254
2039	53,859	151,656	4,376	53,707	153,441	4,120	152	-1,784	256
2040	54,567	152,919	4,406	54,413	154,718	4,148	154	-1,799	258

Annual Truck Traffic Values in Study Area 2023 to 2040

Year	No-Build			Build (Alt 1)			Improvement			
	Annual Traffic	Annual VMT	Annual VHT	Annual Traffic	Annual VMT	Annual VHT	Annual Traffic	Annual VMT	Annual VHT	% VMT
2017	14,749,776	46,126,253	1,377,377	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2022	15,744,964	48,078,340	1,424,565	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2023	15,951,917	48,478,562	1,434,194	15,906,894	49,048,997	1,350,276	45,023	-570,436	83,918	-1.18%
2024	16,161,590	48,882,114	1,443,888	16,115,974	49,457,298	1,359,404	45,616	-575,183	84,484	-1.18%
2025	16,374,019	49,289,026	1,453,646	16,327,802	49,868,997	1,368,593	46,217	-579,970	85,054	-1.18%
2026	16,589,239	49,699,326	1,463,471	16,542,414	50,284,123	1,377,843	46,825	-584,797	85,628	-1.18%
2027	16,807,288	50,113,041	1,473,361	16,759,846	50,702,705	1,387,156	47,441	-589,665	86,205	-1.18%
2028	17,028,202	50,530,200	1,483,318	16,980,136	51,124,772	1,396,531	48,066	-594,572	86,787	-1.18%
2029	17,252,019	50,950,831	1,493,342	17,203,321	51,550,352	1,405,970	48,699	-599,521	87,372	-1.18%
2030	17,478,778	51,374,964	1,503,433	17,429,438	51,979,474	1,415,471	49,340	-604,511	87,961	-1.18%
2031	17,708,517	51,802,627	1,513,592	17,658,528	52,412,169	1,425,037	49,989	-609,542	88,554	-1.18%
2032	17,941,275	52,233,850	1,523,819	17,890,628	52,848,465	1,434,667	50,647	-614,615	89,152	-1.18%
2033	18,177,092	52,668,664	1,534,115	18,125,778	53,288,394	1,444,362	51,314	-619,730	89,753	-1.18%
2034	18,416,008	53,107,096	1,544,480	18,364,018	53,731,984	1,454,122	51,990	-624,888	90,358	-1.18%
2035	18,658,064	53,549,178	1,554,914	18,605,390	54,179,268	1,463,947	52,674	-630,089	90,967	-1.18%
2036	18,903,300	53,994,941	1,565,419	18,849,933	54,630,274	1,473,839	53,367	-635,333	91,581	-1.18%
2037	19,151,760	54,444,414	1,575,995	19,097,690	55,085,035	1,483,796	54,070	-640,621	92,198	-1.18%
2038	19,403,485	54,897,628	1,586,641	19,348,703	55,543,581	1,493,821	54,782	-645,953	92,820	-1.18%
2039	19,658,518	55,354,615	1,597,359	19,603,015	56,005,944	1,503,913	55,503	-651,329	93,446	-1.18%
2040	19,916,902	55,815,407	1,608,149	19,860,669	56,472,157	1,514,073	56,233	-656,750	94,076	-1.18%

Operation Costs Savings Summary (Vehicle Miles Travelled)					
Year	Automobiles		Trucks		Total Cost Savings
	Mile Reduction	Value	Mile Reduction	Value	
2019	N/A	N/A	N/A	N/A	N/A
2025	N/A	$0	N/A	$0	$0
2026	N/A	$0	N/A	$0	$0
2027	N/A	$0	N/A	$0	$0
2028	-9,376,782	-$2,906,802	-594,572	-$350,798	-$3,257,600
2029	-9,454,671	-$2,930,948	-599,521	-$353,717	-$3,284,665
2030	-9,533,207	-$2,955,294	-604,511	-$356,661	-$3,311,955
2031	-9,612,395	-$2,979,842	-609,542	-$359,630	-$3,339,472
2032	-9,692,241	-$3,004,595	-614,615	-$362,623	-$3,367,218
2033	-9,772,750	-$3,029,553	-619,730	-$365,641	-$3,395,193
2034	-9,853,928	-$3,054,718	-624,888	-$368,684	-$3,423,402
2035	-9,935,780	-$3,080,092	-630,089	-$371,753	-$3,451,845
2036	-10,018,313	-$3,105,677	-635,333	-$374,847	-$3,480,524
2037	-10,101,530	-$3,131,474	-640,621	-$377,966	-$3,509,441
2038	-10,185,439	-$3,157,486	-645,953	-$381,112	-$3,538,598
2039	-10,270,045	-$3,183,714	-651,329	-$384,284	-$3,567,998
2040	-10,355,354	-$3,210,160	-656,750	-$387,483	-$3,597,642

Economic Update Factor (Using GDP Deflator)	
	1.0152
*See Economic Update Factor tab for calculation.	

Vehicle Operation Cost	
Travel Type	**2019**
Automobile	$0.31
Truck	$0.59

Estimated Vehicle Miles Travelled - I-15 Flamingo to Sahara Feasibility Study																
No-Build							Build (Alt 1)						Miles Travelled Improvement			
All Vehicles			Automobiles		Trucks		All Vehicles		Automobiles		Trucks		All Vehicles	Automobiles	Trucks	% VMT
Year	Annual Traffic	Annual VMT	Annual Traffic	Annual VMT	Annual Traffic	Annual VMT	Annual Traffic	Annual VMT	Annual Traffic	Annual VMT	Annual Traffic	Annual VMT	Annual VMT	Annual VMT	Annual VMT	
2019	265,095,969	844,011,282	250,346,194	797,885,029	14,749,776	46,126,253	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2025	293,914,227	901,762,907	277,540,208	852,473,881	16,374,019	49,289,026	292,987,066	911,489,822	276,659,264	861,620,825	16,327,802	49,868,997	-9,726,915	-9,146,944	-579,970	-1.07%
2026	297,730,135	909,254,338	281,140,896	859,555,012	16,589,239	49,699,326	296,790,936	919,062,059	280,248,523	868,777,936	16,542,414	50,284,123	-9,807,721	-9,222,924	-584,797	-1.07%
2027	301,595,585	916,808,004	284,788,297	866,694,963	16,807,288	50,113,041	300,644,193	926,697,203	283,884,347	875,994,498	16,759,846	50,702,705	-9,889,199	-9,299,535	-589,665	-1.07%
2028	305,511,220	924,424,422	288,483,018	873,894,223	17,028,202	50,530,200	304,547,476	934,395,777	287,567,340	883,271,005	16,980,136	51,124,772	-9,971,354	-9,376,782	-594,572	-1.07%
2029	309,477,693	932,104,114	292,225,673	881,153,284	17,252,019	50,950,831	308,501,436	942,158,306	291,298,116	890,607,954	17,203,321	51,550,352	-10,054,192	-9,454,671	-599,521	-1.07%
2030	313,495,662	939,847,606	296,016,884	888,472,642	17,478,778	51,374,964	312,506,731	949,985,323	295,077,293	898,005,849	17,429,438	51,979,474	-10,137,717	-9,533,207	-604,511	-1.07%
2031	317,565,797	947,655,427	299,857,280	895,852,799	17,708,517	51,802,627	316,564,027	957,877,363	298,905,499	905,465,194	17,658,528	52,412,169	-10,221,937	-9,612,395	-609,542	-1.07%
2032	321,688,775	955,528,111	303,747,500	903,294,261	17,941,275	52,233,850	320,673,998	965,834,967	302,783,371	912,986,501	17,890,628	52,848,465	-10,306,856	-9,692,241	-614,615	-1.07%
2033	325,865,282	963,466,198	307,688,190	910,797,535	18,177,092	52,668,664	324,837,330	973,858,679	306,711,552	920,570,285	18,125,778	53,288,394	-10,392,480	-9,772,750	-619,730	-1.07%
2034	330,096,012	971,470,231	311,680,004	918,363,135	18,416,008	53,107,096	329,054,715	981,949,048	310,690,696	928,217,063	18,364,018	53,731,984	-10,478,816	-9,853,928	-624,888	-1.07%
2035	334,381,671	979,540,758	315,723,607	925,991,580	18,658,064	53,549,178	333,326,854	990,106,628	314,721,464	935,927,360	18,605,390	54,179,268	-10,565,870	-9,935,780	-630,089	-1.07%
2036	338,722,970	987,678,332	319,819,670	933,683,391	18,903,300	53,994,941	337,654,459	998,331,978	318,804,525	943,701,704	18,849,933	54,630,274	-10,653,646	-10,018,313	-635,333	-1.07%
2037	343,120,633	995,883,508	323,968,873	941,439,094	19,151,760	54,444,414	342,038,249	1,006,625,660	322,940,559	951,540,625	19,097,690	55,085,035	-10,742,152	-10,101,530	-640,621	-1.07%
2038	347,575,391	1,004,156,849	328,171,906	949,259,221	19,403,485	54,897,628	346,478,954	1,014,988,242	327,130,251	959,444,661	19,348,703	55,543,581	-10,831,392	-10,185,439	-645,953	-1.07%
2039	352,087,985	1,012,498,922	332,429,468	957,144,306	19,658,518	55,354,615	350,977,313	1,023,420,296	331,374,299	967,414,352	19,603,015	56,005,944	-10,921,375	-10,270,045	-651,329	-1.07%
2040	356,659,167	1,020,910,296	336,742,265	965,094,889	19,916,902	55,815,407	355,534,075	1,031,922,400	335,673,407	975,450,244	19,860,669	56,472,157	-11,012,104	-10,355,354	-656,750	-1.07%

NDOT Values

Table E-8 Vehicle Non-Fuel Operating Costs (2019 USD)

Vehicle Non-Fuel Operating Costs	Cost Per Mile ($)
Light Duty Vehicle[1]	0.31
Commercial Truck[2]	0.59

1. Source: American Automobile Association, Your Driving Costs – 2019 Edition.
2. Source: American Transportation Research Institute, An Analysis of the Operational Costs of Trucking: 2018 Update.

Time Savings Summary (Person Hours)					
Year	Auto (Hours)	Value ($)	Truck (Hours)	Value ($)	Total Cost Savings
2019	N/A	$0	N/A	$0	$0
2025	N/A	$0	N/A	$0	$0
2026	N/A	$0	N/A	$0	$0
2027	N/A	$0	N/A	$0	$0
2028	2,244,386	#########	86,787	#########	$33,864,130
2029	2,260,711	#########	87,372	#########	$34,108,916
2030	2,277,155	#########	87,961	#########	$34,355,472
2031	2,293,719	#########	88,554	#########	$34,603,811
2032	2,310,403	#########	89,152	#########	$34,853,944
2033	2,327,209	#########	89,753	#########	$35,105,886
2034	2,344,137	#########	90,358	#########	$35,359,648
2035	2,361,188	#########	90,967	#########	$35,615,245
2036	2,378,363	#########	91,581	#########	$35,872,689
2037	2,395,663	#########	92,198	#########	$36,131,995
2038	2,413,089	#########	92,820	#########	$36,393,174
2039	2,430,641	#########	93,446	#########	$36,656,242
2040	2,448,321	33,771,556	94,076	#########	$36,921,211

Economic Update Factor (Using GDP Deflator)	
	1.0152
*See Economic Update Factor tab for calculation.	

Travel Cost	
Travel Type	2019
Personal Travel	$11.16
Business Travel	$33.48

Travel Values	
Travel Category	
Personal Travel Percentage	88.20%
Business Travel Percentage	11.80%
Passenger Vehicle Occupancy per Car**	1.51
**Southern Nevada Regional Transportation Commission	

NDOT Values

Table E-1 Travel Costs (2019 USD)

Statistical Area	Mean Wage ($/hour)	Personal Travel ($/hour)	Business Travel ($/hour)
Nevada	$22.60	$11.30	$33.90
Las Vegas – Paradise MSA	$22.32	$11.16	$33.48
Reno – Sparks MSA	$23.19	$11.60	$34.79
Carson City MSA	$24.88	$12.44	$37.32

Source: Occupational Employment Statistics (OES) survey for Nevada conducted by the Research and Analysis Bureau

Estimated TravelTime Values - I-15 Flamingo to Sahara Feasibility Study																								
	No-Build								Build (Alt 1)								Travel Time Improvements							
	All Vehicles			Automobiles			Trucks		All Vehicles			Automobiles			Trucks			All Vehicles			Automobiles			Trucks		
Year	Annual Traffic	Annual VHT	Annual PHT	Annual Traffic	Annual VHT	Annual PHT	Annual Traffic	Annual VHT	Annual PHT	Annual Traffic	Annual VHT	Annual PHT	Annual Traffic	Annual VHT	Annual PHT	Annual Traffic	Annual VHT	Annual PHT	Annual Traffic	Annual VHT	Annual PHT	Annual Traffic	Annual VHT	Annual PHT	Annual Traffic	Annual VHT	Annual PHT
2019	265,095,969	24,230,151	250,346,194	22,852,774	34,507,689	14,749,776	1,377,377	1,377,377	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2025	293,914,227	25,670,603	277,540,208	24,216,957	36,567,605	16,374,019	1,453,646	1,453,646	292,987,066	24,131,170	276,659,264	22,762,577	34,371,491	16,327,802	1,368,593	1,368,593	927,161	1,539,433	880,944	1,454,380	2,196,113	46,217	85,054	85,054
2026	297,730,135	25,856,579	281,140,896	24,393,108	36,833,594	16,589,239	1,463,471	1,463,471	296,790,936	24,305,993	280,248,523	22,928,150	34,621,506	16,542,414	1,377,843	1,377,843	939,198	1,550,586	892,373	1,464,959	2,212,088	46,825	85,628	85,628
2027	301,595,585	26,043,902	284,788,297	24,570,541	37,101,517	16,807,288	1,473,361	1,473,361	300,644,193	24,482,083	283,884,347	23,094,927	34,873,339	16,759,846	1,387,156	1,387,156	951,392	1,561,820	903,951	1,475,615	2,228,178	47,441	86,205	86,205
2028	305,511,220	26,232,583	288,483,018	24,749,265	37,371,390	17,028,202	1,483,318	1,483,318	304,547,476	24,659,448	287,567,340	23,262,917	35,127,004	16,980,136	1,396,531	1,396,531	963,744	1,573,135	915,678	1,486,348	2,244,386	48,066	86,787	86,787
2029	309,477,693	26,422,630	292,225,673	24,929,288	37,643,225	17,252,019	1,493,342	1,493,342	308,501,436	24,838,098	291,298,116	23,432,129	35,382,514	17,203,321	1,405,970	1,405,970	976,256	1,584,531	927,558	1,497,160	2,260,711	48,699	87,372	87,372
2030	313,495,662	26,614,054	296,016,884	25,110,621	37,917,038	17,478,778	1,503,433	1,503,433	312,506,731	25,018,043	295,077,293	23,602,572	35,639,883	17,429,438	1,415,471	1,415,471	988,931	1,596,011	939,591	1,508,050	2,277,155	49,340	87,961	87,961
2031	317,565,797	26,806,865	299,857,280	25,293,273	38,192,843	17,708,517	1,513,592	1,513,592	316,564,027	25,199,292	298,905,499	23,774,254	35,899,124	17,658,528	1,425,037	1,425,037	1,001,770	1,607,574	951,781	1,519,019	2,293,719	49,989	88,554	88,554
2032	321,688,775	27,001,073	303,747,500	25,477,254	38,470,654	17,941,275	1,523,819	1,523,819	320,673,998	25,381,853	302,783,371	23,947,186	36,160,251	17,890,628	1,434,667	1,434,667	1,014,777	1,619,220	964,129	1,530,068	2,310,403	50,647	89,152	89,152
2033	325,865,282	27,196,688	307,688,190	25,662,573	38,750,485	18,177,092	1,534,115	1,534,115	324,837,330	25,565,737	306,711,552	24,121,375	36,423,276	18,125,778	1,444,362	1,444,362	1,027,951	1,630,951	976,637	1,541,198	2,327,209	51,314	89,753	89,753
2034	330,096,012	27,393,720	311,680,004	25,849,240	39,032,352	18,416,008	1,544,480	1,544,480	329,054,715	25,750,953	310,690,696	24,296,832	36,688,216	18,364,018	1,454,122	1,454,122	1,041,297	1,642,767	989,308	1,552,408	2,344,137	51,990	90,358	90,358
2035	334,381,671	27,592,179	315,723,607	26,037,265	39,316,270	18,658,064	1,554,914	1,554,914	333,326,854	25,937,511	314,721,464	24,473,564	36,955,082	18,605,390	1,463,947	1,463,947	1,054,817	1,654,668	1,002,143	1,563,700	2,361,188	52,674	90,967	90,967
2036	338,722,970	27,792,076	319,819,670	26,226,657	39,602,252	18,903,300	1,565,419	1,565,419	337,654,459	26,125,421	318,804,525	24,651,582	37,223,889	18,849,933	1,473,839	1,473,839	1,068,511	1,666,655	1,015,144	1,575,075	2,378,363	53,367	91,581	91,581
2037	343,120,633	27,993,422	323,968,873	26,417,427	39,890,315	19,151,760	1,575,995	1,575,995	342,038,249	26,314,692	322,940,559	24,830,895	37,494,652	19,097,690	1,483,796	1,483,796	1,082,384	1,678,730	1,028,314	1,586,532	2,395,663	54,070	92,198	92,198
2038	347,575,391	28,196,226	328,171,906	26,609,585	40,180,473	19,403,485	1,586,641	1,586,641	346,478,954	26,505,334	327,130,251	25,011,513	37,767,384	19,348,703	1,493,821	1,493,821	1,096,437	1,690,892	1,041,655	1,598,072	2,413,089	54,782	92,820	92,820
2039	352,087,985	28,400,499	332,429,468	26,803,140	40,472,741	19,658,518	1,597,359	1,597,359	350,977,313	26,697,357	331,374,299	25,193,444	38,042,100	19,603,015	1,503,913	1,503,913	1,110,672	1,703,142	1,055,169	1,609,696	2,430,641	55,503	93,446	93,446
2040	356,659,167	28,606,252	336,742,265	26,998,103	40,767,136	19,916,902	1,608,149	1,608,149	355,534,075	26,890,772	335,673,407	25,376,698	38,318,815	19,860,669	1,514,073	1,514,073	1,125,092	1,715,481	1,068,858	1,621,405	2,448,321	56,233	94,076	94,076

72	32	39	30.98%	35.23%
53	23	29	22.32%	26.29%
39	17	22	16.45%	19.65%
2,845	1,447	1,414		

0.000	
0.000	
0.000	
0.000	Total Daily Delay Reduction (Cars)
0	Total Annual Delay Reduction (Cars)

Costs for I-15 Flamingo to Sahara Feasibility Study

Project Inputs	
Total Project Cost ($2019)	$250,414,149
Annual O&M	$230,000
Discount Rate	7%

Construction and O&M Costs in 2019 Dollars

Year	Construction Costs	O&M Costs	Total Costs
2025	$83,471,383	$0	**$83,471,383**
2026	$83,471,383	$0	**$83,471,383**
2027	$83,471,383	$0	**$83,471,383**
2028	$0	$230,000	**$230,000**
2029	$0	$230,000	**$230,000**
2030	$0	$230,000	**$230,000**
2031	$0	$230,000	**$230,000**
2032	$0	$230,000	**$230,000**
2033	$0	$230,000	**$230,000**
2034	$0	$230,000	**$230,000**
2035	$0	$230,000	**$230,000**
2036	$0	$230,000	**$230,000**
2037	$0	$230,000	**$230,000**
2038	$0	$230,000	**$230,000**
2039	$0	$230,000	**$230,000**
2040	$0	$230,000	**$230,000**

Total Project

Item	Description	Total Cost
SECTION I	ROADWAY CONSTRUCTION	$25,336,828
SECTION II	BRIDGES	$18,196,388
SECTION III	WALLS	$4,355,934
SECTION IV	TYPICAL INTERCHANGES	$0
SECTION V	SIGNAL SYSTEMS AT INTERSECTIONS	$792,000
SECTION VI	DEMOLITION	$1,964,460
SECTION VII	ADDITIONAL ITEMS	$37,392,243
	Subtotal	$88,037,853
SECTION VIII	STANDARD PERCENTAGE ADDERS	$22,176,735
TOTAL PRESENT DAY CONSTRUCTION COST (2019)		$177,445,487
TOTAL ESCALATED CONSTRUCTION COST (2019)		$177,445,487
TOTAL ENGINEERING / ADMINISTRATION / LEGAL COSTS		$18,631,776
RIGHT OF WAY		$40,162,500
TOTAL CONSTRUCTION & ENGINEERING (2019)		**$236,239,763**
SECTION IX	HYDRAULICS/STORM WATER COSTS (2019)	$7,087,193
SECTION X	ENVIRONMENTAL CONSIDERATION COSTS (2019)	$7,087,193
	Project Total ($2019) =	**$250,414,149**

Percentage of Roadway Construction	46.9%
Percentage of Bridge Construction	53.1%

$58,794,276

Roadway

Project Inputs	
Roadway Cost ($2019)	$117,325,133
Annual O&M	$200,000
Discount Rate	7%

Construction and O&M Costs in 2019 Dollars

Year	Construction Costs	O&M Costs	Total Costs
2025	$39,108,378	$0	**$39,108,378**
2026	$39,108,378	$0	**$39,108,378**
2027	$39,108,378	$0	**$39,108,378**
2028		$200,000	**$200,000**
2029		$200,000	**$200,000**
2030		$200,000	**$200,000**
2031		$200,000	**$200,000**
2032		$200,000	**$200,000**
2033		$200,000	**$200,000**
2034		$200,000	**$200,000**
2035		$200,000	**$200,000**
2036		$200,000	**$200,000**
2037		$200,000	**$200,000**
2038		$200,000	**$200,000**
2039		$200,000	**$200,000**
2040		$200,000	**$200,000**

Item	Description	Total Cost
SECTION I	ROADWAY CONSTRUCTION	$25,336,828
SECTION II	BRIDGES	$0
SECTION III	WALLS	$0
SECTION IV	TYPICAL INTERCHANGES	$0
SECTION V	SIGNAL SYSTEMS AT INTERSECTIONS	$792,000
SECTION VI	DEMOLITION	$920,397
SECTION VII	ADDITIONAL ITEMS	$17,519,177
	Subtotal	$44,568,403
SECTION VIII	STANDARD PERCENTAGE ADDERS	$10,390,341
TOTAL PRESENT DAY CONSTRUCTION COST (2019)		$83,137,536
TOTAL ESCALATED CONSTRUCTION COST (2019)		$83,137,536
TOTAL ENGINEERING / ADMINISTRATION / LEGAL COSTS		$8,729,441
RIGHT OF WAY COSTS		$18,817,110
TOTAL CONSTRUCTION & ENGINEERING (2019)		$110,684,087
SECTION IX	HYDRAULICS/STORM WATER COSTS (2019)	$3,320,523
SECTION X	ENVIRONMENTAL CONSIDERATION COSTS (2019)	$3,320,523
	Roadway Total ($2019) =	**$117,325,133**

Bridge Structures

Project Inputs	
Bridge Structures Cost ($2019)	$133,089,016
Annual O&M	$30,000
Discount Rate	7%

Construction and O&M Costs in 2019 Dollars

Year	Construction Costs	O&M Costs	Total Costs
2025	$44,363,005	$0	**$44,363,005**
2026	$44,363,005	$0	**$44,363,005**
2027	$44,363,005	$0	**$44,363,005**
2028		$30,000	**$30,000**
2029		$30,000	**$30,000**
2030		$30,000	**$30,000**
2031		$30,000	**$30,000**
2032		$30,000	**$30,000**
2033		$30,000	**$30,000**
2034		$30,000	**$30,000**
2035		$30,000	**$30,000**
2036		$30,000	**$30,000**
2037		$30,000	**$30,000**
2038		$30,000	**$30,000**
2039		$30,000	**$30,000**
2040		$30,000	**$30,000**

Item	Description	Total Cost
SECTION I	ROADWAY CONSTRUCTION	$0
SECTION II	BRIDGES	$18,196,388
SECTION III	WALLS	$4,355,934
SECTION IV	TYPICAL INTERCHANGES	$0
SECTION V	SIGNAL SYSTEMS AT INTERSECTIONS	$0
SECTION VI	DEMOLITION	$1,044,063
SECTION VII	ADDITIONAL ITEMS	$19,873,066
	Subtotal	$43,469,451
SECTION VIII	STANDARD PERCENTAGE ADDERS	$11,786,394
TOTAL PRESENT DAY CONSTRUCTION COST (2019)		$94,307,951
TOTAL ESCALATED CONSTRUCTION COST (2019)		$94,307,951
TOTAL ENGINEERING / ADMINISTRATION / LEGAL COSTS		$9,902,335
RIGHT OF WAY COSTS		$21,345,390
TOTAL CONSTRUCTION & ENGINEERING (2019)		$125,555,676
SECTION IX	HYDRAULICS/STORM WATER COSTS (2019)	$3,766,670
SECTION X	ENVIRONMENTAL CONSIDERATION COSTS (2019)	
	Structures Total ($2019) =	**$133,089,016**

Annual Maintenance Cost for I-15 Flamingo to Sahara Feasibility Study	
Facility Type	O&M per Year ($2019)
Roadways: Asphalt Pavement	$200,000
Concrete Bridges	$20,000
Steel Bridges	$10,000
Total	**$230,000**

Note: O&M cost per C-A Group

Analysis Period	
Start Year	2028
End Year	2040
Years in Analysis Period	12

Roadway Construction ($2019)	$ 117,325,133
Bridge Structures ($2019)	$ 133,089,016

Project Useful Service Life (Years)		
Project Type	Years	Source
Pavement	20	2019 Nevada DOT Road Design Guide (Page 26)
Bridge Structure	75	2019 Nevada State Highway Preservation Report (Pages 5, 6, 61, 68)

Residual Values	
Residual Value (Roadway)	$ 46,930,053.06
Residual Value (Bridge Structures)	$ 111,794,773.73
Total	**$ 158,724,827**

Alternative 1 Crash Savings Summary			
Year	Estimated No-Build Crash Costs	Estimated Build Crash Costs	Estimated Annual Crash Cost Savings
2019	$69,567,068	N/A	N/A
2025	$70,183,135	$0	N/A
2026	$70,804,658	$0	N/A
2027	$71,431,685	$0	N/A
2028	$72,064,265	$71,294,347	$769,917
2029	$72,702,446	$71,925,711	$776,736
2030	$73,346,279	$72,562,665	$783,614
2031	$73,995,814	$73,205,261	$790,554
2032	$74,651,101	$73,853,547	$797,554
2033	$75,312,191	$74,507,574	$804,617
2034	$75,979,135	$75,167,392	$811,743
2035	$76,651,986	$75,833,054	$818,931
2036	$77,330,795	$76,504,611	$826,184
2037	$78,015,616	$77,182,116	$833,500
2038	$78,706,501	$77,865,619	$840,881
2039	$79,403,504	$78,555,176	$848,328
2040	$80,106,680	$79,250,840	$855,841

NDOT Valuation of a Statistical Life in Economic Analysis	
KABCO Level	Monetized Value (2019)
C - Possible Injury	$65,100
B - Non-incapacitating	$127,300
A - Incapacitating	$467,400
K - Killed	$9,800,000
Property Damage Only	$4,500

Study Area No-Build Crashes (2040)			
KABCO Level	Monetized Value (2019)	Incidents	2019 Value
C - Possible Injury	$65,100	405	$26,359,875
B - Non-incapacitating	$127,300	58	$7,363,643
A - Incapacitating	$467,400	8	$3,674,886
K - Killed	$9,800,000	4	$38,525,760
Property Damage Only	$4,500	929	$4,182,516
	Totals	1,404	$80,106,680

Study Area Build Alt. 1 Crashes (2040)			
KABCO Level	Monetized Value (2019)	Incidents	2019 Value
C - Possible Injury	$65,100	401	$26,078,253
B - Non-incapacitating	$127,300	57	$7,284,972
A - Incapacitating	$467,400	8	$3,635,624
K - Killed	$9,800,000	4	$38,114,160
Property Damage Only	$4,500	920	$4,137,831
	Totals	1,389	$79,250,840
	Improvements	15	$855,841
	Percentage Improvement		1.07%

No-Build VMT Increase	
Annual VMT Increase	0.83%

Build Condition Improvement	
Estimated Annual VMT Improvement	-0.88%

Economic Update Factor (Using GDP Deflator)	1.0152

Decrease in Crashes (2040 No Build versus 2040 Build Alt. 1)	1.07%

NDOT Valuation of a Statistical Life in Economic Analysis	
KABCO Level	Monetized Value (2019)
C - Possible Injury	$65,100
B - Non-incapacitating	$127,300
A - Incapacitating	$467,400
K - Killed	$9,800,000
Property Damage Only	$4,500

Study Area 2040 Crashes							
KABCO Level	Monetized Value (2019)	2040 No-Build		2040 Build Alt 1		2040 Build Alt 2	
		Incidents	2019 Value	Incidents	2019 Value	Incidents	2019 Value
C - Possible Injury	$65,100	405	$26,359,875	401	$26,078,253	395	$25,719,653
B - Non-incapacitating	$127,300	58	$7,363,643	57	$7,284,972	56	$7,184,797
A - Incapacitating	$467,400	8	$3,674,886	8	$3,635,624	8	$3,585,631
K - Killed	$9,800,000	4	$38,525,760	4	$38,114,160	4	$37,590,056
Property Damage Only	$4,500	929	$4,182,516	920	$4,137,831	907	$4,080,932
	Totals	1,404	$80,106,680	1,389	$79,250,840	1,370	$78,161,069
				Improvement	$855,841	Improvement	$1,945,611
				Percentage	1.07%	Percentage	2.43%

2040 No-Build

Facility	Total	FI	K	A	B	C	PDO	Totals
I-15 Mainline	660.6	168.3	1.8	3.7	27.2	190.5	437.3	660.6
I-15 CD Roads	272.9	189.4	0.8	1.5	11.2	78.7	180.7	272.9
Service Interchanges	320.1	136.2	0.9	1.8	13.2	92.3	211.9	320.1
Arterial Intersections	68.4	37.5	0.2	0.4	2.8	19.7	45.3	68.4
Arterial Segments	82.0	35.5	0.2	0.5	3.4	23.6	54.3	82.0
Overall Total	1404.0	566.9	3.9	7.9	57.8	404.9	929.4	1404.0

2040 Build Alt. 1

Facility	Total	FI	K	A	B	C	PDO	Totals
I-15 Mainline	636.8	162.9	1.8	3.6	26.2	183.7	421.6	636.8
I-15 CD Roads	238.8	159.1	0.7	1.3	9.8	68.9	158.1	238.8
Service Interchanges	361.2	153.6	1.0	2.0	14.9	104.2	239.1	361.2
Arterial Intersections	68.4	37.5	0.2	0.4	2.8	19.7	45.3	68.4
Arterial Segments	83.8	36.1	0.2	0.5	3.5	24.2	55.5	83.8
Overall Total	1389	549.2	3.9	7.8	57.2	400.6	919.5	1389.0

2040 Build Alt. 1 Improvements

Facility	Total	FI	K	A	B	C	PDO	Totals
I-15 Mainline	636.8	5.4	0.1	0.1	1.0	6.9	15.8	23.8
I-15 CD Roads	238.8	30.3	0.1	0.2	1.4	9.8	22.6	34.1
Service Interchanges	361.2	-17.4	-0.1	-0.2	-1.7	-11.9	-27.2	-41.1
Arterial Intersections	68.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Arterial Segments	83.8	-0.6	0.0	0.0	-0.1	-0.5	-1.2	-1.8
Overall Total	1389	17.7	0.0	0.1	0.6	4.3	9.9	15.0

2040 Build Alt. 2

Facility	Total	FI	K	A	B	C	PDO	Totals
I-15 Mainline	640.9	163.0	1.8	3.6	26.4	184.8	424.3	640.9
I-15 CD Roads	210.1	131.1	0.6	1.2	8.7	60.6	139.1	210.1
Service Interchanges	366.9	157.3	1.0	2.1	15.1	105.8	242.9	366.9
Arterial Intersections	68.4	37.5	0.2	0.4	2.8	19.7	45.3	68.4
Arterial Segments	83.6	36.0	0.2	0.5	3.4	24.1	55.3	83.6
Overall Total	1370	524.9	3.8	7.7	56.4	395.1	906.9	1369.9

2040 Build Alt. 2 Improvements

Facility	Total	FI	K	A	B	C	PDO	Totals
I-15 Mainline	636.8	5.3	0.1	0.1	0.8	5.7	13.0	19.7
I-15 CD Roads	238.8	58.3	0.2	0.4	2.6	18.1	41.6	62.8
Service Interchanges	361.2	-21.1	-0.1	-0.3	-1.9	-13.5	-31.0	-46.8
Arterial Intersections	68.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Arterial Segments	83.8	-0.5	0.0	0.0	-0.1	-0.5	-1.1	-1.6
Overall Total	1389	42.0	0.0	0.2	1.4	9.8	22.6	34.0

From: Perez-Bravo, Dante <Dante.Perez-Bravo@atkinsglobal.com>
Sent: Tuesday, September 22, 2020 4:30 PM
To: Mohan, Garakhalli <GarakhalliMohan@atkinsglobal.com>
Subject: RE: I-15 Sahara to Flamingo: Atkins' Deliverables

Hi Mohan,
Based on the 2.5K crashes I found (there should be 7.5 K), below is the corridor crash severity distribution

K	A	B	C	PDO	Total
0.28%	0.56%	4.12%	28.84%	66.20%	100.00%

Facility	2040 No-Build			2040 Build Alt 1			2040 Build Alt 2		
	FI	PDO	Total	FI	PDO	Total	FI	PDO	Total
I-15 Mainline	168.3	492.4	660.6	162.9	473.9	636.8	163.0	477.9	640.9
				(-3%)	(-4%)	(-4%)	(-3%)	(-3%)	(-3%)
I-15 CD Roads	189.4	83.6	272.9	159.1	79.7	238.8	131.1	79.1	210.1
				(-16%)	(-5%)	(-13%)	(-37%)	(-6%)	(-26%)
Service Interchanges	136.2	183.9	320.1	153.6	207.5	361.2	157.3	209.6	366.9
				(13%)	(13%)	(13%)	(14%)	(12%)	(13%)
Arterial Intersections	37.5	30.9	68.4	37.5	30.9	68.4	37.5	30.9	68.4
				(0%)	(0%)	(0%)	(0%)	(0%)	(0%)
Arterial Segments	35.5	46.5	82.0	36.1	47.7	83.8	36.0	47.6	83.6
				(2%)	(3%)	(2%)	(1%)	(2%)	(2%)
Overall Total	566.8	837.2	1,404.0	549.2	839.8	1,389.0	524.9	845.1	1,370.0
				(-3%)	(0%)	(-1%)	(-8%)	(1%)	(-2%)

Parameter	2017 Existing Conditions		2040 No-Action		2040 Conceptual Alternative 1		2040 Conceptual Alternative 2	
Emissions Data from AIMSUM	AM	PM	AM	PM	AM	PM	AM	PM
Carbon Dioxide, CO_2 (Grams)	132,761,295	162,193,209	185,718,255	211,527,365	170,879,115	196,176,825	165,195,570	190,179,620
Nitrogen Oxide, NO_x (Grams)	325,717	592,099	449,179	732,265	419,320	691,869	409,983	676,734
Particulate Matter, PM_{10} (Grams)	8,486	11,557	14,274	16,486	11,695	13,616	10,814	12,696
Volatile Organic Compounds, VOC (Grams)	130,857	201,049	152,579	204,947	145,895	188,351	145,229	184,964

Carbon Dioxide (CO_2) Emissions Annual Summary				Nitrogen Oxide (NO_x) Emissions Annual Summary				Fine Particulate Matter (PM) Emissions Annual Summary				Volatile Organic Compounds (VOC) Emissions Annual Summary			
2017 Existing Conditions (Short Tons)	2040 No-Action (ShortTons)	2040 Alternative 1 (Short Tons)	2040 Alternative 1 Improvement (Short Tons)	2017 Existing Conditions (ShortTons)	2040 No-Action (Short Tons)	2040 Alternative 1 (Short Tons)	2040 Alternative 1 Improvement (Short Tons)	2017 Existing Conditions (ShortTons)	2040 No-Action (Short Tons)	2040 Alternative 1 (Short Tons)	2040 Alternative 1 Improvement (Short Tons)	2017 Existing Conditions (ShortTons)	2040 No-Action (Short Tons)	2040 Alternative 1 (Short Tons)	2040 Alternative 1 Improvement (Short Tons)
368.806	495.129	457.666	37.463	1.168	1.496	1.408	88	25	38	32	7	419	449	419	30

Alt 1 Emissions Savings

Year	CO_2 Reduction	CO_2 Savings	NO_x Reduction (Short Tons)	NO_x Savings	PM Reduction (Short Tons)	PM Savings	VOC Reduction (Short Tons)	VOC Savings
2019	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2025	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2026	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2027	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2028	32.069	$35.958	64	$8.176	6	$2.295.263	26	$55.039
2029	32.487	$37.192	66	$8.411	6	$2.324.743	26	$55.746
2030	32.911	$38.468	68	$8.649	6	$2.354.602	26	$56.462
2031	33,340	$39,788	70	$8,891	6	$2,384,844	27	$57,187
2032	33.775	$41.154	72	$9.135	6	$2.415.475	27	$57.922
2033	34.215	$42.566	74	$9.382	6	$2.446.499	27	$58.666
2034	34.661	$44.026	76	$9.633	6	$2.477.921	28	$59.419
2035	35.113	$45.537	78	$9.887	6	$2.509.748	28	$60.183
2036	35.571	$47.100	80	$10.144	6	$2.541.983	28	$60.956
2037	36.035	$48.716	82	$10.405	7	$2.574.632	29	$61.739
2038	36.505	$50.387	84	$10.669	7	$2.607.700	29	$62.531
2039	36.981	$52.116	86	$10.937	7	$2.641.193	30	$63.335
2040	37.463	$53.905	88	$11.208	7	$2.675.116	30	$64.148
Totals	**451.125**	**$576.914**	**988**	**$125.528**	**82**	**$32.249.717**	**361**	**$773.334**

Annual Growth	1.28%

NDOT Values

Table E-7 Damage Costs for Pollutant Emissions (2019 USD)

Emission Type	$/short ton*
Carbon Dioxide (CO_2)	[illegible]**
Fine Particulate Matter (PM)	$394,300
Nitrogen Oxides (NO_x)	$8,800
Sulfur Dioxide (SO_x)	$51,000
Volatile Organic Compounds (VOC)	$2,140

1. Source: Benefit-Cost Analysis Guidance for Discretionary Grant Programs, USDOT, January 2020.
2. * A metric ton is equal to 1.1023 short tons.
3. **Cost of CO_2 is assumed to grow by 2.1 percent annually.

NDOT					
Emission Type					
Year	NO_x	SO_x	PM	CO_2	VOC
2019	$8.800	$21.000	$394.300	$0.93	$2.140.00
2020	$8.800	$21.000	$394.300	$0.95	$2.140.00
2021	$8.800	$21.000	$394.300	$0.97	$2.140.00
2022	$8.800	$21.000	$394.300	$0.99	$2.140.00
2023	$8.800	$21.000	$394.300	$1.01	$2.140.00
2024	$8.800	$21.000	$394.300	$1.03	$2.140.00
2025	$8.800	$21.000	$394.300	$1.05	$2.140.00
2026	$8.800	$21.000	$394.300	$1.08	$2.140.00
2027	$8.800	$21.000	$394.300	$1.10	$2.140.00
2028	$8.800	$21.000	$394.300	$1.12	$2.140.00
2029	$8.800	$21.000	$394.300	$1.14	$2.140.00
2030	$8.800	$21.000	$394.300	$1.17	$2.140.00
2031	$8.800	$21.000	$394.300	$1.19	$2.140.00
2032	$8.800	$21.000	$394.300	$1.22	$2.140.00
2033	$8.800	$21.000	$394.300	$1.24	$2.140.00
2034	$8.800	$21.000	$394.300	$1.27	$2.140.00
2035	$8.800	$21.000	$394.300	$1.30	$2.140.00
2036	$8.800	$21.000	$394.300	$1.32	$2.140.00
2037	$8.800	$21.000	$394.300	$1.35	$2.140.00
2038	$8.800	$21.000	$394.300	$1.38	$2.140.00
2039	$8.800	$21.000	$394.300	$1.41	$2.140.00
2040	$8.800	$21.000	$394.300	$1.44	$2.140.00
2041	$8.800	$21.000	$394.300	$1.47	$2.140.00
2042	$8.800	$21.000	$394.300	$1.50	$2.140.00
2043	$8.800	$21.000	$394.300	$1.53	$2.140.00
2044	$8.800	$21.000	$394.300	$1.56	$2.140.00
2045	$8.800	$21.000	$394.300	$1.60	$2.140.00
2046	$8.800	$21.000	$394.300	$1.63	$2.140.00
2047	$8.800	$21.000	$394.300	$1.66	$2.140.00
2048	$8.800	$21.000	$394.300	$1.70	$2.140.00
2049	$8.800	$21.000	$394.300	$1.73	$2.140.00
2050	$8.800	$21.000	$394.300	$1.77	$2.140.00

Daily Estimate of Existing (2017) CO_2 Emissions

	Hour	Existing Peak Hour (2017) (grams)	Proportion of Analysis Hour (Based on Daily Counts and count locations)	Estimated Existing Emissions - Peak Hours	Percent of Peak Hour (based on Daily Count Distributions)	Estimated Existing CO_2 per Hour (grams)
	0:00				44.92%	22.086.589
	1:00				31.08%	15.281.724
	2:00				25.31%	12,442,652
	3:00				27.02%	13.285.197
	4:00				31.51%	15.489.939
	5:00				49.73%	24.450.104
AM analysis peak begins at 6:30	*6:00		13.43%	########	72.53%	35.659.744
	7:00	132,761,295	34.42%	########	92.96%	45.701.265
	8:00		35.12%	########	94.83%	46.623.837
AM analysis peak ends at 9:30	*9:00		17.03%	########	91.96%	45,212,642
	10:00				93.59%	46.013.851
	11:00				100.00%	49.164.128
	12:00				86.68%	48.710.491
	13:00				89.90%	50.518.572
	14:00				95.80%	53.831.693
PM analysis peak begins at 15:30	*15:00		16.85%	########	97.26%	54.653.433
	16:00	162,193,209	34.65%	########	100.00%	56.192.732
	17:00		33.92%	########	97.92%	55.022.386
PM analysis peak ends at 18:30	*18:00		14.58%	########	84.18%	47.302.748
	19:00				75.64%	42.504.009
	20:00				68.15%	38.295.064
	21:00				63.85%	35.877.981
	22:00				59.28%	33.308.457
	23:00				52.84%	29.690.407
					Daily Grams	917.319.645
					Daily Kilograms	917.320
					Daily Metric Tons	917
					Annual Metric Tons	334.822
					Annual Short Tons	368.806

Daily Estimate of 2040 No-Action CO2 Emissions

Hour	2040 No-Action Peak Hour (grams)	Proportion of Analysis Hour (Based on Daily Counts and count locations)	Estimated 2040 No-Action Emissions - Peak Hours	Percent of Peak Hour (based on Daily Count Distributions)	Estimated 2040 No-Action CO_2 per Hour (grams)
0:00				44.92%	30.896.676
1:00				31.08%	21.377.429
2:00				25.31%	17,405,883
3:00				27.02%	18.584.510
4:00				31.51%	21.668.698
5:00				49.73%	34.202.971
*6:00		13.43%	########	72.53%	49.884.007
7:00	185,718,255	34.42%	########	92.96%	63.930.976
8:00		35.12%	########	94.83%	65.221.552
*9:00		17.03%	########	91.96%	63,247,447
10:00				93.59%	64.368.249
11:00				100.00%	68.775.136
12:00				86.68%	63.526.715
13:00				89.90%	65.884.759
14:00				95.80%	70.205.628
*15:00		16.85%	########	97.26%	71.277.317
16:00	211,527,365	34.65%	########	100.00%	73.284.823
17:00		33.92%	########	97.92%	71.758.494
*18:00		14.58%	########	84.18%	61.690.780
19:00				75.64%	55.432.413
20:00				68.15%	49.943.238
21:00				63.85%	46.790.952
22:00				59.28%	43.439.859
23:00				52.84%	38.721.310
				Daily Grams	###########
				Daily Kilograms	1.231.520
				Daily Metric Tons	1.232
				Annual Metric Tons	449.505
				Annual Short Tons	495.129

Daily Estimate of 2040 Alternative 1 CO2 Emissions

Hour	2040 Alternative 1 Peak Hour (grams)	Proportion of Analysis Hour (Based on Daily Counts and count locations)	Estimated 2040 Alternative 1 Emissions - Peak Hours	Percent of Peak Hour (based on Daily Count Distributions)	Estimated 2040 Alternative 1 CO_2 per Hour (grams)
0:00				44.92%	28.427.990
1:00				31.08%	19.669.343
2:00				25.31%	16,015,130
3:00				27.02%	17.099.583
4:00				31.51%	19.937.340
5:00				49.73%	31.470.107
*6:00		13.43%	########	72.53%	45.898.208
7:00	170,879,115	34.42%	########	92.96%	58.822.804
8:00		35.12%	########	94.83%	60.010.262
*9:00		17.03%	########	91.96%	58,193,891
10:00				93.59%	59.225.138
11:00				100.00%	63.279.910
12:00				86.68%	58.916.581
13:00				89.90%	61.103.502
14:00				95.80%	65.110.806
*15:00		16.85%	########	97.26%	66.104.722
16:00	196,176,825	34.65%	########	100.00%	67.966.543
17:00		33.92%	########	97.92%	66.550.980
*18:00		14.58%	########	84.18%	57.213.880
19:00				75.64%	51.409.683
20:00				68.15%	46.318.857
21:00				63.85%	43.395.333
22:00				59.28%	40.287.429
23:00				52.84%	35.911.304
				Daily Grams	###########
				Daily Kilograms	1.138.339
				Daily Metric Tons	1.138
				Annual Metric Tons	415.494
				Annual Short Tons	457.666

Daily Estimate of 2040 Alternative 2 CO2 Emissions

Hour	2040 Alternative 2 Peak Hour (grams)	Proportion of Analysis Hour (Based on Daily Counts and count locations)	Estimated 2040 Alternative 2 Emissions - Peak Hours	Percent of Peak Hour (based on Daily Count Distributions)	Estimated 2040 Alternative 2 CO_2 per Hour (grams)
0:00				44.92%	27.482.457
1:00				31.08%	19.015.129
2:00				25.31%	15,482,456
3:00				27.02%	16.530.840
4:00				31.51%	19.274.212
5:00				49.73%	30.423.392
*6:00		13.43%	########	72.53%	44.371.605
7:00	165,195,570	34.42%	########	92.96%	56.866.322
8:00		35.12%	########	94.83%	58.014.283
*9:00		17.03%	########	91.96%	56,258,326
10:00				93.59%	57.255.274
11:00				100.00%	61.175.181
12:00				86.68%	57.115.478
13:00				89.90%	59.235.543
14:00				95.80%	63.120.342
*15:00		16.85%	########	97.26%	64.083.874
16:00	190,179,620	34.65%	########	100.00%	65.888.779
17:00		33.92%	########	97.92%	64.516.490
*18:00		14.58%	########	84.18%	55.464.829
19:00				75.64%	49.838.068
20:00				68.15%	44.902.871
21:00				63.85%	42.068.720
22:00				59.28%	39.055.826
23:00				52.84%	34.813.481
				Daily Grams	###########
				Daily Kilograms	1.102.254
				Daily Metric Tons	1.102
				Annual Metric Tons	402.323
				Annual Short Tons	443.158

Daily Estimate of Existing (2017) NO_x Emissions

	Hour	Existing Peak Hour (2017) (grams)	Proportion of Analysis Hour (Based on Daily Counts and count locations)	Estimated Existing Emissions - Peak Hours	Percent of Peak Hour (based on Daily Count Distributions)	Estimated Existing NO_x per Hour (grams)
	0:00				44.92%	54.187
	1:00				31.08%	37.492
	2:00				25.31%	30.527
	3:00				27.02%	32.594
	4:00				31.51%	38.003
	5:00				49.73%	59.986
AM analysis peak begins at 6:30	*6:00		13.43%	43.744	72.53%	87.488
	7:00	325,717	34.42%	112.124	92.96%	112.124
	8:00		35.12%	114.387	94.83%	114.387
AM analysis peak ends at 9:30	*9:00		17.03%	55.462	91.96%	110.925
	10:00				93.59%	112.891
	11:00				100.00%	120.619
	12:00				86.68%	177.821
	13:00				89.90%	184.422
	14:00				95.80%	196.517
PM analysis peak begins at 15:30	*15:00		16.85%	99.758	97.26%	199.517
	16:00	592,099	34.65%	205.136	100.00%	205.136
	17:00		33.92%	200.864	97.92%	200.864
PM analysis peak ends at 18:30	*18:00		14.58%	86.341	84.18%	172.682
	19:00				75.64%	155.164
	20:00				68.15%	139.799
	21:00				63.85%	130.975
	22:00				59.28%	121.595
	23:00				52.84%	108.387
					Daily Grams	2.904.102
					Daily Kilograms	2.904
					Daily Metric Tons	3
					Annual Metric Tons	1.060
					Annual Short Tons	1.168

Daily Estimate of 2040 No-Action NO_x Emissions

Hour	2040 No-Action Peak Hour (grams)	Proportion of Analysis Hour (Based on Daily Counts and count locations)	Estimated 2040 No-Action Emissions - Peak Hours	Percent of Peak Hour (based on Daily Count Distributions)	Estimated 2040 No-Action NO_x per Hour (grams)
0:00				44.92%	74.727
1:00				31.08%	51.704
2:00				25.31%	42.098
3:00				27.02%	44.949
4:00				31.51%	52.408
5:00				49.73%	82.723
*6:00		13.43%	60.325	72.53%	120.650
7:00	449,179	34.42%	154.624	92.96%	154.624
8:00		35.12%	157.745	94.83%	157.745
*9:00		17.03%	76.485	91.96%	152.971
10:00				93.59%	155.681
11:00				100.00%	166.340
12:00				86.68%	219.917
13:00				89.90%	228.080
14:00				95.80%	243.038
*15:00		16.85%	123.374	97.26%	246.748
16:00	732,265	34.65%	253.697	100.00%	253.697
17:00		33.92%	248.413	97.92%	248.413
*18:00		14.58%	106.781	84.18%	213.561
19:00				75.64%	191.896
20:00				68.15%	172.893
21:00				63.85%	161.981
22:00				59.28%	150.380
23:00				52.84%	134.045
				Daily Grams	3.721.268
				Daily Kilograms	3.721
				Daily Metric Tons	4
				Annual Metric Tons	1.358
				Annual Short Tons	1.496

Daily Estimate of 2040 Alternative 1 NO_x Emissions

Hour	2040 Alternative 1 Peak Hour (grams)	Proportion of Analysis Hour (Based on Daily Counts and count locations)	Estimated 2040 Alternative 1 Emissions - Peak	Percent of Peak Hour (based on Daily Count Distributions)	Estimated 2040 Alternative 1 NO_x per Hour (grams)
0:00				44.92%	69.759
1:00				31.08%	48.267
2:00				25.31%	39.300
3:00				27.02%	41.961
4:00				31.51%	48.924
5:00				49.73%	77.224
*6:00		13.43%	56.315	72.53%	112.630
7:00	419,320	34.42%	144.345	92.96%	144.345
8:00		35.12%	147.259	94.83%	147.259
*9:00		17.03%	71.401	91.96%	142.802
10:00				93.59%	145.332
11:00				100.00%	155.282
12:00				86.68%	207.785
13:00				89.90%	215.498
14:00				95.80%	229.630
*15:00		16.85%	116.568	97.26%	233.136
16:00	691,869	34.65%	239.702	100.00%	239.702
17:00		33.92%	234.709	97.92%	234.709
*18:00		14.58%	100.890	84.18%	201.780
19:00				75.64%	181.310
20:00				68.15%	163.356
21:00				63.85%	153.045
22:00				59.28%	142.084
23:00				52.84%	126.651
				Daily Grams	3.501.770
				Daily Kilograms	3.502
				Daily Metric Tons	4
				Annual Metric Tons	1.278
				Annual Short Tons	1.408

Daily Estimate of 2040 Alternative 2 NO_x Emissions

Hour	2040 Alternative 2 Peak Hour (grams)	Proportion of Analysis Hour (Based on Daily Counts and count locations)	Estimated 2040 Alternative 2 Emissions - Peak	Percent of Peak Hour (based on Daily Count Distributions)	Estimated 2040 Alternative 2 NO_x per Hour (grams)
0:00				44.92%	68.206
1:00				31.08%	47.192
2:00				25.31%	38.424
3:00				27.02%	41.026
4:00				31.51%	47.835
5:00				49.73%	75.505
*6:00	409,983	13.43%	55.061	72.53%	110.122
7:00		34.42%	141.131	92.96%	141.131
8:00		35.12%	143.980	94.83%	143.980
*9:00		17.03%	69.811	91.96%	139.622
10:00				93.59%	142.096
11:00				100.00%	151.825
12:00				86.68%	203.239
13:00				89.90%	210.783
14:00				95.80%	224.607
*15:00	676,734	16.85%	114.018	97.26%	228.036
16:00		34.65%	234.458	100.00%	234.458
17:00		33.92%	229.575	97.92%	229.575
*18:00		14.58%	98.683	84.18%	197.366
19:00				75.64%	177.343
20:00				68.15%	159.782
21:00				63.85%	149.697
22:00				59.28%	138.976
23:00				52.84%	123.880
				Daily Grams	3.424.708
				Daily Kilograms	3.425
				Daily Metric Tons	3
				Annual Metric Tons	1.250
				Annual Short Tons	1.377

Daily Estimate of Existing (2017) PM Emissions

	Hour	Existing Peak Hour (2017) (grams)	Proportion of Analysis Hour (Based on Daily Counts and count locations)	Estimated Existing Emissions - Peak Hours	Percent of Peak Hour (based on Daily Count Distributions)	Estimated Existing NO_x per Hour (grams)
	0:00				44.92%	1.412
	1:00				31.08%	977
	2:00				25.31%	795
	3:00				27.02%	849
	4:00				31.51%	990
	5:00				49.73%	1.563
AM analysis peak begins at 6:30	*6:00		13.43%	1.140	72.53%	2.279
	7:00	8,486	34.42%	2.921	92.96%	2.921
	8:00		35.12%	2.980	94.83%	2.980
AM analysis peak ends at 9:30	*9:00		17.03%	1.445	91.96%	2.890
	10:00				93.59%	2.941
	11:00				100.00%	3.143
	12:00				86.68%	3.471
	13:00				89.90%	3.600
	14:00				95.80%	3.836
PM analysis peak begins at 15:30	*15:00		16.85%	1.947	97.26%	3.894
	16:00	11,557	34.65%	4.004	100.00%	4.004
	17:00		33.92%	3.921	97.92%	3.921
PM analysis peak ends at 18:30	*18:00		14.58%	1.685	84.18%	3.371
	19:00				75.64%	3.029
	20:00				68.15%	2.729
	21:00				63.85%	2.556
	22:00				59.28%	2.373
	23:00				52.84%	2.116
					Daily Grams	62.639
					Daily Kilograms	63
					Daily Metric Tons	0
					Annual Metric Tons	23
					Annual Short Tons	25

Daily Estimate of 2040 No-Action PM Emissions

Hour	2040 No-Action Peak Hour (grams)	Proportion of Analysis Hour (Based on Daily Counts and count locations)	Estimated 2040 No-Action Emissions - Peak Hours	Percent of Peak Hour (based on Daily Count Distributions)	Estimated 2040 No-Action NO_x per Hour (grams)
0:00				44.92%	2.375
1:00				31.08%	1.643
2:00				25.31%	1.338
3:00				27.02%	1.428
4:00				31.51%	1.665
5:00				49.73%	2.629
*6:00		13.43%	1.917	72.53%	3.834
7:00	14,274	34.42%	4.914	92.96%	4.914
8:00		35.12%	5.013	94.83%	5.013
*9:00		17.03%	2.431	91.96%	4.861
10:00				93.59%	4.947
11:00				100.00%	5.286
12:00				86.68%	4.951
13:00				89.90%	5.135
14:00				95.80%	5.472
*15:00		16.85%	2.778	97.26%	5.555
16:00	16,486	34.65%	5.712	100.00%	5.712
17:00		33.92%	5.593	97.92%	5.593
*18:00		14.58%	2.404	84.18%	4.808
19:00				75.64%	4.320
20:00				68.15%	3.892
21:00				63.85%	3.647
22:00				59.28%	3.386
23:00				52.84%	3.018
				Daily Grams	95.421
				Daily Kilograms	95
				Daily Metric Tons	0
				Annual Metric Tons	35
				Annual Short Tons	38

Daily Estimate of 2040 Alternative 1 PM Emissions

Hour	2040 Alternative 1 Peak Hour (grams)	Proportion of Analysis Hour (Based on Daily Counts and count locations)	Estimated 2040 Alternative 1 Emissions - Peak	Percent of Peak Hour (based on Daily Count Distributions)	Estimated 2040 Alternative 1 NO_x per Hour (grams)
0:00				44.92%	1.946
1:00				31.08%	1.346
2:00				25.31%	1.096
3:00				27.02%	1.170
4:00				31.51%	1.365
5:00				49.73%	2.154
*6:00		13.43%	1.571	72.53%	3.141
7:00	11,695	34.42%	4.026	92.96%	4.026
8:00		35.12%	4.107	94.83%	4.107
*9:00		17.03%	1.991	91.96%	3.983
10:00				93.59%	4.053
11:00				100.00%	4.331
12:00				86.68%	4.089
13:00				89.90%	4.241
14:00				95.80%	4.519
*15:00		16.85%	2.294	97.26%	4.588
16:00	13,616	34.65%	4.717	100.00%	4.717
17:00		33.92%	4.619	97.92%	4.619
*18:00		14.58%	1.986	84.18%	3.971
19:00				75.64%	3.568
20:00				68.15%	3.215
21:00				63.85%	3.012
22:00				59.28%	2.796
23:00				52.84%	2.492
				Daily Grams	78.546
				Daily Kilograms	79
				Daily Metric Tons	0
				Annual Metric Tons	29
				Annual Short Tons	32

Daily Estimate of 2040 Alternative 2 PM Emissions

Hour	2040 Alternative 2 Peak Hour (grams)	Proportion of Analysis Hour (Based on Daily Counts and count locations)	Estimated 2040 Alternative 2 Emissions - Peak	Percent of Peak Hour (based on Daily Count Distributions)	Estimated 2040 Alternative 2 NO_x per Hour (grams)
0:00				44.92%	1.799
1:00				31.08%	1.245
2:00				25.31%	1.014
3:00				27.02%	1.082
4:00				31.51%	1.262
5:00				49.73%	1.992
*6:00	10,814	13.43%	1.452	72.53%	2.905
7:00		34.42%	3.723	92.96%	3.723
8:00		35.12%	3.798	94.83%	3.798
*9:00		17.03%	1.841	91.96%	3.683
10:00				93.59%	3.748
11:00				100.00%	4.005
12:00				86.68%	3.813
13:00				89.90%	3.954
14:00				95.80%	4.214
*15:00	12,696	16.85%	2.139	97.26%	4.278
16:00		34.65%	4.399	100.00%	4.399
17:00		33.92%	4.307	97.92%	4.307
*18:00		14.58%	1.851	84.18%	3.703
19:00				75.64%	3.327
20:00				68.15%	2.998
21:00				63.85%	2.808
22:00				59.28%	2.607
23:00				52.84%	2.324
				Daily Grams	72.985
				Daily Kilograms	73
				Daily Metric Tons	0
				Annual Metric Tons	27
				Annual Short Tons	29

Daily Estimate of Existing (2017) VOC Emissions

	Hour	Existing Peak Hour (2017) (grams)	Proportion of Analysis Hour (Based on Daily Counts and count locations)	Estimated Existing Emissions - Peak Hours	Percent of Peak Hour (based on Daily Count Distributions)	Estimated Existing VOC per Hour (grams)
	0:00				44.92%	21.770
	1:00				31.08%	15.063
	2:00				25.31%	12.264
	3:00				27.02%	13.095
	4:00				31.51%	15.268
	5:00				49.73%	24.099
AM analysis peak begins at 6:30	*6:00		13.43%	17.574	72.53%	35.148
	7:00	130,857	34.42%	45.046	92.96%	45.046
	8:00		35.12%	45.955	94.83%	45.955
AM analysis peak ends at 9:30	*9:00		17.03%	22.282	91.96%	44.564
	10:00				93.59%	45.354
	11:00				100.00%	48.459
	12:00				86.68%	60.380
	13:00				89.90%	62.621
	14:00				95.80%	66.728
PM analysis peak begins at 15:30	*15:00		16.85%	33.873	97.26%	67.746
	16:00	201,049	34.65%	69.655	100.00%	69.655
	17:00		33.92%	68.204	97.92%	68.204
PM analysis peak ends at 18:30	*18:00		14.58%	29.317	84.18%	58.635
	19:00				75.64%	52.686
	20:00				68.15%	47.469
	21:00				63.85%	44.473
	22:00				59.28%	41.288
	23:00				52.84%	36.803
					Daily Grams	1.042.773
					Daily Kilograms	1.043
					Daily Metric Tons	1
					Annual Metric Tons	381
					Annual Short Tons	419

Daily Estimate of 2040 No-Action VOC Emissions

Hour	2040 No-Action Peak Hour (grams)	Proportion of Analysis Hour (Based on Daily Counts and count locations)	Estimated 2040 No-Action Emissions - Peak Hours	Percent of Peak Hour (based on Daily Count Distributions)	Estimated 2040 No-Action VOC per Hour (grams)
0:00				44.92%	25.384
1:00				31.08%	17.563
2:00				25.31%	14.300
3:00				27.02%	15.268
4:00				31.51%	17.802
5:00				49.73%	28.100
*6:00	152,579	13.43%	20.491	72.53%	40.983
7:00		34.42%	52.523	92.96%	52.523
8:00		35.12%	53.584	94.83%	53.584
*9:00		17.03%	25.981	91.96%	51.962
10:00				93.59%	52.882
11:00				100.00%	56.503
12:00				86.68%	61.550
13:00				89.90%	63.835
14:00				95.80%	68.022
*15:00	204,947	16.85%	34.530	97.26%	69.060
16:00		34.65%	71.005	100.00%	71.005
17:00		33.92%	69.526	97.92%	69.526
*18:00		14.58%	29.886	84.18%	59.772
19:00				75.64%	53.708
20:00				68.15%	48.390
21:00				63.85%	45.335
22:00				59.28%	42.088
23:00				52.84%	37.517
				Daily Grams	1.116.662
				Daily Kilograms	1.117
				Daily Metric Tons	1
				Annual Metric Tons	408
				Annual Short Tons	449

Daily Estimate of 2040 Alternative 1 VOC Emissions

Hour	2040 Alternative 1 Peak Hour (grams)	Proportion of Analysis Hour (Based on Daily Counts and count locations)	Estimated 2040 Alternative 1 Emissions - Peak	Percent of Peak Hour (based on Daily Count Distributions)	Estimated 2040 Alternative 1 VOC per Hour
0:00				44.92%	24.272
1:00				31.08%	16.794
2:00				25.31%	13.674
3:00				27.02%	14.599
4:00				31.51%	17.022
5:00				49.73%	26.869
*6:00		13.43%	19.594	72.53%	39.187
7:00	145,895	34.42%	50.222	92.96%	50.222
8:00		35.12%	51.236	94.83%	51.236
*9:00		17.03%	24.843	91.96%	49.685
10:00				93.59%	50.566
11:00				100.00%	54.028
12:00				86.68%	56.566
13:00				89.90%	58.666
14:00				95.80%	62.513
*15:00		16.85%	31.734	97.26%	63.468
16:00	188,351	34.65%	65.255	100.00%	65.255
17:00		33.92%	63.896	97.92%	63.896
*18:00		14.58%	27.466	84.18%	54.932
19:00				75.64%	49.359
20:00				68.15%	44.471
21:00				63.85%	41.664
22:00				59.28%	38.680
23:00				52.84%	34.479
				Daily Grams	1.042.104
				Daily Kilograms	1.042
				Daily Metric Tons	1
				Annual Metric Tons	380
				Annual Short Tons	419

Daily Estimate of 2040 Alternative 2 VOC Emissions

Hour	2040 Alternative 2 Peak Hour (grams)	Proportion of Analysis Hour (Based on Daily Counts and count locations)	Estimated 2040 Alternative 2 Emissions - Peak	Percent of Peak Hour (based on Daily Count Distributions)	Estimated 2040 Alternative 2 VOC per Hour
0:00				44.92%	24.161
1:00				31.08%	16.717
2:00				25.31%	13.611
3:00				27.02%	14.533
4:00				31.51%	16.945
5:00				49.73%	26.746
*6:00	145,229	13.43%	19.504	72.53%	39.009
7:00		34.42%	49.993	92.96%	49.993
8:00		35.12%	51.002	94.83%	51.002
*9:00		17.03%	24.729	91.96%	49.459
10:00				93.59%	50.335
11:00				100.00%	53.781
12:00				86.68%	55.549
13:00				89.90%	57.611
14:00				95.80%	61.389
*15:00	184,964	16.85%	31.163	97.26%	62.326
16:00		34.65%	64.082	100.00%	64.082
17:00		33.92%	62.747	97.92%	62.747
*18:00		14.58%	26.972	84.18%	53.944
19:00				75.64%	48.471
20:00				68.15%	43.671
21:00				63.85%	40.915
22:00				59.28%	37.985
23:00				52.84%	33.859
				Daily Grams	1.028.841
				Daily Kilograms	1.029
				Daily Metric Tons	1
				Annual Metric Tons	376
				Annual Short Tons	414

Gross Domestic Product Deflator										
Year	2018				2019				2020	
Quarter	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2
Gross Domestic Product	109.237	110.176	110.614	111.14	111.424	112.141	112.531	112.95	113.415	112.803

Index Gross Domestic Product Year
2012

Index Gross Domestic Product
100

Deflation Rate (2020 to 2019)
98.505%

Current Quarter Year
2020

2012-2020 GDP Deflator Annual Increase
1.517%

Economic Update Factor (Using GDP Deflator)
1.0152

Table 1.1.9. Implicit Price Deflators for Gross Domestic Product

[Index numbers, 2012=100] Seasonally adjusted

Bureau of Economic Analysis

Last Revised on: July 30, 2020 - Next Release Date August 27, 2020

Line		2018				2019				2020	
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2
1	**Gross domestic product**	109.237	110.176	110.614	111.14	111.424	112.141	112.531	112.95	113.415	112.803
2	**Personal consumption expenditures**	107.481	108.077	108.498	108.885	109.039	109.722	110.104	110.525	110.878	110.352
3	Goods	95.232	95.42	95.318	95.009	94.571	94.984	94.765	94.816	94.598	93.127
4	Durable goods	87.958	87.694	87.375	87.102	86.971	86.756	86.372	85.784	85.415	84.448
5	Nondurable goods	99.048	99.494	99.519	99.191	98.577	99.356	99.236	99.669	99.54	97.784
6	Services	113.828	114.645	115.35	116.12	116.6	117.431	118.15	118.777	119.452	119.505
7	**Gross private domestic investment**	106.359	107.43	107.505	107.991	108.373	109.03	109.115	109.355	110.255	109.889
8	Fixed investment	107.183	107.843	108.33	108.622	109.277	109.766	110.048	110.098	110.446	110.67
9	Nonresidential	102.438	102.75	103.069	103.254	103.884	104.341	104.457	104.343	104.59	104.784
10	Structures	113.406	114.071	114.644	116.194	117.328	118.609	119.232	119.662	120.118	119.835
11	Equipment	97.485	97.497	97.882	97.866	98.079	97.991	97.757	97.721	97.887	97.806
12	Intellectual property products	102.055	102.55	102.615	102.26	103.147	103.846	104.126	103.603	103.836	104.597
13	Residential	128.045	130.224	131.455	132.228	132.984	133.609	134.65	135.452	136.24	136.597
14	Change in private inventories	---	---	---	---	---	---	---	---	---	---
15	**Net exports of goods and services**	---	---	---	---	---	---	---	---	---	---
16	Exports	98.199	99.417	99.721	99.398	98.557	99.337	98.764	98.351	97.74	93.093
17	Goods	92.29	93.646	93.86	93.203	92.002	92.547	91.565	91.177	90.113	84.694
18	Services	111.464	112.354	112.867	113.319	113.326	114.646	115.015	114.544	115.014	112.198
19	Imports	91.461	91.524	91.859	91.419	90.519	90.713	89.97	89.65	89.337	86.381
20	Goods	88.207	88.158	88.459	87.91	86.822	86.981	86.082	85.67	85.336	82.142
21	Services	108.519	109.202	109.73	109.892	110.029	110.402	110.499	110.666	110.469	109.051
22	**Government consumption expenditures and gross investment**	109.897	110.929	111.817	112.588	112.927	113.253	113.544	114.019	114.524	113.931
23	Federal	107.954	108.754	109.405	110.212	111.478	110.762	110.924	111.285	111.209	111.016
24	National defense	106.409	107.21	107.862	108.383	108.814	109.112	109.341	109.738	109.697	109.072
25	Nondefense	110.383	111.182	111.832	113.079	115.655	113.349	113.409	113.712	113.582	114.038
26	State and local	111.188	112.363	113.397	114.146	113.911	114.887	115.259	115.808	116.685	115.829
	Addendum:										
27	Gross national product	109.206	110.141	110.58	111.104	111.388	112.102	112.492	112.911	113.375	---

Appendix C: Build Alt. 1 Shift BCA Workbook

I-15 Flamingo to Sahara Feasibility Study

General Economic Parameters

Year of Current Dollars for Model	2019	
Economic Update Factor (Using GDP Deflator)	1.0152	1
Real Discount Rate	7.0%	2

Value of Travel Time Savings (2019)

	Value	Units	
Truck Drivers			
Hourly Value	$ 33.48	$/hr	3
Value of Time			
Personal	$ 11.16	$/hr/per	4
Business	$ 33.48	$/hr/veh	4

Vehicle Occupancies

Passenger Vehicles	1.51	per vehicle	5
Trucks	1.00	per vehicle	5

Vehicle Operating Costs (2019)

Operating Costs			
Automobile (regular unleaded)	$ 0.31	$/mile	6
Truck (diesel)	$ 0.59	$/mile	6

Crash Costs

Cost of a Fatality (2019)	$ 6,200,000	$/event	7
Cost of an Injury (2019)			
Level A (Incapacitating)	$ 330,600	$/event	7
Level B (Non-incapacitating)	$ 120,700	$/event	7
Level C (Possibly Injured)	$ 67,900	$/event	7
Cost of Property Damage (2019)	$ 11,000	$/event	7
Cost of Highway Accident (2019)			
Fatal Crash	$ 9,800,000	$/accident	8
Injury A Crash	$ 467,400	$/accident	8
Injury B Crash	$ 127,300	$/accident	8
Injury C Crash	$ 65,100	$/accident	8
PDO Crash	$ 4,500	$/accident	8

1 2012-2020 GDP Deflator Annual Increase
2 Nevada DOT Guidance for BCAs
3 Nevada DOT Guidance for BCAs
4 Nevada DOT Guidance for BCAs
5 Nevada DOT Guidance for BCAs
6 Nevada DOT Guidance for BCAs
7 Nevada DOT Guidance for BCAs
8 Nevada DOT Guidance for BCAs

I-15 Flamingo to Sahara Feasibility Study Alt. 1 Shift Benefit /Cost Summary (Discounted at 7% Rate)	
Benefits and Costs	**Present Value (2019$)**
Benefits	
Travel time savings	$170,902,694
Operation costs savings	($16,531,505)
Crash cost savings	$3,918,139
Emissions cost savings	$12,421,813
Residual Value	$50,705,727
Total Benefits	**$221,416,868**
Costs	
Construction Costs	$209,460,832
Road and Bridge O&M	$1,118,773
Total Costs	**$210,579,604**
Net Benefits	**$10,837,264**
Benefit/Cost Ratio	**1.05**

I-15 Flamingo to Sahara Feasibility Study Alt. 1 Shift Benefit /Cost Sensitivity Summary (Discounted at 3% Rate)	
Benefits and Costs	**Present Value (2019$)**
Benefits	
Travel time savings	$296,081,503
Operation costs savings	($28,656,243)
Crash cost savings	$6,793,767
Emissions cost savings	$21,583,900
Residual Value	$112,858,592
Total Benefits	**$408,661,518**
Costs	
Construction Costs	$273,144,672
Road and Bridge O&M	$1,930,926
Total Costs	**$275,075,598**
Net Benefits	**$133,585,920**
Benefit/Cost Ratio	**1.49**

Costs and Benefits I-15 Flamingo to Sahara Feasibility Study

Benefits and Costs by Year, 2019$

Year	Travel Time Savings	Operation Costs Savings	Crash Reduction Savings	Emissions CO_2 Savings	Emissions NO_x Savings	Emissions PM Savings	Emissions VOC Savings	Design and Construction Costs	O&M Costs	Residual Value
2019	N/A	N/A	N/A	$0	$0	N/A	N/A	N/A	N/A	N/A
2025	$0	$0	$0	$0	$0	$0	$0	$111,945,226	$0	$0
2026	$0	$0	$0	$0	$0	$0	$0	$111,945,226	$0	$0
2027	$0	$0	$0	$0	$0	$0	$0	$111,945,226	$0	$0
2028	$33,864,130	($3,257,600)	$769,917	$32,069	$8,176	$2,295,263	$55,039	$0	$230,000	$0
2029	$34,108,916	($3,284,665)	$776,736	$32,487	$8,411	$2,324,743	$55,746	$0	$230,000	$0
2030	$34,355,472	($3,311,955)	$783,614	$32,911	$8,649	$2,354,602	$56,462	$0	$230,000	$0
2031	$34,603,811	($3,339,472)	$790,554	$33,340	$8,891	$2,384,844	$57,187	$0	$230,000	$0
2032	$34,853,944	($3,367,218)	$797,554	$33,775	$9,135	$2,415,475	$57,922	$0	$230,000	$0
2033	$35,105,886	($3,395,193)	$804,617	$34,215	$9,382	$2,446,499	$58,666	$0	$230,000	$0
2034	$35,359,648	($3,423,402)	$811,743	$34,661	$9,633	$2,477,921	$59,419	$0	$230,000	$0
2035	$35,615,245	($3,451,845)	$818,931	$35,113	$9,887	$2,509,748	$60,183	$0	$230,000	$0
2036	$35,872,689	($3,480,524)	$826,184	$35,571	$10,144	$2,541,983	$60,956	$0	$230,000	$0
2037	$36,131,995	($3,509,441)	$833,500	$36,035	$10,405	$2,574,632	$61,739	$0	$230,000	$0
2038	$36,393,174	($3,538,598)	$840,881	$36,505	$10,669	$2,607,700	$62,531	$0	$230,000	$0
2039	$36,656,242	($3,567,998)	$848,328	$36,981	$10,937	$2,641,193	$63,335	$0	$230,000	$0
2040	$36,921,211	($3,597,642)	$855,841	$37,463	$11,208	$2,675,116	$64,148	$0	$230,000	$209,950,226
Totals	**$459,842,364**	**($44,525,553)**	**$10,558,401**	**$451,125**	**$125,528**	**$32,249,717**	**$773,334**	**$335,835,677**	**$2,990,000**	**$209,950,226**
									Total Benefits	$669,425,141

Present Value of Benefits and Costs by Year

Discount Rate = 7.00%

Year	Travel Time Savings	Operation Costs Savings	Crash Reduction Savings	Emissions CO_2 Savings	Emissions NO_x Savings	Emissions PM Savings	Emissions VOC Savings	Design and Construction Costs	O&M Costs	Residual Value
2019	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2025	$0	$0	$0	$0	$0	$0	$0	$74,593,831	$0	$0
2026	$0	$0	$0	$0	$0	$0	$0	$69,713,860	$0	$0
2027	$0	$0	$0	$0	$0	$0	$0	$65,153,141	$0	$0
2028	$18,419,843	($1,771,919)	$418,784	$17,443	$4,447	$1,248,471	$29,938	$0	$125,105	$0
2029	$17,339,243	($1,669,757)	$394,853	$16,515	$4,276	$1,181,781	$28,339	$0	$116,920	$0
2030	$16,322,037	($1,573,486)	$372,289	$15,636	$4,109	$1,118,654	$26,825	$0	$109,271	$0
2031	$15,364,506	($1,482,766)	$351,015	$14,803	$3,948	$1,058,899	$25,392	$0	$102,123	$0
2032	$14,463,148	($1,397,276)	$330,957	$14,015	$3,791	$1,002,336	$24,036	$0	$95,442	$0
2033	$13,614,668	($1,316,715)	$312,045	$13,269	$3,639	$948,794	$22,752	$0	$89,198	$0
2034	$12,815,964	($1,240,788)	$294,213	$12,563	$3,492	$898,113	$21,536	$0	$83,363	$0
2035	$12,064,116	($1,169,259)	$277,400	$11,894	$3,349	$850,138	$20,386	$0	$77,909	$0
2036	$11,356,375	($1,101,845)	$261,549	$11,261	$3,211	$804,727	$19,297	$0	$72,812	$0
2037	$10,690,153	($1,038,317)	$246,603	$10,661	$3,078	$761,741	$18,266	$0	$68,049	$0
2038	$10,063,016	($978,452)	$232,511	$10,094	$2,950	$721,051	$17,290	$0	$63,597	$0
2039	$9,472,670	($922,039)	$219,224	$9,557	$2,826	$682,534	$16,367	$0	$59,436	$0
2040	$8,916,956	($868,878)	$206,697	$9,048	$2,707	$646,076	$15,493	$0	$55,548	$50,705,727
Totals	**$170,902,694**	**($16,531,505)**	**$3,918,139**	**$166,759**	**$45,823**	**$11,923,315**	**$285,916**	**$209,460,832**	**$1,118,773**	**$50,705,727**
								Total Discounted Benefits		$221,416,868

Costs and Benefits I-15 Flamingo to Sahara Feasibility Study Sensitivity Analysis @ 3.0% Discount Rate

Present Value of Benefits and Costs by Year

Discount Rate = 3.00%

Year	Travel Time Savings	Operation Costs Savings	Crash Reduction Savings	Emissions CO_2 Savings	Emissions NO_x Savings	Emissions PM Savings	Emissions VOC Savings	Design and Construction Costs	O&M Costs	Residual Value
2019	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2025	$0	$0	$0	$0	$0	$0	$0	$93,752,364	$0	$0
2026	$0	$0	$0	$0	$0	$0	$0	$91,021,713	$0	$0
2027	$0	$0	$0	$0	$0	$0	$0	$88,370,595	$0	$0
2028	$25,954,036	($2,496,679)	$590,078	$24,578	$6,266	$1,759,128	$42,183	$0	$176,276	$0
2029	$25,380,237	($2,444,099)	$577,964	$24,173	$6,259	$1,729,827	$41,480	$0	$171,142	$0
2030	$24,819,124	($2,392,627)	$566,099	$23,775	$6,249	$1,701,014	$40,790	$0	$166,157	$0
2031	$24,270,417	($2,342,239)	$554,478	$23,384	$6,236	$1,672,681	$40,110	$0	$161,317	$0
2032	$23,733,840	($2,292,911)	$543,096	$22,999	$6,220	$1,644,821	$39,442	$0	$156,619	$0
2033	$23,209,126	($2,244,623)	$531,947	$22,620	$6,203	$1,617,424	$38,785	$0	$152,057	$0
2034	$22,696,013	($2,197,351)	$521,027	$22,248	$6,183	$1,590,483	$38,139	$0	$147,628	$0
2035	$22,194,243	($2,151,075)	$510,331	$21,881	$6,161	$1,563,992	$37,504	$0	$143,328	$0
2036	$21,703,567	($2,105,774)	$499,855	$21,521	$6,138	$1,537,941	$36,879	$0	$139,154	$0
2037	$21,223,739	($2,061,427)	$489,594	$21,167	$6,112	$1,512,325	$36,265	$0	$135,101	$0
2038	$20,754,519	($2,018,013)	$479,543	$20,818	$6,084	$1,487,135	$35,661	$0	$131,166	$0
2039	$20,295,672	($1,975,514)	$469,699	$20,475	$6,055	$1,462,365	$35,067	$0	$127,345	$0
2040	$19,846,970	($1,933,910)	$460,056	$20,138	$6,025	$1,438,007	$34,483	$0	$123,636	$112,858,592
Totals	**$296,081,503**	**($28,656,243)**	**$6,793,767**	**$289,778**	**$80,191**	**$20,717,143**	**$496,788**	**$273,144,672**	**$1,930,926**	**$112,858,592**
									Total Discounted Benefits	$408,661,518

Abbreviation Legend and Notes	
N/A	No Application
TRK	Truck Trips
AM Peak	7:00 AM to 9:00 AM, PST
HPMS	Highway Performance Monitoring System
PCE	Passenger Car Equivalent
TDM	Travel Demand Model
AADT	Annual Average Daily Traffic
VHT	Vehicle Hours Travelled
VMT	Vehicle Miles Travelled
PHT	Person Hours Travelled

PCE Travel Demand Model	
TRK	1.63

Average Vehicle Occupancies Travel Demand Model	
Automobile	1.51
TRK	1.00

All Vehicle Volumes			
	2017	2040 No-Build	2040 Alt1
AM (7-9) Peak Traffic	74,820	98,685	98,194
PM (4-6) Peak Traffic	86,644	118,191	117,966
Average Daily Speed			
AADT	726,290	977,148	974,066
Daily VMT	2,312,360	2,797,015	2,827,185
Daily VHT	66,384	78,373	73,673

Car Volumes			
	2017	2040 No-Build	2040 Alt1
AM (7-9) Peak Traffic	71,753	94,639	94,168
PM (4-6) Peak Traffic	80,925	110,391	110,180
Average Daily Speed			
AADT	685,880	922,582	919,653
Daily VMT	2,185,986	2,644,096	2,672,466
Daily VHT	62,610	73,967	69,525

Truck Volumes			
	2017	2040 No-Build	2040 Alt1
AM (7-9) Peak Traffic	3,068	4,046	4,026
PM (4-6) Peak Traffic	5,718	7,801	7,786
Average Daily Speed			
AADT	40,410	54,567	54,413
Daily VMT	126,373	152,919	154,718
Daily VHT	3,774	4,406	4,148

Annual Growth Rates (2017 and 2040-No Build)			
	2017	2040 No-Build	Annual Growth
AADT	726,290	977,148	1.30%
VMT	2,312,360	2,797,015	0.83%
VHT	66,384	78,373	0.72%

Annual Growth Rates (2017 and 2040 Build)			
	2017	2040 Build	Annual Growth
AADT	726,290	974,066	1.28%
VMT	2,312,360	2,827,185	0.88%
VHT	66,384	73,673	0.45%

Annual Growth Rates (Automobile)			
	2017	2040 No-Build	Annual Growth
AADT	685,880	922,582	1.30%
VMT	2,185,986	2,644,096	0.83%
VHT	62,610	73,967	0.73%

Annual Growth Rates (Truck)			
	2017	2040 No-Build	Annual Growth
AADT	40,410	54,567	1.31%
VMT	126,373	152,919	0.83%
VHT	3,774	4,406	0.68%

Daily Traffic Values in Study Area 2023 to 2040 (All Vehicles)

Year	No-Build			Build (Alt 1)			Improvement		
	AADT	Daily VMT	Daily VHT	AADT	Daily VMT	Daily VHT	ADT	Daily VMT	Daily VHT
2017	726,290	2,312,360	66,384	N/A	N/A	N/A	N/A	N/A	N/A
2022	774,678	2,410,019	68,824	N/A	N/A	N/A	N/A	N/A	N/A
2023	784,736	2,430,040	69,322	782,260	2,456,252	65,165	2,475	-26,212	4,157
2024	794,924	2,450,228	69,825	792,416	2,476,657	65,637	2,508	-26,430	4,187
2025	805,244	2,470,583	70,330	802,704	2,497,232	66,113	2,540	-26,649	4,218
2026	815,699	2,491,108	70,840	813,126	2,517,978	66,592	2,573	-26,870	4,248
2027	826,289	2,511,803	71,353	823,683	2,538,896	67,074	2,607	-27,094	4,279
2028	837,017	2,532,670	71,870	834,377	2,559,988	67,560	2,640	-27,319	4,310
2029	847,884	2,553,710	72,391	845,209	2,581,256	68,050	2,675	-27,546	4,341
2030	858,892	2,574,925	72,915	856,183	2,602,700	68,543	2,709	-27,775	4,373
2031	870,043	2,596,316	73,443	867,299	2,624,322	69,039	2,745	-28,005	4,404
2032	881,339	2,617,885	73,976	878,559	2,646,123	69,539	2,780	-28,238	4,436
2033	892,782	2,639,633	74,511	889,965	2,668,106	70,043	2,816	-28,473	4,468
2034	904,373	2,661,562	75,051	901,520	2,690,271	70,551	2,853	-28,709	4,501
2035	916,114	2,683,673	75,595	913,224	2,712,621	71,062	2,890	-28,948	4,533
2036	928,008	2,705,968	76,143	925,081	2,735,156	71,576	2,927	-29,188	4,566
2037	940,057	2,728,448	76,694	937,091	2,757,879	72,095	2,965	-29,431	4,599
2038	952,261	2,751,115	77,250	949,257	2,780,790	72,617	3,004	-29,675	4,633
2039	964,625	2,773,970	77,810	961,582	2,803,891	73,143	3,043	-29,922	4,666
2040	977,148	2,797,015	78,373	974,066	2,827,185	73,673	3,082	-30,170	4,700

Annual Traffic Values in Study Area 2023 to 2040 (All Vehicles)

Year	No-Build			Build (Alt 1)			Improvement			
	Annual Traffic	Annual VMT	Annual VHT	Annual Traffic	Annual VMT	Annual VHT	Annual Traffic	Annual VMT	Annual VHT	% VMT
2017	265,095,969	844,011,282	24,230,151	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2022	282,757,447	879,656,921	25,120,663	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2023	286,428,506	886,964,705	25,302,655	285,524,959	896,531,998	23,785,287	903,547	-9,567,293	1,517,368	-1.08%
2024	290,147,226	894,333,199	25,485,965	289,231,948	903,979,973	23,957,604	915,278	-9,646,774	1,528,361	-1.08%
2025	293,914,227	901,762,907	25,670,603	292,987,066	911,489,822	24,131,170	927,161	-9,726,915	1,539,433	-1.08%
2026	297,730,135	909,254,338	25,856,579	296,790,936	919,062,059	24,305,993	939,198	-9,807,721	1,550,586	-1.08%
2027	301,595,585	916,808,004	26,043,902	300,644,193	926,697,203	24,482,083	951,392	-9,889,199	1,561,820	-1.08%
2028	305,511,220	924,424,422	26,232,583	304,547,476	934,395,777	24,659,448	963,744	-9,971,354	1,573,135	-1.08%
2029	309,477,693	932,104,114	26,422,630	308,501,436	942,158,306	24,838,098	976,256	-10,054,192	1,584,531	-1.08%
2030	313,495,662	939,847,606	26,614,054	312,506,731	949,985,323	25,018,043	988,931	-10,137,717	1,596,011	-1.08%
2031	317,565,797	947,655,427	26,806,865	316,564,027	957,877,363	25,199,292	1,001,770	-10,221,937	1,607,574	-1.08%
2032	321,688,775	955,528,111	27,001,073	320,673,998	965,834,967	25,381,853	1,014,777	-10,306,856	1,619,220	-1.08%
2033	325,865,282	963,466,198	27,196,688	324,837,330	973,858,679	25,565,737	1,027,951	-10,392,480	1,630,951	-1.08%
2034	330,096,012	971,470,231	27,393,720	329,054,715	981,949,048	25,750,953	1,041,297	-10,478,816	1,642,767	-1.08%
2035	334,381,671	979,540,758	27,592,179	333,326,854	990,106,628	25,937,511	1,054,817	-10,565,870	1,654,668	-1.08%
2036	338,722,970	987,678,332	27,792,076	337,654,459	998,331,978	26,125,421	1,068,511	-10,653,646	1,666,655	-1.08%
2037	343,120,633	995,883,508	27,993,422	342,038,249	1,006,625,660	26,314,692	1,082,384	-10,742,152	1,678,730	-1.08%
2038	347,575,391	1,004,156,849	28,196,226	346,478,954	1,014,988,242	26,505,334	1,096,437	-10,831,392	1,690,892	-1.08%
2039	352,087,985	1,012,498,922	28,400,499	350,977,313	1,023,420,296	26,697,357	1,110,672	-10,921,375	1,703,142	-1.08%
2040	356,659,167	1,020,910,296	28,606,252	355,534,075	1,031,922,400	26,890,772	1,125,092	-11,012,104	1,715,481	-1.08%

Daily Automobile Traffic Values in Study Area 2023 to 2040

Year	No-Build			Build (Alt 1)			Improvement		
	ADT	Daily VMT	Daily VHT	ADT	Daily VMT	Daily VHT	ADT	Daily VMT	Daily VHT
2017	685,880	2,185,986	62,610	N/A	N/A	N/A	N/A	N/A	N/A
2022	731,541	2,278,297	64,921	N/A	N/A	N/A	N/A	N/A	N/A
2023	741,032	2,297,222	65,393	738,680	2,321,871	61,466	2,352	-24,649	3,927
2024	750,646	2,316,304	65,869	748,263	2,341,158	61,913	2,383	-24,854	3,956
2025	760,384	2,335,545	66,348	757,971	2,360,605	62,363	2,414	-25,060	3,985
2026	770,249	2,354,945	66,830	767,804	2,380,214	62,817	2,445	-25,268	4,014
2027	780,242	2,374,507	67,317	777,765	2,399,985	63,274	2,477	-25,478	4,043
2028	790,364	2,394,231	67,806	787,856	2,419,921	63,734	2,509	-25,690	4,072
2029	800,618	2,414,119	68,299	798,077	2,440,022	64,198	2,541	-25,903	4,102
2030	811,005	2,434,172	68,796	808,431	2,460,290	64,665	2,574	-26,118	4,132
2031	821,527	2,454,391	69,297	818,919	2,480,727	65,135	2,608	-26,335	4,162
2032	832,185	2,474,779	69,801	829,543	2,501,333	65,609	2,641	-26,554	4,192
2033	842,981	2,495,336	70,308	840,306	2,522,110	66,086	2,676	-26,775	4,222
2034	853,918	2,516,063	70,820	851,207	2,543,060	66,567	2,710	-26,997	4,253
2035	864,996	2,536,963	71,335	862,251	2,564,185	67,051	2,746	-27,221	4,284
2036	876,218	2,558,037	71,854	873,437	2,585,484	67,539	2,781	-27,447	4,315
2037	887,586	2,579,285	72,377	884,769	2,606,961	68,030	2,817	-27,675	4,347
2038	899,101	2,600,710	72,903	896,247	2,628,616	68,525	2,854	-27,905	4,378
2039	910,766	2,622,313	73,433	907,875	2,650,450	69,023	2,891	-28,137	4,410
2040	922,582	2,644,096	73,967	919,653	2,672,466	69,525	2,928	-28,371	4,442

Annual Automobile Traffic Values in Study Area 2023 to 2040

Year	No-Build			Build (Alt 1)			Improvement			
	Annual Traffic	Annual VMT	Annual VHT	Annual Traffic	Annual VMT	Annual VHT	Annual Traffic	Annual VMT	Annual VHT	% VMT
2017	250,346,194	797,885,029	22,852,774	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2022	267,012,483	831,578,581	23,696,097	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2023	270,476,589	838,486,144	23,868,460	269,618,065	847,483,001	22,435,010	858,524	-8,996,857	1,433,450	-1.07%
2024	273,985,636	845,451,085	24,042,077	273,115,974	854,522,675	22,598,200	869,662	-9,071,590	1,443,877	-1.07%
2025	277,540,208	852,473,881	24,216,957	276,659,264	861,620,825	22,762,577	880,944	-9,146,944	1,454,380	-1.07%
2026	281,140,896	859,555,012	24,393,108	280,248,523	868,777,936	22,928,150	892,373	-9,222,924	1,464,959	-1.07%
2027	284,788,297	866,694,963	24,570,541	283,884,347	875,994,498	23,094,927	903,951	-9,299,535	1,475,615	-1.07%
2028	288,483,018	873,894,223	24,749,265	287,567,340	883,271,005	23,262,917	915,678	-9,376,782	1,486,348	-1.07%
2029	292,225,673	881,153,284	24,929,288	291,298,116	890,607,954	23,432,129	927,558	-9,454,671	1,497,160	-1.07%
2030	296,016,884	888,472,642	25,110,621	295,077,293	898,005,849	23,602,572	939,591	-9,533,207	1,508,050	-1.07%
2031	299,857,280	895,852,799	25,293,273	298,905,499	905,465,194	23,774,254	951,781	-9,612,395	1,519,019	-1.07%
2032	303,747,500	903,294,261	25,477,254	302,783,371	912,986,501	23,947,186	964,129	-9,692,241	1,530,068	-1.07%
2033	307,688,190	910,797,535	25,662,573	306,711,552	920,570,285	24,121,375	976,637	-9,772,750	1,541,198	-1.07%
2034	311,680,004	918,363,135	25,849,240	310,690,696	928,217,063	24,296,832	989,308	-9,853,928	1,552,408	-1.07%
2035	315,723,607	925,991,580	26,037,265	314,721,464	935,927,360	24,473,564	1,002,143	-9,935,780	1,563,700	-1.07%
2036	319,819,670	933,683,391	26,226,657	318,804,525	943,701,704	24,651,582	1,015,144	-10,018,313	1,575,075	-1.07%
2037	323,968,873	941,439,094	26,417,427	322,940,559	951,540,625	24,830,895	1,028,314	-10,101,530	1,586,532	-1.07%
2038	328,171,906	949,259,221	26,609,585	327,130,251	959,444,661	25,011,513	1,041,655	-10,185,439	1,598,072	-1.07%
2039	332,429,468	957,144,306	26,803,140	331,374,299	967,414,352	25,193,444	1,055,169	-10,270,045	1,609,696	-1.07%
2040	336,742,265	965,094,889	26,998,103	335,673,407	975,450,244	25,376,698	1,068,858	-10,355,354	1,621,405	-1.07%

Daily Truck Traffic Values in Study Area 2023 to 2040

Year	No-Build			Build (Alt 1)			Improvement		
	ADT	Daily VMT	Daily VHT	ADT	Daily VMT	Daily VHT	ADT	Daily VMT	Daily VHT
2017	40,410	126,373	3,774	N/A	N/A	N/A	N/A	N/A	N/A
2022	43,137	131,721	3,903	N/A	N/A	N/A	N/A	N/A	N/A
2023	43,704	132,818	3,929	43,581	134,381	3,699	123	-1,563	230
2024	44,278	133,924	3,956	44,153	135,499	3,724	125	-1,576	231
2025	44,860	135,038	3,983	44,734	136,627	3,750	127	-1,589	233
2026	45,450	136,163	4,010	45,322	137,765	3,775	128	-1,602	235
2027	46,047	137,296	4,037	45,917	138,912	3,800	130	-1,616	236
2028	46,653	138,439	4,064	46,521	140,068	3,826	132	-1,629	238
2029	47,266	139,591	4,091	47,132	141,234	3,852	133	-1,643	239
2030	47,887	140,753	4,119	47,752	142,410	3,878	135	-1,656	241
2031	48,516	141,925	4,147	48,380	143,595	3,904	137	-1,670	243
2032	49,154	143,106	4,175	49,015	144,790	3,931	139	-1,684	244
2033	49,800	144,298	4,203	49,660	145,996	3,957	141	-1,698	246
2034	50,455	145,499	4,231	50,312	147,211	3,984	142	-1,712	248
2035	51,118	146,710	4,260	50,974	148,436	4,011	144	-1,726	249
2036	51,790	147,931	4,289	51,644	149,672	4,038	146	-1,741	251
2037	52,471	149,163	4,318	52,322	150,918	4,065	148	-1,755	253
2038	53,160	150,404	4,347	53,010	152,174	4,093	150	-1,770	254
2039	53,859	151,656	4,376	53,707	153,441	4,120	152	-1,784	256
2040	54,567	152,919	4,406	54,413	154,718	4,148	154	-1,799	258

Annual Truck Traffic Values in Study Area 2023 to 2040

Year	No-Build			Build (Alt 1)			Improvement			
	Annual Traffic	Annual VMT	Annual VHT	Annual Traffic	Annual VMT	Annual VHT	Annual Traffic	Annual VMT	Annual VHT	% VMT
2017	14,749,776	46,126,253	1,377,377	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2022	15,744,964	48,078,340	1,424,565	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2023	15,951,917	48,478,562	1,434,194	15,906,894	49,048,997	1,350,276	45,023	-570,436	83,918	-1.18%
2024	16,161,590	48,882,114	1,443,888	16,115,974	49,457,298	1,359,404	45,616	-575,183	84,484	-1.18%
2025	16,374,019	49,289,026	1,453,646	16,327,802	49,868,997	1,368,593	46,217	-579,970	85,054	-1.18%
2026	16,589,239	49,699,326	1,463,471	16,542,414	50,284,123	1,377,843	46,825	-584,797	85,628	-1.18%
2027	16,807,288	50,113,041	1,473,361	16,759,846	50,702,705	1,387,156	47,441	-589,665	86,205	-1.18%
2028	17,028,202	50,530,200	1,483,318	16,980,136	51,124,772	1,396,531	48,066	-594,572	86,787	-1.18%
2029	17,252,019	50,950,831	1,493,342	17,203,321	51,550,352	1,405,970	48,699	-599,521	87,372	-1.18%
2030	17,478,778	51,374,964	1,503,433	17,429,438	51,979,474	1,415,471	49,340	-604,511	87,961	-1.18%
2031	17,708,517	51,802,627	1,513,592	17,658,528	52,412,169	1,425,037	49,989	-609,542	88,554	-1.18%
2032	17,941,275	52,233,850	1,523,819	17,890,628	52,848,465	1,434,667	50,647	-614,615	89,152	-1.18%
2033	18,177,092	52,668,664	1,534,115	18,125,778	53,288,394	1,444,362	51,314	-619,730	89,753	-1.18%
2034	18,416,008	53,107,096	1,544,480	18,364,018	53,731,984	1,454,122	51,990	-624,888	90,358	-1.18%
2035	18,658,064	53,549,178	1,554,914	18,605,390	54,179,268	1,463,947	52,674	-630,089	90,967	-1.18%
2036	18,903,300	53,994,941	1,565,419	18,849,933	54,630,274	1,473,839	53,367	-635,333	91,581	-1.18%
2037	19,151,760	54,444,414	1,575,995	19,097,690	55,085,035	1,483,796	54,070	-640,621	92,198	-1.18%
2038	19,403,485	54,897,628	1,586,641	19,348,703	55,543,581	1,493,821	54,782	-645,953	92,820	-1.18%
2039	19,658,518	55,354,615	1,597,359	19,603,015	56,005,944	1,503,913	55,503	-651,329	93,446	-1.18%
2040	19,916,902	55,815,407	1,608,149	19,860,669	56,472,157	1,514,073	56,233	-656,750	94,076	-1.18%

Operation Costs Savings Summary (Vehicle Miles Travelled)					
Year	Automobiles		Trucks		Total Cost Savings
	Mile Reduction	Value	Mile Reduction	Value	
2019	N/A	N/A	N/A	N/A	N/A
2025	N/A	$0	N/A	$0	$0
2026	N/A	$0	N/A	$0	$0
2027	N/A	$0	N/A	$0	$0
2028	-9,376,782	-$2,906,802	-594,572	-$350,798	-$3,257,600
2029	-9,454,671	-$2,930,948	-599,521	-$353,717	-$3,284,665
2030	-9,533,207	-$2,955,294	-604,511	-$356,661	-$3,311,955
2031	-9,612,395	-$2,979,842	-609,542	-$359,630	-$3,339,472
2032	-9,692,241	-$3,004,595	-614,615	-$362,623	-$3,367,218
2033	-9,772,750	-$3,029,553	-619,730	-$365,641	-$3,395,193
2034	-9,853,928	-$3,054,718	-624,888	-$368,684	-$3,423,402
2035	-9,935,780	-$3,080,092	-630,089	-$371,753	-$3,451,845
2036	-10,018,313	-$3,105,677	-635,333	-$374,847	-$3,480,524
2037	-10,101,530	-$3,131,474	-640,621	-$377,966	-$3,509,441
2038	-10,185,439	-$3,157,486	-645,953	-$381,112	-$3,538,598
2039	-10,270,045	-$3,183,714	-651,329	-$384,284	-$3,567,998
2040	-10,355,354	-$3,210,160	-656,750	-$387,483	-$3,597,642

Economic Update Factor (Using GDP Deflator)	
	1.0152
*See Economic Update Factor tab for calculation.	

Vehicle Operation Cost	
Travel Type	2019
Automobile	$0.31
Truck	$0.59

Estimated Vehicle Miles Travelled - I-15 Flamingo to Sahara Feasibility Study																
	No-Build						Build (Alt 1)						Miles Travelled Improvement			
	All Vehicles		Automobiles		Trucks		All Vehicles		Automobiles		Trucks		All Vehicles	Automobiles	Trucks	% VMT
Year	Annual Traffic	Annual VMT	Annual Traffic	Annual VMT	Annual Traffic	Annual VMT	Annual Traffic	Annual VMT	Annual Traffic	Annual VMT	Annual Traffic	Annual VMT	Annual VMT	Annual VMT	Annual VMT	
2019	265,095,969	844,011,282	250,346,194	797,885,029	14,749,776	46,126,253	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2025	293,914,227	901,762,907	277,540,208	852,473,881	16,374,019	49,289,026	292,987,066	911,489,822	276,659,264	861,620,825	16,327,802	49,868,997	-9,726,915	-9,146,944	-579,970	-1.07%
2026	297,730,135	909,254,338	281,140,896	859,555,012	16,589,239	49,699,326	296,790,936	919,062,059	280,248,523	868,777,936	16,542,414	50,284,123	-9,807,721	-9,222,924	-584,797	-1.07%
2027	301,595,585	916,808,004	284,788,297	866,694,963	16,807,288	50,113,041	300,644,193	926,697,203	283,884,347	875,994,498	16,759,846	50,702,705	-9,889,199	-9,299,535	-589,665	-1.07%
2028	305,511,220	924,424,422	288,483,018	873,894,223	17,028,202	50,530,200	304,547,476	934,395,777	287,567,340	883,271,005	16,980,136	51,124,772	-9,971,354	-9,376,782	-594,572	-1.07%
2029	309,477,693	932,104,114	292,225,673	881,153,284	17,252,019	50,950,831	308,501,436	942,158,306	291,298,116	890,607,954	17,203,321	51,550,352	-10,054,192	-9,454,671	-599,521	-1.07%
2030	313,495,662	939,847,606	296,016,884	888,472,642	17,478,778	51,374,964	312,506,731	949,985,323	295,077,293	898,005,849	17,429,438	51,979,474	-10,137,717	-9,533,207	-604,511	-1.07%
2031	317,565,797	947,655,427	299,857,280	895,852,799	17,708,517	51,802,627	316,564,027	957,877,363	298,905,499	905,465,194	17,658,528	52,412,169	-10,221,937	-9,612,395	-609,542	-1.07%
2032	321,688,775	955,528,111	303,747,500	903,294,261	17,941,275	52,233,850	320,673,998	965,834,967	302,783,371	912,986,501	17,890,628	52,848,465	-10,306,856	-9,692,241	-614,615	-1.07%
2033	325,865,282	963,466,198	307,688,190	910,797,535	18,177,092	52,668,664	324,837,330	973,858,679	306,711,552	920,570,285	18,125,778	53,288,394	-10,392,480	-9,772,750	-619,730	-1.07%
2034	330,096,012	971,470,231	311,680,004	918,363,135	18,416,008	53,107,096	329,054,715	981,949,048	310,690,696	928,217,063	18,364,018	53,731,984	-10,478,816	-9,853,928	-624,888	-1.07%
2035	334,381,671	979,540,758	315,723,607	925,991,580	18,658,064	53,549,178	333,326,854	990,106,628	314,721,464	935,927,360	18,605,390	54,179,268	-10,565,870	-9,935,780	-630,089	-1.07%
2036	338,722,970	987,678,332	319,819,670	933,683,391	18,903,300	53,994,941	337,654,459	998,331,978	318,804,525	943,701,704	18,849,933	54,630,274	-10,653,646	-10,018,313	-635,333	-1.07%
2037	343,120,633	995,883,508	323,968,873	941,439,094	19,151,760	54,444,414	342,038,249	1,006,625,660	322,940,559	951,540,625	19,097,690	55,085,035	-10,742,152	-10,101,530	-640,621	-1.07%
2038	347,575,391	1,004,156,849	328,171,906	949,259,221	19,403,485	54,897,628	346,478,954	1,014,988,242	327,130,251	959,444,661	19,348,703	55,543,581	-10,831,392	-10,185,439	-645,953	-1.07%
2039	352,087,985	1,012,498,922	332,429,468	957,144,306	19,658,518	55,354,615	350,977,313	1,023,420,296	331,374,299	967,414,352	19,603,015	56,005,944	-10,921,375	-10,270,045	-651,329	-1.07%
2040	356,659,167	1,020,910,296	336,742,265	965,094,889	19,916,902	55,815,407	355,534,075	1,031,922,400	335,673,407	975,450,244	19,860,669	56,472,157	-11,012,104	-10,355,354	-656,750	-1.07%

NDOT Values

Table E-8 Vehicle Non-Fuel Operating Costs (2019 USD)

Vehicle Non-Fuel Operating Costs	Cost Per Mile ($)
Light Duty Vehicle[1]	0.31
Commercial Truck[2]	0.59

1. Source: American Automobile Association, Your Driving Costs – 2019 Edition.
2. Source: American Transportation Research Institute, An Analysis of the Operational Costs of Trucking: 2018 Update.

Time Savings Summary (Person Hours)					
Year	Auto (Hours)	Value ($)	Truck (Hours)	Value ($)	Total Cost Savings
2019	N/A	$0	N/A	$0	$0
2025	N/A	$0	N/A	$0	$0
2026	N/A	$0	N/A	$0	$0
2027	N/A	$0	N/A	$0	$0
2028	2,244,386	$30,958,515	86,787	$2,905,614	$33,864,130
2029	2,260,711	$31,183,704	87,372	$2,925,212	$34,108,916
2030	2,277,155	$31,410,531	87,961	$2,944,941	$34,355,472
2031	2,293,719	$31,639,008	88,554	$2,964,802	$34,603,811
2032	2,310,403	$31,869,147	89,152	$2,984,797	$34,853,944
2033	2,327,209	$32,100,960	89,753	$3,004,925	$35,105,886
2034	2,344,137	$32,334,459	90,358	$3,025,189	$35,359,648
2035	2,361,188	$32,569,657	90,967	$3,045,588	$35,615,245
2036	2,378,363	$32,806,565	91,581	$3,066,124	$35,872,689
2037	2,395,663	$33,045,197	92,198	$3,086,798	$36,131,995
2038	2,413,089	$33,285,564	92,820	$3,107,611	$36,393,174
2039	2,430,641	$33,527,680	93,446	$3,128,562	$36,656,242
2040	2,448,321	33,771,556	94,076	$3,149,655	$36,921,211

Economic Update Factor (Using GDP Deflator)	
	1.0152
*See Economic Update Factor tab for calculation.	

Travel Cost	
Travel Type	**2019**
Personal Travel	$11.16
Business Travel	$33.48

Travel Values	
Travel Category	
Personal Travel Percentage	88.20%
Business Travel Percentage	11.80%
Passenger Vehicle Occupancy per Car**	1.51
**Southern Nevada Regional Transportation Commission	

NDOT Values

Table E-1 Travel Costs (2019 USD)

Statistical Area	Mean Wage ($/hour)	Personal Travel ($/hour)	Business Travel ($/hour)
Nevada	$22.60	$11.30	$33.90
Las Vegas—Paradise MSA	$22.32	$11.16	$33.48
Reno—Sparks MSA	$23.19	$11.60	$34.79
Carson City MSA	$24.88	$12.44	$37.32

Source: Occupational Employment Statistics (OES) survey for Nevada conducted by the Research and Analysis Bureau

Estimated TravelTime Values - I-15 Flamingo to Sahara Feasibility Study

	No-Build									Build (Alt 1)								Travel Time Improvements							
	All Vehicles		Automobiles			Trucks				All Vehicles		Automobiles			Trucks			All Vehicles		Automobiles			Trucks		
Year	Annual Traffic	Annual VHT	Annual Traffic	Annual VHT	Annual PHT	Annual Traffic	Annual VHT	Annual PHT		Annual Traffic	Annual VHT	Annual Traffic	Annual VHT	Annual PHT	Annual Traffic	Annual VHT	Annual PHT	Annual Traffic	Annual VHT	Annual Traffic	Annual VHT	Annual PHT	Annual Traffic	Annual VHT	Annual PHT
2019	265,095,969	24,230,151	250,346,194	22,852,774	34,507,689	14,749,776	1,377,377	1,377,377		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2025	293,914,227	25,670,603	277,540,208	24,216,957	36,567,605	16,374,019	1,453,646	1,453,646		292,987,066	24,131,170	276,659,264	22,762,577	34,371,491	16,327,802	1,368,593	1,368,593	927,161	1,539,433	880,944	1,454,380	2,196,113	46,217	85,054	85,054
2026	297,730,135	25,856,579	281,140,896	24,393,108	36,833,594	16,589,239	1,463,471	1,463,471		296,790,936	24,305,993	280,248,523	22,928,150	34,621,506	16,542,414	1,377,843	1,377,843	939,198	1,550,586	892,373	1,464,959	2,212,088	46,825	85,628	85,628
2027	301,595,585	26,043,902	284,788,297	24,570,541	37,101,517	16,807,288	1,473,361	1,473,361		300,644,193	24,482,083	283,884,347	23,094,927	34,873,339	16,759,846	1,387,156	1,387,156	951,392	1,561,820	903,951	1,475,615	2,228,178	47,441	86,205	86,205
2028	305,511,220	26,232,583	288,483,018	24,749,265	37,371,390	17,028,202	1,483,318	1,483,318		304,547,476	24,659,448	287,567,340	23,262,917	35,127,004	16,980,136	1,396,531	1,396,531	963,744	1,573,135	915,678	1,486,348	2,244,386	48,066	86,787	86,787
2029	309,477,693	26,422,630	292,225,673	24,929,288	37,643,225	17,252,019	1,493,342	1,493,342		308,501,436	24,838,098	291,298,116	23,432,129	35,382,514	17,203,321	1,405,970	1,405,970	976,256	1,584,531	927,558	1,497,160	2,260,711	48,699	87,372	87,372
2030	313,495,662	26,614,054	296,016,884	25,110,621	37,917,038	17,478,778	1,503,433	1,503,433		312,506,731	25,018,043	295,077,293	23,602,572	35,639,883	17,429,438	1,415,471	1,415,471	988,931	1,596,011	939,591	1,508,050	2,277,155	49,340	87,961	87,961
2031	317,565,797	26,806,865	299,857,280	25,293,273	38,192,843	17,708,517	1,513,592	1,513,592		316,564,027	25,199,292	298,905,499	23,774,254	35,899,124	17,658,528	1,425,037	1,425,037	1,001,770	1,607,574	951,781	1,519,019	2,293,719	49,989	88,554	88,554
2032	321,688,775	27,001,073	303,747,500	25,477,254	38,470,654	17,941,275	1,523,819	1,523,819		320,673,998	25,381,853	302,783,371	23,947,186	36,160,251	17,890,628	1,434,667	1,434,667	1,014,777	1,619,220	964,129	1,530,068	2,310,403	50,647	89,152	89,152
2033	325,865,282	27,196,688	307,688,190	25,662,573	38,750,485	18,177,092	1,534,115	1,534,115		324,837,330	25,565,737	306,711,552	24,121,375	36,423,276	18,125,778	1,444,362	1,444,362	1,027,951	1,630,951	976,637	1,541,198	2,327,209	51,314	89,753	89,753
2034	330,096,012	27,393,720	311,680,004	25,849,240	39,032,352	18,416,008	1,544,480	1,544,480		329,054,715	25,750,953	310,690,696	24,296,832	36,688,216	18,364,018	1,454,122	1,454,122	1,041,297	1,642,767	989,308	1,552,408	2,344,137	51,990	90,358	90,358
2035	334,381,671	27,592,179	315,723,607	26,037,265	39,316,270	18,658,064	1,554,914	1,554,914		333,326,854	25,937,511	314,721,464	24,473,564	36,955,082	18,605,390	1,463,947	1,463,947	1,054,817	1,654,668	1,002,143	1,563,700	2,361,188	52,674	90,967	90,967
2036	338,722,970	27,792,076	319,819,670	26,226,657	39,602,252	18,903,300	1,565,419	1,565,419		337,654,459	26,125,421	318,804,525	24,651,582	37,223,889	18,849,933	1,473,839	1,473,839	1,068,511	1,666,655	1,015,144	1,575,075	2,378,363	53,367	91,581	91,581
2037	343,120,633	27,993,422	323,968,873	26,417,427	39,890,315	19,151,760	1,575,995	1,575,995		342,038,249	26,314,692	322,940,559	24,830,895	37,494,652	19,097,690	1,483,796	1,483,796	1,082,384	1,678,730	1,028,314	1,586,532	2,395,663	54,070	92,198	92,198
2038	347,575,391	28,196,226	328,171,906	26,609,585	40,180,473	19,403,485	1,586,641	1,586,641		346,478,954	26,505,334	327,130,251	25,011,513	37,767,384	19,348,703	1,493,821	1,493,821	1,096,437	1,690,892	1,041,655	1,598,072	2,413,089	54,782	92,820	92,820
2039	352,087,985	28,400,499	332,429,468	26,803,140	40,472,741	19,658,518	1,597,359	1,597,359		350,977,313	26,697,357	331,374,299	25,193,444	38,042,100	19,603,015	1,503,913	1,503,913	1,110,672	1,703,142	1,055,169	1,609,696	2,430,641	55,503	93,446	93,446
2040	356,659,167	28,606,252	336,742,265	26,998,103	40,767,136	19,916,902	1,608,149	1,608,149		355,534,075	26,890,772	335,673,407	25,376,698	38,318,815	19,860,669	1,514,073	1,514,073	1,125,092	1,715,481	1,068,858	1,621,405	2,448,321	56,233	94,076	94,076

72	32	39	30.98%	35.23%
53	23	29	22.32%	26.29%
39	17	22	16.45%	19.65%
2,845	1,447	1,414		

0.000	
0.000	
0.000	
0.000	Total Daily Delay Reduction (Cars)
0	Total Annual Delay Reduction (Cars)

Costs for I-15 Flamingo to Sahara Feasibility Study

Project Inputs	
Total Project Cost ($2019)	$335,835,677
Annual O&M	$230,000
Discount Rate	7%

Construction and O&M Costs in 2019 Dollars

Year	Construction Costs	O&M Costs	Total Costs
2025	$111,945,226	$0	**$111,945,226**
2026	$111,945,226	$0	**$111,945,226**
2027	$111,945,226	$0	**$111,945,226**
2028	$0	$230,000	**$230,000**
2029	$0	$230,000	**$230,000**
2030	$0	$230,000	**$230,000**
2031	$0	$230,000	**$230,000**
2032	$0	$230,000	**$230,000**
2033	$0	$230,000	**$230,000**
2034	$0	$230,000	**$230,000**
2035	$0	$230,000	**$230,000**
2036	$0	$230,000	**$230,000**
2037	$0	$230,000	**$230,000**
2038	$0	$230,000	**$230,000**
2039	$0	$230,000	**$230,000**
2040	$0	$230,000	**$230,000**

Total Project

Item	Description	Total Cost
SECTION I	ROADWAY CONSTRUCTION	$30,069,831
SECTION II	BRIDGES	$16,307,458
SECTION III	WALLS	$6,554,412
SECTION IV	TYPICAL INTERCHANGES	$0
SECTION V	SIGNAL SYSTEMS AT INTERSECTIONS	$814,000
SECTION VI	DEMOLITION	$5,855,611
SECTION VII	ADDITIONAL ITEMS	$64,619,466
	Subtotal	$124,220,779
SECTION VIII	STANDARD PERCENTAGE ADDERS	$31,291,214
TOTAL PRESENT DAY CONSTRUCTION COST (2019)		$250,374,308
TOTAL ESCALATED CONSTRUCTION COST (2019)		$250,374,308
TOTAL ENGINEERING / ADMINISTRATION / LEGAL COSTS		$26,289,302
RIGHT OF WAY COSTS		$40,162,500
TOTAL CONSTRUCTION & ENGINEERING (2019)		$316,826,110
SECTION IX	HYDRAULICS/STORM WATER COSTS (2019)	$9,504,783
SECTION X	ENVIRONMENTAL CONSIDERATION COSTS (2019)	$9,504,783
	Project Total ($2019) =	**$335,835,677.10**

Percentage of Roadway Construction	48.8%
Percentage of Bridge Construction	51.2%

Roadway

Project Inputs	
Roadway Cost ($2019)	$163,981,233
Annual O&M	$200,000
Discount Rate	7%

Construction and O&M Costs in 2019 Dollars

Year	Construction Costs	O&M Costs	Total Costs
2025	$54,660,411	$0	**$54,660,411**
2026	$54,660,411	$0	**$54,660,411**
2027	$54,660,411	$0	**$54,660,411**
2028		$200,000	**$200,000**
2029		$200,000	**$200,000**
2030		$200,000	**$200,000**
2031		$200,000	**$200,000**
2032		$200,000	**$200,000**
2033		$200,000	**$200,000**
2034		$200,000	**$200,000**
2035		$200,000	**$200,000**
2036		$200,000	**$200,000**
2037		$200,000	**$200,000**
2038		$200,000	**$200,000**
2039		$200,000	**$200,000**
2040		$200,000	**$200,000**

Item	Description	Total Cost
SECTION I	ROADWAY CONSTRUCTION	$30,069,831
SECTION II	BRIDGES	$0
SECTION III	WALLS	$0
SECTION IV	TYPICAL INTERCHANGES	$0
SECTION V	SIGNAL SYSTEMS AT INTERSECTIONS	$814,000
SECTION VI	DEMOLITION	$2,859,167
SECTION VII	ADDITIONAL ITEMS	$31,552,275
	Subtotal	$65,295,274
SECTION VIII	STANDARD PERCENTAGE ADDERS	$15,278,817
TOTAL PRESENT DAY CONSTRUCTION COST (2019)		$122,252,311
TOTAL ESCALATED CONSTRUCTION COST (2019)		$122,252,311
TOTAL ENGINEERING / ADMINISTRATION / LEGAL COSTS		$12,836,493
RIGHT OF WAY COSTS		$19,610,472
TOTAL CONSTRUCTION & ENGINEERING (2019)		$154,699,276
SECTION IX	HYDRAULICS/STORM WATER COSTS (2019)	$4,640,978
SECTION X	ENVIRONMENTAL CONSIDERATION COSTS (2019)	$4,640,978
	Roadway Total ($2019) =	**$163,981,233**

Structures

Project Inputs	
Bridge Structures Cost ($2019)	$171,854,444
Annual O&M	$30,000
Discount Rate	7%

Construction and O&M Costs in 2019 Dollars

Year	Construction Costs	O&M Costs	Total Costs
2025	$57,284,815	$0	**$57,284,815**
2026	$57,284,815	$0	**$57,284,815**
2027	$57,284,815	$0	**$57,284,815**
2028		$30,000	**$30,000**
2029		$30,000	**$30,000**
2030		$30,000	**$30,000**
2031		$30,000	**$30,000**
2032		$30,000	**$30,000**
2033		$30,000	**$30,000**
2034		$30,000	**$30,000**
2035		$30,000	**$30,000**
2036		$30,000	**$30,000**
2037		$30,000	**$30,000**
2038		$30,000	**$30,000**
2039		$30,000	**$30,000**
2040		$30,000	**$30,000**

Item	Description	Total Cost
SECTION I	ROADWAY CONSTRUCTION	$0
SECTION II	BRIDGES	$16,307,458
SECTION III	WALLS	$6,554,412
SECTION IV	TYPICAL INTERCHANGES	$0
SECTION V	SIGNAL SYSTEMS AT INTERSECTIONS	$0
SECTION VI	DEMOLITION	$2,996,444
SECTION VII	ADDITIONAL ITEMS	$33,067,191
	Subtotal	$58,925,505
SECTION VIII	STANDARD PERCENTAGE ADDERS	$16,012,397
TOTAL PRESENT DAY CONSTRUCTION COST (2019)		$128,121,997
TOTAL ESCALATED CONSTRUCTION COST (2019)		$128,121,997
TOTAL ENGINEERING / ADMINISTRATION / LEGAL COSTS		$13,452,810
RIGHT OF WAY COSTS		$20,552,028
TOTAL CONSTRUCTION & ENGINEERING (2019)		$162,126,834
SECTION IX	HYDRAULICS/STORM WATER COSTS (2019)	$4,863,805
SECTION X	ENVIRONMENTAL CONSIDERATION COSTS (2019)	
	Structures Total ($2019) =	**$171,854,444**

Annual Maintenance Cost for I-15 Flamingo to Sahara Feasibility Study	
Facility Type	O&M per Year ($2019)
Roadways: Asphalt Pavement	$200,000
Concrete Bridges	$20,000
Steel Bridges	$10,000
Total	**$230,000**

Note: O&M cost per C-A Group

Analysis Period	
Start Year	2028
End Year	2040
Years in Analysis Period	12

Project Useful Service Life (Years)		
Project Type	Years	Source
Pavement	20	2019 Nevada DOT Road Design Guide (Page 26)
Bridge Structure	75	2019 Nevada State Highway Preservation Report (Pages 5, 6, 61, 68)

Residual Values	
Residual Value (Roadway)	$ 65,592,493.09
Residual Value (Bridge Structures)	$ 144,357,733.28
Total	**$ 209,950,226**

Roadway Construction ($2019)	$ 163,981,233
Bridge Structures ($2019)	$ 171,854,444

Alternative 1 Crash Savings Summary			
Year	Estimated No-Build Crash Costs	Estimated Build Crash Costs	Estimated Annual Crash Cost Savings
2019	$69,567,068	N/A	N/A
2025	$70,183,135	$0	N/A
2026	$70,804,658	$0	N/A
2027	$71,431,685	$0	N/A
2028	$72,064,265	$71,294,347	$769,917
2029	$72,702,446	$71,925,711	$776,736
2030	$73,346,279	$72,562,665	$783,614
2031	$73,995,814	$73,205,261	$790,554
2032	$74,651,101	$73,853,547	$797,554
2033	$75,312,191	$74,507,574	$804,617
2034	$75,979,135	$75,167,392	$811,743
2035	$76,651,986	$75,833,054	$818,931
2036	$77,330,795	$76,504,611	$826,184
2037	$78,015,616	$77,182,116	$833,500
2038	$78,706,501	$77,865,619	$840,881
2039	$79,403,504	$78,555,176	$848,328
2040	$80,106,680	$79,250,840	$855,841

NDOT Valuation of a Statistical Life in Economic Analysis	
KABCO Level	Monetized Value (2019)
C - Possible Injury	$65,100
B - Non-incapacitating	$127,300
A - Incapacitating	$467,400
K - Killed	$9,800,000
Property Damage Only	$4,500

Study Area No-Build Crashes (2040)			
KABCO Level	Monetized Value (2019)	Incidents	2019 Value
C - Possible Injury	$65,100	405	$26,359,875
B - Non-incapacitating	$127,300	58	$7,363,643
A - Incapacitating	$467,400	8	$3,674,886
K - Killed	$9,800,000	4	$38,525,760
Property Damage Only	$4,500	929	$4,182,516
	Totals	1,404	$80,106,680

Study Area Build Alt. 1 Crashes (2040)			
KABCO Level	Monetized Value (2019)	Incidents	2019 Value
C - Possible Injury	$65,100	401	$26,078,253
B - Non-incapacitating	$127,300	57	$7,284,972
A - Incapacitating	$467,400	8	$3,635,624
K - Killed	$9,800,000	4	$38,114,160
Property Damage Only	$4,500	920	$4,137,831
	Totals	1,389	$79,250,840
	Improvements	15	$855,841
	Percentage Improvement		1.07%

No-Build VMT Increase	
Annual VMT Increase	0.83%

Build Condition Improvement	
Estimated Annual VMT Improvement	-0.88%

Economic Update Factor (Using GDP Deflator)	1.0152

Decrease in Crashes (2040 No Build versus 2040 Build Alt. 1)	1.07%

NDOT Valuation of a Statistical Life in Economic Analysis	
KABCO Level	Monetized Value (2019)
C - Possible Injury	$65,100
B - Non-incapacitating	$127,300
A - Incapacitating	$467,400
K - Killed	$9,800,000
Property Damage Only	$4,500

Study Area 2040 Crashes							
KABCO Level	Monetized Value (2019)	2040 No-Build		2040 Build Alt 1		2040 Build Alt 2	
		Incidents	2019 Value	Incidents	2019 Value	Incidents	2019 Value
C - Possible Injury	$65,100	405	$26,359,875	401	$26,078,253	395	$25,719,653
B - Non-incapacitating	$127,300	58	$7,363,643	57	$7,284,972	56	$7,184,797
A - Incapacitating	$467,400	8	$3,674,886	8	$3,635,624	8	$3,585,631
K - Killed	$9,800,000	4	$38,525,760	4	$38,114,160	4	$37,590,056
Property Damage Only	$4,500	929	$4,182,516	920	$4,137,831	907	$4,080,932
	Totals	1,404	$80,106,680	1,389	$79,250,840	1,370	$78,161,069
				Improvement	$855,841	Improvement	$1,945,611
				Percentage	1.07%	Percentage	2.43%

2040 No-Build

Facility	Total	FI	K	A	B	C	PDO	Totals
I-15 Mainline	660.6	168.3	1.8	3.7	27.2	190.5	437.3	660.6
I-15 CD Roads	272.9	189.4	0.8	1.5	11.2	78.7	180.7	272.9
Service Interchanges	320.1	136.2	0.9	1.8	13.2	92.3	211.9	320.1
Arterial Intersections	68.4	37.5	0.2	0.4	2.8	19.7	45.3	68.4
Arterial Segments	82.0	35.5	0.2	0.5	3.4	23.6	54.3	82.0
Overall Total	1404.0	566.9	3.9	7.9	57.8	404.9	929.4	1404.0

2040 Build Alt. 1

Facility	Total	FI	K	A	B	C	PDO	Totals
I-15 Mainline	636.8	162.9	1.8	3.6	26.2	183.7	421.6	636.8
I-15 CD Roads	238.8	159.1	0.7	1.3	9.8	68.9	158.1	238.8
Service Interchanges	361.2	153.6	1.0	2.0	14.9	104.2	239.1	361.2
Arterial Intersections	68.4	37.5	0.2	0.4	2.8	19.7	45.3	68.4
Arterial Segments	83.8	36.1	0.2	0.5	3.5	24.2	55.5	83.8
Overall Total	1389	549.2	3.9	7.8	57.2	400.6	919.5	1389.0

2040 Build Alt. 1 Improvements

Facility	Total	FI	K	A	B	C	PDO	Totals
I-15 Mainline	636.8	5.4	0.1	0.1	1.0	6.9	15.8	23.8
I-15 CD Roads	238.8	30.3	0.1	0.2	1.4	9.8	22.6	34.1
Service Interchanges	361.2	-17.4	-0.1	-0.2	-1.7	-11.9	-27.2	-41.1
Arterial Intersections	68.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Arterial Segments	83.8	-0.6	0.0	0.0	-0.1	-0.5	-1.2	-1.8
Overall Total	1389	17.7	0.0	0.1	0.6	4.3	9.9	15.0

2040 Build Alt. 2

Facility	Total	FI	K	A	B	C	PDO	Totals
I-15 Mainline	640.9	163.0	1.8	3.6	26.4	184.8	424.3	640.9
I-15 CD Roads	210.1	131.1	0.6	1.2	8.7	60.6	139.1	210.1
Service Interchanges	366.9	157.3	1.0	2.1	15.1	105.8	242.9	366.9
Arterial Intersections	68.4	37.5	0.2	0.4	2.8	19.7	45.3	68.4
Arterial Segments	83.6	36.0	0.2	0.5	3.4	24.1	55.3	83.6
Overall Total	1370	524.9	3.8	7.7	56.4	395.1	906.9	1369.9

2040 Build Alt. 2 Improvements

Facility	Total	FI	K	A	B	C	PDO	Totals
I-15 Mainline	636.8	5.3	0.1	0.1	0.8	5.7	13.0	19.7
I-15 CD Roads	238.8	58.3	0.2	0.4	2.6	18.1	41.6	62.8
Service Interchanges	361.2	-21.1	-0.1	-0.3	-1.9	-13.5	-31.0	-46.8
Arterial Intersections	68.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Arterial Segments	83.8	-0.5	0.0	0.0	-0.1	-0.5	-1.1	-1.6
Overall Total	1389	42.0	0.0	0.2	1.4	9.8	22.6	34.0

From: Perez-Bravo, Dante <Dante.Perez-Bravo@atkinsglobal.com>
Sent: Tuesday, September 22, 2020 4:30 PM
To: Mohan, Garakhalli <GarakhalliMohan@atkinsglobal.com>
Subject: RE: I-15 Sahara to Flamingo: Atkins' Deliverables

Hi Mohan,
Based on the 2.5K crashes I found (there should be 7.5 K), below is the corridor crash severity distribution

K	A	B	C	PDO	Total
0.28%	0.56%	4.12%	28.84%	66.20%	100.00%

Facility	2040 No-Build			2040 Build Alt 1			2040 Build Alt 2		
	FI	PDO	Total	FI	PDO	Total	FI	PDO	Total
I-15 Mainline	168.3	492.4	660.6	162.9	473.9	636.8	163.0	477.9	640.9
				(-3%)	(-4%)	(-4%)	(-3%)	(-3%)	(-3%)
I-15 CD Roads	189.4	83.6	272.9	159.1	79.7	238.8	131.1	79.1	210.1
				(-16%)	(-5%)	(-13%)	(-37%)	(-6%)	(-26%)
Service Interchanges	136.2	183.9	320.1	153.6	207.5	361.2	157.3	209.6	366.9
				(13%)	(13%)	(13%)	(14%)	(12%)	(13%)
Arterial Intersections	37.5	30.9	68.4	37.5	30.9	68.4	37.5	30.9	68.4
				(0%)	(0%)	(0%)	(0%)	(0%)	(0%)
Arterial Segments	35.5	46.5	82.0	36.1	47.7	83.8	36.0	47.6	83.6
				(2%)	(3%)	(2%)	(1%)	(2%)	(2%)
Overall Total	566.8	837.2	1,404.0	549.2	839.8	1,389.0	524.9	845.1	1,370.0
				(-3%)	(0%)	(-1%)	(-8%)	(1%)	(-2%)

Parameter	2017 Existing Conditions		2040 No-Action		2040 Conceptual Alternative 1		2040 Conceptual Alternative 2	
Emissions Data from AIMSUM	AM	PM	AM	PM	AM	PM	AM	PM
Carbon Dioxide, CO_2 (Grams)	132,761,295	162,193,209	185,718,255	211,527,365	170,879,115	196,176,825	165,195,570	190,179,620
Nitrogen Oxide, NO_x (Grams)	325,717	592,099	449,179	732,265	419,320	691,869	409,983	676,734
Particulate Matter, PM_{10} (Grams)	8,486	11,557	14,274	16,486	11,695	13,616	10,814	12,696
Volatile Organic Compounds, VOC (Grams)	130,857	201,049	152,579	204,947	145,895	188,351	145,229	184,964

Carbon Dioxide (CO_2) Emissions Annual Summary				Nitrogen Oxide (NO_x) Emissions Annual Summary				Fine Particulate Matter (PM) Emissions Annual Summary				Volatile Organic Compounds (VOC) Emissions Annual Summary			
2017 Existing Conditions (Short Tons)	2040 No-Action (ShortTons)	2040 Alternative 1 (Short Tons)	2040 Alternative 1 Improvement (Short Tons)	2017 Existing Conditions (ShortTons)	2040 No-Action (Short Tons)	2040 Alternative 1 (Short Tons)	2040 Alternative 1 Improvement (Short Tons)	2017 Existing Conditions (ShortTons)	2040 No-Action (Short Tons)	2040 Alternative 1 (Short Tons)	2040 Alternative 1 Improvement (Short Tons)	2017 Existing Conditions (ShortTons)	2040 No-Action (Short Tons)	2040 Alternative 1 (Short Tons)	2040 Alternative 1 Improvement (Short Tons)
368.806	495.129	457.666	37.463	1.168	1.496	1.408	88	25	38	32	7	419	449	419	30

Alt 1 Emissions Savings

Year	CO_2 Reduction	CO_2 Savings	NO_x Reduction (Short Tons)	NO_x Savings	PM Reduction (Short Tons)	PM Savings	VOC Reduction (Short Tons)	VOC Savings
2019	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2025	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2026	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2027	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2028	32.069	$35.958	64	$8.176	6	$2.295.263	26	$55.039
2029	32.487	$37.192	66	$8.411	6	$2.324.743	26	$55.746
2030	32.911	$38.468	68	$8.649	6	$2.354.602	26	$56.462
2031	33,340	$39,788	70	$8,891	6	$2,384,844	27	$57,187
2032	33.775	$41.154	72	$9.135	6	$2.415.475	27	$57.922
2033	34.215	$42.566	74	$9.382	6	$2.446.499	27	$58.666
2034	34.661	$44.026	76	$9.633	6	$2.477.921	28	$59.419
2035	35.113	$45.537	78	$9.887	6	$2.509.748	28	$60.183
2036	35.571	$47.100	80	$10.144	6	$2.541.983	28	$60.956
2037	36.035	$48.716	82	$10.405	7	$2.574.632	29	$61.739
2038	36.505	$50.387	84	$10.669	7	$2.607.700	29	$62.531
2039	36.981	$52.116	86	$10.937	7	$2.641.193	30	$63.335
2040	37.463	$53.905	88	$11.208	7	$2.675.116	30	$64.148
Totals	**451.125**	**$576.914**	**988**	**$125.528**	**82**	**$32.249.717**	**361**	**$773.334**

Annual Growth	1.28%

NDOT Values

Table E-7 Damage Costs for Pollutant Emissions (2019 USD)

Emission Type	$/short ton*
Carbon Dioxide (CO_2)	$0.81**
Fine Particulate Matter (PM)	$394,300
Nitrogen Oxides (NO_X)	$8,800
Sulfur Dioxide (SO_2)	$51,000
Volatile Organic Compounds (VOC)	$2,140

1. Source: Benefit-Cost Analysis Guidance for Discretionary Grant Programs, USDOT, January 2020.
2. * A metric ton is equal to 1.1023 short tons.
3. **Cost of CO_2 is assumed to grow by 2.1 percent annually.

NDOT					
	Emission Type				
Year	NO_x	SO_2	PM	CO_2	VOC
2019	$8.800	$21.000	$394.300	$0.93	$2.140.00
2020	$8.800	$21.000	$394.300	$0.95	$2.140.00
2021	$8.800	$21.000	$394.300	$0.97	$2.140.00
2022	$8.800	$21.000	$394.300	$0.99	$2.140.00
2023	$8.800	$21.000	$394.300	$1.01	$2.140.00
2024	$8.800	$21.000	$394.300	$1.03	$2.140.00
2025	$8.800	$21.000	$394.300	$1.05	$2.140.00
2026	$8.800	$21.000	$394.300	$1.08	$2.140.00
2027	$8.800	$21.000	$394.300	$1.10	$2.140.00
2028	$8.800	$21.000	$394.300	$1.12	$2.140.00
2029	$8.800	$21.000	$394.300	$1.14	$2.140.00
2030	$8.800	$21.000	$394.300	$1.17	$2.140.00
2031	$8.800	$21.000	$394.300	$1.19	$2.140.00
2032	$8.800	$21.000	$394.300	$1.22	$2.140.00
2033	$8.800	$21.000	$394.300	$1.24	$2.140.00
2034	$8.800	$21.000	$394.300	$1.27	$2.140.00
2035	$8.800	$21.000	$394.300	$1.30	$2.140.00
2036	$8.800	$21.000	$394.300	$1.32	$2.140.00
2037	$8.800	$21.000	$394.300	$1.35	$2.140.00
2038	$8.800	$21.000	$394.300	$1.38	$2.140.00
2039	$8.800	$21.000	$394.300	$1.41	$2.140.00
2040	$8.800	$21.000	$394.300	$1.44	$2.140.00
2041	$8.800	$21.000	$394.300	$1.47	$2.140.00
2042	$8.800	$21.000	$394.300	$1.50	$2.140.00
2043	$8.800	$21.000	$394.300	$1.53	$2.140.00
2044	$8.800	$21.000	$394.300	$1.56	$2.140.00
2045	$8.800	$21.000	$394.300	$1.60	$2.140.00
2046	$8.800	$21.000	$394.300	$1.63	$2.140.00
2047	$8.800	$21.000	$394.300	$1.66	$2.140.00
2048	$8.800	$21.000	$394.300	$1.70	$2.140.00
2049	$8.800	$21.000	$394.300	$1.73	$2.140.00
2050	$8.800	$21.000	$394.300	$1.77	$2.140.00

Daily Estimate of Existing (2017) CO_2 Emissions

	Hour	Existing Peak Hour (2017) (grams)	Proportion of Analysis Hour (Based on Daily Counts and count locations)	Estimated Existing Emissions - Peak Hours	Percent of Peak Hour (based on Daily Count Distributions)	Estimated Existing CO_2 per Hour (grams)
	0:00				44.92%	22.086.589
	1:00				31.08%	15.281.724
	2:00				25.31%	12,442,652
	3:00				27.02%	13.285.197
	4:00				31.51%	15.489.939
	5:00				49.73%	24.450.104
AM analysis peak begins at 6:30	*6:00		13.43%	########	72.53%	35.659.744
	7:00	132,761,295	34.42%	########	92.96%	45.701.265
	8:00		35.12%	########	94.83%	46.623.837
AM analysis peak ends at 9:30	*9:00		17.03%	########	91.96%	45,212,642
	10:00				93.59%	46.013.851
	11:00				100.00%	49.164.128
	12:00				86.68%	48.710.491
	13:00				89.90%	50.518.572
	14:00				95.80%	53.831.693
PM analysis peak begins at 15:30	*15:00		16.85%	########	97.26%	54.653.433
	16:00	162,193,209	34.65%	########	100.00%	56.192.732
	17:00		33.92%	########	97.92%	55.022.386
PM analysis peak ends at 18:30	*18:00		14.58%	########	84.18%	47.302.748
	19:00				75.64%	42.504.009
	20:00				68.15%	38.295.064
	21:00				63.85%	35.877.981
	22:00				59.28%	33.308.457
	23:00				52.84%	29.690.407
					Daily Grams	917.319.645
					Daily Kilograms	917.320
					Daily Metric Tons	917
					Annual Metric Tons	334.822
					Annual Short Tons	368.806

Daily Estimate of 2040 No-Action CO2 Emissions

Hour	2040 No-Action Peak Hour (grams)	Proportion of Analysis Hour (Based on Daily Counts and count locations)	Estimated 2040 No-Action Emissions - Peak Hours	Percent of Peak Hour (based on Daily Count Distributions)	Estimated 2040 No-Action CO_2 per Hour (grams)
0:00				44.92%	30.896.676
1:00				31.08%	21.377.429
2:00				25.31%	17,405,883
3:00				27.02%	18.584.510
4:00				31.51%	21.668.698
5:00				49.73%	34.202.971
*6:00		13.43%	########	72.53%	49.884.007
7:00	185,718,255	34.42%	########	92.96%	63.930.976
8:00		35.12%	########	94.83%	65.221.552
*9:00		17.03%	########	91.96%	63,247,447
10:00				93.59%	64.368.249
11:00				100.00%	68.775.136
12:00				86.68%	63.526.715
13:00				89.90%	65.884.759
14:00				95.80%	70.205.628
*15:00		16.85%	########	97.26%	71.277.317
16:00	211,527,365	34.65%	########	100.00%	73.284.823
17:00		33.92%	########	97.92%	71.758.494
*18:00		14.58%	########	84.18%	61.690.780
19:00				75.64%	55.432.413
20:00				68.15%	49.943.238
21:00				63.85%	46.790.952
22:00				59.28%	43.439.859
23:00				52.84%	38.721.310
				Daily Grams	###########
				Daily Kilograms	1.231.520
				Daily Metric Tons	1.232
				Annual Metric Tons	449.505
				Annual Short Tons	495.129

Daily Estimate of 2040 Alternative 1 CO2 Emissions

Hour	2040 Alternative 1 Peak Hour (grams)	Proportion of Analysis Hour (Based on Daily Counts and count locations)	Estimated 2040 Alternative 1 Emissions - Peak Hours	Percent of Peak Hour (based on Daily Count Distributions)	Estimated 2040 Alternative 1 CO_2 per Hour (grams)
0:00				44.92%	28.427.990
1:00				31.08%	19.669.343
2:00				25.31%	16,015,130
3:00				27.02%	17.099.583
4:00				31.51%	19.937.340
5:00				49.73%	31.470.107
*6:00		13.43%	########	72.53%	45.898.208
7:00	170,879,115	34.42%	########	92.96%	58.822.804
8:00		35.12%	########	94.83%	60.010.262
*9:00		17.03%	########	91.96%	58,193,891
10:00				93.59%	59.225.138
11:00				100.00%	63.279.910
12:00				86.68%	58.916.581
13:00				89.90%	61.103.502
14:00				95.80%	65.110.806
*15:00		16.85%	########	97.26%	66.104.722
16:00	196,176,825	34.65%	########	100.00%	67.966.543
17:00		33.92%	########	97.92%	66.550.980
*18:00		14.58%	########	84.18%	57.213.880
19:00				75.64%	51.409.683
20:00				68.15%	46.318.857
21:00				63.85%	43.395.333
22:00				59.28%	40.287.429
23:00				52.84%	35.911.304
				Daily Grams	###########
				Daily Kilograms	1.138.339
				Daily Metric Tons	1.138
				Annual Metric Tons	415.494
				Annual Short Tons	457.666

Daily Estimate of 2040 Alternative 2 CO2 Emissions

Hour	2040 Alternative 2 Peak Hour (grams)	Proportion of Analysis Hour (Based on Daily Counts and count locations)	Estimated 2040 Alternative 2 Emissions - Peak Hours	Percent of Peak Hour (based on Daily Count Distributions)	Estimated 2040 Alternative 2 CO_2 per Hour (grams)
0:00				44.92%	27.482.457
1:00				31.08%	19.015.129
2:00				25.31%	15,482,456
3:00				27.02%	16.530.840
4:00				31.51%	19.274.212
5:00				49.73%	30.423.392
*6:00		13.43%	########	72.53%	44.371.605
7:00	165,195,570	34.42%	########	92.96%	56.866.322
8:00		35.12%	########	94.83%	58.014.283
*9:00		17.03%	########	91.96%	56,258,326
10:00				93.59%	57.255.274
11:00				100.00%	61.175.181
12:00				86.68%	57.115.478
13:00				89.90%	59.235.543
14:00				95.80%	63.120.342
*15:00		16.85%	########	97.26%	64.083.874
16:00	190,179,620	34.65%	########	100.00%	65.888.779
17:00		33.92%	########	97.92%	64.516.490
*18:00		14.58%	########	84.18%	55.464.829
19:00				75.64%	49.838.068
20:00				68.15%	44.902.871
21:00				63.85%	42.068.720
22:00				59.28%	39.055.826
23:00				52.84%	34.813.481
				Daily Grams	###########
				Daily Kilograms	1.102.254
				Daily Metric Tons	1.102
				Annual Metric Tons	402.323
				Annual Short Tons	443.158

Daily Estimate of Existing (2017) NO_X Emissions

	Hour	Existing Peak Hour (2017) (grams)	Proportion of Analysis Hour (Based on Daily Counts and count locations)	Estimated Existing Emissions - Peak Hours	Percent of Peak Hour (based on Daily Count Distributions)	Estimated Existing NO_X per Hour (grams)
	0:00				44.92%	54.187
	1:00				31.08%	37.492
	2:00				25.31%	30.527
	3:00				27.02%	32.594
	4:00				31.51%	38.003
	5:00				49.73%	59.986
AM analysis peak begins at 6:30	*6:00		13.43%	43.744	72.53%	87.488
	7:00	325,717	34.42%	112.124	92.96%	112.124
	8:00		35.12%	114.387	94.83%	114.387
AM analysis peak ends at 9:30	*9:00		17.03%	55.462	91.96%	110.925
	10:00				93.59%	112.891
	11:00				100.00%	120.619
	12:00				86.68%	177.821
	13:00				89.90%	184.422
	14:00				95.80%	196.517
PM analysis peak begins at 15:30	*15:00		16.85%	99.758	97.26%	199.517
	16:00	592,099	34.65%	205.136	100.00%	205.136
	17:00		33.92%	200.864	97.92%	200.864
PM analysis peak ends at 18:30	*18:00		14.58%	86.341	84.18%	172.682
	19:00				75.64%	155.164
	20:00				68.15%	139.799
	21:00				63.85%	130.975
	22:00				59.28%	121.595
	23:00				52.84%	108.387
					Daily Grams	2.904.102
					Daily Kilograms	2.904
					Daily Metric Tons	3
					Annual Metric Tons	1.060
					Annual Short Tons	1.168

Daily Estimate of 2040 No-Action NO_X Emissions

Hour	2040 No-Action Peak Hour (grams)	Proportion of Analysis Hour (Based on Daily Counts and count locations)	Estimated 2040 No-Action Emissions - Peak Hours	Percent of Peak Hour (based on Daily Count Distributions)	Estimated 2040 No-Action NO_X per Hour (grams)
0:00				44.92%	74.727
1:00				31.08%	51.704
2:00				25.31%	42.098
3:00				27.02%	44.949
4:00				31.51%	52.408
5:00				49.73%	82.723
*6:00		13.43%	60.325	72.53%	120.650
7:00	449,179	34.42%	154.624	92.96%	154.624
8:00		35.12%	157.745	94.83%	157.745
*9:00		17.03%	76.485	91.96%	152.971
10:00				93.59%	155.681
11:00				100.00%	166.340
12:00				86.68%	219.917
13:00				89.90%	228.080
14:00				95.80%	243.038
*15:00		16.85%	123.374	97.26%	246.748
16:00	732,265	34.65%	253.697	100.00%	253.697
17:00		33.92%	248.413	97.92%	248.413
*18:00		14.58%	106.781	84.18%	213.561
19:00				75.64%	191.896
20:00				68.15%	172.893
21:00				63.85%	161.981
22:00				59.28%	150.380
23:00				52.84%	134.045
				Daily Grams	3.721.268
				Daily Kilograms	3.721
				Daily Metric Tons	4
				Annual Metric Tons	1.358
				Annual Short Tons	1.496

Daily Estimate of 2040 Alternative 1 NO_X Emissions

Hour	2040 Alternative 1 Peak Hour (grams)	Proportion of Analysis Hour (Based on Daily Counts and count locations)	Estimated 2040 Alternative 1 Emissions - Peak	Percent of Peak Hour (based on Daily Count Distributions)	Estimated 2040 Alternative 1 NO_X per Hour (grams)
0:00				44.92%	69.759
1:00				31.08%	48.267
2:00				25.31%	39.300
3:00				27.02%	41.961
4:00				31.51%	48.924
5:00				49.73%	77.224
*6:00		13.43%	56.315	72.53%	112.630
7:00	419,320	34.42%	144.345	92.96%	144.345
8:00		35.12%	147.259	94.83%	147.259
*9:00		17.03%	71.401	91.96%	142.802
10:00				93.59%	145.332
11:00				100.00%	155.282
12:00				86.68%	207.785
13:00				89.90%	215.498
14:00				95.80%	229.630
*15:00		16.85%	116.568	97.26%	233.136
16:00	691,869	34.65%	239.702	100.00%	239.702
17:00		33.92%	234.709	97.92%	234.709
*18:00		14.58%	100.890	84.18%	201.780
19:00				75.64%	181.310
20:00				68.15%	163.356
21:00				63.85%	153.045
22:00				59.28%	142.084
23:00				52.84%	126.651
				Daily Grams	3.501.770
				Daily Kilograms	3.502
				Daily Metric Tons	4
				Annual Metric Tons	1.278
				Annual Short Tons	1.408

Daily Estimate of 2040 Alternative 2 NO_X Emissions

Hour	2040 Alternative 2 Peak Hour (grams)	Proportion of Analysis Hour (Based on Daily Counts and count locations)	Estimated 2040 Alternative 2 Emissions - Peak	Percent of Peak Hour (based on Daily Count Distributions)	Estimated 2040 Alternative 2 NO_X per Hour (grams)
0:00				44.92%	68.206
1:00				31.08%	47.192
2:00				25.31%	38.424
3:00				27.02%	41.026
4:00				31.51%	47.835
5:00				49.73%	75.505
*6:00	409,983	13.43%	55.061	72.53%	110.122
7:00		34.42%	141.131	92.96%	141.131
8:00		35.12%	143.980	94.83%	143.980
*9:00		17.03%	69.811	91.96%	139.622
10:00				93.59%	142.096
11:00				100.00%	151.825
12:00				86.68%	203.239
13:00				89.90%	210.783
14:00				95.80%	224.607
*15:00	676,734	16.85%	114.018	97.26%	228.036
16:00		34.65%	234.458	100.00%	234.458
17:00		33.92%	229.575	97.92%	229.575
*18:00		14.58%	98.683	84.18%	197.366
19:00				75.64%	177.343
20:00				68.15%	159.782
21:00				63.85%	149.697
22:00				59.28%	138.976
23:00				52.84%	123.880
				Daily Grams	3.424.708
				Daily Kilograms	3.425
				Daily Metric Tons	3
				Annual Metric Tons	1.250
				Annual Short Tons	1.377

Daily Estimate of Existing (2017) PM Emissions

	Hour	Existing Peak Hour (2017) (grams)	Proportion of Analysis Hour (Based on Daily Counts and count locations)	Estimated Existing Emissions - Peak Hours	Percent of Peak Hour (based on Daily Count Distributions)	Estimated Existing NO_X per Hour (grams)
	0:00				44.92%	1.412
	1:00				31.08%	977
	2:00				25.31%	795
	3:00				27.02%	849
	4:00				31.51%	990
	5:00				49.73%	1.563
AM analysis peak begins at 6:30	*6:00		13.43%	1.140	72.53%	2.279
	7:00	8,486	34.42%	2.921	92.96%	2.921
	8:00		35.12%	2.980	94.83%	2.980
AM analysis peak ends at 9:30	*9:00		17.03%	1.445	91.96%	2.890
	10:00				93.59%	2.941
	11:00				100.00%	3.143
	12:00				86.68%	3.471
	13:00				89.90%	3.600
	14:00				95.80%	3.836
PM analysis peak begins at 15:30	*15:00		16.85%	1.947	97.26%	3.894
	16:00	11,557	34.65%	4.004	100.00%	4.004
	17:00		33.92%	3.921	97.92%	3.921
PM analysis peak ends at 18:30	*18:00		14.58%	1.685	84.18%	3.371
	19:00				75.64%	3.029
	20:00				68.15%	2.729
	21:00				63.85%	2.556
	22:00				59.28%	2.373
	23:00				52.84%	2.116
					Daily Grams	62.639
					Daily Kilograms	63
					Daily Metric Tons	0
					Annual Metric Tons	23
					Annual Short Tons	25

Daily Estimate of 2040 No-Action PM Emissions

Hour	2040 No-Action Peak Hour (grams)	Proportion of Analysis Hour (Based on Daily Counts and count locations)	Estimated 2040 No-Action Emissions - Peak Hours	Percent of Peak Hour (based on Daily Count Distributions)	Estimated 2040 No-Action NO_X per Hour (grams)
0:00				44.92%	2.375
1:00				31.08%	1.643
2:00				25.31%	1.338
3:00				27.02%	1.428
4:00				31.51%	1.665
5:00				49.73%	2.629
*6:00		13.43%	1.917	72.53%	3.834
7:00	14,274	34.42%	4.914	92.96%	4.914
8:00		35.12%	5.013	94.83%	5.013
*9:00		17.03%	2.431	91.96%	4.861
10:00				93.59%	4.947
11:00				100.00%	5.286
12:00				86.68%	4.951
13:00				89.90%	5.135
14:00				95.80%	5.472
*15:00		16.85%	2.778	97.26%	5.555
16:00	16,486	34.65%	5.712	100.00%	5.712
17:00		33.92%	5.593	97.92%	5.593
*18:00		14.58%	2.404	84.18%	4.808
19:00				75.64%	4.320
20:00				68.15%	3.892
21:00				63.85%	3.647
22:00				59.28%	3.386
23:00				52.84%	3.018
				Daily Grams	95.421
				Daily Kilograms	95
				Daily Metric Tons	0
				Annual Metric Tons	35
				Annual Short Tons	38

Daily Estimate of 2040 Alternative 1 PM Emissions

Hour	2040 Alternative 1 Peak Hour (grams)	Proportion of Analysis Hour (Based on Daily Counts and count locations)	Estimated 2040 Alternative 1 Emissions - Peak	Percent of Peak Hour (based on Daily Count Distributions)	Estimated 2040 Alternative 1 NO_X per Hour (grams)
0:00				44.92%	1.946
1:00				31.08%	1.346
2:00				25.31%	1.096
3:00				27.02%	1.170
4:00				31.51%	1.365
5:00				49.73%	2.154
*6:00		13.43%	1.571	72.53%	3.141
7:00	11,695	34.42%	4.026	92.96%	4.026
8:00		35.12%	4.107	94.83%	4.107
*9:00		17.03%	1.991	91.96%	3.983
10:00				93.59%	4.053
11:00				100.00%	4.331
12:00				86.68%	4.089
13:00				89.90%	4.241
14:00				95.80%	4.519
*15:00		16.85%	2.294	97.26%	4.588
16:00	13,616	34.65%	4.717	100.00%	4.717
17:00		33.92%	4.619	97.92%	4.619
*18:00		14.58%	1.986	84.18%	3.971
19:00				75.64%	3.568
20:00				68.15%	3.215
21:00				63.85%	3.012
22:00				59.28%	2.796
23:00				52.84%	2.492
				Daily Grams	78.546
				Daily Kilograms	79
				Daily Metric Tons	0
				Annual Metric Tons	29
				Annual Short Tons	32

Daily Estimate of 2040 Alternative 2 PM Emissions

Hour	2040 Alternative 2 Peak Hour (grams)	Proportion of Analysis Hour (Based on Daily Counts and count locations)	Estimated 2040 Alternative 2 Emissions - Peak	Percent of Peak Hour (based on Daily Count Distributions)	Estimated 2040 Alternative 2 NO_X per Hour (grams)
0:00				44.92%	1.799
1:00				31.08%	1.245
2:00				25.31%	1.014
3:00				27.02%	1.082
4:00				31.51%	1.262
5:00				49.73%	1.992
*6:00	10,814	13.43%	1.452	72.53%	2.905
7:00		34.42%	3.723	92.96%	3.723
8:00		35.12%	3.798	94.83%	3.798
*9:00		17.03%	1.841	91.96%	3.683
10:00				93.59%	3.748
11:00				100.00%	4.005
12:00				86.68%	3.813
13:00				89.90%	3.954
14:00				95.80%	4.214
*15:00	12,696	16.85%	2.139	97.26%	4.278
16:00		34.65%	4.399	100.00%	4.399
17:00		33.92%	4.307	97.92%	4.307
*18:00		14.58%	1.851	84.18%	3.703
19:00				75.64%	3.327
20:00				68.15%	2.998
21:00				63.85%	2.808
22:00				59.28%	2.607
23:00				52.84%	2.324
				Daily Grams	72.985
				Daily Kilograms	73
				Daily Metric Tons	0
				Annual Metric Tons	27
				Annual Short Tons	29

Daily Estimate of Existing (2017) VOC Emissions

	Hour	Existing Peak Hour (2017) (grams)	Proportion of Analysis Hour (Based on Daily Counts and count locations)	Estimated Existing Emissions - Peak Hours	Percent of Peak Hour (based on Daily Count Distributions)	Estimated Existing VOC per Hour (grams)
	0:00				44.92%	21.770
	1:00				31.08%	15.063
	2:00				25.31%	12.264
	3:00				27.02%	13.095
	4:00				31.51%	15.268
	5:00				49.73%	24.099
AM analysis peak begins at 6:30	*6:00		13.43%	17.574	72.53%	35.148
	7:00	130,857	34.42%	45.046	92.96%	45.046
	8:00		35.12%	45.955	94.83%	45.955
AM analysis peak ends at 9:30	*9:00		17.03%	22.282	91.96%	44.564
	10:00				93.59%	45.354
	11:00				100.00%	48.459
	12:00				86.68%	60.380
	13:00				89.90%	62.621
	14:00				95.80%	66.728
PM analysis peak begins at 15:30	*15:00		16.85%	33.873	97.26%	67.746
	16:00	201,049	34.65%	69.655	100.00%	69.655
	17:00		33.92%	68.204	97.92%	68.204
PM analysis peak ends at 18:30	*18:00		14.58%	29.317	84.18%	58.635
	19:00				75.64%	52.686
	20:00				68.15%	47.469
	21:00				63.85%	44.473
	22:00				59.28%	41.288
	23:00				52.84%	36.803
					Daily Grams	1.042.773
					Daily Kilograms	1.043
					Daily Metric Tons	1
					Annual Metric Tons	381
					Annual Short Tons	419

Daily Estimate of 2040 No-Action VOC Emissions

Hour	2040 No-Action Peak Hour (grams)	Proportion of Analysis Hour (Based on Daily Counts and count locations)	Estimated 2040 No-Action Emissions - Peak Hours	Percent of Peak Hour (based on Daily Count Distributions)	Estimated 2040 No-Action VOC per Hour (grams)
0:00				44.92%	25.384
1:00				31.08%	17.563
2:00				25.31%	14.300
3:00				27.02%	15.268
4:00				31.51%	17.802
5:00				49.73%	28.100
*6:00	152,579	13.43%	20.491	72.53%	40.983
7:00		34.42%	52.523	92.96%	52.523
8:00		35.12%	53.584	94.83%	53.584
*9:00		17.03%	25.981	91.96%	51.962
10:00				93.59%	52.882
11:00				100.00%	56.503
12:00				86.68%	61.550
13:00				89.90%	63.835
14:00				95.80%	68.022
*15:00	204,947	16.85%	34.530	97.26%	69.060
16:00		34.65%	71.005	100.00%	71.005
17:00		33.92%	69.526	97.92%	69.526
*18:00		14.58%	29.886	84.18%	59.772
19:00				75.64%	53.708
20:00				68.15%	48.390
21:00				63.85%	45.335
22:00				59.28%	42.088
23:00				52.84%	37.517
				Daily Grams	1.116.662
				Daily Kilograms	1.117
				Daily Metric Tons	1
				Annual Metric Tons	408
				Annual Short Tons	449

Daily Estimate of 2040 Alternative 1 VOC Emissions

Hour	2040 Alternative 1 Peak Hour (grams)	Proportion of Analysis Hour (Based on Daily Counts and count locations)	Estimated 2040 Alternative 1 Emissions - Peak	Percent of Peak Hour (based on Daily Count Distributions)	Estimated 2040 Alternative 1 VOC per Hour
0:00				44.92%	24.272
1:00				31.08%	16.794
2:00				25.31%	13.674
3:00				27.02%	14.599
4:00				31.51%	17.022
5:00				49.73%	26.869
*6:00		13.43%	19.594	72.53%	39.187
7:00	145,895	34.42%	50.222	92.96%	50.222
8:00		35.12%	51.236	94.83%	51.236
*9:00		17.03%	24.843	91.96%	49.685
10:00				93.59%	50.566
11:00				100.00%	54.028
12:00				86.68%	56.566
13:00				89.90%	58.666
14:00				95.80%	62.513
*15:00		16.85%	31.734	97.26%	63.468
16:00	188,351	34.65%	65.255	100.00%	65.255
17:00		33.92%	63.896	97.92%	63.896
*18:00		14.58%	27.466	84.18%	54.932
19:00				75.64%	49.359
20:00				68.15%	44.471
21:00				63.85%	41.664
22:00				59.28%	38.680
23:00				52.84%	34.479
				Daily Grams	1.042.104
				Daily Kilograms	1.042
				Daily Metric Tons	1
				Annual Metric Tons	380
				Annual Short Tons	419

Daily Estimate of 2040 Alternative 2 VOC Emissions

Hour	2040 Alternative 2 Peak Hour (grams)	Proportion of Analysis Hour (Based on Daily Counts and count locations)	Estimated 2040 Alternative 2 Emissions - Peak	Percent of Peak Hour (based on Daily Count Distributions)	Estimated 2040 Alternative 2 VOC per Hour
0:00				44.92%	24.161
1:00				31.08%	16.717
2:00				25.31%	13.611
3:00				27.02%	14.533
4:00				31.51%	16.945
5:00				49.73%	26.746
*6:00	145,229	13.43%	19.504	72.53%	39.009
7:00		34.42%	49.993	92.96%	49.993
8:00		35.12%	51.002	94.83%	51.002
*9:00		17.03%	24.729	91.96%	49.459
10:00				93.59%	50.335
11:00				100.00%	53.781
12:00				86.68%	55.549
13:00				89.90%	57.611
14:00				95.80%	61.389
*15:00	184,964	16.85%	31.163	97.26%	62.326
16:00		34.65%	64.082	100.00%	64.082
17:00		33.92%	62.747	97.92%	62.747
*18:00		14.58%	26.972	84.18%	53.944
19:00				75.64%	48.471
20:00				68.15%	43.671
21:00				63.85%	40.915
22:00				59.28%	37.985
23:00				52.84%	33.859
				Daily Grams	1.028.841
				Daily Kilograms	1.029
				Daily Metric Tons	1
				Annual Metric Tons	376
				Annual Short Tons	414

Gross Domestic Product Deflator										
Year	2018				2019				2020	
Quarter	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2
Gross Domestic Product	109.237	110.176	110.614	111.14	111.424	112.141	112.531	112.95	113.415	112.803

Index Gross Domestic Product Year
2012

Index Gross Domestic Product
100

Deflation Rate (2020 to 2019)
98.505%

Current Quarter Year
2020

2012-2020 GDP Deflator Annual Increase
1.517%

Economic Update Factor (Using GDP Deflator)
1.0152

Table 1.1.9. Implicit Price Deflators for Gross Domestic Product

[Index numbers, 2012=100] Seasonally adjusted

Bureau of Economic Analysis

Last Revised on: July 30, 2020 - Next Release Date August 27, 2020

Line		2018				2019				2020	
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2
1	**Gross domestic product**	109.237	110.176	110.614	111.14	111.424	112.141	112.531	112.95	113.415	112.803
2	**Personal consumption expenditures**	107.481	108.077	108.498	108.885	109.039	109.722	110.104	110.525	110.878	110.352
3	Goods	95.232	95.42	95.318	95.009	94.571	94.984	94.765	94.816	94.598	93.127
4	Durable goods	87.958	87.694	87.375	87.102	86.971	86.756	86.372	85.784	85.415	84.448
5	Nondurable goods	99.048	99.494	99.519	99.191	98.577	99.356	99.236	99.669	99.54	97.784
6	Services	113.828	114.645	115.35	116.12	116.6	117.431	118.15	118.777	119.452	119.505
7	**Gross private domestic investment**	106.359	107.43	107.505	107.991	108.373	109.03	109.115	109.355	110.255	109.889
8	Fixed investment	107.183	107.843	108.33	108.622	109.277	109.766	110.048	110.098	110.446	110.67
9	Nonresidential	102.438	102.75	103.069	103.254	103.884	104.341	104.457	104.343	104.59	104.784
10	Structures	113.406	114.071	114.644	116.194	117.328	118.609	119.232	119.662	120.118	119.835
11	Equipment	97.485	97.497	97.882	97.866	98.079	97.991	97.757	97.721	97.887	97.806
12	Intellectual property products	102.055	102.55	102.615	102.26	103.147	103.846	104.126	103.603	103.836	104.597
13	Residential	128.045	130.224	131.455	132.228	132.984	133.609	134.65	135.452	136.24	136.597
14	Change in private inventories	---	---	---	---	---	---	---	---	---	---
15	**Net exports of goods and services**	---	---	---	---	---	---	---	---	---	---
16	Exports	98.199	99.417	99.721	99.398	98.557	99.337	98.764	98.351	97.74	93.093
17	Goods	92.29	93.646	93.86	93.203	92.002	92.547	91.565	91.177	90.113	84.694
18	Services	111.464	112.354	112.867	113.319	113.326	114.646	115.015	114.544	115.014	112.198
19	Imports	91.461	91.524	91.859	91.419	90.519	90.713	89.97	89.65	89.337	86.381
20	Goods	88.207	88.158	88.459	87.91	86.822	86.981	86.082	85.67	85.336	82.142
21	Services	108.519	109.202	109.73	109.892	110.029	110.402	110.499	110.666	110.469	109.051
22	**Government consumption expenditures and gross investment**	109.897	110.929	111.817	112.588	112.927	113.253	113.544	114.019	114.524	113.931
23	Federal	107.954	108.754	109.405	110.212	111.478	110.762	110.924	111.285	111.209	111.016
24	National defense	106.409	107.21	107.862	108.383	108.814	109.112	109.341	109.738	109.697	109.072
25	Nondefense	110.383	111.182	111.832	113.079	115.655	113.349	113.409	113.712	113.582	114.038
26	State and local	111.188	112.363	113.397	114.146	113.911	114.887	115.259	115.808	116.685	115.829
	Addendum:										
27	Gross national product	109.206	110.141	110.58	111.104	111.388	112.102	112.492	112.911	113.375	---

Appendix D: Build Alt. 2 BCA Workbook

I-15 Flamingo to Sahara Feasibility Study

General Economic Parameters

Year of Current Dollars for Model	2019		
Economic Update Factor (Using GDP Deflator)	1.0152		1
Real Discount Rate	7.0%		2

Value of Travel Time Savings (2019)

		Value	Units	
Truck Drivers				
Hourly Value	$	33.48	$/hr	3
Value of Time				
Personal	$	11.16	$/hr/per	4
Business	$	33.48	$/hr/veh	4

Vehicle Occupancies

Passenger Vehicles	1.51	per vehicle	5
Trucks	1.00	per vehicle	5

Vehicle Operating Costs (2019)

Operating Costs				
Automobile (regular unleaded)	$	0.31	$/mile	6
Truck (diesel)	$	0.59	$/mile	6

Crash Costs

Cost of a Fatality (2019)	$	6,200,000	$/event	7
Cost of an Injury (2019)				
Level A (Incapacitating)	$	330,600	$/event	7
Level B (Non-incapacitating)	$	127,300	$/event	7
Level C (Possibly Injured)	$	67,900	$/event	7
Cost of Property Damage (2019)	$	11,000	$/event	7
Cost of Highway Accident (2019)				
Fatal Crash	$	9,800,000	$/accident	8
Injury A Crash	$	467,400	$/accident	8
Injury B Crash	$	127,300	$/accident	8
Injury C Crash	$	65,100	$/accident	8
PDO Crash	$	4,500	$/accident	8

1 2012-2020 GDP Deflator Annual Increase
2 Nevada DOT Guidance for BCAs
3 Nevada DOT Guidance for BCAs
4 Nevada DOT Guidance for BCAs
5 Nevada DOT Guidance for BCAs
6 Nevada DOT Guidance for BCAs
7 Nevada DOT Guidance for BCAs
8 Nevada DOT Guidance for BCAs

I-15 Flamingo to Sahara Feasibility Study Alt. 2 Benefit/Cost Summary (Discounted at 7% Rate)	
Benefits and Costs	**Present Value (2019$)**
Benefits	
Travel time savings	$149,565,928
Operation costs savings	($9,060,355)
Crash cost savings	$8,920,305
Emissions cost savings	$16,495,479
Residual Value	$81,241,210
Total Benefits	**$247,162,567**
Costs	
Construction Costs	$247,419,280
Road and Bridge O&M	$2,222,953
Total Costs	**$249,642,233**
Net Benefits	**($2,479,666)**
Benefit/Cost Ratio	**0.99**

I-15 Flamingo to Sahara Feasibility Study Alt. 2 Benefit /Cost Sensitivity Summary (Discounted at 3% Rate)	
Benefits and Costs	**Present Value (2019$)**
Benefits	
Travel time savings	$259,116,471
Operation costs savings	($15,705,511)
Crash cost savings	$15,465,408
Emissions cost savings	$28,660,509
Residual Value	$180,823,136
Total Benefits	**$468,360,013**
Costs	
Construction Costs	$322,643,893
Road and Bridge O&M	$3,836,667
Total Costs	**$326,480,560**
Net Benefits	**$141,879,453**
Benefit/Cost Ratio	**1.43**

Costs and Benefits I-15 Flamingo to Sahara Feasibility Study

Benefits and Costs by Year, 2019$

Year	Travel Time Savings	Operation Costs Savings	Crash Reduction Savings	Emissions CO_2 Savings	Emissions NO_x Savings	Emissions PM Savings	Emissions VOC Savings	Design and Construction Costs	O&M Costs	Residual Value
2019	N/A	N/A	N/A	$0	$0	N/A	N/A	N/A	N/A	N/A
2025	$0	$0	$0	$0	$0	$0	$0	$132,231,916	$0	$0
2026	$0	$0	$0	$0	$0	$0	$0	$132,231,916	$0	$0
2027	$0	$0	$0	$0	$0	$0	$0	$132,231,916	$0	$0
2028	$29,636,291	($1,785,380)	$1,754,802	$44,548	$11,561	$3,055,388	$64,909	$0	$457,000	$0
2029	$29,850,515	($1,800,213)	$1,769,961	$45,123	$11,839	$3,094,318	$65,736	$0	$457,000	$0
2030	$30,066,287	($1,815,170)	$1,785,251	$45,707	$12,120	$3,133,744	$66,574	$0	$457,000	$0
2031	$30,283,618	($1,830,251)	$1,800,674	$46,298	$12,405	$3,173,673	$67,422	$0	$457,000	$0
2032	$30,502,521	($1,845,457)	$1,816,229	$46,896	$12,694	$3,214,110	$68,281	$0	$457,000	$0
2033	$30,723,006	($1,860,790)	$1,831,919	$47,502	$12,987	$3,255,063	$69,151	$0	$457,000	$0
2034	$30,945,084	($1,876,250)	$1,847,745	$48,117	$13,283	$3,296,537	$70,032	$0	$457,000	$0
2035	$31,168,768	($1,891,838)	$1,863,707	$48,739	$13,583	$3,338,540	$70,924	$0	$457,000	$0
2036	$31,394,068	($1,907,556)	$1,879,807	$49,369	$13,887	$3,381,078	$71,828	$0	$457,000	$0
2037	$31,620,998	($1,923,405)	$1,896,047	$50,007	$14,195	$3,424,158	$72,743	$0	$457,000	$0
2038	$31,849,567	($1,939,385)	$1,912,426	$50,653	$14,507	$3,467,786	$73,670	$0	$457,000	$0
2039	$32,079,789	($1,955,498)	$1,928,947	$51,308	$14,822	$3,511,971	$74,609	$0	$457,000	$0
2040	$32,311,675	($1,971,745)	$1,945,611	$51,971	$15,142	$3,556,719	$75,559	$0	$457,000	##########
Totals	**$402,432,186**	**($24,402,939)**	**$24,033,127**	**$626,237**	**$173,025**	**$42,903,083**	**$911,439**	**$396,695,749**	**$5,941,000**	**$336,384,299**

Total Benefits $783,060,457

Present Value of Benefits and Costs by Year

Discount Rate = 7.00%

Year	Travel Time Savings	Operation Costs Savings	Crash Reduction Savings	Emissions CO_2 Savings	Emissions NO_x Savings	Emissions PM Savings	Emissions VOC Savings	Design and Construction Costs	O&M Costs	Residual Value
2019	N/A	N/A	N/A	$0	$0	N/A	N/A	N/A	N/A	N/A
2025	$0	$0	$0	$0	$0	$0	$0	$88,111,709	$0	$0
2026	$0	$0	$0	$0	$0	$0	$0	$82,347,392	$0	$0
2027	$0	$0	$0	$0	$0	$0	$0	$76,960,179	$0	$0
2028	$16,120,179	($971,128)	$954,496	$24,231	$6,288	$1,661,928	$35,306	$0	$248,578	$0
2029	$15,174,488	($915,137)	$899,758	$22,938	$6,018	$1,572,994	$33,417	$0	$232,316	$0
2030	$14,284,276	($862,374)	$848,160	$21,715	$5,758	$1,488,819	$31,629	$0	$217,117	$0
2031	$13,446,289	($812,653)	$799,521	$20,557	$5,508	$1,409,149	$29,936	$0	$202,913	$0
2032	$12,657,462	($765,799)	$753,671	$19,460	$5,268	$1,333,741	$28,334	$0	$189,639	$0
2033	$11,914,911	($721,646)	$710,450	$18,422	$5,036	$1,262,369	$26,818	$0	$177,232	$0
2034	$11,215,923	($680,039)	$669,708	$17,440	$4,814	$1,194,817	$25,383	$0	$165,638	$0
2035	$10,557,940	($640,831)	$631,302	$16,509	$4,601	$1,130,879	$24,025	$0	$154,802	$0
2036	$9,938,558	($603,884)	$595,099	$15,629	$4,396	$1,070,363	$22,739	$0	$144,674	$0
2037	$9,355,512	($569,066)	$560,972	$14,795	$4,200	$1,013,085	$21,522	$0	$135,210	$0
2038	$8,806,671	($536,256)	$528,802	$14,006	$4,011	$958,872	$20,370	$0	$126,364	$0
2039	$8,290,027	($505,338)	$498,477	$13,259	$3,830	$907,560	$19,280	$0	$118,097	$0
2040	$7,803,692	($476,202)	$469,891	$12,552	$3,657	$858,994	$18,249	$0	$110,371	$81,241,210
Totals	**$149,565,928**	**($9,060,355)**	**$8,920,305**	**$231,513**	**$63,387**	**$15,863,570**	**$337,008**	**$247,419,280**	**$2,222,953**	**$81,241,210**

Total Discounted Benefits $247,162,567

Costs and Benefits I-15 Flamingo to Sahara Feasibility Study Sensitivity Analysis @ 3.0% Discount Rate

Present Value of Benefits and Costs by Year

Discount Rate = 3.00%

Year	Travel Time Savings	Operation Costs Savings	Crash Reduction Savings	Emissions CO_2 Savings	Emissions NO_x Savings	Emissions PM Savings	Emissions VOC Savings	Design and Construction Costs	O&M Costs	Residual Value
2019	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2025	$0	$0	$0	$0	$0	$0	$0	$110,742,148	$0	$0
2026	$0	$0	$0	$0	$0	$0	$0	$107,516,649	$0	$0
2027	$0	$0	$0	$0	$0	$0	$0	$104,385,096	$0	$0
2028	$22,713,750	($1,368,345)	$1,344,909	$34,142	$8,861	$2,341,700	$49,747	$0	$350,252	$0
2029	$22,211,586	($1,339,528)	$1,317,017	$33,576	$8,809	$2,302,463	$48,914	$0	$340,051	$0
2030	$21,720,525	($1,311,317)	$1,289,704	$33,020	$8,756	$2,263,883	$48,094	$0	$330,147	$0
2031	$21,240,321	($1,283,701)	$1,262,956	$32,472	$8,701	$2,225,950	$47,288	$0	$320,531	$0
2032	$20,770,732	($1,256,667)	$1,236,764	$31,934	$8,644	$2,188,652	$46,496	$0	$311,195	$0
2033	$20,311,526	($1,230,201)	$1,211,115	$31,405	$8,586	$2,151,980	$45,717	$0	$302,131	$0
2034	$19,862,472	($1,204,293)	$1,185,997	$30,884	$8,526	$2,115,922	$44,951	$0	$293,331	$0
2035	$19,423,346	($1,178,931)	$1,161,401	$30,372	$8,464	$2,080,468	$44,198	$0	$284,787	$0
2036	$18,993,928	($1,154,103)	$1,137,314	$29,869	$8,402	$2,045,608	$43,457	$0	$276,493	$0
2037	$18,574,003	($1,129,798)	$1,113,728	$29,374	$8,338	$2,011,332	$42,729	$0	$268,439	$0
2038	$18,163,363	($1,106,004)	$1,090,630	$28,887	$8,273	$1,977,630	$42,013	$0	$260,621	$0
2039	$17,761,801	($1,082,712)	$1,068,011	$28,408	$8,207	$1,944,493	$41,309	$0	$253,030	$0
2040	$17,369,117	($1,059,910)	$1,045,862	$27,937	$8,140	$1,911,912	$40,617	$0	$245,660	$180,823,136
Totals	**$259,116,471**	**($15,705,511)**	**$15,465,408**	**$402,279**	**$110,706**	**$27,561,993**	**$585,531**	**$322,643,893**	**$3,836,667**	**$180,823,136**

Abbreviation Legend and Notes	
N/A	No Application
TRK	Truck Trips
AM Peak	7:00 AM to 9:00 AM, PST
HPMS	Highway Performance Monitoring System
PCE	Passenger Car Equivalent
TDM	Travel Demand Model
AADT	Annual Average Daily Traffic
VHT	Vehicle Hours Travelled
VMT	Vehicle Miles Travelled
PHT	Person Hours Travelled

PCE Travel Demand Model	
TRK	1.63

Average Vehicle Occupancies Travel Demand Model	
Automobile	1.51
TRK	1.00

All Vehicle Volumes			
	2017	2040 No-Build	2040 Alt2
AM (7-9) Peak Traffic	74,820	98,685	97,796
PM (4-6) Peak Traffic	86,644	118,191	117,831
Average Daily Speed			
AADT	726,290	977,148	971,803
Daily VMT	########	2,797,015	2,813,474
Daily VHT	66,384	78,373	74,253

Car Volumes			
	2017	2040 No-Build	2040 Alt2
AM (7-9) Peak Traffic	71,753	94,639	93,787
PM (4-6) Peak Traffic	80,925	110,391	110,054
Average Daily Speed			
AADT	685,880	922,582	917,499
Daily VMT	########	2,644,096	2,659,485
Daily VHT	62,610	73,967	70,061

Truck Volumes			
	2017	2040 No-Build	2040 Alt2
AM (7-9) Peak Traffic	3,068	4,046	4,010
PM (4-6) Peak Traffic	5,718	7,801	7,777
Average Daily Speed			
AADT	40,410	54,567	54,303
Daily VMT	126,373	152,919	153,989
Daily VHT	3,774	4,406	4,192

Annual Growth Rates (2017 and 2040-No Build)			
	2017	2040 No-Build	Annual Growth
AADT	726,290	977,148	1.30%
VMT	2,312,360	2,797,015	0.83%
VHT	66,384	78,373	0.72%

Annual Growth Rates (2017 and 2040 Build)			
	2017	2040 Build	Annual Growth
AADT	726,290	971,803	1.27%
VMT	2,312,360	2,813,474	0.86%
VHT	66,384	74,253	0.49%

Annual Growth Rates (Automobile)			
	2017	2040 No-Build	Annual Growth
AADT	685,880	922,582	1.30%
VMT	2,185,986	2,644,096	0.83%
VHT	62,610	73,967	0.73%

Annual Growth Rates (Truck)			
	2017	2040 No-Build	Annual Growth
AADT	40,410	54,567	1.31%
VMT	126,373	152,919	0.83%
VHT	3,774	4,406	0.68%

Daily Traffic Values in Study Area 2023 to 2040 (All Vehicles)

Year	No-Build			Build (Alt 2)			Improvement		
	AADT	Daily VMT	Daily VHT	AADT	Daily VMT	Daily VHT	ADT	Daily VMT	Daily VHT
2017	726,290	########	66,384	N/A	N/A	N/A	N/A	N/A	N/A
2022	774,678	########	68,824	N/A	N/A	N/A	N/A	N/A	N/A
2023	784,736	########	69,322	780,443	2,444,340	65,678	4,293	-14,300	3,645
2024	794,924	########	69,825	790,575	2,464,647	66,154	4,349	-14,419	3,671
2025	805,244	########	70,330	800,839	2,485,122	66,633	4,405	-14,538	3,698
2026	815,699	########	70,840	811,237	2,505,767	67,116	4,462	-14,659	3,724
2027	826,289	########	71,353	821,769	2,526,584	67,602	4,520	-14,781	3,751
2028	837,017	########	71,870	832,438	2,547,573	68,092	4,579	-14,904	3,779
2029	847,884	########	72,391	843,246	2,568,737	68,585	4,639	-15,028	3,806
2030	858,892	########	72,915	854,193	2,590,077	69,082	4,699	-15,152	3,833
2031	870,043	########	73,443	865,283	2,611,594	69,582	4,760	-15,278	3,861
2032	881,339	########	73,976	876,518	2,633,290	70,086	4,822	-15,405	3,889
2033	892,782	########	74,511	887,897	2,655,167	70,594	4,884	-15,533	3,917
2034	904,373	########	75,051	899,425	2,677,224	71,106	4,948	-15,662	3,946
2035	916,114	########	75,595	911,102	2,699,466	71,621	5,012	-15,792	3,974
2036	928,008	########	76,143	922,931	2,721,892	72,140	5,077	-15,924	4,003
2037	940,057	########	76,694	934,914	2,744,504	72,662	5,143	-16,056	4,032
2038	952,261	########	77,250	947,052	2,767,304	73,189	5,210	-16,189	4,061
2039	964,625	########	77,810	959,347	2,790,293	73,719	5,277	-16,324	4,091
2040	977,148	########	78,373	971,803	2,813,474	74,253	5,346	-16,459	4,120

Annual Traffic Values in Study Area 2023 to 2040 (All Vehicles)

Year	No-Build			Build (Alt 2)			Improvement			
	Annual Traffic	Annual VMT	Annual VHT	Annual Traffic	Annual VMT	Annual VHT	Annual Traffic	Annual VMT	Annual VHT	% VMT
2017	265,095,969	844,011,282	24,230,151	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2022	282,757,447	879,656,921	25,120,663	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2023	286,428,506	886,964,705	25,302,655	284,861,530	892,184,129	23,972,384	1,566,976	-5,219,424	1,330,270	-0.59%
2024	290,147,226	894,333,199	25,485,965	288,559,906	899,595,984	24,146,057	1,587,320	-5,262,784	1,339,908	-0.59%
2025	293,914,227	901,762,907	25,670,603	292,306,299	907,069,412	24,320,988	1,607,928	-5,306,505	1,349,615	-0.59%
2026	297,730,135	909,254,338	25,856,579	296,101,331	914,604,927	24,497,187	1,628,804	-5,350,589	1,359,392	-0.59%
2027	301,595,585	916,808,004	26,043,902	299,945,634	922,203,043	24,674,662	1,649,951	-5,395,039	1,369,241	-0.59%
2028	305,511,220	924,424,422	26,232,583	303,839,848	929,864,281	24,853,422	1,671,372	-5,439,859	1,379,161	-0.59%
2029	309,477,693	932,104,114	26,422,630	307,784,621	937,589,165	25,033,478	1,693,072	-5,485,051	1,389,152	-0.59%
2030	313,495,662	939,847,606	26,614,054	311,780,609	945,378,224	25,214,838	1,715,053	-5,530,618	1,399,216	-0.59%
2031	317,565,797	947,655,427	26,806,865	315,828,477	953,231,990	25,397,512	1,737,320	-5,576,564	1,409,353	-0.59%
2032	321,688,775	955,528,111	27,001,073	319,928,899	961,151,002	25,581,510	1,759,876	-5,622,891	1,419,563	-0.59%
2033	325,865,282	963,466,198	27,196,688	324,082,557	969,135,802	25,766,840	1,782,724	-5,669,604	1,429,848	-0.59%
2034	330,096,012	971,470,231	27,393,720	328,290,143	977,186,936	25,953,513	1,805,869	-5,716,704	1,440,207	-0.59%
2035	334,381,671	979,540,758	27,592,179	332,552,356	985,304,954	26,141,539	1,829,315	-5,764,196	1,450,640	-0.59%
2036	338,722,970	987,678,332	27,792,076	336,869,905	993,490,414	26,330,926	1,853,065	-5,812,082	1,461,150	-0.59%
2037	343,120,633	995,883,508	27,993,422	341,243,509	###########	26,521,686	1,877,124	-5,860,366	1,471,735	-0.59%
2038	347,575,391	###########	28,196,226	345,673,896	###########	26,713,828	1,901,494	-5,909,051	1,482,398	-0.59%
2039	352,087,985	###########	28,400,499	350,161,803	###########	26,907,362	1,926,182	-5,958,141	1,493,137	-0.59%
2040	356,659,167	###########	28,606,252	354,707,977	###########	27,102,298	1,951,189	-6,007,639	1,503,955	-0.59%

Daily Automobile Traffic Values in Study Area 2023 to 2040

Year	No-Build			Build (Alt 2)			Improvement		
	ADT	Daily VMT	Daily VHT	ADT	Daily VMT	Daily VHT	ADT	Daily VMT	Daily VHT
2017	685,880	########	62,610	N/A	N/A	N/A	N/A	N/A	N/A
2022	731,541	########	64,921	N/A	N/A	N/A	N/A	N/A	N/A
2023	741,032	########	65,393	736,950	2,310,593	61,939	4,082	-13,370	3,454
2024	750,646	########	65,869	746,510	2,329,786	62,390	4,135	-13,481	3,479
2025	760,384	########	66,348	756,195	2,349,138	62,843	4,189	-13,593	3,504
2026	770,249	########	66,830	766,006	2,368,651	63,301	4,243	-13,706	3,530
2027	780,242	########	67,317	775,944	2,388,327	63,761	4,298	-13,820	3,556
2028	790,364	########	67,806	786,010	2,408,166	64,225	4,354	-13,935	3,581
2029	800,618	########	68,299	796,208	2,428,169	64,692	4,410	-14,051	3,607
2030	811,005	########	68,796	806,538	2,448,339	65,163	4,468	-14,167	3,634
2031	821,527	########	69,297	817,001	2,468,676	65,637	4,526	-14,285	3,660
2032	832,185	########	69,801	827,601	2,489,182	66,114	4,584	-14,404	3,687
2033	842,981	########	70,308	838,338	2,509,859	66,595	4,644	-14,523	3,714
2034	853,918	########	70,820	849,214	2,530,707	67,079	4,704	-14,644	3,741
2035	864,996	########	71,335	860,231	2,551,729	67,567	4,765	-14,766	3,768
2036	876,218	########	71,854	871,391	2,572,925	68,059	4,827	-14,888	3,795
2037	887,586	########	72,377	882,696	2,594,297	68,554	4,890	-15,012	3,823
2038	899,101	########	72,903	894,148	2,615,847	69,052	4,953	-15,137	3,851
2039	910,766	########	73,433	905,748	2,637,575	69,555	5,017	-15,262	3,879
2040	922,582	########	73,967	917,499	2,659,485	70,061	5,082	-15,389	3,907

Annual Automobile Traffic Values in Study Area 2023 to 2040

Year	No-Build			Build (Alt 2)			Improvement			
	Annual Traffic	Annual VMT	Annual VHT	Annual Traffic	Annual VMT	Annual VHT	Annual Traffic	Annual VMT	Annual VHT	% VMT
2017	250,346,194	797,885,029	22,852,774	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2022	267,012,483	831,578,581	23,696,097	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2023	270,476,589	838,486,144	23,868,460	268,986,595	843,366,267	22,607,778	1,489,993	-4,880,123	1,260,683	-0.58%
2024	273,985,636	845,451,085	24,042,077	272,476,312	850,371,745	22,772,224	1,509,324	-4,920,660	1,269,853	-0.58%
2025	277,540,208	852,473,881	24,216,957	276,011,303	857,435,414	22,937,867	1,528,905	-4,961,534	1,279,090	-0.58%
2026	281,140,896	859,555,012	24,393,108	279,592,155	864,557,759	23,104,715	1,548,741	-5,002,747	1,288,394	-0.58%
2027	284,788,297	866,694,963	24,570,541	283,219,464	871,739,266	23,272,776	1,568,833	-5,044,303	1,297,765	-0.58%
2028	288,483,018	873,894,223	24,749,265	286,893,832	878,980,426	23,442,060	1,589,187	-5,086,204	1,307,205	-0.58%
2029	292,225,673	881,153,284	24,929,288	290,615,869	886,281,736	23,612,575	1,609,804	-5,128,452	1,316,713	-0.58%
2030	296,016,884	888,472,642	25,110,621	294,386,195	893,643,694	23,784,330	1,630,689	-5,171,052	1,326,291	-0.58%
2031	299,857,280	895,852,799	25,293,273	298,205,435	901,066,805	23,957,335	1,651,845	-5,214,006	1,335,938	-0.58%
2032	303,747,500	903,294,261	25,477,254	302,074,225	908,551,577	24,131,598	1,673,275	-5,257,316	1,345,656	-0.58%
2033	307,688,190	910,797,535	25,662,573	305,993,206	916,098,521	24,307,129	1,694,984	-5,300,987	1,355,444	-0.58%
2034	311,680,004	918,363,135	25,849,240	309,963,031	923,708,155	24,483,937	1,716,974	-5,345,020	1,365,303	-0.58%
2035	315,723,607	925,991,580	26,037,265	313,984,358	931,380,999	24,662,030	1,739,249	-5,389,418	1,375,234	-0.58%
2036	319,819,670	933,683,391	26,226,657	318,057,856	939,117,577	24,841,419	1,761,813	-5,434,186	1,385,238	-0.58%
2037	323,968,873	941,439,094	26,417,427	322,184,203	946,918,420	25,022,113	1,784,670	-5,479,325	1,395,314	-0.58%
2038	328,171,906	949,259,221	26,609,585	326,364,082	954,784,061	25,204,121	1,807,824	-5,524,840	1,405,463	-0.58%
2039	332,429,468	957,144,306	26,803,140	330,598,190	962,715,039	25,387,454	1,831,278	-5,570,732	1,415,686	-0.58%
2040	336,742,265	965,094,889	26,998,103	334,887,229	970,711,895	25,572,119	1,855,036	-5,617,006	1,425,984	-0.58%

Daily Truck Traffic Values in Study Area 2023 to 2040

Year	No-Build			Build (Alt 2)			Improvement		
	ADT	Daily VMT	Daily VHT	ADT	Daily VMT	Daily VHT	ADT	Daily VMT	Daily VHT
2017	40,410	126,373	3,774	N/A	N/A	N/A	N/A	N/A	N/A
2022	43,137	131,721	3,903	N/A	N/A	N/A	N/A	N/A	N/A
2023	43,704	132,818	3,929	43,493	133,748	3,739	211	-930	191
2024	44,278	133,924	3,956	44,065	134,861	3,764	214	-937	192
2025	44,860	135,038	3,983	44,644	135,984	3,789	217	-945	193
2026	45,450	136,163	4,010	45,231	137,116	3,815	219	-953	195
2027	46,047	137,296	4,037	45,825	138,257	3,841	222	-961	196
2028	46,653	138,439	4,064	46,427	139,408	3,867	225	-969	197
2029	47,266	139,591	4,091	47,038	140,568	3,893	228	-977	198
2030	47,887	140,753	4,119	47,656	141,738	3,919	231	-985	200
2031	48,516	141,925	4,147	48,282	142,918	3,946	234	-993	201
2032	49,154	143,106	4,175	48,917	144,108	3,972	237	-1,002	202
2033	49,800	144,298	4,203	49,560	145,308	3,999	240	-1,010	204
2034	50,455	145,499	4,231	50,211	146,517	4,026	244	-1,018	205
2035	51,118	146,710	4,260	50,871	147,737	4,053	247	-1,027	207
2036	51,790	147,931	4,289	51,540	148,967	4,081	250	-1,035	208
2037	52,471	149,163	4,318	52,217	150,207	4,108	253	-1,044	209
2038	53,160	150,404	4,347	52,904	151,457	4,136	257	-1,053	211
2039	53,859	151,656	4,376	53,599	152,718	4,164	260	-1,061	212
2040	54,567	152,919	4,406	54,303	153,989	4,192	263	-1,070	214

Annual Truck Traffic Values in Study Area 2023 to 2040

Year	No-Build			Build (Alt 2)			Improvement			
	Annual Traffic	Annual VMT	Annual VHT	Annual Traffic	Annual VMT	Annual VHT	Annual Traffic	Annual VMT	Annual VHT	% VMT
2017	14,749,776	46,126,253	1,377,377	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2022	15,744,964	48,078,340	1,424,565	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2023	15,951,917	48,478,562	1,434,194	15,874,935	48,817,862	1,364,607	76,982	-339,301	69,587	-0.70%
2024	16,161,590	48,882,114	1,443,888	16,083,594	49,224,239	1,373,833	77,996	-342,124	70,055	-0.70%
2025	16,374,019	49,289,026	1,453,646	16,294,996	49,633,998	1,383,121	79,023	-344,971	70,525	-0.70%
2026	16,589,239	49,699,326	1,463,471	16,509,175	50,047,168	1,392,472	80,063	-347,842	70,999	-0.70%
2027	16,807,288	50,113,041	1,473,361	16,726,170	50,463,777	1,401,885	81,118	-350,737	71,476	-0.70%
2028	17,028,202	50,530,200	1,483,318	16,946,016	50,883,855	1,411,362	82,186	-353,655	71,956	-0.70%
2029	17,252,019	50,950,831	1,493,342	17,168,751	51,307,429	1,420,903	83,268	-356,598	72,439	-0.70%
2030	17,478,778	51,374,964	1,503,433	17,394,414	51,734,529	1,430,508	84,364	-359,566	72,925	-0.70%
2031	17,708,517	51,802,627	1,513,592	17,623,042	52,165,185	1,440,177	85,475	-362,558	73,415	-0.70%
2032	17,941,275	52,233,850	1,523,819	17,854,675	52,599,425	1,449,911	86,600	-365,575	73,908	-0.70%
2033	18,177,092	52,668,664	1,534,115	18,089,351	53,037,281	1,459,711	87,741	-368,617	74,404	-0.70%
2034	18,416,008	53,107,096	1,544,480	18,327,112	53,478,781	1,469,577	88,896	-371,684	74,903	-0.70%
2035	18,658,064	53,549,178	1,554,914	18,567,997	53,923,956	1,479,509	90,066	-374,777	75,406	-0.70%
2036	18,903,300	53,994,941	1,565,419	18,812,048	54,372,837	1,489,507	91,252	-377,896	75,912	-0.70%
2037	19,151,760	54,444,414	1,575,995	19,059,306	54,825,454	1,499,573	92,454	-381,041	76,422	-0.70%
2038	19,403,485	54,897,628	1,586,641	19,309,814	55,281,840	1,509,707	93,671	-384,212	76,935	-0.70%
2039	19,658,518	55,354,615	1,597,359	19,563,613	55,742,024	1,519,908	94,904	-387,409	77,451	-0.70%
2040	19,916,902	55,815,407	1,608,149	19,820,748	56,206,039	1,530,178	96,154	-390,633	77,971	-0.70%

Operation Costs Savings Summary (Vehicle Miles Travelled)					
Year	Automobiles		Trucks		Total Cost Savings
	Mile Reduction	Value	Mile Reduction	Value	
2019	N/A	N/A	N/A	N/A	N/A
2025	N/A	$0	N/A	$0	$0
2026	N/A	$0	N/A	$0	$0
2027	N/A	$0	N/A	$0	$0
2028	-5,086,204	-$1,576,723	-353,655	-$208,657	-$1,785,380
2029	-5,128,452	-$1,589,820	-356,598	-$210,393	-$1,800,213
2030	-5,171,052	-$1,603,026	-359,566	-$212,144	-$1,815,170
2031	-5,214,006	-$1,616,342	-362,558	-$213,909	-$1,830,251
2032	-5,257,316	-$1,629,768	-365,575	-$215,689	-$1,845,457
2033	-5,300,987	-$1,643,306	-368,617	-$217,484	-$1,860,790
2034	-5,345,020	-$1,656,956	-371,684	-$219,294	-$1,876,250
2035	-5,389,418	-$1,670,720	-374,777	-$221,119	-$1,891,838
2036	-5,434,186	-$1,684,598	-377,896	-$222,959	-$1,907,556
2037	-5,479,325	-$1,698,591	-381,041	-$224,814	-$1,923,405
2038	-5,524,840	-$1,712,700	-384,212	-$226,685	-$1,939,385
2039	-5,570,732	-$1,726,927	-387,409	-$228,571	-$1,955,498
2040	-5,617,006	-$1,741,272	-390,633	-$230,473	-$1,971,745

Economic Update Factor (Using GDP Deflator)
1.0152
*See Economic Update Factor tab for calculation.

Vehicle Operation Cost Inflation at 1.52%/year	
Travel Type	2019
Automobile	$0.31
Truck	$0.59

NDOT Values

Table E-8 Vehicle Non-Fuel Operating Costs (2019 USD)

Vehicle Non-Fuel Operating Costs	Cost Per Mile ($)
Light Duty Vehicle[1]	0.31
Commercial Truck[2]	0.59

1. Source: American Automobile Association, Your Driving Costs – 2019 Edition.
2. Source: American Transportation Research Institute, An Analysis of the Operational Costs of Trucking: 2018 Update.

Estimated Vehicle Miles Travelled - I-15 Flamingo to Sahara Feasibility Study																
	No-Build						Build (Alt 2)						Miles Travelled Improvement			
	All Vehicles		Automobiles		Trucks		All Vehicles		Automobiles		Trucks		All Vehicles	Automobiles	Trucks	% VMT
Year	Annual Traffic	Annual VMT	Annual Traffic	Annual VMT	Annual Traffic	Annual VMT	Annual Traffic	Annual VMT	Annual Traffic	Annual VMT	Annual Traffic	Annual VMT	Annual VMT	Annual VMT	Annual VMT	
2019	265,095,969	844,011,282	250,346,194	797,885,029	14,749,776	46,126,253	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2025	293,914,227	901,762,907	277,540,208	852,473,881	16,374,019	49,289,026	292,306,299	907,069,412	276,011,303	857,435,414	16,294,996	49,633,998	-5,306,505	-4,961,534	-344,971	-0.59%
2026	297,730,135	909,254,338	281,140,896	859,555,012	16,589,239	49,699,326	296,101,331	914,604,927	279,592,155	864,557,759	16,509,175	50,047,168	-5,350,589	-5,002,747	-347,842	-0.59%
2027	301,595,585	916,808,004	284,788,297	866,694,963	16,807,288	50,113,041	299,945,634	922,203,043	283,219,464	871,739,266	16,726,170	50,463,777	-5,395,039	-5,044,303	-350,737	-0.59%
2028	305,511,220	924,424,422	288,483,018	873,894,223	17,028,202	50,530,200	303,839,848	929,864,281	286,893,832	878,980,426	16,946,016	50,883,855	-5,439,859	-5,086,204	-353,655	-0.59%
2029	309,477,693	932,104,114	292,225,673	881,153,284	17,252,019	50,950,831	307,784,621	937,589,165	290,615,869	886,281,736	17,168,751	51,307,429	-5,485,051	-5,128,452	-356,598	-0.59%
2030	313,495,662	939,847,606	296,016,884	888,472,642	17,478,778	51,374,964	311,780,609	945,378,224	294,386,195	893,643,694	17,394,414	51,734,529	-5,530,618	-5,171,052	-359,566	-0.59%
2031	317,565,797	947,655,427	299,857,280	895,852,799	17,708,517	51,802,627	315,828,477	953,231,990	298,205,435	901,066,805	17,623,042	52,165,185	-5,576,564	-5,214,006	-362,558	-0.59%
2032	321,688,775	955,528,111	303,747,500	903,294,261	17,941,275	52,233,850	319,928,899	961,151,002	302,074,225	908,551,577	17,854,675	52,599,425	-5,622,891	-5,257,316	-365,575	-0.59%
2033	325,865,282	963,466,198	307,688,190	910,797,535	18,177,092	52,668,664	324,082,557	969,135,802	305,993,206	916,098,521	18,089,351	53,037,281	-5,669,604	-5,300,987	-368,617	-0.59%
2034	330,096,012	971,470,231	311,680,004	918,363,135	18,416,008	53,107,096	328,290,143	977,186,936	309,963,031	923,708,155	18,327,112	53,478,781	-5,716,704	-5,345,020	-371,684	-0.59%
2035	334,381,671	979,540,758	315,723,607	925,991,580	18,658,064	53,549,178	332,552,356	985,304,954	313,984,358	931,380,999	18,567,997	53,923,956	-5,764,196	-5,389,418	-374,777	-0.59%
2036	338,722,970	987,678,332	319,819,670	933,683,391	18,903,300	53,994,941	336,869,905	993,490,414	318,057,856	939,117,577	18,812,048	54,372,837	-5,812,082	-5,434,186	-377,896	-0.59%
2037	343,120,633	995,883,508	323,968,873	941,439,094	19,151,760	54,444,414	341,243,509	1,001,743,874	322,184,203	946,918,420	19,059,306	54,825,454	-5,860,366	-5,479,325	-381,041	-0.59%
2038	347,575,391	1,004,156,849	328,171,906	949,259,221	19,403,485	54,897,628	345,673,896	1,010,065,901	326,364,082	954,784,061	19,309,814	55,281,840	-5,909,051	-5,524,840	-384,212	-0.59%
2039	352,087,985	1,012,498,922	332,429,468	957,144,306	19,658,518	55,354,615	350,161,803	1,018,457,063	330,598,190	962,715,039	19,563,613	55,742,024	-5,958,141	-5,570,732	-387,409	-0.59%
2040	356,659,167	1,020,910,296	336,742,265	965,094,889	19,916,902	55,815,407	354,707,977	1,026,917,935	334,887,229	970,711,895	19,820,748	56,206,039	-6,007,639	-5,617,006	-390,633	-0.59%

Time Savings Summary (Person Hours)					
Year	Auto (Hours)	Value ($)	Truck (Hours)	Value ($)	Total Cost Savings
2019	N/A	$0	N/A	$0	$0
2025	N/A	$0	N/A	$0	$0
2026	N/A	$0	N/A	$0	$0
2027	N/A	$0	N/A	$0	$0
2028	1,973,879	#########	71,956	#########	$29,636,291
2029	1,988,237	#########	72,439	#########	$29,850,515
2030	2,002,700	#########	72,925	#########	$30,066,287
2031	2,017,267	#########	73,415	#########	$30,283,618
2032	2,031,940	#########	73,908	#########	$30,502,521
2033	2,046,720	#########	74,404	#########	$30,723,006
2034	2,061,608	#########	74,903	#########	$30,945,084
2035	2,076,604	#########	75,406	#########	$31,168,768
2036	2,091,709	#########	75,912	#########	$31,394,068
2037	2,106,924	#########	76,422	#########	$31,620,998
2038	2,122,249	#########	76,935	#########	$31,849,567
2039	2,137,686	#########	77,451	#########	$32,079,789
2040	2,153,236	29,701,217	77,971	#########	$32,311,675

Economic Update Factor (Using GDP Deflator)
1.0152

*See Economic Update Factor tab for calculation.

Travel Cost	
Travel Type	2019
Personal Travel	$11.16
Business Travel	$33.48

Travel Values	
Travel Category	
Personal Travel Percentage	88.20%
Business Travel Percentage	11.80%
Passenger Vehicle Occupancy per Car**	1.51

**Southern Nevada Regional Transportation Commission

NDOT Values

Table E-1 Travel Costs (2019 USD)

Statistical Area	Mean Wage ($/hour)	Personal Travel ($/hour)	Business Travel ($/hour)
Nevada	$22.60	$11.30	$33.90
Las Vegas – Paradise MSA	$22.32	$11.16	$33.48
Reno – Sparks MSA	$23.19	$11.60	$34.79
Carson City MSA	$24.88	$12.44	$37.32

Source: Occupational Employment Statistics (OES) survey for Nevada conducted by the Research and Analysis Bureau

Estimated TravelTime Values - I-15 Flamingo to Sahara Feasibility Study																									
	No-Build								Build (Alt 2)								Travel Time Improvements								
	All Vehicles		Automobiles			Trucks			All Vehicles		Automobiles			Trucks			All Vehicles		Automobiles			Trucks		
Year	Annual Traffic	Annual VHT	Annual Traffic	Annual VHT	Annual PHT	Annual Traffic	Annual VHT	Annual PHT	Annual Traffic	Annual VHT	Annual Traffic	Annual VHT	Annual PHT	Annual Traffic	Annual VHT	Annual PHT	Annual Traffic	Annual VHT	Annual Traffic	Annual VHT	Annual PHT	Annual Traffic	Annual VHT	Annual PHT
2019	265,095,969	24,230,151	250,346,194	22,852,774	34,507,689	14,749,776	1,377,377	1,377,377	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2025	293,914,227	25,670,603	277,540,208	24,216,957	36,567,605	16,374,019	1,453,646	1,453,646	292,306,299	24,320,988	276,011,303	22,937,867	34,636,179	16,294,996	1,383,121	1,383,121	1,607,928	1,349,615	1,528,905	1,279,090	1,931,425	79,023	70,525	70,525
2026	297,730,135	25,856,579	281,140,896	24,393,108	36,833,594	16,589,239	1,463,471	1,463,471	296,101,331	24,497,187	279,592,155	23,104,715	34,888,119	16,509,175	1,392,472	1,392,472	1,628,804	1,359,392	1,548,741	1,288,394	1,945,474	80,063	70,999	70,999
2027	301,595,585	26,043,902	284,788,297	24,570,541	37,101,517	16,807,288	1,473,361	1,473,361	299,945,634	24,674,662	283,219,464	23,272,776	35,141,892	16,726,170	1,401,885	1,401,885	1,649,951	1,369,241	1,568,833	1,297,765	1,959,625	81,118	71,476	71,476
2028	305,511,220	26,232,583	288,483,018	24,749,265	37,371,390	17,028,202	1,483,318	1,483,318	303,839,848	24,853,422	286,893,832	23,442,060	35,397,510	16,946,016	1,411,362	1,411,362	1,671,372	1,379,161	1,589,187	1,307,265	1,973,879	82,186	71,956	71,956
2029	309,477,693	26,422,630	292,225,673	24,929,288	37,643,225	17,252,019	1,493,342	1,493,342	307,784,621	25,033,478	290,615,869	23,612,575	35,654,988	17,168,751	1,420,903	1,420,903	1,693,072	1,389,152	1,609,804	1,316,713	1,988,237	83,268	72,439	72,439
2030	313,495,662	26,614,054	296,016,884	25,110,621	37,917,038	17,478,778	1,503,433	1,503,433	311,780,609	25,214,838	294,386,195	23,784,330	35,914,339	17,394,414	1,430,508	1,430,508	1,715,053	1,399,216	1,630,689	1,326,291	2,002,700	84,364	72,925	72,925
2031	317,565,797	26,806,865	299,857,280	25,293,273	38,192,843	17,708,517	1,513,592	1,513,592	315,828,477	25,397,512	298,205,435	23,957,335	36,175,576	17,623,042	1,440,177	1,440,177	1,737,320	1,409,353	1,651,845	1,335,938	2,017,267	85,475	73,415	73,415
2032	321,688,775	27,001,073	303,747,500	25,477,254	38,470,654	17,941,275	1,523,819	1,523,819	319,928,899	25,581,510	302,074,225	24,131,598	36,438,713	17,854,675	1,449,911	1,449,911	1,759,876	1,419,583	1,673,275	1,345,656	2,031,940	86,600	73,908	73,908
2033	325,865,282	27,196,688	307,688,190	25,662,573	38,750,485	18,177,092	1,534,115	1,534,115	324,082,557	25,766,840	305,993,206	24,307,129	36,703,765	18,089,351	1,459,711	1,459,711	1,782,724	1,429,848	1,694,984	1,355,444	2,046,728	87,741	74,404	74,404
2034	330,096,012	27,393,720	311,680,004	25,849,240	39,032,352	18,416,008	1,544,480	1,544,480	328,290,143	25,953,513	309,963,031	24,483,937	36,970,744	18,327,112	1,469,577	1,469,577	1,805,869	1,440,207	1,716,974	1,365,303	2,061,608	88,896	74,903	74,903
2035	334,381,671	27,592,179	315,723,607	26,037,265	39,316,270	18,658,064	1,554,914	1,554,914	332,552,356	26,141,539	313,984,358	24,662,030	37,239,666	18,567,997	1,479,509	1,479,509	1,829,315	1,450,640	1,739,249	1,375,234	2,076,604	90,066	75,406	75,406
2036	338,722,970	27,792,076	319,819,670	26,226,657	39,602,252	18,903,300	1,565,419	1,565,419	336,869,905	26,330,926	318,057,856	24,841,419	37,510,543	18,812,048	1,489,507	1,489,507	1,853,065	1,461,150	1,761,813	1,385,238	2,091,709	91,252	75,912	75,912
2037	343,120,633	27,993,422	323,968,873	26,417,427	39,890,315	19,151,760	1,575,995	1,575,995	341,243,509	26,521,686	322,184,203	25,022,113	37,783,391	19,059,306	1,499,573	1,499,573	1,877,124	1,471,735	1,784,670	1,395,314	2,106,924	92,454	76,422	76,422
2038	347,575,391	28,196,226	328,171,906	26,609,585	40,180,473	19,403,485	1,586,641	1,586,641	345,673,896	26,713,828	326,364,082	25,204,121	38,058,223	19,309,814	1,509,707	1,509,707	1,901,494	1,482,398	1,807,824	1,405,463	2,122,249	93,671	76,935	76,935
2039	352,087,985	28,400,499	332,429,468	26,803,140	40,472,741	19,658,518	1,597,359	1,597,359	350,161,803	26,907,362	330,598,190	25,387,454	38,335,055	19,563,613	1,519,908	1,519,908	1,926,182	1,493,137	1,831,278	1,415,686	2,137,686	94,904	77,451	77,451
2040	356,659,167	28,606,252	336,742,265	26,998,103	40,767,136	19,916,902	1,608,149	1,608,149	354,707,977	27,102,298	334,887,229	25,572,119	38,613,900	19,820,748	1,530,178	1,530,178	1,951,189	1,503,955	1,855,036	1,425,984	2,153,236	96,154	77,971	77,971

72	32	39	30.98%	35.23%
53	23	29	22.32%	26.29%
39	17	22	16.45%	19.65%
2,845	1,447	1,414		

0.000	
0.000	
0.000	
0.000	Total Daily Delay Reduction (Cars)
0	Total Annual Delay Reduction (Cars)

Costs for I-15 Flamingo to Sahara Feasibility Study

Project Inputs	
Total Project Cost ($2019)	$396,695,749
Annual O&M	$457,000

Construction and O&M Costs in 2019 Dollars

Year	Construction Costs	O&M Costs	Total Costs
2025	$132,231,916	$0	**$132,231,916**
2026	$132,231,916	$0	**$132,231,916**
2027	$132,231,916	$0	**$132,231,916**
2028	$0	$457,000	**$457,000**
2029	$0	$457,000	**$457,000**
2030	$0	$457,000	**$457,000**
2031	$0	$457,000	**$457,000**
2032	$0	$457,000	**$457,000**
2033	$0	$457,000	**$457,000**
2034	$0	$457,000	**$457,000**
2035	$0	$457,000	**$457,000**
2036	$0	$457,000	**$457,000**
2037	$0	$457,000	**$457,000**
2038	$0	$457,000	**$457,000**
2039	$0	$457,000	**$457,000**
2040	$0	$457,000	**$457,000**

Total Project

Item	Description	Total Cost
SECTION I	ROADWAY CONSTRUCTION	$39,588,391
SECTION II	BRIDGES	$30,054,868
SECTION III	WALLS	$5,236,372
SECTION IV	TYPICAL INTERCHANGES	$0
SECTION V	SIGNAL SYSTEMS AT INTERSECTIONS	$1,122,000
SECTION VI	DEMOLITION	$2,011,314
SECTION VII	ADDITIONAL ITEMS	$70,724,330
	Subtotal	$148,737,275
SECTION VIII	STANDARD PERCENTAGE ADDERS	$76,569,801
TOTAL PRESENT DAY CONSTRUCTION COST (2019)		$299,788,754
TOTAL ESCALATED CONSTRUCTION COST (2019)		$299,788,754
TOTAL ENGINEERING / ADMINISTRATION / LEGAL COSTS		$31,477,819
RIGHT OF WAY COSTS		$42,974,700
TOTAL CONSTRUCTION & ENGINEERING (2019)		**$374,241,273**
SECTION IX	HYDRAULICS/STORM WATER COSTS	$11,227,238
SECTION X	ENVIRONMENTAL CONSIDERATION COSTS	$11,227,238
	Project Total ($2019) =	**$396,695,749**

Percentage of Roadway Construction	46.7%
Percentage of Bridge Construction	53.3%

$74,452,519

Roadway

Project Inputs	
Roadway Cost ($2019)	$185,140,988
Annual O&M	$375,000

Construction and O&M Costs in 2019 Dollars

Year	Construction Costs	O&M Costs	Total Costs
2025	$61,713,663	$0	**$61,713,663**
2026	$61,713,663	$0	**$61,713,663**
2027	$61,713,663	$0	**$61,713,663**
2028		$375,000	**$375,000**
2029		$375,000	**$375,000**
2030		$375,000	**$375,000**
2031		$375,000	**$375,000**
2032		$375,000	**$375,000**
2033		$375,000	**$375,000**
2034		$375,000	**$375,000**
2035		$375,000	**$375,000**
2036		$375,000	**$375,000**
2037		$375,000	**$375,000**
2038		$375,000	**$375,000**
2039		$375,000	**$375,000**
2040		$375,000	**$375,000**

Item	Description	Total Cost
SECTION I	ROADWAY CONSTRUCTION	$39,588,391
SECTION II	BRIDGES	$0
SECTION III	WALLS	$0
SECTION IV	TYPICAL INTERCHANGES	$0
SECTION V	SIGNAL SYSTEMS AT INTERSECTIONS	$1,122,000
SECTION VI	DEMOLITION	$938,696
SECTION VII	ADDITIONAL ITEMS	$33,007,594
	Subtotal	$74,656,681
SECTION VIII	STANDARD PERCENTAGE ADDERS	$35,735,721
TOTAL PRESENT DAY CONSTRUCTION COST (2019)		$139,913,741
TOTAL ESCALATED CONSTRUCTION COST (2019)		$139,913,741
TOTAL ENGINEERING / ADMINISTRATION / LEGAL COSTS		$14,690,943
RIGHT OF WAY COSTS		$20,056,626
TOTAL CONSTRUCTION & ENGINEERING (2019)		$174,661,310
SECTION IX	HYDRAULICS/STORM WATER COSTS (2019)	$5,239,839
SECTION X	ENVIRONMENTAL CONSIDERATION COSTS (2019	$5,239,839
	Roadway Total ($2019) =	$185,140,988

Bridge Structures

Project Inputs	
Bridge Structures Cost ($2019)	$211,554,761
Annual O&M	$82,000

Construction and O&M Costs in 2019 Dollars

Year	Construction Costs	O&M Costs	Total Costs
2025	$70,518,254	$0	**$70,518,254**
2026	$70,518,254	$0	**$70,518,254**
2027	$70,518,254	$0	**$70,518,254**
2028		$82,000	**$82,000**
2029		$82,000	**$82,000**
2030		$82,000	**$82,000**
2031		$82,000	**$82,000**
2032		$82,000	**$82,000**
2033		$82,000	**$82,000**
2034		$82,000	**$82,000**
2035		$82,000	**$82,000**
2036		$82,000	**$82,000**
2037		$82,000	**$82,000**
2038		$82,000	**$82,000**
2039		$82,000	**$82,000**
2040		$82,000	**$82,000**

Item	Description	Total Cost
SECTION I	ROADWAY CONSTRUCTION	$0
SECTION II	BRIDGES	$30,054,868
SECTION III	WALLS	$5,236,372
SECTION IV	TYPICAL INTERCHANGES	$0
SECTION V	SIGNAL SYSTEMS AT INTERSECTIONS	$0
SECTION VI	DEMOLITION	$1,072,618
SECTION VII	ADDITIONAL ITEMS	$37,716,736
	Subtotal	$74,080,594
SECTION VIII	STANDARD PERCENTAGE ADDERS	$40,834,080
TOTAL PRESENT DAY CONSTRUCTION COST (2019)		$159,875,013
TOTAL ESCALATED CONSTRUCTION COST (2019)		$159,875,013
TOTAL ENGINEERING / ADMINISTRATION / LEGAL COSTS		$16,786,876
RIGHT OF WAY COSTS		$22,918,074
TOTAL CONSTRUCTION & ENGINEERING (2019)		$199,579,963
SECTION IX	HYDRAULICS/STORM WATER COSTS (2019)	$5,987,399
SECTION X	ENVIRONMENTAL CONSIDERATION COSTS (2019	$5,987,399
	Structures Total ($2019) =	**$211,554,761**

$396,695,749

Annual Maintenance Cost for I-15 Flamingo to Sahara Feasibility Study	
Facility Type	O&M per Year ($2019)
Roadways: Asphalt Pavement	$375,000
Concrete Bridges	$29,000
Steel Bridges	$53,000
Total	**$457,000**

Note: O&M cost per C-A Group

Analysis Period	
Start Year	2028
End Year	2040
Years in Analysis Period	12

Roadway Construction ($2019)	$ 396,695,749
Bridge Structures ($2019)	$ 211,554,761

Project Useful Service Life (Years)		
Project Type	Years	Source
Pavement	20	2019 Nevada DOT Road Design Guide (Page 26)
Bridge Structure	75	2019 Nevada State Highway Preservation Report (Pages 5, 6, 61, 68)

Residual Values	
Residual Value (Roadway)	$ 158,678,299.73
Residual Value (Bridge Structures)	$ 177,705,999.13
Total	**$ 336,384,299**

Alternative 2 Crash Savings Summary			
Year	Estimated No-Build Crash Costs	Estimated Build Crash Costs	Estimated Annual Crash Cost Savings
2019	$69,806,864	N/A	N/A
2025	$70,409,910	N/A	N/A
2026	$71,018,166	N/A	N/A
2027	$71,631,677	N/A	N/A
2028	$72,250,487	$70,495,685	$1,754,802
2029	$72,874,643	$71,104,682	$1,769,961
2030	$73,504,191	$71,718,940	$1,785,251
2031	$74,139,178	$72,338,504	$1,800,674
2032	$74,779,650	$72,963,421	$1,816,229
2033	$75,425,656	$73,593,736	$1,831,919
2034	$76,077,241	$74,229,496	$1,847,745
2035	$76,734,456	$74,870,749	$1,863,707
2036	$77,397,348	$75,517,541	$1,879,807
2037	$78,065,967	$76,169,921	$1,896,047
2038	$78,740,362	$76,827,936	$1,912,426
2039	$79,420,583	$77,491,636	$1,928,947
2040	$80,106,680	$78,161,069	$1,945,611

NDOT Valuation of a Statistical Life in Economic Analysis	
KABCO Level	Monetized Value (2019)
C - Possible Injury	$65,100
B - Non-incapacitating	$127,300
A - Incapacitating	$467,400
K - Killed	$9,800,000
Property Damage Only	$4,500

Study Area No-Build Crashes (2040)			
KABCO Level	Monetized Value (2019)	Incidents	2019 Value
C - Possible Injury	$65,100	405	$26,359,875
B - Non-incapacitating	$127,300	58	$7,363,643
A - Incapacitating	$467,400	8	$3,674,886
K - Killed	$9,800,000	4	$38,525,760
Property Damage Only	$4,500	929	$4,182,516
	Totals	1,404	$80,106,680

Study Area Build Alt. 2 Crashes (2040)			
KABCO Level	Monetized Value (2019)	Incidents	2019 Value
C - Possible Injury	$65,100	395	$25,719,653
B - Non-incapacitating	$127,300	56	$7,184,797
A - Incapacitating	$467,400	8	$3,585,631
K - Killed	$9,800,000	4	$37,590,056
Property Damage Only	$4,500	907	$4,080,932
	Totals	1,370	$78,161,069
	Improvements	34	$1,945,611
	Percentage Improvement		2.43%

No-Build VMT Increase	
Annual VMT Increase	0.83%

Build Condition Improvement	
Estimated Annual VMT Improvement	-0.86%

Economic Update Factor (Using GDP Deflator)	1.0152

Decrease in Crashes (2040 No Build versus 2040 Build Alt. 2)	2.43%

NDOT Valuation of a Statistical Life in Economic Analysis	
KABCO Level	Monetized Value (2019)
C - Possible Injury	$65,100
B - Non-incapacitating	$127,300
A - Incapacitating	$467,400
K - Killed	$9,800,000
Property Damage Only	$4,500

0

Study Area 2040 Crashes							
KABCO Level	Monetized Value (2019)	2040 No-Build		2040 Build Alt 1		2040 Build Alt 2	
		Incidents	2019 Value	Incidents	2019 Value	Incidents	2019 Value
C - Possible Injury	$65,100	405	$26,359,875	401	$26,078,253	395	$25,719,653
B - Non-incapacitating	$127,300	58	$7,363,643	57	$7,284,972	56	$7,184,797
A - Incapacitating	$467,400	8	$3,674,886	8	$3,635,624	8	$3,585,631
K - Killed	$9,800,000	4	$38,525,760	4	$38,114,160	4	$37,590,056
Property Damage Only	$4,500	929	$4,182,516	920	$4,137,831	907	$4,080,932
	Totals	1,404	$80,106,680	1,389	$79,250,840	1,370	$78,161,069
				Improvement	$855,841	Improvement	$1,945,611
				Percentage	1.07%	Percentage	2.43%

2040 No-Build

Facility	Total	FI	K	A	B	C	PDO	Totals
I-15 Mainline	660.6	168.3	1.8	3.7	27.2	190.5	437.3	660.6
I-15 CD Roads	272.9	189.4	0.8	1.5	11.2	78.7	180.7	272.9
Service Interchanges	320.1	136.2	0.9	1.8	13.2	92.3	211.9	320.1
Arterial Intersections	68.4	37.5	0.2	0.4	2.8	19.7	45.3	68.4
Arterial Segments	82.0	35.5	0.2	0.5	3.4	23.6	54.3	82.0
Overall Total	1404.0	566.9	3.9	7.9	57.8	404.9	929.4	1404.0

2040 Build Alt. 1

Facility	Total	FI	K	A	B	C	PDO	Totals
I-15 Mainline	636.8	162.9	1.8	3.6	26.2	183.7	421.6	636.8
I-15 CD Roads	238.8	159.1	0.7	1.3	9.8	68.9	158.1	238.8
Service Interchanges	361.2	153.6	1.0	2.0	14.9	104.2	239.1	361.2
Arterial Intersections	68.4	37.5	0.2	0.4	2.8	19.7	45.3	68.4
Arterial Segments	83.8	36.1	0.2	0.5	3.5	24.2	55.5	83.8
Overall Total	1389	549.2	3.9	7.8	57.2	400.6	919.5	1389.0

2040 Build Alt. 1 Improvements

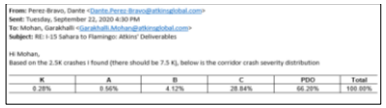
Facility	Total	FI	K	A	B	C	PDO	Totals
I-15 Mainline	636.8	5.4	0.1	0.1	1.0	6.9	15.8	23.8
I-15 CD Roads	238.8	30.3	0.1	0.2	1.4	9.8	22.6	34.1
Service Interchanges	361.2	-17.4	-0.1	-0.2	-1.7	-11.9	-27.2	-41.1
Arterial Intersections	68.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Arterial Segments	83.8	-0.6	0.0	0.0	-0.1	-0.5	-1.2	-1.8
Overall Total	1389	17.7	0.0	0.1	0.6	4.3	9.9	15.0

2040 Build Alt. 2

Facility	Total	FI	K	A	B	C	PDO	Totals
I-15 Mainline	640.9	163.0	1.8	3.6	26.4	184.8	424.3	640.9
I-15 CD Roads	210.1	131.1	0.6	1.2	8.7	60.6	139.1	210.1
Service Interchanges	366.9	157.3	1.0	2.1	15.1	105.8	242.9	366.9
Arterial Intersections	68.4	37.5	0.2	0.4	2.8	19.7	45.3	68.4
Arterial Segments	83.6	36.0	0.2	0.5	3.4	24.1	55.3	83.6
Overall Total	1370	524.9	3.8	7.7	56.4	395.1	906.9	1369.9

2040 Build Alt. 2 Improvements

Facility	Total	FI	K	A	B	C	PDO	Totals
I-15 Mainline	636.8	5.3	0.1	0.1	0.8	5.7	13.0	19.7
I-15 CD Roads	238.8	58.3	0.2	0.4	2.6	18.1	41.6	62.8
Service Interchanges	361.2	-21.1	-0.1	-0.3	-1.9	-13.5	-31.0	-46.8
Arterial Intersections	68.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Arterial Segments	83.8	-0.5	0.0	0.0	-0.1	-0.5	-1.1	-1.6
Overall Total	1389	42.0	0.0	0.2	1.4	9.8	22.6	34.0


From: Perez-Bravo, Dante <Dante.Perez-Bravo@atkinsglobal.com>
Sent: Tuesday, September 22, 2020 4:30 PM
To: Mohan, Garakhalli <Garakhalli.Mohan@atkinsglobal.com>
Subject: RE: I-15 Sahara to Flamingo: Atkins' Deliverables

Hi Mohan,
Based on the 2.5K crashes I found (there should be 7.5 K), below is the corridor crash severity distribution

K	A	B	C	PDO	Total
0.28%	0.56%	4.12%	28.84%	66.20%	100.00%

K	A	B	C	PDO	Total
0.28%	0.56%	4.12%	28.84%	66.20%	100.00%

Facility	2040 No-Build			2040 Build Alt 1			2040 Build Alt 2		
	FI	PDO	Total	FI	PDO	Total	FI	PDO	Total
I-15 Mainline	168.3	492.4	660.6	162.9 (-3%)	473.9 (-4%)	636.8 (-4%)	163.0 (-3%)	477.9 (-3%)	640.9 (-3%)
I-15 CD Roads	189.4	83.6	272.9	159.1 (-16%)	79.7 (-5%)	238.8 (-13%)	131.1 (-37%)	79.1 (-6%)	210.1 (-23%)
Service Interchanges	136.2	183.9	320.1	153.6 (13%)	207.5 (13%)	361.2 (13%)	157.3 (14%)	209.6 (12%)	366.9 (15%)
Arterial Intersections	37.5	30.9	68.4	37.5 (0%)	30.9 (0%)	68.4 (0%)	37.5 (0%)	30.9 (0%)	68.4 (0%)
Arterial Segments	35.5	46.5	82.0	36.1 (2%)	47.7 (3%)	83.8 (2%)	36.0 (1%)	47.6 (2%)	83.6 (2%)
Overall Total	566.8	837.2	1,404.0	549.2 (-3%)	839.8 (0%)	1,389.0 (-1%)	524.9 (-8%)	845.1 (1%)	1,370.0 (-2%)

		2040 No Build	2040 Build Alt 1	2040 Build Alt 2
K	0.28%	1.6	1.5	1.5
A	0.56%	3.2	3.1	2.9
B	4.12%	23.4	22.6	21.6
C	28.84%	163.5	158.4	151.4
PDO	66.20%	375.2	363.6	347.5
Total	100.00%	566.8	549.2	524.9
% Change			-3%	-7%

K	0.28%	21
A	0.56%	42
B	4.12%	309
C	28.84%	2,163
PDO	66.20%	4,965
Total	100.00%	7,500

Emissions Data from AIMSUM								
Parameter	2017 Existing Conditions		2040 No-Action		2040 Conceptual Alternative 1		2040 Conceptual Alternative 2	
	AM	PM	AM	PM	AM	PM	AM	PM
Carbon Dioxide, CO_2 (Grams)	132,761,295	162,193,209	185,718,255	211,527,365	170,879,115	196,176,825	165,195,570	190,179,620
Nitrogen Oxide, NO_x (Grams)	325,717	592,099	449,179	732,265	419,320	691,869	409,983	676,734
Particulate Matter, PM_{10} (Grams)	8,486	11,557	14,274	16,486	11,695	13,616	10,814	12,696
Volatile Organic Compounds, VOC (Grams)	130,857	201,049	152,579	204,947	145,895	188,351	145,229	184,964

Carbon Dioxide (CO_2) Emissions Annual Summary				Nitrogen Oxide (NO_x) Emissions Annual Summary				Fine Particulate Matter (PM) Emissions Annual Summary				Volatile Organic Compounds (VOC) Emissions Annual Summary			
2017 Existing Conditions (Short Tons)	2040 No-Action (ShortTons)	2040 Alternative 2 (Short Tons)	2040 Alternative 2 Improvement (Short Tons)	2017 Existing Conditions (ShortTons)	2040 No-Action (Short Tons)	2040 Alternative 2 (Short Tons)	2040 Alternative 2 Improvement (Short Tons)	2017 Existing Conditions (ShortTons)	2040 No-Action (Short Tons)	2040 Alternative 2 (Short Tons)	2040 Alternative 2 Improvement (Short Tons)	2017 Existing Conditions (ShortTons)	2040 No-Action (Short Tons)	2040 Alternative 2 (Short Tons)	2040 Alternative 2 Improvement (Short Tons)
368.806	495.129	443.158	51.971	1.168	1.496	1.377	119	25	38	29	9	419	449	414	35

Alt 2 Emissions Savings								
Year	CO_2 Reduction	CO_2 Savings	NO_x Reduction (Short Tons)	NO_x Savings	PM Reduction (Short Tons)	PM Savings	VOC Reduction (Short Tons)	VOC Savings
2019	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2025	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2026	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2027	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2028	44.548	$49.950	91	$11.561	8	$3.055.388	30	$64.909
2029	45.123	$51.659	93	$11.839	8	$3.094.318	31	$65.736
2030	45.707	$53.425	95	$12.120	8	$3.133.744	31	$66.574
2031	46,298	$55,252	98	$12,405	8	$3,173,673	32	$67,422
2032	46.896	$57.142	100	$12.694	8	$3.214.110	32	$68.281
2033	47.502	$59.096	102	$12.987	8	$3.255.063	32	$69.151
2034	48.117	$61.117	105	$13.283	8	$3.296.537	33	$70.032
2035	48.739	$63.207	107	$13.583	8	$3.338.540	33	$70.924
2036	49.369	$65.369	109	$13.887	9	$3.381.078	34	$71.828
2037	50.007	$67.604	112	$14.195	9	$3.424.158	34	$72.743
2038	50.653	$69.916	114	$14.507	9	$3.467.786	34	$73.670
2039	51.308	$72.307	117	$14.822	9	$3.511.971	35	$74.609
2040	51.971	$74.780	119	$15.142	9	$3.556.719	35	$75.559
Totals	**626.237**	**$800.826**	**1.362**	**$173.025**	**109**	**$42.903.083**	**426**	**$911.439**

Annual Growth	1.27%

NDOT Values

Table E-7 Damage Costs for Pollutant Emissions (2019 USD)

Emission Type	$ / short ton*
Carbon Dioxide (CO_2)	$0.93**
Fine Particulate Matter (PM)	$394,300
Nitrogen Oxides (NO_x)	$8,800
Sulfur Dioxide (SO_x)	$51,000
Volatile Organic Compounds (VOC)	$2,140

1. Source: Benefit-Cost Analysis Guidance for Discretionary Grant Programs, USDOT, January 2020.
2. * A metric ton is equal to 1.1023 short tons.
3. **Cost of CO_2 is assumed to grow by 2.1 percent annually.

NDOT					
Emission Type					
Year	NO_x	SO_x	PM	CO_2	VOC
2019	$8.800	$21.000	$394.300	$0.93	$2.140.00
2020	$8.800	$21.000	$394.300	$0.95	$2.140.00
2021	$8.800	$21.000	$394.300	$0.97	$2.140.00
2022	$8.800	$21.000	$394.300	$0.99	$2.140.00
2023	$8.800	$21.000	$394.300	$1.01	$2.140.00
2024	$8.800	$21.000	$394.300	$1.03	$2.140.00
2025	$8.800	$21.000	$394.300	$1.05	$2.140.00
2026	$8.800	$21.000	$394.300	$1.08	$2.140.00
2027	$8.800	$21.000	$394.300	$1.10	$2.140.00
2028	$8.800	$21.000	$394.300	$1.12	$2.140.00
2029	$8.800	$21.000	$394.300	$1.14	$2.140.00
2030	$8.800	$21.000	$394.300	$1.17	$2.140.00
2031	$8.800	$21.000	$394.300	$1.19	$2.140.00
2032	$8.800	$21.000	$394.300	$1.22	$2.140.00
2033	$8.800	$21.000	$394.300	$1.24	$2.140.00
2034	$8.800	$21.000	$394.300	$1.27	$2.140.00
2035	$8.800	$21.000	$394.300	$1.30	$2.140.00
2036	$8.800	$21.000	$394.300	$1.32	$2.140.00
2037	$8.800	$21.000	$394.300	$1.35	$2.140.00
2038	$8.800	$21.000	$394.300	$1.38	$2.140.00
2039	$8.800	$21.000	$394.300	$1.41	$2.140.00
2040	$8.800	$21.000	$394.300	$1.44	$2.140.00
2041	$8.800	$21.000	$394.300	$1.47	$2.140.00
2042	$8.800	$21.000	$394.300	$1.50	$2.140.00
2043	$8.800	$21.000	$394.300	$1.53	$2.140.00
2044	$8.800	$21.000	$394.300	$1.56	$2.140.00
2045	$8.800	$21.000	$394.300	$1.60	$2.140.00
2046	$8.800	$21.000	$394.300	$1.63	$2.140.00
2047	$8.800	$21.000	$394.300	$1.66	$2.140.00
2048	$8.800	$21.000	$394.300	$1.70	$2.140.00
2049	$8.800	$21.000	$394.300	$1.73	$2.140.00
2050	$8.800	$21.000	$394.300	$1.77	$2.140.00

Daily Estimate of Existing (2017) CO_2 Emissions

	Hour	Existing Peak Hour (2017) (grams)	Proportion of Analysis Hour (Based on Daily Counts and count locations)	Estimated Existing Emissions - Peak Hours	Percent of Peak Hour (based on Daily Count Distributions)	Estimated Existing CO_2 per Hour (grams)
	0:00				44.92%	22.086.589
	1:00				31.08%	15.281.724
	2:00				25.31%	12,442,652
	3:00				27.02%	13.285.197
	4:00				31.51%	15.489.939
	5:00				49.73%	24.450.104
AM analysis peak begins at 6:30	*6:00		13.43%	########	72.53%	35.659.744
	7:00	132,761,295	34.42%	########	92.96%	45.701.265
	8:00		35.12%	########	94.83%	46.623.837
AM analysis peak ends at 9:30	*9:00		17.03%	########	91.96%	45,212,642
	10:00				93.59%	46.013.851
	11:00				100.00%	49.164.128
	12:00				86.68%	48.710.491
	13:00				89.90%	50.518.572
	14:00				95.80%	53.831.693
PM analysis peak begins at 15:30	*15:00		16.85%	########	97.26%	54.653.433
	16:00	162,193,209	34.65%	########	100.00%	56.192.732
	17:00		33.92%	########	97.92%	55.022.386
PM analysis peak ends at 18:30	*18:00		14.58%	########	84.18%	47.302.748
	19:00				75.64%	42.504.009
	20:00				68.15%	38.295.064
	21:00				63.85%	35.877.981
	22:00				59.28%	33.308.457
	23:00				52.84%	29.690.407
					Daily Grams	917.319.645
					Daily Kilograms	917.320
					Daily Metric Tons	917
					Annual Metric Tons	334.822
					Annual Short Tons	368.806

Daily Estimate of 2040 No-Action CO2 Emissions

Hour	2040 No-Action Peak Hour (grams)	Proportion of Analysis Hour (Based on Daily Counts and count locations)	Estimated 2040 No-Action Emissions - Peak Hours	Percent of Peak Hour (based on Daily Count Distributions)	Estimated 2040 No-Action CO_2 per Hour (grams)
0:00				44.92%	30.896.676
1:00				31.08%	21.377.429
2:00				25.31%	17,405,883
3:00				27.02%	18.584.510
4:00				31.51%	21.668.698
5:00				49.73%	34.202.971
*6:00		13.43%	########	72.53%	49.884.007
7:00	185,718,255	34.42%	########	92.96%	63.930.976
8:00		35.12%	########	94.83%	65.221.552
*9:00		17.03%	########	91.96%	63,247,447
10:00				93.59%	64.368.249
11:00				100.00%	68.775.136
12:00				86.68%	63.526.715
13:00				89.90%	65.884.759
14:00				95.80%	70.205.628
*15:00		16.85%	########	97.26%	71.277.317
16:00	211,527,365	34.65%	########	100.00%	73.284.823
17:00		33.92%	########	97.92%	71.758.494
*18:00		14.58%	########	84.18%	61.690.780
19:00				75.64%	55.432.413
20:00				68.15%	49.943.238
21:00				63.85%	46.790.952
22:00				59.28%	43.439.859
23:00				52.84%	38.721.310
				Daily Grams	###########
				Daily Kilograms	1.231.520
				Daily Metric Tons	1.232
				Annual Metric Tons	449.505
				Annual Short Tons	495.129

Daily Estimate of 2040 Alternative 1 CO2 Emissions

Hour	2040 Alternative 1 Peak Hour (grams)	Proportion of Analysis Hour (Based on Daily Counts and count locations)	Estimated 2040 Alternative 1 Emissions - Peak Hours	Percent of Peak Hour (based on Daily Count Distributions)	Estimated 2040 Alternative 1 CO_2 per Hour (grams)
0:00				44.92%	28.427.990
1:00				31.08%	19.669.343
2:00				25.31%	16,015,130
3:00				27.02%	17.099.583
4:00				31.51%	19.937.340
5:00				49.73%	31.470.107
*6:00		13.43%	########	72.53%	45.898.208
7:00	170,879,115	34.42%	########	92.96%	58.822.804
8:00		35.12%	########	94.83%	60.010.262
*9:00		17.03%	########	91.96%	58,193,891
10:00				93.59%	59.225.138
11:00				100.00%	63.279.910
12:00				86.68%	58.916.581
13:00				89.90%	61.103.502
14:00				95.80%	65.110.806
*15:00		16.85%	########	97.26%	66.104.722
16:00	196,176,825	34.65%	########	100.00%	67.966.543
17:00		33.92%	########	97.92%	66.550.980
*18:00		14.58%	########	84.18%	57.213.880
19:00				75.64%	51.409.683
20:00				68.15%	46.318.857
21:00				63.85%	43.395.333
22:00				59.28%	40.287.429
23:00				52.84%	35.911.304
				Daily Grams	###########
				Daily Kilograms	1.138.339
				Daily Metric Tons	1.138
				Annual Metric Tons	415.494
				Annual Short Tons	457.666

Daily Estimate of 2040 Alternative 2 CO2 Emissions

Hour	2040 Alternative 2 Peak Hour (grams)	Proportion of Analysis Hour (Based on Daily Counts and count locations)	Estimated 2040 Alternative 2 Emissions - Peak Hours	Percent of Peak Hour (based on Daily Count Distributions)	Estimated 2040 Alternative 2 CO_2 per Hour (grams)
0:00				44.92%	27.482.457
1:00				31.08%	19.015.129
2:00				25.31%	15,482,456
3:00				27.02%	16.530.840
4:00				31.51%	19.274.212
5:00				49.73%	30.423.392
*6:00		13.43%	########	72.53%	44.371.605
7:00	165,195,570	34.42%	########	92.96%	56.866.322
8:00		35.12%	########	94.83%	58.014.283
*9:00		17.03%	########	91.96%	56,258,326
10:00				93.59%	57.255.274
11:00				100.00%	61.175.181
12:00				86.68%	57.115.478
13:00				89.90%	59.235.543
14:00				95.80%	63.120.342
*15:00		16.85%	########	97.26%	64.083.874
16:00	190,179,620	34.65%	########	100.00%	65.888.779
17:00		33.92%	########	97.92%	64.516.490
*18:00		14.58%	########	84.18%	55.464.829
19:00				75.64%	49.838.068
20:00				68.15%	44.902.871
21:00				63.85%	42.068.720
22:00				59.28%	39.055.826
23:00				52.84%	34.813.481
				Daily Grams	###########
				Daily Kilograms	1.102.254
				Daily Metric Tons	1.102
				Annual Metric Tons	402.323
				Annual Short Tons	443.158

Daily Estimate of Existing (2017) NO_x Emissions

	Hour	Existing Peak Hour (2017) (grams)	Proportion of Analysis Hour (Based on Daily Counts and count locations)	Estimated Existing Emissions - Peak Hours	Percent of Peak Hour (based on Daily Count Distributions)	Estimated Existing NO_x per Hour (grams)
	0:00				44.92%	54.187
	1:00				31.08%	37.492
	2:00				25.31%	30.527
	3:00				27.02%	32.594
	4:00				31.51%	38.003
	5:00				49.73%	59.986
AM analysis peak begins at 6:30	*6:00		13.43%	43.744	72.53%	87.488
	7:00	325,717	34.42%	112.124	92.96%	112.124
	8:00		35.12%	114.387	94.83%	114.387
AM analysis peak ends at 9:30	*9:00		17.03%	55.462	91.96%	110.925
	10:00				93.59%	112.891
	11:00				100.00%	120.619
	12:00				86.68%	177.821
	13:00				89.90%	184.422
	14:00				95.80%	196.517
PM analysis peak begins at 15:30	*15:00		16.85%	99.758	97.26%	199.517
	16:00	592,099	34.65%	205.136	100.00%	205.136
	17:00		33.92%	200.864	97.92%	200.864
PM analysis peak ends at 18:30	*18:00		14.58%	86.341	84.18%	172.682
	19:00				75.64%	155.164
	20:00				68.15%	139.799
	21:00				63.85%	130.975
	22:00				59.28%	121.595
	23:00				52.84%	108.387
					Daily Grams	2.904.102
					Daily Kilograms	2.904
					Daily Metric Tons	3
					Annual Metric Tons	1.060
					Annual Short Tons	1.168

Daily Estimate of 2040 No-Action NO_x Emissions

Hour	2040 No-Action Peak Hour (grams)	Proportion of Analysis Hour (Based on Daily Counts and count locations)	Estimated 2040 No-Action Emissions - Peak Hours	Percent of Peak Hour (based on Daily Count Distributions)	Estimated 2040 No-Action NO_x per Hour (grams)
0:00				44.92%	74.727
1:00				31.08%	51.704
2:00				25.31%	42.098
3:00				27.02%	44.949
4:00				31.51%	52.408
5:00				49.73%	82.723
*6:00		13.43%	60.325	72.53%	120.650
7:00	449,179	34.42%	154.624	92.96%	154.624
8:00		35.12%	157.745	94.83%	157.745
*9:00		17.03%	76.485	91.96%	152.971
10:00				93.59%	155.681
11:00				100.00%	166.340
12:00				86.68%	219.917
13:00				89.90%	228.080
14:00				95.80%	243.038
*15:00		16.85%	123.374	97.26%	246.748
16:00	732,265	34.65%	253.697	100.00%	253.697
17:00		33.92%	248.413	97.92%	248.413
*18:00		14.58%	106.781	84.18%	213.561
19:00				75.64%	191.896
20:00				68.15%	172.893
21:00				63.85%	161.981
22:00				59.28%	150.380
23:00				52.84%	134.045
				Daily Grams	3.721.268
				Daily Kilograms	3.721
				Daily Metric Tons	4
				Annual Metric Tons	1.358
				Annual Short Tons	1.496

Daily Estimate of 2040 Alternative 1 NO_x Emissions

Hour	2040 Alternative 1 Peak Hour (grams)	Proportion of Analysis Hour (Based on Daily Counts and count locations)	Estimated 2040 Alternative 1 Emissions - Peak	Percent of Peak Hour (based on Daily Count Distributions)	Estimated 2040 Alternative 1 NO_x per Hour (grams)
0:00				44.92%	69.759
1:00				31.08%	48.267
2:00				25.31%	39.300
3:00				27.02%	41.961
4:00				31.51%	48.924
5:00				49.73%	77.224
*6:00		13.43%	56.315	72.53%	112.630
7:00	419,320	34.42%	144.345	92.96%	144.345
8:00		35.12%	147.259	94.83%	147.259
*9:00		17.03%	71.401	91.96%	142.802
10:00				93.59%	145.332
11:00				100.00%	155.282
12:00				86.68%	207.785
13:00				89.90%	215.498
14:00				95.80%	229.630
*15:00		16.85%	116.568	97.26%	233.136
16:00	691,869	34.65%	239.702	100.00%	239.702
17:00		33.92%	234.709	97.92%	234.709
*18:00		14.58%	100.890	84.18%	201.780
19:00				75.64%	181.310
20:00				68.15%	163.356
21:00				63.85%	153.045
22:00				59.28%	142.084
23:00				52.84%	126.651
				Daily Grams	3.501.770
				Daily Kilograms	3.502
				Daily Metric Tons	4
				Annual Metric Tons	1.278
				Annual Short Tons	1.408

Daily Estimate of 2040 Alternative 2 NO_x Emissions

Hour	2040 Alternative 2 Peak Hour (grams)	Proportion of Analysis Hour (Based on Daily Counts and count locations)	Estimated 2040 Alternative 2 Emissions - Peak	Percent of Peak Hour (based on Daily Count Distributions)	Estimated 2040 Alternative 2 NO_x per Hour (grams)
0:00				44.92%	68.206
1:00				31.08%	47.192
2:00				25.31%	38.424
3:00				27.02%	41.026
4:00				31.51%	47.835
5:00				49.73%	75.505
*6:00	409,983	13.43%	55.061	72.53%	110.122
7:00		34.42%	141.131	92.96%	141.131
8:00		35.12%	143.980	94.83%	143.980
*9:00		17.03%	69.811	91.96%	139.622
10:00				93.59%	142.096
11:00				100.00%	151.825
12:00				86.68%	203.239
13:00				89.90%	210.783
14:00				95.80%	224.607
*15:00	676,734	16.85%	114.018	97.26%	228.036
16:00		34.65%	234.458	100.00%	234.458
17:00		33.92%	229.575	97.92%	229.575
*18:00		14.58%	98.683	84.18%	197.366
19:00				75.64%	177.343
20:00				68.15%	159.782
21:00				63.85%	149.697
22:00				59.28%	138.976
23:00				52.84%	123.880
				Daily Grams	3.424.708
				Daily Kilograms	3.425
				Daily Metric Tons	3
				Annual Metric Tons	1.250
				Annual Short Tons	1.377

Daily Estimate of Existing (2017) PM Emissions

	Hour	Existing Peak Hour (2017) (grams)	Proportion of Analysis Hour (Based on Daily Counts and count locations)	Estimated Existing Emissions - Peak Hours	Percent of Peak Hour (based on Daily Count Distributions)	Estimated Existing NO_x per Hour (grams)
	0:00				44.92%	1.412
	1:00				31.08%	977
	2:00				25.31%	795
	3:00				27.02%	849
	4:00				31.51%	990
	5:00				49.73%	1.563
AM analysis peak begins at 6:30	*6:00		13.43%	1.140	72.53%	2.279
	7:00	8,486	34.42%	2.921	92.96%	2.921
	8:00		35.12%	2.980	94.83%	2.980
AM analysis peak ends at 9:30	*9:00		17.03%	1.445	91.96%	2.890
	10:00				93.59%	2.941
	11:00				100.00%	3.143
	12:00				86.68%	3.471
	13:00				89.90%	3.600
	14:00				95.80%	3.836
PM analysis peak begins at 15:30	*15:00		16.85%	1.947	97.26%	3.894
	16:00	11,557	34.65%	4.004	100.00%	4.004
	17:00		33.92%	3.921	97.92%	3.921
PM analysis peak ends at 18:30	*18:00		14.58%	1.685	84.18%	3.371
	19:00				75.64%	3.029
	20:00				68.15%	2.729
	21:00				63.85%	2.556
	22:00				59.28%	2.373
	23:00				52.84%	2.116
					Daily Grams	62.639
					Daily Kilograms	63
					Daily Metric Tons	0
					Annual Metric Tons	23
					Annual Short Tons	25

Daily Estimate of 2040 No-Action PM Emissions

Hour	2040 No-Action Peak Hour (grams)	Proportion of Analysis Hour (Based on Daily Counts and count locations)	Estimated 2040 No-Action Emissions - Peak Hours	Percent of Peak Hour (based on Daily Count Distributions)	Estimated 2040 No-Action NO_x per Hour (grams)
0:00				44.92%	2.375
1:00				31.08%	1.643
2:00				25.31%	1.338
3:00				27.02%	1.428
4:00				31.51%	1.665
5:00				49.73%	2.629
*6:00		13.43%	1.917	72.53%	3.834
7:00	14,274	34.42%	4.914	92.96%	4.914
8:00		35.12%	5.013	94.83%	5.013
*9:00		17.03%	2.431	91.96%	4.861
10:00				93.59%	4.947
11:00				100.00%	5.286
12:00				86.68%	4.951
13:00				89.90%	5.135
14:00				95.80%	5.472
*15:00		16.85%	2.778	97.26%	5.555
16:00	16,486	34.65%	5.712	100.00%	5.712
17:00		33.92%	5.593	97.92%	5.593
*18:00		14.58%	2.404	84.18%	4.808
19:00				75.64%	4.320
20:00				68.15%	3.892
21:00				63.85%	3.647
22:00				59.28%	3.386
23:00				52.84%	3.018
				Daily Grams	95.421
				Daily Kilograms	95
				Daily Metric Tons	0
				Annual Metric Tons	35
				Annual Short Tons	38

Daily Estimate of 2040 Alternative 1 PM Emissions

Hour	2040 Alternative 1 Peak Hour (grams)	Proportion of Analysis Hour (Based on Daily Counts and count locations)	Estimated 2040 Alternative 1 Emissions - Peak	Percent of Peak Hour (based on Daily Count Distributions)	Estimated 2040 Alternative 1 NO_x per Hour (grams)
0:00				44.92%	1.946
1:00				31.08%	1.346
2:00				25.31%	1.096
3:00				27.02%	1.170
4:00				31.51%	1.365
5:00				49.73%	2.154
*6:00		13.43%	1.571	72.53%	3.141
7:00	11,695	34.42%	4.026	92.96%	4.026
8:00		35.12%	4.107	94.83%	4.107
*9:00		17.03%	1.991	91.96%	3.983
10:00				93.59%	4.053
11:00				100.00%	4.331
12:00				86.68%	4.089
13:00				89.90%	4.241
14:00				95.80%	4.519
*15:00		16.85%	2.294	97.26%	4.588
16:00	13,616	34.65%	4.717	100.00%	4.717
17:00		33.92%	4.619	97.92%	4.619
*18:00		14.58%	1.986	84.18%	3.971
19:00				75.64%	3.568
20:00				68.15%	3.215
21:00				63.85%	3.012
22:00				59.28%	2.796
23:00				52.84%	2.492
				Daily Grams	78.546
				Daily Kilograms	79
				Daily Metric Tons	0
				Annual Metric Tons	29
				Annual Short Tons	32

Daily Estimate of 2040 Alternative 2 PM Emissions

Hour	2040 Alternative 2 Peak Hour (grams)	Proportion of Analysis Hour (Based on Daily Counts and count locations)	Estimated 2040 Alternative 2 Emissions - Peak	Percent of Peak Hour (based on Daily Count Distributions)	Estimated 2040 Alternative 2 NO_x per Hour (grams)
0:00				44.92%	1.799
1:00				31.08%	1.245
2:00				25.31%	1.014
3:00				27.02%	1.082
4:00				31.51%	1.262
5:00				49.73%	1.992
*6:00	10,814	13.43%	1.452	72.53%	2.905
7:00		34.42%	3.723	92.96%	3.723
8:00		35.12%	3.798	94.83%	3.798
*9:00		17.03%	1.841	91.96%	3.683
10:00				93.59%	3.748
11:00				100.00%	4.005
12:00				86.68%	3.813
13:00				89.90%	3.954
14:00				95.80%	4.214
*15:00	12,696	16.85%	2.139	97.26%	4.278
16:00		34.65%	4.399	100.00%	4.399
17:00		33.92%	4.307	97.92%	4.307
*18:00		14.58%	1.851	84.18%	3.703
19:00				75.64%	3.327
20:00				68.15%	2.998
21:00				63.85%	2.808
22:00				59.28%	2.607
23:00				52.84%	2.324
				Daily Grams	72.985
				Daily Kilograms	73
				Daily Metric Tons	0
				Annual Metric Tons	27
				Annual Short Tons	29

Daily Estimate of Existing (2017) VOC Emissions

	Hour	Existing Peak Hour (2017) (grams)	Proportion of Analysis Hour (Based on Daily Counts and count locations)	Estimated Existing Emissions - Peak Hours	Percent of Peak Hour (based on Daily Count Distributions)	Estimated Existing VOC per Hour (grams)
	0:00				44.92%	21.770
	1:00				31.08%	15.063
	2:00				25.31%	12.264
	3:00				27.02%	13.095
	4:00				31.51%	15.268
	5:00				49.73%	24.099
AM analysis peak begins at 6:30	*6:00		13.43%	17.574	72.53%	35.148
	7:00	130,857	34.42%	45.046	92.96%	45.046
	8:00		35.12%	45.955	94.83%	45.955
AM analysis peak ends at 9:30	*9:00		17.03%	22.282	91.96%	44.564
	10:00				93.59%	45.354
	11:00				100.00%	48.459
	12:00				86.68%	60.380
	13:00				89.90%	62.621
	14:00				95.80%	66.728
PM analysis peak begins at 15:30	*15:00		16.85%	33.873	97.26%	67.746
	16:00	201,049	34.65%	69.655	100.00%	69.655
	17:00		33.92%	68.204	97.92%	68.204
PM analysis peak ends at 18:30	*18:00		14.58%	29.317	84.18%	58.635
	19:00				75.64%	52.686
	20:00				68.15%	47.469
	21:00				63.85%	44.473
	22:00				59.28%	41.288
	23:00				52.84%	36.803
					Daily Grams	1.042.773
					Daily Kilograms	1.043
					Daily Metric Tons	1
					Annual Metric Tons	381
					Annual Short Tons	419

Daily Estimate of 2040 No-Action VOC Emissions

Hour	2040 No-Action Peak Hour (grams)	Proportion of Analysis Hour (Based on Daily Counts and count locations)	Estimated 2040 No-Action Emissions - Peak Hours	Percent of Peak Hour (based on Daily Count Distributions)	Estimated 2040 No-Action VOC per Hour (grams)
0:00				44.92%	25.384
1:00				31.08%	17.563
2:00				25.31%	14.300
3:00				27.02%	15.268
4:00				31.51%	17.802
5:00				49.73%	28.100
*6:00	152,579	13.43%	20.491	72.53%	40.983
7:00		34.42%	52.523	92.96%	52.523
8:00		35.12%	53.584	94.83%	53.584
*9:00		17.03%	25.981	91.96%	51.962
10:00				93.59%	52.882
11:00				100.00%	56.503
12:00				86.68%	61.550
13:00				89.90%	63.835
14:00				95.80%	68.022
*15:00	204,947	16.85%	34.530	97.26%	69.060
16:00		34.65%	71.005	100.00%	71.005
17:00		33.92%	69.526	97.92%	69.526
*18:00		14.58%	29.886	84.18%	59.772
19:00				75.64%	53.708
20:00				68.15%	48.390
21:00				63.85%	45.335
22:00				59.28%	42.088
23:00				52.84%	37.517
				Daily Grams	1.116.662
				Daily Kilograms	1.117
				Daily Metric Tons	1
				Annual Metric Tons	408
				Annual Short Tons	449

Daily Estimate of 2040 Alternative 1 VOC Emissions

Hour	2040 Alternative 1 Peak Hour (grams)	Proportion of Analysis Hour (Based on Daily Counts and count locations)	Estimated 2040 Alternative 1 Emissions - Peak	Percent of Peak Hour (based on Daily Count Distributions)	Estimated 2040 Alternative 1 VOC per Hour
0:00				44.92%	24.272
1:00				31.08%	16.794
2:00				25.31%	13.674
3:00				27.02%	14.599
4:00				31.51%	17.022
5:00				49.73%	26.869
*6:00		13.43%	19.594	72.53%	39.187
7:00	145,895	34.42%	50.222	92.96%	50.222
8:00		35.12%	51.236	94.83%	51.236
*9:00		17.03%	24.843	91.96%	49.685
10:00				93.59%	50.566
11:00				100.00%	54.028
12:00				86.68%	56.566
13:00				89.90%	58.666
14:00				95.80%	62.513
*15:00		16.85%	31.734	97.26%	63.468
16:00	188,351	34.65%	65.255	100.00%	65.255
17:00		33.92%	63.896	97.92%	63.896
*18:00		14.58%	27.466	84.18%	54.932
19:00				75.64%	49.359
20:00				68.15%	44.471
21:00				63.85%	41.664
22:00				59.28%	38.680
23:00				52.84%	34.479
				Daily Grams	1.042.104
				Daily Kilograms	1.042
				Daily Metric Tons	1
				Annual Metric Tons	380
				Annual Short Tons	419

Daily Estimate of 2040 Alternative 2 VOC Emissions

Hour	2040 Alternative 2 Peak Hour (grams)	Proportion of Analysis Hour (Based on Daily Counts and count locations)	Estimated 2040 Alternative 2 Emissions - Peak	Percent of Peak Hour (based on Daily Count Distributions)	Estimated 2040 Alternative 2 VOC per Hour
0:00				44.92%	24.161
1:00				31.08%	16.717
2:00				25.31%	13.611
3:00				27.02%	14.533
4:00				31.51%	16.945
5:00				49.73%	26.746
*6:00	145,229	13.43%	19.504	72.53%	39.009
7:00		34.42%	49.993	92.96%	49.993
8:00		35.12%	51.002	94.83%	51.002
*9:00		17.03%	24.729	91.96%	49.459
10:00				93.59%	50.335
11:00				100.00%	53.781
12:00				86.68%	55.549
13:00				89.90%	57.611
14:00				95.80%	61.389
*15:00	184,964	16.85%	31.163	97.26%	62.326
16:00		34.65%	64.082	100.00%	64.082
17:00		33.92%	62.747	97.92%	62.747
*18:00		14.58%	26.972	84.18%	53.944
19:00				75.64%	48.471
20:00				68.15%	43.671
21:00				63.85%	40.915
22:00				59.28%	37.985
23:00				52.84%	33.859
				Daily Grams	1.028.841
				Daily Kilograms	1.029
				Daily Metric Tons	1
				Annual Metric Tons	376
				Annual Short Tons	414

Gross Domestic Product Deflator										
Year	2018				2019				2020	
Quarter	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2
Gross Domestic Product	109.237	110.176	110.614	111.14	111.424	112.141	112.531	112.95	113.415	112.803

Index Gross Domestic Product Year
2012

Index Gross Domestic Product
100

Deflation Rate (2020 to 2019)
98.505%

Current Quarter Year
2020

2012-2020 GDP Deflator Annual Increase
1.517%

Economic Update Factor (Using GDP Deflator)
1.0152

Table 1.1.9. Implicit Price Deflators for Gross Domestic Product

[Index numbers, 2012=100] Seasonally adjusted

Bureau of Economic Analysis

Last Revised on: July 30, 2020 - Next Release Date August 27, 2020

Line		2018				2019				2020	
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2
1	**Gross domestic product**	109.237	110.176	110.614	111.14	111.424	112.141	112.531	112.95	113.415	112.803
2	**Personal consumption expenditures**	107.481	108.077	108.498	108.885	109.039	109.722	110.104	110.525	110.878	110.352
3	Goods	95.232	95.42	95.318	95.009	94.571	94.984	94.765	94.816	94.598	93.127
4	Durable goods	87.958	87.694	87.375	87.102	86.971	86.756	86.372	85.784	85.415	84.448
5	Nondurable goods	99.048	99.494	99.519	99.191	98.577	99.356	99.236	99.669	99.54	97.784
6	Services	113.828	114.645	115.35	116.12	116.6	117.431	118.15	118.777	119.452	119.505
7	**Gross private domestic investment**	106.359	107.43	107.505	107.991	108.373	109.03	109.115	109.355	110.255	109.889
8	Fixed investment	107.183	107.843	108.33	108.622	109.277	109.766	110.048	110.098	110.446	110.67
9	Nonresidential	102.438	102.75	103.069	103.254	103.884	104.341	104.457	104.343	104.59	104.784
10	Structures	113.406	114.071	114.644	116.194	117.328	118.609	119.232	119.662	120.118	119.835
11	Equipment	97.485	97.497	97.882	97.866	98.079	97.991	97.757	97.721	97.887	97.806
12	Intellectual property products	102.055	102.55	102.615	102.26	103.147	103.846	104.126	103.603	103.836	104.597
13	Residential	128.045	130.224	131.455	132.228	132.984	133.609	134.65	135.452	136.24	136.597
14	Change in private inventories	---	---	---	---	---	---	---	---	---	---
15	**Net exports of goods and services**	---	---	---	---	---	---	---	---	---	---
16	Exports	98.199	99.417	99.721	99.398	98.557	99.337	98.764	98.351	97.74	93.093
17	Goods	92.29	93.646	93.86	93.203	92.002	92.547	91.565	91.177	90.113	84.694
18	Services	111.464	112.354	112.867	113.319	113.326	114.646	115.015	114.544	115.014	112.198
19	Imports	91.461	91.524	91.859	91.419	90.519	90.713	89.97	89.65	89.337	86.381
20	Goods	88.207	88.158	88.459	87.91	86.822	86.981	86.082	85.67	85.336	82.142
21	Services	108.519	109.202	109.73	109.892	110.029	110.402	110.499	110.666	110.469	109.051
22	**Government consumption expenditures and gross investment**	109.897	110.929	111.817	112.588	112.927	113.253	113.544	114.019	114.524	113.931
23	Federal	107.954	108.754	109.405	110.212	111.478	110.762	110.924	111.285	111.209	111.016
24	National defense	106.409	107.21	107.862	108.383	108.814	109.112	109.341	109.738	109.697	109.072
25	Nondefense	110.383	111.182	111.832	113.079	115.655	113.349	113.409	113.712	113.582	114.038
26	State and local	111.188	112.363	113.397	114.146	113.911	114.887	115.259	115.808	116.685	115.829
	Addendum:										
27	Gross national product	109.206	110.141	110.58	111.104	111.388	112.102	112.492	112.911	113.375	---

Appendix E: Build Alt. 2 Shift BCA Workbook

I-15 Flamingo to Sahara Feasibility Study

General Economic Parameters

Year of Current Dollars for Model	2019	
Economic Update Factor (Using GDP Deflator)	1.0152	1
Real Discount Rate	7.0%	2

Value of Travel Time Savings (2019)

	Value	Units	
Truck Drivers			
Hourly Value	$ 33.48	$/hr	3
Value of Time			
Personal	$ 11.16	$/hr/per	4
Business	$ 33.48	$/hr/veh	4

Vehicle Occupancies

Passenger Vehicles	1.51	per vehicle	5
Trucks	1.00	per vehicle	5

Vehicle Operating Costs (2019)

Operating Costs			
Automobile (regular unleaded)	$ 0.31	$/mile	6
Truck (diesel)	$ 0.59	$/mile	6

Crash Costs

Cost of a Fatality (2019)	$ 6,200,000	$/event	7
Cost of an Injury (2019)			
Level A (Incapacitating)	$ 330,600	$/event	7
Level B (Non-incapacitating)	$ 127,300	$/event	7
Level C (Possibly Injured)	$ 67,900	$/event	7
Cost of Property Damage (2019)	$ 11,000	$/event	7
Cost of Highway Accident (2019)			
Fatal Crash	$ 9,800,000	$/accident	8
Injury A Crash	$ 467,400	$/accident	8
Injury B Crash	$ 127,300	$/accident	8
Injury C Crash	$ 65,100	$/accident	8
PDO Crash	$ 4,500	$/accident	8

1 2012-2020 GDP Deflator Annual Increase
2 Nevada DOT Guidance for BCAs
3 Nevada DOT Guidance for BCAs
4 Nevada DOT Guidance for BCAs
5 Nevada DOT Guidance for BCAs
6 Nevada DOT Guidance for BCAs
7 Nevada DOT Guidance for BCAs
8 Nevada DOT Guidance for BCAs

I-15 Flamingo to Sahara Feasibility Study Alt. 2 Benefit/Cost Summary (Discounted at 7% Rate)	
Benefits and Costs	**Present Value (2019$)**
Benefits	
Travel time savings	$149,565,928
Operation costs savings	($9,060,355)
Crash cost savings	$8,920,305
Emissions cost savings	$16,495,479
Residual Value	$98,735,092
Total Benefits	**$264,656,449**
Costs	
Construction Costs	$300,696,718
Road and Bridge O&M	$2,222,953
Total Costs	**$302,919,670**
Net Benefits	**($38,263,221)**
Benefit/Cost Ratio	**0.87**

I-15 Flamingo to Sahara Feasibility Study Alt. 2 Benefit /Cost Sensitivity Summary (Discounted at 3% Rate)	
Benefits and Costs	**Present Value (2019$)**
Benefits	
Travel time savings	$259,116,471
Operation costs savings	($15,705,511)
Crash cost savings	$15,465,408
Emissions cost savings	$28,660,509
Residual Value	$219,760,254
Total Benefits	**$507,297,131**
Costs	
Construction Costs	$392,119,642
Road and Bridge O&M	$3,836,667
Total Costs	**$395,956,309**
Net Benefits	**$111,340,822**
Benefit/Cost Ratio	**1.28**

Costs and Benefits I-15 Flamingo to Sahara Feasibility Study

Benefits and Costs by Year, 2019$

Year	Travel Time Savings	Operation Costs Savings	Crash Reduction Savings	Emissions CO_2 Savings	Emissions NO_x Savings	Emissions PM Savings	Emissions VOC Savings	Design and Construction Costs	O&M Costs	Residual Value
2019	N/A	N/A	N/A	$0	$0	N/A	N/A	N/A	N/A	N/A
2025	$0	$0	$0	$0	$0	$0	$0	$160,705,759	$0	$0
2026	$0	$0	$0	$0	$0	$0	$0	$160,705,759	$0	$0
2027	$0	$0	$0	$0	$0	$0	$0	$160,705,759	$0	$0
2028	$29,636,291	($1,785,380)	$1,754,802	$44,548	$11,561	$3,055,388	$64,909	$0	$457,000	$0
2029	$29,850,515	($1,800,213)	$1,769,961	$45,123	$11,839	$3,094,318	$65,736	$0	$457,000	$0
2030	$30,066,287	($1,815,170)	$1,785,251	$45,707	$12,120	$3,133,744	$66,574	$0	$457,000	$0
2031	$30,283,618	($1,830,251)	$1,800,674	$46,298	$12,405	$3,173,673	$67,422	$0	$457,000	$0
2032	$30,502,521	($1,845,457)	$1,816,229	$46,896	$12,694	$3,214,110	$68,281	$0	$457,000	$0
2033	$30,723,006	($1,860,790)	$1,831,919	$47,502	$12,987	$3,255,063	$69,151	$0	$457,000	$0
2034	$30,945,084	($1,876,250)	$1,847,745	$48,117	$13,283	$3,296,537	$70,032	$0	$457,000	$0
2035	$31,168,768	($1,891,838)	$1,863,707	$48,739	$13,583	$3,338,540	$70,924	$0	$457,000	$0
2036	$31,394,068	($1,907,556)	$1,879,807	$49,369	$13,887	$3,381,078	$71,828	$0	$457,000	$0
2037	$31,620,998	($1,923,405)	$1,896,047	$50,007	$14,195	$3,424,158	$72,743	$0	$457,000	$0
2038	$31,849,567	($1,939,385)	$1,912,426	$50,653	$14,507	$3,467,786	$73,670	$0	$457,000	$0
2039	$32,079,789	($1,955,498)	$1,928,947	$51,308	$14,822	$3,511,971	$74,609	$0	$457,000	$0
2040	$32,311,675	($1,971,745)	$1,945,611	$51,971	$15,142	$3,556,719	$75,559	$0	$457,000	##########
Totals	**$402,432,186**	**($24,402,939)**	**$24,033,127**	**$626,237**	**$173,025**	**$42,903,083**	**$911,439**	**$482,117,277**	**$5,941,000**	**$408,818,808**

Total Benefits $855,494,966

Present Value of Benefits and Costs by Year

Discount Rate = 7.00%

Year	Travel Time Savings	Operation Costs Savings	Crash Reduction Savings	Emissions CO_2 Savings	Emissions NO_x Savings	Emissions PM Savings	Emissions VOC Savings	Design and Construction Costs	O&M Costs	Residual Value
2019	N/A	N/A	N/A	$0	$0	N/A	N/A	N/A	N/A	N/A
2025	$0	$0	$0	$0	$0	$0	$0	##########	$0	$0
2026	$0	$0	$0	$0	$0	$0	$0	##########	$0	$0
2027	$0	$0	$0	$0	$0	$0	$0	$93,532,215	$0	$0
2028	$16,120,179	($971,128)	$954,496	$24,231	$6,288	$1,661,928	$35,306	$0	$248,578	$0
2029	$15,174,488	($915,137)	$899,758	$22,938	$6,018	$1,572,994	$33,417	$0	$232,316	$0
2030	$14,284,276	($862,374)	$848,160	$21,715	$5,758	$1,488,819	$31,629	$0	$217,117	$0
2031	$13,446,289	($812,653)	$799,521	$20,557	$5,508	$1,409,149	$29,936	$0	$202,913	$0
2032	$12,657,462	($765,799)	$753,671	$19,460	$5,268	$1,333,741	$28,334	$0	$189,639	$0
2033	$11,914,911	($721,646)	$710,450	$18,422	$5,036	$1,262,369	$26,818	$0	$177,232	$0
2034	$11,215,923	($680,039)	$669,708	$17,440	$4,814	$1,194,817	$25,383	$0	$165,638	$0
2035	$10,557,940	($640,831)	$631,302	$16,509	$4,601	$1,130,879	$24,025	$0	$154,802	$0
2036	$9,938,558	($603,884)	$595,099	$15,629	$4,396	$1,070,363	$22,739	$0	$144,674	$0
2037	$9,355,512	($569,066)	$560,972	$14,795	$4,200	$1,013,085	$21,522	$0	$135,210	$0
2038	$8,806,671	($536,256)	$528,802	$14,006	$4,011	$958,872	$20,370	$0	$126,364	$0
2039	$8,290,027	($505,338)	$498,477	$13,259	$3,830	$907,560	$19,280	$0	$118,097	$0
2040	$7,803,692	($476,202)	$469,891	$12,552	$3,657	$858,994	$18,249	$0	$110,371	$98,735,092
Totals	**$149,565,928**	**($9,060,355)**	**$8,920,305**	**$231,513**	**$63,387**	**$15,863,570**	**$337,008**	**$300,696,718**	**$2,222,953**	**$98,735,092**

Total Discounted Benefits $264,656,449

Costs and Benefits I-15 Flamingo to Sahara Feasibility Study Sensitivity Analysis @ 3.0% Discount Rate

Present Value of Benefits and Costs by Year

Discount Rate = 3.00%

Year	Travel Time Savings	Operation Costs Savings	Crash Reduction Savings	Emissions CO_2 Savings	Emissions NO_x Savings	Emissions PM Savings	Emissions VOC Savings	Design and Construction Costs	O&M Costs	Residual Value
2019	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2025	$0	$0	$0	$0	$0	$0	$0	$134,588,543	$0	$0
2026	$0	$0	$0	$0	$0	$0	$0	$130,668,489	$0	$0
2027	$0	$0	$0	$0	$0	$0	$0	$126,862,610	$0	$0
2028	$22,713,750	($1,368,345)	$1,344,909	$34,142	$8,861	$2,341,700	$49,747	$0	$350,252	$0
2029	$22,211,586	($1,339,528)	$1,317,017	$33,576	$8,809	$2,302,463	$48,914	$0	$340,051	$0
2030	$21,720,525	($1,311,317)	$1,289,704	$33,020	$8,756	$2,263,883	$48,094	$0	$330,147	$0
2031	$21,240,321	($1,283,701)	$1,262,956	$32,472	$8,701	$2,225,950	$47,288	$0	$320,531	$0
2032	$20,770,732	($1,256,667)	$1,236,764	$31,934	$8,644	$2,188,652	$46,496	$0	$311,195	$0
2033	$20,311,526	($1,230,201)	$1,211,115	$31,405	$8,586	$2,151,980	$45,717	$0	$302,131	$0
2034	$19,862,472	($1,204,293)	$1,185,997	$30,884	$8,526	$2,115,922	$44,951	$0	$293,331	$0
2035	$19,423,346	($1,178,931)	$1,161,401	$30,372	$8,464	$2,080,468	$44,198	$0	$284,787	$0
2036	$18,993,928	($1,154,103)	$1,137,314	$29,869	$8,402	$2,045,608	$43,457	$0	$276,493	$0
2037	$18,574,003	($1,129,798)	$1,113,728	$29,374	$8,338	$2,011,332	$42,729	$0	$268,439	$0
2038	$18,163,363	($1,106,004)	$1,090,630	$28,887	$8,273	$1,977,630	$42,013	$0	$260,621	$0
2039	$17,761,801	($1,082,712)	$1,068,011	$28,408	$8,207	$1,944,493	$41,309	$0	$253,030	$0
2040	$17,369,117	($1,059,910)	$1,045,862	$27,937	$8,140	$1,911,912	$40,617	$0	$245,660	$219,760,254
Totals	**$259,116,471**	**($15,705,511)**	**$15,465,408**	**$402,279**	**$110,706**	**$27,561,993**	**$585,531**	**$392,119,642**	**$3,836,667**	**$219,760,254**

Abbreviation Legend and Notes	
N/A	No Application
TRK	Truck Trips
AM Peak	7:00 AM to 9:00 AM, PST
HPMS	Highway Performance Monitoring System
PCE	Passenger Car Equivalent
TDM	Travel Demand Model
AADT	Annual Average Daily Traffic
VHT	Vehicle Hours Travelled
VMT	Vehicle Miles Travelled
PHT	Person Hours Travelled

PCE Travel Demand Model	
TRK	1.63

Average Vehicle Occupancies Travel Demand Model	
Automobile	1.51
TRK	1.00

All Vehicle Volumes			
	2017	2040 No-Build	2040 Alt2
AM (7-9) Peak Traffic	74,820	98,685	97,796
PM (4-6) Peak Traffic	86,644	118,191	117,831
Average Daily Speed			
AADT	726,290	977,148	971,803
Daily VMT	########	2,797,015	2,813,474
Daily VHT	66,384	78,373	74,253

Car Volumes			
	2017	2040 No-Build	2040 Alt2
AM (7-9) Peak Traffic	71,753	94,639	93,787
PM (4-6) Peak Traffic	80,925	110,391	110,054
Average Daily Speed			
AADT	685,880	922,582	917,499
Daily VMT	########	2,644,096	2,659,485
Daily VHT	62,610	73,967	70,061

Truck Volumes			
	2017	2040 No-Build	2040 Alt2
AM (7-9) Peak Traffic	3,068	4,046	4,010
PM (4-6) Peak Traffic	5,718	7,801	7,777
Average Daily Speed			
AADT	40,410	54,567	54,303
Daily VMT	126,373	152,919	153,989
Daily VHT	3,774	4,406	4,192

Annual Growth Rates (2017 and 2040-No Build)			
	2017	2040 No-Build	Annual Growth
AADT	726,290	977,148	1.30%
VMT	2,312,360	2,797,015	0.83%
VHT	66,384	78,373	0.72%

Annual Growth Rates (2017 and 2040 Build)			
	2017	2040 Build	Annual Growth
AADT	726,290	971,803	1.27%
VMT	2,312,360	2,813,474	0.86%
VHT	66,384	74,253	0.49%

Annual Growth Rates (Automobile)			
	2017	2040 No-Build	Annual Growth
AADT	685,880	922,582	1.30%
VMT	2,185,986	2,644,096	0.83%
VHT	62,610	73,967	0.73%

Annual Growth Rates (Truck)			
	2017	2040 No-Build	Annual Growth
AADT	40,410	54,567	1.31%
VMT	126,373	152,919	0.83%
VHT	3,774	4,406	0.68%

Daily Traffic Values in Study Area 2023 to 2040 (All Vehicles)

Year	No-Build			Build (Alt 2)			Improvement		
	AADT	Daily VMT	Daily VHT	AADT	Daily VMT	Daily VHT	ADT	Daily VMT	Daily VHT
2017	726,290	########	66,384	N/A	N/A	N/A	N/A	N/A	N/A
2022	774,678	########	68,824	N/A	N/A	N/A	N/A	N/A	N/A
2023	784,736	########	69,322	780,443	2,444,340	65,678	4,293	-14,300	3,645
2024	794,924	########	69,825	790,575	2,464,647	66,154	4,349	-14,419	3,671
2025	805,244	########	70,330	800,839	2,485,122	66,633	4,405	-14,538	3,698
2026	815,699	########	70,840	811,237	2,505,767	67,116	4,462	-14,659	3,724
2027	826,289	########	71,353	821,769	2,526,584	67,602	4,520	-14,781	3,751
2028	837,017	########	71,870	832,438	2,547,573	68,092	4,579	-14,904	3,779
2029	847,884	########	72,391	843,246	2,568,737	68,585	4,639	-15,028	3,806
2030	858,892	########	72,915	854,193	2,590,077	69,082	4,699	-15,152	3,833
2031	870,043	########	73,443	865,283	2,611,594	69,582	4,760	-15,278	3,861
2032	881,339	########	73,976	876,518	2,633,290	70,086	4,822	-15,405	3,889
2033	892,782	########	74,511	887,897	2,655,167	70,594	4,884	-15,533	3,917
2034	904,373	########	75,051	899,425	2,677,224	71,106	4,948	-15,662	3,946
2035	916,114	########	75,595	911,102	2,699,466	71,621	5,012	-15,792	3,974
2036	928,008	########	76,143	922,931	2,721,892	72,140	5,077	-15,924	4,003
2037	940,057	########	76,694	934,914	2,744,504	72,662	5,143	-16,056	4,032
2038	952,261	########	77,250	947,052	2,767,304	73,189	5,210	-16,189	4,061
2039	964,625	########	77,810	959,347	2,790,293	73,719	5,277	-16,324	4,091
2040	977,148	########	78,373	971,803	2,813,474	74,253	5,346	-16,459	4,120

Annual Traffic Values in Study Area 2023 to 2040 (All Vehicles)

Year	No-Build			Build (Alt 2)			Improvement			
	Annual Traffic	Annual VMT	Annual VHT	Annual Traffic	Annual VMT	Annual VHT	Annual Traffic	Annual VMT	Annual VHT	% VMT
2017	265,095,969	844,011,282	24,230,151	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2022	282,757,447	879,656,921	25,120,663	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2023	286,428,506	886,964,705	25,302,655	284,861,530	892,184,129	23,972,384	1,566,976	-5,219,424	1,330,270	-0.59%
2024	290,147,226	894,333,199	25,485,965	288,559,906	899,595,984	24,146,057	1,587,320	-5,262,784	1,339,908	-0.59%
2025	293,914,227	901,762,907	25,670,603	292,306,299	907,069,412	24,320,988	1,607,928	-5,306,505	1,349,615	-0.59%
2026	297,730,135	909,254,338	25,856,579	296,101,331	914,604,927	24,497,187	1,628,804	-5,350,589	1,359,392	-0.59%
2027	301,595,585	916,808,004	26,043,902	299,945,634	922,203,043	24,674,662	1,649,951	-5,395,039	1,369,241	-0.59%
2028	305,511,220	924,424,422	26,232,583	303,839,848	929,864,281	24,853,422	1,671,372	-5,439,859	1,379,161	-0.59%
2029	309,477,693	932,104,114	26,422,630	307,784,621	937,589,165	25,033,478	1,693,072	-5,485,051	1,389,152	-0.59%
2030	313,495,662	939,847,606	26,614,054	311,780,609	945,378,224	25,214,838	1,715,053	-5,530,618	1,399,216	-0.59%
2031	317,565,797	947,655,427	26,806,865	315,828,477	953,231,990	25,397,512	1,737,320	-5,576,564	1,409,353	-0.59%
2032	321,688,775	955,528,111	27,001,073	319,928,899	961,151,002	25,581,510	1,759,876	-5,622,891	1,419,563	-0.59%
2033	325,865,282	963,466,198	27,196,688	324,082,557	969,135,802	25,766,840	1,782,724	-5,669,604	1,429,848	-0.59%
2034	330,096,012	971,470,231	27,393,720	328,290,143	977,186,936	25,953,513	1,805,869	-5,716,704	1,440,207	-0.59%
2035	334,381,671	979,540,758	27,592,179	332,552,356	985,304,954	26,141,539	1,829,315	-5,764,196	1,450,640	-0.59%
2036	338,722,970	987,678,332	27,792,076	336,869,905	993,490,414	26,330,926	1,853,065	-5,812,082	1,461,150	-0.59%
2037	343,120,633	995,883,508	27,993,422	341,243,509	###########	26,521,686	1,877,124	-5,860,366	1,471,735	-0.59%
2038	347,575,391	###########	28,196,226	345,673,896	###########	26,713,828	1,901,494	-5,909,051	1,482,398	-0.59%
2039	352,087,985	###########	28,400,499	350,161,803	###########	26,907,362	1,926,182	-5,958,141	1,493,137	-0.59%
2040	356,659,167	###########	28,606,252	354,707,977	###########	27,102,298	1,951,189	-6,007,639	1,503,955	-0.59%

Daily Automobile Traffic Values in Study Area 2023 to 2040

Year	No-Build			Build (Alt 2)			Improvement		
	ADT	Daily VMT	Daily VHT	ADT	Daily VMT	Daily VHT	ADT	Daily VMT	Daily VHT
2017	685,880	########	62,610	N/A	N/A	N/A	N/A	N/A	N/A
2022	731,541	########	64,921	N/A	N/A	N/A	N/A	N/A	N/A
2023	741,032	########	65,393	736,950	2,310,593	61,939	4,082	-13,370	3,454
2024	750,646	########	65,869	746,510	2,329,786	62,390	4,135	-13,481	3,479
2025	760,384	########	66,348	756,195	2,349,138	62,843	4,189	-13,593	3,504
2026	770,249	########	66,830	766,006	2,368,651	63,301	4,243	-13,706	3,530
2027	780,242	########	67,317	775,944	2,388,327	63,761	4,298	-13,820	3,556
2028	790,364	########	67,806	786,010	2,408,166	64,225	4,354	-13,935	3,581
2029	800,618	########	68,299	796,208	2,428,169	64,692	4,410	-14,051	3,607
2030	811,005	########	68,796	806,538	2,448,339	65,163	4,468	-14,167	3,634
2031	821,527	########	69,297	817,001	2,468,676	65,637	4,526	-14,285	3,660
2032	832,185	########	69,801	827,601	2,489,182	66,114	4,584	-14,404	3,687
2033	842,981	########	70,308	838,338	2,509,859	66,595	4,644	-14,523	3,714
2034	853,918	########	70,820	849,214	2,530,707	67,079	4,704	-14,644	3,741
2035	864,996	########	71,335	860,231	2,551,729	67,567	4,765	-14,766	3,768
2036	876,218	########	71,854	871,391	2,572,925	68,059	4,827	-14,888	3,795
2037	887,586	########	72,377	882,696	2,594,297	68,554	4,890	-15,012	3,823
2038	899,101	########	72,903	894,148	2,615,847	69,052	4,953	-15,137	3,851
2039	910,766	########	73,433	905,748	2,637,575	69,555	5,017	-15,262	3,879
2040	922,582	########	73,967	917,499	2,659,485	70,061	5,082	-15,389	3,907

Annual Automobile Traffic Values in Study Area 2023 to 2040

Year	No-Build			Build (Alt 2)			Improvement			
	Annual Traffic	Annual VMT	Annual VHT	Annual Traffic	Annual VMT	Annual VHT	Annual Traffic	Annual VMT	Annual VHT	% VMT
2017	250,346,194	797,885,029	22,852,774	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2022	267,012,483	831,578,581	23,696,097	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2023	270,476,589	838,486,144	23,868,460	268,986,595	843,366,267	22,607,778	1,489,993	-4,880,123	1,260,683	-0.58%
2024	273,985,636	845,451,085	24,042,077	272,476,312	850,371,745	22,772,224	1,509,324	-4,920,660	1,269,853	-0.58%
2025	277,540,208	852,473,881	24,216,957	276,011,303	857,435,414	22,937,867	1,528,905	-4,961,534	1,279,090	-0.58%
2026	281,140,896	859,555,012	24,393,108	279,592,155	864,557,759	23,104,715	1,548,741	-5,002,747	1,288,394	-0.58%
2027	284,788,297	866,694,963	24,570,541	283,219,464	871,739,266	23,272,776	1,568,833	-5,044,303	1,297,765	-0.58%
2028	288,483,018	873,894,223	24,749,265	286,893,832	878,980,426	23,442,060	1,589,187	-5,086,204	1,307,205	-0.58%
2029	292,225,673	881,153,284	24,929,288	290,615,869	886,281,736	23,612,575	1,609,804	-5,128,452	1,316,713	-0.58%
2030	296,016,884	888,472,642	25,110,621	294,386,195	893,643,694	23,784,330	1,630,689	-5,171,052	1,326,291	-0.58%
2031	299,857,280	895,852,799	25,293,273	298,205,435	901,066,805	23,957,335	1,651,845	-5,214,006	1,335,938	-0.58%
2032	303,747,500	903,294,261	25,477,254	302,074,225	908,551,577	24,131,598	1,673,275	-5,257,316	1,345,656	-0.58%
2033	307,688,190	910,797,535	25,662,573	305,993,206	916,098,521	24,307,129	1,694,984	-5,300,987	1,355,444	-0.58%
2034	311,680,004	918,363,135	25,849,240	309,963,031	923,708,155	24,483,937	1,716,974	-5,345,020	1,365,303	-0.58%
2035	315,723,607	925,991,580	26,037,265	313,984,358	931,380,999	24,662,030	1,739,249	-5,389,418	1,375,234	-0.58%
2036	319,819,670	933,683,391	26,226,657	318,057,856	939,117,577	24,841,419	1,761,813	-5,434,186	1,385,238	-0.58%
2037	323,968,873	941,439,094	26,417,427	322,184,203	946,918,420	25,022,113	1,784,670	-5,479,325	1,395,314	-0.58%
2038	328,171,906	949,259,221	26,609,585	326,364,082	954,784,061	25,204,121	1,807,824	-5,524,840	1,405,463	-0.58%
2039	332,429,468	957,144,306	26,803,140	330,598,190	962,715,039	25,387,454	1,831,278	-5,570,732	1,415,686	-0.58%
2040	336,742,265	965,094,889	26,998,103	334,887,229	970,711,895	25,572,119	1,855,036	-5,617,006	1,425,984	-0.58%

Daily Truck Traffic Values in Study Area 2023 to 2040

Year	No-Build			Build (Alt 2)			Improvement		
	ADT	Daily VMT	Daily VHT	ADT	Daily VMT	Daily VHT	ADT	Daily VMT	Daily VHT
2017	40,410	126,373	3,774	N/A	N/A	N/A	N/A	N/A	N/A
2022	43,137	131,721	3,903	N/A	N/A	N/A	N/A	N/A	N/A
2023	43,704	132,818	3,929	43,493	133,748	3,739	211	-930	191
2024	44,278	133,924	3,956	44,065	134,861	3,764	214	-937	192
2025	44,860	135,038	3,983	44,644	135,984	3,789	217	-945	193
2026	45,450	136,163	4,010	45,231	137,116	3,815	219	-953	195
2027	46,047	137,296	4,037	45,825	138,257	3,841	222	-961	196
2028	46,653	138,439	4,064	46,427	139,408	3,867	225	-969	197
2029	47,266	139,591	4,091	47,038	140,568	3,893	228	-977	198
2030	47,887	140,753	4,119	47,656	141,738	3,919	231	-985	200
2031	48,516	141,925	4,147	48,282	142,918	3,946	234	-993	201
2032	49,154	143,106	4,175	48,917	144,108	3,972	237	-1,002	202
2033	49,800	144,298	4,203	49,560	145,308	3,999	240	-1,010	204
2034	50,455	145,499	4,231	50,211	146,517	4,026	244	-1,018	205
2035	51,118	146,710	4,260	50,871	147,737	4,053	247	-1,027	207
2036	51,790	147,931	4,289	51,540	148,967	4,081	250	-1,035	208
2037	52,471	149,163	4,318	52,217	150,207	4,108	253	-1,044	209
2038	53,160	150,404	4,347	52,904	151,457	4,136	257	-1,053	211
2039	53,859	151,656	4,376	53,599	152,718	4,164	260	-1,061	212
2040	54,567	152,919	4,406	54,303	153,989	4,192	263	-1,070	214

Annual Truck Traffic Values in Study Area 2023 to 2040

Year	No-Build			Build (Alt 2)			Improvement			
	Annual Traffic	Annual VMT	Annual VHT	Annual Traffic	Annual VMT	Annual VHT	Annual Traffic	Annual VMT	Annual VHT	% VMT
2017	14,749,776	46,126,253	1,377,377	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2022	15,744,964	48,078,340	1,424,565	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2023	15,951,917	48,478,562	1,434,194	15,874,935	48,817,862	1,364,607	76,982	-339,301	69,587	-0.70%
2024	16,161,590	48,882,114	1,443,888	16,083,594	49,224,239	1,373,833	77,996	-342,124	70,055	-0.70%
2025	16,374,019	49,289,026	1,453,646	16,294,996	49,633,998	1,383,121	79,023	-344,971	70,525	-0.70%
2026	16,589,239	49,699,326	1,463,471	16,509,175	50,047,168	1,392,472	80,063	-347,842	70,999	-0.70%
2027	16,807,288	50,113,041	1,473,361	16,726,170	50,463,777	1,401,885	81,118	-350,737	71,476	-0.70%
2028	17,028,202	50,530,200	1,483,318	16,946,016	50,883,855	1,411,362	82,186	-353,655	71,956	-0.70%
2029	17,252,019	50,950,831	1,493,342	17,168,751	51,307,429	1,420,903	83,268	-356,598	72,439	-0.70%
2030	17,478,778	51,374,964	1,503,433	17,394,414	51,734,529	1,430,508	84,364	-359,566	72,925	-0.70%
2031	17,708,517	51,802,627	1,513,592	17,623,042	52,165,185	1,440,177	85,475	-362,558	73,415	-0.70%
2032	17,941,275	52,233,850	1,523,819	17,854,675	52,599,425	1,449,911	86,600	-365,575	73,908	-0.70%
2033	18,177,092	52,668,664	1,534,115	18,089,351	53,037,281	1,459,711	87,741	-368,617	74,404	-0.70%
2034	18,416,008	53,107,096	1,544,480	18,327,112	53,478,781	1,469,577	88,896	-371,684	74,903	-0.70%
2035	18,658,064	53,549,178	1,554,914	18,567,997	53,923,956	1,479,509	90,066	-374,777	75,406	-0.70%
2036	18,903,300	53,994,941	1,565,419	18,812,048	54,372,837	1,489,507	91,252	-377,896	75,912	-0.70%
2037	19,151,760	54,444,414	1,575,995	19,059,306	54,825,454	1,499,573	92,454	-381,041	76,422	-0.70%
2038	19,403,485	54,897,628	1,586,641	19,309,814	55,281,840	1,509,707	93,671	-384,212	76,935	-0.70%
2039	19,658,518	55,354,615	1,597,359	19,563,613	55,742,024	1,519,908	94,904	-387,409	77,451	-0.70%
2040	19,916,902	55,815,407	1,608,149	19,820,748	56,206,039	1,530,178	96,154	-390,633	77,971	-0.70%

Operation Costs Savings Summary (Vehicle Miles Travelled)					
Year	Automobiles		Trucks		Total Cost Savings
	Mile Reduction	Value	Mile Reduction	Value	
2019	N/A	N/A	N/A	N/A	N/A
2025	N/A	$0	N/A	$0	$0
2026	N/A	$0	N/A	$0	$0
2027	N/A	$0	N/A	$0	$0
2028	-5,086,204	-$1,576,723	-353,655	-$208,657	-$1,785,380
2029	-5,128,452	-$1,589,820	-356,598	-$210,393	-$1,800,213
2030	-5,171,052	-$1,603,026	-359,566	-$212,144	-$1,815,170
2031	-5,214,006	-$1,616,342	-362,558	-$213,909	-$1,830,251
2032	-5,257,316	-$1,629,768	-365,575	-$215,689	-$1,845,457
2033	-5,300,987	-$1,643,306	-368,617	-$217,484	-$1,860,790
2034	-5,345,020	-$1,656,956	-371,684	-$219,294	-$1,876,250
2035	-5,389,418	-$1,670,720	-374,777	-$221,119	-$1,891,838
2036	-5,434,186	-$1,684,598	-377,896	-$222,959	-$1,907,556
2037	-5,479,325	-$1,698,591	-381,041	-$224,814	-$1,923,405
2038	-5,524,840	-$1,712,700	-384,212	-$226,685	-$1,939,385
2039	-5,570,732	-$1,726,927	-387,409	-$228,571	-$1,955,498
2040	-5,617,006	-$1,741,272	-390,633	-$230,473	-$1,971,745

Economic Update Factor (Using GDP Deflator)
1.0152
*See Economic Update Factor tab for calculation.

Vehicle Operation Cost Inflation at 1.52%/year	
Travel Type	2019
Automobile	$0.31
Truck	$0.59

NDOT Values

Table E-8 Vehicle Non-Fuel Operating Costs (2019 USD)

Vehicle Non-Fuel Operating Costs	Cost Per Mile ($)
Light Duty Vehicle[1]	0.31
Commercial Truck[2]	0.59

1. Source: American Automobile Association, Your Driving Costs – 2019 Edition.
2. Source: American Transportation Research Institute, An Analysis of the Operational Costs of Trucking: 2018 Update.

Estimated Vehicle Miles Travelled - I-15 Flamingo to Sahara Feasibility Study																
	No-Build						Build (Alt 2)						Miles Travelled Improvement			
	All Vehicles		Automobiles		Trucks		All Vehicles		Automobiles		Trucks		All Vehicles	Automobiles	Trucks	% VMT
Year	Annual Traffic	Annual VMT	Annual Traffic	Annual VMT	Annual Traffic	Annual VMT	Annual Traffic	Annual VMT	Annual Traffic	Annual VMT	Annual Traffic	Annual VMT	Annual VMT	Annual VMT	Annual VMT	
2019	265,095,969	844,011,282	250,346,194	797,885,029	14,749,776	46,126,253	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2025	293,914,227	901,762,907	277,540,208	852,473,881	16,374,019	49,289,026	292,306,299	907,069,412	276,011,303	857,435,414	16,294,996	49,633,998	-5,306,505	-4,961,534	-344,971	-0.59%
2026	297,730,135	909,254,338	281,140,896	859,555,012	16,589,239	49,699,326	296,101,331	914,604,927	279,592,155	864,557,759	16,509,175	50,047,168	-5,350,589	-5,002,747	-347,842	-0.59%
2027	301,595,585	916,808,004	284,788,297	866,694,963	16,807,288	50,113,041	299,945,634	922,203,043	283,219,464	871,739,266	16,726,170	50,463,777	-5,395,039	-5,044,303	-350,737	-0.59%
2028	305,511,220	924,424,422	288,483,018	873,894,223	17,028,202	50,530,200	303,839,848	929,864,281	286,893,832	878,980,426	16,946,016	50,883,855	-5,439,859	-5,086,204	-353,655	-0.59%
2029	309,477,693	932,104,114	292,225,673	881,153,284	17,252,019	50,950,831	307,784,621	937,589,165	290,615,869	886,281,736	17,168,751	51,307,429	-5,485,051	-5,128,452	-356,598	-0.59%
2030	313,495,662	939,847,606	296,016,884	888,472,642	17,478,778	51,374,964	311,780,609	945,378,224	294,386,195	893,643,694	17,394,414	51,734,529	-5,530,618	-5,171,052	-359,566	-0.59%
2031	317,565,797	947,655,427	299,857,280	895,852,799	17,708,517	51,802,627	315,828,477	953,231,990	298,205,435	901,066,805	17,623,042	52,165,185	-5,576,564	-5,214,006	-362,558	-0.59%
2032	321,688,775	955,528,111	303,747,500	903,294,261	17,941,275	52,233,850	319,928,899	961,151,002	302,074,225	908,551,577	17,854,675	52,599,425	-5,622,891	-5,257,316	-365,575	-0.59%
2033	325,865,282	963,466,198	307,688,190	910,797,535	18,177,092	52,668,664	324,082,557	969,135,802	305,993,206	916,098,521	18,089,351	53,037,281	-5,669,604	-5,300,987	-368,617	-0.59%
2034	330,096,012	971,470,231	311,680,004	918,363,135	18,416,008	53,107,096	328,290,143	977,186,936	309,963,031	923,708,155	18,327,112	53,478,781	-5,716,704	-5,345,020	-371,684	-0.59%
2035	334,381,671	979,540,758	315,723,607	925,991,580	18,658,064	53,549,178	332,552,356	985,304,954	313,984,358	931,380,999	18,567,997	53,923,956	-5,764,196	-5,389,418	-374,777	-0.59%
2036	338,722,970	987,678,332	319,819,670	933,683,391	18,903,300	53,994,941	336,869,905	993,490,414	318,057,856	939,117,577	18,812,048	54,372,837	-5,812,082	-5,434,186	-377,896	-0.59%
2037	343,120,633	995,883,508	323,968,873	941,439,094	19,151,760	54,444,414	341,243,509	1,001,743,874	322,184,203	946,918,420	19,059,306	54,825,454	-5,860,366	-5,479,325	-381,041	-0.59%
2038	347,575,391	1,004,156,849	328,171,906	949,259,221	19,403,485	54,897,628	345,673,896	1,010,065,901	326,364,082	954,784,061	19,309,814	55,281,840	-5,909,051	-5,524,840	-384,212	-0.59%
2039	352,087,985	1,012,498,922	332,429,468	957,144,306	19,658,518	55,354,615	350,161,803	1,018,457,063	330,598,190	962,715,039	19,563,613	55,742,024	-5,958,141	-5,570,732	-387,409	-0.59%
2040	356,659,167	1,020,910,296	336,742,265	965,094,889	19,916,902	55,815,407	354,707,977	1,026,917,935	334,887,229	970,711,895	19,820,748	56,206,039	-6,007,639	-5,617,006	-390,633	-0.59%

Time Savings Summary (Person Hours)					
Year	Auto (Hours)	Value ($)	Truck (Hours)	Value ($)	Total Cost Savings
2019	N/A	$0	N/A	$0	$0
2025	N/A	$0	N/A	$0	$0
2026	N/A	$0	N/A	$0	$0
2027	N/A	$0	N/A	$0	$0
2028	1,973,879	#########	71,956	#########	$29,636,291
2029	1,988,237	#########	72,439	#########	$29,850,515
2030	2,002,700	#########	72,925	#########	$30,066,287
2031	2,017,267	#########	73,415	#########	$30,283,618
2032	2,031,940	#########	73,908	#########	$30,502,521
2033	2,046,720	#########	74,404	#########	$30,723,006
2034	2,061,608	#########	74,903	#########	$30,945,084
2035	2,076,604	#########	75,406	#########	$31,168,768
2036	2,091,709	#########	75,912	#########	$31,394,068
2037	2,106,924	#########	76,422	#########	$31,620,998
2038	2,122,249	#########	76,935	#########	$31,849,567
2039	2,137,686	#########	77,451	#########	$32,079,789
2040	2,153,236	29,701,217	77,971	#########	$32,311,675

Economic Update Factor (Using GDP Deflator)
1.0152

*See Economic Update Factor tab for calculation.

Travel Cost	
Travel Type	2019
Personal Travel	$11.16
Business Travel	$33.48

Travel Values	
Travel Category	
Personal Travel Percentage	88.20%
Business Travel Percentage	11.80%
Passenger Vehicle Occupancy per Car**	1.51

**Southern Nevada Regional Transportation Commission

NDOT Values

Table E-1 Travel Costs (2019 USD)

Statistical Area	Mean Wage ($/hour)	Personal Travel ($/hour)	Business Travel ($/hour)
Nevada	$22.60	$11.30	$33.90
Las Vegas – Paradise MSA	$22.32	$11.16	$33.48
Reno – Sparks MSA	$23.19	$11.60	$34.79
Carson City MSA	$24.88	$12.44	$37.32

Source: Occupational Employment Statistics (OES) survey for Nevada conducted by the Research and Analysis Bureau

Estimated TravelTime Values - I-15 Flamingo to Sahara Feasibility Study																									
	No-Build								Build (Alt 2)								Travel Time Improvements								
	All Vehicles		Automobiles			Trucks			All Vehicles		Automobiles			Trucks			All Vehicles		Automobiles			Trucks		
Year	Annual Traffic	Annual VHT	Annual Traffic	Annual VHT	Annual PHT	Annual Traffic	Annual VHT	Annual PHT	Annual Traffic	Annual VHT	Annual Traffic	Annual VHT	Annual PHT	Annual Traffic	Annual VHT	Annual PHT	Annual Traffic	Annual VHT	Annual Traffic	Annual VHT	Annual PHT	Annual Traffic	Annual VHT	Annual PHT
2019	265,095,969	24,230,151	250,346,194	22,852,774	34,507,689	14,749,776	1,377,377	1,377,377	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2025	293,914,227	25,670,603	277,540,208	24,216,957	36,567,605	16,374,019	1,453,646	1,453,646	292,306,299	24,320,988	276,011,303	22,937,867	34,636,179	16,294,996	1,383,121	1,383,121	1,607,928	1,349,615	1,528,905	1,279,090	1,931,425	79,023	70,525	70,525
2026	297,730,135	25,856,579	281,140,896	24,393,108	36,833,594	16,589,239	1,463,471	1,463,471	296,101,331	24,497,187	279,592,155	23,104,715	34,888,119	16,509,175	1,392,472	1,392,472	1,628,804	1,359,392	1,548,741	1,288,394	1,945,474	80,063	70,999	70,999
2027	301,595,585	26,043,902	284,788,297	24,570,541	37,101,517	16,807,288	1,473,361	1,473,361	299,945,634	24,674,662	283,219,464	23,272,776	35,141,892	16,726,170	1,401,885	1,401,885	1,649,951	1,369,241	1,568,833	1,297,765	1,959,625	81,118	71,476	71,476
2028	305,511,220	26,232,583	288,483,018	24,749,265	37,371,390	17,028,202	1,483,318	1,483,318	303,839,848	24,853,422	286,893,832	23,442,060	35,397,510	16,946,016	1,411,362	1,411,362	1,671,372	1,379,161	1,589,187	1,307,265	1,973,879	82,186	71,956	71,956
2029	309,477,693	26,422,630	292,225,673	24,929,288	37,643,225	17,252,019	1,493,342	1,493,342	307,784,621	25,033,478	290,615,869	23,612,575	35,654,988	17,168,751	1,420,903	1,420,903	1,693,072	1,389,152	1,609,804	1,316,713	1,988,237	83,268	72,439	72,439
2030	313,495,662	26,614,054	296,016,884	25,110,621	37,917,038	17,478,778	1,503,433	1,503,433	311,780,609	25,214,838	294,386,195	23,784,330	35,914,339	17,394,414	1,430,508	1,430,508	1,715,053	1,399,216	1,630,689	1,326,291	2,002,700	84,364	72,925	72,925
2031	317,565,797	26,806,865	299,857,280	25,293,273	38,192,843	17,708,517	1,513,592	1,513,592	315,828,477	25,397,512	298,205,435	23,957,335	36,175,576	17,623,042	1,440,177	1,440,177	1,737,320	1,409,353	1,651,845	1,335,938	2,017,267	85,475	73,415	73,415
2032	321,688,775	27,001,073	303,747,500	25,477,254	38,470,654	17,941,275	1,523,819	1,523,819	319,928,899	25,581,510	302,074,225	24,131,598	36,438,713	17,854,675	1,449,911	1,449,911	1,759,876	1,419,583	1,673,275	1,345,656	2,031,940	86,600	73,908	73,908
2033	325,865,282	27,196,688	307,688,190	25,662,573	38,750,485	18,177,092	1,534,115	1,534,115	324,082,557	25,766,840	305,993,206	24,307,129	36,703,765	18,089,351	1,459,711	1,459,711	1,782,724	1,429,848	1,694,984	1,355,444	2,046,728	87,741	74,404	74,404
2034	330,096,012	27,393,720	311,680,004	25,849,240	39,032,352	18,416,008	1,544,480	1,544,480	328,290,143	25,953,513	309,963,031	24,483,937	36,970,744	18,327,112	1,469,577	1,469,577	1,805,869	1,440,207	1,716,974	1,365,303	2,061,608	88,896	74,903	74,903
2035	334,381,671	27,592,179	315,723,607	26,037,265	39,316,270	18,658,064	1,554,914	1,554,914	332,552,356	26,141,539	313,984,358	24,662,030	37,239,666	18,567,997	1,479,509	1,479,509	1,829,315	1,450,640	1,739,249	1,375,234	2,076,604	90,066	75,406	75,406
2036	338,722,970	27,792,076	319,819,670	26,226,657	39,602,252	18,903,300	1,565,419	1,565,419	336,869,905	26,330,926	318,057,856	24,841,419	37,510,543	18,812,048	1,489,507	1,489,507	1,853,065	1,461,150	1,761,813	1,385,238	2,091,709	91,252	75,912	75,912
2037	343,120,633	27,993,422	323,968,873	26,417,427	39,890,315	19,151,760	1,575,995	1,575,995	341,243,509	26,521,686	322,184,203	25,022,113	37,783,391	19,059,306	1,499,573	1,499,573	1,877,124	1,471,735	1,784,670	1,395,314	2,106,924	92,454	76,422	76,422
2038	347,575,391	28,196,226	328,171,906	26,609,585	40,180,473	19,403,485	1,586,641	1,586,641	345,673,896	26,713,828	326,364,082	25,204,121	38,058,223	19,309,814	1,509,707	1,509,707	1,901,494	1,482,398	1,807,824	1,405,463	2,122,249	93,671	76,935	76,935
2039	352,087,985	28,400,499	332,429,468	26,803,140	40,472,741	19,658,518	1,597,359	1,597,359	350,161,803	26,907,362	330,598,190	25,387,454	38,335,055	19,563,613	1,519,908	1,519,908	1,926,182	1,493,137	1,831,278	1,415,686	2,137,686	94,904	77,451	77,451
2040	356,659,167	28,606,252	336,742,265	26,998,103	40,767,136	19,916,902	1,608,149	1,608,149	354,707,977	27,102,298	334,887,229	25,572,119	38,613,900	19,820,748	1,530,178	1,530,178	1,951,189	1,503,955	1,855,036	1,425,984	2,153,236	96,154	77,971	77,971

72	32	39	30.98%	35.23%
53	23	29	22.32%	26.29%
39	17	22	16.45%	19.65%
2,845	1,447	1,414		

0.000	
0.000	
0.000	
0.000	Total Daily Delay Reduction (Cars)
0	Total Annual Delay Reduction (Cars)

Costs for I-15 Flamingo to Sahara Feasibility Study

Project Inputs	
Total Project Cost ($2019)	$482,117,277
Annual O&M	$457,000

Construction and O&M Costs in 2019 Dollars

Year	Construction Costs	O&M Costs	Total Costs
2025	$160,705,759	$0	**$160,705,759**
2026	$160,705,759	$0	**$160,705,759**
2027	$160,705,759	$0	**$160,705,759**
2028	$0	$457,000	**$457,000**
2029	$0	$457,000	**$457,000**
2030	$0	$457,000	**$457,000**
2031	$0	$457,000	**$457,000**
2032	$0	$457,000	**$457,000**
2033	$0	$457,000	**$457,000**
2034	$0	$457,000	**$457,000**
2035	$0	$457,000	**$457,000**
2036	$0	$457,000	**$457,000**
2037	$0	$457,000	**$457,000**
2038	$0	$457,000	**$457,000**
2039	$0	$457,000	**$457,000**
2040	$0	$457,000	**$457,000**

Total Project

Item	Description	Total Cost
SECTION I	ROADWAY CONSTRUCTION	$39,588,391
SECTION II	BRIDGES	$30,054,868
SECTION III	WALLS	$5,236,372
SECTION IV	TYPICAL INTERCHANGES	$0
SECTION V	SIGNAL SYSTEMS AT INTERSECTIONS	$1,122,000
SECTION VI	DEMOLITION	$2,011,314
SECTION VII	ADDITIONAL ITEMS	$70,724,330
	Subtotal	$148,737,275
SECTION VIII	STANDARD PERCENTAGE ADDERS	$76,569,801
TOTAL PRESENT DAY CONSTRUCTION COST (2019)		$299,788,754
TOTAL ESCALATED CONSTRUCTION COST (2019)		$299,788,754
TOTAL ENGINEERING / ADMINISTRATION / LEGAL COSTS		$116,899,347
RIGHT OF WAY COSTS		$42,974,700
TOTAL CONSTRUCTION & ENGINEERING (2019)		$459,662,801
SECTION IX	HYDRAULICS/STORM WATER COSTS (2019)	$11,227,238
SECTION X	ENVIRONMENTAL CONSIDERATION COSTS (2019)	$11,227,238
	Project Total ($2019) =	**$482,117,277**

Percentage of Roadway Construction	46.7%
Percentage of Bridge Construction	53.3%

202,320,875
85,421,528

Roadway

Project Inputs	
Roadway Cost ($2019)	$225,007,876
Annual O&M	$375,000

Construction and O&M Costs in 2019 Dollars

Year	Construction Costs	O&M Costs	Total Costs
2025	$75,002,625	$0	**$75,002,625**
2026	$75,002,625	$0	**$75,002,625**
2027	$75,002,625	$0	**$75,002,625**
2028		$375,000	**$375,000**
2029		$375,000	**$375,000**
2030		$375,000	**$375,000**
2031		$375,000	**$375,000**
2032		$375,000	**$375,000**
2033		$375,000	**$375,000**
2034		$375,000	**$375,000**
2035		$375,000	**$375,000**
2036		$375,000	**$375,000**
2037		$375,000	**$375,000**
2038		$375,000	**$375,000**
2039		$375,000	**$375,000**
2040		$375,000	**$375,000**

Item	Description	Total Cost
SECTION I	ROADWAY CONSTRUCTION	$39,588,391
SECTION II	BRIDGES	$0
SECTION III	WALLS	$0
SECTION IV	TYPICAL INTERCHANGES	$0
SECTION V	SIGNAL SYSTEMS AT INTERSECTIONS	$1,122,000
SECTION VI	DEMOLITION	$938,696
SECTION VII	ADDITIONAL ITEMS	$33,007,594
	Subtotal	$74,656,680
SECTION VIII	STANDARD PERCENTAGE ADDERS	$35,735,720
TOTAL PRESENT DAY CONSTRUCTION COST (2019)		$139,913,739
TOTAL ESCALATED CONSTRUCTION COST (2019)		$139,913,739
TOTAL ENGINEERING / ADMINISTRATION / LEGAL COSTS		$54,557,833
RIGHT OF WAY COSTS		$20,056,626
TOTAL CONSTRUCTION & ENGINEERING (2019)		$214,528,198
SECTION IX	HYDRAULICS/STORM WATER COSTS (2019)	$5,239,839
SECTION X	ENVIRONMENTAL CONSIDERATION COSTS (2019)	$5,239,839
	Roadway Total ($2019) =	$225,007,876

Bridge Structures

Project Inputs	
Bridge Structures Cost ($2019)	$257,109,401
Annual O&M	$82,000

Construction and O&M Costs in 2019 Dollars

Year	Construction Costs	O&M Costs	Total Costs
2025	$85,703,134	$0	**$85,703,134**
2026	$85,703,134	$0	**$85,703,134**
2027	$85,703,134	$0	**$85,703,134**
2028		$82,000	**$82,000**
2029		$82,000	**$82,000**
2030		$82,000	**$82,000**
2031		$82,000	**$82,000**
2032		$82,000	**$82,000**
2033		$82,000	**$82,000**
2034		$82,000	**$82,000**
2035		$82,000	**$82,000**
2036		$82,000	**$82,000**
2037		$82,000	**$82,000**
2038		$82,000	**$82,000**
2039		$82,000	**$82,000**
2040		$82,000	**$82,000**

Item	Description	Total Cost
SECTION I	ROADWAY CONSTRUCTION	$0
SECTION II	BRIDGES	$30,054,868
SECTION III	WALLS	$5,236,372
SECTION IV	TYPICAL INTERCHANGES	$0
SECTION V	SIGNAL SYSTEMS AT INTERSECTIONS	$0
SECTION VI	DEMOLITION	$1,072,618
SECTION VII	ADDITIONAL ITEMS	$37,716,736
	Subtotal	$74,080,595
SECTION VIII	STANDARD PERCENTAGE ADDERS	$40,834,080
TOTAL PRESENT DAY CONSTRUCTION COST (2019)		$159,875,015
TOTAL ESCALATED CONSTRUCTION COST (2019)		$159,875,015
TOTAL ENGINEERING / ADMINISTRATION / LEGAL COSTS		$62,341,514
RIGHT OF WAY COSTS		$22,918,074
TOTAL CONSTRUCTION & ENGINEERING (2019)		$245,134,603
SECTION IX	HYDRAULICS/STORM WATER COSTS (2019)	$5,987,399
SECTION X	ENVIRONMENTAL CONSIDERATION COSTS (2019)	
	Structures Total ($2019) =	**$257,109,401**

Annual Maintenance Cost for I-15 Flamingo to Sahara Feasibility Study	
Facility Type	O&M per Year ($2019)
Roadways: Asphalt Pavement	$375,000
Concrete Bridges	$29,000
Steel Bridges	$53,000
Total	**$457,000**

Note: O&M cost per C-A Group

Analysis Period	
Start Year	2028
End Year	2040
Years in Analysis Period	12

Roadway Construction ($2019)	$ 482,117,277
Bridge Structures ($2019)	$ 257,109,401

Project Useful Service Life (Years)		
Project Type	Years	Source
Pavement	20	2019 Nevada DOT Road Design Guide (Page 26)
Bridge Structure	75	2019 Nevada State Highway Preservation Report (Pages 5, 6, 61, 68)

Residual Values	
Residual Value (Roadway)	$ 192,846,910.93
Residual Value (Bridge Structures)	$ 215,971,896.97
Total	**$ 408,818,808**

Alternative 2 Crash Savings Summary			
Year	Estimated No-Build Crash Costs	Estimated Build Crash Costs	Estimated Annual Crash Cost Savings
2019	$69,806,864	N/A	N/A
2025	$70,409,910	N/A	N/A
2026	$71,018,166	N/A	N/A
2027	$71,631,677	N/A	N/A
2028	$72,250,487	$70,495,685	$1,754,802
2029	$72,874,643	$71,104,682	$1,769,961
2030	$73,504,191	$71,718,940	$1,785,251
2031	$74,139,178	$72,338,504	$1,800,674
2032	$74,779,650	$72,963,421	$1,816,229
2033	$75,425,656	$73,593,736	$1,831,919
2034	$76,077,241	$74,229,496	$1,847,745
2035	$76,734,456	$74,870,749	$1,863,707
2036	$77,397,348	$75,517,541	$1,879,807
2037	$78,065,967	$76,169,921	$1,896,047
2038	$78,740,362	$76,827,936	$1,912,426
2039	$79,420,583	$77,491,636	$1,928,947
2040	$80,106,680	$78,161,069	$1,945,611

NDOT Valuation of a Statistical Life in Economic Analysis	
KABCO Level	Monetized Value (2019)
C - Possible Injury	$65,100
B - Non-incapacitating	$127,300
A - Incapacitating	$467,400
K - Killed	$9,800,000
Property Damage Only	$4,500

Study Area No-Build Crashes (2040)			
KABCO Level	Monetized Value (2019)	Incidents	2019 Value
C - Possible Injury	$65,100	405	$26,359,875
B - Non-incapacitating	$127,300	58	$7,363,643
A - Incapacitating	$467,400	8	$3,674,886
K - Killed	$9,800,000	4	$38,525,760
Property Damage Only	$4,500	929	$4,182,516
	Totals	1,404	$80,106,680

Study Area Build Alt. 2 Crashes (2040)			
KABCO Level	Monetized Value (2019)	Incidents	2019 Value
C - Possible Injury	$65,100	395	$25,719,653
B - Non-incapacitating	$127,300	56	$7,184,797
A - Incapacitating	$467,400	8	$3,585,631
K - Killed	$9,800,000	4	$37,590,056
Property Damage Only	$4,500	907	$4,080,932
	Totals	1,370	$78,161,069
	Improvements	34	$1,945,611
	Percentage Improvement		2.43%

No-Build VMT Increase	
Annual VMT Increase	0.83%

Build Condition Improvement	
Estimated Annual VMT Improvement	-0.86%

Economic Update Factor (Using GDP Deflator)	1.0152

Decrease in Crashes (2040 No Build versus 2040 Build Alt. 2)	2.43%

NDOT Valuation of a Statistical Life in Economic Analysis	
KABCO Level	Monetized Value (2019)
C - Possible Injury	$65,100
B - Non-incapacitating	$127,300
A - Incapacitating	$467,400
K - Killed	$9,800,000
Property Damage Only	$4,500

0

Study Area 2040 Crashes							
KABCO Level	Monetized Value (2019)	2040 No-Build		2040 Build Alt 1		2040 Build Alt 2	
		Incidents	2019 Value	Incidents	2019 Value	Incidents	2019 Value
C - Possible Injury	$65,100	405	$26,359,875	401	$26,078,253	395	$25,719,653
B - Non-incapacitating	$127,300	58	$7,363,643	57	$7,284,972	56	$7,184,797
A - Incapacitating	$467,400	8	$3,674,886	8	$3,635,624	8	$3,585,631
K - Killed	$9,800,000	4	$38,525,760	4	$38,114,160	4	$37,590,056
Property Damage Only	$4,500	929	$4,182,516	920	$4,137,831	907	$4,080,932
	Totals	1,404	$80,106,680	1,389	$79,250,840	1,370	$78,161,069
				Improvement	$855,841	Improvement	$1,945,611
				Percentage	1.07%	Percentage	2.43%

2040 No-Build

Facility	Total	FI	K	A	B	C	PDO	Totals
I-15 Mainline	660.6	168.3	1.8	3.7	27.2	190.5	437.3	660.6
I-15 CD Roads	272.9	189.4	0.8	1.5	11.2	78.7	180.7	272.9
Service Interchanges	320.1	136.2	0.9	1.8	13.2	92.3	211.9	320.1
Arterial Intersections	68.4	37.5	0.2	0.4	2.8	19.7	45.3	68.4
Arterial Segments	82.0	35.5	0.2	0.5	3.4	23.6	54.3	82.0
Overall Total	1404.0	566.9	3.9	7.9	57.8	404.9	929.4	1404.0

2040 Build Alt. 1

Facility	Total	FI	K	A	B	C	PDO	Totals
I-15 Mainline	636.8	162.9	1.8	3.6	26.2	183.7	421.6	636.8
I-15 CD Roads	238.8	159.1	0.7	1.3	9.8	68.9	158.1	238.8
Service Interchanges	361.2	153.6	1.0	2.0	14.9	104.2	239.1	361.2
Arterial Intersections	68.4	37.5	0.2	0.4	2.8	19.7	45.3	68.4
Arterial Segments	83.8	36.1	0.2	0.5	3.5	24.2	55.5	83.8
Overall Total	1389	549.2	3.9	7.8	57.2	400.6	919.5	1389.0

2040 Build Alt. 1 Improvements

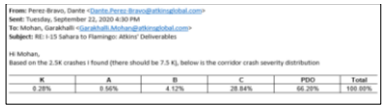
Facility	Total	FI	K	A	B	C	PDO	Totals
I-15 Mainline	636.8	5.4	0.1	0.1	1.0	6.9	15.8	23.8
I-15 CD Roads	238.8	30.3	0.1	0.2	1.4	9.8	22.6	34.1
Service Interchanges	361.2	-17.4	-0.1	-0.2	-1.7	-11.9	-27.2	-41.1
Arterial Intersections	68.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Arterial Segments	83.8	-0.6	0.0	0.0	-0.1	-0.5	-1.2	-1.8
Overall Total	1389	17.7	0.0	0.1	0.6	4.3	9.9	15.0

2040 Build Alt. 2

Facility	Total	FI	K	A	B	C	PDO	Totals
I-15 Mainline	640.9	163.0	1.8	3.6	26.4	184.8	424.3	640.9
I-15 CD Roads	210.1	131.1	0.6	1.2	8.7	60.6	139.1	210.1
Service Interchanges	366.9	157.3	1.0	2.1	15.1	105.8	242.9	366.9
Arterial Intersections	68.4	37.5	0.2	0.4	2.8	19.7	45.3	68.4
Arterial Segments	83.6	36.0	0.2	0.5	3.4	24.1	55.3	83.6
Overall Total	1370	524.9	3.8	7.7	56.4	395.1	906.9	1369.9

2040 Build Alt. 2 Improvements

Facility	Total	FI	K	A	B	C	PDO	Totals
I-15 Mainline	636.8	5.3	0.1	0.1	0.8	5.7	13.0	19.7
I-15 CD Roads	238.8	58.3	0.2	0.4	2.6	18.1	41.6	62.8
Service Interchanges	361.2	-21.1	-0.1	-0.3	-1.9	-13.5	-31.0	-46.8
Arterial Intersections	68.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Arterial Segments	83.8	-0.5	0.0	0.0	-0.1	-0.5	-1.1	-1.6
Overall Total	1389	42.0	0.0	0.2	1.4	9.8	22.6	34.0


From: Perez-Bravo, Dante <Dante.Perez-Bravo@atkinsglobal.com>
Sent: Tuesday, September 22, 2020 4:30 PM
To: Mohan, Garakhalli <Garakhalli.Mohan@atkinsglobal.com>
Subject: RE: I-15 Sahara to Flamingo: Atkins' Deliverables

Hi Mohan,
Based on the 2.5K crashes I found (there should be 7.5 K), below is the corridor crash severity distribution

K	A	B	C	PDO	Total
0.28%	0.56%	4.12%	28.84%	66.20%	100.00%

K	A	B	C	PDO	Total
0.28%	0.56%	4.12%	28.84%	66.20%	100.00%

Facility	2040 No-Build			2040 Build Alt 1			2040 Build Alt 2		
	FI	PDO	Total	FI	PDO	Total	FI	PDO	Total
I-15 Mainline	168.3	492.4	660.6	162.9 (-3%)	473.9 (-4%)	636.8 (-4%)	163.0 (-3%)	477.9 (-3%)	640.9 (-3%)
I-15 CD Roads	189.4	83.6	272.9	159.1 (-16%)	79.7 (-5%)	238.8 (-13%)	131.1 (-37%)	79.1 (-6%)	210.1 (-23%)
Service Interchanges	136.2	183.9	320.1	153.6 (13%)	207.5 (13%)	361.2 (13%)	157.3 (14%)	209.6 (12%)	366.9 (15%)
Arterial Intersections	37.5	30.9	68.4	37.5 (0%)	30.9 (0%)	68.4 (0%)	37.5 (0%)	30.9 (0%)	68.4 (0%)
Arterial Segments	35.5	46.5	82.0	36.1 (2%)	47.7 (3%)	83.8 (2%)	36.0 (1%)	47.6 (2%)	83.6 (2%)
Overall Total	566.8	837.2	1,404.0	549.2 (-3%)	839.8 (0%)	1,389.0 (-1%)	524.9 (-8%)	845.1 (1%)	1,370.0 (-2%)

		2040 No Build	2040 Build Alt 1	2040 Build Alt 2
K	0.28%	1.6	1.5	1.5
A	0.56%	3.2	3.1	2.9
B	4.12%	23.4	22.6	21.6
C	28.84%	163.5	158.4	151.4
PDO	66.20%	375.2	363.6	347.5
Total	100.00%	566.8	549.2	524.9
% Change			-3%	-7%

K	0.28%	21
A	0.56%	42
B	4.12%	309
C	28.84%	2,163
PDO	66.20%	4,965
Total	100.00%	7,500

Parameter	2017 Existing Conditions		2040 No-Action		2040 Conceptual Alternative 1		2040 Conceptual Alternative 2	
Emissions Data from AIMSUM	AM	PM	AM	PM	AM	PM	AM	PM
Carbon Dioxide, CO_2 (Grams)	132,761,295	162,193,209	185,718,255	211,527,365	170,879,115	196,176,825	165,195,570	190,179,620
Nitrogen Oxide, NO_x (Grams)	325,717	592,099	449,179	732,265	419,320	691,869	409,983	676,734
Particulate Matter, PM_{10} (Grams)	8,486	11,557	14,274	16,486	11,695	13,616	10,814	12,696
Volatile Organic Compounds, VOC (Grams)	130,857	201,049	152,579	204,947	145,895	188,351	145,229	184,964

Carbon Dioxide (CO_2) Emissions Annual Summary				Nitrogen Oxide (NO_x) Emissions Annual Summary				Fine Particulate Matter (PM) Emissions Annual Summary				Volatile Organic Compounds (VOC) Emissions Annual Summar			
2017 Existing Conditions (Short Tons)	2040 No-Action (ShortTons)	2040 Alternative 2 (Short Tons)	2040 Alternative 2 Improvement (Short Tons)	2017 Existing Conditions (ShortTons)	2040 No-Action (Short Tons)	2040 Alternative 2 (Short Tons)	2040 Alternative 2 Improvement (Short Tons)	2017 Existing Conditions (ShortTons)	2040 No-Action (Short Tons)	2040 Alternative 2 (Short Tons)	2040 Alternative 2 Improvement (Short Tons)	2017 Existing Conditions (ShortTons)	2040 No-Action (Short Tons)	2040 Alternative 2 (Short Tons)	2040 Alternative 2 Improvement (Short Tons)
368.806	495.129	443.158	51.971	1.168	1.496	1.377	119	25	38	29	9	419	449	414	35

Alt 2 Emissions Savings

Year	CO_2 Reduction	CO_2 Savings	NO_x Reduction (Short Tons)	NO_x Savings	PM Reduction (Short Tons)	PM Savings	VOC Reduction (Short Tons)	VOC Savings
2019	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2025	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2026	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2027	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2028	44.548	$49.950	91	$11.561	8	$3.055.388	30	$64.909
2029	45.123	$51.659	93	$11.839	8	$3.094.318	31	$65.736
2030	45.707	$53.425	95	$12.120	8	$3.133.744	31	$66.574
2031	46,298	$55,252	98	$12,405	8	$3,173,673	32	$67,422
2032	46.896	$57.142	100	$12.694	8	$3.214.110	32	$68.281
2033	47.502	$59.096	102	$12.987	8	$3.255.063	32	$69.151
2034	48.117	$61.117	105	$13.283	8	$3.296.537	33	$70.032
2035	48.739	$63.207	107	$13.583	8	$3.338.540	33	$70.924
2036	49.369	$65.369	109	$13.887	9	$3.381.078	34	$71.828
2037	50.007	$67.604	112	$14.195	9	$3.424.158	34	$72.743
2038	50.653	$69.916	114	$14.507	9	$3.467.786	34	$73.670
2039	51.308	$72.307	117	$14.822	9	$3.511.971	35	$74.609
2040	51.971	$74.780	119	$15.142	9	$3.556.719	35	$75.559
Totals	**626.237**	**$800.826**	**1.362**	**$173.025**	**109**	**$42.903.083**	**426**	**$911.439**

Annual Growth	1.27%

NDOT Values

Table E-7 Damage Costs for Pollutant Emissions (2019 USD)

Emission Type	$/short ton*
Carbon Dioxide (CO_2)	$0.93**
Fine Particulate Matter (PM)	$394,300
Nitrogen Oxides (NO_x)	$8,800
Sulfur Dioxide (SO_2)	$51,000
Volatile Organic Compounds (VOC)	$2,140

1. Source: Benefit-Cost Analysis Guidance for Discretionary Grant Programs, USDOT, January 2020.
2. * A metric ton is equal to 1.1023 short tons.
3. **Cost of CO_2 is assumed to grow by 2.1 percent annually.

NDOT

Emission Type					
Year	NO_x	SO_x	PM	CO_2	VOC
2019	$8.800	$21.000	$394.300	$0.93	$2.140.00
2020	$8.800	$21.000	$394.300	$0.95	$2.140.00
2021	$8.800	$21.000	$394.300	$0.97	$2.140.00
2022	$8.800	$21.000	$394.300	$0.99	$2.140.00
2023	$8.800	$21.000	$394.300	$1.01	$2.140.00
2024	$8.800	$21.000	$394.300	$1.03	$2.140.00
2025	$8.800	$21.000	$394.300	$1.05	$2.140.00
2026	$8.800	$21.000	$394.300	$1.08	$2.140.00
2027	$8.800	$21.000	$394.300	$1.10	$2.140.00
2028	$8.800	$21.000	$394.300	$1.12	$2.140.00
2029	$8.800	$21.000	$394.300	$1.14	$2.140.00
2030	$8.800	$21.000	$394.300	$1.17	$2.140.00
2031	$8.800	$21.000	$394.300	$1.19	$2.140.00
2032	$8.800	$21.000	$394.300	$1.22	$2.140.00
2033	$8.800	$21.000	$394.300	$1.24	$2.140.00
2034	$8.800	$21.000	$394.300	$1.27	$2.140.00
2035	$8.800	$21.000	$394.300	$1.30	$2.140.00
2036	$8.800	$21.000	$394.300	$1.32	$2.140.00
2037	$8.800	$21.000	$394.300	$1.35	$2.140.00
2038	$8.800	$21.000	$394.300	$1.38	$2.140.00
2039	$8.800	$21.000	$394.300	$1.41	$2.140.00
2040	$8.800	$21.000	$394.300	$1.44	$2.140.00
2041	$8.800	$21.000	$394.300	$1.47	$2.140.00
2042	$8.800	$21.000	$394.300	$1.50	$2.140.00
2043	$8.800	$21.000	$394.300	$1.53	$2.140.00
2044	$8.800	$21.000	$394.300	$1.56	$2.140.00
2045	$8.800	$21.000	$394.300	$1.60	$2.140.00
2046	$8.800	$21.000	$394.300	$1.63	$2.140.00
2047	$8.800	$21.000	$394.300	$1.66	$2.140.00
2048	$8.800	$21.000	$394.300	$1.70	$2.140.00
2049	$8.800	$21.000	$394.300	$1.73	$2.140.00
2050	$8.800	$21.000	$394.300	$1.77	$2.140.00

Daily Estimate of Existing (2017) CO_2 Emissions

	Hour	Existing Peak Hour (2017) (grams)	Proportion of Analysis Hour (Based on Daily Counts and count locations)	Estimated Existing Emissions - Peak Hours	Percent of Peak Hour (based on Daily Count Distributions)	Estimated Existing CO_2 per Hour (grams)
	0:00				44.92%	22.086.589
	1:00				31.08%	15.281.724
	2:00				25.31%	12,442,652
	3:00				27.02%	13.285.197
	4:00				31.51%	15.489.939
	5:00				49.73%	24.450.104
AM analysis peak begins at 6:30	*6:00		13.43%	########	72.53%	35.659.744
	7:00	132,761,295	34.42%	########	92.96%	45.701.265
	8:00		35.12%	########	94.83%	46.623.837
AM analysis peak ends at 9:30	*9:00		17.03%	########	91.96%	45,212,642
	10:00				93.59%	46.013.851
	11:00				100.00%	49.164.128
	12:00				86.68%	48.710.491
	13:00				89.90%	50.518.572
	14:00				95.80%	53.831.693
PM analysis peak begins at 15:30	*15:00		16.85%	########	97.26%	54.653.433
	16:00	162,193,209	34.65%	########	100.00%	56.192.732
	17:00		33.92%	########	97.92%	55.022.386
PM analysis peak ends at 18:30	*18:00		14.58%	########	84.18%	47.302.748
	19:00				75.64%	42.504.009
	20:00				68.15%	38.295.064
	21:00				63.85%	35.877.981
	22:00				59.28%	33.308.457
	23:00				52.84%	29.690.407
					Daily Grams	917.319.645
					Daily Kilograms	917.320
					Daily Metric Tons	917
					Annual Metric Tons	334.822
					Annual Short Tons	368.806

Daily Estimate of 2040 No-Action CO2 Emissions

Hour	2040 No-Action Peak Hour (grams)	Proportion of Analysis Hour (Based on Daily Counts and count locations)	Estimated 2040 No-Action Emissions - Peak Hours	Percent of Peak Hour (based on Daily Count Distributions)	Estimated 2040 No-Action CO_2 per Hour (grams)
0:00				44.92%	30.896.676
1:00				31.08%	21.377.429
2:00				25.31%	17,405,883
3:00				27.02%	18.584.510
4:00				31.51%	21.668.698
5:00				49.73%	34.202.971
*6:00		13.43%	########	72.53%	49.884.007
7:00	185,718,255	34.42%	########	92.96%	63.930.976
8:00		35.12%	########	94.83%	65.221.552
*9:00		17.03%	########	91.96%	63,247,447
10:00				93.59%	64.368.249
11:00				100.00%	68.775.136
12:00				86.68%	63.526.715
13:00				89.90%	65.884.759
14:00				95.80%	70.205.628
*15:00		16.85%	########	97.26%	71.277.317
16:00	211,527,365	34.65%	########	100.00%	73.284.823
17:00		33.92%	########	97.92%	71.758.494
*18:00		14.58%	########	84.18%	61.690.780
19:00				75.64%	55.432.413
20:00				68.15%	49.943.238
21:00				63.85%	46.790.952
22:00				59.28%	43.439.859
23:00				52.84%	38.721.310
				Daily Grams	###########
				Daily Kilograms	1.231.520
				Daily Metric Tons	1.232
				Annual Metric Tons	449.505
				Annual Short Tons	495.129

Daily Estimate of 2040 Alternative 1 CO2 Emissions

Hour	2040 Alternative 1 Peak Hour (grams)	Proportion of Analysis Hour (Based on Daily Counts and count locations)	Estimated 2040 Alternative 1 Emissions - Peak Hours	Percent of Peak Hour (based on Daily Count Distributions)	Estimated 2040 Alternative 1 CO_2 per Hour (grams)
0:00				44.92%	28.427.990
1:00				31.08%	19.669.343
2:00				25.31%	16,015,130
3:00				27.02%	17.099.583
4:00				31.51%	19.937.340
5:00				49.73%	31.470.107
*6:00		13.43%	########	72.53%	45.898.208
7:00	170,879,115	34.42%	########	92.96%	58.822.804
8:00		35.12%	########	94.83%	60.010.262
*9:00		17.03%	########	91.96%	58,193,891
10:00				93.59%	59.225.138
11:00				100.00%	63.279.910
12:00				86.68%	58.916.581
13:00				89.90%	61.103.502
14:00				95.80%	65.110.806
*15:00		16.85%	########	97.26%	66.104.722
16:00	196,176,825	34.65%	########	100.00%	67.966.543
17:00		33.92%	########	97.92%	66.550.980
*18:00		14.58%	########	84.18%	57.213.880
19:00				75.64%	51.409.683
20:00				68.15%	46.318.857
21:00				63.85%	43.395.333
22:00				59.28%	40.287.429
23:00				52.84%	35.911.304
				Daily Grams	###########
				Daily Kilograms	1.138.339
				Daily Metric Tons	1.138
				Annual Metric Tons	415.494
				Annual Short Tons	457.666

Daily Estimate of 2040 Alternative 2 CO2 Emissions

Hour	2040 Alternative 2 Peak Hour (grams)	Proportion of Analysis Hour (Based on Daily Counts and count locations)	Estimated 2040 Alternative 2 Emissions - Peak Hours	Percent of Peak Hour (based on Daily Count Distributions)	Estimated 2040 Alternative 2 CO_2 per Hour (grams)
0:00				44.92%	27.482.457
1:00				31.08%	19.015.129
2:00				25.31%	15,482,456
3:00				27.02%	16.530.840
4:00				31.51%	19.274.212
5:00				49.73%	30.423.392
*6:00		13.43%	########	72.53%	44.371.605
7:00	165,195,570	34.42%	########	92.96%	56.866.322
8:00		35.12%	########	94.83%	58.014.283
*9:00		17.03%	########	91.96%	56,258,326
10:00				93.59%	57.255.274
11:00				100.00%	61.175.181
12:00				86.68%	57.115.478
13:00				89.90%	59.235.543
14:00				95.80%	63.120.342
*15:00		16.85%	########	97.26%	64.083.874
16:00	190,179,620	34.65%	########	100.00%	65.888.779
17:00		33.92%	########	97.92%	64.516.490
*18:00		14.58%	########	84.18%	55.464.829
19:00				75.64%	49.838.068
20:00				68.15%	44.902.871
21:00				63.85%	42.068.720
22:00				59.28%	39.055.826
23:00				52.84%	34.813.481
				Daily Grams	###########
				Daily Kilograms	1.102.254
				Daily Metric Tons	1.102
				Annual Metric Tons	402.323
				Annual Short Tons	443.158

Daily Estimate of Existing (2017) NO_x Emissions

	Hour	Existing Peak Hour (2017) (grams)	Proportion of Analysis Hour (Based on Daily Counts and count locations)	Estimated Existing Emissions - Peak Hours	Percent of Peak Hour (based on Daily Count Distributions)	Estimated Existing NO_x per Hour (grams)
	0:00				44.92%	54.187
	1:00				31.08%	37.492
	2:00				25.31%	30.527
	3:00				27.02%	32.594
	4:00				31.51%	38.003
	5:00				49.73%	59.986
AM analysis peak begins at 6:30	*6:00		13.43%	43.744	72.53%	87.488
	7:00	325,717	34.42%	112.124	92.96%	112.124
	8:00		35.12%	114.387	94.83%	114.387
AM analysis peak ends at 9:30	*9:00		17.03%	55.462	91.96%	110.925
	10:00				93.59%	112.891
	11:00				100.00%	120.619
	12:00				86.68%	177.821
	13:00				89.90%	184.422
	14:00				95.80%	196.517
PM analysis peak begins at 15:30	*15:00		16.85%	99.758	97.26%	199.517
	16:00	592,099	34.65%	205.136	100.00%	205.136
	17:00		33.92%	200.864	97.92%	200.864
PM analysis peak ends at 18:30	*18:00		14.58%	86.341	84.18%	172.682
	19:00				75.64%	155.164
	20:00				68.15%	139.799
	21:00				63.85%	130.975
	22:00				59.28%	121.595
	23:00				52.84%	108.387
					Daily Grams	2.904.102
					Daily Kilograms	2.904
					Daily Metric Tons	3
					Annual Metric Tons	1.060
					Annual Short Tons	1.168

Daily Estimate of 2040 No-Action NO_x Emissions

Hour	2040 No-Action Peak Hour (grams)	Proportion of Analysis Hour (Based on Daily Counts and count locations)	Estimated 2040 No-Action Emissions - Peak Hours	Percent of Peak Hour (based on Daily Count Distributions)	Estimated 2040 No-Action NO_x per Hour (grams)
0:00				44.92%	74.727
1:00				31.08%	51.704
2:00				25.31%	42.098
3:00				27.02%	44.949
4:00				31.51%	52.408
5:00				49.73%	82.723
*6:00		13.43%	60.325	72.53%	120.650
7:00	449,179	34.42%	154.624	92.96%	154.624
8:00		35.12%	157.745	94.83%	157.745
*9:00		17.03%	76.485	91.96%	152.971
10:00				93.59%	155.681
11:00				100.00%	166.340
12:00				86.68%	219.917
13:00				89.90%	228.080
14:00				95.80%	243.038
*15:00		16.85%	123.374	97.26%	246.748
16:00	732,265	34.65%	253.697	100.00%	253.697
17:00		33.92%	248.413	97.92%	248.413
*18:00		14.58%	106.781	84.18%	213.561
19:00				75.64%	191.896
20:00				68.15%	172.893
21:00				63.85%	161.981
22:00				59.28%	150.380
23:00				52.84%	134.045
				Daily Grams	3.721.268
				Daily Kilograms	3.721
				Daily Metric Tons	4
				Annual Metric Tons	1.358
				Annual Short Tons	1.496

Daily Estimate of 2040 Alternative 1 NO_x Emissions

Hour	2040 Alternative 1 Peak Hour (grams)	Proportion of Analysis Hour (Based on Daily Counts and count locations)	Estimated 2040 Alternative 1 Emissions - Peak	Percent of Peak Hour (based on Daily Count Distributions)	Estimated 2040 Alternative 1 NO_x per Hour (grams)
0:00				44.92%	69.759
1:00				31.08%	48.267
2:00				25.31%	39.300
3:00				27.02%	41.961
4:00				31.51%	48.924
5:00				49.73%	77.224
*6:00		13.43%	56.315	72.53%	112.630
7:00	419,320	34.42%	144.345	92.96%	144.345
8:00		35.12%	147.259	94.83%	147.259
*9:00		17.03%	71.401	91.96%	142.802
10:00				93.59%	145.332
11:00				100.00%	155.282
12:00				86.68%	207.785
13:00				89.90%	215.498
14:00				95.80%	229.630
*15:00		16.85%	116.568	97.26%	233.136
16:00	691,869	34.65%	239.702	100.00%	239.702
17:00		33.92%	234.709	97.92%	234.709
*18:00		14.58%	100.890	84.18%	201.780
19:00				75.64%	181.310
20:00				68.15%	163.356
21:00				63.85%	153.045
22:00				59.28%	142.084
23:00				52.84%	126.651
				Daily Grams	3.501.770
				Daily Kilograms	3.502
				Daily Metric Tons	4
				Annual Metric Tons	1.278
				Annual Short Tons	1.408

Daily Estimate of 2040 Alternative 2 NO_x Emissions

Hour	2040 Alternative 2 Peak Hour (grams)	Proportion of Analysis Hour (Based on Daily Counts and count locations)	Estimated 2040 Alternative 2 Emissions - Peak	Percent of Peak Hour (based on Daily Count Distributions)	Estimated 2040 Alternative 2 NO_x per Hour (grams)
0:00				44.92%	68.206
1:00				31.08%	47.192
2:00				25.31%	38.424
3:00				27.02%	41.026
4:00				31.51%	47.835
5:00				49.73%	75.505
*6:00	409,983	13.43%	55.061	72.53%	110.122
7:00		34.42%	141.131	92.96%	141.131
8:00		35.12%	143.980	94.83%	143.980
*9:00		17.03%	69.811	91.96%	139.622
10:00				93.59%	142.096
11:00				100.00%	151.825
12:00				86.68%	203.239
13:00				89.90%	210.783
14:00				95.80%	224.607
*15:00	676,734	16.85%	114.018	97.26%	228.036
16:00		34.65%	234.458	100.00%	234.458
17:00		33.92%	229.575	97.92%	229.575
*18:00		14.58%	98.683	84.18%	197.366
19:00				75.64%	177.343
20:00				68.15%	159.782
21:00				63.85%	149.697
22:00				59.28%	138.976
23:00				52.84%	123.880
				Daily Grams	3.424.708
				Daily Kilograms	3.425
				Daily Metric Tons	3
				Annual Metric Tons	1.250
				Annual Short Tons	1.377

Daily Estimate of Existing (2017) PM Emissions

	Hour	Existing Peak Hour (2017) (grams)	Proportion of Analysis Hour (Based on Daily Counts and count locations)	Estimated Existing Emissions - Peak Hours	Percent of Peak Hour (based on Daily Count Distributions)	Estimated Existing NO_x per Hour (grams)
	0:00				44.92%	1.412
	1:00				31.08%	977
	2:00				25.31%	795
	3:00				27.02%	849
	4:00				31.51%	990
	5:00				49.73%	1.563
AM analysis peak begins at 6:30	*6:00		13.43%	1.140	72.53%	2.279
	7:00	8,486	34.42%	2.921	92.96%	2.921
	8:00		35.12%	2.980	94.83%	2.980
AM analysis peak ends at 9:30	*9:00		17.03%	1.445	91.96%	2.890
	10:00				93.59%	2.941
	11:00				100.00%	3.143
	12:00				86.68%	3.471
	13:00				89.90%	3.600
	14:00				95.80%	3.836
PM analysis peak begins at 15:30	*15:00		16.85%	1.947	97.26%	3.894
	16:00	11,557	34.65%	4.004	100.00%	4.004
	17:00		33.92%	3.921	97.92%	3.921
PM analysis peak ends at 18:30	*18:00		14.58%	1.685	84.18%	3.371
	19:00				75.64%	3.029
	20:00				68.15%	2.729
	21:00				63.85%	2.556
	22:00				59.28%	2.373
	23:00				52.84%	2.116
					Daily Grams	62.639
					Daily Kilograms	63
					Daily Metric Tons	0
					Annual Metric Tons	23
					Annual Short Tons	25

Daily Estimate of 2040 No-Action PM Emissions

Hour	2040 No-Action Peak Hour (grams)	Proportion of Analysis Hour (Based on Daily Counts and count locations)	Estimated 2040 No-Action Emissions - Peak Hours	Percent of Peak Hour (based on Daily Count Distributions)	Estimated 2040 No-Action NO_x per Hour (grams)
0:00				44.92%	2.375
1:00				31.08%	1.643
2:00				25.31%	1.338
3:00				27.02%	1.428
4:00				31.51%	1.665
5:00				49.73%	2.629
*6:00		13.43%	1.917	72.53%	3.834
7:00	14,274	34.42%	4.914	92.96%	4.914
8:00		35.12%	5.013	94.83%	5.013
*9:00		17.03%	2.431	91.96%	4.861
10:00				93.59%	4.947
11:00				100.00%	5.286
12:00				86.68%	4.951
13:00				89.90%	5.135
14:00				95.80%	5.472
*15:00		16.85%	2.778	97.26%	5.555
16:00	16,486	34.65%	5.712	100.00%	5.712
17:00		33.92%	5.593	97.92%	5.593
*18:00		14.58%	2.404	84.18%	4.808
19:00				75.64%	4.320
20:00				68.15%	3.892
21:00				63.85%	3.647
22:00				59.28%	3.386
23:00				52.84%	3.018
				Daily Grams	95.421
				Daily Kilograms	95
				Daily Metric Tons	0
				Annual Metric Tons	35
				Annual Short Tons	38

Daily Estimate of 2040 Alternative 1 PM Emissions

Hour	2040 Alternative 1 Peak Hour (grams)	Proportion of Analysis Hour (Based on Daily Counts and count locations)	Estimated 2040 Alternative 1 Emissions - Peak	Percent of Peak Hour (based on Daily Count Distributions)	Estimated 2040 Alternative 1 NO_x per Hour (grams)
0:00				44.92%	1.946
1:00				31.08%	1.346
2:00				25.31%	1.096
3:00				27.02%	1.170
4:00				31.51%	1.365
5:00				49.73%	2.154
*6:00		13.43%	1.571	72.53%	3.141
7:00	11,695	34.42%	4.026	92.96%	4.026
8:00		35.12%	4.107	94.83%	4.107
*9:00		17.03%	1.991	91.96%	3.983
10:00				93.59%	4.053
11:00				100.00%	4.331
12:00				86.68%	4.089
13:00				89.90%	4.241
14:00				95.80%	4.519
*15:00		16.85%	2.294	97.26%	4.588
16:00	13,616	34.65%	4.717	100.00%	4.717
17:00		33.92%	4.619	97.92%	4.619
*18:00		14.58%	1.986	84.18%	3.971
19:00				75.64%	3.568
20:00				68.15%	3.215
21:00				63.85%	3.012
22:00				59.28%	2.796
23:00				52.84%	2.492
				Daily Grams	78.546
				Daily Kilograms	79
				Daily Metric Tons	0
				Annual Metric Tons	29
				Annual Short Tons	32

Daily Estimate of 2040 Alternative 2 PM Emissions

Hour	2040 Alternative 2 Peak Hour (grams)	Proportion of Analysis Hour (Based on Daily Counts and count locations)	Estimated 2040 Alternative 2 Emissions - Peak	Percent of Peak Hour (based on Daily Count Distributions)	Estimated 2040 Alternative 2 NO_x per Hour (grams)
0:00				44.92%	1.799
1:00				31.08%	1.245
2:00				25.31%	1.014
3:00				27.02%	1.082
4:00				31.51%	1.262
5:00				49.73%	1.992
*6:00	10,814	13.43%	1.452	72.53%	2.905
7:00		34.42%	3.723	92.96%	3.723
8:00		35.12%	3.798	94.83%	3.798
*9:00		17.03%	1.841	91.96%	3.683
10:00				93.59%	3.748
11:00				100.00%	4.005
12:00				86.68%	3.813
13:00				89.90%	3.954
14:00				95.80%	4.214
*15:00	12,696	16.85%	2.139	97.26%	4.278
16:00		34.65%	4.399	100.00%	4.399
17:00		33.92%	4.307	97.92%	4.307
*18:00		14.58%	1.851	84.18%	3.703
19:00				75.64%	3.327
20:00				68.15%	2.998
21:00				63.85%	2.808
22:00				59.28%	2.607
23:00				52.84%	2.324
				Daily Grams	72.985
				Daily Kilograms	73
				Daily Metric Tons	0
				Annual Metric Tons	27
				Annual Short Tons	29

Daily Estimate of Existing (2017) VOC Emissions

	Hour	Existing Peak Hour (2017) (grams)	Proportion of Analysis Hour (Based on Daily Counts and count locations)	Estimated Existing Emissions - Peak Hours	Percent of Peak Hour (based on Daily Count Distributions)	Estimated Existing VOC per Hour (grams)
	0:00				44.92%	21.770
	1:00				31.08%	15.063
	2:00				25.31%	12.264
	3:00				27.02%	13.095
	4:00				31.51%	15.268
	5:00				49.73%	24.099
AM analysis peak begins at 6:30	*6:00		13.43%	17.574	72.53%	35.148
	7:00	130,857	34.42%	45.046	92.96%	45.046
	8:00		35.12%	45.955	94.83%	45.955
AM analysis peak ends at 9:30	*9:00		17.03%	22.282	91.96%	44.564
	10:00				93.59%	45.354
	11:00				100.00%	48.459
	12:00				86.68%	60.380
	13:00				89.90%	62.621
	14:00				95.80%	66.728
PM analysis peak begins at 15:30	*15:00		16.85%	33.873	97.26%	67.746
	16:00	201,049	34.65%	69.655	100.00%	69.655
	17:00		33.92%	68.204	97.92%	68.204
PM analysis peak ends at 18:30	*18:00		14.58%	29.317	84.18%	58.635
	19:00				75.64%	52.686
	20:00				68.15%	47.469
	21:00				63.85%	44.473
	22:00				59.28%	41.288
	23:00				52.84%	36.803
					Daily Grams	1.042.773
					Daily Kilograms	1.043
					Daily Metric Tons	1
					Annual Metric Tons	381
					Annual Short Tons	419

Daily Estimate of 2040 No-Action VOC Emissions

Hour	2040 No-Action Peak Hour (grams)	Proportion of Analysis Hour (Based on Daily Counts and count locations)	Estimated 2040 No-Action Emissions - Peak Hours	Percent of Peak Hour (based on Daily Count Distributions)	Estimated 2040 No-Action VOC per Hour (grams)
0:00				44.92%	25.384
1:00				31.08%	17.563
2:00				25.31%	14.300
3:00				27.02%	15.268
4:00				31.51%	17.802
5:00				49.73%	28.100
*6:00	152,579	13.43%	20.491	72.53%	40.983
7:00		34.42%	52.523	92.96%	52.523
8:00		35.12%	53.584	94.83%	53.584
*9:00		17.03%	25.981	91.96%	51.962
10:00				93.59%	52.882
11:00				100.00%	56.503
12:00				86.68%	61.550
13:00				89.90%	63.835
14:00				95.80%	68.022
*15:00	204,947	16.85%	34.530	97.26%	69.060
16:00		34.65%	71.005	100.00%	71.005
17:00		33.92%	69.526	97.92%	69.526
*18:00		14.58%	29.886	84.18%	59.772
19:00				75.64%	53.708
20:00				68.15%	48.390
21:00				63.85%	45.335
22:00				59.28%	42.088
23:00				52.84%	37.517
				Daily Grams	1.116.662
				Daily Kilograms	1.117
				Daily Metric Tons	1
				Annual Metric Tons	408
				Annual Short Tons	449

Daily Estimate of 2040 Alternative 1 VOC Emissions

Hour	2040 Alternative 1 Peak Hour (grams)	Proportion of Analysis Hour (Based on Daily Counts and count locations)	Estimated 2040 Alternative 1 Emissions - Peak	Percent of Peak Hour (based on Daily Count Distributions)	Estimated 2040 Alternative 1 VOC per Hour
0:00				44.92%	24.272
1:00				31.08%	16.794
2:00				25.31%	13.674
3:00				27.02%	14.599
4:00				31.51%	17.022
5:00				49.73%	26.869
*6:00		13.43%	19.594	72.53%	39.187
7:00	145,895	34.42%	50.222	92.96%	50.222
8:00		35.12%	51.236	94.83%	51.236
*9:00		17.03%	24.843	91.96%	49.685
10:00				93.59%	50.566
11:00				100.00%	54.028
12:00				86.68%	56.566
13:00				89.90%	58.666
14:00				95.80%	62.513
*15:00		16.85%	31.734	97.26%	63.468
16:00	188,351	34.65%	65.255	100.00%	65.255
17:00		33.92%	63.896	97.92%	63.896
*18:00		14.58%	27.466	84.18%	54.932
19:00				75.64%	49.359
20:00				68.15%	44.471
21:00				63.85%	41.664
22:00				59.28%	38.680
23:00				52.84%	34.479
				Daily Grams	1.042.104
				Daily Kilograms	1.042
				Daily Metric Tons	1
				Annual Metric Tons	380
				Annual Short Tons	419

Daily Estimate of 2040 Alternative 2 VOC Emissions

Hour	2040 Alternative 2 Peak Hour (grams)	Proportion of Analysis Hour (Based on Daily Counts and count locations)	Estimated 2040 Alternative 2 Emissions - Peak	Percent of Peak Hour (based on Daily Count Distributions)	Estimated 2040 Alternative 2 VOC per Hour
0:00				44.92%	24.161
1:00				31.08%	16.717
2:00				25.31%	13.611
3:00				27.02%	14.533
4:00				31.51%	16.945
5:00				49.73%	26.746
*6:00	145,229	13.43%	19.504	72.53%	39.009
7:00		34.42%	49.993	92.96%	49.993
8:00		35.12%	51.002	94.83%	51.002
*9:00		17.03%	24.729	91.96%	49.459
10:00				93.59%	50.335
11:00				100.00%	53.781
12:00				86.68%	55.549
13:00				89.90%	57.611
14:00				95.80%	61.389
*15:00	184,964	16.85%	31.163	97.26%	62.326
16:00		34.65%	64.082	100.00%	64.082
17:00		33.92%	62.747	97.92%	62.747
*18:00		14.58%	26.972	84.18%	53.944
19:00				75.64%	48.471
20:00				68.15%	43.671
21:00				63.85%	40.915
22:00				59.28%	37.985
23:00				52.84%	33.859
				Daily Grams	1.028.841
				Daily Kilograms	1.029
				Daily Metric Tons	1
				Annual Metric Tons	376
				Annual Short Tons	414

Gross Domestic Product Deflator										
Year	2018				2019				2020	
Quarter	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2
Gross Domestic Product	109.237	110.176	110.614	111.14	111.424	112.141	112.531	112.95	113.415	112.803

Index Gross Domestic Product Year
2012

Index Gross Domestic Product
100

Deflation Rate (2020 to 2019)
98.505%

Current Quarter Year
2020

2012-2020 GDP Deflator Annual Increase
1.517%

Economic Update Factor (Using GDP Deflator)
1.0152

Table 1.1.9. Implicit Price Deflators for Gross Domestic Product

[Index numbers, 2012=100] Seasonally adjusted

Bureau of Economic Analysis

Last Revised on: July 30, 2020 - Next Release Date August 27, 2020

Line		2018				2019				2020	
		Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2
1	**Gross domestic product**	109.237	110.176	110.614	111.14	111.424	112.141	112.531	112.95	113.415	112.803
2	**Personal consumption expenditures**	107.481	108.077	108.498	108.885	109.039	109.722	110.104	110.525	110.878	110.352
3	Goods	95.232	95.42	95.318	95.009	94.571	94.984	94.765	94.816	94.598	93.127
4	Durable goods	87.958	87.694	87.375	87.102	86.971	86.756	86.372	85.784	85.415	84.448
5	Nondurable goods	99.048	99.494	99.519	99.191	98.577	99.356	99.236	99.669	99.54	97.784
6	Services	113.828	114.645	115.35	116.12	116.6	117.431	118.15	118.777	119.452	119.505
7	**Gross private domestic investment**	106.359	107.43	107.505	107.991	108.373	109.03	109.115	109.355	110.255	109.889
8	Fixed investment	107.183	107.843	108.33	108.622	109.277	109.766	110.048	110.098	110.446	110.67
9	Nonresidential	102.438	102.75	103.069	103.254	103.884	104.341	104.457	104.343	104.59	104.784
10	Structures	113.406	114.071	114.644	116.194	117.328	118.609	119.232	119.662	120.118	119.835
11	Equipment	97.485	97.497	97.882	97.866	98.079	97.991	97.757	97.721	97.887	97.806
12	Intellectual property products	102.055	102.55	102.615	102.26	103.147	103.846	104.126	103.603	103.836	104.597
13	Residential	128.045	130.224	131.455	132.228	132.984	133.609	134.65	135.452	136.24	136.597
14	Change in private inventories	---	---	---	---	---	---	---	---	---	---
15	**Net exports of goods and services**	---	---	---	---	---	---	---	---	---	---
16	Exports	98.199	99.417	99.721	99.398	98.557	99.337	98.764	98.351	97.74	93.093
17	Goods	92.29	93.646	93.86	93.203	92.002	92.547	91.565	91.177	90.113	84.694
18	Services	111.464	112.354	112.867	113.319	113.326	114.646	115.015	114.544	115.014	112.198
19	Imports	91.461	91.524	91.859	91.419	90.519	90.713	89.97	89.65	89.337	86.381
20	Goods	88.207	88.158	88.459	87.91	86.822	86.981	86.082	85.67	85.336	82.142
21	Services	108.519	109.202	109.73	109.892	110.029	110.402	110.499	110.666	110.469	109.051
22	**Government consumption expenditures and gross investment**	109.897	110.929	111.817	112.588	112.927	113.253	113.544	114.019	114.524	113.931
23	Federal	107.954	108.754	109.405	110.212	111.478	110.762	110.924	111.285	111.209	111.016
24	National defense	106.409	107.21	107.862	108.383	108.814	109.112	109.341	109.738	109.697	109.072
25	Nondefense	110.383	111.182	111.832	113.079	115.655	113.349	113.409	113.712	113.582	114.038
26	State and local	111.188	112.363	113.397	114.146	113.911	114.887	115.259	115.808	116.685	115.829
	Addendum:										
27	Gross national product	109.206	110.141	110.58	111.104	111.388	112.102	112.492	112.911	113.375	---

Appendix F: Safety Memorandum

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Technical Memorandum

To:	Jeff Lerud, NDOT		
From:	Atkins	Email:	dante.perez-bravo@atkinsglobal.com
Date:	18 September 2020	Phone:	
Subject:	I-15 from Flamingo to Sahara: Alternatives Safety Performance Evaluation Memorandum		

1. Introduction

I-15 is a major corridor in southern Nevada connecting California to Utah. For the past three decades, Nevada Department of Transportation (NDOT) has been making significant investments on improvements to I-15 to keep up with the growth in the Las Vegas area. The section of I-15 between Flamingo Road and Sahara Avenue is the last section to be upgraded adjacent to the resort corridor (Las Vegas Strip). Recently completed projects include NDOT's I-15 South Design-Build Project (Silverado Ranch Boulevard to Tropicana Avenue) to the south and NDOT's Project NEON (Sahara Avenue to I-15/US95/I-515 Interchange) to the north.

The existing corridor I-15 from Flamingo Road to Sahara Avenue can only accommodate five through-lanes in each direction, while future traffic demands are expected to lead to further traffic operations breakdown I-15 within this segment. The I-15 from Flamingo to Sahara Feasibility Study was initiated by NDOT to develop and evaluate alternatives primarily focusing on improving I-15 safety and traffic operations, and to accommodate future demand on I-15 and adjacent streets.

The purpose of this analysis is to quantify the safety impacts of the proposed improvements in the I-15 study area. The American Association of State Highway and Transportation Officials (AASHTO) Highway Safety Manual (HSM) and the National Cooperative Highway Research Program (NCHRP) Report 17-58 predictive methods were used to estimate the safety performance differences between scenarios.

This Safety Performance Evaluation Technical Memorandum presents the results of the existing and design year safety performance evaluation conducted to estimate the differences in predicted crash frequency between the No-Build and the two build alternatives.

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2. Study Corridor

The project study limits extend from North of Charleston Boulevard interchange to south of Russell Road interchange. It includes all eight service interchanges (Charleston Boulevard interchange, Neon Gateway, Sahara Road, Spring Mountain Road, Flamingo Road, Harmon Road, Tropicana Avenue, and Russell Road), the north end and south end Collector-Distributor roads, one intersection on either side of Sahara, Spring Mountain, Flamingo service interchanges, and the arterial roads in between. **Figure 1** depicts all the roadways and intersections that are part of the study area limits for the safety performance evaluation.

Figure 1. Project Limits for Safety Performance Analysis

3. Methodology

The safety performance evaluation to assess the impacts associated with modifications of geometric elements was conducted using the AASHTO HSM predictive methods. The HSM provides predictive methods for evaluating freeways, ramps and interchanges, and urban and suburban arterials among other facility types. The models can be used to evaluate the impact of design alternatives on crash frequency, diagnose safety issues, and assess future safety conditions. These models provide several important advantages, including:

- Measuring the effects of roadway geometry, physical features, and traffic volumes on crash frequency
- Allowing for a thorough understanding of safety performance and creating opportunities to improve performance

Each model predicts average crash frequency using Safety Performance Functions (SPF) and Crash Modification Factors (CMF). An SPF expresses the nonlinear relationship between traffic volume and crash frequency. It is established by modeling road segments and the crashes that are recorded on them. The SPF is based on the most frequent or common set of road characteristics, referred to as the "base condition."

The CMFs included as part of the predictive models are used to adjust the predicted average crash frequency, estimated by the SPF for a site with base conditions, to local conditions of the site under evaluation. A CMF represents the relative change in estimated average crash frequency because of a change in one specific condition. It provides an estimate of the effectiveness of the implementation of a particular safety countermeasure (e.g., transportation solutions such as paving gravel shoulders, adding a left-turn lane, or increasing the radius of a horizontal curve).

HSM models require the application of a calibration factor, which serves to address differences in databases associated with the state in which the analysis is performed versus the underlying database research. Some of these differences include changes in driver behavior, vehicle design, vehicle crash worthiness, crash reporting processes, and road design policy over time. At this time, NDOT does not have calibration factors; therefore, a calibration factor of 1.0 was used for analysis. Crash prediction results obtained from the analysis tool will be used to establish relative comparisons between the build alternatives and the No-Build scenario.

The general form of the predictive models is as follows:

$$N_{Pred} = N_b \times (CMF_1 \times CMF_2 \times CMF_3 \times \cdots \times CMF_n) \times C$$

Where:

N_{Pred} = Predicted average fatal and injury crash frequency for a specific year for site type x

N_b = Base predicted average fatal and injury crash frequency determined for base conditions of the SPF developed for site type x

CMF = Crash Modification Factor specific to site type x and specified geometric design and traffic control features

C = Calibration factor to account for local conditions

The HSM freeway predictive methods have some limitations that are included below:

- High-occupancy vehicle (HOV) lanes cannot be modeled

- Ramps with more than two lanes cannot be modeled
- Freeways with more than 10 lanes cannot be modeled
- Consecutive merge ramps within a single freeway section cannot be modelled

Since HOV lanes are not addressed with the HSM predictive models, an extensive literature review was conducted to identify external SPF and/or CMFs that can be used for the I-15 project.

Only a couple research papers were found related to converting General Purpose Lanes to HOV lanes. Jang. et. al. reported on an evaluation of the relationship between cross-section design (i.e., lane width, shoulder width, and buffer width) and safety performance for HOV lanes. The authors used three years of crash data for thirteen Southern California segments totaling 153 miles.

The segments were buffer separated between the HOV lanes and the general-purpose lanes. Crashes included those that occurred on the median shoulder, in the HOV lane, or in the adjacent general-purpose left lane. The paper cites that wider HOV lane width and wider shoulder width were associated with lower crash frequencies. The buffer width and the width of the lane next to the HOV lane were not found to be statistically significant. The study also provided case studies of preferred cross-section allocation if converting a section from an HOV lane and left shoulder to a section having a buffer, HOV lane, and left shoulder. In all case studies, the authors recommended the inclusion of a buffer by reallocating some of the shoulder width to the buffer.

Srinivasan, et.al., developed crash prediction models for freeway facilities with HOV and HOT lanes by number of freeway lanes using Florida data. Models were developed for six-, eight-, ten-, and twelve-lane freeways (number of lanes reflect both directions and include the managed lanes). For all the models, segment length and average annual daily traffic (AADT) were significant and included. For most of the models, left shoulder width was the only other significant variable. An increase in left shoulder width was associated with decreases in crashes. The effect of buffer type on crashes was found to be statistically significant only in the model for 10-lane freeways. The inclusion of a 2- to 3-ft buffer was associated with fewer fatal and injury crashes.

Application of these predictive models would require them to be calibrated to local conditions. The same applies to the HSM freeway predictive models used for the existing and No-Build scenarios. For this reason, the California and Florida HOV predictive models cannot be used for the I-15 project.

The Highway Safety Manual section 13.4.2.2 provides an “add lanes by narrowing existing lanes and shoulders” CMF. The safety strategy consists of maintaining the existing cross section and adding one lane by narrowing existing lanes and shoulders. The CMF captures the crash effects of adding one more lane to either a four-lane or five-lane urban freeway. The CMFs apply to urban freeways with median barrier and a base condition of 12-ft lanes. For this treatment, existing general-purpose lanes are narrowed to 11-ft and inside shoulders are narrowed to provide the additional space for the new lane. The new lane may be used as a general-purpose lane or a HOV lane.

Although this condition does not exactly match the proposed condition of the build alternatives, it was determined that this methodology is the closest match to the proposed conditions and would likely provide the best overall results.

For the purpose of this project, it is recommended to use the four to five lane conversion CMF of 1.11 and the five to six lane conversion CMF of 1.03 for all crash types and severity types. The CMF of 1.11 was used for analysis as this represents a more conservative value for analysis. This adjustment accounts for the additional crashes associated with an HOV lane as compared to a general-purpose lane.

Note that this methodology likely over-represents the number of predicted crashes for the build alternatives that include HOV lanes. This is because this factor assumes that the addition of HOV lanes is accomplished by reducing the widths of other general-purpose lanes and freeway shoulders. However, the proposed build alternatives for this study would not narrow other travel lanes or shoulders to implement the HOV lanes.

3.1. Analysis Tool

The Interactive Highway Safety Design Model (IHSDM) tool was developed by FHWA as a suite of software analysis tools used to evaluate operational effects of geometric design decisions on highways. IHSDM was designed originally to provide “decision support” in the highway design process—comparing existing or proposed roadway designs against relevant design and operations policy values. A crash prediction module, which incorporates the HSM methodology, was added to estimate the safety impacts of design decisions. One advantage that IHSDM software has over other tools, such as ISATe, is the ability to import CAD files which can substantially simplify both the segmenting of the freeway section being evaluating and gathering of the necessary roadway geometry data. However, if CAD files are not available, manual segmentation and gathering of roadway geometry is required.

3.1.1. IHSDM Data Input

IHSDM requires the same data needed for HSM predictive models, which is different for each facility type. IHSDM uses geometric data, speed limit, area type, AADT, and other data variables to create homogenous segments. The HSM predictive methods for the different facility types embedded into IHSDM require different data input elements to generate predicted crash frequencies. Some of these include, but are not limited to:

- Facility type
- Horizontal alignment
- AADT
- Cross section elements, including number of lanes, lane width, inside and outside shoulder width, median width, clear zone, presence of ramps, inside and outside median barrier, presence of shoulder rumble strips
- Intersections elements, including traffic control type, lane configuration, presence of bus stops, schools, alcohol establishments, right- and left-turn information

All the roadways, ramp terminals, intersections, and arterials were coded as part of a single network.

Appendix A contains the historical crash severity distribution for years 2013 to 2018.

3.1.2. I-15 Sahara to Tropicana Modeling Assumptions

Some assumptions were used for the modeling process and are summarized in the bullet points below:

- The 2040 No-Build Lane Geometry comprises of the construction of the I-15/Tropicana Avenue interchange project and the final phase of Project NEON.
- The IHDSM analysis is based on the 2040 Traffic Forecast. Alignments with no AADT or peak hour information were not included in the analysis.
- AADTs were provided for the ramps and freeway segments, and peak hour intersection turning movements were provided for the ramp terminals and adjacent intersections along

Flamingo Road, Spring Mountain Road, and Sahara Avenue. In addition, the peak hour movements were provided for the HOV Accesses at Harmon Road and Neon Gateway. The peak hour volumes were converted to AADT by dividing the peak hour by a k factor of 0.07. Based on NDOT's Traffic Forecasting Guidelines, the AADTs were rounded to the nearest 500. After converting the peak hour to AADT, Atkins balanced the AADT volumes using engineering judgement. The mainline volumes were adjusted from the interchanges to the north and south end of the project.

- The 2040 Build Alternative 1 and 2 Lane Geometry is based on the latest design files.
- HOV and general-purpose (GP) volumes provided in the traffic diagrams are combined and included in the AADT and peak hour volumes. The total cross section volume used in the IHDSM analysis includes the HOV volumes.
- Pedestrian volume at intersections were based on HSM methodology Table 12-15. The Pedestrian Crossing Volume was assumed to be Medium to Medium-low.
- The proposed HOV access at Meade Ave was not analyzed since there was no AADT information provided.

3.1.3. Freeway Predictive Models

HSM Chapter 18, Freeways and Interchanges, contains different SPFs for four-, six-, eight-, and ten-lane freeway segments. The models are based on AADT and are used to predict crash frequency. Crash frequency is influenced by lane width and shoulder width dimensions, the presence and location of roadside and median barriers, mainline horizontal alignment, and the presence of entrance and exit ramps, with CMFs calculated for each of these factors.

Mainline crashes are influenced by the proximity of ramps, with specific sensitivity to weaving. The location of ramps (left-hand versus right-hand) and their design (lane balance versus lane drop) also influence crash frequency. Finally, congestion influences safety performance, which is described by the number of hours during a typical day in which traffic volume exceeds 1,000 vehicles per hour per lane.

Table 1 lists the different SPF included in the freeways chapter.

Table 1. HSM Chapter 18 Safety Performance Functions

Site Type	Cross Section/Type
Freeway Segments	Urban four-lane freeways
	Urban six-lane freeways
	Urban eight-lane freeways
	Urban ten-lane freeway
	Rural four-lane freeways
	Rural six-lane freeways
	Rural eight-lane freeways

Some of the limitations of the HSM freeway predictive models include:

- High-occupancy vehicle (HOV) lanes cannot be modeled.
- Ramps with more than two lanes cannot be modeled.
- Freeways with more than ten lanes cannot be modeled.

- Consecutive merge ramps within a single freeway section cannot be modeled.

3.1.4. Ramps and Interchanges Predictive Models

HSM Chapter 19, Predictive Method for Ramps, was used to estimate the safety performance for ramps, ramp terminals, and interchanges located along the corridor and the arterials. **Table 2** summarizes the predictive models included in the HSM for different ramp segments and ramp terminal configurations. Similarly, the models are AADT-based and generate predicted average annual fatal and injury crash frequency and property damage only crash frequency. A severity distribution function is available to further quantify the crash frequency by the following severity levels: fatal, incapacitating injury, non-incapacitating injury, and possible injury. The ramp models use several factors including, but not limited to, number of through lanes, presence of horizontal curve, radius of the curve, widths of lanes, and widths of right and left shoulders. The ramp terminal model factors include ramp terminal control type, skew angle, distance to adjacent ramp terminal, presence of protected left-turn operation, crossroad median width, and number of through lanes on the inside and outside crossroad approach, among others.

Table 2. HSM Chapter 19 Safety Performance Functions

Site Type	Cross Section/Type
Ramp Segments	One-lane entrance ramp
	Two-lane entrance ramp
	One-lane exit ramp
	Two-lane exit ramp
Urban Crossroad Ramp Terminal SPFs	Three-leg ramp terminal with diagonal exit or entrance ramp (D3EX or D3EN)
	Four-leg ramp terminal with diagonal ramps (D4)
	Four-leg ramp terminal at four-quadrant partial cloverleaf interchange (parclo) A (A4)
	Four-leg ramp terminal at four-quadrant parclo B (B4)
	Three-leg ramp terminal at two-quadrant parclo A (A2)
	Three-leg ramp terminal at two-quadrant parclo B (B2)

3.1.5. Urban and Suburban Arterial Predictive Models

HSM Chapter 12, Urban and Suburban Arterials, was used to estimate the safety performance for arterial roadway segments. This methodology includes different SPFs to analyze the following segment and intersection types. The HSM does not include a safety prediction methodology for urban and suburban arterials with six or more lanes and one-way segments. NCHRP Report 17-58 addresses this need by providing SPFs for these additional facility types. The models from NCHRP Report 17-58 will be included in the next edition of the HSM. The NCHRP 17-58 models are embedded in the IHSDM tool and have been applied in this project. **Table 3** lists all the models available in the HSM and NCHRP 17-58.

The models are AADT-based and are used to predict intersection and segment crash frequency. Crash frequency is influenced by several factors including, but not limited to, median width, presence of driveways, the density of fixed roadside objects, on-street parking, presence of left-turn and right-turn lanes, and lighting.

Table 3. HSM Chapter 12 Urban and Suburban Arterial Segments and Intersections SPFs

Facility Type	Site Types with SPFs in HSM Chapter 12 and NCHRP 17-58
Roadway Segments	Two-lane undivided arterials (2U)
	Three-lane arterials with a center two-way left-turn lane (TWLTL) (3T)
	Four-lane undivided arterials (4U)
	Four-lane divided arterials (4D)
	Five-lane arterials including a center TWLTL (5T)
	Six-lane undivided arterials (6U)1
	Six-lane divided arterials (6D) 1
	Seven-lane arterials including a center TWLTL (7T) 1
	Eight-lane divided arterials (8D) 1
	Two-lane one-way arterial (2O) 1
	Three-lane one-way arterial (3O) 1
	Four-lane one-way arterial (4O) 1
Intersections	Unsignalized three-leg (stop control on minor-road approaches) (3ST)
	Signalized three-leg intersections (3SG)
	Unsignalized four-leg (stop control on minor-road approaches) (4ST)
	Signalized four-leg (4SG)

4. Alternatives Evaluated

The alternatives evaluated in the safety performance analysis include a No Build model (2040) and two build alternatives.

4.1. No-Build Alternatives

The 2040 No-Build Alternative comprises of the existing roadway conditions and configuration. Within the analyzed area, I-15 is a five-lane (four GP lanes and one HOV lane) divided highway. The No-Build Alternative assumes the completion of the I-15 Tropicana Avenue Interchange project and the final phase of Project NEON.

The Tropicana Avenue interchange project improvements carry northbound C-D road lanes under a fully reconstructed I-15/Tropicana Avenue interchange, adding capacity at Tropicana Avenue, which then provides a configuration of one HOV lane and four GP lanes, with two lanes entering northbound I-15 from Tropicana Avenue. The future phase of Project NEON would braid the southbound Sahara Avenue on-ramp and Spring Mountain Road off-ramp and widens I-15 north of Desert Inn Road to a configuration of two HOV lanes and four GP lanes. The future phase of Project NEON widens northbound I-15 north of Desert Inn Road to the configuration of two HOV lanes and four GP lanes and would construct an exit to a new northbound C-D road near Sahara Avenue.

4.2. Build Alternative 1

Build Alternative 1 consists of southbound I-15 with one HOV lane and four GP lanes south of Flamingo Road, and two HOV lanes and four GP lanes north of Flamingo Road. Northbound I-15 would have one HOV lane and four GP lanes south of Twain Avenue and two HOV lanes and four GP lanes north of Twain Avenue.

Alternative 1 also proposes modifying the I-15/Flamingo Road interchange to a typical tight diamond interchange (TDI). The I-15/Spring Mountain interchange would remain in its current configuration; however, the southbound I-15 to eastbound Spring Mountain Road flyover is proposed to be realigned to accommodate the additional lanes on I-15.

Alternative 1 also proposes that the southbound Sahara Avenue on-ramp (parallel entrance) would merge onto southbound I-15 just north of Meade Avenue. The following ramps would be braided: southbound Flamingo Road off-ramp with southbound Spring Mountain Road on-ramp and southbound Tropicana Avenue off-ramp with southbound Flamingo Road on-ramp. An auxiliary lane would be added between the southbound Spring Mountain Road on-ramp and the southbound Tropicana Avenue off-ramp. Future single-lane HOV connections in each direction would be accommodated by leaving adequate space in the median of I-15 to Meade Avenue.

4.3. Build Alternative 2

Similar to Build Alternative 1, Build Alternative 2 consists of southbound I-15 with one HOV lane and four GP lanes south of Flamingo Road and two HOV lanes and four GP lanes north of Flamingo Road. Northbound I-15 would have one HOV lane and four GP lanes south of Twain Avenue and two HOV lanes and four GP lanes north of Twain Avenue.

Similar to Alternative 1, Alternative 2 proposes modifying the I-15/Flamingo Road interchange to a typical TDI. The I-15/Spring Mountain interchange would remain in its current configuration; however, the southbound I-15 to eastbound Spring Mountain Road flyover is proposed to be realigned to accommodate the additional lanes on I-15.

Alternative 2 proposes adding a slip-ramp on the northbound C-D road from eastbound CC-215 to northbound I-15 at the Sunset Road Bridge. The following ramps would be braided: southbound Flamingo Road off-ramp with southbound Spring Mountain Road on-ramp, southbound Tropicana Avenue off-ramp with southbound Flamingo Road on-ramp, northbound Russell Road on-ramp (as a full auxiliary lane to Flamingo Road off-ramp) with the northbound C-D Road/northbound Tropicana Avenue off-ramp, and northbound Tropicana Avenue on-ramp with the northbound Flamingo Road off-ramp. Auxiliary lanes would be added between the northbound Russell Road on-ramp and the northbound Flamingo Road off-ramp and the northbound Tropicana Avenue on-ramp and the northbound Spring Mountain Road off-ramp. Future single-lane HOV connections in each direction would be accommodated by leaving adequate space in the median of I-15 to Meade Avenue.

5. Evaluation Results

Prediction results are reported by freeway, interchanges, and arterials. Results of the analysis are summarized for mainline, ramps and ramp terminals, and arterial segments and intersections. Detailed results from IHSDM are provided in **Appendix B**. The results of the crash prediction models for the No-

Build scenario and the two alternatives are presented in **Table 4**. The overall total predicted crash frequencies for Alternative 1 and Alternative 2 are lower than the No-Build Alternative by 1 and 5 percent respectively. Reductions are primarily associated with changes in latent demand, provision of braided ramps, and gore points reconfiguration. **Figure 2** and **Figure 3** show the mainline predicted crash frequencies for the No-Build and the two alternatives.

Table 4. Overall Safety Performance Evaluation Results

Facility	2040 No-Build			2040 Build Alt 1			2040 Build Alt 2		
	FI	PDO	Total	FI	PDO	Total	FI	PDO	Total
I-15 Mainline	168.2	491.9	660.1	162.9	473.9	636.8	163.0	477.9	640.9
				(-3%)	(-4%)	(-4%)	(-3%)	(-3%)	(-3%)
I-15 CD Roads	189.4	83.6	272.9	159.1	79.7	238.8	101.0	75.2	176.2
				(-16%)	(-5%)	(-13%)	(-56%)	(-11%)	(-40%)
Service Interchanges	136.2	183.9	320.1	153.6	207.5	361.2	157.3	209.6	366.9
				(13%)	(13%)	(13%)	(14%)	(12%)	(13%)
Arterial Intersections	37.5	30.9	68.4	37.5	30.9	68.4	37.5	60.9	68.4
				(0%)	(0%)	(0%)	(0%)	(0%)	(0%)
Arterial Segments	35.5	46.5	82.0	36.1	47.7	83.8	36.0	47.6	83.6
				(2%)	(3%)	(2%)	(1%)	(2%)	(2%)
Overall Total	**566.7**	**836.8**	**1,403.5**	**549.2**	**839.8**	**1,389.0**	**494.9**	**841.2**	**1,336.1**
				(-3%)	**(0%)**	**(-1%)**	**(-13%)**	**(1%)**	**(-5%)**

Figure 2. Mainline Safety Performance Results – Fatal and Injury Predicted Crashes per Year

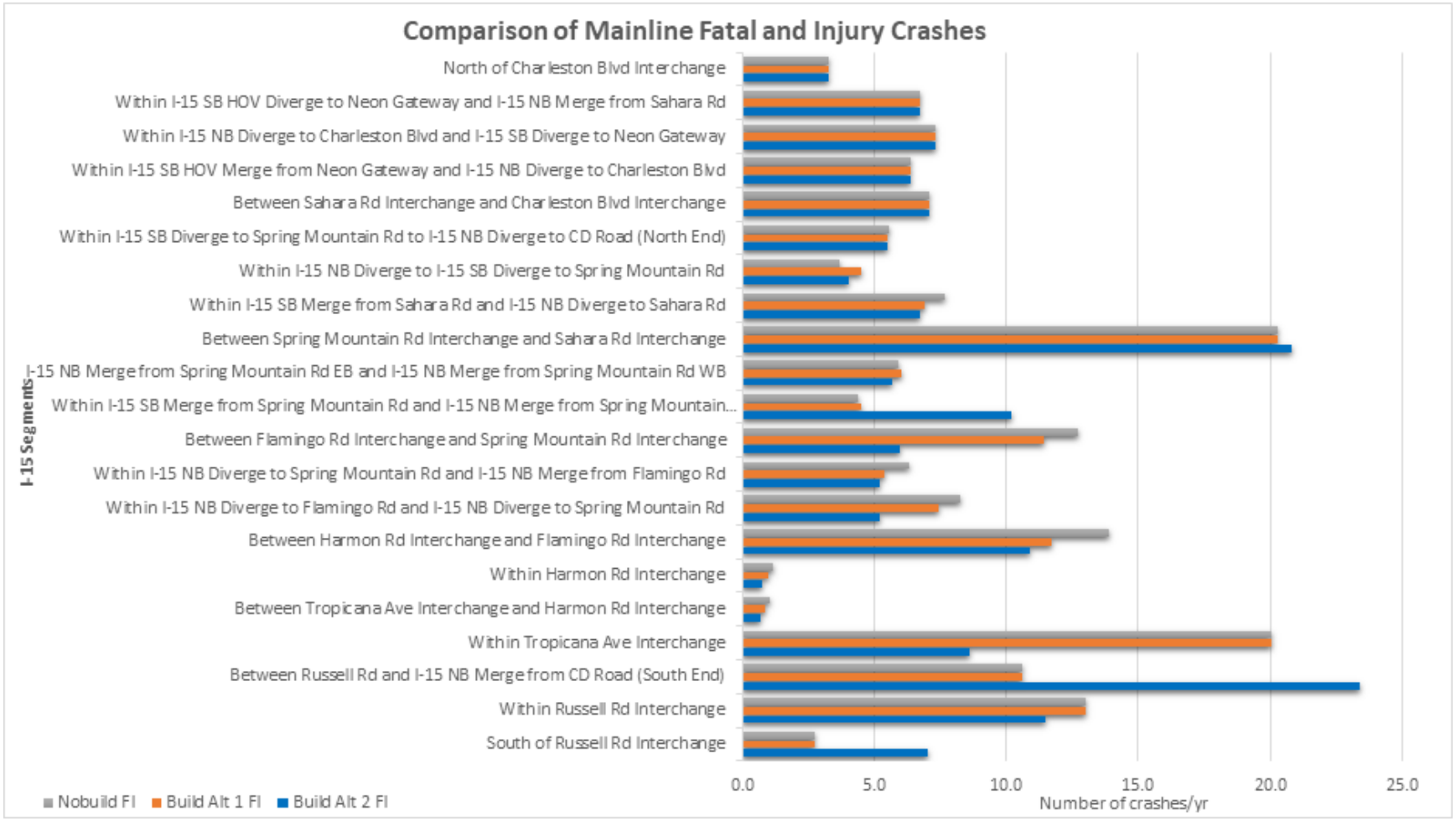
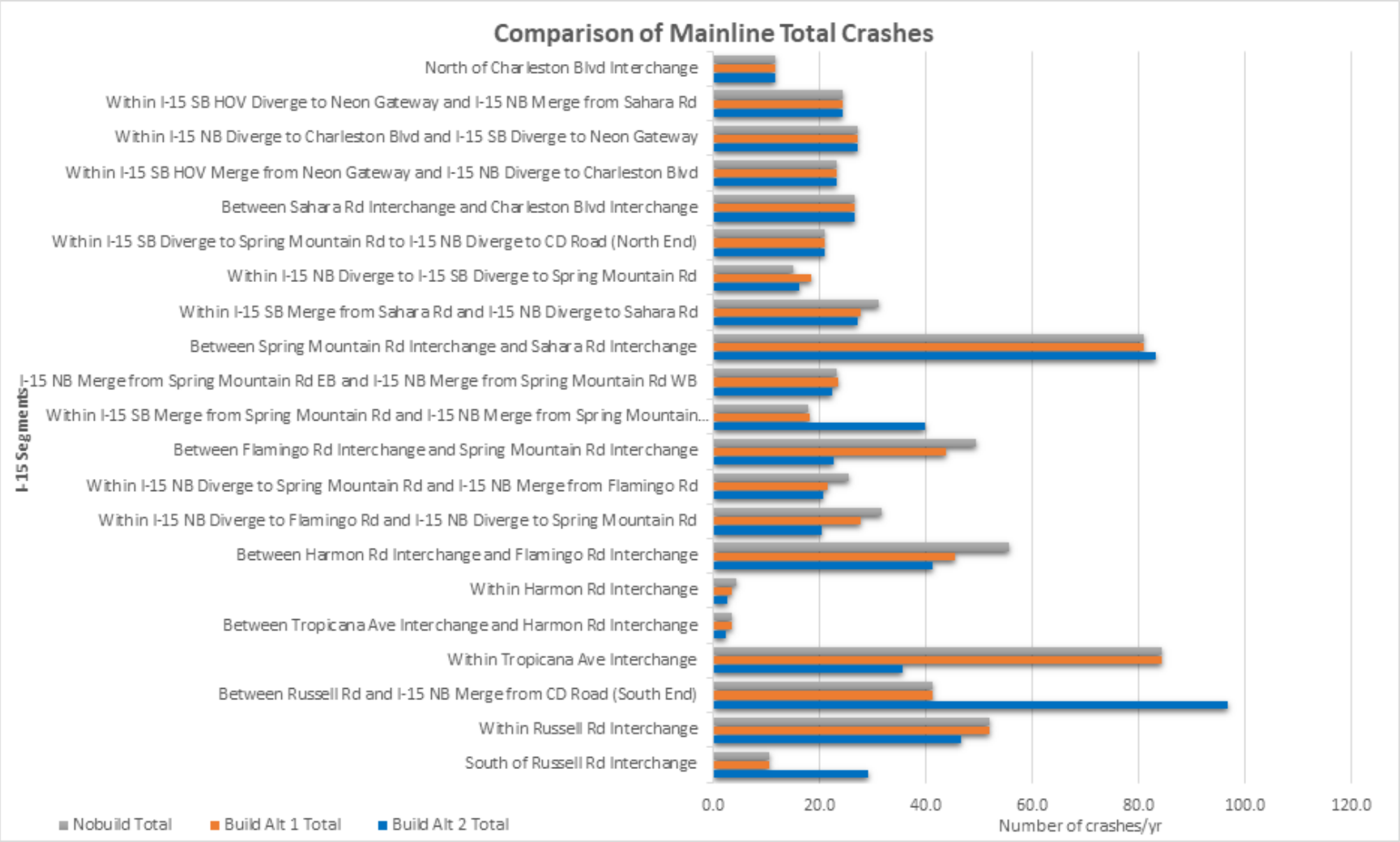


Figure 3. Mainline Safety Performance Results – Total Predicted Crashes per Year



5.1. Service Interchanges

Crashes at the Flamingo Road Interchange increased due to the reconfiguration changes at the ramps and ramp terminals. The HSM predictive methods does not capture the effect of ramps with three or more lanes and dual right turn lanes. There might be some positive safety benefits associated with this type of improvement, but they could not be quantified as part of this analysis.

The crashes at Flamingo Road at I-15 SB Ramp Terminal increased since the I-15 Off-Ramp combined the I-15 EB Off-Ramp and I-15 WB Off-Ramp from the No-Build. The ramp terminal has to process more volume in both alternatives' configuration.

Crashes at Tropicana interchange increased due to the realignment of some of the ramps and also the provision of additional lanes at entrance ramps.

The proposed geometric configurations at Flamingo Road and Tropicana interchanges increase the total predicted crash frequencies by approximately 13 percent in both alternatives. **Figure 4** and **Figure 5** show the results comparison.

Figure 4. Interchange Safety Performance Results – Fatal and Injury Predicted Crashes per Year

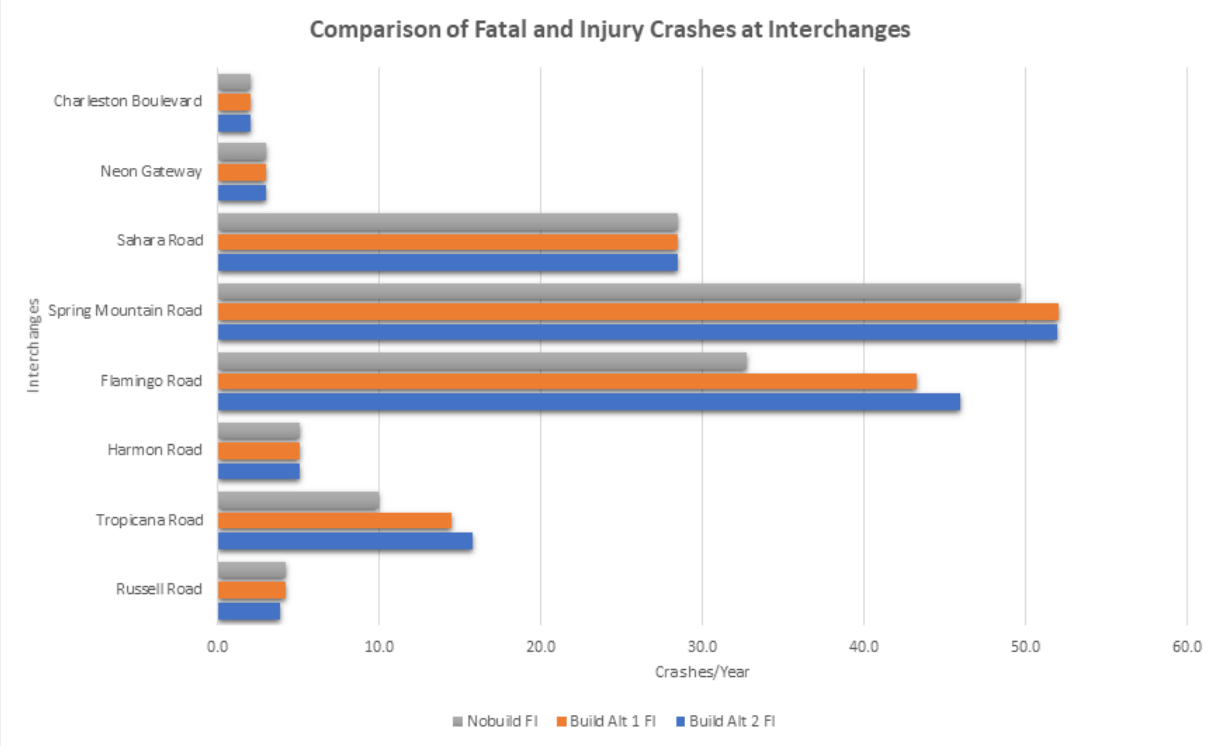
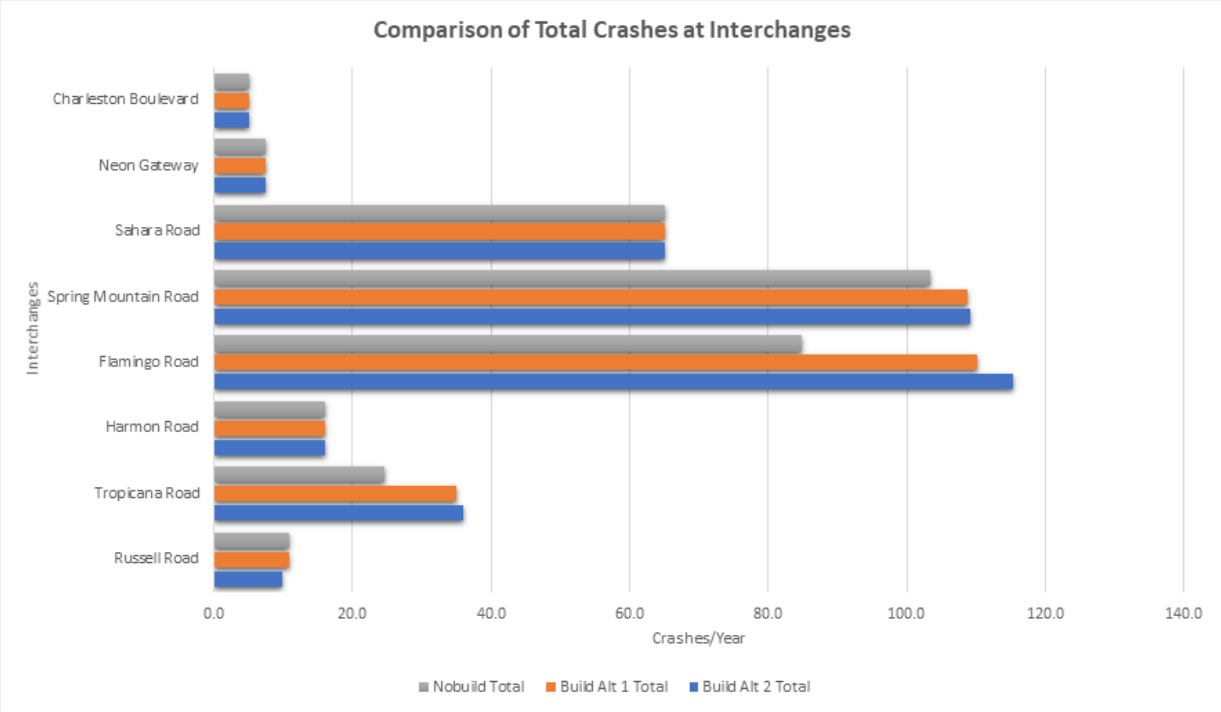


Figure 5. Interchange Safety Performance Results – Total Predicted Crashes per Year



5.2. C-D Roads

Crashes along the SB C-D road in the south end decreased due to the decrease in AADT, this was driven by the Tropicana On-Ramp AADT change from 22,500 in the No-Build to 11,500 in the Build Alternatives. Alternative 2.

Crashes along the NB C-D road in the south end decreased in Alternative 2 due to design modifications. The slip ramp access from the C-D road between Russell Road and Tropicana is removed in Alternative 2, moving the C-D volume getting onto I-15 mainline. The Russell Road on-ramp is connected to the mainline instead of the C-D road in Alternative 2.

The changes in latent demand along the C-D road system are more drastic in Alternative 2, resulting in a decrease of 37 and 26 percent in fatal and injury and total predicted crash frequency, respectively. This is primarily driven by the SB direction. Alternative 1 fatal and injury and total predicted crashes decrease by 16 and 13 percent with respect to the No-Build scenario. **Figure 6** through **Figure 9** summarize the results of the analysis.

Figure 6. I-15 NB C-D Road South End Safety Performance Results – Fatal and Injury Predicted Crashes per Year

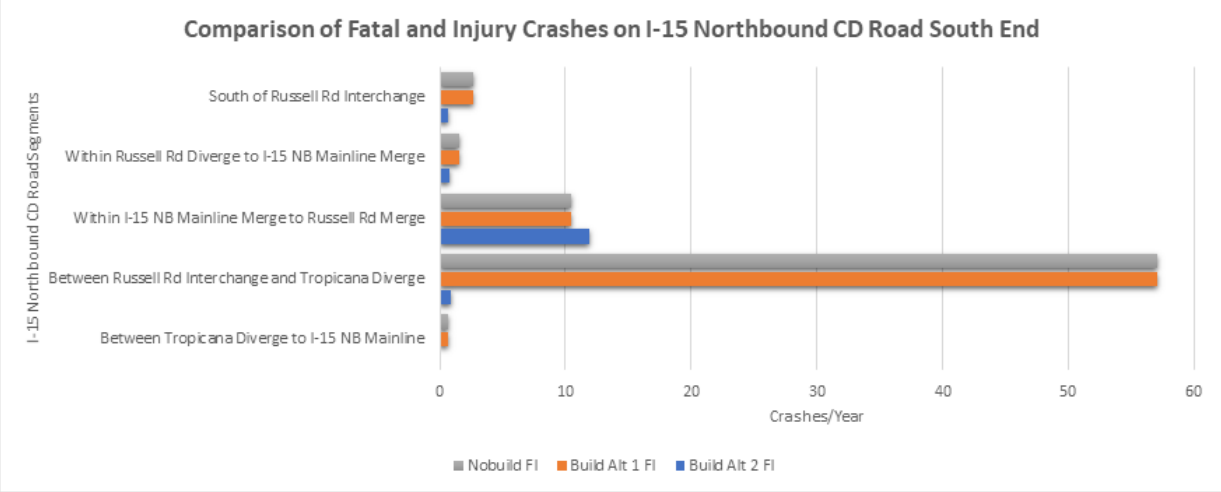


Figure 7. I-15 NB C-D Road South End Safety Performance Results – Total Predicted Crashes per Year

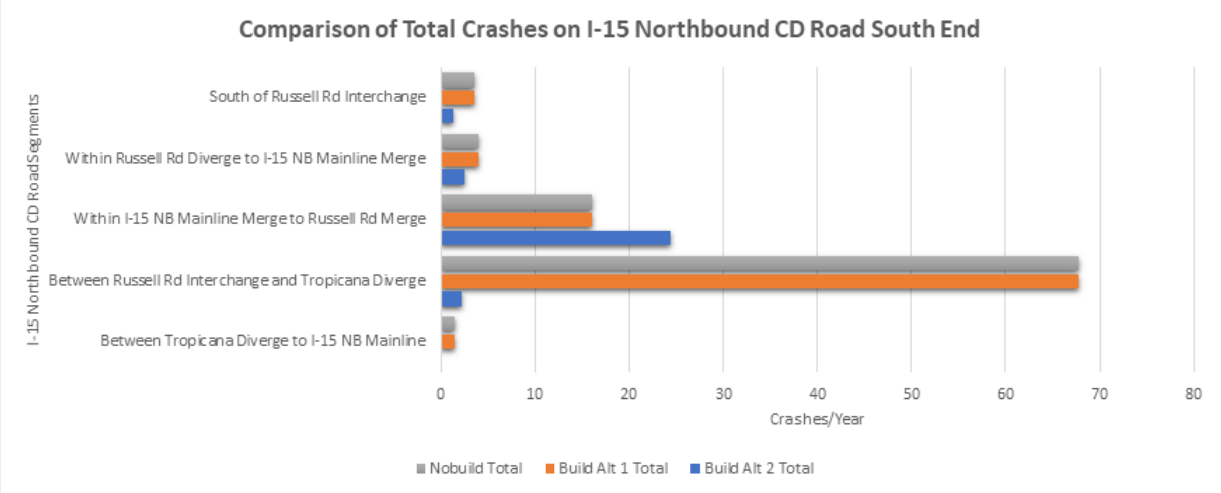


Figure 8. I-15 SB C-D Road South End Safety Performance Results – Fatal and Injury Predicted Crashes per Year

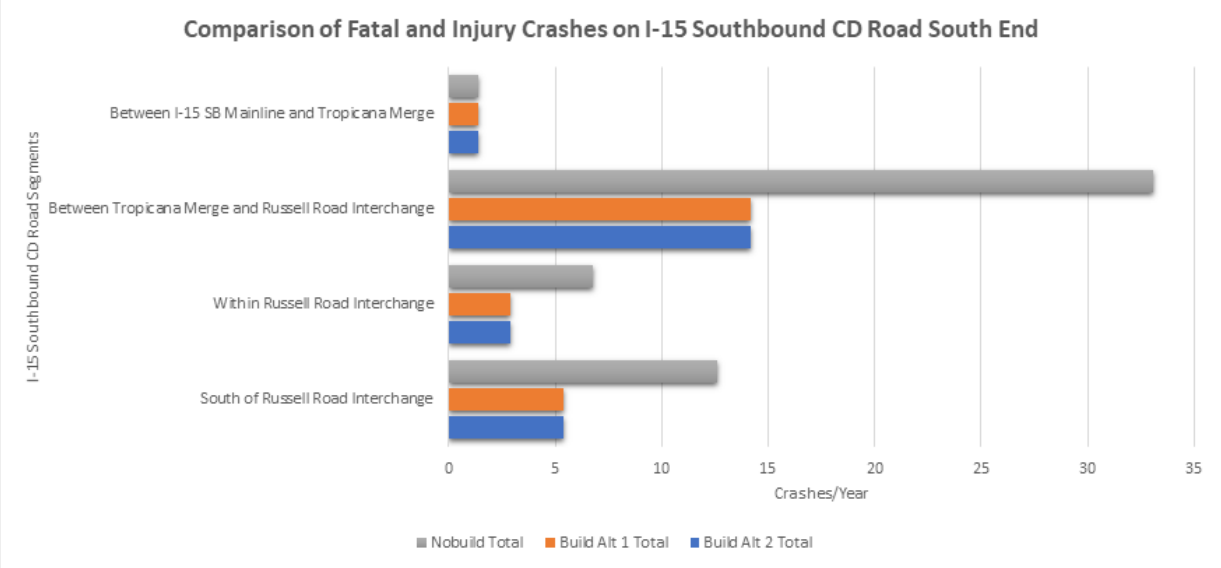
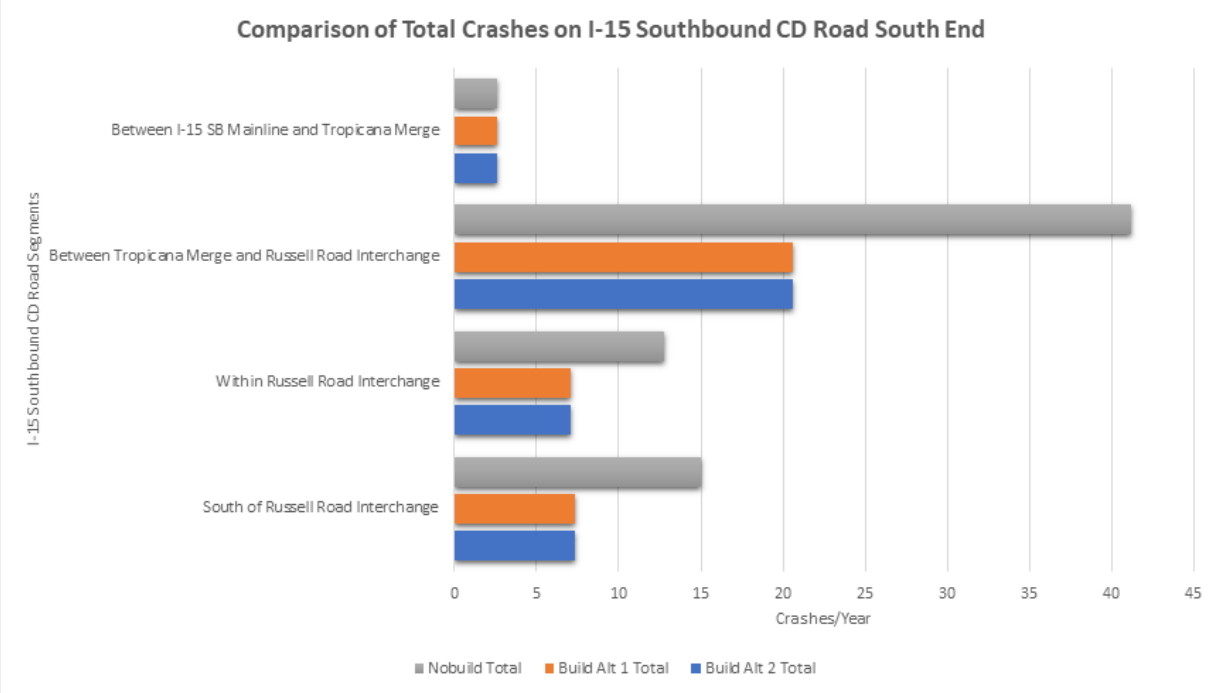


Figure 9. I-15 SB C-D Road South End Safety Performance Results – Total Predicted Crashes per Year



6. Conclusions

The I-15 safety performance evaluation was conducted to understand the safety performance differences between the No-Build and Build scenarios. The results of the analysis indicate that predicted crashes will decrease slightly as a result of various factors, including changes in latent demand, removal of traffic conflicts due to the addition of braided ramps, reallocation of gore points, and changes in geometric configurations.

The results show a decrease in fatal and injury and total predicted crashes along the I-15 mainline of approximately 3 to 4 percent.

The geometric changes at Flamingo Rd interchange generate a slight increase in crashes. The HSM predictive methods do not capture the effect of ramps with three or more lanes and dual right turn lanes. There might be some positive safety benefits associated with this type of improvement, but they could not be quantified as part of this analysis. Crashes at Tropicana interchange increased due to the realignment of some of the ramps, and also the provision of additional lanes at entrance ramps. The proposed geometric changes at these interchange locations will result in an increase in predicted crashes of about 13 percent in both alternatives.

Crashes on the C-D roads decrease due to changes in latent demand and ramp access reconfiguration. The changes in latent demand along the C-D road system in Alternative 2 result in a decrease of 37 and 26 percent in fatal and injury and total predicted crash frequency, respectively. Alternative 1 fatal and injury and total predicted crashes decrease by 16 and 13 percent with respect to the No-Build scenario.

Crash predictions in the arterial system yield pretty much the same number of predicted crashes in the No-Build and the two alternatives. There is a slight change at Flamingo Rd to the ramp reconfiguration at this location.

Overall, Alternative 1 shows a decrease in fatal and injury crashes of 3 percent, and a decrease in all crashes of 1 percent. The systemwide total predicted crash frequency is 1,403 crashes/year and 1,389 crashes/year for the No-Build and Alternative 1, respectively.

Similarly, the fatal and injury and total crashes under Alternative 2 decrease by 13 and 5 percent, respectively. The systemwide total predicted crash frequencies for No-Build and Alternative 2 are 1,403 crashes/year and 1,336 crashes/year, respectively.

7. References

K. Jang, S. Kang, J. Seo, and C. Y. Chan. 2013. *Cross-Section Designs for the Safety Performance of Buffer-Separated High Occupancy Vehicle Lanes. ASCE Journal of Transportation Engineering,* Vol. 139, pp. 247–254

S. Srinivasan, P. Haas, P. Alluri, A. Gan, and J. Bonneson. 2015.*Crash Prediction Method for Freeway Facilities with High-Occupancy Vehicle (HOV) and High-Occupancy Toll (HOT) Lanes.* FDOT Contract BDV32-977-04.

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Appendix A. Crash Severity Distribution Table

K	A	B	C	PDO	Total
0.28%	0.56%	4.12%	28.84%	66.20%	100.00%

Appendix B. Detailed Summary Tables

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Overall Summary - No-Build vs Build Alt 1

Facility	2040 No-Build			2040 Build Alt 1			Difference			Percentage		
	FI	PDO	Total	FI	PDO	Total	FI	PDO	Total	FI	PDO	Total
I-15 Mainline	168.2	491.9	660.1	162.9	473.5	636.3	-5.3	-18.5	-23.8	-3%	-4%	-4%
I-15 CD Roads	189.4	83.6	272.9	159.1	79.7	238.8	-30.2	-3.9	-34.1	-16%	-5%	-13%
Service Interchanges	136.2	183.9	320.1	153.6	207.5	361.2	17.4	23.7	41.1	13%	13%	13%
Arterial Intersections	37.5	30.9	68.4	37.5	30.9	68.4	0.0	0.0	0.0	0%	0%	0%
Arterial Segments	35.5	46.5	82.0	36.1	47.7	83.8	0.6	1.2	1.8	2%	3%	2%
Overall Total	566.7	836.8	1,403.5	549.2	839.4	1,388.5	-17.6	2.5	-15.0	-3%	0%	-1%

Overall Summary - No-Build vs Build Alt 2

Facility	2040 No-Build			2040 Build Alt 2			Difference			Percentage		
	FI	PDO	Total	FI	PDO	Total	FI	PDO	Total	FI	PDO	Total
I-15 Mainline	168.2	491.9	660.1	163.0	477.9	640.9	-5.2	-14.1	-19.2	-3%	-3%	-3%
I-15 CD Roads	189.4	83.6	272.9	101.0	75.2	176.2	-88.3	-8.4	-96.7	-47%	-10%	-35%
Service Interchanges	136.2	183.9	320.1	157.3	209.6	366.9	21.1	25.7	46.9	15%	14%	15%
Arterial Intersections	37.5	30.9	68.4	37.5	30.9	68.4	0.0	0.0	0.0	0%	0%	0%
Arterial Segments	35.5	46.5	82.0	36.0	47.6	83.6	0.5	1.1	1.7	2%	2%	2%
Overall Total	566.7	836.8	1,403.5	494.9	841.2	1,336.1	-71.9	4.4	-67.4	-13%	1%	-5%

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Mainline Summary - No-Build vs Build Alt 1

Corridor	Segment	2040 No-Build			2040 Build Alt 1			Difference			Percentage		
		Fatal and Injury	Property Damage Only	Total	Fatal and Injury	Property Damage Only	Total	Fatal and Injury	Property Damage Only	Total	Fatal and Injury	Property Damage Only	Total
I-15 Mainline	South of Russell Rd Interchange	0.6	1.5	2.1	0.6	1.5	2.1	0.0	0.0	0.0	0%	0%	0%
	Within Russell Rd Interchange	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0%	0%	0%
	Between Russell Rd and I-15 NB Merge from CD Road (South End)	0.1	0.2	0.3	0.1	0.2	0.3	0.0	0.0	0.0	0%	0%	0%
	Within Tropicana Ave Interchange	0.5	0.8	1.3	0.5	0.8	1.3	0.0	0.0	0.0	0%	0%	0%
	Between Tropicana Ave Interchange and Harmon Rd Interchange	0.8	1.6	2.4	0.3	0.6	0.9	-0.5	-1.0	-1.5	-64%	-62%	-63%
	Within Harmon Rd Interchange	0.4	1.0	1.4	0.4	0.8	1.2	0.0	-0.1	-0.2	-11%	-12%	-12%
	Between Harmon Rd Interchange and Flamingo Rd Interchange	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0%	0%	0%
	Within I-15 NB Diverge to Flamingo Rd and I-15 NB Diverge to Spring Mountain Rd	1.8	3.3	5.0	1.6	2.9	4.5	-0.2	-0.3	-0.5	-11%	-10%	-10%
	Within I-15 NB Diverge to Spring Mountain Rd and I-15 NB Merge from Flamingo Rd	0.8	2.0	2.9	0.1	0.2	0.3	-0.7	-1.8	-2.5	-85%	-91%	-89%
	Between Flamingo Rd Interchange and Spring Mountain Rd Interchange	2.3	4.9	7.2	0.7	1.2	1.9	-1.6	-3.7	-5.3	-69%	-75%	-73%
	Within I-15 SB Merge from Spring Mountain Rd and I-15 NB Merge from Spring Mountain Rd EB	0.3	0.6	0.9	0.3	0.4	0.7	-0.1	-0.2	-0.3	-17%	-33%	-28%
	I-15 NB Merge from Spring Mountain Rd EB and I-15 NB Merge from Spring Mountain Rd WB	1.1	2.5	3.6	1.1	2.5	3.6	0.0	0.0	0.0	0%	0%	0%
	Between Spring Mountain Rd Interchange and Sahara Rd Interchange	3.8	7.2	11.0	3.8	7.2	11.0	0.0	0.0	0.0	0%	0%	0%
	Within I-15 SB Merge from Sahara Rd and I-15 NB Diverge to Sahara Rd	0.5	1.0	1.5	0.5	1.0	1.5	0.0	0.0	0.0	0%	0%	0%
	Within I-15 NB Diverge to I-15 SB Diverge to Spring Mountain Rd	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0%	0%	0%
	Within I-15 SB Diverge to Spring Mountain Rd to I-15 NB Diverge to CD Road (North End)	0.6	1.2	1.8	0.6	1.2	1.8	0.0	0.0	0.0	0%	0%	0%
	Between Sahara Rd Interchange and Charleston Blvd Interchange	0.7	1.7	2.3	0.7	1.7	2.3	0.0	0.0	0.0	0%	0%	0%
	Within I-15 SB HOV Merge from Neon Gateway and I-15 NB Diverge to Charleston Blvd	1.1	2.0	3.1	1.1	2.0	3.1	0.0	0.0	0.0	0%	0%	0%
	Within I-15 NB Diverge to Charleston Blvd and I-15 SB Diverge to Neon Gateway	0.6	1.1	1.6	0.6	1.1	1.6	0.0	0.0	0.0	0%	0%	0%
	Within I-15 SB HOV Diverge to Neon Gateway and I-15 NB Merge from Sahara Rd	0.8	1.4	2.2	0.8	1.4	2.2	0.0	0.0	0.0	0%	0%	0%
	North of Charleston Blvd Interchange	0.5	1.0	1.6	0.5	1.0	1.6	0.0	0.0	0.0	0%	0%	0%
	Total	**17.3**	**34.9**	**52.2**	**14.2**	**27.8**	**42.0**	**-3.1**	**-7.1**	**-10.3**	**-18%**	**-20%**	**-20%**

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Mainline Summary - No-Build vs Build Alt 2

Corridor	Segment	2040 No-Build			2040 Build Alt 2			Difference			Percentage		
		Fatal and Injury	Property Damage Only	Total	Fatal and Injury	Property Damage Only	Total	Fatal and Injury	Property Damage Only	Total	Fatal and Injury	Property Damage Only	Total
I-15 Mainline	South of Russell Rd Interchange	2.7	7.9	10.6	7.0	22.2	29.2	4.3	14.3	18.6	157%	182%	176%
	Within Russell Rd Interchange	13.0	38.8	51.9	11.5	35.2	46.7	-1.5	-3.6	-5.2	-12%	-9%	-10%
	Between Russell Rd and I-15 NB Merge from CD Road (South End)	10.6	30.7	41.3	23.4	73.3	96.7	12.8	42.5	55.4	121%	138%	134%
	Within Tropicana Ave Interchange	20.1	64.3	84.4	8.6	27.1	35.7	-11.5	-37.2	-48.7	-57%	-58%	-58%
	Between Tropicana Ave Interchange and Harmon Rd Interchange	1.1	2.3	3.4	0.7	1.8	2.4	-0.4	-0.6	-1.0	-36%	-25%	-29%
	Within Harmon Rd Interchange	1.2	3.2	4.3	0.8	2.0	2.7	-0.4	-1.2	-1.6	-35%	-37%	-37%
	Between Harmon Rd Interchange and Flamingo Rd Interchange	13.9	41.6	55.5	10.9	30.3	41.2	-3.0	-11.3	-14.4	-22%	-27%	-26%
	Within I-15 NB Diverge to Flamingo Rd and I-15 NB Diverge to Spring Mountain Rd	8.3	23.3	31.6	5.2	15.1	20.3	-3.1	-8.2	-11.3	-37%	-35%	-36%
	Within I-15 NB Diverge to Spring Mountain Rd and I-15 NB Merge from Flamingo Rd	6.3	19.2	25.6	5.2	15.6	20.8	-1.1	-3.7	-4.8	-17%	-19%	-19%
	Between Flamingo Rd Interchange and Spring Mountain Rd Interchange	12.7	36.7	49.4	6.0	16.7	22.7	-6.8	-20.0	-26.7	-53%	-54%	-54%
	Within I-15 SB Merge from Spring Mountain Rd and I-15 NB Merge from Spring Mountain Rd EB	4.4	13.3	17.7	10.2	29.8	39.9	5.8	16.4	22.2	131%	123%	125%
	I-15 NB Merge from Spring Mountain Rd EB and I-15 NB Merge from Spring Mountain Rd WB	5.9	17.3	23.2	5.7	16.6	22.2	-0.2	-0.8	-1.0	-4%	-4%	-4%
	Between Spring Mountain Rd Interchange and Sahara Rd Interchange	20.3	60.7	81.0	20.8	62.3	83.1	0.5	1.6	2.1	3%	3%	3%
	Within I-15 SB Merge from Sahara Rd and I-15 NB Diverge to Sahara Rd	7.7	23.4	31.0	6.7	20.3	27.1	-0.9	-3.0	-4.0	-12%	-13%	-13%
	Within I-15 NB Diverge to I-15 SB Diverge to Spring Mountain Rd	3.7	11.4	15.1	4.0	12.1	16.2	0.3	0.7	1.0	9%	6%	7%
	Within I-15 SB Diverge to Spring Mountain Rd to I-15 NB Diverge to CD Road (North End)	5.5	15.4	21.0	5.5	15.4	20.9	0.0	0.0	0.0	0%	0%	0%
	Between Sahara Rd Interchange and Charleston Blvd Interchange	7.1	19.6	26.7	7.1	19.6	26.7	0.0	0.0	0.0	0%	0%	0%
	Within I-15 SB HOV Merge from Neon Gateway and I-15 NB Diverge to Charleston Blvd	6.4	16.7	23.1	6.4	16.7	23.1	0.0	0.0	0.0	0%	0%	0%
	Within I-15 NB Diverge to Charleston Blvd and I-15 SB Diverge to Neon Gateway	7.3	19.8	27.1	7.3	19.8	27.1	0.0	0.0	0.0	0%	0%	0%
	Within I-15 SB HOV Diverge to Neon Gateway and I-15 NB Merge from Sahara Rd	6.7	17.7	24.4	6.7	17.7	24.4	0.0	0.0	0.0	0%	0%	0%
	North of Charleston Blvd Interchange	3.3	8.4	11.7	3.3	8.4	11.7	0.0	0.0	0.0	0%	0%	0%
	Total	**168.2**	**491.9**	**660.1**	**163.0**	**477.9**	**640.9**	**-5.2**	**-14.1**	**-19.2**	**-3%**	**-3%**	**-3%**

Mainline Overall Summary - No-Build vs Build Alt 1

Mainline Facility	2040 No-Build			2040 Build Alt 1			Difference			Percentage		
	Fatal and Injury	Property Damage Only	Total	Fatal and Injury	Property Damage Only	Total	Fatal and Injury	Property Damage Only	Total	Fatal and Injury	Property Damage Only	Total
I-15 Mainline	150.9	457.0	607.9	148.7	445.7	594.3	-2.2	-11.4	-13.6	-1%	-2%	-2%
I-15 Mainline Speed Change Lanes	17.3	34.9	52.2	14.2	27.8	42.0	-3.1	-7.1	-10.3	-18%	-20%	-20%
I-15 NB CD Road (South End)	72.4	20.6	93.0	72.4	20.6	93.0	0.0	0.0	0.0	0%	0%	0%
I-15 SB CD Road (South End)	53.8	17.7	71.5	23.8	13.8	37.6	-30.0	-3.9	-33.9	-56%	-22%	-47%
I-15 NB CD Road (North End)	29.2	23.8	53.0	29.2	23.8	53.0	0.0	0.0	0.0	0%	0%	0%
I-15 SB CD Road (North End)	33.9	21.5	55.4	33.7	21.5	55.2	-0.2	0.0	-0.2	-1%	0%	0%

Mainline Overall Summary - No-Build vs Build Alt 2

Mainline Facility	2040 No-Build			2040 Build Alt 2			Difference			Percentage		
	Fatal and Injury	Property Damage Only	Total	Fatal and Injury	Property Damage Only	Total	Fatal and Injury	Property Damage Only	Total	Fatal and Injury	Property Damage Only	Total
I-15 Mainline	150.9	457.0	607.9	148.7	449.6	598.4	-2.2	-7.4	-9.5	-1%	-2%	-2%
I-15 Mainline Speed Change Lanes	17.3	34.9	52.2	14.3	28.3	42.5	-3.0	-6.7	-9.7	-17%	-19%	-19%
I-15 NB CD Road (South End)	72.4	20.6	93.0	14.3	16.1	30.4	-58.1	-4.5	-62.6	-80%	-22%	-67%
I-15 SB CD Road (South End)	53.8	17.7	71.5	23.8	13.8	37.6	-30.0	-3.9	-33.9	-56%	-22%	-47%
I-15 NB CD Road (North End)	29.2	23.8	53.0	29.2	23.8	53.0	0.0	0.0	0.0	0%	0%	0%
I-15 SB CD Road (North End)	33.9	21.5	55.4	33.7	21.5	55.2	-0.2	0.0	-0.2	-1%	0%	0%

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Interchange Summary - No-Build vs Build Alt 1

Corridor	Interchange	Ramp	2040 No-Build			2040 Build Alt 1			Difference			Percentage		
			Fatal and Injury	Property Damage Only	Total	Fatal and Injury	Property Damage Only	Total	Fatal and Injury	Property Damage Only	Total	Fatal and Injury	Property Damage Only	Total
I-15 Interchanges	Russell Road	I-15 NB Exit	1.5	2.6	4.1	1.5	2.6	4.1	0.0	0.0	0.0	0%	0%	0%
		I-15 NB Entrance	0.7	1.2	1.9	0.7	1.2	1.9	0.0	0.0	0.0	0%	0%	0%
		I-15 SB Exit	0.7	1.2	1.9	0.7	1.2	1.9	0.0	0.0	0.0	0%	0%	0%
		I-15 SB Entrance	1.2	1.8	3.0	1.2	1.8	3.0	0.0	0.0	0.0	0%	0%	0%
		Total	**4.2**	**6.7**	**10.9**	**4.2**	**6.7**	**10.9**	**0.0**	**0.0**	**0.0**	**0%**	**0%**	**0%**
	I-15 NB CD Road (South End)	I-15 NB Exit	0.4	0.6	1.0	0.4	0.6	1.0	0.0	0.0	0.0	0%	0%	0%
		Total	**0.4**	**0.6**	**1.0**	**0.4**	**0.6**	**1.0**	**0.0**	**0.0**	**0.0**	**0%**	**0%**	**0%**
	Tropicana Avenue	I-15 NB Exit to Tropicana Avenue	2.1	2.9	5.0	2.1	2.9	5.0	0.0	0.0	0.0	0%	0%	0%
		I-15 NB Exit to Frank Sinatra Road	1.2	2.2	3.3	1.2	2.2	3.3	0.0	0.0	0.0	0%	0%	0%
		I-15 NB Entrance	2.1	2.4	4.5	2.8	2.8	5.6	0.7	0.4	1.1	33%	18%	25%
		I-15 SB Exit to WB Tropicana Avenue	0.2	0.4	0.6	0.2	0.4	0.6	0.0	0.0	0.0	0%	0%	0%
		I-15 SB Exit to EB Tropicana Avenue	3.0	5.3	8.2	6.9	10.7	17.5	3.9	5.4	9.3	129%	103%	113%
		I-15 SB Entrance	1.4	1.5	2.9	1.4	1.5	2.9	0.0	0.0	0.0	0%	0%	0%
		Total	**9.9**	**14.6**	**24.6**	**14.5**	**20.5**	**35.0**	**4.5**	**5.8**	**10.4**	**46%**	**40%**	**42%**
	Harmon Road	I-15 HOV NB Exit	0.3	0.3	0.6	0.3	0.3	0.6	0.0	0.0	0.0	0%	0%	0%
		Harmon Road & I-15 NB Off-Ramp (HOV Access)	3.1	6.4	9.5	3.1	6.4	9.5	0.0	0.0	0.0	0%	0%	0%
		Harmon Road & I-15 SB On-Ramp (HOV Access)	1.5	3.9	5.3	1.5	3.9	5.3	0.0	0.0	0.0	0%	0%	0%
		I-15 HOV SB Entrance	0.3	0.4	0.7	0.3	0.4	0.7	0.0	0.0	0.0	0%	0%	0%
		Total	**5.1**	**11.0**	**16.1**	**5.1**	**11.0**	**16.1**	**0.0**	**0.0**	**0.0**	**0%**	**0%**	**0%**
	Flamingo Road	I-15 NB Exit	1.1	1.3	2.4	1.1	1.3	2.4	0.0	0.0	0.0	0%	0%	0%
		I-15 NB Off-Ramp/I-15 NB On-Ramp & Flamingo Rd	23.6	36.7	60.3	14.2	20.3	34.5	-9.4	-16.4	-25.8	-40%	-45%	-43%
		I-15 NB Entrance	0.6	1.3	1.9	0.9	1.4	2.4	0.3	0.2	0.4	45%	12%	23%
		I-15 SB Exit to WB Flamingo Road	0.7	0.9	1.6	3.2	4.7	7.9	2.4	3.8	6.2	326%	428%	382%
		I-15 SB Exit to EB Flamingo Road	1.2	1.6	2.8	NA	NA	NA	NA	NA	NA	NA	NA	NA
		I-15 SB On Ramp & Flamingo Rd	3.6	7.3	10.8	22.9	38.0	60.8	19.3	30.7	50.0	538%	423%	461%
		I-15 SB Entrance	1.9	3.0	4.9	1.1	1.1	2.2	-0.9	-1.9	-2.7	-45%	-62%	-56%
		Total	**32.8**	**52.0**	**84.8**	**43.3**	**66.8**	**110.1**	**10.5**	**14.8**	**25.3**	**32%**	**28%**	**30%**
	Spring Mountain Road	I-15 NB Exit to EB Spring Mountain Road	1.2	1.8	3.1	1.2	1.8	3.1	0.0	0.0	0.0	0%	0%	0%
		I-15 NB Exit to WB Spring Mountain Road	7.4	10.2	17.6	7.4	10.3	17.7	0.0	0.0	0.1	1%	0%	1%
		I-15 NB Ramp Exit to Highland Avenue	0.4	0.6	1.0	0.4	0.6	1.0	0.0	0.0	0.0	0%	0%	0%
		I-15 NB Ramp Entrance from Highland Avenue	1.3	2.0	3.3	1.3	2.0	3.3	0.0	0.0	0.0	0%	0%	0%
		I-15 NB Entrance from EB Spring Mountain Road	1.4	2.3	3.7	1.4	2.3	3.7	0.0	0.0	0.0	0%	0%	0%
		I-15 NB Entrance from WB Spring Mountain Road	0.8	1.6	2.4	0.8	1.6	2.4	0.0	0.0	0.0	0%	0%	0%

Corridor	Interchange	Ramp	2040 No-Build			2040 Build Alt 1			Difference			Percentage		
			Fatal and Injury	Property Damage Only	Total	Fatal and Injury	Property Damage Only	Total	Fatal and Injury	Property Damage Only	Total	Fatal and Injury	Property Damage Only	Total
		I-15 SB Exit to WB Spring Mountain Road	0.3	0.4	0.7	0.5	0.7	1.2	0.2	0.4	0.5	53%	103%	77%
		I-15 SB Exit to EB Spring Mountain Road (Flyover)	5.8	11.0	16.8	7.5	13.1	20.6	1.7	2.1	3.8	28%	19%	23%
		I-15 SB On Ramp/I-15 SB Off Ramp & Spring Mountain Road	30.4	23.1	53.6	30.2	22.8	53.0	-0.2	-0.3	-0.5	-1%	-1%	-1%
		I-15 SB Entrance	0.6	0.8	1.5	1.3	1.7	3.0	0.7	0.8	1.5	115%	100%	106%
		Total	**49.7**	**53.8**	**103.5**	**52.0**	**56.8**	**108.9**	**2.3**	**3.1**	**5.4**	**5%**	**6%**	**5%**
	Sahara Road	I-15 NB Exit	1.1	1.6	2.6	1.1	1.6	2.6	0.0	0.0	0.0	0%	0%	0%
		I-15 NB On Ramp/I-15 NB Off Ramp & Sahara Road	14.5	17.6	32.0	14.5	17.6	32.0	0.0	0.0	0.0	0%	0%	0%
		I-15 NB Entrance	0.7	1.5	2.2	0.7	1.5	2.2	0.0	0.0	0.0	0%	0%	0%
		I-15 SB Exit (From I-15 Mainline)	0.7	1.1	1.8	0.7	1.1	1.8	0.0	0.0	0.0	0%	0%	0%
		I-15 SB Exit to EB Sahara Road (Flyover)	2.8	3.9	6.8	2.8	3.9	6.8	0.0	0.0	0.0	0%	0%	0%
		I-15 SB Exit to EB Sahara Road (Loop)	0.8	1.1	2.0	0.8	1.1	2.0	0.0	0.0	0.0	0%	0%	0%
		I-15 SB Exit to WB Sahara Road	0.2	0.2	0.4	0.2	0.2	0.4	0.0	0.0	0.0	0%	0%	0%
		I-15 SB Off-Ramp & Sahara Road	1.9	3.4	5.3	1.9	3.4	5.3	0.0	0.0	0.0	0%	0%	0%
		I-15 SB On-Ramp & Sahara Road	0.4	0.4	0.8	0.4	0.4	0.8	0.0	0.0	0.0	0%	0%	0%
		I-15 SB Entrance	5.3	5.9	11.3	5.3	5.9	11.3	0.0	0.0	0.0	0%	0%	0%
		Total	**28.4**	**36.7**	**65.1**	**28.4**	**36.7**	**65.1**	**0.0**	**0.0**	**0.0**	**0%**	**0%**	**0%**
	Neon Gateway	I-15 HOV NB Exit	0.1	0.2	0.3	0.1	0.2	0.3	0.0	0.0	0.0	0%	0%	0%
		I-15 HOV NB Entrance	0.3	0.4	0.7	0.3	0.4	0.7	0.0	0.0	0.0	0%	0%	0%
		I-15 HOV SB Exit	0.6	0.9	1.6	0.6	0.9	1.6	0.0	0.0	0.0	0%	0%	0%
		I-15 HOV SB Off-Ramp/I-15 HOV SB On-Ramp & Neon Gateway	1.9	2.8	4.7	1.9	2.8	4.7	0.0	0.0	0.0	0%	0%	0%
		I-15 HOV SB Entrance	0.1	0.1	0.2	0.1	0.1	0.2	0.0	0.0	0.0	0%	0%	0%
		Total	**3.0**	**4.4**	**7.4**	**3.0**	**4.4**	**7.4**	**0.0**	**0.0**	**0.0**	**0%**	**0%**	**0%**
	I-15 NB CD Road (North End)	I-15 NB Entrance	0.7	1.1	1.9	0.7	1.1	1.9	0.0	0.0	0.0	0%	0%	0%
		Total	**0.7**	**1.1**	**1.9**	**0.7**	**1.1**	**1.9**	**0.0**	**0.0**	**0.0**	**0%**	**0%**	**0%**
	Charleston Boulevard	I-15 NB Exit	0.9	1.4	2.3	0.9	1.4	2.3	0.0	0.0	0.0	0%	0%	0%
		I-15 SB Entrance	1.1	1.6	2.7	1.1	1.6	2.7	0.0	0.0	0.0	0%	0%	0%
		Total	**2.0**	**3.0**	**5.1**	**2.0**	**3.0**	**5.1**	**0.0**	**0.0**	**0.0**	**0%**	**0%**	**0%**
Overall Total			**136.2**	**183.9**	**320.1**	**153.6**	**207.5**	**361.2**	**17.4**	**23.7**	**41.1**	**13%**	**13%**	**13%**

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Interchange Summary - No-Build vs Build Alt 2

Corridor	Interchange	Ramp	2040 No-Build			2040 Build Alt 2			Difference			Percentage		
			Fatal and Injury	Property Damage Only	Total	Fatal and Injury	Property Damage Only	Total	Fatal and Injury	Property Damage Only	Total	Fatal and Injury	Property Damage Only	Total
I-15 Interchanges	Russell Road	I-15 NB Exit	1.5	2.6	4.1	1.5	2.6	4.1	0.0	0.0	0.0	0%	0%	0%
		I-15 NB Entrance	0.7	1.2	1.9	0.4	0.4	0.8	-0.4	-0.7	-1.1	-49%	-62%	-57%
		I-15 SB Exit	0.7	1.2	1.9	0.7	1.2	1.9	0.0	0.0	0.0	0%	0%	0%
		I-15 SB Entrance	1.2	1.8	3.0	1.2	1.8	3.0	0.0	0.0	0.0	0%	0%	0%
		Total	**4.2**	**6.7**	**10.9**	**3.8**	**6.0**	**9.8**	**-0.4**	**-0.7**	**-1.1**	**-9%**	**-11%**	**-10%**
	I-15 NB CD Road (South End)	I-15 NB Exit	0.4	0.6	1.0	0.6	0.7	1.2	0.2	0.1	0.3	40%	25%	31%
		Total	**0.4**	**0.6**	**1.0**	**0.6**	**0.7**	**1.2**	**0.2**	**0.1**	**0.3**	**40%**	**25%**	**31%**
	Tropicana Avenue	I-15 NB Exit to Tropicana Avenue	2.1	2.9	5.0	NA	NA	NA	NA	NA	NA	NA	NA	NA
		I-15 NB Exit to Frank Sinatra Road	1.2	2.2	3.3	1.1	2.0	3.1	-0.1	-0.2	-0.2	-7%	-7%	-7%
		I-15 NB Entrance	2.1	2.4	4.5	6.2	5.7	11.9	4.1	3.3	7.4	199%	139%	167%
		I-15 SB Exit to WB Tropicana Avenue	0.2	0.4	0.6	0.2	0.4	0.6	0.0	0.0	0.0	0%	0%	0%
		I-15 SB Exit to EB Tropicana Avenue	3.0	5.3	8.2	6.9	10.7	17.5	3.9	5.4	9.3	129%	103%	113%
		I-15 SB Entrance	1.4	1.5	2.9	1.4	1.5	2.9	0.0	0.0	0.0	0%	0%	0%
		Total	**9.9**	**14.6**	**24.6**	**15.8**	**20.2**	**36.1**	**5.9**	**5.6**	**11.5**	**59%**	**38%**	**47%**
	Harmon Road	I-15 HOV NB Exit	0.3	0.3	0.6	0.3	0.3	0.6	0.0	0.0	0.0	0%	0%	0%
		Harmon Road & I-15 NB Off-Ramp (HOV Access)	3.1	6.4	9.5	3.1	6.4	9.5	0.0	0.0	0.0	0%	0%	0%
		Harmon Road & I-15 SB On-Ramp (HOV Access)	1.5	3.9	5.3	1.5	3.9	5.3	0.0	0.0	0.0	0%	0%	0%
		I-15 HOV SB Entrance	0.3	0.4	0.7	0.3	0.4	0.7	0.0	0.0	0.0	0%	0%	0%
		Total	**5.1**	**11.0**	**16.1**	**5.1**	**11.0**	**16.1**	**0.0**	**0.0**	**0.0**	**0%**	**0%**	**0%**
	Flamingo Road	I-15 NB Exit	1.1	1.3	2.4	3.7	3.8	7.6	2.6	2.5	5.2	242%	200%	220%
		I-15 NB Off-Ramp/I-15 NB On-Ramp & Flamingo Rd	23.6	36.7	60.3	14.2	20.3	34.5	-9.4	-16.4	-25.8	-40%	-45%	-43%
		I-15 NB Entrance	0.6	1.3	1.9	0.9	1.4	2.4	0.3	0.2	0.4	45%	12%	23%
		I-15 SB Exit to WB Flamingo Road	0.7	0.9	1.6	3.2	4.7	7.9	2.4	3.8	6.2	326%	428%	382%
		I-15 SB Exit to EB Flamingo Road	1.2	1.6	2.8	NA	NA	NA	NA	NA	NA	NA	NA	NA
		I-15 SB On Ramp & Flamingo Rd	3.6	7.3	10.8	22.9	38.0	60.8	19.3	30.7	50.0	538%	423%	461%
		I-15 SB Entrance	1.9	3.0	4.9	1.1	1.1	2.2	-0.9	-1.9	-2.7	-45%	-62%	-56%
		Total	**32.8**	**52.0**	**84.8**	**45.9**	**69.3**	**115.3**	**13.2**	**17.3**	**30.5**	**40%**	**33%**	**36%**
	Spring Mountain Road	I-15 NB Exit to EB Spring Mountain Road	1.2	1.8	3.1	1.2	1.8	3.1	0.0	0.0	0.0	0%	0%	0%
		I-15 NB Exit to WB Spring Mountain Road	7.4	10.2	17.6	7.5	10.9	18.4	0.1	0.6	0.8	2%	6%	4%
		I-15 NB Ramp Exit to Highland Avenue	0.4	0.6	1.0	0.4	0.6	1.0	0.0	0.0	0.0	0%	0%	0%
		I-15 NB Ramp Entrance from Highland Avenue	1.3	2.0	3.3	1.3	2.0	3.3	0.0	0.0	0.0	0%	0%	0%
		I-15 NB Entrance from EB Spring Mountain Road	1.4	2.3	3.7	1.4	2.3	3.7	0.0	0.0	0.0	0%	0%	0%
		I-15 NB Entrance from WB Spring Mountain Road	0.8	1.6	2.4	0.8	1.6	2.4	0.0	0.0	0.0	0%	0%	0%

Corridor	Interchange	Ramp	2040 No-Build			2040 Build Alt 2			Difference			Percentage		
			Fatal and Injury	Property Damage Only	Total	Fatal and Injury	Property Damage Only	Total	Fatal and Injury	Property Damage Only	Total	Fatal and Injury	Property Damage Only	Total
		I-15 SB Exit to WB Spring Mountain Road	0.3	0.4	0.7	0.5	0.7	1.2	0.2	0.4	0.5	53%	103%	77%
		I-15 SB Exit to EB Spring Mountain Road (Flyover)	5.8	11.0	16.8	7.4	13.0	20.4	1.6	2.0	3.6	27%	18%	22%
		I-15 SB On Ramp/I-15 SB Off Ramp & Spring Mountain Road	30.4	23.1	53.6	30.2	22.8	53.0	-0.2	-0.3	-0.5	-1%	-1%	-1%
		I-15 SB Entrance	0.6	0.8	1.5	1.2	1.5	2.7	0.6	0.7	1.3	97%	79%	86%
		Total	**49.7**	**53.8**	**103.5**	**52.0**	**57.1**	**109.1**	**2.3**	**3.4**	**5.6**	**5%**	**6%**	**5%**
	Sahara Road	I-15 NB Exit	1.1	1.6	2.6	1.1	1.6	2.6	0.0	0.0	0.0	0%	0%	0%
		I-15 NB On Ramp/I-15 NB Off Ramp & Sahara Road	14.5	17.6	32.0	14.5	17.6	32.0	0.0	0.0	0.0	0%	0%	0%
		I-15 NB Entrance	0.7	1.5	2.2	0.7	1.5	2.2	0.0	0.0	0.0	0%	0%	0%
		I-15 SB Exit (From I-15 Mainline)	0.7	1.1	1.8	0.7	1.1	1.8	0.0	0.0	0.0	0%	0%	0%
		I-15 SB Exit to EB Sahara Road (Flyover)	2.8	3.9	6.8	2.8	3.9	6.8	0.0	0.0	0.0	0%	0%	0%
		I-15 SB Exit to EB Sahara Road (Loop)	0.8	1.1	2.0	0.8	1.1	2.0	0.0	0.0	0.0	0%	0%	0%
		I-15 SB Exit to WB Sahara Road	0.2	0.2	0.4	0.2	0.2	0.4	0.0	0.0	0.0	0%	0%	0%
		I-15 SB Off-Ramp & Sahara Road	1.9	3.4	5.3	1.9	3.4	5.3	0.0	0.0	0.0	0%	0%	0%
		I-15 SB On-Ramp & Sahara Road	0.4	0.4	0.8	0.4	0.4	0.8	0.0	0.0	0.0	0%	0%	0%
		I-15 SB Entrance	5.3	5.9	11.3	5.3	5.9	11.3	0.0	0.0	0.0	0%	0%	0%
		Total	**28.4**	**36.7**	**65.1**	**28.4**	**36.7**	**65.1**	**0.0**	**0.0**	**0.0**	**0%**	**0%**	**0%**
	Neon Gateway	I-15 HOV NB Exit	0.1	0.2	0.3	0.1	0.2	0.3	0.0	0.0	0.0	0%	0%	0%
		I-15 HOV NB Entrance	0.3	0.4	0.7	0.3	0.4	0.7	0.0	0.0	0.0	0%	0%	0%
		I-15 HOV SB Exit	0.6	0.9	1.6	0.6	0.9	1.6	0.0	0.0	0.0	0%	0%	0%
		I-15 HOV SB Off-Ramp/I-15 HOV SB On-Ramp & Neon Gateway	1.9	2.8	4.7	1.9	2.8	4.7	0.0	0.0	0.0	0%	0%	0%
		I-15 HOV SB Entrance	0.1	0.1	0.2	0.1	0.1	0.2	0.0	0.0	0.0	0%	0%	0%
		Total	**3.0**	**4.4**	**7.4**	**3.0**	**4.4**	**7.4**	**0.0**	**0.0**	**0.0**	**0%**	**0%**	**0%**
	I-15 NB CD Road (North End)	I-15 NB Entrance	0.7	1.1	1.9	0.7	1.1	1.9	0.0	0.0	0.0	0%	0%	0%
		Total	**0.7**	**1.1**	**1.9**	**0.7**	**1.1**	**1.9**	**0.0**	**0.0**	**0.0**	**0%**	**0%**	**0%**
	Charleston Boulevard	I-15 NB Exit	0.9	1.4	2.3	0.9	1.4	2.3	0.0	0.0	0.0	0%	0%	0%
		I-15 SB Entrance	1.1	1.6	2.7	1.1	1.6	2.7	0.0	0.0	0.0	0%	0%	0%
		Total	2.0	3.0	5.1	2.0	3.0	5.1	0.0	0.0	0.0	0%	0%	0%
Overall Total			**136.2**	**183.9**	**320.1**	**157.3**	**209.6**	**366.9**	**21.1**	**25.7**	**46.9**	**15%**	**14%**	**15%**

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Arterial Segments and Intersections Summary - No-Build vs Build Alt 1

Major Road	Name	2040 No-Build			2040 Build Alt 1			Absolute Difference			Percentage		
		Fatal and Injury	Property Damage Only	Total	Fatal and Injury	Property Damage Only	Total	Fatal and Injury	Property Damage Only	Total	Fatal and Injury	Property Damage Only	Total
Flamingo Road	Hotel Rio Dr & Flamingo Rd	7.0	5.8	12.8	7.0	5.8	12.8	0.0	0.0	0.0	0%	0%	0%
	Via Del Nord & Flamingo Rd	3.0	2.4	5.4	3.0	2.4	5.4	0.0	0.0	0.0	0%	0%	0%
	Corridor Segments	12.2	16.0	28.2	12.8	17.2	30.1	0.6	1.2	1.8	5%	8%	6%
	Total	**22.2**	**24.2**	**46.4**	**22.9**	**25.4**	**48.3**	**0.6**	**1.2**	**1.8**	**3%**	**5%**	**4%**
Spring Mountain Road	Polaris Ave & Spring Mountain Rd	4.1	3.4	7.4	4.1	3.4	7.4	0.0	0.0	0.0	0%	0%	0%
	Mel Tome Way & Spring Mountain Rd	4.9	4.1	9.0	4.9	4.1	9.0	0.0	0.0	0.0	0%	0%	0%
	Corridor Segments	6.2	8.3	14.4	6.2	8.3	14.4	0.0	0.0	0.0	0%	0%	0%
	Total	**15.2**	**15.7**	**30.9**	**15.2**	**15.7**	**30.9**	**0.0**	**0.0**	**0.0**	**0%**	**0%**	**0%**
Sahara Avenue	Palace Station & Sahara Ave	4.7	3.8	8.5	4.7	3.8	8.5	0.0	0.0	0.0	0%	0%	0%
	Las Vegas Blvd & Sahara Ave	13.8	11.5	25.3	13.8	11.5	25.3	0.0	0.0	0.0	0%	0%	0%
	Corridor Segments	17.1	22.2	39.3	17.1	22.2	39.3	0.0	0.0	0.0	0%	0%	0%
	Total	**35.5**	**37.6**	**73.1**	**35.5**	**37.6**	**73.1**	**0.0**	**0.0**	**0.0**	**0%**	**0%**	**0%**
Overall Intersection Total		**37.5**	**30.9**	**68.4**	**37.5**	**30.9**	**68.4**	**0.0**	**0.0**	**0.0**	**0%**	**0%**	**0%**
Overall Segment Total		**35.5**	**46.5**	**82.0**	**36.1**	**47.7**	**83.8**	**0.6**	**1.2**	**1.8**	**2%**	**3%**	**2%**

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Arterial Segments and Intersections Summary - No-Build vs Build Alt 2

Major Road	Name	2040 No-Build			2040 Build Alt 2			Absolute Difference			Percentage		
		Fatal and Injury	Property Damage Only	Total	Fatal and Injury	Property Damage Only	Total	Fatal and Injury	Property Damage Only	Total	Fatal and Injury	Property Damage Only	Total
Flamingo Road	Hotel Rio Dr & Flamingo Rd	7.0	5.8	12.8	7.0	5.8	12.8	0.0	0.0	0.0	0%	0%	0%
	Via Del Nord & Flamingo Rd	3.0	2.4	5.4	3.0	2.4	5.4	0.0	0.0	0.0	0%	0%	0%
	Corridor Segments	12.2	16.0	28.2	12.8	17.1	29.9	0.5	1.1	1.7	4%	7%	6%
	Total	**22.2**	**24.2**	**46.4**	**22.8**	**25.3**	**48.1**	**0.5**	**1.1**	**1.6**	**2%**	**5%**	**4%**
Spring Mountain Road	Polaris Ave & Spring Mountain Rd	4.1	3.4	7.4	4.1	3.4	7.4	0.0	0.0	0.0	0%	0%	0%
	Mel Tome Way & Spring Mountain Rd	4.9	4.1	9.0	4.9	4.1	9.0	0.0	0.0	0.0	0%	0%	0%
	Corridor Segments	6.2	8.3	14.4	6.2	8.3	14.4	0.0	0.0	0.0	0%	0%	0%
	Total	**15.2**	**15.7**	**30.9**	**15.2**	**15.7**	**30.9**	**0.0**	**0.0**	**0.0**	**0%**	**0%**	**0%**
Sahara Avenue	Palace Station & Sahara Ave	4.7	3.8	8.5	4.7	3.8	8.5	0.0	0.0	0.0	0%	0%	0%
	Las Vegas Blvd & Sahara Ave	13.8	11.5	25.3	13.8	11.5	25.3	0.0	0.0	0.0	0%	0%	0%
	Corridor Segments	17.1	22.2	39.3	17.1	22.2	39.3	0.0	0.0	0.0	0%	0%	0%
	Total	35.5	37.6	73.1	35.5	37.6	73.1	0.0	0.0	0.0	0%	0%	0%
Overall Intersection Total		**37.5**	**30.9**	**68.4**	**37.5**	**30.9**	**68.4**	**0.0**	**0.0**	**0.0**	**0%**	**0%**	**0%**
Overall Segment Total		**35.5**	**46.5**	**82.0**	**36.0**	**47.6**	**83.6**	**0.5**	**1.1**	**1.7**	**2%**	**2%**	**2%**