

Appendix A – Air Quality

Regional Conformity Analysis

PM10 Quantitative Hot-Spot Air Quality Technical Report

Air Quality Consultation

Air Quality Regional Conformity Analysis

Paul Spur/Douglas

PM10 Nonattainment Area

Cochise County

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1. INTRODUCTION

As the number of vehicles on the nation's roadways increased in the second half of the 20th century, air pollution from mobile sources was identified as an important national health concern. Recognizing this connection, the 1990 Clean Air Act Amendments (CAAAAs) and the Arizona Transportation Conformity Rules require transportation plans, transportation improvement programs (TIP), and projects to conform to the purpose of the Arizona State Implementation Plan (SIP). Conformity to a SIP means that planned transportation activities will not produce new air quality violations, worsen existing violations, or delay timely attainment of the national ambient air quality standards (NAAQS). The current federal transportation legislation, the Infrastructure Investment and Jobs Act (IIJA), reinforces the need for coordinated transportation and air quality planning through the metropolitan planning provisions.

The air quality conformity process establishes the connection between transportation planning and emission reductions from transportation sources and is intended to ensure that integrated transportation and air quality planning occurs in areas designated as Nonattainment or Maintenance Areas by the United States Environmental Protection Agency (EPA). A regional emissions analysis must be conducted to assess the impacts that transportation projects will have on emissions within an air quality planning area.

A Nonattainment area is an area that has violated one or more of the National Ambient Air Quality Standards (NAAQS). The Paul Spur/Douglas planning area is currently in nonattainment for large particulates, otherwise known as PM₁₀. This area was designated as a moderate nonattainment area on Oct. 31, 1990 (55 FR 45799). As an isolated rural nonattainment area, the Paul Spur/Douglas planning area is subject to a regional air quality conformity process. Arizona Department of Environmental Quality (ADEQ) is in the process of developing a nonattainment State Implementation Plan (SIP) which will include an emission inventory, modeling demonstration, strategy for Exceptional Events, and requirements for PM₁₀ controls. ADEQ identifies six sources of PM₁₀ for the area – agricultural activities, unpaved roads, cleared areas/vacant lots, open burning and wildfires, windblown dust, and emissions coming across the border from areas outside the U.S. border¹.

The planned Douglas Commercial Port of Entry Connector Road is likely to be classified as regionally significant and is not within a conforming State Improvement Program (SIP). As such, a PM₁₀ regional air quality conformity analysis is required. The purpose of this analysis is to demonstrate that implementation of the project will not worsen PM₁₀ emissions in the Paul Spur/Douglas nonattainment area.

1.1 PM₁₀ Nonattainment Area

The Paul Spur/Douglas PM₁₀ nonattainment area is located along the Mexico-United States Border in Cochise County as shown in **Figure 1**. The Paul Spur/Douglas area is in nonattainment for PM₁₀ particulate matter, which is a mix of solid and liquid droplets 10 microns or less in diameter. The Paul Spur/Douglas area was designated as a nonattainment area under the 1987 24-hour PM₁₀ standard, which was retained under the Environmental Protection Agency's (EPA's) 2006 PM National Ambient Air Quality Standards (NAAQS) review (effective December 18, 2006). The baseline year is defined as the most recent year for which EPA's Air Emissions Reporting Rule requires submission of on-road mobile source emissions inventories as of the effective date of designation, which is 1990 for the 2006 PM NAAQS.

¹ <https://azdeq.gov/paul-spurdouglas-pm-10-nonattainment-area>

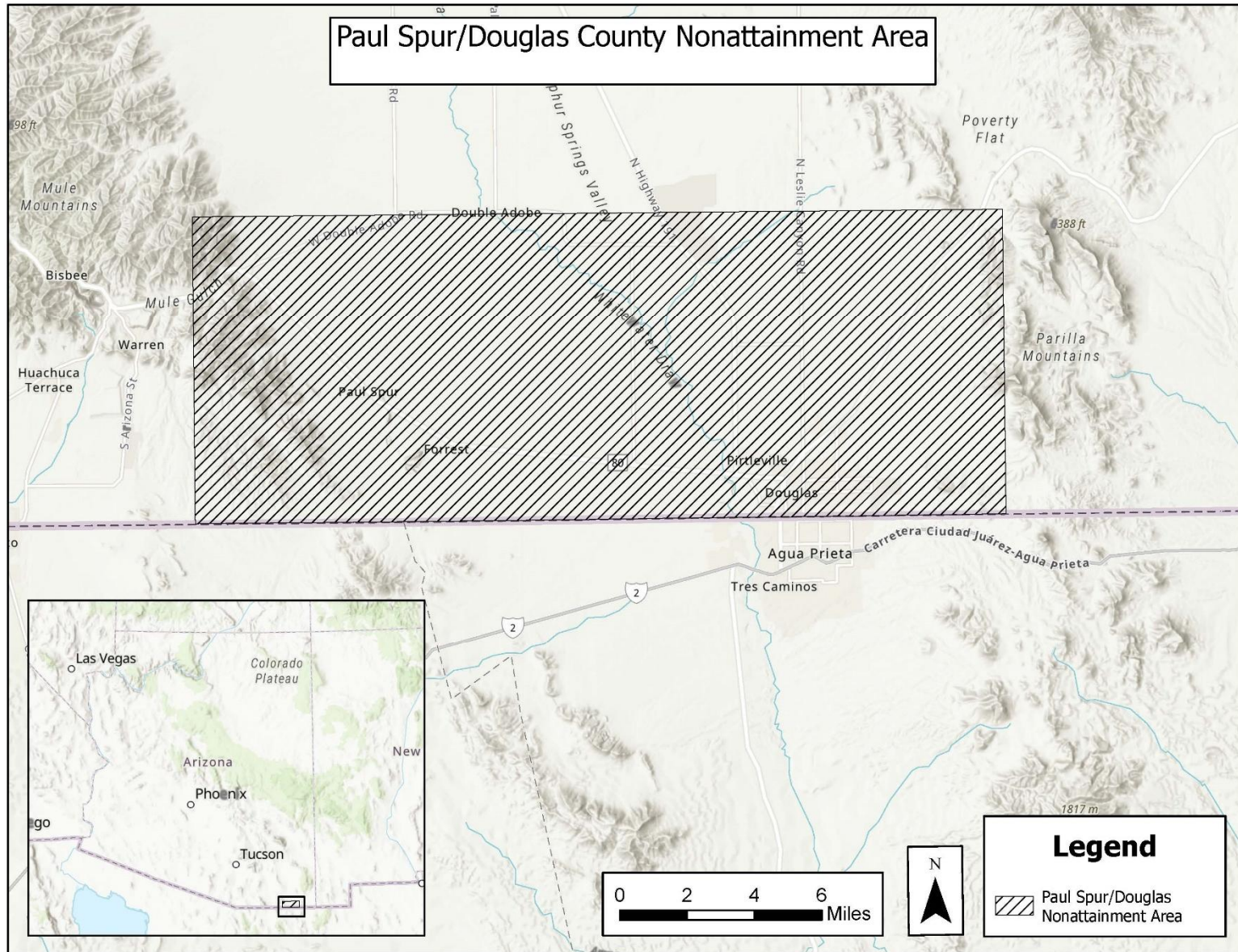


Figure 1. Paul Spur/Douglas Nonattainment Area

2. CONFORMITY OVERVIEW

Regional air quality conformity is most commonly determined by comparing the future year emissions to a motor vehicle emission budget (MVEB) established by the SIP. However, since a SIP has not yet been adopted for this nonattainment area, MVEBs have not yet been established for the area. Therefore, an interim emissions test was performed to demonstrate conformity and meet the air quality requirements for the Paul Spur/Douglas nonattainment area. The no-greater-than-baseline year emissions test was completed to demonstrate regional conformity.

The purpose of this conformity analysis is to demonstrate that the future year “build” emissions are not greater than the emissions from a baseline year for a given standard, referred to as the “no-greater-than-baseline” year, for the Paul Spur/Douglas nonattainment area. If build emissions are found to fall below the baseline emissions, they will not jeopardize the Paul Spur/Douglas region’s attainment of the annual NAAQS. The conformity determination has been performed according to procedures prescribed by the following federal, state and local regulations: 69 FR 40004, 40 CFR Parts 51 and 93 (i.e., Transportation Conformity Rule Requirements); Arizona transportation conformity rules; and Planning Assistance and Standards guidance (23 CFR 450) implementing FAST Act and MAP-21 requirements. Results of this conformity determination are found in this report. For this analysis to be found to conform, ADOT must demonstrate that the applicable criteria and procedures have been satisfied (section §93.109-a).

This report documents the process used for the Paul Spur/Douglas regional conformity analysis. EPA’s Motor Vehicle Emissions Simulator 3.1 (MOVES3.1²) software was used to estimate emissions as required by the EPA³. The MOVES input files were created and modified as discussed in the interagency consultation process, with general assumptions and methodology outlined in this chapter. The modeled emissions are based on inputs including temperature, relative humidity, presence of inspection and maintenance programs, vehicle source type mix, vehicle age distribution, average daily vehicle miles traveled (VMT), source type populations, hourly distribution, road type distribution, and average speed distribution.

2.1 Latest Emissions Estimation Model

Mobile source emissions estimates were developed using EPA's Motor Vehicle Emission Simulator, MOVES3.1 (November 2022 Release). According to EPA, MOVES3.1 is a major revision to MOVES2014 and improves upon it in many respects. MOVES3.1 includes new data, new emissions standards, and new functional improvements and features. It incorporates substantial new data for emissions, fleet, and activity developed since the release of MOVES2014. These new emissions data are for light- and heavy-duty vehicles, exhaust and evaporative emissions, and fuel effects. MOVES3.1 also adds updated vehicle sales, population, age distribution, and VMT data. In the MOVES3 Mobile Source Emissions Model Questions and Answers⁴ the EPA states that for on-road emissions, MOVES3.1 updated heavy-duty (HD) diesel and compressed natural gas (CNG) emission running rates and updated HD gasoline emission rates. MOVES3.1 updated light-duty (LD) emission rates for hydrocarbon (HC), carbon monoxide (CO), and nitrogen oxide (NOx) and updated light-duty (LD) particulate matter rates, incorporating new data on Gasoline Direct Injection (GDI) vehicles.

² <https://www.epa.gov/moves/moves-versions-limited-current-use>

³ [MOVES3 Technical Guidance: Using MOVES to Prepare Emission Inventories for State Implementation Plans and Transportation Conformity, November 2020.](#)

⁴ [EPA Releases MOVES3 Mobile Source Emissions Model - Questions and Answers \(EPA-420-F-20-050\), November 2020.](#)

EPA approved MOVES4 in September 2023 with a two-year grace period extending until September 2025. This analysis was initiated prior to the release of MOVES4. Therefore, this regional conformity analysis was conducted using MOVES3.1.

2.2 Interagency Consultation and Public Participation

Interagency consultation (IAC) is the central coordinating mechanism for public agency involvement and input to the conformity determination. The conformity determination must be made according to 40 CFR §93.105-(a)-(2) and (e) and the requirements of 23 CFR 450 (40 CFR §93.112, Criteria and Procedures).

ADOT coordinated its activities for this conformity determination with numerous stakeholders and review agencies, including ADEQ, FHWA, EPA, local jurisdictions, and other necessary agencies. ADOT held teleconference calls and email correspondence to discuss the issues pertinent to the Paul Spur/Douglas Regional Conformity Demonstration, such as use of the latest planning assumptions. The meetings that were held and scheduled are listed below:

- IAC Kick-Off Meeting – May 8, 2023
- IAC Methodology Meeting – June 22, 2023
- IAC Methodology Meeting – August 21, 2023
- IAC Report Review –December 7, 2023
- IAC Updated Base Year Methodology Meeting – March 15, 2024

2.3 Conformity Test

The conformity tests specified in the federal transportation conformity rule are: (1) the emissions budget test, and (2) the interim emissions test. For the emissions budget test, predicted emissions for the TIP/RTP must be less than or equal to the motor vehicle emissions budget (MVEB) specified in the approved air quality implementation plan or the emissions budget found to be adequate for transportation conformity purposes. If there is no approved air quality plan for a pollutant for which the region is in nonattainment or no emission budget has been found to be adequate for transportation conformity purposes, the interim emissions reduction test applies.

Since a budget has not been established for the Paul/Spur Douglas area the interim emission reduction test, known as the no-greater-than-baseline test, was applied. The baseline year is defined as the most recent year for which EPA’s Air Emissions Reporting Rule requires submission of on-road mobile source emissions inventories as of the effective date of designation, which is 1990 for the 2006 PM10 NAAQS.

3. METHODOLOGY

The emissions inventory development and emissions projection discussion below identify procedures used by the ADOT to obtain emissions for the PM10 nonattainment area. Pre-consensus memoranda were developed for the 1990 base year and future analysis years and discussed during the interagency consultation coordination outlining the model assumptions and data sources. A copy of the updated pre-consensus memoranda can be found in **Appendix A**. The pre-consensus memoranda outline the approach taken for data sources for the conformity demonstration.

3.1 Mobile Source Emissions

3.1.1 Runspec Parameters

Table 1 summarizes the settings used in the MOVES run specification file for PM10, respectively.

<i>Table 1 – PM10 MOVES Runspec Parameters</i>	
MOVES Runspec Parameter	Settings
MOVES3.1 Version	Database version 2022/10/07
Scale	County, Inventory
Time Span	Years: 2008, 2028, 2035, 2040, and 2050 Time aggregation: Hour All Months All hours of the day selected Weekdays and Weekends
Geographic Bounds	Arizona – Cochise County
Vehicles/Equipment	All available fuel types All available source types
Road Type	All road types including off-network
Pollutants and Processes	<u>Pollutants</u> : PM10 and any additional pre-requisites <u>All Processes</u>
General Output	Units: grams, joules, miles Activity: Distance Traveled, Population
Output Emissions	Time = hour, location = county
Advanced Features	None

3.1.2 County Data Manager

Once all of the base parameters have been established for a given MOVES Runspec, the County Data Manager can be used to enter locally-specific data. Input provided in Excel spreadsheet format can be referenced using this tool, which converts the data to MySQL format and incorporates it into the MOVES analysis. For this analysis, locally-specific data could consist of data used for the entire region, statewide, or county-level data. Default data refers to data extracted from the most up to date available MOVES program (MOVES3.1) for each scenario being modeled. The methodology used for each input contained within the MOVES County Data Manager is detailed below.

3.1.2.1 Vehicle Type VMT

Source Type (vehicle type) Population and Vehicle Type VMT were developed as part of the same procedure using a combination of data from Arizona Motor Vehicle Division (MVD) reports, default MOVES data, and ADOT HPMS VMT data. The process began with the development of a source type population and VMT at the county level, and then using the county data to develop estimates for the nonattainment area.

Default VMT and source type population for Cochise County were obtained from MOVES for 1990 and 2022. Local Cochise County source type population was gathered from MVD reports for January 2003 and January 2020. The MVD reports and a MOVES converter tool were provided by ADOT. ADOT's MOVES converter tool can convert different data, including MVD reports, into MOVES-ready input files. The 2003 data was extrapolated to

1990 based on overall County population estimates to develop a local source type population for 1990. The 2020 data was used as a conservative estimate for 2022 as the County population decreased slightly by 1.4%. Cochise County population estimates from the U.S. Census are provided in **Table 2**.

Table 2 – U.S. Census Population Estimates for Cochise County			
1990	2003	2020	2022
97,624	120,638	127,450	125,663

Local County VMT by source type was not available. However, according to MOVES technical guidance⁵, it is possible to calculate the local VMT or source type population by using the following ratio:

$$\frac{\text{Local VMT}}{\text{Local Population}} = \frac{\text{Default VMT}}{\text{Default Population}}$$

This resulted in the estimated Cochise County VMT by source type for 1990 and 2022 as seen in **Table 3** and **Table 4**, respectively.

Table 3 – Default and Local 1990 Cochise County Source Type and VMT				
Source Type ID	Default Data (from MOVES)		Local County Data	
	VMT	Source Type Population	VMT (Calculated)	Source Type Population (ADOT MVD Reports)
11	16,190	1,857	20,862	2,393
21	1,907,462	65,164	1,718,533	58,710
31	583,421	17,968	751,060	23,131
32	61,769	1,875	89,218	2,708
41	8,357	97	7,505	88
42	2,202	26	2,167	25
43	5,910	191	5,370	173
51	2,947	33	1,250	14
52	96,596	1,952	43,786	885
53	7,926	84	3,675	39
54	9,724	494	2,972	151
61	77,412	676	22,050	193
62	163,180	531	54,360	177

⁵ <https://nepis.epa.gov/Exec/ZipPDF.cgi?Dockey=P1010LY2.pdf>

Table 4 – Default and Local 2022 Cochise County Source Type and VMT				
Source Type ID	Default Data (from MOVES)		Local County Data	
	VMT	Source Type Population	VMT (Calculated)	Source Type Population (ADOT MVD Reports)
11	30,199	4,610	43,152	6,588
21	1,647,734	52,576	2,890,731	92,238
31	2,271,265	66,513	1,204,123	35,262
32	244,375	6,941	145,362	4,129
41	16,375	198	16,720	203
42	5,252	61	5,699	66
43	8,593	298	8,290	288
51	1,867	37	627	12
52	192,281	5,241	63,680	1,736
53	12,573	226	4,259	77
54	7,452	546	2,352	172
61	75,617	732	22,932	222
62	383,951	1,592	88,811	368

Additional local County-level VMT was available through ADOT HPMS data. This data is broken down into three (3) categories: all vehicles, single unit, and combination unit trucks. A passenger vehicles category was also developed by subtracting the single and combination unit VMT from the total VMT. HPMS daily VMT (DVMT) data for the three vehicle categories for both the County and nonattainment area was obtained for the years 2013 and 2022. ADOT does not have reliable HPMS data for the year 1990. The earliest VMT data available through ADOT is from 2007, but only includes Average Annual Daily Traffic (AADT) for interstates, US routes, and state routes. 2013 AADT data is available for additional roads and is the oldest data set that can be reliably used to develop VMT for the County and nonattainment area. This data is only collected on paved roads that are classified as collector and above, so it is understood that it does not account for the total VMT in the county. The total estimated county VMT by functional class for 2022 was obtained from ADOT's Extent and Travel Reports⁶, as well as historical DVMT data by county for 1990 and 2013. HPMS VMT for the County and nonattainment area is summarized in **Table 5-Table 7**.

Table 5 – ADOT HPMS VMT Data by Vehicle Category			
Year	Category	Cochise County VMT	Nonattainment Area VMT
2013	Passenger Vehicles	2,532,647	213,063
	Single-Unit Trucks	128,399	5,824
	Combination-Unit Trucks	639,647	7,589
	Total	3,300,692	226,477
2022	Passenger Vehicles	3,388,981	257,327
	Single-Unit Trucks	229,151	14,505
	Combination-Unit Trucks	677,979	8,824

⁶ <https://experience.arcgis.com/experience/ac0948fc05224aa8a80313f59a634fde?org=adot>

	Total	4,296,111	280,656
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Table 6 – ADOT 2022 HPMS VMT for Cochise County by Functional Class⁶

Functional Class ID	Functional Class	VMT (known counts)	Total Estimated VMT
1	Interstate	1,690,265	1,822,873
3	PA – Other	652,200	652,201
4	Minor Arterial	1,030,114	1,038,339
5	Major Collector	448,805	453,062
6	Minor Collector	148,917	182,701
7	Local	5,583	1,638,426
Total		3,975,884	5,787,602

Table 7 – ADOT Historical HPMS DVMT for Cochise County

Year	DVMT
1990	3,395,000
2013	3,673,000

To determine cumulative VMT estimates by vehicle category, the ratio of the total County HPMS VMT from **Table 7** to the total DVMT (for 2013) and total estimated VMT by functional class (for 2022) was used to scale the VMT of each vehicle category. Then, the percentage of 1990 DVMT to 2013 DVMT (92.4%) was used to determine the estimated VMT breakdown by vehicle category for 1990. The same factors were used to scale the nonattainment area VMT. Final VMT by vehicle category for 1990 and 2022 is displayed in **Table 8**.

Table 8 – ADOT HPMS VMT Data by Vehicle Category

Year	Category	Cochise County VMT	Nonattainment Area VMT
1990	Passenger Vehicles	2,605,010	243,871
	Single-Unit Trucks	132,067	6,666
	Combination-Unit Trucks	657,923	8,686
	Total	3,395,000	259,223
2022	Passenger Vehicles	4,565,541	346,663
	Single-Unit Trucks	308,706	19,541
	Combination-Unit Trucks	913,355	11,888
	Total	5,787,602	378,092

This VMT data was then allocated to the 13 MOVES source types through a mapping process to determine the final VMT for Cochise County. The process uses distributions from the local County VMT from **Table 3** and **Table 4** for each of the ADOT vehicle categories to allocate VMT to each MOVES source type. The same distributions are then used to allocate VMT for the nonattainment area. A breakdown of the distributions (rounded to two decimals in the table) is shown below in **Table 9** with the final VMT by source type for Cochise County and the nonattainment area shown in **Table 10**.

Table 9 – VMT Distributions						
ADOT Vehicle Category	Source Type ID	Source Type	Initial 1990 VMT	1990 VMT Distribution	Initial 2022 VMT	2022 VMT Distribution
Passenger Vehicles	11	Motorcycle	20,862	0.81%	43,152	1.01%
	21	Passenger Car	1,718,533	66.62%	2,890,731	67.49%
	31	Passenger Truck	751,060	29.11%	1,204,123	28.11%
	32	Light Commercial Truck	89,218	3.46%	145,362	3.39%
Passenger Total			2,579,672	100%	4,283,368	100%
Single-Unit Trucks	41	Intercity Bus	7,505	11.25%	16,720	16.45%
	42	Transit Bus	2,167	3.25%	5,699	5.61%
	43	School Bus	5,370	8.05%	8,290	8.16%
	51	Refuse Truck	1,250	1.87%	627	0.62%
	52	Single Unit Short-haul Truck	43,786	65.62%	63,680	62.66%
	53	Single Unit Long-haul Truck	3,675	5.51%	4,259	4.19%
	54	Motor Home	2,972	4.45%	2,352	2.31%
Single-Unit Total			66,725	100%	101,627	100%
Combination -Unit Trucks	61	Combination Short-haul Truck	22,050	28.86%	22,932	20.52%
	62	Combination Long-haul Truck	54,360	71.14%	88,811	79.48%
Combination-Unit Total			76,409	100%	111,743	100%

Table 10 – Final 1990 and 2022 VMT for Cochise County and the Nonattainment Area				
Source Type ID	Cochise County		Nonattainment Area	
	1990 VMT	2022 VMT	1990 VMT	2022 VMT
11	21,067	45,995	1,972	3,492
21	1,735,412	3,081,162	162,462	233,954
31	758,436	1,283,446	71,002	97,453
32	90,094	154,938	8,434	11,764
41	14,854	50,790	750	3,215
42	4,290	17,311	217	1,096
43	10,628	25,183	536	1,594
51	2,474	1,905	125	121
52	86,666	193,436	4,374	12,244
53	7,275	12,938	367	819
54	5,882	7,143	297	452
61	189,859	187,437	2,507	2,440
62	468,064	725,918	6,180	9,448

MOVES requires VMT to be in input by HPMS vehicle type. The mapping of MOVES source type to HPMS vehicle type is shown in **Table 11**, with the 1990 and 2022 VMT for the nonattainment area aggregated in **Table 12**.

<i>Table 11 - Source Type and HPMS Vehicle Type</i>			
Source Type ID	Source Type	HPMS Vehicle Type ID	HPMS Vehicle Types
11	Motorcycle	10	Motorcycles
21	Passenger Car	25	Light Duty Vehicles
31	Passenger Truck		
32	Light Commercial Truck		
41	Intercity Bus	40	Buses
42	Transit Bus		
43	School Bus		
51	Refuse Truck	50	Single Unit Trucks
52	Single Unit Short-haul Truck		
53	Single Unit Long-haul Truck		
54	Motor Home		
61	Combination Short-haul Truck	60	Combination Trucks
62	Combination Long-haul Truck		

<i>Table 12 – Daily VMT for the Nonattainment Area by HPMS Vehicle Type</i>		
HPMS Vehicle Type ID	Analysis Year	
	1990	2022
10	1,972	3,492
25	241,898	343,171
40	1,503	5,905
50	5,163	13,636
60	8,686	11,888
Total DVMT	259,223	378,092

Future year VMT was developed by first creating a no-build scenario for each analysis year that only contained background VMT growth for the nonattainment area. Background VMT growth was obtained by applying a 2% annual growth rate to the 2022 VMT. This growth rate was determined to be representative of the nonattainment area based information contained in the City of Douglas International Port of Entry Connector Road Final Traffic Report, attached as **Appendix B**. Next, a build scenario was developed for each analysis year to account for additional VMT growth expected due to the Port of Entry Connector Road and adjacent land uses. The Traffic Report contained traffic volumes and truck percentages for the Connector Road and SR 80 for years 2028 and 2050. Additional traffic for years 2035 and 2040 was interpolated from the 2028 and 2050 analysis years. For each build scenario, additional VMT based on the traffic volumes and truck percentages from the Traffic Report was added to the VMT in the no-build scenario. **Table 13** displays the total DVMT by HPMS vehicle type for each no-build and build scenario.

Table 13 – No-Build and Build Scenario Daily VMT for the Nonattainment Area by HPMS Vehicle Type for Each Analysis Year

HPMS Vehicle Type ID	2028		2035		2040		2050	
	No-Build	Build	No-Build	Build	No-Build	Build	No-Build	Build
10	3,933	4,354	4,518	5,216	4,988	5,884	6,080	7,372
25	386,466	427,861	443,928	512,529	490,132	578,167	597,469	724,369
40	6,650	8,614	7,638	10,893	8,434	12,611	10,280	16,302
50	15,356	19,892	17,640	25,156	19,476	29,122	23,741	37,645
60	13,388	18,884	15,378	25,000	16,979	28,629	20,697	36,435
Total DVMT	425,793	479,605	489,103	578,795	540,009	654,412	658,268	822,123

MOVES requires the HPMS VMT input to be a yearly VMT value. EPA’s AADVMT Converter tool was used to convert daily VMT to yearly VMT for each analysis year. **Table 14** summarizes the Yearly VMT for PM10 by HPMS vehicle type and analysis year.

Table 14 – Yearly VMT by Analysis Year and Nonattainment Area

HPMS Vehicle Type ID	Analysis Year VMT				
	1990	2028	2035	2040	2050
10	677,284	1,495,307	1,791,210	2,020,603	2,531,558
25	82,829,950	146,506,435	175,498,252	197,973,603	248,035,720
40	514,553	2,949,517	3,730,089	4,318,043	5,581,900
50	1,768,037	6,811,380	8,613,970	9,971,744	12,890,396
60	2,974,360	6,466,080	8,560,362	9,803,151	12,475,947
Total Yearly VMT	88,764,185	164,228,718	198,193,882	224,087,142	281,515,520

3.1.2.2 Source Type Population

As discussed briefly in the previous section, MOVES divides the vehicle population into 13 vehicle types to calculate start and evaporative emissions. 2003 and 2020 source type population information for Cochise County was obtained from MVD reports, provided by ADOT, and ADOT’s MOVES Converter tool. The 2003 data was extrapolated to 1990 based on overall County population estimates to develop a local source type population for 1990. The 2020 data was used as a conservative estimate for 2022. Default source type for both 1990 and 2022 was also obtained from MOVES. **Table 15** recaps the source type information provided in **Table 3** and **Table 4** in **Section 3.1.2.1**.

Table 15 – Default and Local 1990 and 2022 Cochise County Source Type Population					
Source Type ID	Source Type	1990		2022	
		Default Source Type Population	MVD Source Type Population	Default Source Type Population	MVD Source Type Population
11	Motorcycle	1,857	2,393	4,610	6,588
21	Passenger Car	65,164	58,710	52,576	92,238
31	Passenger Truck	17,968	23,131	66,513	35,262
32	Light Commercial Truck	1,875	2,708	6,941	4,129
41	Intercity Bus	97	88	198	203
42	Transit Bus	26	25	61	66
43	School Bus	191	173	298	288
51	Refuse Truck	33	14	37	12
52	Single Unit Short-haul Truck	1,952	885	5,241	1,736
53	Single Unit Long-haul Truck	84	39	226	77
54	Motor Home	494	151	546	172
61	Combination Short-haul Truck	676	193	732	222
62	Combination Long-haul Truck	531	177	1,592	368
Total		90,949	88,687	139,571	141,360

The source type population data from the MVD reports had a limited amount of vehicles for source types 61 and 62, so the default population from MOVES was used for these source types. Therefore, the final Cochise County source type population was a combination of MVD data (source types 11 - 54) and default MOVES data (source types 61 and 62), as seen in **Table 16**.

Table 16 – Final Base Cochise County Source Type Population			
Source Type ID	Data Year		Source
	1990	2022	
11	2,393	6,588	MVD Report
21	58,710	92,238	MVD Report
31	23,131	35,262	MVD Report
32	2,708	4,129	MVD Report
41	88	203	MVD Report
42	25	66	MVD Report
43	173	288	MVD Report
51	14	12	MVD Report
52	885	1,736	MVD Report
53	39	77	MVD Report
54	151	172	MVD Report
61	676	732	MOVES Default
62	531	1,592	MOVES Default

Source type population for the County was adjusted to the nonattainment area using a ratio proportionate to HPMS VMT for the County and nonattainment area for both 1990 and 2022. For 1990, the percentage of nonattainment area VMT (259,223) to Cochise County VMT (3,395,000) was determined to be 7.64%. For 2022, the percentage of nonattainment area VMT (378,092) to Cochise County VMT (5,787,602) was determined to be 6.53%. Applying these percentages to the County source type populations resulted in the nonattainment area source type populations shown below in **Table 17**.

<i>Table 17 – Base Nonattainment Area Source Type Population</i>		
Source Type ID	Data Year	
	1990	2022
11	224	501
21	5,496	7,004
31	2,165	2,678
32	254	314
41	4	13
42	1	5
43	9	19
51	1	1
52	45	110
53	2	5
54	8	11
61	9	10
62	7	21

This initial population contained a low level of long-haul combination trucks (source types 61 and 62) relative to the amount of DVMT shown in **Table 13**. Therefore, source types 61 and 62 were adjusted in both the 1990 base year and all future analysis years to account for the commercial vehicles using the Port of Entry. Appendix 1 of the Traffic Report (**Appendix B**) contains excerpts from the Douglas Arizona Regional Feasibility Study completed by Stantec in 2018. Figure J from this study contains inbound commercial vehicle (COV) trends for the years 1996 to 2017 and is shown below as **Error! Reference source not found.** The trend line from this chart results in an estimated yearly inbound commercial truck volume of about 32,800 for inbound vehicles (Mexico to the U.S.). This appears to be a conservative estimate for 1990 as all years prior to the year 2001 are all well above the trend line. Assuming the commercial vehicle processing is open 5 days a week for 9 hours each day and the outbound demand is equal to the total inbound trucks results in about 252 trucks per day using the existing Port of Entry in 1990. These additional trucks were added proportionally to source types 61 and 62 based on the distribution of combination-unit trucks from **Table 9**.

Figure J: 22-Year Inbound COV Processing Trends

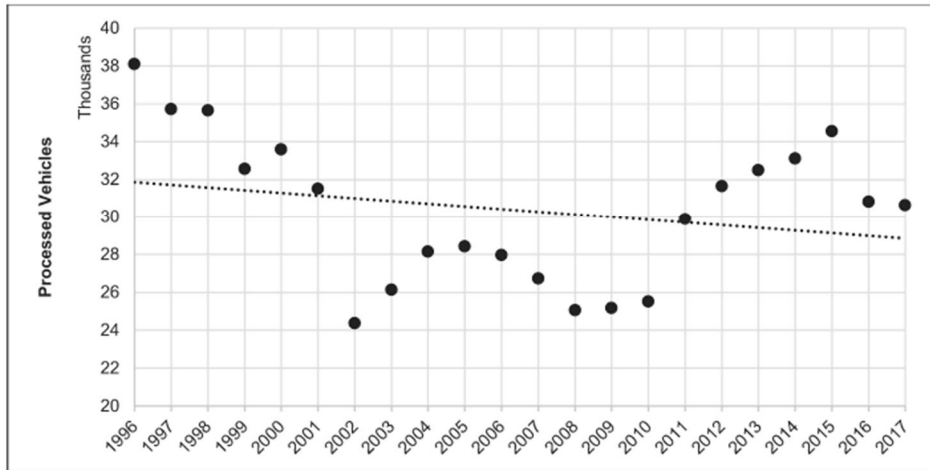


Figure 2: Figure J from the Douglas Arizona Regional Feasibility Study

To determine source type population estimates for future analysis years, no-build and build scenarios were developed for each year similar to the development of future VMT. The same 2% annual growth rate was used to develop background source type estimates for each no-build scenario as was used for VMT. In addition to the background growth, additional truck growth is expected at the proposed Commercial Port of Entry. The Traffic Report states that the hourly truck demand at the proposed Commercial Port of Entry in the opening year of 2028 will be 31 trucks per hour, for a total daily bi-directional demand of 496 trucks per day. These 496 trucks were added proportionally to the no-build populations for source types 61 and 62 to obtain a build 2028 source type population. In addition, an annual growth rate for trucks of 1.1% is expected at the proposed Port beyond the opening year. This additional growth was added to source types 61 and 62 for the remaining analysis years. **Table 18** displays the source type population for each no-build and build scenario. The final nonattainment area source type population by analysis year is shown in **Table 19**.

Table 18 – No-Build and Build Scenario Source Type Population for the Nonattainment Area for Each Analysis Year

Source Type ID	2028		2035		2040		2050	
	No-Build	Build	No-Build	Build	No-Build	Build	No-Build	Build
11	564	564	648	648	716	716	872	872
21	7,888	7,888	9,060	9,060	10,003	10,003	12,194	12,194
31	3,016	3,016	3,464	3,464	3,825	3,825	4,662	4,662
32	354	354	406	406	448	448	547	547
41	15	15	17	17	19	19	23	23
42	6	6	6	6	7	7	9	9
43	21	21	25	25	27	27	33	33
51	1	1	1	1	1	1	2	2
52	124	124	142	142	157	157	192	192
53	6	6	6	6	7	7	9	9
54	12	12	14	14	16	16	19	19
61	11	113	13	131	14	139	17	156
62	24	418	27	483	34	511	37	573

Table 19 – Final Nonattainment Area Source Type Population by Analysis Year

Source Type ID	Analysis Year				
	1990	2028	2035	2040	2050
11	224	564	648	716	872
21	5,496	7,888	9,060	10,003	12,194
31	2,165	3,016	3,464	3,825	4,662
32	254	354	406	448	547
41	4	15	17	19	23
42	1	6	6	7	9
43	9	21	25	27	33
51	1	1	1	1	2
52	45	124	142	157	192
53	2	6	6	7	9
54	8	12	14	16	19
61	82	113	131	139	156
62	187	418	483	511	573

3.1.2.3 Age Distribution

MOVES requires each of the 13 source types (vehicle types) to have an age distribution to break down the population from new vehicles to 30+ year-old vehicles. January 2003 and January 2020 vehicle registration data for Cochise County were obtained from Motor Vehicle Division (MVD) reports, furnished by ADOT. Due to the lack of more historical data, the January 2003 registration data was used as a proxy to develop the age distribution for the 1990 analysis year. EPA's age distribution forecasting tool was used to create age distribution files for each future analysis year from the 2020 age distribution.

3.1.2.4 Meteorology

MOVES requires temperature and relative humidity information to calculate emissions rates. Local meteorological data for all months was obtained from the National Centers for Environmental Information (NCEI) website developed by the National Oceanic and Atmospheric Administration (NOAA). Meteorological information collected at the Douglas-Bisbee International Airport was selected based on available data. Historical meteorological data from 1990 was used for the 1990 analysis year. The most recent full year of data at the airport at the time of the analysis was found to be 2019 and was used for all future analysis years.

3.1.2.5 Monthly/Daily/Hourly VMT Fractions

Vehicle speeds and volumes vary depending on the time of day, type of day, and time of year. Monthly, daily, and hourly VMT fractions are required by MOVES to break down the yearly Vehicle Type VMT input file to various time periods. Locally available data sources do not provide information that allows for the generation of VMT by month, day, or time of day. Discussions with ADOT considered surrogate data sources elsewhere in the state but determined that these sources were not of sufficient quality to use for the Paul Spur/Douglas

nonattainment area. As a result, the final VMT data for each analysis year was input into EPA's AADVMT Converter tool to develop the monthly, daily, and hourly VMT fractional distributions by roadway type and vehicle type.

3.1.2.6 Average Speed Distribution

MOVES separates vehicle speed information into 16 average speed bins by road type, source type, and hour of the day. Each bin represents a five (5) mile per hour (mph) range of speeds. MOVES uses average speed distribution information to calculate operating mode distributions and determine emission rates. Detailed speed data is not available at a regional or state level so default speed data from MOVES for Cochise County was used for all analysis years.

3.1.2.7 Road Type Distribution

VMT distributions vary between different road types, which impacts the level of emissions from vehicles on each facility. MOVES recognizes five (5) roadway types: Off-Network (related to parking and refueling vehicles), Rural Restricted Access, Rural Unrestricted Access, Urban Restricted Access, and Urban Unrestricted Access. MOVES requires a VMT fraction for each of the roadway types by source type. ADOT HPMS data was used to determine the most current road type distribution for year 2022 for the nonattainment area. ADOT HPMS VMT data was provided for three vehicle classes: passenger, single unit, and combination unit. Road type distributions for each of the three vehicle classes were used for each source type they represent. The road type distribution for the passenger class was used for source types 11, 21, 31, and 32. The road type distribution for the single unit class was used for source types 41, 42, 43, 51, 52, and 53. The road type distribution for the combination unit class was used for source types 61 and 62. Detailed historical data was not available for 1990. As in the discussion of Vehicle Type VMT, 2013 is the earliest year with reliable VMT data. During Interagency Consultation, it was also agreed that the 2013 road type distribution would be representative of 1990 conditions. Therefore, the distribution from 2013 was used for the 1990 analysis year.

2022 VMT by HPMS type was projected for all no-build scenario analysis years by the same 2% growth rate mentioned previously. Road type volume distributions were adjusted for the build scenarios based on the volume impacts associated with the Port of Entry contained in the Final Traffic Report and mentioned previously in **Section 3.1.2.4**. The proposed Connector Road is located in a rural portion of the nonattainment area and will move traffic away from the urban portion of the area. Therefore, there is a higher percentage of VMT on rural roads than urban roads in future years. Due to the changes in vehicle patterns in future analysis years, a different road type distribution was developed for each year.

3.1.2.8 Fuel

In MOVES, fuel information is broken down into four inputs: Fuel Supply, Fuel Formulation, Fuel Usage Fraction, and AVFT (fuel type and vehicle technology). There is no locally available fuels data for the Paul Spur/Douglas nonattainment area. Default fuel data from MOVES for Cochise County was used.

3.1.2.9 Inspection/Maintenance (I/M) Program

No inspection/maintenance programs exist in the nonattainment area of Cochise County. This is assumed to continue in the future.

3.1.2.10 Starts

Starts is an optional input that is only used if local information is available for vehicle start activity. No local data is available, so this input was not used. When no local information is provided, MOVES calculates start activity based on source type population and default vehicle activity assumptions.

3.1.2.11 Hoteling

Hoteling is an optional input that is only used if local information is available for long-haul combination truck hoteling activity. No local data is available, so this input was not used. When no local information is provided, MOVES calculates hoteling activity based on long-haul combination truck VMT on restricted access roads.

3.1.2.12 Idle

Idle is an optional input that is only used if local information is available for off-network idle activity. This off-network idle is not related to combination truck hoteling activity. No local data is available, so this input was not used. When no local information is provided, MOVES default information is used.

3.1.2.13 Retrofit Data

Retrofit Data is an optional input that is only used if there are local heavy-duty diesel retrofit and/or replacement programs in use. No retrofit programs currently exist in the nonattainment area and this is assumed to continue in the future.

4. PM10 ANALYSIS

The following sections outline the analysis components and results of the PM10 conformity demonstration.

4.1 Paved and Unpaved Road Dust

The primary contributor to PM10 emissions in the Paul Spur/Douglas - area is road dust from paved and unpaved roads. Emissions for road dust are calculated using the AP-42⁸. The *AP-42, Compilation of Air Pollutant Emission Factors*, has been published since 1972 as the primary compilation of EPA's emission factor information. This document, currently in its fifth edition, contains guidance on how to determine PM10 road dust emissions from both paved and unpaved roads in Chapter 13, Sections 13.2.1 (updated January 2011) and 13.2.2 (updated November 2006) respectively. The methodology for determining paved and unpaved road dust emissions was determined following consultation with the FHWA Resource Center.

During interagency consultation, it was determined that due to changes in the AP-42 methodology over the years, the road dust for 1990 should be calculated using the current methodology. The 2020 NEI uses the current AP-42 methodology, so road dust emissions estimates for future years were calculated by adjusting the dust emissions from the 2020 NEI based on projected VMT growth in the nonattainment area.

⁸ <https://www.epa.gov/air-emissions-factors-and-quantification/ap-42-compilation-air-emission-factors>

4.1.1 Paved Roadways

Emissions for future year paved road dust were estimated for Cochise County using the 2020 NEI, population estimates, and VMT projections. 2020 paved road dust emissions for Cochise County were obtained directly from the 2020 NEI.

Emissions for 1990 were calculated based on the AP-42 methodology used in the 2020 NEI. According to AP-42 and the 2020 NEI, paved road dust emissions can be calculated at the state or county level by multiplying VMT per road type and the appropriate emissions factor, which can be determined using the following equation:

$$E = k(sL)^{0.91} \times W^{1.02}$$

where:

E = particulate emission factor (having units matching the units of k),

k = particle size multiplier for particle size range and units of interest (1.00 for PM10 and units of g/VMT),

sL = road surface silt loading (grams per square meter) (g/m²), and

W = average weight (tons) of the vehicles traveling the road.

AP-42 and the 2020 NEI contain tables that list the appropriate values for each variable in the equation above. The value of silt loading is based on road type and average daily traffic volumes. The average vehicle weights for each county by road type were estimated based on the VMT by each vehicle type, total county VMT for all vehicle types, and the average vehicle type mass within EPA's MOVES software. Road surface silt loading values and average vehicle weights can be found in AP-42 and the 2020 NEI guidance⁹.

For 1990, county level VMT by road type was not available. The 1990 FHWA Highway Statistics¹⁰ document does contain state-level VMT by road type as well as the state-level paved and unpaved roadway mileage. Therefore, emissions were first calculated at the state level. Paved road VMT was determined by applying a factor of paved VMT to unpaved VMT that was determined in the development of the PM10 SIP for Payson, Arizona. In this SIP, ADEQ assumed that 1% of the VMT occurred on unpaved roads, where applicable. Not every road type had unpaved mileage in 1990, so this factor was only applied to road types that did have unpaved mileage to remove unpaved VMT. Once the paved VMT was determined for each road type, it was multiplied by the associated emissions factor calculated from the above equation to determine statewide emissions. Statewide emissions were then allocated to Cochise County using population estimates from the 1990 U.S. Census. **Table 20** summarizes the 1990 population estimates for the State of Arizona and Cochise County.

<i>Table 20 – 1990 U.S. Census Population Estimates</i>		
Arizona	Cochise County	Percent of County to State
3,665,228	97,624	2.66%

Both the 1990 and 2020 emissions estimates were then apportioned to the nonattainment area. For the 1990 Census, population information for the nonattainment area was not readily available, so the population estimate of nonattainment area to County for 2020 was determined to be an acceptable proxy.

⁹ https://www.epa.gov/system/files/documents/2023-03/NEI2020_TSD_Section23_Dust_PavedRoads.pdf

¹⁰ <https://rosap.nhtl.bts.gov/view/dot/36034>

The population of the nonattainment area was estimated at the block group level. **Table 21** summarizes the 2020 population estimates for Cochise County and the nonattainment area.

<i>Table 21 – 2020 U.S. Census Population Estimates</i>		
Cochise County	Nonattainment Area	Percent of Nonattainment to County
127,450	21,242	16.67%

Once 1990 and 2020 emissions estimates were determined for the nonattainment area, paved road dust emissions for future analysis were then calculated by projecting the 2020 emissions estimates to each analysis year using the estimated VMT growth in the nonattainment area.

4.1.2 Unpaved Roadways

Emissions estimates for future year unpaved road dust in the nonattainment area were developed using the 2020 NEI for Cochise County, population estimates, and VMT projections. 2020 unpaved road dust emissions for Cochise County were obtained directly from the 2020 NEI.

Emissions estimates for 1990 were developed using the AP-42 methodology used in the 2020 NEI. According to AP-42, state or county-level unpaved road dust emissions per roadway type can be developed by multiplying annual unpaved road VMT estimates by an AP-42 emissions factor. This emissions factor was calculated using the following equation from AP-42:

$$E = \frac{k \left(\frac{s}{12}\right)^a \left(\frac{S}{30}\right)^d}{\left(\frac{M}{0.5}\right)^c} - C$$

where:

E = size-specific emission factor (lb/VMT), calculated for each of nine unpaved roadway types

k = empirical constant = 1.8 lb/VMT; from AP-42

a = empirical constant = 1; from AP-42

d = empirical constant = 0.5; from AP-42

c = empirical constant = 0.2; from AP-42

s = surface material silt content (%) = 3.9%; average state value based on samples taken as part of the 1985 NAPAP Inventory (NEI section 24, table 24-3)

M = surface material moisture content (%)

S = mean vehicle speed (mph) = range between 39 miles per hour (mph) and 20 mph based on roadway type

C = 0.00047 lb/VMT; PM10 emission factor for 1980s vehicle fleet exhaust, brake wear, and tire wear

Surface material moisture content is the only variable that does not have a direct value designated by AP-42 or the 2020 NEI guidance as it varies throughout different regions of the country. The basis for the silt material moisture content is a study titled Improved Activity Levels for National Emission Inventories of Fugitive Dust from Paved and Unpaved Roads¹¹. This study collected soil data across the country to determine levels of material moisture content. A portion of the study was conducted in 1990 in three

¹¹ https://gaftp.epa.gov/ap42/ch13/s021/references/ref_24c13s0201_2011.pdf

counties in Arizona – Pinal County, Pima County, and Yuma County. The measured material moisture contents of the counties are shown below in **Table 22**.

<i>Table 22 – 1990 Measured Material Moisture Content</i>	
County	Moisture Content
Pinal	0.20
Pima	0.22
Yuma	0.17
Average	0.197

The average moisture content of the three values taken in Arizona is 0.197. For the 1990 analysis, this average value was used as the silt material moisture content. As in the 1990 paved road dust methodology, unpaved road dust emissions were first calculated at the state level due to lack of county-level data. The unpaved statewide VMT was determined by applying the 1% factor from the Payson, Arizona SIP to the statewide total VMT for road types that had unpaved road mileage. The unpaved mileage by road type was multiplied by the associated emissions factor calculated from the above equation to determine statewide unpaved road dust emissions.

Statewide emissions were then allocated to Cochise County using the same factor as paved road dust seen in **Table 20**. Both the 1990 and 2020 County emissions estimates were then apportioned to the nonattainment area using the factor of nonattainment area population to County population as seen in **Table 21**. Once 1990 and 2020 emissions estimates were determined for the nonattainment area, unpaved road dust emissions for future analysis years were projected based on estimated VMT growth in the nonattainment area.

Additional adjustment was not included related to the proposed project for paving a portion of an unpaved road, because of the low project level volume that exists on the roadway today is negligible related to the regional analysis.

4.1.3 Road Dust Emissions Results

Table 23 displays the total dust emissions from the 2020 NEI for Cochise County and the nonattainment area. **Table 24** displays the results of the paved and unpaved road dust emissions calculations by analysis year.

<i>Table 23 – Dust Emissions from the 2020 NEI for Cochise County and the Nonattainment Area</i>		
Source	Cochise County	Nonattainment Area
Unpaved Road Dust	1106.32	184.39
Paved Road Dust	156.24	26.04
Total	1262.56	210.43

<i>Table 24 – Final Road Dust Emissions by Analysis Year</i>					
Source Type ID	Analysis Year				
	1990	2028	2035	2040	2050
Unpaved Road Dust	347.94	216.04	248.16	273.99	334.00
Paved Road Dust	71.89	30.51	35.05	38.69	47.17
Total	442.33	246.55	283.21	312.69	381.16

4.2 Total PM10 Emissions

Emissions from all processes were combined to estimate the overall impact of on-road mobile sources on PM10 levels in the Paul Spur/Douglas nonattainment area. **Table 25** and **Figure 3** show these emissions for all analysis years, along with the values used to calculate paved road dust emissions.

Table 25 – Paul Spur/Douglas Particulate Matter (PM10) Conformity Analysis					
Source	1990	2028	2035	2040	2050
	(Tons/Year)				
Unpaved Road Dust	347.94	216.04	248.16	273.99	334.00
Paved Road Dust	71.89	30.51	35.05	38.69	47.17
On-Road Emissions (exhaust, brake, and tire wear included)	22.49	10.30	11.67	12.74	16.02
Total	442.33	256.85	294.89	325.43	397.18

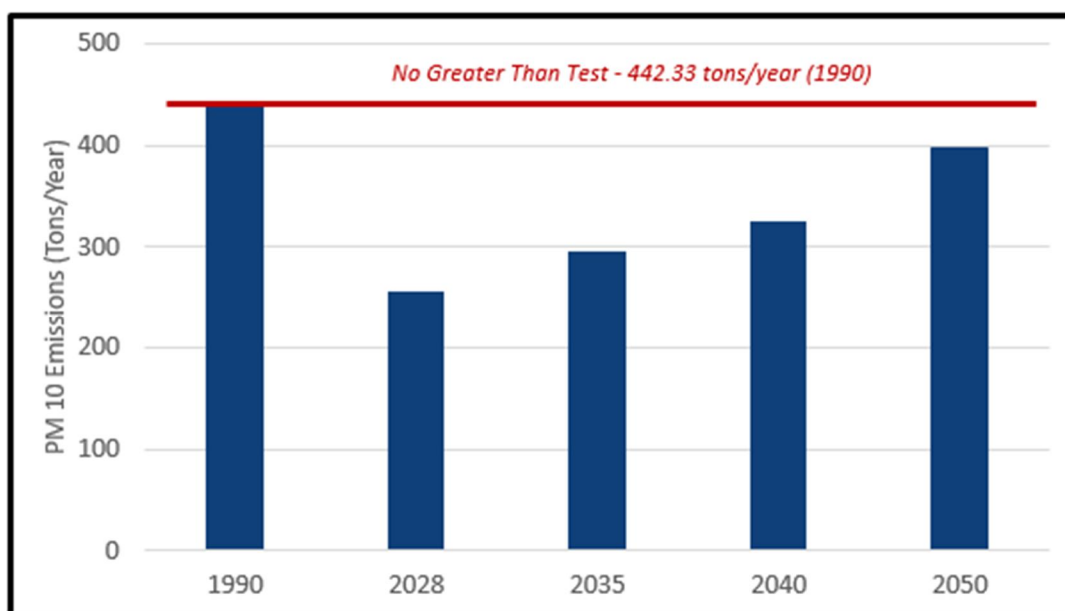


Figure 3: Interim PM10 Emissions Test

5. CONFORMITY DETERMINATION

The analysis indicates that the projected emissions levels for the Paul Spur/Douglas nonattainment area meet the applicable conformity tests with the planned Douglas Commercial Port of Entry Connector Road project. Therefore, it is the determination of this analysis that this plan conforms under the 24-hour PM10 National Ambient Air Quality Standards (NAAQS).

APPENDIX A

Pre-Analysis Consensus Memoranda



1990 Baseline Pre-Analysis Consensus Memorandum

To: Beverly Chenausky, Arizona Department of Transportation (ADOT)
From: Allison Fluitt, P.E., AICP
Kimley-Horn and Associates, Inc.
Date: February 16, 2024
Subject: Douglas Non-Attainment Area Air Quality Conformity 1990 Baseline Pre-Analysis
Consensus Memorandum

Background

The purpose of this memo is to detail the assumptions and procedures that will be used in the regional air quality conformity 1990 baseline analysis for the Paul Spur/Douglas planning area in Cochise County, Arizona. The Paul Spur/Douglas planning area is currently in non-attainment for large particulates, otherwise known as PM₁₀. This area was designated as a moderate non-attainment area on Oct. 31, 1990 ([55 FR 45799](#)). As an isolated rural non-attainment area, the Paul Spur/Douglas planning area is subject to a regional air quality conformity process. The planned Douglas Commercial Port of Entry Connector Road is likely to be classified as regionally significant and is not within a conforming Transportation Improvement Program (TIP). As such, a PM₁₀ regional air quality conformity analysis will be required to complete this project.

Only the data, methodology, and assumptions needed for the 1990 baseline analysis are included in this memorandum. Data, methodology, and assumptions for the other years have been documented in previous efforts.

Conformity Test

Regional air quality conformity is most commonly determined by comparing the future year emissions to a motor vehicle emission budget (MVEB) established by the State Implementation Plan (SIP). However, if an area does not have an approved MVEB, an interim emissions test may be performed to determine conformity. The two types of interim emissions tests consist of:

- Demonstrating that future year “build” emissions (representing projects included within a TIP or LRTP) are not greater than emissions from a baseline “no-build” scenario, referred to as a “build/no-build” test.
- Demonstrating that the future year “build” emissions are not greater than the emissions from a baseline year for a given standard, referred to as the “no greater than” test.

At this time, the Paul Spur/Douglas PM₁₀ area does not have an approved MVEB, meaning that an interim conformity test will be used. Specifically, the no-greater-than-baseline year emissions test is

proposed to be used to demonstrate regional conformity. The Douglas area was designated as a non-attainment area under the 1987 24-hour PM₁₀ standard, which was retained under the Environmental Protection Agency's (EPA's) 2006 PM National Ambient Air Quality Standards (NAAQS) review (effective December 18, 2006). The baseline year is defined as the most recent year for which EPA's Air Emissions Reporting Rule requires submission of on-road mobile source emissions inventories as of the effective date of designation, which is 1990 for the 2006 PM NAAQS. The PM₁₀ non-attainment area is shown in **Figure 1**.

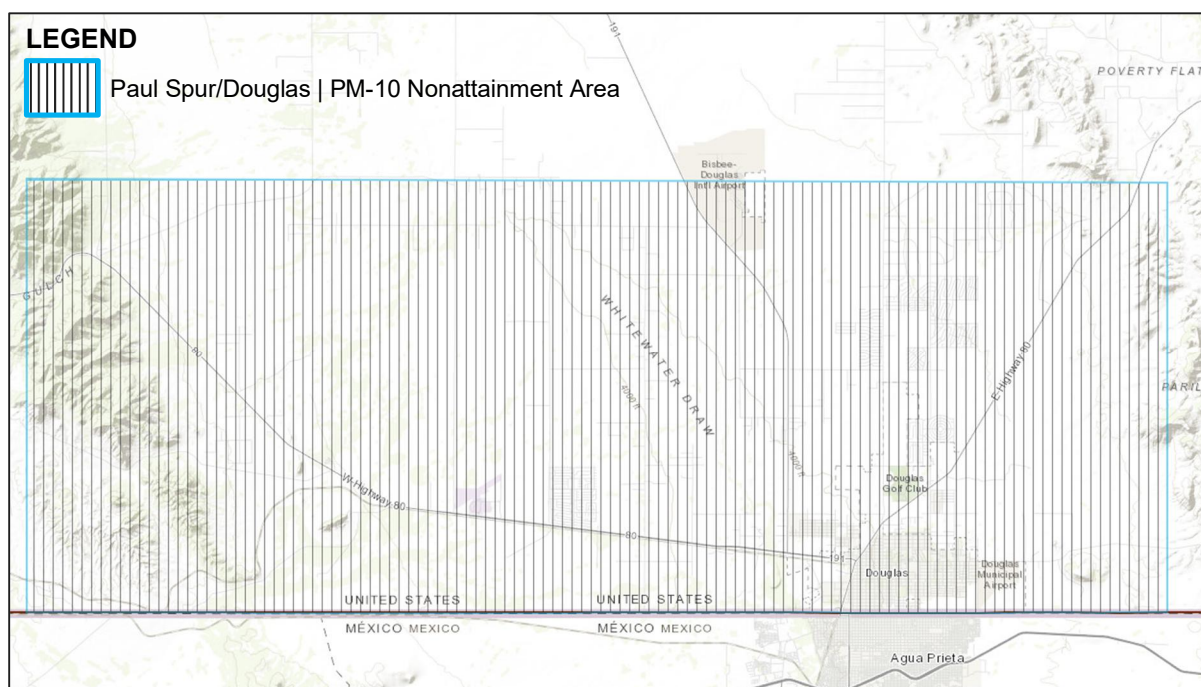


Figure 1. PM₁₀ Non-Attainment Area (AZDEQ)¹

¹ <https://azdeq.gov/node/3943>

On-Road Emissions

The on-road PM₁₀ emissions will be modeled using EPA's Motor Vehicle Emissions Simulator 3.1 (MOVES3.1) software. Several parameters have been identified for use in the preparation of this analysis. The parameters listed below will be applied in the base MOVES3.1 setup:

- Description
 - Use this to document the purpose of each run (e.g., "base year")
- Scale
 - Domain/Scale: County
 - Calculation Type: Inventory
- Time Span:
 - Years: 1990
 - Months:
 - PM 10: All Months
 - Days: Weekdays and Weekends
 - Hours: All Hours
- Geographic Bounds: Arizona – Cochise County
- Vehicles/Equipment
 - All Available Fuel Types
 - Compressed Natural Gas (CNG)
 - Diesel Fuel
 - Electricity
 - Ethanol (E85)
 - Gasoline
 - All Available Source Types
 - Combination Long-haul Truck
 - Combination Short-haul Truck
 - Intercity Bus
 - Light Commercial Truck
 - Motor Home
 - Motorcycle
 - Passenger Car
 - Passenger Truck
 - Refuse Truck
 - School Bus
 - Single Unit Long-haul Truck
 - Single Unity Short-haul Truck

- Transit Bus
- Road Type
 - All road types including off-network
- Pollutants and Processes:
 - Pollutants:
 - PM10, and any additional pre-requisites.
 - Processes: All processes
- General Output:
 - Mass Units: Grams
 - Energy Units: Joules
 - Distance Units: Miles
 - Activity: Distance Traveled, Population

The following assumptions will be applied within the County Data Manager portion of the MOVES3.1 software package. Each parameter is identified, along with the source data that will be applied (if applicable). Due to the rural nature of the Paul Spur/Douglas non-attainment area, local data is not readily available for all input files. Where local data is unavailable, more detail is provided for the data sources being used for the affected input areas.

- Age Distribution: January 2003 vehicle registration data for Cochise County will be obtained from Motor Vehicle Division (MVD) reports, furnished by ADOT. January 2003 is the oldest MVD data available for this area. The age distribution associated with January 2003 will be used for 1990.
- Source Type Population: January 2003 vehicle registration data will be obtained from MVD reports for Cochise County, in addition to the 2008 and 2020 information gathered previously. January 2003 is the oldest MVD data available for this area. The MVD data will be reviewed to determine if any adjustments need to be made to source types 61 and 62, similar to the remainder of the analysis. If adjustments are needed, MOVES default data for 1990 will be used in place of the MVD data. 1990 source type population for Cochise County will be developed by extrapolating the 2003 data to 1990 using overall county population totals from the U.S. Census. The source type population for the nonattainment area will be developed using the same process as was completed previously for 2008 and 2022 (see report).
- Meteorology Data: Local meteorological data for all months of 1990 at the Douglas International Airport will be obtained from the National Centers for Environmental Information (NCEI) website developed by the National Oceanic and Atmospheric Administration (NOAA).
- Inspection/Maintenance (I/M) Programs: No I/M program information will be applied.

- Vehicle Type VMT (Highway Performance Monitoring System [HPMS]): ADOT does not have reliable HPMS VMT data for 1990. The earliest VMT data available through ADOT is from 2007, but only includes Average Annual Daily Traffic (AADT) for interstates, US routes, and state routes. 2013 AADT data is available for additional roads and is the oldest data set that can be reliably used to develop VMT for the nonattainment area. This data is provided for passenger vehicles, single unit trucks, and combination unit trucks. 1990 VMT data for these three vehicle types will be developed by extrapolating the 2013 data to 1990 using population totals for the nonattainment area from the U.S. Census. This VMT data will be distributed to the HPMS vehicle classes using distributions from default MOVES data for 1990, as is consistent with methodology used for the 2022 data in the remainder of the analysis.
- Day/Month/Hour VMT Fraction: Locally available data sources do not provide information that allows for the generation of VMT by time of day. Discussions with ADOT considered surrogate data sources elsewhere in the state but determined that these sources were not of sufficient quality to use for the Douglas area. As a result, the final VMT data for nonattainment area will be input into EPA's AADVMT converter to develop all three VMT fractions to remain consistent with the other analysis years for regional conformity. This process was already vetted by the IAC during the development of those years.
- Fuels: There is no locally available fuels data for the Douglas area. Default data is extracted from MOVES3.1. Note: MOVES 3.1 was the most up to date available MOVES program in effect at the inception of this analysis process. As such, this version is being carried forward to complete the analysis.
- Road Type Distribution: HPMS data for 2013 will be used to determine the road type distribution. The distribution for 2013 will be used for 1990 due to the lack of more detailed data noted in the Vehicle Type VMT description. This is consistent with the way the previous 2008 road type distribution was developed.
- Average Speed Distribution: Default data will be used because more detailed data is not available at a regional or state level. This is consistent with the other model years in this analysis. Default data is extracted from MOVES3.1.
- Starts: No input necessary
- Hoteling: No input necessary

Paved, Unpaved, and Construction Road Dust

There are two methodologies that could be used for 1990 paved and unpaved road dust. We ask the members of the IAC to weigh the two options detailed here and determine which option is the best for use in this regional conformity analysis.

The first option is to use the values developed in the 1990 NEI for PM10 in Cochise County. After discussions with EPA and FHWA, along with reading language on EPA's website, it appears that this is not a supported method as calculation methods have changed.

The second option involves calculating estimates of road dust emissions. To develop new estimates of road dust emissions for 1990, the current AP-42 emissions factor equation and trends assumptions must be used. Unfortunately, county-level data for 1990 is not expansive. So, emissions can be calculated at the state level and then apportioned to Cochise County and the nonattainment area using population information from the U.S. Census.

Available 1990 data for this analysis includes the following:

- State-level mileage and VMT estimates for 1990 by 12 road types (seen below) taken from FHWA's 1990 *Highway Statistics* report

Rural	Urban
Interstate	Interstate
Other Principal Arterial	Other Freeways & Expressways
Minor Arterial	Other Principal Arterial
Major Collector	Minor Arterial
Minor Collector	Collector
Local	Local

- County-level rural and total population estimates from the U.S. Census
- Total county-level daily VMT developed by ADOT broken down into state highway system VMT and local and federal agencies VMT
- Paved and unpaved mileage by road type from FHWA's *Highway Statistics* report, including all road types above except rural and urban local
- Fleet average vehicle weight for 1990 from the NEI Procedures Document

Paved and unpaved VMT is not available. To determine estimates of unpaved VMT at the state-level, the ratio of unpaved mileage to total mileage for each road type will be applied to the total VMT for each functional class. Paved VMT can then be calculated by subtracting unpaved VMT from the total VMT.

VMT by vehicle type for 1990 is not available. Instead, the fleet average vehicle weight for 1990 of 6,360 lbs was taken from Section 4.8.1.5 of the NEI Procedures Document 1985-1999.

Paved Roadways

According to the 2020 NEI, paved road dust emissions can be calculated by multiplying VMT per road type and the appropriate emissions factor as described in AP-42, which can be determined using the following equation:

$$E = k(sL)^{0.91} \times W^{1.02}$$

where:

E = particulate emission factor (having units matching the units of k),

k = particle size multiplier for particle size range and units of interest (1.00 for PM10 and units of g/VMT),

sL = road surface silt loading (grams per square meter) (g/m²), and

W = average weight (tons) of the vehicles traveling the road.

The 2020 NEI documentation for Paved Road Dust contains a table that lists the appropriate values for silt loading by road type based on the ADTV range. Once the emission factors are developed for each road type, they will be multiplied by the paved VMT for each road type to calculate state-level emissions. Then, state-level emissions will be apportioned to the County and then to the non-attainment area through a comparison of population totals taken from the U.S. Census.

Unpaved Roadways

According to the NEI, unpaved road emissions can be calculated by multiplying unpaved VMT per road type by the appropriate emissions factor as described in AP-42, which can be determined using the following equation:

$$E = \frac{k \left(\frac{s}{12}\right)^a \left(\frac{S}{30}\right)^d}{\left(\frac{M}{0.5}\right)^c} - C$$

where:

E = size-specific emission factor (lb/VMT), calculated for each of nine unpaved roadway types

k = empirical constant = 1.8 lb/VMT; from AP-42

a = empirical constant = 1; from AP-42

d = empirical constant = 0.5; from AP-42

c = empirical constant = 0.2; from AP-42

s = surface material silt content (%) = 3.0%; average state value based on samples taken as part of the 1985 NAPAP Inventory (AZ is on this table twice and has values of either 3.0% or 3.9%, NEI section 24, table 24-3)

M = surface material moisture content (%) = 0.5% (conservative national default value used for the NEI)

S = mean vehicle speed (mph) = range between 39 miles per hour (mph) and 20 mph based on roadway type

C = 0.00047 lb/VMT; PM10 emission factor for 1980s vehicle fleet exhaust, brake wear, and tire wear

The emissions factor for each unpaved road type can then be multiplied by the corresponding unpaved VMT estimates for each road type to calculate emissions at the state level. State-level emissions were allocated to Cochise County based on a ratio of rural population in the county to the state per data from the U.S. Census. Non-attainment area emissions estimates can then be developed using the same ratio of non-attainment area population to county population as in the paved roadways analysis.

Road Construction

The calculations for estimating the emissions from road construction involve first estimating the acres disturbed from new road construction. The amount of state-level road construction spending by road type is available from the Federal Highway Administration (FHWA) and is converted to acreage disturbed using conversion factors from the Florida Department of Transportation (FDOT). The state-level acreage disturbed by road type can then be summed together and distributed to Cochise County based on the proportion of building starts in the county. The emissions factor for PM10 can then be calculated based on the precipitation-evaporation value and dry silt content for Cochise County using the following equation:

$$UEF_{PM10,c} = EF_{PM10} \times \frac{24}{PE_s} \times \frac{S_c}{9\%}$$

where:

$UEF_{PM10,c}$ = Uncontrolled PM10 emission factor corrected for soil moisture and silt content in state s and county c, in tons/acre-month

EF_{PM10} = Initial PM10 emissions for road construction, 0.42 tons/acre-month

PE_s = Precipitation-evaporation value for state s

S_c = Percent dry silt content in soil for county c

The total amount of acres disturbed is multiplied by this emissions factors to estimate emissions of at the county-level. Non-attainment area emissions estimates can then be developed using the same ratio of non-attainment area population to county population as in the paved and unpaved roadway analyses.

Next Steps

We ask the IAC to review this content and offer any comments, edits, or questions no later than end of day **Thursday, February 29, 2024**. Following the feedback received by the project team, we will proceed with the development of the 1990 baseline analysis for regional conformity.



Pre-Consensus Memorandum

To: Beverly Chenausky, Arizona Department of Transportation (ADOT)

From: Allison Fluitt, P.E., AICP
Kimley-Horn and Associates, Inc.

Date: June 2, 2023; Updated September 7, 2023

Subject: Douglas Non-Attainment Area Air Quality Conformity Pre-Consensus Memorandum

Background

The purpose of this memo is to detail the assumptions and procedures that will be used in the regional air quality conformity analysis for the Paul Spur/Douglas planning area in Cochise County, Arizona. The Paul Spur/Douglas planning area is currently in non-attainment for large particulates, otherwise known as PM₁₀. This area was designated as a moderate non-attainment area on Oct. 31, 1990 ([55 FR 45799](#)). As an isolated rural non-attainment area, the Paul Spur/Douglas planning area is subject to a regional air quality conformity process. The planned Douglas Commercial Port of Entry Connector Road is likely to be classified as regionally significant and is not within a conforming Transportation Improvement Program (TIP). As such, a PM₁₀ regional air quality conformity analysis will be required to complete this project.

Conformity Test

Regional air quality conformity is most commonly determined by comparing the future year emissions to a motor vehicle emission budget (MVEB) established by the State Implementation Plan (SIP). However, if an area does not have an approved MVEB, an interim emissions test may be performed to determine conformity. The two types of interim emissions tests consist of:

- Demonstrating that future year “build” emissions (representing projects included within a TIP or LRTP) are not greater than emissions from a baseline “no-build” scenario, referred to as a “build/no-build” test.
- Demonstrating that the future year “build” emissions are not greater than the emissions from a baseline year for a given standard, referred to as the “no greater than” test.

At this time, the Paul Spur/Douglas PM₁₀ area does not have an approved MVEB, meaning that an interim conformity test will be used. Specifically, the no-greater-than-baseline year emissions test is proposed to be used to demonstrate regional conformity. The Douglas area was designated as a non-attainment area under the 1987 24-hour PM₁₀ standard, which was retained under the Environmental Protection Agency’s (EPA’s) 2006 PM National Ambient Air Quality Standards (NAAQS) review (effective December 18, 2006). The baseline year is defined as the most recent year for which EPA’s

Air Emissions Reporting Rule requires submission of on-road mobile source emissions inventories as of the effective date of designation, which is 2008 for the 2006 PM NAAQS. The PM10 non-attainment area is shown in **Figure 1**.

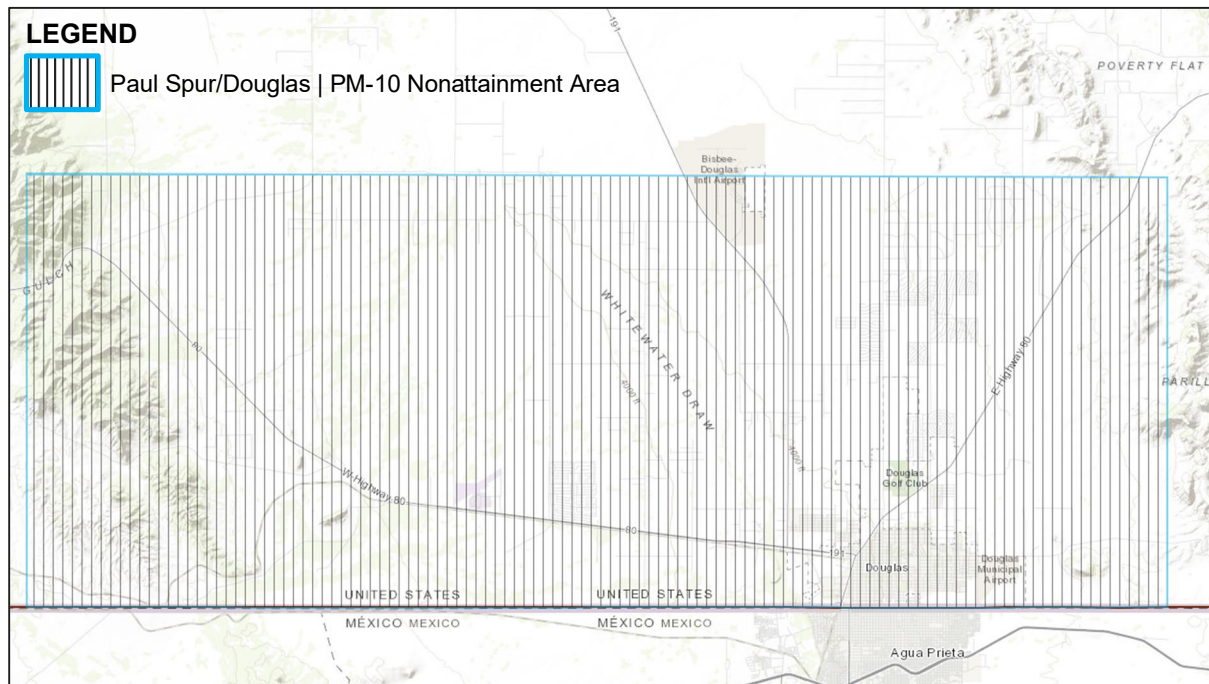


Figure 1. PM10 Non-Attainment Area (AZDEQ)¹

The planning horizon years were identified based on correspondence with the Interagency Consultation Group on August 21, 2023. These years are 2028, 2035, 2040, and 2050.

On-Road Emissions

The on-road PM10 emissions will be modeled using EPA's Motor Vehicle Emissions Simulator 3.1 (MOVES3.1) software. Several parameters have been identified for use in the preparation of this analysis. The parameters listed below will be applied in the base MOVES3.1 setup:

- Description
 - Use this to document the purpose of each run (e.g., “base year”, “2008 No-build”, etc.)

¹ <https://azdeq.gov/node/3943>

- Scale
 - Domain/Scale: County
 - Calculation Type: Inventory
- Time Span:
 - Years: 2008, 2028, 2035, 2040, and 2050
 - Months:
 - PM 10: All Months
 - Days: Weekdays
 - Hours: All Hours
- Geographic Bounds: Arizona – Cochise County
- Vehicles/Equipment
 - All Available Fuel Types
 - Compressed Natural Gas (CNG)
 - Diesel Fuel
 - Electricity
 - Ethanol (E85)
 - Gasoline
 - All Available Source Types
 - Combination Long-haul Truck
 - Combination Short-haul Truck
 - Intercity Bus
 - Light Commercial Truck
 - Motor Home
 - Motorcycle
 - Passenger Car
 - Passenger Truck
 - Refuse Truck
 - School Bus
 - Single Unit Long-haul Truck
 - Single Unity Short-haul Truck
 - Transit Bus
- Road Type
 - All road types including off-network
- Pollutants and Processes:
 - Pollutants:
 - PM10, and any additional pre-requisites.
 - Processes: All processes
- General Output:
 - Mass Units: Grams

- Energy Units: Joules
- Distance Units: Miles
- Activity: Distance Traveled, Population

The following assumptions will be applied within the County Data Manager portion of the MOVES3.1 software package. Each parameter is identified, along with the source data that will be applied (if applicable). Due to the rural nature of the Paul Spur/Douglas non-attainment area, local data is not readily available for all input files. Where local data is unavailable, more detail is provided for the data sources being used for the affected input areas.

- Age Distribution: January 2008, July 2008, and January 2020 vehicle registration data for the Douglas area will be obtained from Motor Vehicle Division (MVD) reports, furnished by ADOT. EPA's age distribution forecasting tool will be used to create age distribution files for each analysis year.
- Source Type Population: 2008 and 2020 source type population information will be obtained for the Douglas area from MVD reports, furnished by ADOT. Future year growth will be obtained by determining annual growth rates in Vehicle Miles Traveled (VMT) generated from information contained within the City of Douglas International Port of Entry Connector Road Final Traffic Report, and then applying those growth rates to the source type population data for each study year.
- Meteorology Data: Local meteorological data for all months will be obtained from the National Centers for Environmental Information (NCEI) website developed by the National Oceanic and Atmospheric Administration (NOAA).
- Inspection/Maintenance (I/M) Programs: No I/M program information will be applied
- Vehicle Type VMT (Highway Performance Monitoring System [HPMS]): The daily VMT by vehicle type for Cochise County will be obtained from ADOT. The ADOT Statewide Travel Demand Model (TDM) will be used to factor the County VMT within the Paul Spur/Douglas planning area. Future year VMT will be obtained by generating annual growth rates from information contained within the City of Douglas International Port of Entry Connector Road Final Traffic Report.
- Hourly VMT Fraction: Locally available data sources do not provide information that allows for the generation of VMT by time of day. Discussions with ADOT considered surrogate data sources elsewhere in the state but determined that these sources were not of sufficient quality to use for the Douglas area. As a result, default data will be used for hourly VMT fractional distributions by roadway type and vehicle type (Default data is extracted from the most up to date available MOVES program (MOVES3.1)).
- Fuels: There is no locally available fuels data for the Douglas area. Default data is extracted from the most up to date available MOVES program (MOVES3.1).

- Road Type Distribution: County-wide HPMS data will be used to determine the road type distribution.
- Average Speed Distribution: Default data will be used because more detailed data is not available at a regional or state level (Default data is extracted from the most up to date available MOVES program (MOVES3.1)).
- Starts: No input necessary
- Hoteling: No input necessary

Paved and Unpaved Road Dust

The primary contributor to PM₁₀ emissions in the Paul Spur/Douglas nonattainment area is road dust from paved and unpaved roads. Emissions for road dust were calculated using the AP-42². The *AP-42, Compilation of Air Pollutant Emission Factors*, has been published since 1972 as the primary compilation of EPA's emission factor information. This document, currently in its fifth edition, contains guidance on how to determine PM₁₀ road dust emissions from both paved and unpaved roads. The methodology for determining paved and unpaved road dust emissions will be confirmed following consultation with IAC.

Paved Roadways

Emissions for paved road dust were estimated for Cochise County using the 2020 NEI and were then distributed to the non-attainment area using a population comparison. According to the 2020 NEI, paved road dust emissions can be calculated at the county level by multiplying VMT per road type and the appropriate emissions factor as described in AP-42, which can be determined using the following equation:

$$E = k(sL)^{0.91} \times W^{1.02}$$

where:

E = particulate emission factor (having units matching the units of k),

k = particle size multiplier for particle size range and units of interest (1.00 for PM₁₀ and units of g/VMT),

sL = road surface silt loading (grams per square meter) (g/m²), and

W = average weight (tons) of the vehicles traveling the road.

² <https://www.epa.gov/air-emissions-factors-and-quantification/ap-42-compilation-air-emission-factors>

The 2020 NEI contains tables that list the appropriate values for each variable in the equation above. The value of silt loading is based on road type and average daily traffic volumes. The average vehicle weights for each county by road type were estimated based on the VMT by each vehicle type, total county VMT for all vehicle types, and the average vehicle type mass within EPA's MOVES software. Control factors were applied to the emissions factor based on the assumed control measure of vacuum sweeping of paved roads twice per month. Because the area is considered a moderate non-attainment area, the control factors were only applied to urban roads. A meteorological adjustment was also applied in the NEI to account for the reduction in road dust emissions from precipitation and other meteorological factors.

County-level emissions were apportioned to the non-attainment area through a comparison of non-attainment area population to county population. Methodology for determining the non-attainment area population will be confirmed through consultation with the Interagency Consultation (IAC) Group.

2020 non-attainment area emissions were forecast to each analysis year using county-wide population growth estimates developed using forecasts provided by the Arizona Department of Administration, Employment and Population Statistics, Office of Economic Opportunity.

Unpaved Roadways

Emissions estimates for unpaved road dust in the non-attainment area were developed using the 2020 NEI for Cochise County and recent rural population estimates and forecasts. County-level unpaved road dust emissions per roadway type were developed by multiplying annual unpaved road VMT estimates by an AP-42 emissions factor. This emissions factor was calculated using the following equation from AP-42:

$$E = \frac{k \left(\frac{s}{12}\right)^a \left(\frac{S}{30}\right)^d}{\left(\frac{M}{0.5}\right)^c} - C$$

where:

E = size-specific emission factor (lb/VMT), calculated for each of nine unpaved roadway types

k = empirical constant = 1.8 lb/VMT; from AP-42

a = empirical constant = 1; from AP-42

d = empirical constant = 0.5; from AP-42

c = empirical constant = 0.2; from AP-42

s = surface material silt content (%) = 3.0%; average state value based on samples taken as part of the 1985 NAPAP Inventory (AZ is on this table twice and has values of either 3.0% or 3.9%, NEI section 24, table 24-3)

M = surface material moisture content (%) = 0.5% (conservative national default value used for the NEI)

S = mean vehicle speed (mph) = range between 39 miles per hour (mph) and 20 mph based on roadway type

C = 0.00047 lb/VMT; PM10 emission factor for 1980s vehicle fleet exhaust, brake wear, and tire wear

As in the paved road emissions methodology, controls were only applied to urban roads due to the area being denoted as a moderate non-attainment area. The control factor listed in the NEI for unpaved roads is assumed to be paving of the road. A meteorological adjustment was also applied to the unpaved road emissions to account for the reduction in emissions from precipitation and other meteorological events.

Annual unpaved road VMT by roadway type were first estimated at the state-level based on Federal Highway Administration (FHWA) data on unpaved road lengths by road type and annual average daily traffic (AADT). State-level VMT estimates were then allocated to Cochise County based on a ratio of rural population in the county to the state per the 2020 U.S. Census. Non-attainment area VMT estimates were developed using the same ratio of non-attainment area population to county population as in the paved roadways analysis.

2020 non-attainment area emissions were forecast to each analysis year using county-wide population growth estimates developed using forecasts provided by the Arizona Department of Administration, Employment and Population Statistics, Office of Economic Opportunity.

Documentation

Documentation of the air quality conformity analysis will be prepared as a stand-alone deliverable. Following the conclusion of the analysis and preparation of documentation, these materials will be presented to the IAC group for review. Feedback received during this process will be incorporated as needed into the analysis and final documentation.

APPENDIX B

City of Douglas International Port of Entry Connector Road
Final Traffic Study

FINAL TRAFFIC REPORT

CITY OF DOUGLAS INTERNATIONAL PORT OF ENTRY CONNECTOR ROAD
ADOT SOUTHEAST DISTRICT/COCHISE COUNTY

ADOT CONTRACT NO. 2023-003
ADOT PROJECT NO. F0534 01L
FEDERAL PROJECT NO. 999-A(561)T

Prepared For:



ARIZONA DEPARTMENT OF TRANSPORTATION
MULTIMODAL PLANNING DIVISION
CORRIDOR PLANNING GROUP

Prepared By:

Kimley»Horn

JUNE 2023



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1. INTRODUCTION

This Final Traffic Report has been developed to support the Design Concept Report (DCR) for a connector road between the proposed Douglas Commercial International Port of Entry (IPOE) at the United States (U.S.)-Mexico border and Arizona State Route 80 (SR 80). The project is located in the Arizona Department of Transportation (ADOT) Southeast District in Cochise County west of Douglas, Arizona and is anticipated to open in 2028. The project location and vicinity maps are shown in **Figure 1.1** and **Figure 1.2**, respectively.

There are three alignment alternatives currently being considered for the proposed connector road west of United States Route 191 (US 191), two of which intersect SR 80 at James Ranch Road and one of which intersects SR 80 at Brooks Road. The three alignment alternatives are shown in **Figure 1.3**. For the purposes of this report, the preferred alignment alternative for the connector road is assumed to intersect SR 80 at the existing SR 80 / James Ranch Road intersection. The results of the analysis at the SR 80 / James Ranch Road intersection are anticipated to be similar at the SR 80 / Brooks Road intersection if the preferred alignment alternative for the connector road intersects SR 80 at Brooks Road instead of James Ranch Road.

The purpose of this report is to document the existing safety and operational characteristics of the SR 80 / James Ranch Road intersection, develop and evaluate intersection configuration alternatives at the SR 80 / James Ranch Road intersection, identify appropriate roadway geometry for the connector road, and provide recommendations for improvements within the study area that provide acceptable future traffic operations, promote safety, and enhance regional mobility.

The traffic analysis includes the evaluation of the following intersection configuration alternatives at the intersection of SR 80 / James Ranch Road:

- Two-Way Stop Control (TWSC)
- Traffic Signal Control
- Roundabout

Additionally, it is anticipated that all truck traffic entering the U.S. will continue to be required to travel to the ADOT Commercial Inspection Facility, which is currently located on the northeast corner of the intersection of SR 80 / US 191, for additional processing. Because the location of the proposed commercial IPOE would change the travel patterns of commercial trucks accessing the ADOT Commercial Inspection Facility, the intersection of SR 80 / US 191 was also studied in this analysis to determine the necessary lane configuration and signal phasing at the intersection. No changes in intersection control type were analyzed for this intersection.

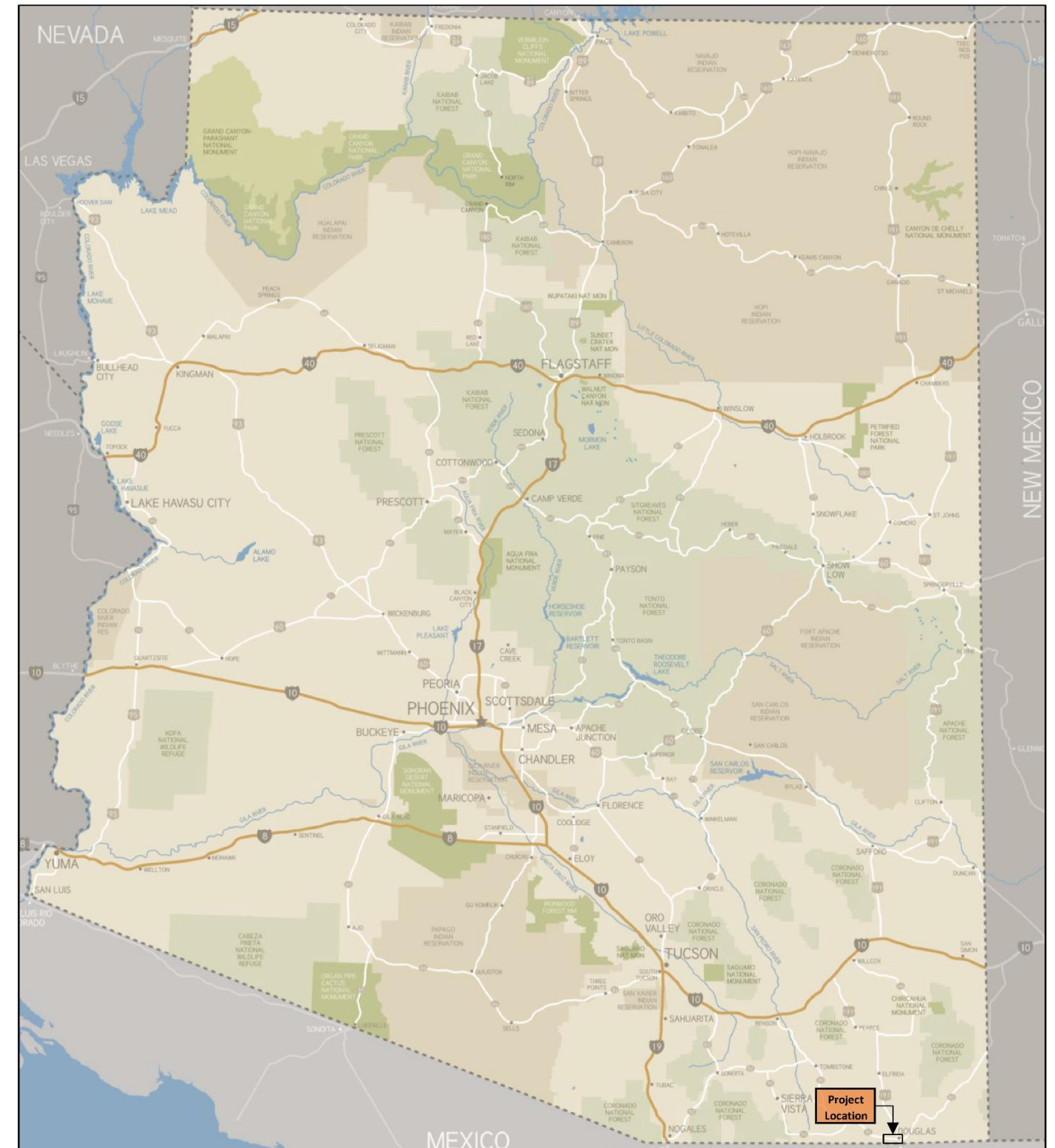


Figure 1.1 – Project Location Map



Figure 1.2 – Project Vicinity Map

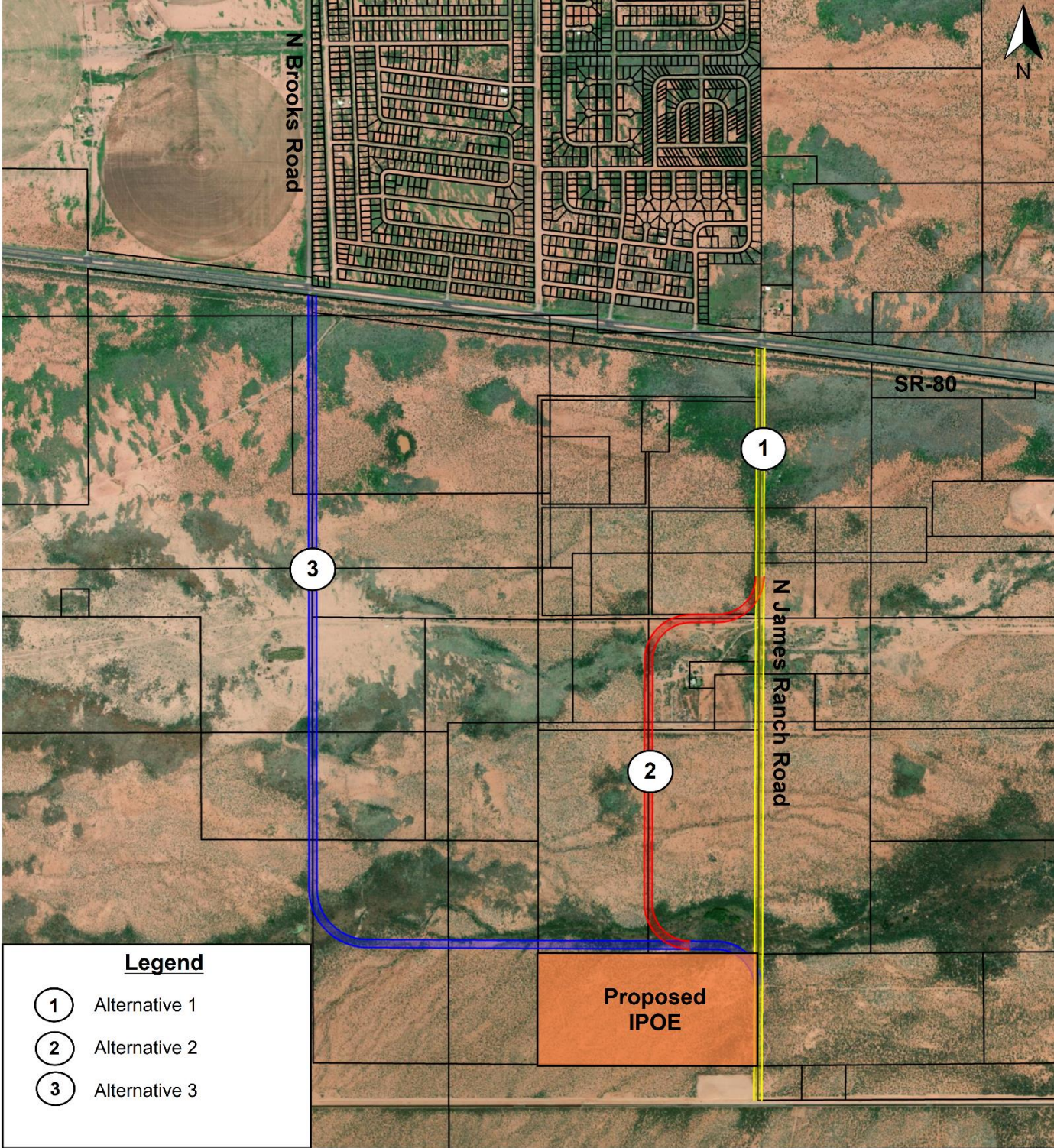


Figure 1.3 – Connector Road Alignment Alternatives Map

2. EXISTING CONDITIONS

2.1 Transportation System Overview

The existing roadway system within the study area includes SR 80, US 191, and James Ranch Road. Other notable roadways in the project vicinity include US 191 Business (Pan American Avenue) and Chino Road. This report analyzes the intersections of SR 80 / James Ranch Road and SR 80 / US 191.

2.1.1 Regional Roadway Network

SR 80 generally runs east-west in the study area and is owned, operated, and maintained by ADOT. Per the ADOT “Arizona Roads by Federal Functional Classifications” GIS map, ADOT classifies SR 80 as an “urban principal arterial – other” roadway within the study area. The posted speed limit on SR 80 is 65 miles per hour (mph) in the vicinity of James Ranch Road and is 55 mph in the vicinity of US 191. The existing SR 80 roadway section in the study area typically includes two 12-foot-wide through lanes in both the eastbound (EB) and westbound (WB) directions. An approximately 28-foot-wide median separates the EB and WB through lanes. The median is generally unpaved except for raised medians for left-turn lanes at intersections and bridge crossings. Inside paved shoulders are typically four feet wide or less and outside paved shoulders are typically ten feet wide.

US 191 generally runs north-south in the study area and is owned, operated, and maintained by ADOT. US 191 extends north from SR 80 approximately four miles east of James Ranch Road and approximately 1.5 miles west of US 191 Business (Pan American Avenue) in Douglas. ADOT classifies US 191 as an “urban minor arterial” roadway within the study area. The posted speed limit on US 191 is 45 mph within the study area. The existing US 191 roadway section in the study area typically includes one 12-foot-wide through lane in both the northbound (NB) and southbound (SB) directions separated by a 12-foot-wide two-way left-turn lane (TWLTL) that converts to an exclusive SB left-turn lane approaching SR 80.

US 191 Business (also known as Pan American Avenue) is located outside the study area but is notable because it serves as a connector road between SR 80 and the existing Raul H. Castro IPOE (RHC IPOE). US 191 Business generally runs north-south and is owned, operated, and maintained by the City of Douglas. US 191 Business goes from the U.S.-Mexico border to where SR 80 has a 90-degree bend in Douglas. The existing Raul H. Castro IPOE (RHC IPOE) is located at the southern terminus of US 191 Business at the U.S.-Mexico border. ADOT classifies US 191 Business as an “urban principal arterial – other” roadway between SR 80 and the U.S.-Mexico border. The posted speed limit on US 191 Business is 35 mph. The existing US 191 Business roadway section includes two through lanes in both the NB and SB directions, separated by a TWLTL, along with curb/gutter, sidewalk, and a shared use path on the west side.

2.1.2 Local Roadway Network

James Ranch Road runs north-south in the study area and is currently a privately-owned unpaved two-lane local roadway. James Ranch Road is anticipated to serve as the connector road between the proposed commercial IPOE at the U.S.-Mexico border and SR 80 (assuming that James Ranch Road is the preferred alignment alternative for the connector road). The parcels along the James Ranch Road alignment south of SR 80 are zoned as “C-Developing” by Cochise County and are anticipated to contain industrial and/or commercial land uses in the future when the proposed commercial IPOE connector road is constructed.

Chino Road is currently located outside the study area but is notable because it serves as a connector road between SR 80 and US 191 Business. Chino Road generally runs north-south and is owned, operated, and maintained by the City of Douglas. Chino Road currently intersects SR 80 approximately 0.45 miles east of US 191 and intersects US 191 Business approximately 0.15 miles north of the RHC IPOE. ADOT classifies Chino Road as an “urban minor arterial” roadway. The existing Chino Road roadway section near SR 80 includes one through lane in both the NB and SB directions along with paved shoulders that vary from one foot to eight feet in width. The City of Douglas is planning to realign Chino Road to tie into the currently barricaded south leg of the intersection of SR 80 / US 191 by 2028 but this improvement is not yet funded.

2.1.3 Intersections

The TWSC intersection of **SR 80 / James Ranch Road** is located near milepost 360.6 along SR 80. The EB and WB approaches to the intersection each have a left-turn lane, a through lane, and a shared through/right-turn lane. The NB and SB approaches each have a shared left-turn/through/right-turn lane. The existing SR 80 / James Ranch Road intersection lane geometry is shown in **Figure 2.1**. The area surrounding the SR 80 / James Ranch Road intersection is largely undeveloped. A single-family residence is located near the northeast corner of the intersection and some other structures exist to the east and west of the road south of SR 80.

The signalized intersection of **SR 80 / US 191** is located near milepost 364.7 along SR 80. The intersection is currently constructed as a four-legged intersection but functions as a three-legged T-intersection because the south leg is barricaded. As mentioned previously, the City of Douglas is planning to realign Chino Road by 2028 to tie into the currently barricaded south leg of the intersection of SR 80 / US 191. The EB and WB approaches to the intersection each have a left-turn lane, two through lanes, and a right-turn lane. The NB and SB approaches each have a left-turn lane and a shared through/right-turn lane. The existing SR 80 / US 191 intersection lane geometry is shown in **Figure 2.2**. Three quadrants of the SR 80 / US 191 intersection are undeveloped. The ADOT Commercial Inspection Facility and an ADOT Motor Vehicle Division Customer Service Center are located on the northeast corner of the intersection.

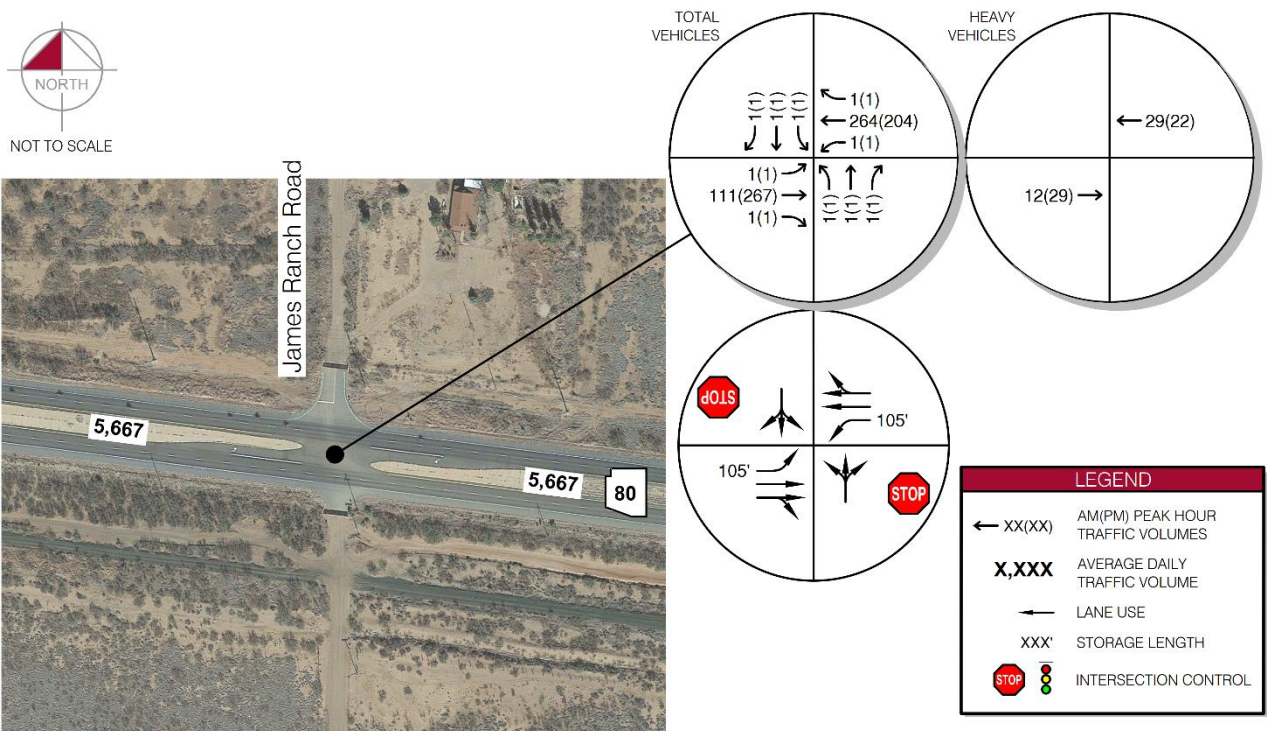


Figure 2.1 – Existing Conditions: SR 80 / James Ranch Road Intersection

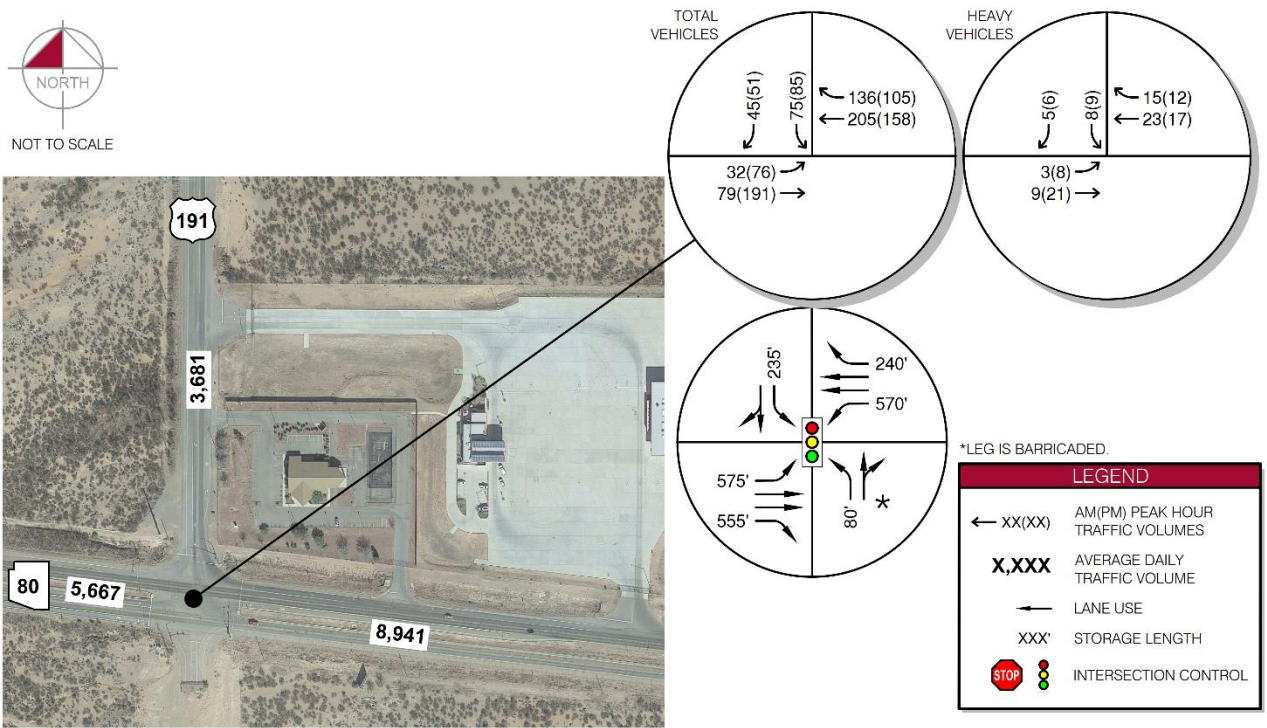


Figure 2.2 – Existing Conditions: SR 80 / US 191 Intersection

2.1.4 Transit and Active Transportation

The City of Douglas currently has bus routes that run along SR 80 between the RHC IPOE east of the study area and Cochise College, located approximately 2.5 miles west of James Ranch Road. Current pedestrian traffic is estimated to be very low along SR 80, US 191, and James Ranch Road in the study area due to the study area's distance from the City of Douglas, minimal adjacent development, and lack of pedestrian accommodations. Bicyclists are currently accommodated along SR 80 by the approximately ten-foot-wide paved outside shoulders in each travel direction.

2.2 Existing Ports of Entry

The existing RHC IPOE located along the U.S.-Mexico border at the southern terminus of US 191 Business (Pan American Avenue) is open from 9 AM to 5 PM daily. The RHC IPOE has seven lanes that process vehicular traffic entering the United States. One of these lanes is a designated Secure Electronic Network for Travelers Rapid Inspection (SENTRI) lane that allows expedited processing for pre-approved travelers. The number of dedicated commercial vehicle lanes varies, with a maximum of two lanes dedicated to commercial vehicles at a time. Per information provided by ADOT staff, all commercial vehicles entering the United States at the RHC IPOE are required to continue to the ADOT Commercial Inspection Facility on the northeast corner of the intersection of SR 80 / US 191 for additional processing before traveling to their ultimate destination. The RHC IPOE also has a facility east of the vehicle lanes to process pedestrian traffic. The facility has three booths for processing pedestrians; however, not all booths are open at all times.

The existing ADOT Commercial Inspection Facility on the northeast corner of the SR 80 / US 191 intersection is typically open the same hours as the RHC IPOE (9AM to 5PM daily). All inbound commercial vehicles from Mexico, as well as commercial vehicles traveling in both directions on US 191 and SR 80, are required to be processed at the ADOT Commercial Inspection Facility when it is open. The ADOT Commercial Inspection Facility has one driveway on SR 80 and one driveway on US 191. Internal site circulation follows a counterclockwise direction. Access at the SR 80 driveway is restricted to right-in/right-out movements due to the presence of the median on SR 80.

2.3 Existing Traffic Volumes and Operations

2.3.1 Truck Traffic at the Ports of Entry

Existing truck traffic volume data at the RHC IPOE was obtained from the Douglas Arizona Regional Feasibility Study prepared by Stantec in June 2018 (Stantec Study). The study obtained traffic data from the U.S. Customs and Border Patrol (CBP) collected from February 2017 to January 2018 for vehicles entering the United States. The collected vehicle data differentiated between passenger cars, also referred to as personally-owned vehicles (POVs), and trucks, also referred to as commercially-operated vehicles (COVs). The peak number of trucks processed at the RHC IPOE was 24 trucks per hour, with a total estimated

demand of 31 trucks per hour. The truck volumes reported by the Stantec Study were utilized to represent anticipated truck volumes at the proposed commercial IPOE as detailed in Section 3.4.2 of this report.

ADOT provided 2021 and 2022 monthly statistics for processing of trucks at the ADOT Commercial Inspection Facility. This data indicates that truck volumes vary over time throughout the year but the data is not broken out by hour or direction of travel.

Relevant excerpts from the Stantec Study and ADOT annual volume data from the Douglas State POE are included in **Appendix 1** and **Appendix 2**, respectively.

2.3.2 Intersection and Roadway Traffic Volumes

Existing (2021) morning (AM) and afternoon (PM) peak period turning movement counts (TMCs) were estimated at the intersections of SR 80 / James Ranch Road and SR 80 / US 191 based on bi-directional average daily traffic (ADT) counts from the ADOT Transportation Data Management System (TDMS) and from the Southeastern Arizona Governments Organization (SEAGO) TDMS. Details regarding the ADOT and SEAGO counts are provided in **Appendix 3**.

The EB and WB through volumes at the intersection of SR 80 / James Ranch Road were estimated using the total AM and PM peak hour volumes from the ADOT TDMS counts. Existing volumes on James Ranch Road are anticipated to be very low due to the lack of development along the existing unpaved roadway. Therefore, a small volume was assumed on all movements other than the SR 80 mainline through traffic movements for the purposes of obtaining existing level of service (LOS) results.

Turning movement volumes at the existing intersection of SR 80 / US 191 were estimated based on the relative proportion of ADT volumes on each intersection leg.

The peak hour and ADT volumes at the existing intersections are shown in the previously referenced **Figure 2.1**. Existing traffic volume calculations are included in **Appendix 4**.

The EB and WB through volumes on SR 80 are heavily directional in the AM peak hour and moderately directional in the PM peak hour. The WB volumes are over 100 percent greater than the EB approach volumes in the AM peak hour, and the EB volumes are about 30 percent greater than the WB volumes in the PM peak hour. Daily EB and WB volumes on SR 80 are approximately equal.

Existing medium and heavy vehicle (truck) percentages along the study area roadways were obtained from the 2021 ADOT Average Annual Daily Traffic Reports.

Table 2.1 summarizes the existing ADT, K-factors (design peak hour percentage of daily volume), D-factors (directional split), T-factors (truck percentage), and percent medium and heavy vehicles (per the Federal Highway Administration [FHWA] 13-Class classification scheme detailed later in Section 7 of this report) obtained from the ADOT TDMS for the study area roadways. More information on existing TDMS traffic data can be found in **Appendix 3**.

Table 2.1 – Existing Traffic Data Summary

Input	SR 80 west of James Ranch Road	SR 80 / US 191			
		North Leg	South Leg	East Leg	West Leg
ADT (vpd)	5,667	3,681	-	8,941	5,667
K-Factor	9%	9%	-	8%	9%
D-Factor	59%	60%	-	54%	59%
T-Factor	11%	11%	-	11%	11%
Medium Vehicle %	6%	7%	-	9%	6%
Heavy Vehicle %	5%	4%	-	2%	5%

3. FUTURE TRAFFIC VOLUMES ANALYSIS AND ALTERNATIVES

3.1 Available Future Conditions Models and Data

Future conditions data was obtained from the following travel demand models:

- ADOT statewide model
- Sierra Vista Metropolitan Planning Organization (SVMPO) model

Upon initial analysis of both models, neither was found to adequately predict future traffic conditions within the study area. The ADOT statewide model has not been updated or calibrated for this area in many years and the model volumes and projected growth rates on SR 80 do not appear reasonable compared to existing counted volumes and expected growth rates. The SVMPO model extents are somewhat close to, but do not include, the study area. Information from the SVMPO model end links is not applicable as there are several roadway network connections between the edge of the SVMPO model and the study area. Therefore, neither travel demand model was used to determine future traffic conditions. The ADOT and SVMPO model outputs are included in **Appendix 3** for reference.

Instead of using model projections, 2040 annual average daily traffic (AADT) projections from the ADOT TDMS were used to calculate an average annual growth rate for the study roadway segments. Based on the existing and 2040 AADT projections, a growth rate of two percent per year was applied to the existing traffic volumes on SR 80 and US 191 to estimate opening year 2028 and horizon year 2050 daily and peak hour traffic volumes. Detailed volume calculations can be found in **Appendix 4**.

3.2 Future Build Analysis Alternatives

The following intersection configuration alternatives were analyzed at the study intersection of SR 80 / James Ranch Road under the opening year 2028 Build and horizon year 2050 Build conditions (see illustrations of the general intersection configurations, control types, and control locations shown in **Figure 3.1**):

- TWSC
- Traffic Signal Control
- Roundabout

The TWSC configuration assumes the existing northbound/southbound stop control on James Ranch Road remains; however, different lane geometry than existing was considered in the future analyses. The traffic signal control configuration assumes the installation of a traffic signal at the study intersection. The roundabout configuration assumes the installation of a two-lane roundabout at the study intersection.

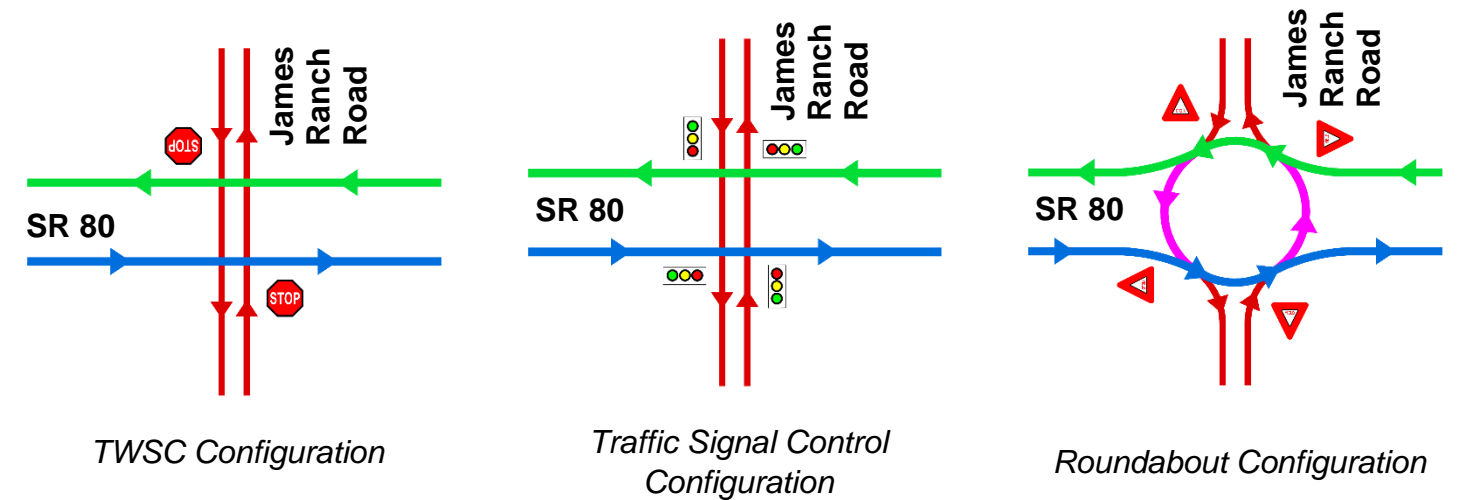


Figure 3.1 – Intersection Configuration Alternatives Analyzed

Additionally, the SR 80 / US 191 intersection was analyzed for all scenarios to identify how the intersection will be affected by the change in truck traffic routing from the proposed commercial IPOE and other traffic growth. The intersection was analyzed with its current lane geometry in the existing and 2028/2050 No-Build scenarios. The Chino Road re-route described in Section 2.1.2 was assumed to occur in the 2028/2050 Build scenarios; therefore, the currently-barricaded south leg of the intersection was analyzed as being open in these scenarios.

3.3 Future Land Use Forecast

The parcels along the James Ranch Road alignment south of SR 80 are zoned as “C-Developing” by Cochise County and are anticipated to contain commercial and/or industrial land uses. Because no detailed land use plans were available at the time of this report, it was assumed that the parcels fronting James Ranch Road and a portion of other parcels near James Ranch Road will contribute traffic to the proposed connector road. The parcels that were assumed to contribute to traffic on James Ranch Road are shown in **Figure 3.2**. It was assumed that all traffic from the parcels outlined in green and 30 percent of all traffic from the parcels outlined in blue would utilize James Ranch Road to get to and from SR 80. To estimate a leasable floor area for each parcel, a floor-area ratio (FAR) of 0.25 was assumed for all parcels. Additionally, it was assumed that 30 percent of the total adjacent parcel area would be developed by opening year 2028 and 100 percent of the total adjacent parcel area would be developed by horizon year 2050.

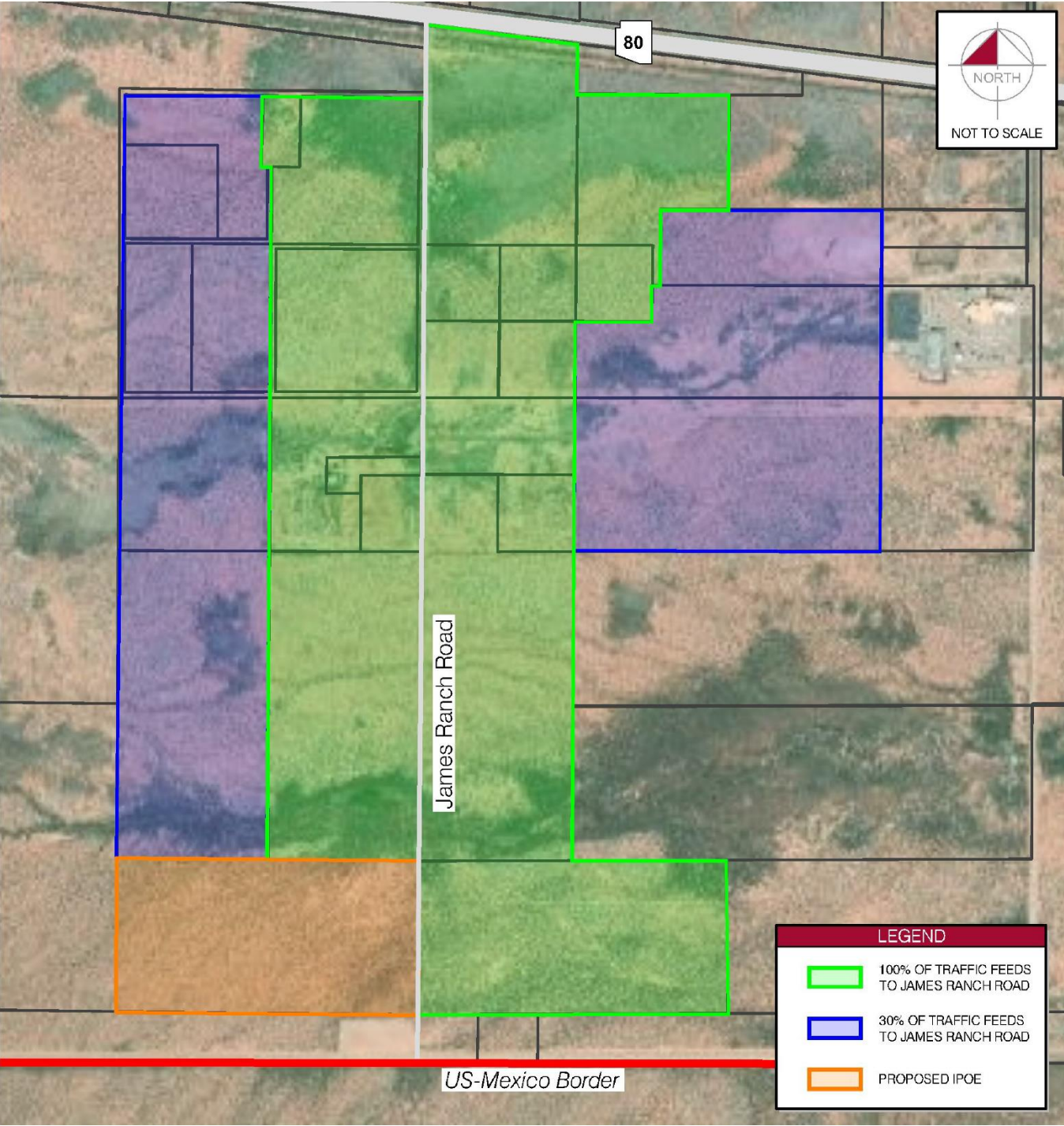


Figure 3.2 – Adjacent Parcel Area Assumptions

3.4 Future Traffic Volumes

3.4.1 Growth of Existing Traffic

Existing traffic on SR 80 and US 191 was grown based on a comparison of the existing and 2040 projected ADT volumes from the ADOT TDMS. From these volumes, an average annual growth rate of two percent per year was determined. This rate was applied to the existing volumes along SR 80, US 191, and Chino Road to obtain opening year 2028 and horizon year 2050 traffic volumes. Like the existing conditions analysis, a small traffic volume was also assumed for movements at the study intersections that are not anticipated to be affected by development on James Ranch Road south of SR 80. This assumed volume was increased in each successive analysis year to account for potential growth.

3.4.2 Proposed Commercial IPOE Traffic Volumes

Future volumes generated by the proposed commercial IPOE were estimated based on the existing traffic count data collected at the RHC IPOE from the Stantec Study previously described in Section 2.2. The study utilized the peak volume day of the 90th percentile peak volume week to determine daily and hourly passenger vehicle and heavy vehicle volumes. From this data, a daily heavy vehicle peak hour volume was determined, and a demand factor of 1.3 was applied to account for additional traffic demand that arrived within the peak hour but was not processed. The same peak hour heavy vehicle demand volume was assumed for the proposed commercial IPOE’s trip generation for both trips entering and exiting the United States during both the AM and PM peak hours and represents a conservative estimate of expected traffic. Relevant excerpts from the Stantec Study are included in **Appendix 1**.

The proposed commercial IPOE trip generation was then distributed to the roadway network based on existing and anticipated traffic patterns in the study area. It is anticipated that all truck traffic entering the U.S. will be required to travel to the ADOT Commercial Inspection Facility located on the northeast corner of the intersection of SR 80 / US 191 for additional processing. Therefore, traffic entering the U.S. was first routed to the ADOT Commercial Inspection Facility before being distributed east and west along SR 80 and north on US 191. Entering and exiting traffic was distributed based on existing and anticipated traffic patterns on SR 80 and US 191.

The proposed commercial IPOE traffic assignment was grown based on the average annual growth rate used in the Stantec Study. The Stantec Study analyzed historical inbound volumes processed at the RHC IPOE between 2011 and 2017 and calculated an average annual growth rate of 1.1 percent per year. The proposed commercial IPOE traffic was assumed to grow at this annual rate to the opening year 2028 and horizon year 2050. Future traffic volume calculations for the proposed commercial IPOE are included in **Appendix 4**.

3.4.3 Adjacent Development Traffic Volumes

Volumes were estimated for the future developments along James Ranch Road south of US 80 using the Institute of Transportation Engineers (ITE) *Trip Generation Manual*, 11th Edition. Trip generation was calculated using the “peak hour of generator” rates for ITE Land Use 150, Warehousing, to provide an estimate of peak hour traffic that could be generated by the future developments. The land use assumptions for the parcels anticipated to contribute traffic to the connector road are described previously in Section 3.3.

These adjacent development trips were distributed to the roadway network based on anticipated traffic patterns to and from the developments. Because most peak hour trips to and from warehousing land uses are commuters to and from residential areas, traffic is anticipated to be weighted heavily in the direction of Douglas. Therefore, it was estimated that 85 percent of traffic would travel to and from the east and 15 percent of traffic would travel to and from the west on SR 80. Trip generation calculations for the adjacent developments are shown in **Appendix 4**.

Heavy vehicle/truck percentages for the adjacent development traffic assignment were estimated based on Appendix I of the ITE *Trip Generation Handbook*, 3rd Edition and a comparison of the heavy vehicle and total vehicle trip generation rates in the ITE *Trip Generation Manual*. Based on these data, 20 percent of trips to and from the adjacent developments were assumed to be heavy vehicles.

3.4.4 Future Volumes and Lane Configuration Summary

The calculated average annual growth rates discussed in Section 3.4.1 were applied to the existing traffic volumes to obtain traffic volumes for the opening year 2028 and horizon year 2050 No-Build scenarios. The No-Build scenarios assume that the proposed commercial IPOE and the future warehousing developments along James Ranch Road are not constructed and that no changes are made to existing roadway geometry.

To determine future Build condition traffic volumes, the existing traffic volumes and the proposed commercial IPOE volumes were grown by the average annual growth rates discussed in Section 3.4.1 and Section 3.4.2, respectively. The grown existing volumes, the adjacent development volumes discussed in Section 3.4.3, and the grown proposed commercial IPOE traffic volumes were added together to obtain the total traffic volumes for the opening year 2028 and horizon year 2050 Build scenarios. In addition to the geometric improvements of the future Build analysis alternatives, the Build condition assumes that the Chino Road re-route described in Section 2.1.2 is completed by 2028.

The resultant 2028 and 2050 traffic volumes and lane configurations for the different SR 80 / James Ranch Road intersection configurations and for the SR 80 / US 191 intersection are presented in the following figures:

SR 80 / James Ranch Road:

- 2028 No-Build – **Figure 3.3**
- 2028 Build – **Figure 3.4**
- 2050 No-Build – **Figure 3.5**
- 2050 Build – **Figure 3.6**

SR 80 / US 191:

- 2028 No-Build – **Figure 3.7**
- 2028 Build – **Figure 3.8**
- 2050 No-Build – **Figure 3.9**
- 2050 Build – **Figure 3.10**

Table 3.1 and **Table 3.2** summarize the opening year 2028 and horizon year 2050 ADTs, K-factors, D-factors, and T-factors for each leg of the SR 80 / James Ranch Road and SR 80 / US 191/Chino Road intersections, respectively.

Table 3.1 – SR 80 / James Ranch Road Future Traffic Summary

Input	North Leg	South Leg	East Leg	West Leg
2028 ADT (vpd)	300	6,300	13,200	8,000
2050 ADT (vpd)	700	19,200	30,500	14,100
AM (PM) K-Factor	9% (9%)	9% (9%)	7% (8%)	7% (8%)
D-Factor	50%	55%	51%	56%
2028 T-Factor	2%	30%	21%	18%
2050 T-Factor	2%	24%	20%	17%

Table 3.2 – SR 80 / US 191/ Chino Road Future Traffic Summary

Input	North Leg	South Leg	East Leg	West Leg
2028 ADT (vpd)	6,900	3,500	11,900	12,600
2050 ADT (vpd)	11,900	5,400	28,000	29,500
AM (PM) K-Factor	6% (8%)	7% (7%)	7% (8%)	6% (7%)
D-Factor	56%	63%	57%	50%
2028 T-Factor	27%	5%	15%	23%
2050 T-Factor	24%	5%	17%	21%

Note that the K-factors used in the future analysis differ from the existing K-factors from the ADOT TDMS. For the future volumes analysis, these values were recalculated from the hourly TDMS volume data for both the AM and PM peak hours separately to provide an estimate that better reflects the available data for future traffic conditions. Additionally, T-factors were applied per turning movement instead of per approach in the analysis. The approach T-factors reported above represent the weighted average truck percentages by movement volume and are provided for reference.

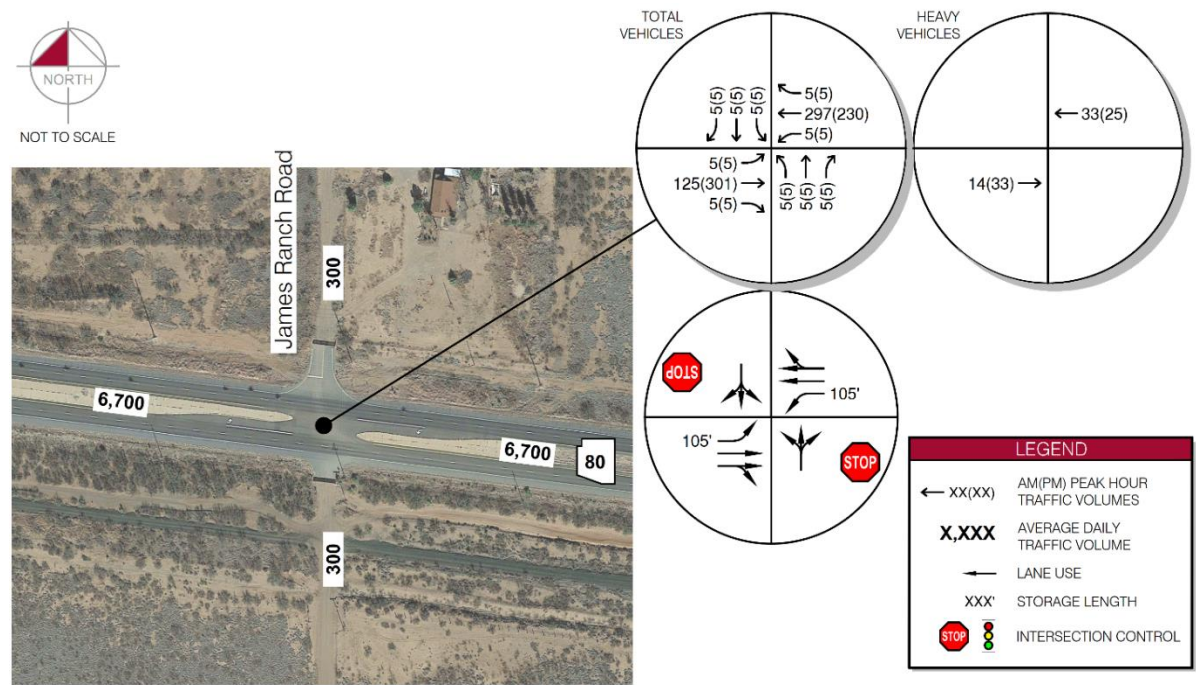


Figure 3.3 – SR 80 / James Ranch Road: 2028 No-Build Traffic Volumes & Lane Configuration

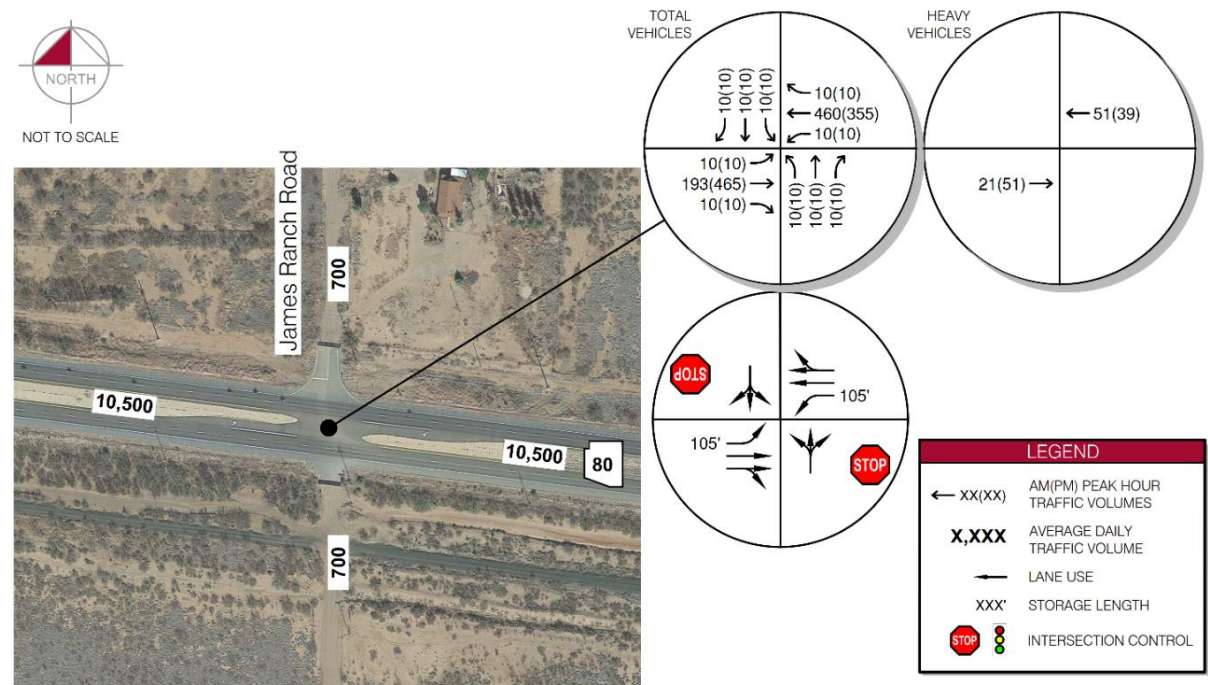


Figure 3.5 – SR 80 / James Ranch Road: 2050 No-Build Traffic Volumes & Lane Configuration

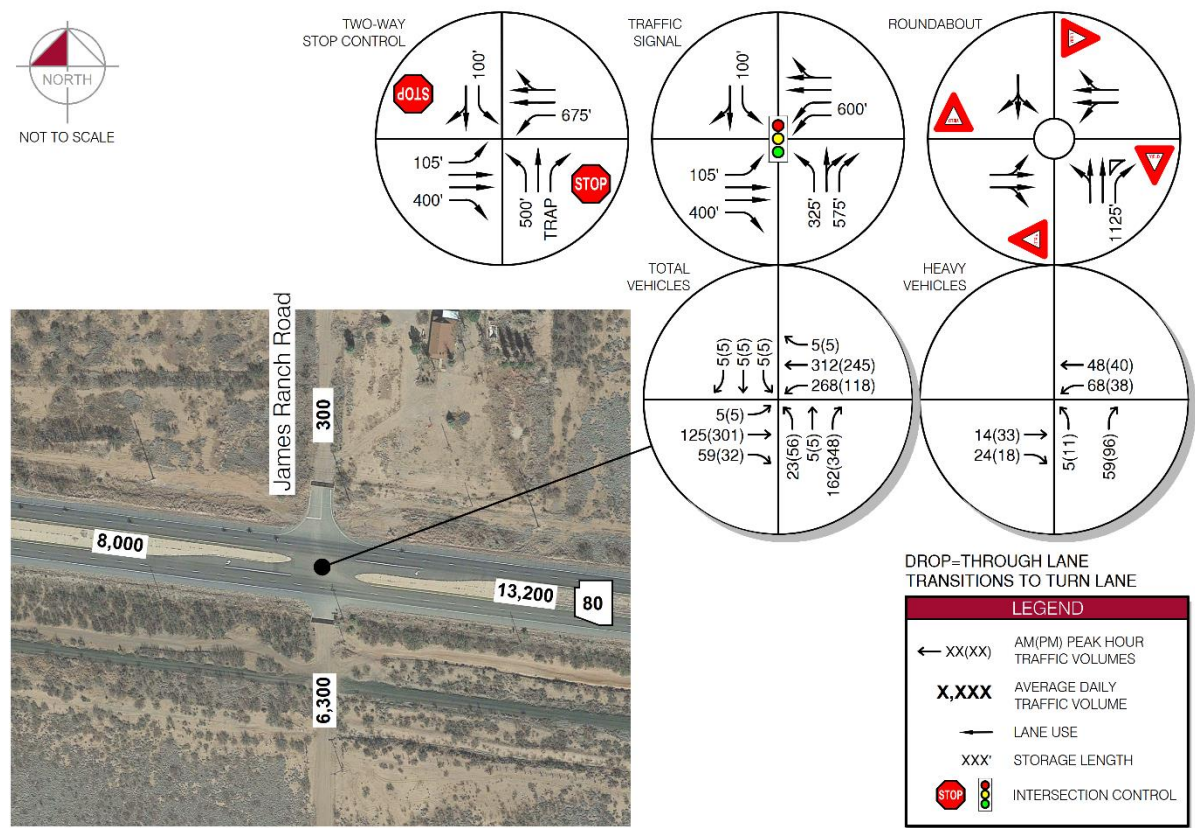


Figure 3.4 – SR 80 / James Ranch Road: 2028 Build Traffic Volumes & Lane Configuration

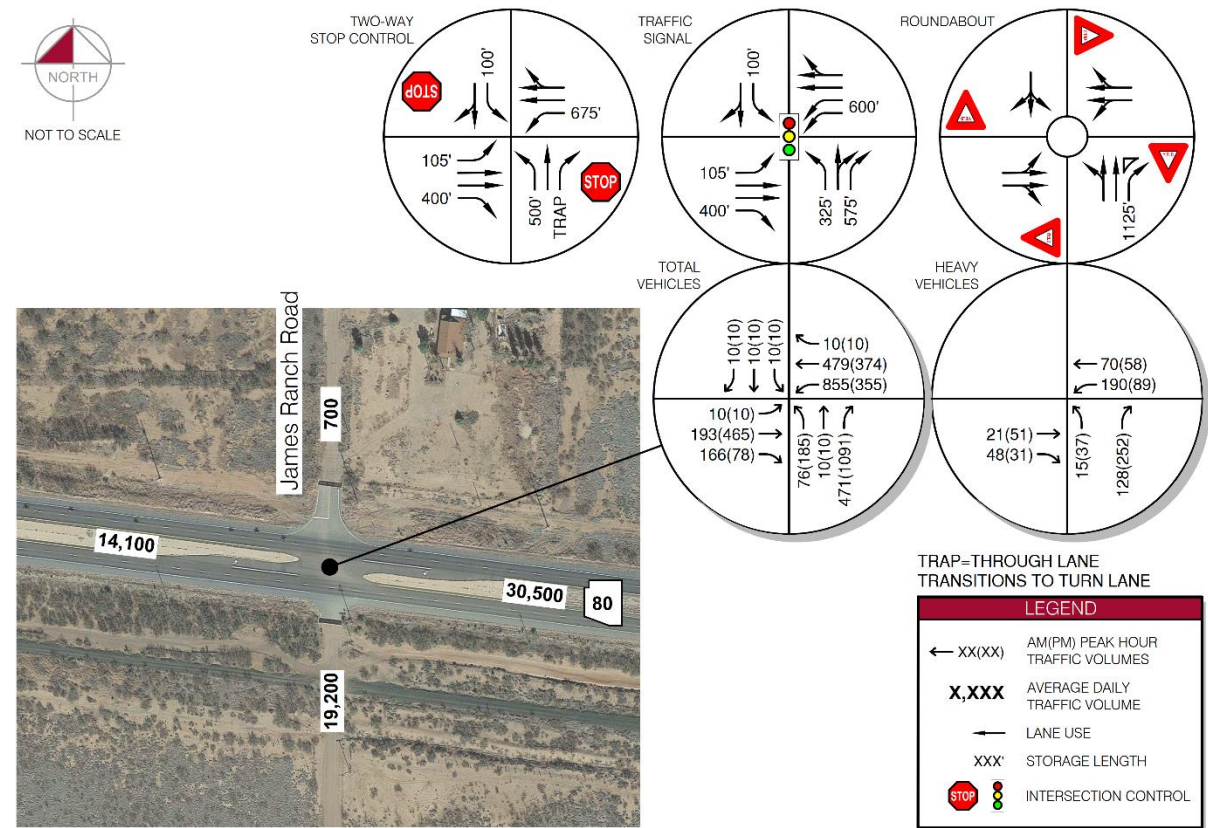


Figure 3.6 – SR 80 / James Ranch Road: 2050 Build Traffic Volumes & Lane Configuration

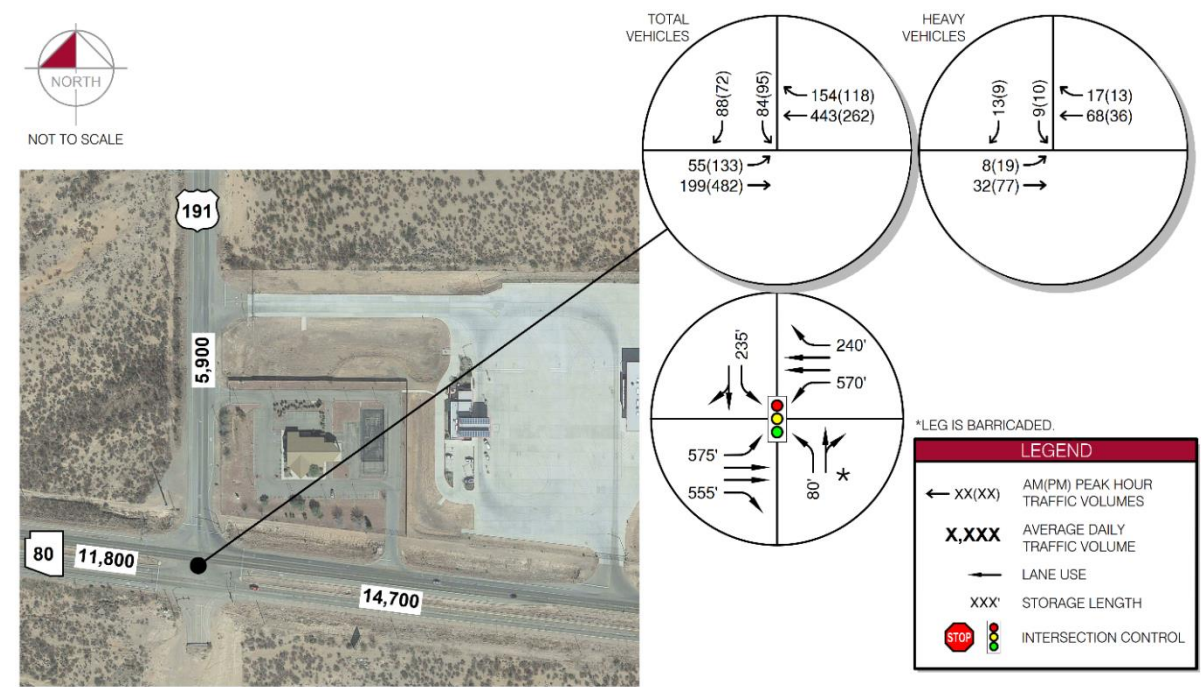


Figure 3.7 – SR 80 / US 191: 2028 No-Build Traffic Volumes & Lane Configuration

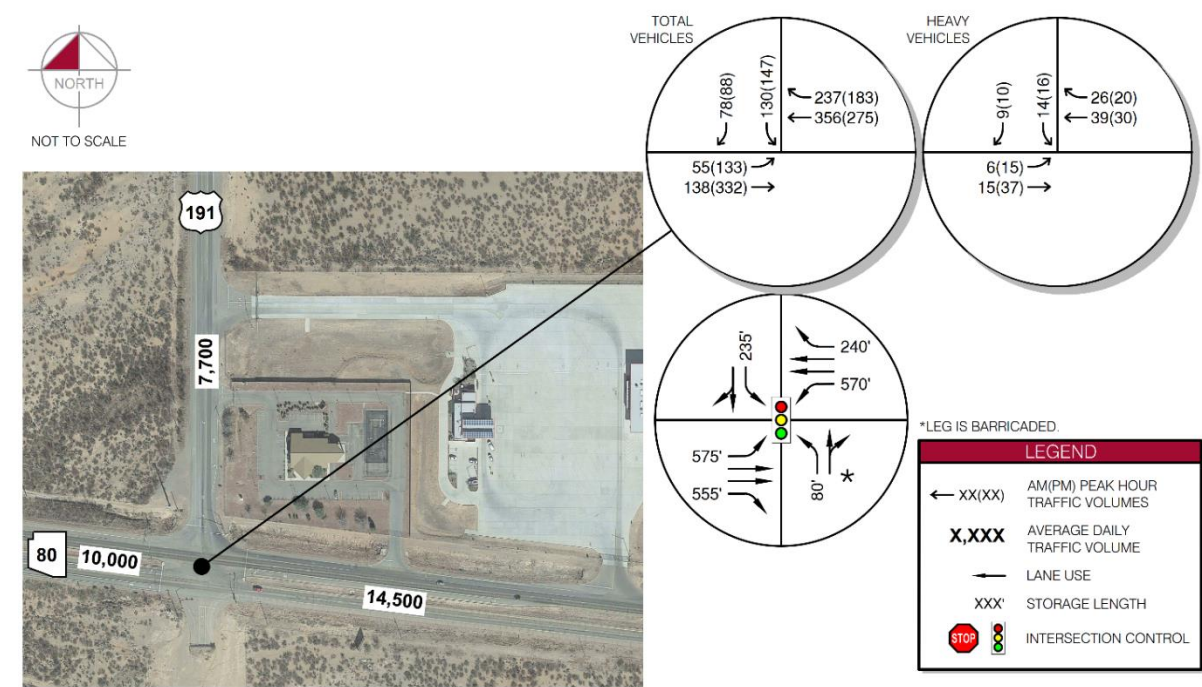


Figure 3.9 – SR 80 / US 191: 2050 No-Build Traffic Volumes & Lane Configuration

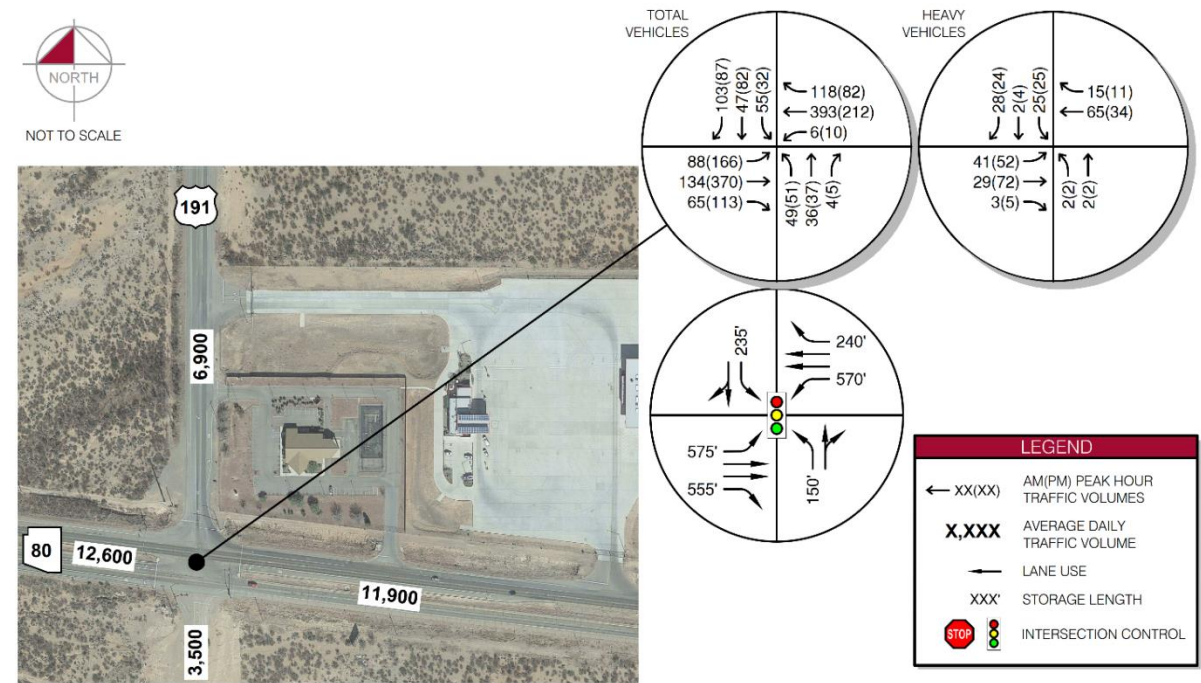


Figure 3.8 – SR 80 / US 191: 2028 Build Traffic Volumes & Lane Configuration

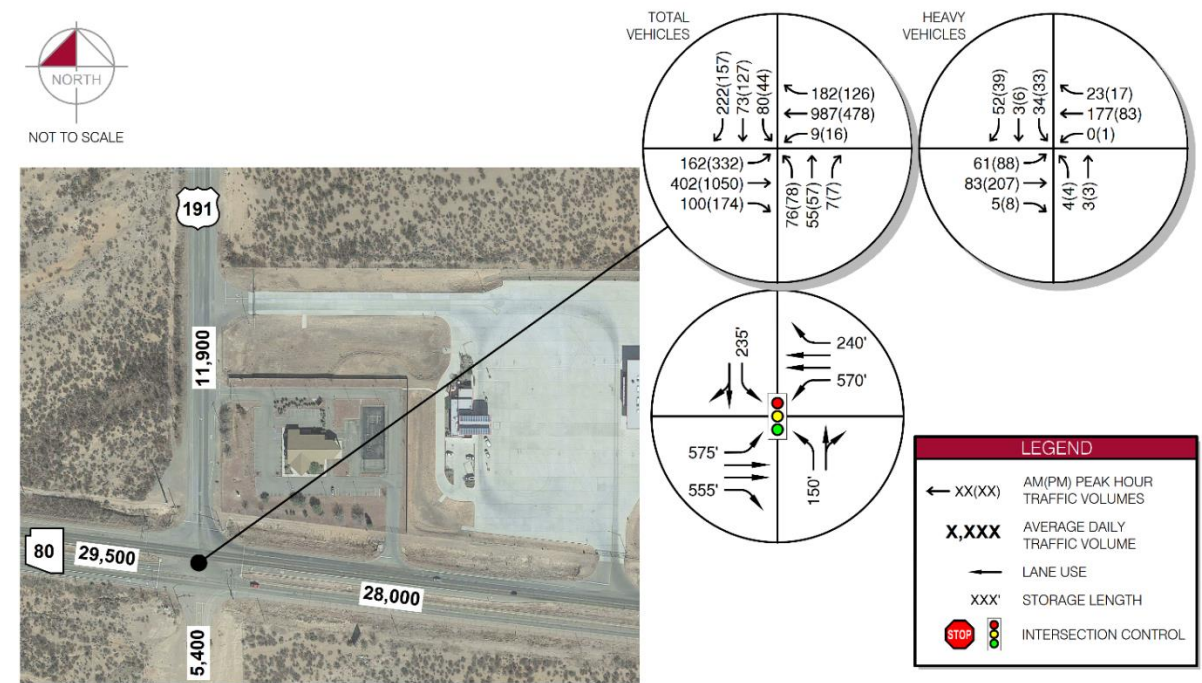


Figure 3.10 – SR 80 / US 191: 2050 Build Traffic Volumes & Lane Configuration

The recommended storage lengths shown in **Figure 3.4** through **Figure 3.10** were determined using the methodology outlined in ADOT Traffic Guidelines and Processes (TGP) Section 430. Tables 430-1 and 430-2 from the TGP were used to select an appropriate gap and braking distance, respectively. The 95th percentile queues from the different operational analyses presented in Section 5 of this report were used as the queue portion of the storage described in TGP 430.

Per ADOT TGP 245, an exclusive EB right-turn lane is warranted at the intersection of SR 80 / James Ranch Road based on projected 2028 and 2050 peak hour turning movement volumes.

Relevant excerpts from TGP 430 and TGP 245 are included in **Appendix 5**.

4. CRASH SUMMARY

A crash summary was conducted for crashes occurring along SR 80 between approximately 1,5 miles west of James Ranch Road and 1.0 mile east of James Ranch Road to identify any crash patterns or trends that may be present within the study area.

Crash data was obtained from ADOT for the dates between January 1, 2017 and December 31, 2021, the five most current full years available.

Nineteen total crashes were reported along this SR 80 study segment. Of the 19 total crashes, there were two angle crashes (11 percent of total crashes). One angle crash occurred at the driveway on SR 80 approximately 1.5 miles west of James Ranch Road and the other occurred at the intersection of SR 80 / Kings Highway (1.0 mile east of James Ranch Road). The crash reported west of James Ranch Road resulted in a suspected serious injury, while the crash east of James Ranch Road resulted in no injury.

The remaining 17 crashes were all single-vehicle crashes along SR 80 (89 percent of total crashes). Of these crashes, 12 crashes involved an animal, 3 crashes involved an object, and 2 crashes were rollovers. Of the single-vehicle crashes, 13 crashes resulted in no injuries, 2 crashes resulted in possible injury, and 2 crashes resulted in suspected minor injury.

Overall, 12 of the 19 total crashes occurred in dark, not lighted conditions (63 percent), 1 occurred during dusk (5 percent), 1 occurred in dark, lighted conditions (5 percent), and 5 occurred in daylight (27 percent). This may indicate lighting issues on SR 80.

Summaries of the total crashes and crash severity by year are shown in **Figure 4.1** and **Figure 4.2**, respectively. **Figure 4.3** shows the locations of all crashes within the study period by injury severity. Note that in these figures, the crash type of one crash is classified as “other”. This crash was described as occurring with an “other non-fixed object” and was therefore included as a single-vehicle crash for the purposes of this analysis.

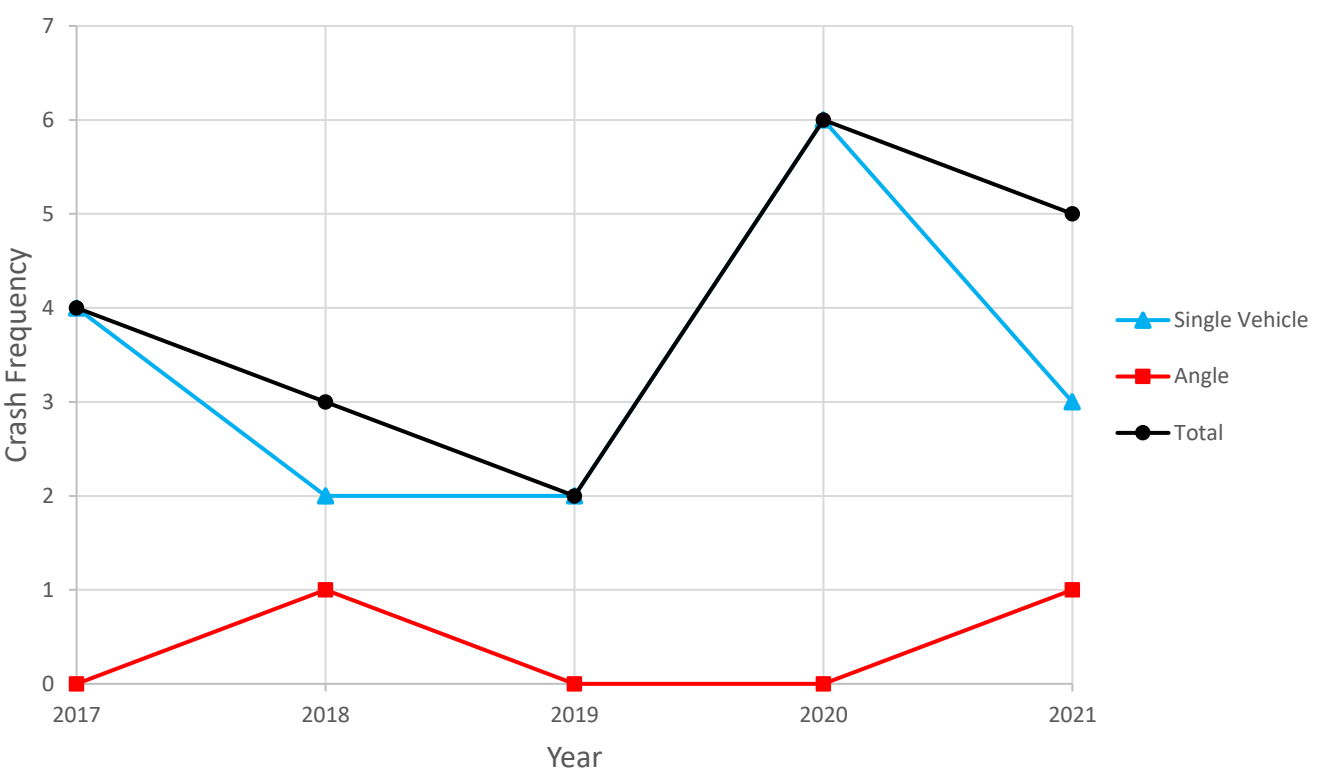


Figure 4.1 – Crash Type by Year

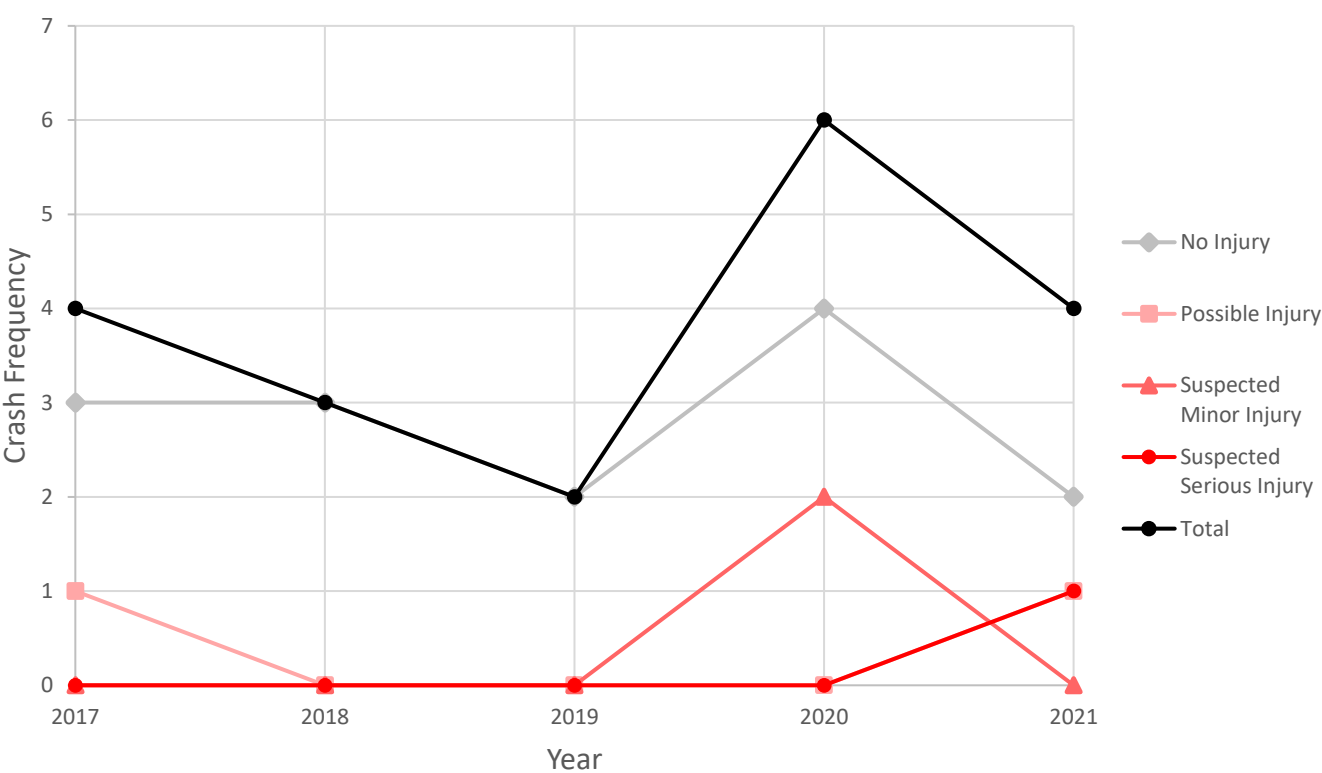
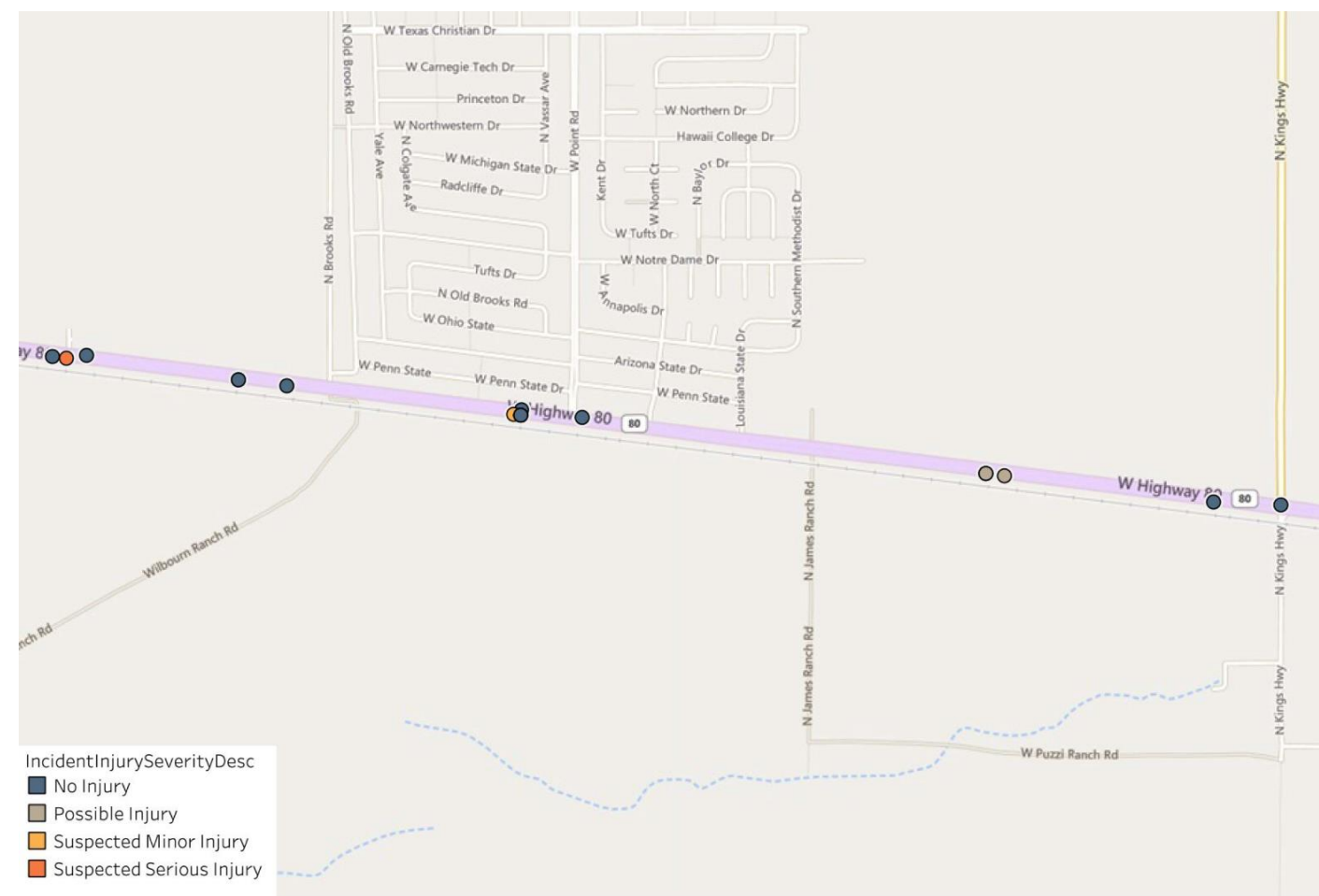


Figure 4.2 – Crash Severity by Year



Source: ADOT

Figure 4.3 – Crash Map

5. OPERATIONAL ANALYSIS

5.1 Intersection Analysis Methodology

An intersection operational analysis was performed at the intersections of SR 80 / James Ranch Road and SR 80 / US 191 for the Existing, 2028 No-Build, 2050 No-Build, 2028 Build, and 2050 Build conditions (for the previously mentioned potential intersection configuration alternatives). The level of service (LOS) and queueing analyses for the TWSC and traffic signal control alternatives were completed using the Highway Capacity Manual, 6th Edition (HCM 6) methodology via Synchro 11 analysis software. Existing signal timing data provided by ADOT at the SR 80 / US 191 intersection were used in the existing and future analyses. The analysis of the Roundabout alternative was completed using Rodel 1.96 analysis software.

Each intersection, approach, or movement is given a letter designation from LOS A to LOS F. LOS A represents operational conditions with minimal delay and traffic volumes significantly less than available capacity (volume-to-capacity ratio [v/c] < 1). LOS F represents poor operational conditions with a high degree of delay and/or traffic volumes greater than the available capacity (v/c >1). Each LOS grade represents a range of operational conditions. **Table 5.1** shows the average vehicle delay ranges for signalized and unsignalized intersections (including roundabouts) that correspond with each LOS letter grade. Note that the HCM methodology does not provide an overall intersection LOS for TWSC intersections.

Table 5.1 – Level of Service Thresholds for Signalized and Unsignalized Intersections

Level of Service	Control Delay (s/veh)	
	Signalized Intersections	Unsignalized Intersections
A	≤ 10	≤ 10
B	> 10 and ≤ 20	> 10 and ≤ 15
C	> 20 and ≤ 35	> 15 and ≤ 25
D	> 35 and ≤ 55	> 25 and ≤ 35
E	> 55 and ≤ 80	> 35 and ≤ 50
F	> 80 or v/c > 1.0*	> 50 or v/c > 1.0*

*v/c = volume-to-capacity ratio
Source: HCM 6th Edition

The existing peak hour factors (PHF) were adjusted in all future analysis scenarios based on the projected traffic demand and proposed lane geometry in accordance with the following guidelines from the ADOT TGP Section 240 for future PHFs:

- PHF = 0.80 for < 75 vehicles per hour (vph) per lane
- PHF = 0.85 for 75 - 300 vph per lane
- PHF = 0.90 for > 300 vph per lane

5.2 Existing Intersection Conditions

The existing LOS, delay, and 95th percentile queues at the study area intersections were evaluated using the existing traffic volumes and lane geometry described previously in Section 2. The SR 80 / US 191 intersection was analyzed using current signal timings provided by ADOT. Existing signal timing inputs are provided in **Appendix 6**. The results of the Existing AM and Existing PM intersection capacity analyses are shown in **Table 5.2** and **Table 5.3**, respectively. Synchro output reports for the Existing analysis scenarios are provided in **Appendix 7**.

Table 5.2 – Existing Intersection Capacity Analysis Results: AM Peak Hour

Intersection	NB Approach			SB Approach			EB Approach			WB Approach			Overall	
	L	T	R	L	T	R	L	T	R	L	T	R		
SR 80 / James Ranch Road														
LOS	B			B			A	-			A	-		
Average Delay (s)	11			11			8	-			8	-		
95 th Percentile Queue (ft)	0			0			0	-			0	-		
SR 80 / US 191														
LOS				B		B	A	A			A	A	A	
Average Delay (s)				11		10	6	5			6	7	7	
95 th Percentile Queue (ft)				25		25	25	25			25	25	-	

All movements at the study area intersections under existing conditions operate at LOS B or better in the AM peak hour with reported 95th percentile queues no greater than 25 feet long.

Table 5.3 – Existing Intersection Capacity Analysis Results: PM Peak Hour

Intersection	NB Approach			SB Approach			EB Approach			WB Approach			Overall
	L	T	R	L	T	R	L	T	R	L	T	R	
SR 80 / James Ranch Road													
LOS	B			B			A	-		A	-		
Average Delay (s)	11			11			8	-		8	-		
95 th Percentile Queue (ft)	0			0			0	-		0	-		
SR 80 / US 191													
LOS				B		B	A	A			A	A	A
Average Delay (s)				11		10	7	6			6	6	7
95 th Percentile Queue (ft)				25		25	25	25			25	25	-

All movements at the study area intersections under existing conditions operate at LOS B or better in the PM peak hour with reported 95th percentile queues no greater than 25 feet long.

5.3 No-Build Intersection Analysis

The 2028 and 2050 No-Build LOS, delay, and 95th percentile queues at the study area intersections were evaluated using the 2028 and 2050 No-Build volumes and the existing geometry described previously in Section 2. The No-Build scenarios assume existing lane geometry, including the existing Chino Road alignment, and do not include proposed commercial IPOE or warehousing traffic volumes. The results of the 2028 No-Build AM, 2028 No-Build PM, 2050 No-Build AM and 2050 No-Build PM intersection capacity analyses are shown in **Table 5.4**, **Table 5.5**, **Table 5.6**, and **Table 5.7**, respectively. The Synchro output reports for the No-Build scenarios are provided in **Appendix 7**.

Table 5.4 – 2028 No-Build Capacity Analysis Results: AM Peak Hour

Intersection	NB Approach			SB Approach			EB Approach			WB Approach			Overall
	L	T	R	L	T	R	L	T	R	L	T	R	
SR 80 / James Ranch Road													
LOS	B			B			A	-		A	-		
Average Delay (s)	12			12			8	-		8	-		
95 th Percentile Queue (ft)	25			25			0	-		0	-		
SR 80 / US 191													
LOS				B		B	A	A			A	A	A
Average Delay (s)				11		11	7	5			6	7	7
95 th Percentile Queue (ft)				25		25	25	25			25	25	-

All movements at the study area intersections are expected to operate at LOS B or better in the 2028 No-Build scenario in the AM peak hour with 95th percentile queues no greater than 25 feet long.

Table 5.5 – 2028 No-Build Capacity Analysis Results: PM Peak Hour

Intersection	NB Approach			SB Approach			EB Approach			WB Approach			Overall	
	L	T	R	L	T	R	L	T	R	L	T	R		
SR 80 / James Ranch Road														
LOS	B			B			A	-			A	-		
Average Delay (s)	13			12			8	-			9	-		
95 th Percentile Queue (ft)	25			25			0	-			0	-		
SR 80 / US 191														
LOS				B		B	A	A			A	A	A	
Average Delay (s)				11		11	7	6			6	7	7	
95 th Percentile Queue (ft)				25		25	25	25			25	25	-	

All movements at the study area intersections are expected to operate at LOS B or better in the 2028 No-Build scenario in the PM peak hour with 95th percentile queues no greater than 25 feet long.

Table 5.6 – 2050 No-Build Capacity Analysis Results: AM Peak Hour

Intersection	NB Approach			SB Approach			EB Approach			WB Approach			Overall	
	L	T	R	L	T	R	L	T	R	L	T	R		
SR 80 / James Ranch Road														
LOS	B			C			A	-			A	-		
Average Delay (s)	15			16			9	-			8	-		
95 th Percentile Queue (ft)	25			25			0	-			0	-		
SR 80 / US 191														
LOS				B		B	A	A			A	A	A	
Average Delay (s)				15		14	7	5			6	7	8	
95 th Percentile Queue (ft)				50		25	25	25			25	50	-	

All movements at the study area intersections are expected to operate at LOS C or better in the 2050 No-Build scenario in the AM peak hour with 95th percentile queues no greater than 50 feet long.

Table 5.7 – 2050 No-Build Capacity Analysis Results: PM Peak Hour

Intersection	NB Approach			SB Approach			EB Approach			WB Approach			Overall	
	L	T	R	L	T	R	L	T	R	L	T	R		
SR 80 / James Ranch Road														
LOS	C			C			A	-			A	-		
Average Delay (s)	20			18			8	-			9	-		
95 th Percentile Queue (ft)	25			25			0	-			0	-		
SR 80 / US 191														
LOS				B		B	A	A			A	A	A	
Average Delay (s)				16		15	8	5			5	6	8	
95 th Percentile Queue (ft)				50		50	25	25			25	25	-	

All movements at the study area intersections are expected to operate at LOS C or better in the 2050 No-Build scenario in the PM peak hour with 95th percentile queues no greater than 50 feet long.

5.4 SR 80 / James Ranch Road Future Build Analysis

The 2028 and 2050 Build LOS, delay, and 95th percentile queues at the SR 80 / James Ranch Road intersection were evaluated using the 2028 and 2050 Build volumes and the TWSC, traffic signal control, and roundabout intersection configuration alternatives described previously in Section 3 of this report.

5.4.1 Two-Way Stop Controlled Intersection Capacity Analysis Results

An intersection diagram extracted from Synchro showing the TWSC lane geometry used in the 2028 and 2050 Build analyses is presented in **Figure 5.1**. The results of the 2028 Build AM, 2028 Build PM, 2050 Build AM and 2050 Build PM intersection capacity analyses with the TWSC configuration are shown in **Table 5.8**, **Table 5.9**, **Table 5.10**, and **Table 5.11**, respectively. The Synchro output reports for the TWSC configuration are provided in **Appendix 7**.

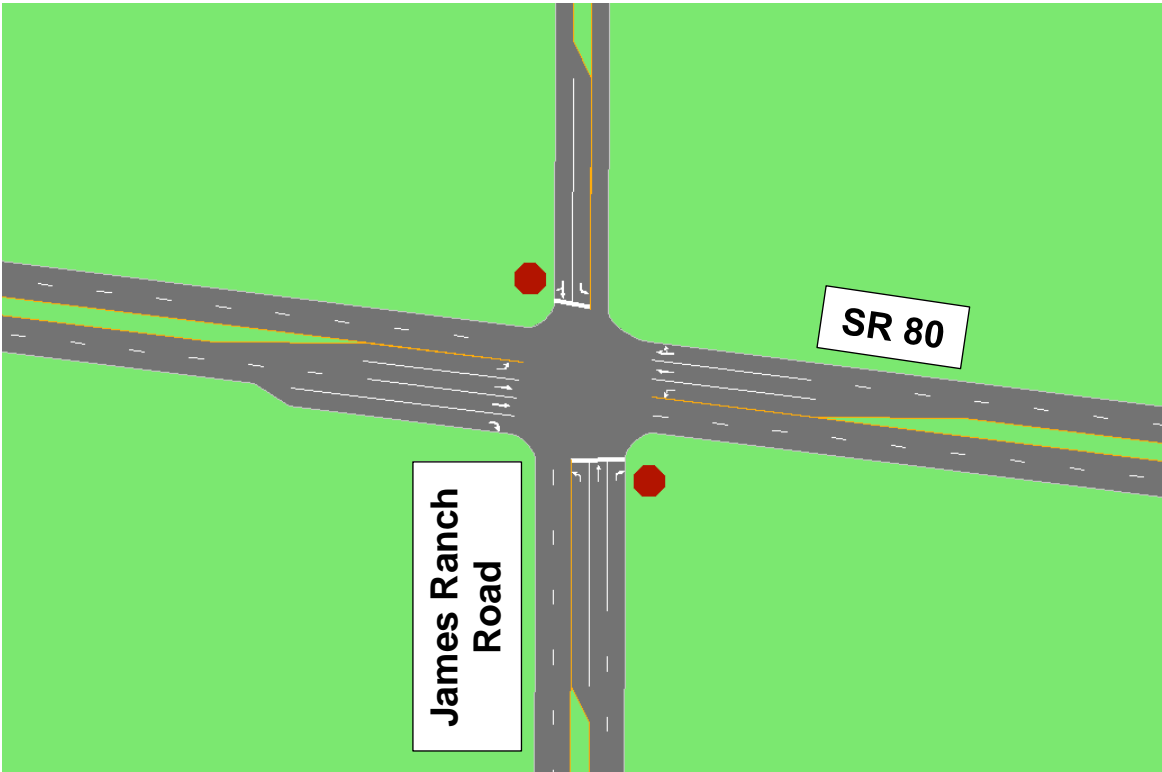


Figure 5.1 – SR 80 / James Ranch Road - TWSC Intersection Diagram

Table 5.8 – SR 80 / James Ranch Road - 2028 Build with TWSC Capacity Analysis
Results: AM Peak Hour

Intersection	NB Approach			SB Approach			EB Approach			WB Approach		
	L	T	R	L	T	R	L	T	R	L	T	R
LOS	E	D	B	E	C		A	-		A	-	
Average Delay (s)	38	32	10	43	22		8	-		9	-	
95 th Percentile Queue (ft)	25	25	25	25	25		0	-		0	-	

The NB and SB left-turn movements at the SR 80 / James Ranch Road intersection are anticipated to operate at LOS E in the 2028 Build with TWSC scenario during the AM peak hour. All other movements are anticipated to operate at LOS D or better. All movements are anticipated to have 95th percentile queues no greater than 25 feet long.

Table 5.9 – SR 80 / James Ranch Road - 2028 Build with TWSC Capacity Analysis
Results: PM Peak Hour

Intersection	NB Approach			SB Approach			EB Approach			WB Approach		
	L	T	R	L	T	R	L	T	R	L	T	R
LOS	D	C	B	D	C		A	-		A	-	
Average Delay (s)	30	22	15	35	16		8	-		9	-	
95 th Percentile Queue (ft)	50	25	75	25	25		0	-		25	-	

All movements at the SR 80 / James Ranch Road intersection are anticipated to operate at LOS D or better in the 2028 Build with TWSC scenario during the PM peak hour. All movements are anticipated to have 95th percentile queues no greater than 75 feet long.

Table 5.10 – SR 80 / James Ranch Road - 2050 Build with TWSC Capacity Analysis
Results: AM Peak Hour

Intersection	NB Approach			SB Approach			EB Approach			WB Approach		
	L	T	R	L	T	R	L	T	R	L	T	R
LOS	F	F	C	F	F		A	-		E	-	
Average Delay (s)	*	*	16	*	*		9	-		38	-	
95 th Percentile Queue (ft)	*	75	125	*	125		0	-		400	-	

* Value not reported due to HCM limitations. Significant delays and queueing anticipated.

The NB and SB left-turn movements, the NB through movement, and the SB through/right-turn movement at the SR 80 / James Ranch Road intersection are anticipated to operate at LOS F in the 2050 Build with TWSC scenario during the AM peak hour. The WB left-turn movement is anticipated to operate at LOS E. All other movements at the study area intersections are anticipated to operate at LOS C or better. Significant queueing is expected on the NB and SB left-turn movements. The WB left-turn movement experiences a 95th

percentile queue of 400 feet, which exceeds the existing storage length. All other movements are anticipated to have 95th percentile queues no greater than 125 feet long.

Table 5.11 – SR 80 / James Ranch Road - 2050 Build with TWSC Capacity Analysis Results: PM Peak Hour

Intersection	NB Approach			SB Approach			EB Approach			WB Approach		
	L	T	R	L	T	R	L	T	R	L	T	R
LOS	F	F	F	F	F	F	A	-	-	B	-	-
Average Delay (s)	*	133	*	*	88	8	-	-	-	14	-	-
95 th Percentile Queue (ft)	*	25	*	*	50	0	-	-	-	75	-	-

* Value not reported due to HCM limitations. Significant delays and queueing anticipated.

The NB and SB left-turn movements, the NB through and right-turn movements, and the SB through/right-turn movement at the SR 80 / James Ranch Road intersection are anticipated to operate at LOS F in the 2050 Build with TWSC scenario during the PM peak hour. All other movements at the study area intersections are anticipated to operate at LOS B or better. Significant queueing is expected on the NB and SB left-turn movements and the NB right-turn movement. All other movements are anticipated to have 95th percentile queues no greater than 75 feet long.

5.4.2 Signalized Intersection Capacity Analysis Results

An intersection diagram extracted from Synchro showing the signalized intersection lane geometry used in the 2028 and 2050 Build analyses is presented in **Figure 5.2**. The results of the 2028 Build AM, 2028 Build PM, 2050 Build AM and 2050 Build PM intersection capacity analyses with the signalized configuration are shown in **Table 5.12**, **Table 5.13**, **Table 5.14**, and **Table 5.15**, respectively. The Synchro output reports for the signalized configuration are provided in **Appendix 7**.

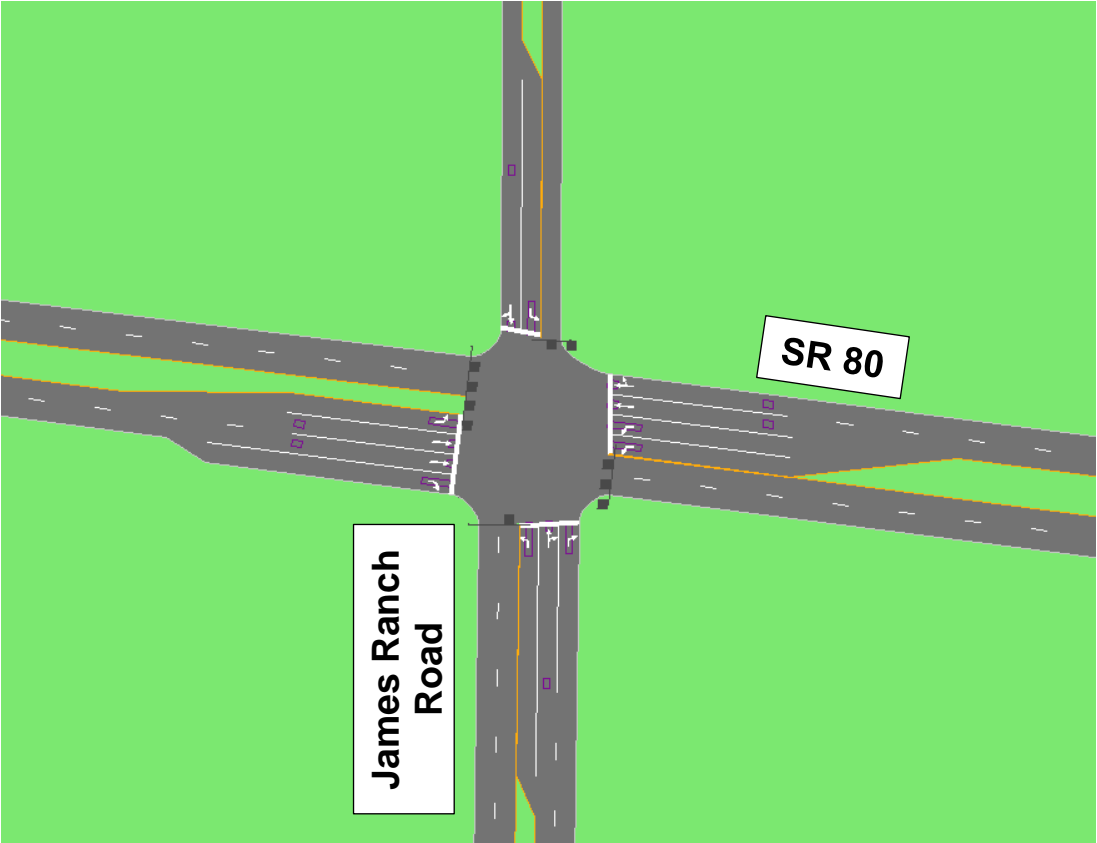


Figure 5.2 – SR 80 / James Ranch Road - Signalized Intersection Diagram

Table 5.12 – SR 80 / James Ranch Road - 2028 Build with Traffic Signal Capacity Analysis Results: AM Peak Hour

Intersection	NB Approach			SB Approach			EB Approach			WB Approach			Overall
	L	T	R	L	T	R	L	T	R	L	T	R	
LOS	B	B	B	B	B	B	A	B	B	A	A	A	A
Average Delay (s)	10	12	10	10	10	9	9	10	12	5	4	4	7
95 th Percentile Queue (ft)	25	25	0	25	0	25	0	25	25	25	25	25	-

The SR 80 / James Ranch Road intersection is anticipated to operate at an overall LOS A in the 2028 Build with traffic signal scenario during the AM peak hour. All movements are anticipated to operate at LOS B or better, with 95th percentile queues no greater than 25 feet long.

Table 5.13 – SR 80 / James Ranch Road - 2028 Build with Traffic Signal Capacity
Analysis Results: PM Peak Hour

Intersection	NB Approach			SB Approach			EB Approach			WB Approach			Overall
	L	T	R	L	T	R	L	T	R	L	T	R	
LOS	B		B	A		A	B	B	B	A		A	B
Average Delay (s)	11		13	10		10	11	13	12	7		5	10
95 th Percentile Queue (ft)	25		25	0		25	0	50	25	25		25	-

The SR 80 / James Ranch Road intersection is anticipated to operate at an overall LOS B in the 2028 Build with traffic signal scenario during the PM peak hour. All movements are anticipated to operate at LOS B or better, with 95th percentile queues no greater than 50 feet long.

Table 5.14 – SR 80 / James Ranch Road - 2050 Build with Traffic Signal Capacity
Analysis Results: AM Peak Hour

Intersection	NB Approach			SB Approach			EB Approach			WB Approach			Overall
	L	T	R	L	T	R	L	T	R	L	T	R	
LOS	C		C	B		B	C	C	C	D		A	C
Average Delay (s)	22		29	19		19	21	22	29	40		6	27
95 th Percentile Queue (ft)	75		175	25		25	25	75	125	325		50	-

The SR 80 / James Ranch Road intersection is anticipated to operate at an overall LOS C in the 2050 Build with traffic signal scenario during the AM peak hour. All movements are anticipated to operate at LOS D or better, with 95th percentile queues no greater than 325 feet long.

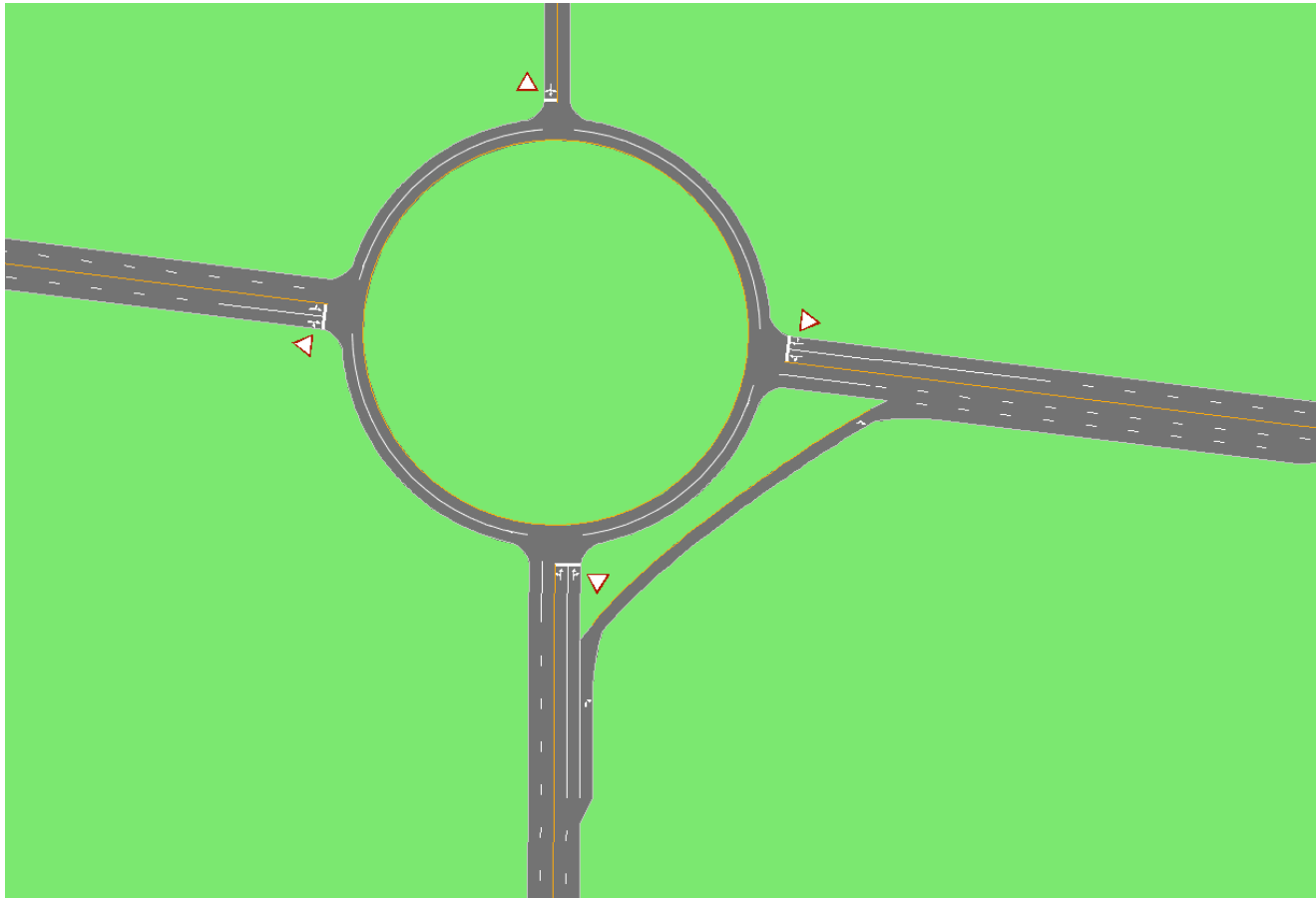
Table 5.15 – SR 80 / James Ranch Road - 2050 Build with Traffic Signal Capacity
Analysis Results: PM Peak Hour

Intersection	NB Approach			SB Approach			EB Approach			WB Approach			Overall
	L	T	R	L	T	R	L	T	R	L	T	R	
LOS	B		C	B		B	C	C	C	D		B	C
Average Delay (s)	16		33	13		12	25	32	29	49		15	30
95 th Percentile Queue (ft)	125		375	25		25	25	225	75	225		125	-

The SR 80 / James Ranch Road intersection is anticipated to operate at an overall LOS C in the 2050 Build with traffic signal scenario during the PM peak hour. All movements are anticipated to operate at LOS D or better, with 95th percentile queues no greater than 375 feet long.

5.4.3 Roundabout Capacity Analysis Results

An intersection diagram extracted from Synchro showing the roundabout lane geometry used in the 2028 and 2050 Build analyses is presented in Figure 5.3.



Note: Synchro diagram shown for visual purposes only. Analysis done using Rodel.

Figure 5.3 – SR 80 / James Ranch Road - Roundabout Diagram

The roundabout geometry was initially analyzed without a NB right-turn bypass lane and was found to provide poor LOS during the 2050 PM peak scenario. Therefore, the roundabout analysis was modified to include a NB right-turn bypass lane, which provides increased capacity.

The results of the 2028 Build AM, 2028 Build PM, 2050 Build AM and 2050 Build PM intersection capacity analyses with the roundabout configuration are shown in Table 5.16, Table 5.17, Table 5.18, and Table 5.19, respectively. The Rodel output reports for the roundabout configuration (both with and without the NB right-turn bypass lane) are provided in Appendix 7.

Table 5.16 – SR 80 / James Ranch Road - 2028 Build with Roundabout Capacity Analysis
Results: AM Peak Hour

Intersection	NB Approach			SB Approach			EB Approach			WB Approach			Overall
	L	T	R	L	T	R	L	T	R	L	T	R	
LOS	A			A			A			A			A
Average Delay (s)	3			2			4			5			5
95 th Percentile Queue (ft)	25			0			25			25			-

The SR 80 / James Ranch Road intersection is anticipated to operate at an overall LOS A in the 2028 Build with roundabout scenario during the AM peak hour. All movements are anticipated to operate at LOS A, with 95th percentile queues no greater than 75 feet long.

Table 5.17 – SR 80 / James Ranch Road - 2028 Build with Roundabout Capacity Analysis
Results: PM Peak Hour

Intersection	NB Approach			SB Approach			EB Approach			WB Approach			Overall
	L	T	R	L	T	R	L	T	R	L	T	R	
LOS	A			A			A			A			A
Average Delay (s)	3			3			4			5			4
95 th Percentile Queue (ft)	25			0			25			25			-

The SR 80 / James Ranch Road intersection is anticipated to operate at an overall LOS A in the 2028 Build with roundabout scenario during the PM peak hour. All movements are anticipated to operate at LOS A, with 95th percentile queues no greater than 50 feet long.

Table 5.18 – SR 80 / James Ranch Road - 2050 Build with Roundabout Capacity Analysis
Results: AM Peak Hour

Intersection	NB Approach			SB Approach			EB Approach			WB Approach			Overall
	L	T	R	L	T	R	L	T	R	L	T	R	
LOS	A			A			A			C			B
Average Delay (s)	3			3			7			9			12
95 th Percentile Queue (ft)	25			0			25			50			-

The SR 80 / James Ranch Road intersection is anticipated to operate at an overall LOS B in the 2050 Build with roundabout scenario during the AM peak hour. All movements are anticipated to operate at LOS C or better, with 95th percentile queues no greater than 450 feet long.

Table 5.19 – SR 80 / James Ranch Road - 2050 Build with Roundabout Capacity Analysis
Results: PM Peak Hour

Intersection	NB Approach			SB Approach			EB Approach			WB Approach			Overall
	L	T	R	L	T	R	L	T	R	L	T	R	
LOS	A			C			A			A			B
Average Delay (s)	5			23			6			7			14
95 th Percentile Queue (ft)	25			1,025			25			75			-

The SR 80 / James Ranch Road intersection is anticipated to operate at an overall LOS B in the 2050 Build with roundabout scenario during the PM peak hour. All movements are anticipated to operate at LOS C or better. The NB right-turn movement has a 95th percentile queue length of 1,025 feet. All other 95th percentile queues are no greater than 125 feet long.

5.5 SR 80 / US 191 Future Build Analysis

The 2028 and 2050 Build LOS, delay, and 95th percentile queues at the SR 80 / US 191 intersection were evaluated using the 2028 and 2050 Build volumes and the existing intersection geometry described previously in Section 3.0 of this report. The Chino Road realignment (which is planned but not funded) was assumed to be complete in the 2028 and 2050 Build analyses; therefore, the south leg of the SR 80 / US 191 intersection was assumed to be open using its currently barricaded geometry except with an extended NB left-turn lane storage length. Signal timing and phasing were optimized at the intersection.

An intersection diagram extracted from Synchro showing the lane geometry is presented in **Figure 5.4**. The results of the 2028 Build AM, 2028 Build PM, 2050 Build AM and 2050 Build PM intersection capacity analyses with the existing traffic signal configuration are shown in **Table 5.20**, **Table 5.21**, **Table 5.22**, and **Table 5.23**, respectively. The Synchro output reports for the SR 80 / US 191 intersection are provided in **Appendix 7**.

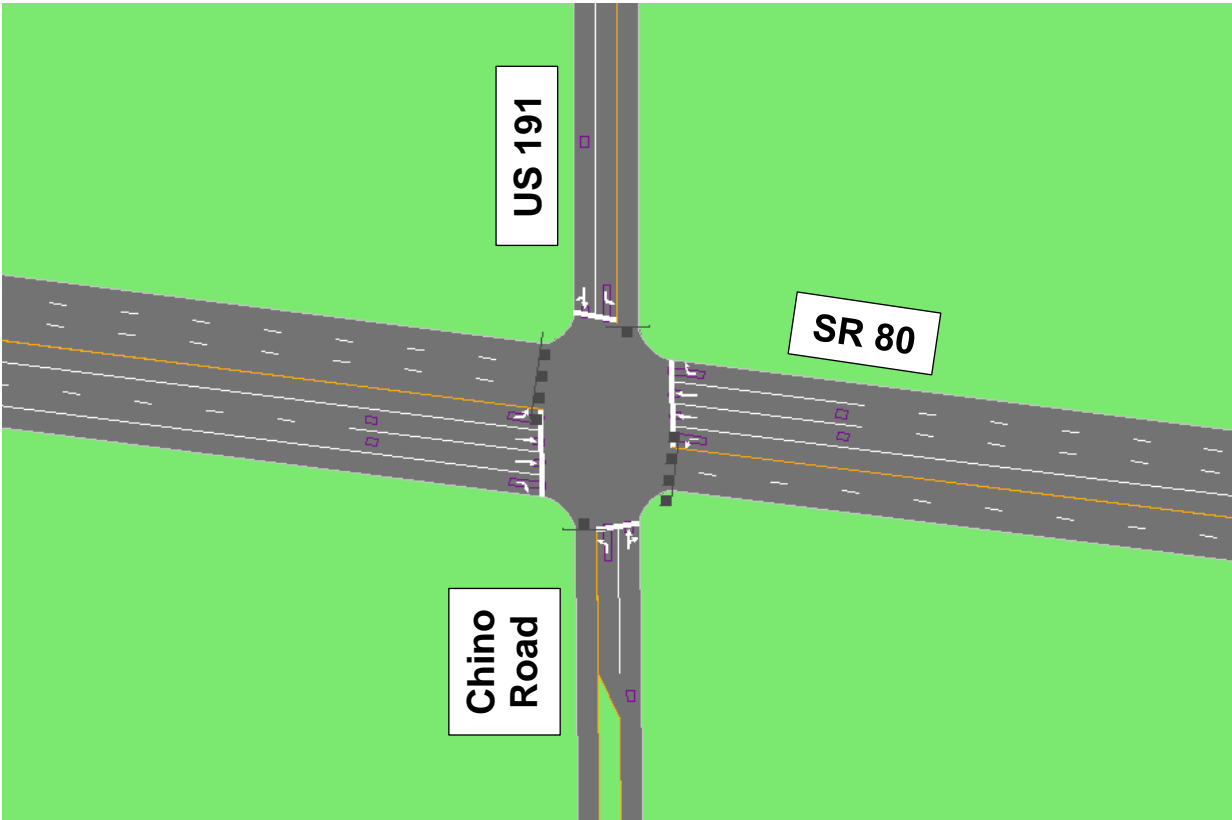


Figure 5.4 – SR 80 / US 191 – Future Intersection Diagram

Table 5.20 – SR 80 / US 191 - 2028 Build Capacity Analysis Results: AM Peak Hour

Intersection	NB Approach			SB Approach			EB Approach			WB Approach			Overall
	L	T	R	L	T	R	L	T	R	L	T	R	
LOS	B	B		B	B		B	A	A	A	A	A	A
Average Delay (s)	16	13		14	14		10	6	6	6	7	6	9
95 th Percentile Queue (ft)	25	25		25	50		25	25	25	0	25	25	-

The SR 80 / US 191 intersection is anticipated to operate at an overall LOS A in the 2028 Build scenario during the AM peak hour with current signal timing and phasing provisions. All movements are anticipated to operate at LOS B or better with 95th percentile queues no greater than 50 feet long.

Table 5.21 – SR 80 / US 191 - 2028 Build Capacity Analysis Results: PM Peak Hour

Intersection	NB Approach			SB Approach			EB Approach			WB Approach			Overall
	L	T	R	L	T	R	L	T	R	L	T	R	
LOS	C	B		B	B		A	A	A	A	A	A	A
Average Delay (s)	21	16		17	18		10	6	6	7	6	6	9
95 th Percentile Queue (ft)	50	25		25	75		50	50	25	25	25	25	-

The SR 80 / US 191 intersection is anticipated to operate at an overall LOS A in the 2028 Build scenario during the PM peak hour. All movements are anticipated to operate at LOS C or better, with 95th percentile queues no greater than 75 feet long.

Table 5.22 – SR 80 / US 191 - 2050 Build Capacity Analysis Results: AM Peak Hour

Intersection	NB Approach			SB Approach			EB Approach			WB Approach			Overall
	L	T	R	L	T	R	L	T	R	L	T	R	
LOS	D	C		C	D		C	B	B	B	C	B	C
Average Delay (s)	46	24		28	41		25	11	10	13	25	17	24
95 th Percentile Queue (ft)	100	50		75	300		100	100	50	25	350	125	-

The SR 80 / US 191 intersection is anticipated to operate at an overall LOS C in the 2050 Build scenario during the AM peak hour, with protected-permitted EB and WB left-turn signal phasing added, which is anticipated to allow all movements to operate at LOS D or better with 95th percentile queues no greater than 350 feet long. All turn lane queues are anticipated to fit within existing storage provisions.

Table 5.23 – SR 80 / US 191 - 2050 Build Capacity Analysis Results: PM Peak Hour

Intersection	NB Approach			SB Approach			EB Approach			WB Approach			Overall
	L	T	R	L	T	R	L	T	R	L	T	R	
LOS	D	C		C	C		C	C	B	B	C	C	C
Average Delay (s)	36	22		24	29		31	21	13	19	25	23	24
95 th Percentile Queue (ft)	100	50		50	250		250	325	100	25	200	100	-

The SR 80 / US 191 intersection is anticipated to operate at an overall LOS C in the 2050 Build scenario during the PM peak hour, with protected-permitted EB and WB left-turn signal phasing added, which is anticipated to allow all movements to operate at LOS D or better with 95th percentile queues no greater than 325 feet long. All turn lane queues are anticipated to fit within existing storage provisions.

5.6 Grade Separation Sensitivity Analysis

Grade separation (i.e., a bridge) is not anticipated to be necessary at the SR 80 / James Ranch Road intersection by the horizon year 2050 based on the at-grade intersection analyses. However, a sensitivity analysis was performed to approximate at what point grade separation may need to be considered at the intersection. The signalized intersection LOS was analyzed using HCM 6 methodology via Synchro 11 analysis software, and the roundabout LOS was analyzed using Rodel 2017 methodology. Queue lengths at the signalized intersection were observed using SimTraffic traffic simulation software to be able to observe queue build-ups over time during the peak hours.

Total 2050 volumes were grown incrementally to determine the traffic level at which the at-grade intersection operations fail. Reasonable improvements were assumed for the signalized

intersection alternative, including dedicated dual northbound right-turn lanes, northbound right-turn overlap phasing, an extension to the WB left-turn storage length, and signal timing modifications.

The analysis results show that grade separation may be needed if future traffic volumes at the signalized intersection alternative are more than 30 percent higher than the 2050 traffic volumes projected in this report. This equates to approximately 700 to 800 more vehicles entering the intersection during the peak hour. For the roundabout alternative, grade separation may be needed if future traffic volumes are more than 10 to 20 percent higher than the 2050 traffic volumes projected in this report. This equates to approximately 300 to 500 more vehicles entering the roundabout during the peak hour. The Synchro and Rodel output reports for the SR 80 / James Ranch Road intersection with the traffic volume increases are provided in **Appendix 7**.

5.7 Connector Road Cross-Section Analysis

Projected daily traffic volumes on the connector road were analyzed to determine an appropriate roadway cross-section in the horizon year 2050. The connector roadway was analyzed as an urban roadway because many driveways and intersections are anticipated along the roadway to service future development. Exhibit 16-16 of the HCM 6 gives generalized daily service volumes of urban roadway facilities based on number of travel lanes, K-factor, D-factor, and desired LOS. Based on the projected 2050 volumes (up to 19,200 vehicles per day), it is anticipated that a four-lane cross-section (two through lanes in each direction) will provide LOS D or better on the connector road. Exhibit 16-16 of the HCM 6 is included in **Appendix 5**.

6. OTHER TRAFFIC CONSIDERATIONS

Other traffic-related considerations besides traffic operations should be evaluated when determining the advantages and disadvantages of various intersection configuration alternatives at the intersection of SR 80 / James Ranch Road. These include motorist safety, intersection type familiarity, oversize vehicle accommodation, and pedestrian and bicyclist accommodation and safety. Additionally, other traffic-related considerations should be evaluated when determining the design of the connector roadway, including transit accommodation, access, truck parking, and intelligent transportation system (ITS) devices.

6.1 Motorist Safety

One measure of motorist safety for intersection configurations is the number of vehicle conflict points, where vehicles may collide if travel right-of-way rules are not observed. Of particular concern are vehicle crossing points, where vehicles traveling different directions could potentially collide (such as in an angle or left-turn crash). These types of crashes are more likely to cause severe injury to vehicle occupants than vehicles traveling the same general direction (such as sideswipe crashes). Perpendicular crossing points have a high potential for severe injury to vehicle occupants.

A standard four-legged intersection (signalized or TWSC) has 32 conflict points, including 16 crossing points (4 of which are perpendicular). A standard four-legged two-lane roundabout has 24 conflict points, including 8 crossing points (none of which are perpendicular).

Head-on/wrong-way crashes have a high potential for severe injury to vehicle occupants. Head-on/wrong-way travel is prohibited only by signage in the TWSC and signalized intersection alternatives, whereas raised curbs and the angles of intersecting lanes make it more difficult to have head-on/wrong-way travel in the roundabout alternative.

Vehicle speeds in the TWSC and signalized intersection alternatives are controlled only by traffic signals and signage, whereas raised curbs and roadway geometry help reduce vehicle speeds in the roundabout alternative. This reduces the likelihood of severe injury to vehicle occupants in the event of a crash.

The TWSC alternative requires drivers on the minor roadway to judge safe gaps in major roadway traffic to safely turn onto or cross the mainline. Improper judgments may lead to crashes involving crossing conflicts, which tend to be more dangerous (as described previously). The signalized alternative allocates dedicated right-of-way cycle time to each movement, removing the need to judge safe gaps in opposing traffic (barring permissive turning movements). However, failure to properly yield right-of-way at the signalized alternative may still lead to severe crashes as the number of crossing conflict points is the same as the TWSC alternative. The roundabout alternative requires all drivers entering the roundabout to yield to traffic inside the roundabout. While drivers must judge safe gaps in traffic, vehicle speeds within a roundabout tend to be much lower than those on mainline roadways. The reduced speeds

combined with the lack of crossing conflict points in a roundabout causes crash at roundabouts to be less severe on average.

6.2 Intersection Type Familiarity

Drivers are likely very familiar with the TWSC and signalized intersection configurations as these traffic control types are very common throughout the U.S. and Mexico. Drivers may be less familiar with how a roundabout operates. While roundabout intersections have become much more prevalent over the last 20 years, they are far less common than TWSC or signalized intersections.

6.3 Oversize Vehicle Accommodation

SR 80 and James Ranch Road are anticipated to be used as routes for oversize vehicles. The SR 80 / James Ranch Road intersection should be designed to accommodate oversize vehicles where feasible. This includes providing adequate vertical clearance and turning radii.

The TWSC intersection alternative can be configured to accommodate oversize vehicles because there are no major horizontal or vertical restrictions. The TWSC intersection alternative can typically be designed to provide adequate turning radii for oversize vehicles.

The signalized intersection alternative can be configured to accommodate oversize vehicles as long as major horizontal and vertical restrictions such as signal poles and mast arms are placed at the correct height and far enough from curbs. The signalized intersection alternative can typically be designed to provide adequate turning radii for oversize vehicles. Because the northbound right-turn movement is anticipated to experience high heavy vehicle traffic volumes, a channelized right-turn bypass lane may be desirable to provide oversize vehicles with a larger turn radius and allow them to bypass the intersection. The bypass lane can be designed as free-flow, yield, or stop-controlled, which eliminates the height restrictions of a traffic signal mast arm.

The roundabout alternative can typically be designed to provide adequate turning radii for oversize vehicles by providing a truck apron and mountable curbs for the central island. However, navigating roundabouts may be difficult for some low-clearance oversize vehicles because of the varying elevation of the intersection from the curbs and islands present. Because the northbound right-turn movement is anticipated to experience high vehicle traffic volumes, a channelized right-turn bypass lane should be considered to provide oversize vehicles with a larger turn radius and allow them to bypass the roundabout.

Vehicle requirements should be coordinated with ADOT's Statewide Permit Services Supervisor during final design to make sure the proper design vehicle is being used.

6.4 Pedestrian and Bicyclist Accommodation and Safety

The TWSC alternative can provide pedestrian crossings on the north and south legs of the intersection but likely cannot accommodate pedestrians crossing SR 80 (unless some kind of

signalized crossing is provided, such as a pedestrian hybrid beacon, or a grade-separated crossing). No pedestrian indications are present, which can make it particularly challenging for those with disabilities to cross.

The signalized alternative can provide pedestrian crossings and crossing indications on all legs of the intersection. Crossing indications can be both visual and audible.

Because the roundabout alternative is yield-controlled, there are typically no signalized crossings for pedestrians, which can make it challenging for those with disabilities to cross. This may be offset to some degree, however, by the lower speed of vehicles at the crossings, as lower vehicle speeds reduce the likelihood of severe injury to pedestrians. Pedestrian-actuated signals or pedestrian hybrid beacons could be added to address this issue but doing so will impede traffic movements entering and exiting the roundabout when the signals/beacons are activated. Grade-separated pedestrian crossings could also be considered.

The TWSC and signalized alternatives typically provide separate facilities for pedestrians (sidewalk) and bicyclists (bike lanes or paved shoulders) on and along each approach. Roundabouts do not typically include bike lanes within the circulating area due to safety concerns. The roundabout alternative could include ramps for bicyclists to transition between the bike lane or paved shoulder and the sidewalk at the intersection.

The design of the connector road should also consider accommodations for pedestrians and bicyclists such as sidewalks and bike lanes due to the anticipated warehousing land uses and other developments along and near the roadway.

6.5 Transit Accommodation

Future bus stops should be considered along or near the connector road to accommodate commuter traffic generated by the anticipated warehousing land uses and other developments along and near the roadway.

6.6 Access

Future access points along the connector road should including adequate access spacing and turning radii should be designed to accommodate heavy vehicles.

6.7 Truck Parking

Truck parking needs should be considered when designing the connector road due to the anticipated high truck volumes utilizing the roadway and the fact that trucks may have to wait to cross the border if it is not open yet.

6.8 ITS Devices

ADOT has indicated there is the potential for the ADOT Commercial Inspection Facility to be relocated from the northeast corner of the intersection of SR 80 / US 191 to a location along the

connector roadway north of the proposed commercial IPOE. The need for ITS devices should be considered when deciding whether/where to relocate the facility. If the ADOT Commercial Inspection Facility stays in its current location, additional cameras, weigh-in-motion sensors, and dynamic message signs may need to be placed east and west of the intersection of SR 80 / James Ranch Road to alert ADOT to heavy vehicles that do not go to the ADOT Commercial Inspection Facility for inspection (i.e., “port runners”). If the ADOT Commercial Inspection Facility is relocated along the connector road, fewer ITS devices may be needed because trucks will have to pass through the inspection station before continuing along their route. ITS devices along SR 80 may still be desirable to detect “port runners” and overweight vehicles.

7. ENVIRONMENTAL REPORT DATA SUMMARY

ADOT requires a Noise Report and Air Quality Report as part of the Environmental Planning process, which include documentation of vehicle classifications, traffic projections and intersection/interchange LOS analysis for the Existing, 2028/2050 No-Build, and 2028/2050 Build scenarios. The following section summarizes these results for use in the Noise Report and Air Quality Report.

7.1 Noise Report Data Summary

For the purposes of this analysis, vehicle volumes were divided into the following three vehicle classification categories:

- Passenger cars;
- Medium vehicles; and
- Heavy vehicles.

Traffic volumes were categorically classified using the FHWA 13-Class classification scheme, where passenger cars are in FHWA Classes 1-4, medium vehicles are in FHWA Class 5, and heavy vehicles are in FHWA Classes 6-13. **Table 7.1**, **Table 7.2**, **Table 7.3**, and **Table 7.4** summarize the approximate weighted average percentages of passenger cars, medium vehicles, and heavy vehicles by total traffic volume on each leg of the study area intersections in the No-Build and Build scenarios, respectively.

All vehicles coming to and from the proposed commercial IPOE and all truck volumes on the north leg of SR 80 / James Ranch Road and the south leg of SR 80 / US 191 (Chino Road) were assumed to be heavy vehicles to provide a conservative analysis as detailed truck classification data were not available for these approaches. Additionally, truck trips generated by the adjacent warehousing developments were assumed to be comprised of 30 percent medium vehicles and 70 percent heavy vehicles to provide a conservative analysis.

Table 7.1 – 2028 / 2050 No-Build Noise Report Vehicle Classification Percentages

Roadway Segment	Passenger Cars	Medium Vehicles	Heavy Vehicles
James Ranch Road south of SR 80	98%	0%	2%
James Ranch Road north of SR 80	98%	0%	2%
SR 80 west of James Ranch Road	89%	6%	5%
SR 80 east of James Ranch Road	89%	6%	5%
US 191 south of SR 80	-	-	-
US 191 north of SR 80	89%	7%	4%
SR 80 west of US 191	89%	7%	4%
SR 80 east of US 191	89%	7%	4%

Table 7.2 – 2050 No-Build Noise Report Vehicle Classification Percentages

Roadway Segment	Passenger Cars	Medium Vehicles	Heavy Vehicles
James Ranch Road south of SR 80	98%	0%	2%
James Ranch Road north of SR 80	98%	0%	2%
SR 80 west of James Ranch Road	89%	6%	5%
SR 80 east of James Ranch Road	89%	6%	5%
US 191 south of SR 80	-	-	-
US 191 north of SR 80	89%	7%	4%
SR 80 west of US 191	89%	7%	4%
SR 80 east of US 191	89%	7%	4%

Table 7.3 – 2028 Build Noise Report Vehicle Classification Percentages

Roadway Segment	Passenger Cars	Medium Vehicles	Heavy Vehicles
James Ranch Road south of SR 80	70%	5%	25%
James Ranch Road north of SR 80	98%	0%	2%
SR 80 west of James Ranch Road	82%	6%	12%
SR 80 east of James Ranch Road	79%	5%	15%
Chino Road south of SR 80	95%	0%	5%
US 191 north of SR 80	73%	6%	21%
SR 80 west of US 191	77%	6%	17%
SR 80 east of US 191	85%	8%	7%

Table 7.4 – 2050 Build Noise Report Vehicle Classification Percentages

Roadway Segment	Passenger Cars	Medium Vehicles	Heavy Vehicles
James Ranch Road south of SR 80	76%	6%	19%
James Ranch Road north of SR 80	98%	0%	2%
SR 80 west of James Ranch Road	83%	6%	11%
SR 80 east of James Ranch Road	80%	6%	14%
Chino Road south of SR 80	95%	0%	5%
US 191 north of SR 80	76%	6%	18%
SR 80 west of US 191	79%	6%	15%
SR 80 east of US 191	83%	8%	9%

Table 7.5 and **Table 7.6** summarize the bidirectional ADT volumes and peak hour volumes on each leg of the intersections of SR 80 / James Ranch Road and SR 80 / US 191, respectively. The bidirectional peak hour volumes were calculated using the peak hour volumes shown in **Figure 3.3** through **Figure 3.10** and the vehicle classification percentages shown in the previously referenced **Table 2.1**, **Table 7.1**, and **Table 7.2**.

Table 7.5 – SR 80 / James Ranch Road Noise Report Traffic Volumes

	Roadway Segment	ADT Volume (vpd)	Peak Hour Volume (vph)			
			Total	Passenger Cars	Medium Vehicles	Heavy Vehicles
Existing	James Ranch Road south of SR 80	0	0	0	0	0
	James Ranch Road north of SR 80	0	0	0	0	0
	SR 80 west of James Ranch Road	5,667	475	423	29	24
	SR 80 east of James Ranch Road	5,667	475	423	29	24
2028 No-Build	James Ranch Road south of SR 80	300	30	29	0	1
	James Ranch Road north of SR 80	300	30	29	0	1
	SR 80 west of James Ranch Road	6,700	550	493	31	27
	SR 80 east of James Ranch Road	6,700	550	492	32	27
2050 No-Build	James Ranch Road south of SR 80	700	60	59	0	1
	James Ranch Road north of SR 80	700	60	59	0	1
	SR 80 west of James Ranch Road	10,500	860	771	48	41
	SR 80 east of James Ranch Road	10,500	860	769	49	42
2028 Build	James Ranch Road south of SR 80	6,300	563	395	29	140
	James Ranch Road north of SR 80	300	30	29	0	1
	SR 80 west of James Ranch Road	8,000	643	530	35	78
	SR 80 east of James Ranch Road	13,200	1021	811	56	154
2050 Build	James Ranch Road south of SR 80	19,200	1,728	1,312	97	320
	James Ranch Road north of SR 80	700	60	59	0	1
	SR 80 west of James Ranch Road	14,100	1,122	932	63	127
	SR 80 east of James Ranch Road	30,500	2305	1,852	131	322

Table 7.6 – SR 80 / US 191 Noise Report Traffic Volumes

	Roadway Segment	ADT Volume (vpd)	Peak Hour Volume (vph)			
			Total	Passenger Cars	Medium Vehicles	Heavy Vehicles
Existing	Chino Rd south of SR 80	0	0	0	0	0
	US 191 north of SR 80	3,681	317	282	19	16
	SR 80 west of US 191	5,667	476	423	29	24
	SR 80 east of US 191	8,941	538	479	48	11
2028 No-Build	Chino Rd south of SR 80	0	0	0	0	0
	US 191 north of SR 80	5,000	357	318	25	14
	SR 80 west of US 191	6,400	536	477	37	21
	SR 80 east of US 191	9,400	606	540	42	24
2050 No-Build	Chino Rd south of SR 80	0	0	0	0	0
	US 191 north of SR 80	7,700	552	491	39	22
	SR 80 west of US 191	10,000	828	737	58	33
	SR 80 east of US 191	14,500	937	834	66	37
2028 Build	Chino Rd south of SR 80	3,500	297	282	0	14
	US 191 north of SR 80	6,900	485	356	28	102
	SR 80 west of US 191	12,600	998	772	59	166
	SR 80 east of US 191	11,900	711	601	57	52
2050 Build	Chino Rd south of SR 80	5,400	459	437	0	22
	US 191 north of SR 80	11,900	843	642	50	152
	SR 80 west of US 191	29,500	2,270	1,794	137	339
	SR 80 east of US 191	28,000	1,721	1,434	129	158

7.2 Air Quality Report Data Summary

Table 7.7 and **Table 7.8** summarize the ADTs for all vehicles, ADTs for trucks (includes the combination of medium and heavy vehicles), and truck percentages (both medium and heavy vehicles) on each leg of the intersections of SR 80 / James Ranch Road and SR 80 / US 191, respectively.

Table 7.7 – SR 80 / James Ranch Road Air Quality Report Daily Traffic Volumes and Truck Percentages

	Existing	2028 No-Build	2028 Build	Difference (2028 Build vs. No-Build)	2050 No-Build	2050 Build	Difference (2050 Build vs. No-Build)
James Ranch Road south of SR 80							
Total ADT	0	300	6,300	6,000	700	19,200	18,500
Truck ADT	0	1	168	168	1	417	415
Truck %	0%	2%	30%	28%	2%	24%	22%
James Ranch Road north of SR 80							
Total ADT	0	300	300	0	700	700	0
Truck ADT	0	1	1	0	1	1	0
Truck %	0%	2%	2%	0%	2%	2%	0%
SR 80 west of James Ranch Road							
Total ADT	5,667	6,700	8,000	1,300	10,500	14,100	3,600
Truck ADT	52	58	113	55	89	189	100
Truck %	11%	11%	18%	7%	10%	17%	6%
SR 80 east of James Ranch Road							
Total ADT	5,667	6,700	13,200	6,500	10,500	30,500	20,000
Truck ADT	52	59	210	151	91	453	362
Truck %	11%	11%	21%	10%	11%	20%	9%

Table 7.8 – SR 80 / US 191 Air Quality Report Daily Traffic Volumes and Truck Percentages

	Existing	2028 No-Build	2028 Build	Difference (2028 Build vs. No-Build)	2050 No-Build	2050 Build	Difference (2050 Build vs. No-Build)
Chino Rd south of SR 80							
Total ADT	0	0	3,500	3,500	0	5,400	5,400
Truck ADT	0	0	14	14	0	22	22
Truck %	0%	0%	5%	5%	0%	5%	5%
US 191 north of SR 80							
Total ADT	3,681	5,000	6,900	1,900	7,700	11,900	4,200
Truck ADT	35	39	129	90	61	201	141
Truck %	11%	11%	27%	16%	11%	24%	13%
SR 80 west of US 191							
Total ADT	5,667	6,400	12,600	6,200	10,000	29,500	19,500
Truck ADT	52	59	226	167	91	476	385
Truck %	11%	11%	23%	12%	11%	21%	10%
SR 80 east of US 191							
Total ADT	8,941	9,400	11,900	2,500	14,500	28,000	13,500
Truck ADT	59	67	109	43	103	287	184
Truck %	11%	11%	15%	4%	11%	17%	6%

Table 7.9 summarizes the overall intersection LOS for scenarios with signalized and roundabout intersections or the worst movement LOS for TWSC scenarios at each study intersection during the AM and PM peak hours.

Table 7.9 – Air Quality Report Overall Intersection Level of Service by Scenario

Intersection	Scenario	LOS	
		AM	PM
SR 80 / James Ranch Road	Existing TWSC^	B	B
	2028 No-Build TWSC^	B	B
	2050 No-Build TWSC^	C	C
	2028 Build TWSC^	E	D
	2050 Build TWSC^	F	F
	2028 Build Signalized	A	B
	2050 Build Signalized	C	C
	2028 Build Roundabout	A	A
	2050 Build Roundabout	B	B
SR 80 / US 191/ Chino Road	Existing	A	A
	2028 No-Build	A	A
	2050 No-Build	A	A
	2028 Build	A	A
	2050 Build	C	C

^TWSC values represent worst movement LOS instead of overall intersection LOS.

8. SUMMARY

The principal findings of the traffic analysis are summarized below:

SR 80 / James Ranch Road

- The existing TWSC intersection provides LOS B in Existing and 2028 No-Build traffic conditions and LOS C or better in 2050 No-Build traffic conditions on the NB and SB approaches with current intersection geometry.
- The TWSC intersection alternative provides LOS E or better in 2028 Build traffic conditions and LOS F in 2050 Build traffic conditions on the NB and SB approaches, even with an exclusive NB right-turn lane provided.
- The signalized intersection alternative provides overall LOS C or better in 2028 and 2050 Build traffic conditions as long as an exclusive NB right-turn lane with an overlap right-turn signal phase and dual westbound left-turn lanes are provided.
- The roundabout intersection alternative provides overall LOS B or better in 2028 and 2050 Build traffic conditions as long as an exclusive free-flow NB right-turn bypass lane is provided.

SR 80 / US 191

- The existing signalized intersection provides overall LOS A in Existing and 2028 No-Build traffic conditions, and overall LOS B in 2050 No-Build traffic conditions, with current intersection geometry and optimized traffic signal timing.
- The existing signalized intersection provides overall LOS A in 2028 Build traffic conditions and LOS C in 2050 Build traffic conditions with current intersection geometry and the opening of the south leg for the realigned Chino Road as long as protected-permitted left-turn EB and WB signal phasing is provided by 2050.

Table 8.1 summarizes the overall intersection LOS for scenarios with signalized and roundabout intersections or the worst movement LOS for TWSC scenarios at each study intersection during the AM and PM peak hours.

Table 8.1 – Overall Level of Service/Longest Queue by Scenario

Intersection	Scenario	LOS / Queue	
		AM	PM
SR 80 / James Ranch Road	Existing TWSC^	B / 0'	B / 0'
	2028 No-Build TWSC^	B / 25'	B / 25'
	2050 No-Build TWSC^	C / 50'	C / 50'
	2028 Build TWSC^	E / 25'	D / 75'
	2050 Build TWSC^	F / *	F / *
	2028 Build Signalized	A / 25'	B / 25'
	2050 Build Signalized	C / 325'	C / 375'
	2028 Build Roundabout	A / 75'	A / 50'
	2050 Build Roundabout	B / 450'	B / 1,025'
SR 80 / US 191/ Chino Road	Existing	A / 25'	A / 25'
	2028 No-Build	A / 25'	A / 25'
	2050 No-Build	A / 50'	A / 50'
	2028 Build	A / 50'	A / 75'
	2050 Build	C / 350'	C / 325'

* Value not reported due to HCM limitations. Significant delays/queueing anticipated.
^TWSC values represent worst movement LOS instead of overall intersection LOS.

Comparison of SR 80 / James Ranch Road Intersection Configuration Alternatives

The various SR 80 / James Ranch Road intersection configuration alternatives (TWSC, Traffic Signal Control, and Roundabout) were compared to each other using several different evaluation criteria. Some of the evaluation criteria used do not lend themselves to numerical quantification, so the evaluation was performed on a “qualitative” basis using the following descriptors to describe the relative impacts of each of the alternatives:

- Strong Advantage;
- Advantage;
- Neutral;
- Disadvantage; and
- Strong Disadvantage.

The Strong Advantage and Advantage descriptors apply when implementation of an alternative is anticipated to result in a positive change or improvement compared to the other alternatives. The Strong Disadvantage and Disadvantage descriptors apply when implementation of an alternative is anticipated to result in a negative change or worsening compared to the other alternatives. The Neutral descriptor applies when implementation of an alternative is anticipated to have no impact or result in both positive and negative changes that effectively cancel each other out.

Table 8.2 summarizes the relative advantages and disadvantages of the alternatives.

Table 8.2 – Intersection Configuration Alternatives Evaluation Matrix of Traffic Criteria

Evaluation Criteria	No-Build (TWSC)	Two-Way Stop Control (TWSC)	Traffic Signal Control	Roundabout
Traffic Operations (2050 AM/PM)	● - LOS C/C - Maximum queues of 50/50 feet	● - LOS F/F - Significant queueing expected	● - LOS C/C - Maximum queues of 325/375 feet	● - LOS B/B - Maximum queues of 450/1,025 feet
Motorist Safety	● - 32 conflict points, 16 crossing points (4 perpendicular) - Speed and wrong-way control by signs only	● - 32 conflict points, 16 crossing points (4 perpendicular) - Speed and wrong-way control by signs only	● - 32 conflict points, 16 crossing points (4 perpendicular) - Speed and wrong-way control by signals and signs	● - 24 conflict points, 8 crossing points (0 perpendicular) - Speed and wrong-way control by curbs and roadway geometry
Driver Familiarity	● - Very common configuration	● - Very common configuration	● - Very common configuration	● - Somewhat common configuration
Oversize Vehicle Accommodation	● - Open geometry with no major horizontal or vertical restrictions	● - Open geometry with no major horizontal or vertical restrictions	● - Open geometry; vertical restrictions due to signal mast arms	● - Restricted geometry; option for large-radius bypass lanes
Pedestrian and Bicyclist Accommodation and Safety	● - No pedestrian accommodations - Paved shoulders for cyclists - High vehicle speeds negatively affect pedestrian and bicyclist safety and comfort	● - At-grade crossings can be provided on stop-controlled legs - Signalized or grade-separated crossing required to cross SR 80 - Includes standard pedestrian and bicyclist facilities - High vehicle speeds negatively affect pedestrian and bicyclist safety and comfort	○ - At-grade crossings can be provided on all 4 legs; all signalized - Includes standard pedestrian and bicyclist facilities - High vehicle speeds negatively affect pedestrian and bicyclist safety and comfort	● - At-grade crossings can be provided on all 4 legs - Includes standard pedestrian and bicyclist facilities - Moderate vehicle speeds somewhat affect pedestrian and bicyclist safety and comfort - Cyclists must transition from roadway to sidewalk

Legend
Strong Advantage ● Advantage ● Neutral ○ Disadvantage ● Strong Disadvantage ●

Findings from Alternatives Evaluation of Traffic Considerations

- If the proposed commercial IPOE and connector road are not built, the existing TWSC configuration is expected to provide acceptable traffic operations through 2050 at SR 80 / James Ranch Road.
- The TWSC alternative likely will not provide acceptable traffic operations where the connector road for the proposed commercial IPOE intersects with SR 80.
- The roundabout alternative provides the most benefit at the SR 80 / James Ranch Road intersection in terms of safety and LOS but will likely have a much longer queue than the signalized alternative.
- Drivers are most familiar with the TWSC and signalized alternatives and may be less familiar with the roundabout alternative.
- Oversize vehicles can most easily be accommodated by the TWSC alternative, followed by the signalized alternative; the roundabout alternative can be challenging for oversize vehicles to navigate if not designed specifically to accommodate oversize vehicles.
- Other factors besides traffic considerations (e.g., right-of-way impacts, cost, etc.) should be considered before determining the preferred intersection configuration at SR 80 / James Ranch Road.

Traffic-Related Considerations for the Connector Road

- Future bus stops should be considered along or near the connector road to accommodate commuter traffic generated by the anticipated warehousing land uses and other developments along and near the roadway.
- Future access points along the connector road should including adequate access spacing and turning radii should be designed to accommodate heavy vehicles.
- Truck parking needs should be considered when designing the connector road due to the anticipated high truck volumes utilizing the roadway and the fact that trucks may have to wait to cross the border if it is not open yet.
- If the ADOT Commercial Inspection Facility stays in its current location, ITS devices such as additional cameras, weigh-in-motion sensors, and dynamic message signs may need to be placed east and west of the intersection of SR 80 / James Ranch Road to alert ADOT to heavy vehicles that do not go to the ADOT Commercial Inspection Facility for inspection (i.e., “port runners”). If the ADOT Commercial Inspection Facility is relocated along the connector road, fewer ITS devices may be needed because trucks will have to pass through the inspection station before continuing along their route. ITS devices along SR 80 may still be desirable to detect “port runners” and overweight vehicles.

Appendix 1. Stantec 2018 *Douglas Arizona Regional Feasibility Study* Excerpts



**Douglas Arizona Regional
Feasibility Study**

Traffic Study for the Raul Hector Castro
Land Port of Entry in Douglas, Arizona

June 29, 2018

Prepared for:

General Services Administration

Prepared by:

Stantec Consulting

1.0 DETERMINING BASELINE FUNCTIONS

1.1 VEHICLE VOLUMES

Stantec was provided traffic data by the U.S. Customs and Border Protection (CBP). This data included time-stamped volumes passing through the facility for a 12-month period (February 2017 to January 2018). The 90th percentile weekly volume was recommended for determining volumes to use in the baseline Scenario.

The study team determined that the volumes of both Personally Owned Vehicles (POVs) and Commercially Operated Vehicles (COVs) are the driving factors that affect traffic flow, queues, and wait time. The number of POVs and COVs were therefore combined to determine the peak week.

The 90th percentile peak week for both personal and commercial vehicles was found to be from October 18th to October 24th, 2017, with a total of 37,551 vehicles (POVs and COVs) passing through the facility during this week (see **Figure A**). This 90th percentile volume, which was identified as the 47th highest volume by week, was found using the following method:

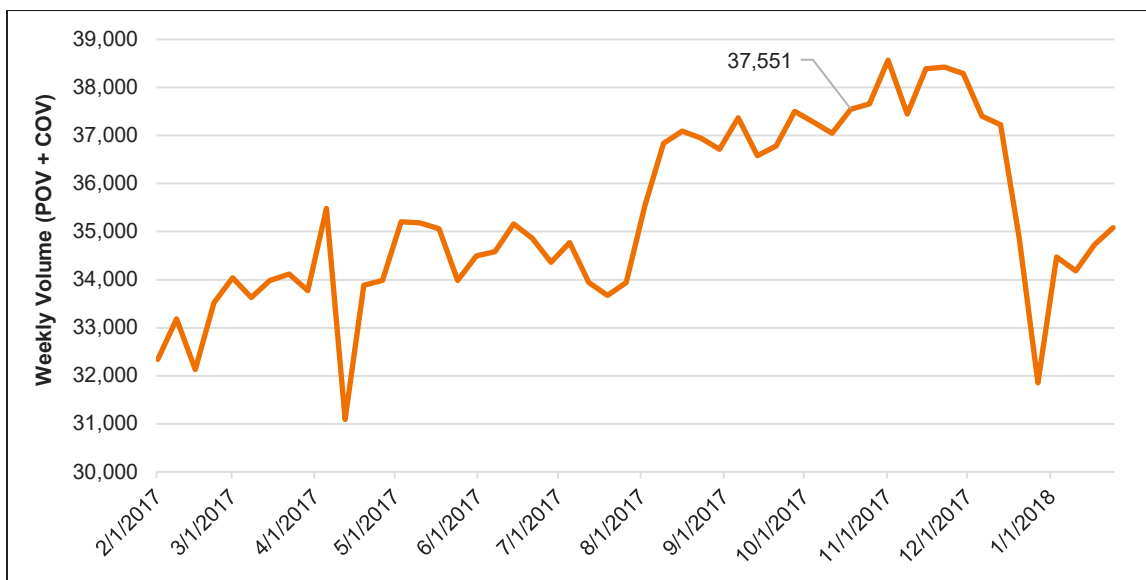
To find the 90th percentile weekly volume:

n = number of weeks = 52

p = percentile = 0.90

$n \times p = 52 \times 0.90 = 46.8$ – or the **47th highest volume week**

Figure A: Weekly Combined POV and COV Volumes (February 2017 to January 2018)



Furthermore, it was determined that the highest-volume day of that peak week was Thursday, October 19, 2017, with a total of 5,504 POVs and 129 COVs entering the facility (see **Table 1.1**).

Table 1.1: Daily POV and COV Volumes during the 90th Percentile Peak Week

Date	# POVs	# COVs	Combined Total
Wednesday, October 18, 2017	5,307	106	5,413
Thursday, October 19, 2017	5,504	129	5,633
Friday, October 20, 2017	5,376	117	5,493
Saturday, October 21, 2017	4,957	24	4,981
Sunday, October 22, 2017	5,119	-	5,119
Monday, October 23, 2017	5,305	118	5,423
Tuesday, October 24, 2017	5,381	108	5,489

1.1.1 Peak Period

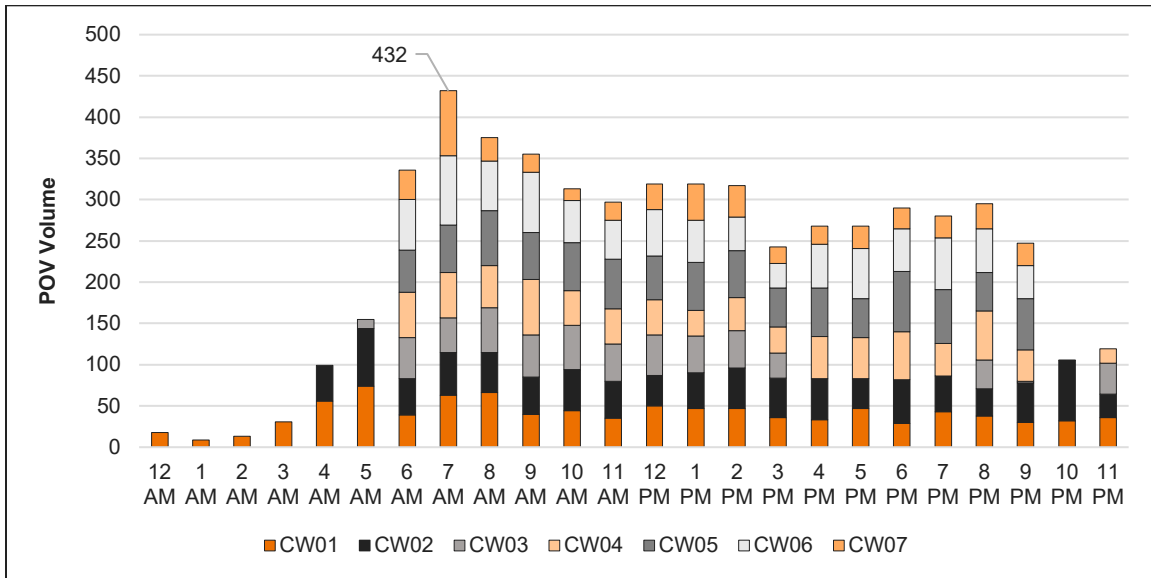
In analyzing the time-stamped processing times for October 19, 2017, the volume of vehicles that pass through each of the seven POV booths can be determined. The booths are referred to as CW01 on the far-right to CW07 at far-left. One can see from **Figure B** that typically all seven booths are open during the peak period. The far-left booth (CW07) is allocated for SENTRI vehicles.

Figure B: Aerial Image Looking Northbound from Mexico at the Douglas LPOE
(Date and Time Unknown)



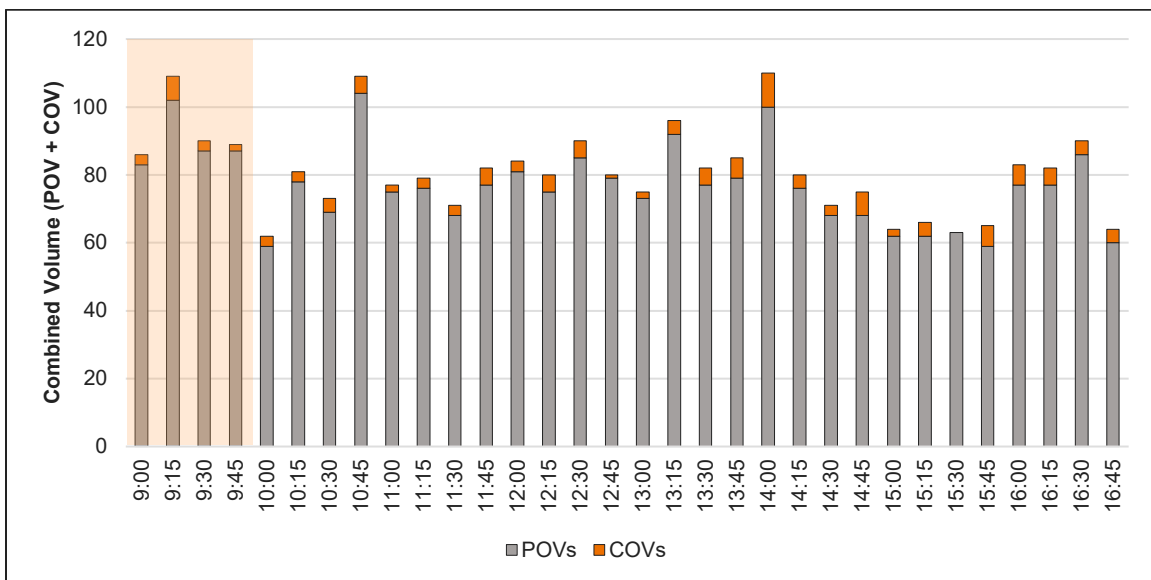
It can be determined from the data that the peak period for POVs is from 7am to 8am, with 432 vehicles processed during that hour on October 19, 2017 (see **Figure C**). This peak hour also represents the highest volume of SENTRI vehicles that pass through booth CW07.

Figure C: Hourly POV Volumes by Booth on October 19, 2017



However, in an effort to capture the peak time window for both POVs and COVs, it is necessary to focus on the hours between 9am and 5pm, when the COV processing facility is open. The volumes processed during those eight hours were isolated for analysis. **Figure D**, below, displays the 15-minute volumes counted between 9am and 5pm for POVs and COVs combined. When the 15-minute volumes are summed for each hour, the combined peak hour is identified as 9am to 10am, with 374 total vehicles entering the facility during this hour (359 POVs and 15 COVs).

Figure D: 15-minute Volumes for 9am to 5pm on October 19, 2017

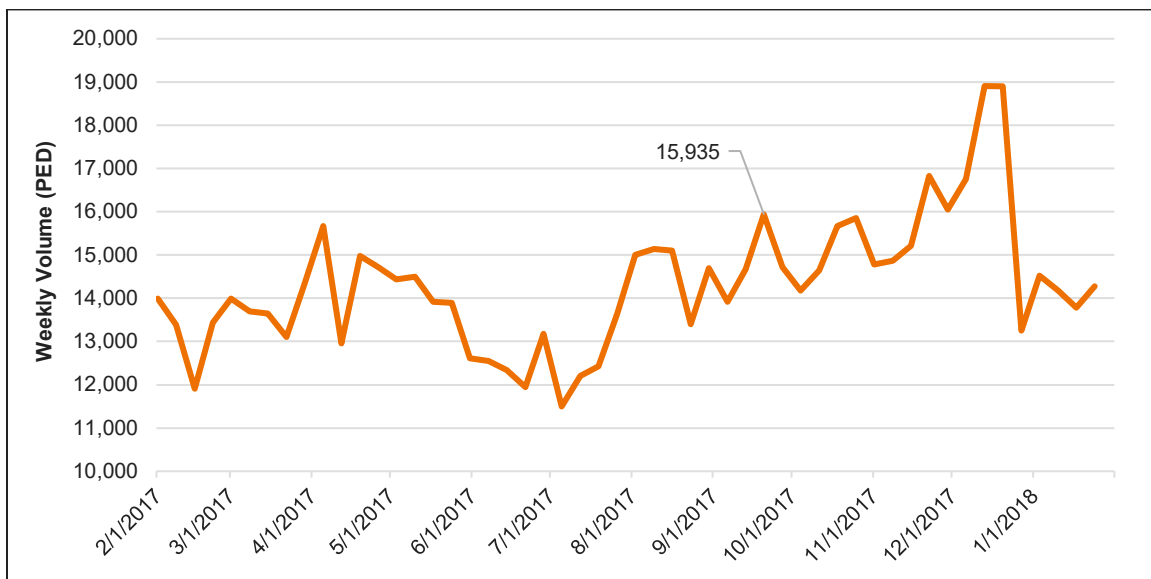


1.2 PEDESTRIAN VOLUMES

Pedestrian (PED) volumes were analyzed separately since they have their own processing facility and booths that are detached from the vehicle processing area. Currently, once processed, pedestrians that wish to access the building facility are required to cross the street where POVs drive through either to exit the facility or to park for secondary inspection. It is recommended that any new facility design allows for minimal interaction between pedestrians and vehicles to avoid conflicts.

Figure E shows the weekly PED volumes that entered the facility from February 2017 to January 2018. Although one can see a significant peak during the month of December, the 90th percentile peak week for pedestrians was found to be from September 20th to September 26th, 2017, with a total of 15,935 pedestrians entering the facility during that week. This 90th percentile volume was identified using the same methodology discussed in **Section 1.1**.

Figure E: Weekly PED Volumes (February 2017 to January 2018)



Furthermore, it was determined that the highest day of that peak week was Friday, September 22, 2017, with a total of 2,467 PEDs entering the facility (see **Table 1.4**).

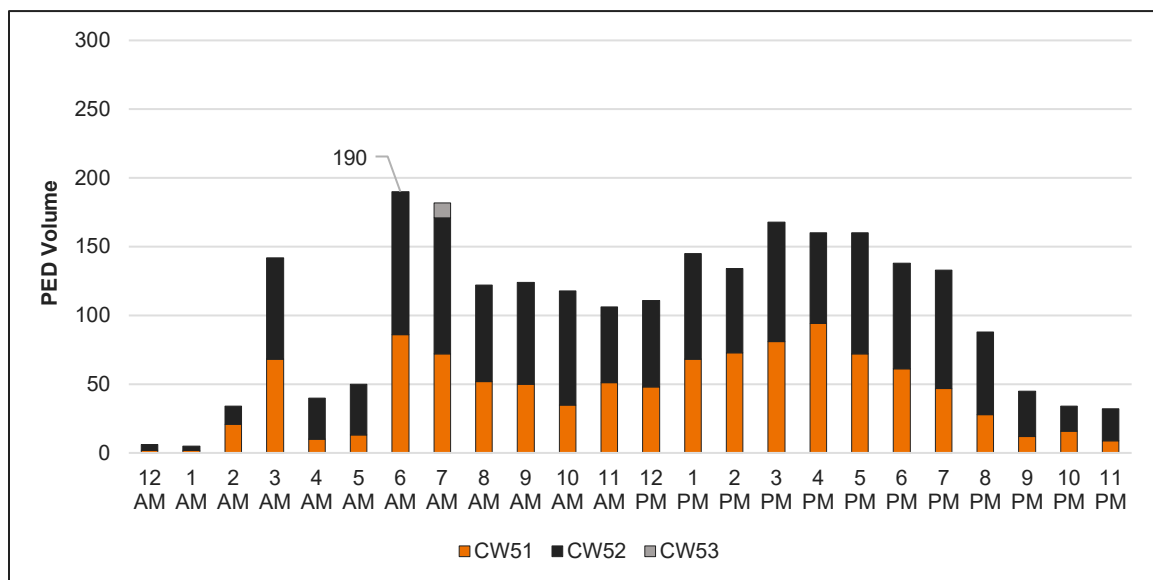
Table 1.4: Daily PED Volumes during the 90th Percentile Peak Week

Date	# PEDs	Weekly Total
Wednesday, September 20, 2017	2,159	15,935
Thursday, September 21, 2017	2,422	
Friday, September 22, 2017	2,467	
Saturday, September 23, 2017	2,457	
Sunday, September 24, 2017	1,917	
Monday, September 25, 2017	2,347	
Tuesday, September 26, 2017	2,166	

1.2.1 Peak Period

A closer look at the pedestrian crossing data for September 22, 2017 shows a peak from 6am to 7am, with 190 PEDs entering the facility (see **Figure F**). There are three processing booths for pedestrians. However, booth CW53 was in operation for only seven minutes on September 22nd, and processed 11 pedestrians from 7:39am to 7:46am.

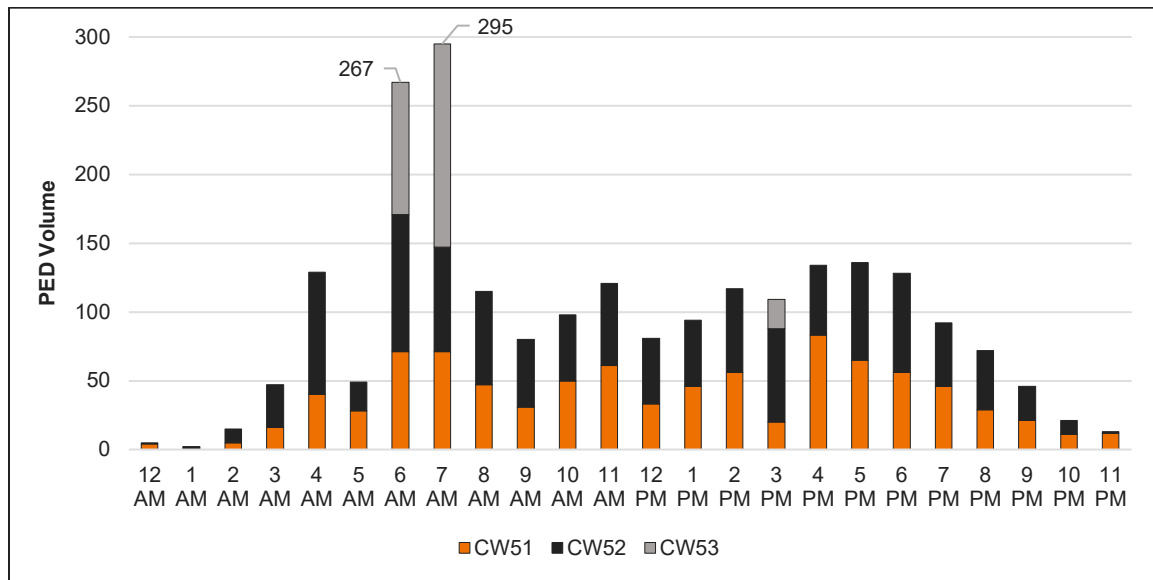
Figure F: Hourly PED Volumes by Booth on September 22, 2017



It is clear from the data for September 22, 2017 that not all three booths are in operation simultaneously all the time. In comparison, on October 19, 2017, which was the day chosen to model baseline behavior for vehicles, all three booths were in operation for a longer period of time. On that day, all three booths operated from 6am to 8am, and again from 3pm to 4pm (see **Figure G**). The total volume of PEDs entering the facility that day was 2,266, with

volumes of 267 from 6am to 7am and 295 from 7am to 8am. This higher-volume period was utilized going forward to provide a more conservative view of the operations of the pedestrian processing facility.

Figure G: Hourly PED Volumes by Booth on October 19, 2017



1.2.2 Pedestrian Processing Times

Just like vehicles, pedestrians entering the facility are also required to pass through a booth for admittance into the USA. **Table 1.5**, below, shows the processing times by booth from 6am to 8am on October 19, 2017. The average PED processing time was determined to be 29 seconds.

Table 1.5: PED Processing Times by Booth for 6am to 8am on October 19, 2017

Time (min:sec)	CW51	CW52	CW53	Average (CW51 – CW53)
Min Time	00:05	00:04	00:04	00:04
50 th Percentile	00:33	00:27	00:10	00:23
90 th Percentile	01:37	01:35	00:34	01:15
Max Time	06:02	03:58	06:34	05:31

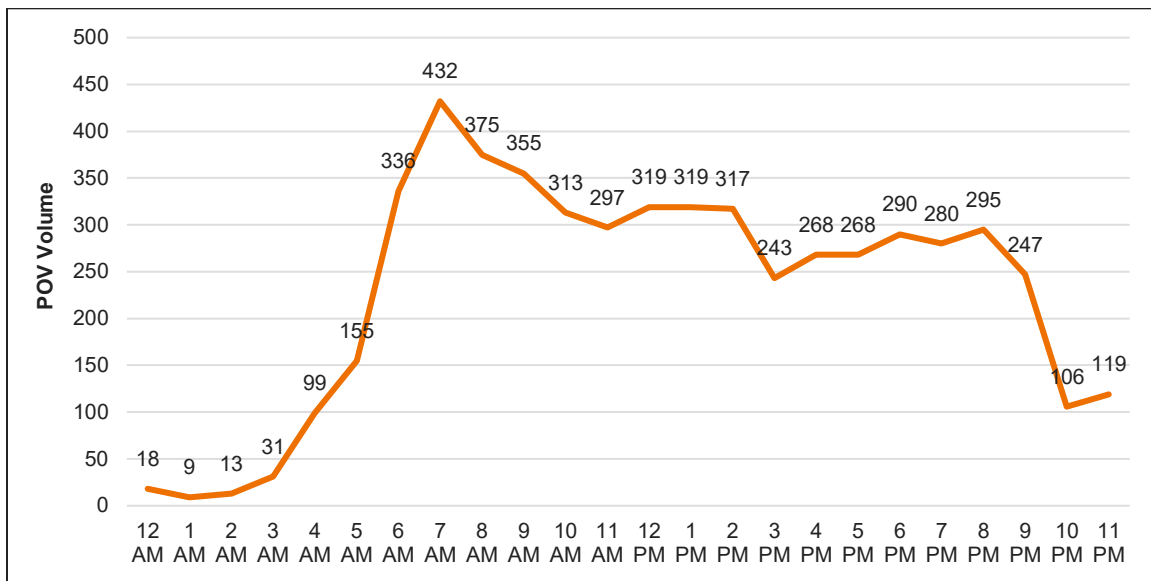
1.2.3 Pedestrian Admittance

The data from CBP also provides insight into the percentage of pedestrians admitted into the USA versus not admitted. An average of 97.38% of PEDs entering the facility pass through into the USA, while 2.62% of PEDs are not admitted.

2.0 DETERMINING DEMAND

To better understand the daily demand for POVs that enter the Douglas LPOE facility, the total number of POVs that passed through on the baseline scenario peak day of October 19, 2017 was assessed. On that day, a total of 5,504 POVs entered the facility through the seven POV booths. **Figure H** shows the flux of volume by hour.

Figure H: Hourly POV Volumes on October 19, 2017



To capture both POV and COV performance in the VISSIM model, the time window between 9am and 3pm was coded into the model. However, without any data regarding arrival information for POVs entering the queue – the actual hourly demand – traffic engineering judgement had to be used to determine the demand. An assumed factor of 1.3 times the actual processed volume was used to calculate a higher demand volume. For consistency, the same methodology was used for POVs, COVs, and PEDs.

Table 2.1 displays the actual volumes of processed POVs per hour on October 19, 2017, as well as the estimated demand volume calculated by applying the factor of 1.3, for all hours between 9am and 3pm. **Table 2.2** shows the same for COVs. **Table 2.3** shows the actual volume of processed PEDs during the peak hour on October 19, 2017, and the demand volume calculated by applying the factor of 1.3.

Table 2.1: Hourly POV Volumes on October 19, 2017

Time Frame	Processed Volume	Demand Volume
9am-10am	359	467
10am-11am	310	403
11am-12pm	296	385
12pm-1pm	320	416
1pm-2pm	321	417
2pm-3pm	313	407

Table 2.2: Hourly COV Volumes on October 19, 2017

Time Frame	Processed Volume	Demand Volume
9am-10am	15	20
10am-11am	15	20
11am-12pm	13	17
12pm-1pm	14	18
1pm-2pm	17	22
2pm-3pm	24	31

Table 2.3: Hourly PED Volumes on October 19, 2017

Time Frame	Processed Volume	Demand Volume
7am-8am	295	384

2.1.1 Computing Growth Rates

The next step in the analysis is determining growth rates to calculate projected volumes for 2018 and 2043.

Using total yearly volumes from 2011 through 2017 for each mode of transportation as shown in **Table 2.4**, a cumulative compound annual growth rate (CAGR) was determined for use in projecting future volumes.

Table 2.4: Yearly Inbound Processed Volumes

Travel Mode	2011	2012	2013	2014	2015	2016	2017
POV	1,393,181	1,405,122	1,470,933	1,571,929	1,716,303	1,614,882	1,765,505
COV	29,883	31,636	32,497	33,104	34,545	30,815	30,649
PED	1,030,357	1,198,838	1,804,110	1,011,564	1,121,717	851,997	854,502
Total	2,453,421	2,635,596	3,307,540	2,616,597	2,872,565	2,497,694	2,650,656

To find the compound annual growth rate (CAGR):

V_f = final volume = 2,650,656

V_i = initial volume = 2,453,421

N = number of years = 7

$CAGR = (V_f/V_i)^{(1/N)} - 1 = (2,650,656 / 2,453,421)^{(1/7)} - 1 = 0.011$ – or **1.1%**

The same growth rate of 1.1% is assumed for all modes: PED, POV, and COV.

2.1.2 Determining 2018 Baseline Demand

After converting the 2017 processed volumes to 2017 demand volumes using the factor of 1.3, the CAGR of 1.1% can be used to calculate the projected 2018 demand volumes using the peak day of October 19, 2017 as a baseline.

Table 2.5 displays side-by-side the daily 2017 processed volumes, 2017 demand volumes, and 2018 demand volumes for all modes.

Table 2.5: Inbound Daily Border Crossing Volumes

Travel Mode	2017 Processed Volume	2017 Demand Volume	2018 Demand Volume
POV	5,504	7,155	7,234
COV	129	168	170
PED	2,266	2,946	2,978

Focusing in on the peak period used in the VISSIM model for the 2018 Baseline Scenario, the CAGR was applied to the hourly 2017 demand volumes previously discussed in **Section 2.0**. These new hourly 2018 demand volumes are presented below in **Table 2.6** for 9am to 3pm for POVs and COVs and for the single peak hour for PEDs.

Figure J: 22-Year Inbound COV Processing Trends

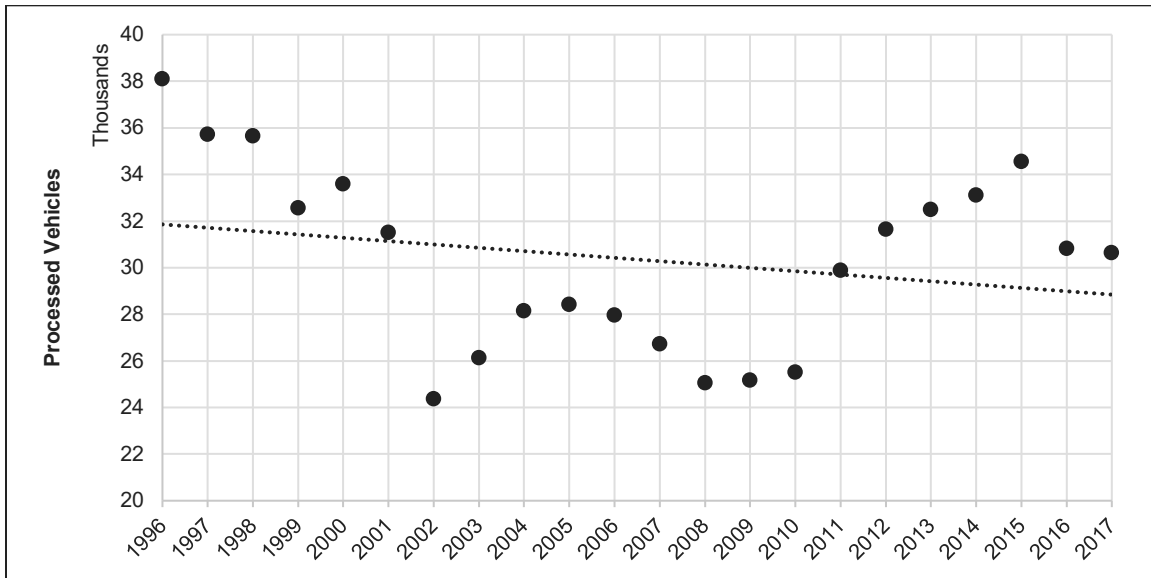
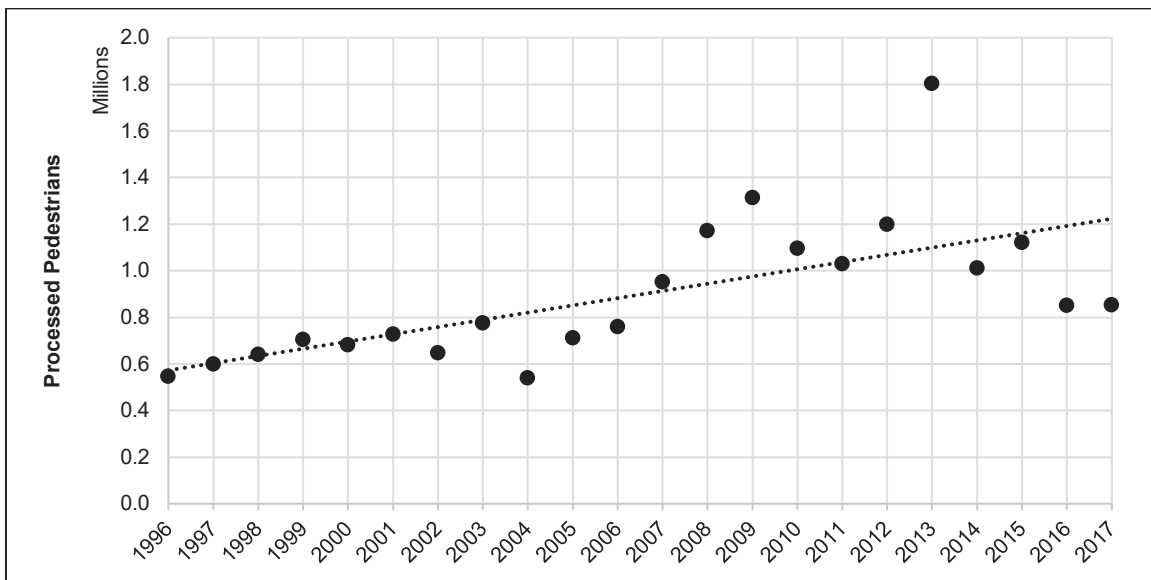


Figure K: 22-Year Inbound PED Processing Trends



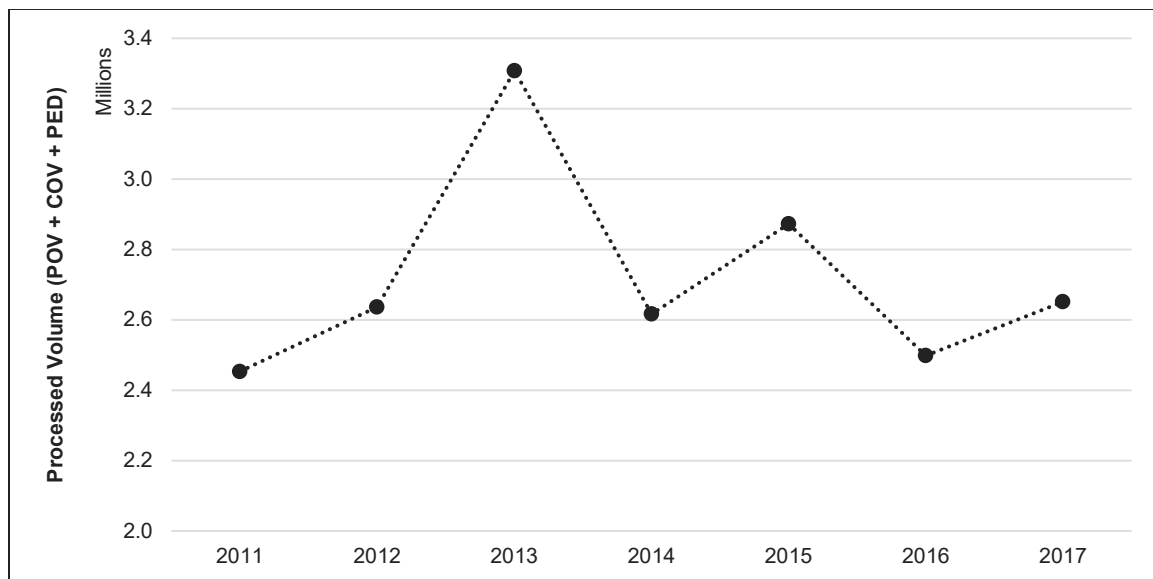
3.1.2 Growth Trends

Results from the 1996 to 2017 border crossing data yielded negative growth for both POV's and COV's. Volumes decreased significantly during the early 2000's which led to skewed data. Various historical events could be seen as large contributing factors to the decline in the three modes of transportation (POV, COV, and PED) during this time.

In December of 2006, Mexican President Felipe Calderon deployed troops to the City of Michoacan, in hopes of regaining control over the area and fighting back against Mexican drug cartels. Although this was the first time that war was officially declared, violence due to drug related matters had begun to surge a couple years earlier. As this issue became recognized worldwide, overall travel into and out of Mexico subsequently dropped (*"Mexico's war on drugs: what has it achieved and how is the US involved"*, *The Guardian*, *Nina Lakhani*, Dec 8 2016).

Given this major impact on the observed volumes, only the years between 2011-2017 were used to compute future growth rates, as described in Section 2.1.1). Since this seven-year period is the most recent data set showing growth, it was determined to be the most pertinent to this study. When these seven years are isolated, growth was noticed amongst all modes. The figure below represents the actual inbound combined total volume of POVs, COVs, and PEDs that entered the USA via the Douglas LPOE from 2011 to 2017.

Figure L: 7-Year Inbound Combined Processing Trends



The CAGR of 1.1% can be applied to the previously determined daily 2017 processed volumes from October 19, 2017 to calculate volumes for POVs, COVs, and PEDs for the horizon year 2043. These estimated future processing volumes are shown below in **Table 3.1**.

Table 3.1: Present and Future Year Inbound Daily Processing Volumes (not Demand)

Travel Mode	October 19, 2017	Projected 2018	Projected 2043	% Growth (2017 – 2043)
POV	5,504	5,565	7,315	32.9%
COV	129	130	171	
PED	2,266	2,291	3,012	

Appendix 2. ADOT Commercial Inspection Facility Data

Douglas State Port Of Entry Stats

January - December 2020

Permits:

Number of Trucks: 2578

Total CVSA inspections for the year: 72

CVSA Inspection: January: 8

February: 30

March: 0

April: 1

May: 0

June: 1

July: 9

August: 6

September: 6

October: 5

November: 4

December: 2

January - December 2021

Permits: 21

Number of Trucks: 2992

Total CVSA inspections for the year: 115

Number of Trucks: January: 391

February: 267

March: 312

April: 375

May: 178

June: 303

July: 242

August: 254

September: 152

October: 233

November: 117

December: 168

CVSA Inspection: January: 1

February: 10

March: 16

April: 15

May: 10

June: 15
July: 14
August: 12
September: 9
October: 5
November: 5
December: 3

January - December 2022

Permits: 6
Number of Trucks: 1816
Total CVSA inspections for the year: 80

Number of trucks: January: 227
February: 229
March: 253
April: 242
May: 153
June: 223
July: 188
August: 132
September: 104
October: 169
November: 27
December: 70

CVSA Inspection: January: 6
February: 13
March: 10
April: 3
May: 5
June: 12
July: 6
August: 10
September: 6
October: 5
November: 2
December: 2

Appendix 3. Collected Traffic Volume Data

Location Info					Count Data Info	
Location ID	100871				Start Date	12/7/2021
Type	LINK				End Date	12/8/2021
Functional Class	3				Start Time	12:00 AM
Located On	SR 80				End Time	12:00 AM
Between	Paul Spur Rd AND US 191 - West of Douglas				Direction	
Direction	2-WAY				Notes	adot
Community	Cochise				Count Source	DOUGLAS00000
MPO_ID	1				File Name	
HPMS ID					Weather	
Agency	Arizona Department of Transportation				Study	
					Owner	adot
					QC Status	Accepted
Interval: 15 mins						
Time	15 Min				Hourly Count	
	1st	2nd	3rd	4th		
00:00 - 01:00	7	11	7	9	34	
01:00 - 02:00	2	2	4	0	8	
02:00 - 03:00	3	3	0	2	8	
03:00 - 04:00	7	4	6	16	33	
04:00 - 05:00	11	19	16	19	65	
05:00 - 06:00	32	51	78	58	219	
06:00 - 07:00	51	82	71	60	264	
07:00 - 08:00	78	84	100	113	375	
08:00 - 09:00	77	77	85	110	349	
09:00 - 10:00	128	72	79	78	357	
10:00 - 11:00	85	69	99	90	343	
11:00 - 12:00	83	67	76	104	330	
12:00 - 13:00	98	83	72	106	359	
13:00 - 14:00	94	104	116	84	398	
14:00 - 15:00	119	81	99	104	403	
15:00 - 16:00	128	113	120	110	471	
16:00 - 17:00	107	111	113	112	443	
17:00 - 18:00	99	132	94	73	398	
18:00 - 19:00	54	51	63	54	222	
19:00 - 20:00	62	45	34	34	175	
20:00 - 21:00	45	42	33	28	148	
21:00 - 22:00	18	35	38	24	115	
22:00 - 23:00	33	21	18	16	88	
23:00 - 24:00	22	17	14	9	62	
TOTAL					5667	

Location Info				
Location ID	102213			
Type	LINK			
Functional Class	4			
Located On	US 191			
Between	SR 80 AND Glenn Rd			
Direction	2-WAY			
Community	Cochise			
MPO_ID	0			
HPMS ID				
Agency	Arizona Department of Transportation			

Location Info					
Location ID	100872				
Type	LINK				
Functional Class	3				
Located On	SR 80				
Between	US 191 - West of Douglas AND Chino Rd				
Direction	2-WAY				
Community	Cochise				
MPO_ID	0				
HPMS ID	VHKCRHTC2014				
Agency	Arizona Department of Transportation				
Interval: 15 mins					
Time	15 Min				Hourly Count
	1st	2nd	3rd	4th	
00:00 - 01:00	9	15	9	8	41
01:00 - 02:00	6	16	11	2	35
02:00 - 03:00	8	13	11	22	54
03:00 - 04:00	26	14	24	44	108
04:00 - 05:00	48	33	42	50	173
05:00 - 06:00	68	132	101	89	390
06:00 - 07:00	101	108	130	143	482
07:00 - 08:00	114	115	150	154	533
08:00 - 09:00	101	110	107	110	428
09:00 - 10:00	103	140	125	110	478
10:00 - 11:00	120	135	125	108	488
11:00 - 12:00	126	138	165	151	580
12:00 - 13:00	149	149	152	158	608
13:00 - 14:00	159	146	178	162	645
14:00 - 15:00	192	177	175	179	723
15:00 - 16:00	164	147	156	145	612
16:00 - 17:00	171	166	154	167	658
17:00 - 18:00	186	152	126	134	598
18:00 - 19:00	101	98	77	75	351
19:00 - 20:00	69	57	61	68	255
20:00 - 21:00	64	53	55	54	226
21:00 - 22:00	56	70	48	40	214
22:00 - 23:00	74	34	35	22	165
23:00 - 24:00	31	33	12	20	96
TOTAL					8941

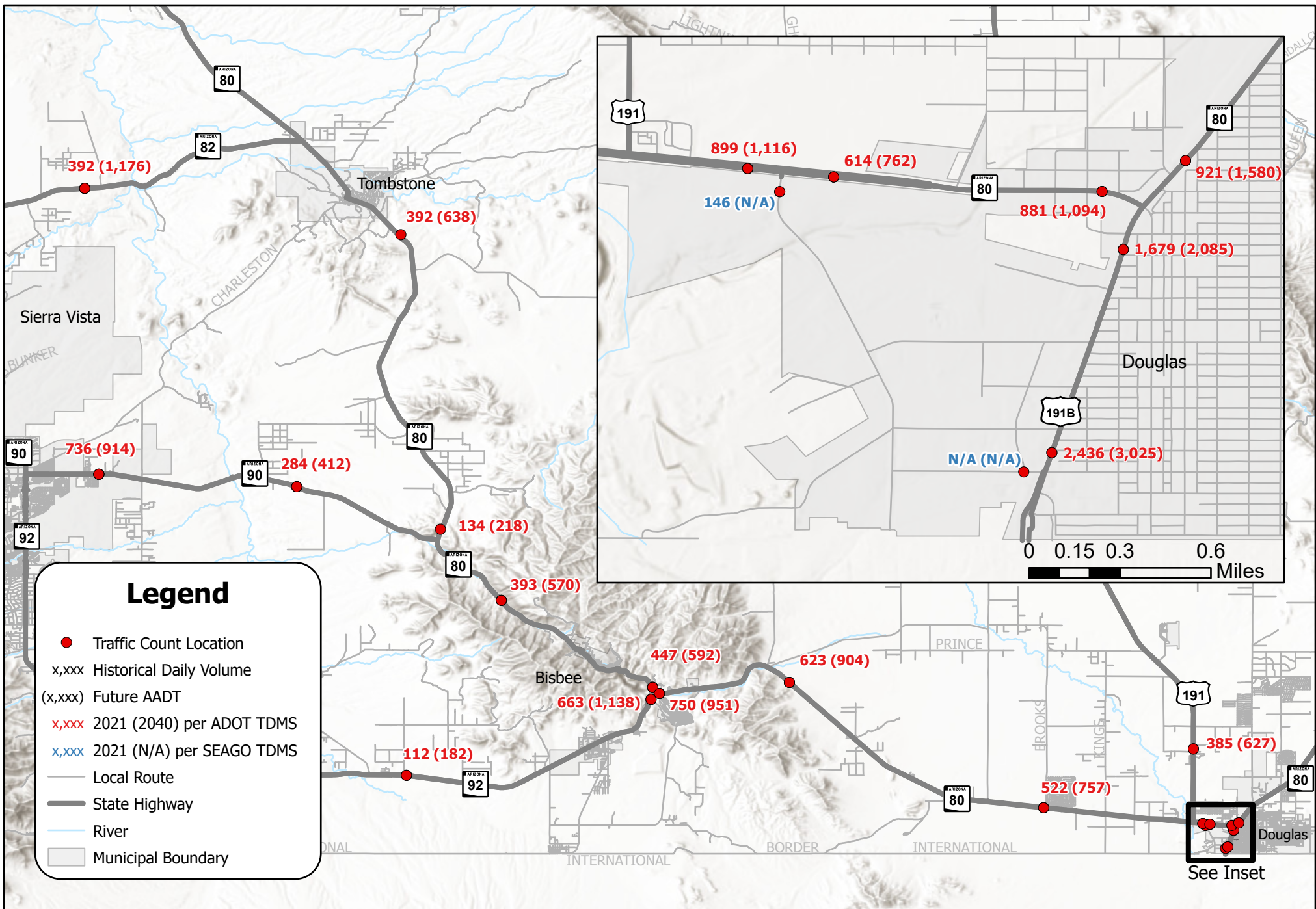
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Notes	adot
Count Source	1.47734E+11
File Name	
Weather	
Study	
Owner	adot
QC Status	Accepted

Location Info					
Location ID	100876				
Type	LINK				
Functional Class	4				
Located On	SR 80				
Between	US 191B / G Ave - Douglas AND A Ave / Leslie Canyon / Fairgrounds Rd				
Direction	2-WAY				
Community	DOUGLAS				
MPO_ID	0				
HPMS ID	S00004883101				
Agency	Arizona Department of Transportation				
Interval: 15 mins					
Time	15 Min				Hourly Count
	1st	2nd	3rd	4th	
00:00 - 01:00	8	5	2	6	21
01:00 - 02:00	5	6	3	1	15
02:00 - 03:00	1	1	2	4	8
03:00 - 04:00	13	0	2	10	25
04:00 - 05:00	4	4	11	8	27
05:00 - 06:00	22	22	19	33	96
06:00 - 07:00	21	24	24	29	98
07:00 - 08:00	23	25	27	48	123
08:00 - 09:00	33	53	46	50	182
09:00 - 10:00	44	34	47	52	177
10:00 - 11:00	35	46	30	41	152
11:00 - 12:00	39	45	43	40	167
12:00 - 13:00	56	42	43	69	210
13:00 - 14:00	72	62	56	60	250
14:00 - 15:00	51	49	60	47	207
15:00 - 16:00	51	45	37	40	173
16:00 - 17:00	44	46	51	68	209
17:00 - 18:00	57	36	57	46	196
18:00 - 19:00	40	39	36	29	144
19:00 - 20:00	36	31	29	23	119
20:00 - 21:00	37	30	23	29	119
21:00 - 22:00	29	33	24	31	117
22:00 - 23:00	18	11	11	11	51
23:00 - 24:00	13	13	7	7	40
TOTAL					2926

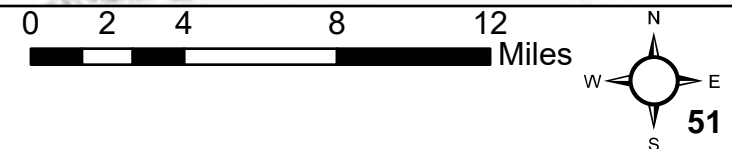
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End Time	1:30 PM
Direction	
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File Name	
Weather	
Study	
Owner	adot
QC Status	Accepted

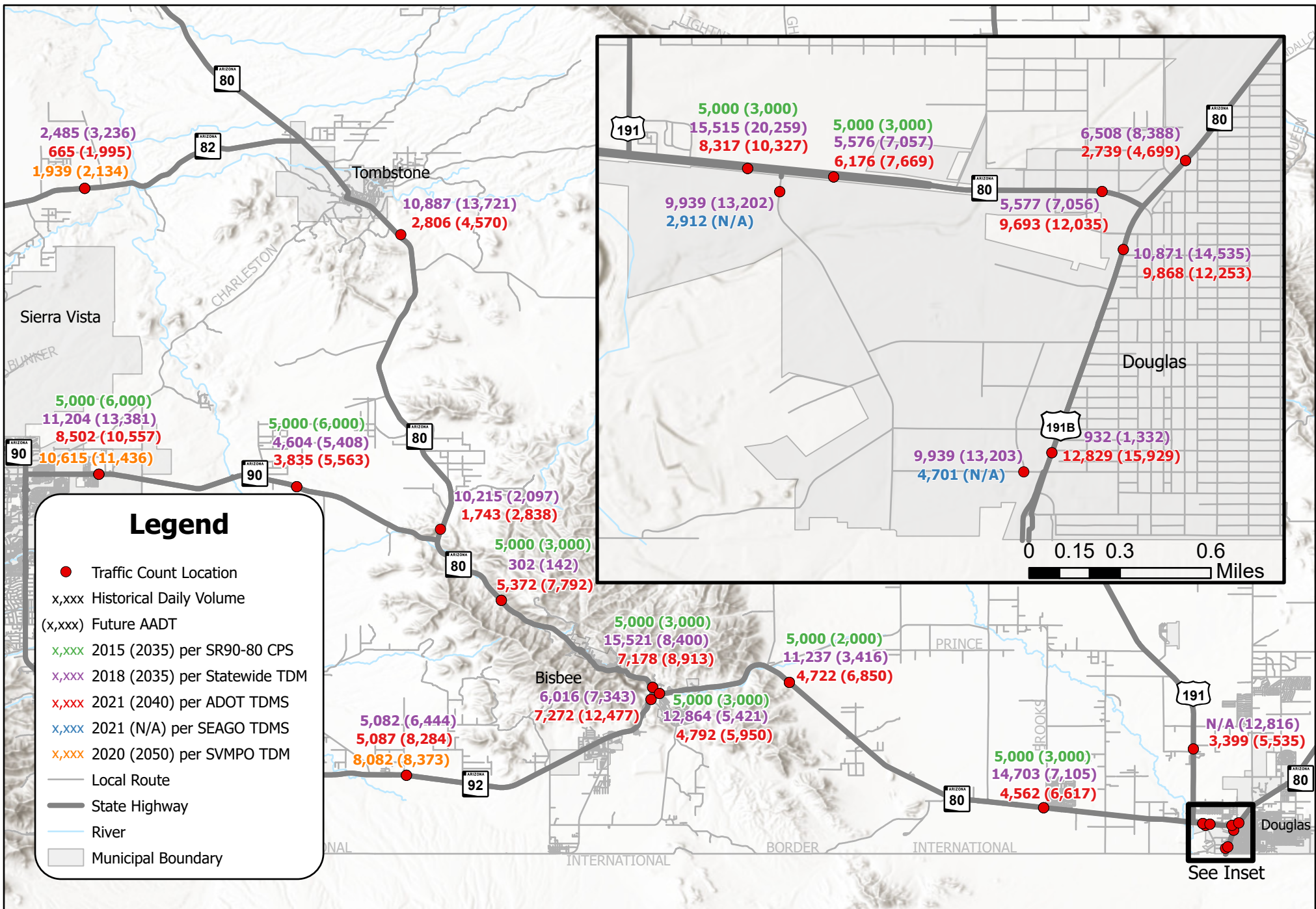
Location Info					
Location ID	c02234				
Type	I-SECTION				
Functional Class	4				
Located On	N Chino Rd				
BETWEEN	W Highway 80 EB				
Direction	2-WAY				
Community	Douglas West				
MPO_ID					
HPMS ID					
Agency	SouthEastern Arizona Governments Organization				
Interval: 15 mins					
Time	15 Min				Hourly Count
	1st	2nd	3rd	4th	
00:00 - 01:00	8	2	4	3	17
01:00 - 02:00	3	4	3	1	11
02:00 - 03:00	1	2	1	3	7
03:00 - 04:00	1	2	3	2	8
04:00 - 05:00	5	5	7	10	27
05:00 - 06:00	19	11	14	20	64
06:00 - 07:00	12	24	22	24	82
07:00 - 08:00	44	34	45	41	164
08:00 - 09:00	49	32	57	31	169
09:00 - 10:00	36	40	30	40	146
10:00 - 11:00	35	42	58	45	180
11:00 - 12:00	39	52	47	45	183
12:00 - 13:00	62	62	44	47	215
13:00 - 14:00	52	48	35	39	174
14:00 - 15:00	45	43	63	44	195
15:00 - 16:00	69	56	46	46	217
16:00 - 17:00	45	40	50	54	189
17:00 - 18:00	60	55	63	64	242
18:00 - 19:00	42	36	35	32	145
19:00 - 20:00	33	37	38	31	139
20:00 - 21:00	26	22	33	21	102
21:00 - 22:00	29	28	25	15	97
22:00 - 23:00	35	15	20	5	75
23:00 - 24:00	9	8	4	2	23
TOTAL					2871

Count Data Info	
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End Date	6/6/2018
Start Time	12:00 AM
End Time	12:00 AM
Direction	2-WAY
Notes	seago
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File Name	c02234_vol.prn
Weather	
Study	
Owner	adam
QC Status	Accepted

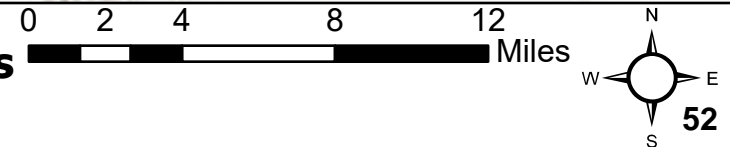


Existing and Projected Future Truck Volumes





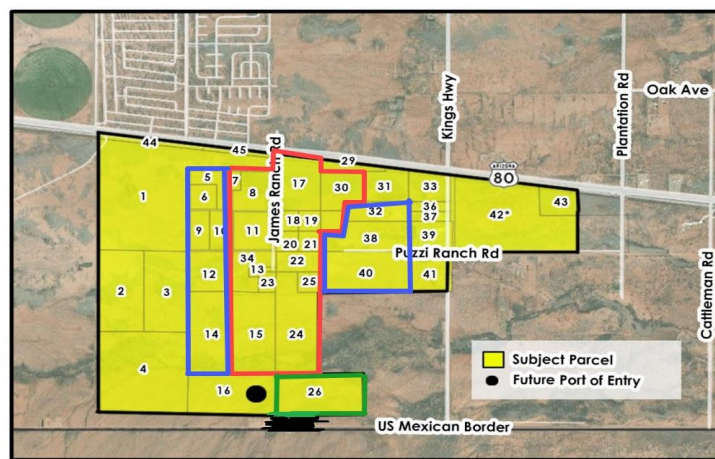
Existing and Projected Future Daily Vehicle Volumes



Appendix 4. Volume Development Calculations

TOTAL AREA (ACRES):			
100%	30%		
82.45	81.22		
92.09	54.59		
10.17	29.17		
20.4	80.33		
10.06	40.11		
10.05	17.25		
10.05	20.22		
10.04	15		
10.03	19.69		
55.41			
36.01			
80.6			
8.03			
28.3			
4.01			
34.9			
33.96			
4.62			
TOTAL AC	541.18	357.58	
TOTAL SF	23573800.8	15576184.8	
ADJUSTED SF	23573800.8	4672855.44	648.454
FAR		0.25	
FLOOR AREA	5893450.2	1168213.86	
GRAND TOTAL SF	7061664.06		7061.664 (KSF)

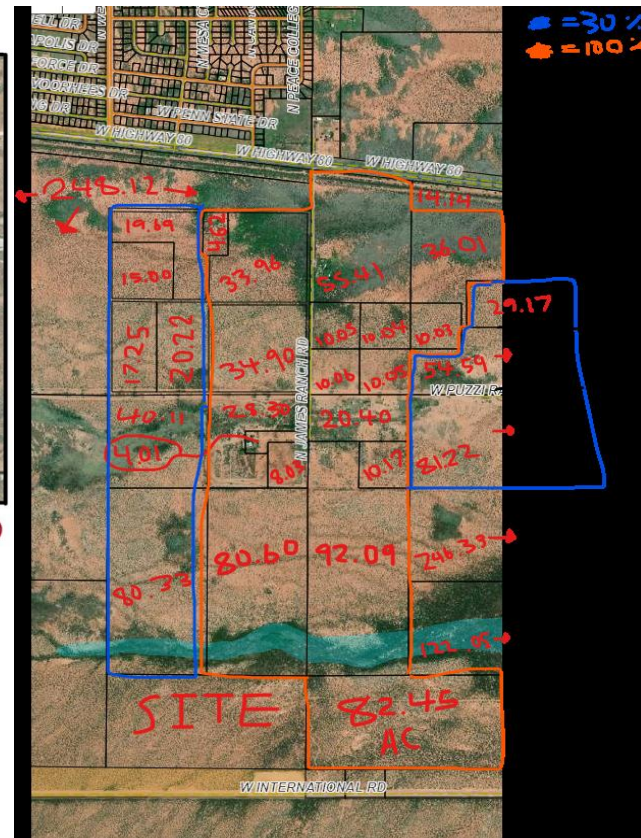
Figure 2: Subject Parcels Map



Land Use Map Amendment Boundaries
CPA 22-01



100% of Red/Green + 30% of blue assumed



Trip Generation Planner (ITE 11th Edition) - Summary Report

Weekday Trip Generation
Trips Based on Average Rates/Equations

Project Name Douglas IPOE Connector Road
Project Number 096552002

ITE Code	Internal Capture Land Use	Land Use Description	Independent Variable	Setting/Location	No. of Units	Avg Rate or Eq	Rates			Total Trips						
							Daily Rate	AM Rate	PM Rate	Daily Trips	AM Trips	PM Trips	AM Trips In	AM Trips Out	PM Trips In	PM Trips Out
150	Select Use	Warehousing	1,000 Sq Ft	General Urban/Suburban	7061.7	Avg	1.71	0.21	0.23	12,076	1,483	1,624	979	504	390	1,234

Data from Stantec Report

Overall Daily Peak Hr

Daily Peak Hr within open hrs (9am-5pm)

Daily Peak Hr Passenger Cars (POVs)

Daily Peak Hr Trucks (COVs)

Truck Daily Peak Hr

Daily Peak Hr within open hrs (9am-5pm)

Daily Peak Hr Passenger Cars (POVs)

Daily Peak Hr Trucks (COVs)

DEMAND FACTOR:

(Trips *entering* USA)

9-10am

Processed Demand

374 486

15 20

2-3pm

Processed Demand

313 407

24 31 <- trips generated by POE will be trucks only

1.3

Adjacent Site Trip Generation

ITE LU 150 (Warehousing)

*AM/PM Peak Hour of Generator

Land Use Summary (see Adjacent Site Trip Gen spreadsheet for details)

Total Acres (adjusted) 648.454 AC

FAR 0.25

Total Building Area 7061.664 KSF

HORIZON TRIP GEN:	In	Out	Total
AM	979	504	1483
PM	390	1234	1624
Daily	6038	6037	12075

	Rate	% In	% Out
AM	0.21	0.66	0.34
PM	0.23	0.24	0.76
Daily	1.71	0.5	0.5

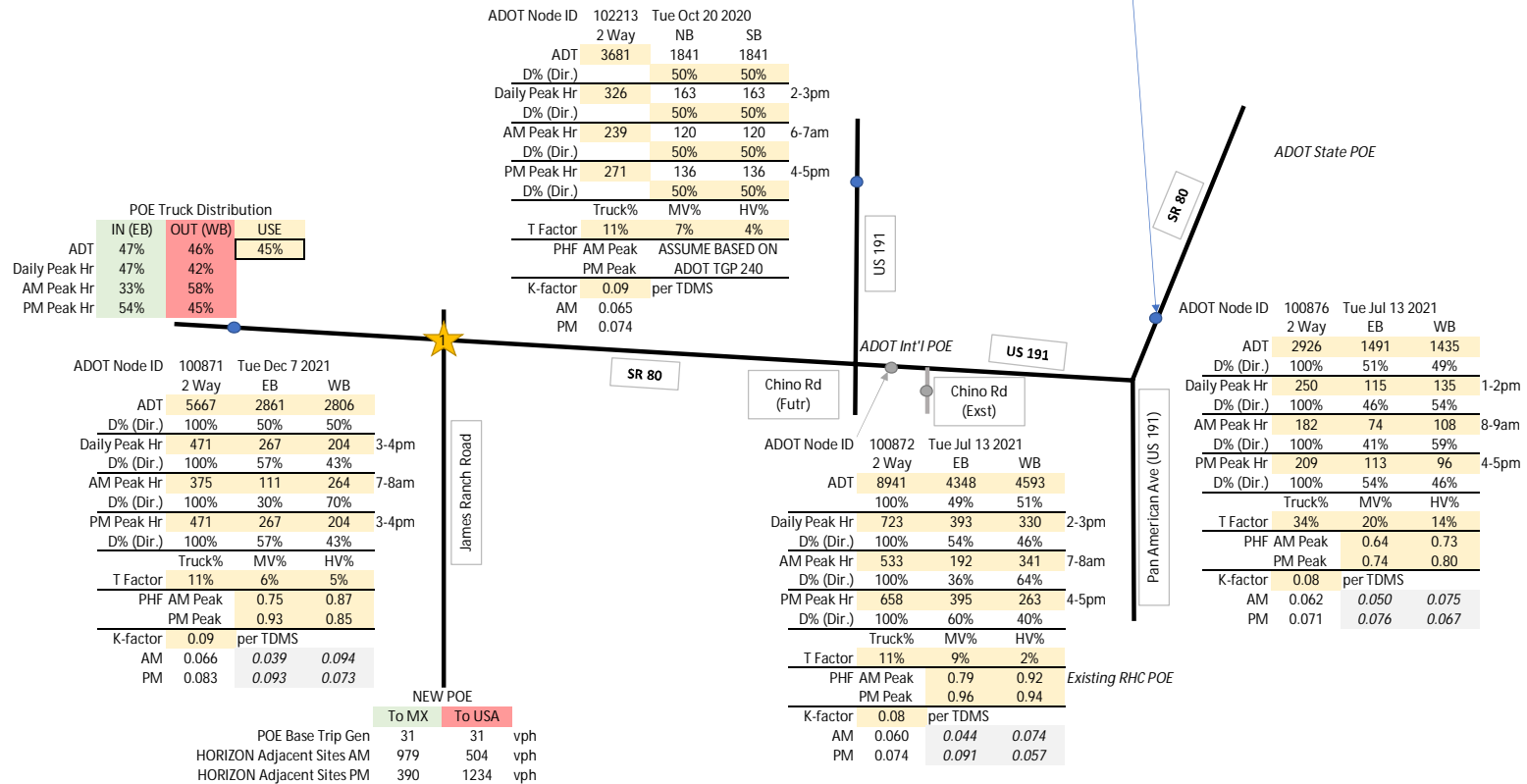
Estimated Total Intersection Hourly Volume

James Ranch Rd & SR 80 (Intersection 1)	Estimated Total Intersection Hourly Volume												Factors	Notes
	L	T	R	L	T	R	L	T	R	L	T	R		
AM Peak Hr Existing Tfc	0	0	0	0	0	0	0	111	0	0	264	0		
PM Peak Hr Existing Tfc	0	0	0	0	0	0	0	267	0	0	204	0		
POE Peak Hr Asmt (To ADOT Int'l POE)			31								14		100%	=% of Int'l POE traffic that must turn NBR to go to State POE
POE Peak Hr Asmt (Remainder)	0		0						14	17				
Adjacent Site Asmt - AM Opening	23		129						44	250			30%	=% of adjacent site built by Site Buildout
Adjacent Site Asmt - PM Opening	56		315						18	99				
Adjacent Site Asmt - AM Horizon	76		428						147	832				
Adjacent Site Asmt - PM Horizon	185		1049						59	332				

WAREHOUSING DISTRIBUTION	
<- To/From West	To/From East ->
15%	85%

POE Truck Distribution		
ADT	IN (SB)	OUT (NB)
Daily Peak Hr	30%	30%
AM Peak Hr	29%	34%
PM Peak Hr	27%	30%

POE Truck Distribution		
ADT	IN (WB)	OUT (EB)
Daily Peak Hr	23%	24%
AM Peak Hr	24%	24%
PM Peak Hr	19%	25%



Estimated Total Intersection Hourly Volume														Factors	Notes
US 191 & SR 80 (Intersection 2)	NB			SB			EB			WB					
	L	T	R	L	T	R	L	T	R	L	T	R			
	AM Peak Hr Existing Tfc	0	0	0	75	0	45	32	79	0	0	205	136		
	PM Peak Hr Existing Tfc	0	0	0	85	0	51	76	191	0	0	158	105		
	POE Peak Hr Asmt (To ADOT Int'l POE)	0	0	0	17	0	14	31	0	0	0	0	0		
	Adjacent Site Asmt - AM Opening	0	0	0	0	0	37	19	109	0	0	212	0		
	Adjacent Site Asmt - PM Opening	0	0	0	0	0	15	47	267	0	0	85	0		
	Adjacent Site Asmt - AM Horizon	0	0	0	0	0	125	64	364	0	0	707	0		
	Adjacent Site Asmt - PM Horizon	0	0	0	0	0	50	157	892	0	0	282	0		
Chino Rd Rerouting AM	42	30	4	-40	40	0	0	-55	55	5	-42	-30			
Chino Rd Rerouting PM	43	31	4	-69	69	0	0	-95	95	9	-43	-31			

WAREHOUSING DISTRIBUTION	
To/From US 191	To/From US 80
15%	85%

	Distribution		
	IN (SB)	OUT (NB)	USE
ADT	20%	20%	20%
Daily Peak Hr	21%	21%	
AM Peak Hr	21%	21%	
PM Peak Hr	20%	18%	

	Distribution		
	IN (WB)	OUT (EB)	USE
ADT	49%	48%	50%
Daily Peak Hr	43%	52%	
AM Peak Hr	60%	33%	
PM Peak Hr	40%	54%	

ADOT Node ID	102213	Tue Oct 20 2020	
	2 Way	NB	SB
ADT	3681	1841	1841
D% (Dir.)	50%	50%	50%
Daily Peak Hr	326	163	163
D% (Dir.)		50%	50%
AM Peak Hr	239	120	120
D% (Dir.)		50%	50%
PM Peak Hr	271	136	136
D% (Dir.)		50%	50%
	Truck%	MV%	HV%
T Factor	11%	7%	4%
PHF	AM Peak	ASSUME BASED ON	
	PM Peak	ADOT TGP 240	
K-factor	0.09	per TDMS	
AM	0.065		
PM	0.074		

	Distribution		
	IN (EB)	OUT (WB)	USE
ADT	31%	31%	30%
Daily Peak Hr	35%	27%	
AM Peak Hr	19%	46%	
PM Peak Hr	40%	28%	

ADOT Node ID	100871	Tue Dec 7 2021	
	2 Way	EB	WB
ADT	5667	2861	2806
D% (Dir.)	100%	50%	50%
Daily Peak Hr	471	267	204
D% (Dir.)	100%	57%	43%
AM Peak Hr	375	111	264
D% (Dir.)	100%	30%	70%
PM Peak Hr	471	267	204
D% (Dir.)	100%	57%	43%
	Truck%	MV%	HV%
T Factor	11%	6%	5%
PHF	AM Peak	0.75	0.87
	PM Peak	0.93	0.85
K-factor	0.09	per TDMS	
AM	0.066	0.039	0.094
PM	0.083	0.093	0.073

ADOT Node ID	100872	Tue Jul 13 2021	
	2 Way	EB	WB
ADT	8941	4348	4593
D% (Dir.)	100%	49%	51%
Daily Peak Hr	723	393	330
D% (Dir.)	100%	54%	46%
AM Peak Hr	533	192	341
D% (Dir.)	100%	36%	64%
PM Peak Hr	658	395	263
D% (Dir.)	100%	60%	40%
	Truck%	MV%	HV%
T Factor	11%	9%	2%
PHF	AM Peak	0.79	0.92
	PM Peak	0.96	0.94
K-factor	0.08	per TDMS	
AM	0.060	0.044	0.074

ADOT Node ID	100876	Tue Jul 13 2021	
	2 Way	EB	WB
ADT	2926	1491	1435
D% (Dir.)	100%	51%	49%
Daily Peak Hr	250	115	135
D% (Dir.)	100%	46%	54%
AM Peak Hr	182	74	108
D% (Dir.)	100%	41%	59%
PM Peak Hr	209	113	96
D% (Dir.)	100%	54%	46%
	Truck%	MV%	HV%
T Factor	34%	20%	14%
PHF	AM Peak	0.64	0.73
	PM Peak	0.74	0.80
K-factor	0.08	per TDMS	
AM	0.062	0.050	0.075
PM	0.071	0.076	0.067

SEAGO Node ID	c02234	Tue Jun 5 2018*	
	2 Way	NB	SB
ADT	2976	1305	1671
D% (Dir.)	100%	44%	56%
Daily Peak Hr	251	78	173
D% (Dir.)	100%	31%	69%
AM Peak Hr	175	76	100
D% (Dir.)	100%	43%	57%
PM Peak Hr	251	78	173
D% (Dir.)	100%	31%	69%
	Truck%		
T Factor	5%		
PHF	AM Peak	0.79	0.71
	PM Peak	0.99	0.93
K-factor	0.09	per TDMS	
AM	0.059	0.058	0.060
PM	0.084	0.060	0.104
	NBL	NBT	NBR
Split %:	55%	40%	5%

*2018 volumes grown to match 2022 ADT:		
2018 ADT	2022 ADT	Growth Factor
2871	2976	1.037

Truck % by Movement												
James Ranch Rd & SR 80 (Intersection 1)	NB			SB			EB			WB		
	L	T	R	L	T	R	L	T	R	L	T	R
AM Peak Hr Existing Tfc	2%	2%	2%	2%	2%	2%	2%	11%	2%	2%	11%	2%
PM Peak Hr Existing Tfc	2%	2%	2%	2%	2%	2%	2%	11%	2%	2%	11%	2%
POE Peak Hr Asmt (To ADOT Int'l POE)	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
POE Peak Hr Asmt (Remainder)	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Adjacent Site Asmt - AM Opening	20%	2%	20%	2%	2%	2%	2%	2%	20%	20%	2%	2%
Adjacent Site Asmt - PM Opening	20%	2%	20%	2%	2%	2%	2%	2%	20%	20%	2%	2%
Adjacent Site Asmt - AM Horizon	20%	2%	20%	2%	2%	2%	2%	2%	20%	20%	2%	2%
Adjacent Site Asmt - PM Horizon	20%	2%	20%	2%	2%	2%	2%	2%	20%	20%	2%	2%
US 191 & SR 80 (Intersection 2)	NB			SB			EB			WB		
	L	T	R	L	T	R	L	T	R	L	T	R
AM Peak Hr Existing Tfc	5%	5%	5%	11%	5%	11%	11%	11%	5%	5%	11%	11%
PM Peak Hr Existing Tfc	5%	5%	5%	11%	5%	11%	11%	11%	5%	5%	11%	11%
POE Peak Hr Asmt (To ADOT Int'l POE)	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Adjacent Site Asmt - AM Opening	2%	2%	2%	20%	2%	20%	20%	20%	2%	2%	20%	20%
Adjacent Site Asmt - PM Opening	2%	2%	2%	20%	2%	20%	20%	20%	2%	2%	20%	20%
Adjacent Site Asmt - AM Horizon	2%	2%	2%	20%	2%	20%	20%	20%	2%	2%	20%	20%
Adjacent Site Asmt - PM Horizon	2%	2%	2%	20%	2%	20%	20%	20%	2%	2%	20%	20%

Medium Vehicle % by Movement												
James Ranch Rd & SR 80 (Intersection 1)	NB			SB			EB			WB		
	L	T	R	L	T	R	L	T	R	L	T	R
AM Peak Hr Existing Tfc								6%			6%	
PM Peak Hr Existing Tfc								6%			6%	
POE Peak Hr Asmt (To ADOT Int'l POE)												
POE Peak Hr Asmt (Remainder)												
Adjacent Site Asmt - AM Opening	6%		6%						6%	6%		
Adjacent Site Asmt - PM Opening	6%		6%						6%	6%		
Adjacent Site Asmt - AM Horizon	6%		6%						6%	6%		
Adjacent Site Asmt - PM Horizon	6%		6%						6%	6%		
US 191 & SR 80 (Intersection 2)	NB			SB			EB			WB		
	L	T	R	L	T	R	L	T	R	L	T	R
AM Peak Hr Existing Tfc				7%		7%	7%	7%			7%	7%
PM Peak Hr Existing Tfc				7%		7%	7%	7%			7%	7%
POE Peak Hr Asmt (To ADOT Int'l POE)												
Adjacent Site Asmt - AM Opening				6%		6%	6%	6%			6%	6%
Adjacent Site Asmt - PM Opening				6%		6%	6%	6%			6%	6%
Adjacent Site Asmt - AM Horizon				6%		6%	6%	6%			6%	6%
Adjacent Site Asmt - PM Horizon				6%		6%	6%	6%			6%	6%

Heavy Vehicle % by Movement												
James Ranch Rd & SR 80 (Intersection 1)	NB			SB			EB			WB		
	L	T	R	L	T	R	L	T	R	L	T	R
AM Peak Hr Existing Tfc	2%	2%	2%	2%	2%	2%	2%	5%	2%	2%	5%	2%
PM Peak Hr Existing Tfc	2%	2%	2%	2%	2%	2%	2%	5%	2%	2%	5%	2%
POE Peak Hr Asmt (To ADOT Int'l POE)	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
POE Peak Hr Asmt (Remainder)	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Adjacent Site Asmt - AM Opening	14%	2%	14%	2%	2%	2%	2%	2%	14%	14%	2%	2%
Adjacent Site Asmt - PM Opening	14%	2%	14%	2%	2%	2%	2%	2%	14%	14%	2%	2%
Adjacent Site Asmt - AM Horizon	14%	2%	14%	2%	2%	2%	2%	2%	14%	14%	2%	2%
Adjacent Site Asmt - PM Horizon	14%	2%	14%	2%	2%	2%	2%	2%	14%	14%	2%	2%
US 191 & SR 80 (Intersection 2)	NB			SB			EB			WB		
	L	T	R	L	T	R	L	T	R	L	T	R
AM Peak Hr Existing Tfc	5%	5%	5%	4%	5%	4%	4%	4%	5%	5%	4%	4%
PM Peak Hr Existing Tfc	5%	5%	5%	4%	5%	4%	4%	4%	5%	5%	4%	4%
POE Peak Hr Asmt (To ADOT Int'l POE)	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Adjacent Site Asmt - AM Opening	2%	2%	2%	14%	2%	14%	14%	14%	2%	2%	14%	14%
Adjacent Site Asmt - PM Opening	2%	2%	2%	14%	2%	14%	14%	14%	2%	2%	14%	14%
Adjacent Site Asmt - AM Horizon	2%	2%	2%	14%	2%	14%	14%	14%	2%	2%	14%	14%
Adjacent Site Asmt - PM Horizon	2%	2%	2%	14%	2%	14%	14%	14%	2%	2%	14%	14%

ITE LU 150 Truck % Data:
11.2% = % of bidirectional truck traffic during truck peak @ 11AM-12PM
9.0% = % of bidirectional vehicle traffic during peak @ 3-4PM
7.3% = % of bidirectional vehicle traffic during truck peak @ 11AM-12PM
20% = ITE LU 150 truck % at one observed location (Trip Gen Handbook Appendix I)
35% = ITE TGM truck ADT rate vs all vehicles ADT rate
29% = ITE TGM truck AM Generator rate vs all vehicles AM Generator rate
26% = ITE TGM truck PM Generator rate vs all vehicles PM Generator rate
USE: 20%

Min Truck Percentage:
2% (per volume methodology email chain)

Additional Truck Data:

Node	Truck %	Notes
100870	13%	SR80 west of site (Near Double Adobe Rd)
100868	16%	SR80 - Lowell east of roundabout before meeting SR92
100867	7%	SR80 - Lowell north of roundabout after meeting SR92
100865	7%	SR80 west of Bisbee
100863	14%	SR80 south of Tombstone
100859	20%	SR80 in St David
100857	16%	SR80 north of St David
101743	14%	SR80 just before merging with I-10
		-> moderate to high truck % on SR80 west of site
102213	9%	US191 north of node 102213 (data we used)
102216	19%	US191 north of McNeal
102217	30%	US191 north of Elfrida
102219	17%	US191 west of Kansas Settlement Rd
102221	27%	US191 north of Dragoon Rd (last count before I-10)
		-> high truck % on US191
100879	11%	SR80 east of Washington Ave
		-> moderate truck % on SR80 east of site

Instructions

-Save each green tab as a separate "Text (Tab Delimited) file"
-Use the "Convert to CSV.xlsxm" to convert the .txt files to necessary Synchro/Traffig .csv files (Use the "Convert Both" button)

Analysis Year			
Existing	2022		
Opening	2028		
Future	2050		

Growth Rate			
SR80 Traffic	POE Traffic	US191 Traffic	
Existing -> Opening (Growth Factor)	2.0%	1.1%	2.0%
	1.126	1.068	1.126
Existing -> Horizon (Growth Factor)	2.0%	1.1%	2.0%
	1.741	1.358	1.741

*No growth for warehousing site traffic

Low Vol Movement Adjustments:	
Extst	1
Opening	5
Horizon	10

ASSUMED ALL ADJUSTMENTS = POVS

JAMES RANCH RD & SR 80 (INTERSECTION 1)												
Passenger Cars	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Existing AM	1	1	1	1	1	1	1	99	1	1	235	1
Existing PM	1	1	1	1	1	1	1	238	1	1	182	1
Opening AM	18	5	103	5	5	5	5	111	35	200	265	5
Opening PM	44	5	252	5	5	5	5	268	14	80	204	5
Horizon AM	60	10	343	10	10	10	10	172	117	666	409	10
Horizon PM	148	10	839	10	10	10	10	414	47	265	316	10
2028 No-Build AM	5	5	5	5	5	5	5	111	5	5	265	5
2028 No-Build PM	5	5	5	5	5	5	5	268	5	5	204	5
2050 No-Build AM	10	10	10	10	10	10	10	172	10	10	409	10
2050 No-Build PM	10	10	10	10	10	10	10	414	10	10	316	10

Medium Vehicles	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Existing AM	0	0	0	0	0	0	0	7	0	0	16	0
Existing PM	0	0	0	0	0	0	0	16	0	0	12	0
Opening AM	1	0	8	0	0	0	0	8	3	15	18	0
Opening PM	3	0	19	0	0	0	0	18	1	6	14	0
Horizon AM	5	0	26	0	0	0	0	12	9	50	28	0
Horizon PM	11	0	63	0	0	0	0	28	4	20	21	0
2028 No-Build AM	0	0	0	0	0	0	0	8	0	0	18	0
2028 No-Build PM	0	0	0	0	0	0	0	18	0	0	14	0
2050 No-Build AM	0	0	0	0	0	0	0	12	0	0	28	0
2050 No-Build PM	0	0	0	0	0	0	0	28	0	0	21	0

Heavy Vehicles	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Existing AM	0	0	0	0	0	0	0	6	0	0	13	0
Existing PM	0	0	0	0	0	0	0	13	0	0	10	0
Opening AM	3	0	51	0	0	0	0	6	21	53	30	0
Opening PM	8	0	77	0	0	0	0	15	17	32	26	0
Horizon AM	11	0	102	0	0	0	0	10	40	140	42	0
Horizon PM	26	0	189	0	0	0	0	23	27	70	37	0
2028 No-Build AM	0	0	0	0	0	0	0	6	0	0	15	0
2028 No-Build PM	0	0	0	0	0	0	0	15	0	0	11	0
2050 No-Build AM	0	0	0	0	0	0	0	10	0	0	23	0
2050 No-Build PM	0	0	0	0	0	0	0	23	0	0	18	0

TOTAL	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Existing AM	1	1	1	1	1	1	1	111	1	1	264	1
Existing PM	1	1	1	1	1	1	1	267	1	1	204	1
Opening AM	23	5	162	5	5	5	5	125	59	268	312	5
Opening PM	56	5	348	5	5	5	5	301	32	118	245	5
Horizon AM	76	10	471	10	10	10	10	193	166	855	479	10
Horizon PM	185	10	1091	10	10	10	10	465	78	355	374	10
2028 No-Build AM	5	5	5	5	5	5	5	125	5	5	297	5
2028 No-Build PM	5	5	5	5	5	5	5	301	5	5	230	5
2050 No-Build AM	10	10	10	10	10	10	10	193	10	10	460	10
2050 No-Build PM	10	10	10	10	10	10	10	465	10	10	355	10

PC %	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Existing AM	98%	98%	98%	98%	98%	98%	98%	89%	98%	98%	89%	98%
Existing PM	98%	98%	98%	98%	98%	98%	98%	89%	98%	98%	89%	98%
Opening AM	80%	98%	64%	98%	98%	98%	98%	89%	60%	75%	85%	98%
Opening PM	80%	98%	72%	98%	98%	98%	98%	89%	43%	68%	84%	98%
Horizon AM	80%	98%	73%	98%	98%	98%	98%	89%	71%	78%	85%	98%
Horizon PM	80%	98%	77%	98%	98%	98%	98%	89%	60%	75%	84%	98%
2028 No-Build AM	98%	98%	98%	98%	98%	98%	98%	89%	98%	98%	89%	98%
2028 No-Build PM	98%	98%	98%	98%	98%	98%	98%	89%	98%	98%	89%	98%
2050 No-Build AM	98%	98%	98%	98%	98%	98%	98%	89%	98%	98%	89%	98%
2050 No-Build PM	98%	98%	98%	98%	98%	98%	98%	89%	98%	98%	89%	98%

MV %	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Existing AM	0%	0%	0%	0%	0%	0%	0%	6%	0%	0%	6%	0%
Existing PM	0%	0%	0%	0%	0%	0%	0%	6%	0%	0%	6%	0%
Opening AM	6%	0%	5%	0%	0%	0%	0%	6%	4%	6%	6%	0%
Opening PM	6%	0%	5%	0%	0%	0%	0%	6%	3%	5%	6%	0%
Horizon AM	6%	0%	5%	0%	0%	0%	0%	6%	5%	6%	6%	0%
Horizon PM	6%	0%	6%	0%	0%	0%	0%	6%	5%	6%	6%	0%
2028 No-Build AM	0%	0%	0%	0%	0%	0%	0%	6%	0%	0%	6%	0%
2028 No-Build PM	0%	0%	0%	0%	0%	0%	0%	6%	0%	0%	6%	0%
2050 No-Build AM	0%	0%	0%	0%	0%	0%	0%	6%	0%	0%	6%	0%
2050 No-Build PM	0%	0%	0%	0%	0%	0%	0%	6%	0%	0%	6%	0%

HV %	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Existing AM	2%	2%	2%	2%	2%	2%	2%	5%	2%	2%	5%	2%
Existing PM	2%	2%	2%	2%	2%	2%	2%	5%	2%	2%	5%	2%
Opening AM	14%	2%	32%	2%	2%	2%	2%	5%	36%	20%	10%	2%
Opening PM	14%	2%	22%	2%	2%	2%	2%	5%	54%	27%	11%	2%
Horizon AM	14%	2%	22%	2%	2%	2%	2%	5%	24%	16%	9%	2%
Horizon PM	14%	2%	17%	2%	2%	2%	2%	5%	35%	20%	10%	2%
2028 No-Build AM	2%	2%	2%	2%	2%	2%	2%	5%	2%	2%	5%	2%
2028 No-Build PM	2%	2%	2%	2%	2%	2%	2%	5%	2%	2%	5%	2%
2050 No-Build AM	2%	2%	2%	2%	2%	2%	2%	5%	2%	2%	5%	2%
2050 No-Build PM	2%	2%	2%	2%	2%	2%	2%	5%	2%	2%	5%	2%

Truck %	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Existing AM	2%	2%	2%	2%	2%	2%	2%	11%	2%	2%	11%	2%
Existing PM	2%	2%	2%	2%	2%	2%	2%	11%	2%	2%	11%	2%
Opening AM	20%	2%	36%	2%	2%	2%	2%	11%	40%	25%	15%	2%
Opening PM	20%	2%	28%	2%	2%	2%	2%	11%	57%	32%	16%	2%
Horizon AM	20%	2%	27%	2%	2%	2%	2%	11%	29%	22%	15%	2%
Horizon PM	20%	2%	23%	2%	2%	2%	2%	11%	40%	25%	16%	2%
2028 No-Build AM	2%	2%	2%	2%	2%	2%	2%	11%	2%	2%	11%	2%
2028 No-Build PM	2%	2%	2%	2%	2%	2%	2%	11%	2%	2%	11%	2%
2050 No-Build AM	2%	2%	2%	2%	2%	2%	2%	11%	2%	2%	11%	2%
2050 No-Build PM	2%	2%	2%	2%	2%	2%	2%	11%	2%	2%	11%	2%

Total * PC%	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Opening AM	18	5	103	5	5	5	5	111	35	200	265	5
Opening PM	44	5	252	5	5	5	5	268	14	80	204	5
Horizon AM	60	10	343	10	10	10	10	172	117	666	409	10
Horizon PM	148	10	839	10	10	10	10	414	47	265	316	10
2028 No-Build AM	5	5	5	5	5	5	5	111	5	5	265	5
2028 No-Build PM	5	5	5	5	5	5	5	268	5	5	204	5
2050 No-Build AM	10	10	10	10	10	10	10	172	10	10	409	10
2050 No-Build PM	10	10	10	10	10	10	10	414	10	10	316	10

PC Weighted Avg	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Opening AM	66%				98%			80%			80%	
Opening PM	74%				98%			85%			79%	
Horizon AM	74%				98%			81%			80%	
Horizon PM	78%				98%			85%			81%	
2028 No-Build AM	98%				98%			90%			89%	
2028 No-Build PM	98%				98%			89%			89%	
2050 No-Build AM	98%				98%			90%			89%	
2050 No-Build PM	98%				98%			89%			89%	

Total * MV%	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Opening AM	1	0	8	0	0	0	0	8	3	15	18	0
Opening PM	3	0	19	0	0	0	0	18	1	6	14	0
Horizon AM	5	0	26	0	0	0	0	12	9	50	28	0
Horizon PM	11	0	63	0	0	0	0	28	4	20	21	0
2028 No-Build AM	0	0	0	0	0	0	0	8	0	0	18	0
2028 No-Build PM	0	0	0	0	0	0	0	18	0	0	14	0
2050 No-Build AM	0	0	0	0	0	0	0	12	0	0	28	0
2050 No-Build PM	0	0	0	0	0	0	0	28	0	0	21	0

MV Weighted Avg	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Opening AM	5%				0%			5%			6%	
Opening PM	5%				0%			6%			5%	
Horizon AM	5%				0%			6%			6%	
Horizon PM	6%				0%			6%			6%	
2028 No-Build AM	0%				0%			6%			6%	
2028 No-Build PM	0%				0%			6%			6%	
2050 No-Build AM	0%				0%			5%			6%	
2050 No-Build PM	0%				0%			6%			6%	

Total * HV%	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Opening AM	3	0	51	0	0	0	6	21	53	30	0	0
Opening PM	8	0	77	0	0	0	15	17	32	26	0	0
Horizontal AM	11	0	102	0	0	0	10	40	140	42	0	0
Horizontal PM	26	0	189	0	0	0	23	27	70	37	0	0
2028 No-Build AM	0	0	0	0	0	0	6	0	0	15	0	0
2028 No-Build PM	0	0	0	0	0	0	15	0	0	11	0	0
2050 No-Build AM	0	0	0	0	0	0	10	0	0	23	0	0
2050 No-Build PM	0	0	0	0	0	0	23	0	0	18	0	0

Total Volumes by Movement	JAMES RANCH RD & SR 80 (INTERSECTION 1)												
		NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
	Existing AM	1	1	1	1	1	1	1	111	1	1	264	1
	Existing PM	1	1	1	1	1	1	1	267	1	1	204	1
	Opening AM	23	5	162	5	5	5	5	125	59	268	312	5
	Opening PM	56	5	348	5	5	5	5	301	32	118	245	5
	Horizon AM	76	10	471	10	10	10	10	193	166	855	479	10
	Horizon PM	185	10	1091	10	10	10	10	465	78	355	374	10
	2028 No-Build AM	5	5	5	5	5	5	5	125	5	5	297	5
	2028 No-Build PM	5	5	5	5	5	5	5	301	5	5	230	5
	2050 No-Build AM	10	10	10	10	10	10	10	193	10	10	460	10
2050 No-Build PM	10	10	10	10	10	10	10	465	10	10	355	10	

Total Volumes by Approach		SOUTH LEG			NORTH LEG			WEST LEG			EAST LEG		
		NB	SB	TOTAL	SB	NB	TOTAL	EB	WB	TOTAL	WB	EB	TOTAL
	Existing AM	3	3	6	3	3	6	113	266	379	266	113	379
	Existing PM	3	3	6	3	3	6	269	206	475	206	269	475
	Opening AM	189	332	521	15	15	30	189	340	529	585	292	877
	Opening PM	408	155	563	15	15	30	338	305	643	367	653	1021
	Horizon AM	556	1031	1587	30	30	60	369	564	933	1344	674	2018
	Horizon PM	1286	442	1728	30	30	60	552	569	1122	739	1566	2305
	2028 No-Build AM	15	15	30	15	15	30	135	307	442	307	135	442
	2028 No-Build PM	15	15	30	15	15	30	311	240	550	240	311	550
	2050 No-Build AM	30	30	60	30	30	60	213	480	693	480	213	693
	2050 No-Build PM	30	30	60	30	30	60	485	375	860	375	485	860

K-Factor	AM	0.09			0.09			0.066			0.066		
	PM	0.09			0.09			0.083			0.083		

Estimated ADT (Raw)		SOUTH LEG			NORTH LEG			WEST LEG			EAST LEG		
		NB	SB	TOTAL	SB	NB	TOTAL	EB	WB	TOTAL	WB	EB	TOTAL
	Existing AM	33	33	67	33	33	67	1708	4020	5727	4020	1708	5727
	Existing PM	33	33	67	33	33	67	3237	2479	5715	2479	3237	5715
	Opening AM	2103	3687	5790	167	167	333	2856	5136	7993	8841	4407	13248
	Opening PM	4537	1723	6260	167	167	333	4069	3672	7741	4419	7862	12281
	Horizon AM	6179	11457	17636	333	333	667	5578	8526	14104	20308	10182	30490
	Horizon PM	14290	4912	19202	333	333	667	6646	6849	13495	8888	18840	27728
	2028 No-Build AM	167	167	333	167	167	333	2040	4644	6684	4644	2040	6684
	2028 No-Build PM	167	167	333	167	167	333	3738	2884	6623	2884	3738	6623
	2050 No-Build AM	333	333	667	333	333	667	3223	7248	10471	7248	3223	10471
	2050 No-Build PM	333	333	667	333	333	667	5834	4514	10348	4514	5834	10348

Estimated ADT (Rounded)		SOUTH LEG			NORTH LEG			WEST LEG			EAST LEG		
		NB	SB	TOTAL	SB	NB	TOTAL	EB	WB	TOTAL	WB	EB	TOTAL
	Existing AM	0	0	100	0	0	100	1700	4000	5700	4000	1700	5700
	Existing PM	0	0	100	0	0	100	3200	2500	5700	2500	3200	5700
	Opening AM	2100	3700	5800	200	200	300	2900	5100	8000	8800	4400	13200
	Opening PM	4500	1700	6300	200	200	300	4100	3700	7700	4400	7900	12300
	Horizon AM	6200	11500	17600	300	300	700	5600	8500	14100	20300	10200	30500
	Horizon PM	14300	4900	19200	300	300	700	6600	6800	13500	8900	18800	27700
	2028 No-Build AM	200	200	300	200	200	300	2000	4600	6700	4600	2000	6700
	2028 No-Build PM	200	200	300	200	200	300	3700	2900	6600	2900	3700	6600
	2050 No-Build AM	300	300	700	300	300	700	3200	7200	10500	7200	3200	10500
	2050 No-Build PM	300	300	700	300	300	700	5800	4500	10300	4500	5800	10300

Round to nearest: 100 Green =max ADT value of the AM/PM estimates

Calculated D-Factors		SOUTH LEG			NORTH LEG			WEST LEG			EAST LEG		
		NB	SB		SB	NB		EB	WB		WB	EB	
	Opening	55%	45%		50%	50%		44%	56%		52%	48%	
	Horizon	56%	44%		50%	50%		44%	56%		50%	50%	
	Average	55%	45%	100%	50%	50%	100%	44%	56%	100%	51%	49%	100%

US 191 & SR 80 (INTERSECTION 2)												
	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Existing AM	0	0	0	75	0	45	32	79	0	0	205	136
Existing PM	0	0	0	85	0	51	76	191	0	0	158	105
Opening AM	49	36	4	55	47	103	88	134	65	6	393	118
Opening PM	51	37	5	32	82	87	166	370	113	10	212	82
Horizon AM	76	55	7	80	73	222	162	402	100	9	987	182
Horizon PM	78	57	7	44	127	157	332	1050	174	16	478	126
2028 No-Build AM	0	0	0	84	0	50	36	89	0	0	230	154
2028 No-Build PM	0	0	0	95	0	57	86	215	0	0	178	118
2050 No-Build AM	0	0	0	130	0	78	55	138	0	0	356	237
2050 No-Build PM	0	0	0	147	0	88	133	332	0	0	275	183

	SOUTH LEG			NORTH LEG			WEST LEG			EAST LEG		
	NB	SB	TOTAL	SB	NB	TOTAL	EB	WB	TOTAL	WB	EB	TOTAL
Existing AM	0	0	0	120	168	288	111	249	360	341	154	495
Existing PM	0	0	0	136	181	317	267	209	476	263	275	538
Opening AM	89	118	207	205	242	447	287	545	832	517	194	711
Opening PM	92	205	297	201	285	485	648	349	998	304	406	710
Horizon AM	138	182	320	375	399	774	664	1285	1949	1179	489	1668
Horizon PM	142	316	459	328	515	843	1556	714	2270	620	1101	1721
2028 No-Build AM	0	0	0	135	189	324	125	281	406	384	173	557
2028 No-Build PM	0	0	0	153	204	357	301	235	536	296	310	606
2050 No-Build AM	0	0	0	208	293	501	193	434	627	594	268	862
2050 No-Build PM	0	0	0	236	316	552	465	363	828	458	479	937

AM K Factor:	0.059			0.065			0.066			0.060		
PM K Factor:	0.084			0.074			0.083			0.074		

	SOUTH LEG			NORTH LEG			WEST LEG			EAST LEG		
	NB	SB	TOTAL	SB	NB	TOTAL	EB	WB	TOTAL	WB	EB	TOTAL
Existing AM	0	0	0	1841	2589	4430	1677	3769	5447	5720	2583	8303
Existing PM	0	0	0	1841	2465	4306	3213	2510	5722	3574	3742	7316
Opening AM	1520	1999	3519	3159	3723	6882	4332	8242	12574	8674	3247	11921
Opening PM	1091	2428	3519	2725	3867	6592	7802	4202	12005	4126	5516	9642
Horizon AM	2350	3090	5440	5775	6146	11922	10031	19424	29455	19773	8211	27983
Horizon PM	1686	3754	5440	4452	7001	11453	18720	8587	27306	8431	14956	23387
2028 No-Build AM	0	0	0	2073	2916	4989	1889	4245	6134	6442	2909	9351
2028 No-Build PM	0	0	0	2073	2776	4849	3618	2827	6444	4025	4214	8239
2050 No-Build AM	0	0	0	3204	4508	7712	2920	6562	9483	9959	4497	14456
2050 No-Build PM	0	0	0	3204	4292	7496	5593	4370	9963	6222	6515	12737

	SOUTH LEG			NORTH LEG			WEST LEG			EAST LEG		
	NB	SB	TOTAL	SB	NB	TOTAL	EB	WB	TOTAL	WB	EB	TOTAL
Existing AM	0	0	0	1800	2600	4400	1700	3800	5400	5700	2600	8300
Existing PM	0	0	0	1800	2500	4300	3200	2500	5700	3600	3700	7300
Opening AM	1500	2000	3500	3200	3700	6900	4300	8200	12600	8700	3200	11900
Opening PM	1100	2400	3500	2700	3900	6600	7800	4200	12000	4100	5500	9600
Horizon AM	2300	3100	5400	5800	6100	11900	10000	19400	29500	19800	8200	28000
Horizon PM	1700	3800	5400	4500	7000	11500	18700	8600	27300	8400	15000	23400
2028 No-Build AM	0	0	0	2100	2900	5000	1900	4200	6100	6400	2900	9400
2028 No-Build PM	0	0	0	2100	2800	4800	3600	2800	6400	4000	4200	8200
2050 No-Build AM	0	0	0	3200	4500	7700	2900	6600	9500	10000	4500	14500
2050 No-Build PM	0	0	0	3200	4300	7500	5600	4400	10000	6200	6500	12700

Appendix 5. Relevant Standards

- b. The specific assumptions and data sources used in deriving trip distribution and assignment shall be documented in the report.

(8) Capacity Analysis

- a. Level of service shall be computed for all signalized and unsignalized intersections within the study area in accordance with the latest edition of the Highway Capacity Manual or with any software that uses HCS methodology. The level of service shall be calculated and reported by intersection, intersection approach, and lane group within the approach.
- b. For signalized intersections, operational analyses shall be performed for time horizons up to five years. The planning method will be acceptable for time horizons beyond five years. Analyses may include modifications to the existing signal timing if the study area is within a coordinated signal system; Highway Capacity Manual signal timing methods should not be used for generating signal timing.
- c. Analyses may include an arterial analysis in accordance with the latest edition of the Highway Capacity Manual.
- d. Peak hour factors used for future conditions shall not exceed 0.90. The following peak hour factors shall be used unless otherwise directed by the Regional Traffic Engineer:

PHF = 0.80 for < 75 vph per lane
PHF = 0.85 for 75 - 300 vph per lane
PHF = 0.90 for > 300 vph per lane

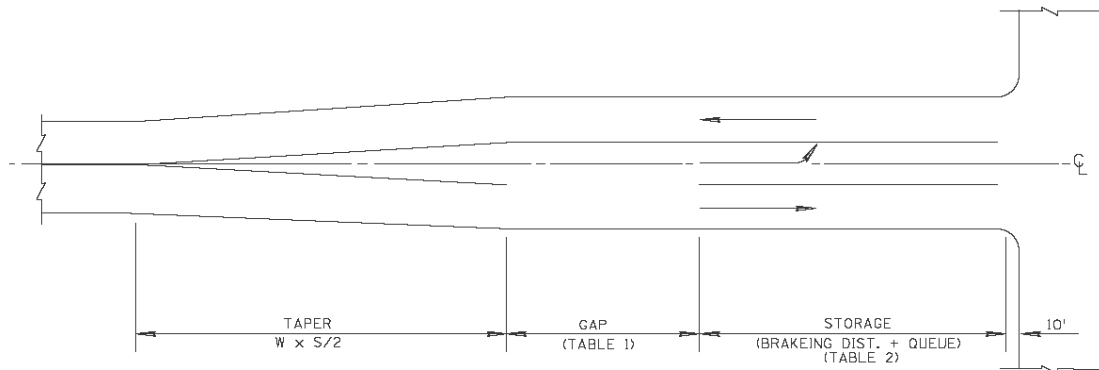
(9) Traffic Signal Needs Study

- a. A Traffic Signal Needs Study shall be conducted for all new proposed signals for the base year. If the warrants are not met for the base year, they should be evaluated for each year in the study horizon.
- b. A Traffic Signal Needs Study shall be conducted in accordance with ADOT Traffic Guidelines and Processes 611.
- c. Existing traffic signals adjacent to the development's access to the State highway shall be evaluated for continued signal warrants, phasing, timing, and coordination for each year in the study horizon, in accordance with Table 240-1.

(10) Crash Analysis

An analysis of three years of traffic crash data and crash prediction per HSM (if required); calculations shall be conducted to determine if the level of safety will deteriorate due to the addition of site traffic.

Figure 430-B. Left Turn Lane - Symmetrical Widening



Example: $W = 12'$ $Gap = 140'$ $Storage = 415' * + 50' = 465'$
 $S = 65 \text{ mph}$ (From Table 430-1)
 $T = \frac{12 \times 65}{2} = 390'$ * From Table 430-2
low ADT, minimum trucks
 $Total \text{ Length} = 390' + 140' + 465' = 995'$

Gap Length

Table 430-1 provides the length of the gap for left turn lanes. See Standard Drawing 4-M-1.03 for the turn lane standard.

Table 430-1. Left Turn Lane Gap Lengths

POSTED or DESIGN SPEED (mph)	GAP (feet)
< 40	60
40 - 50	90
> 50	140

Storage Length

The storage length is a combination of the braking distance (Table 430-2) and a queue length dependent on the anticipated traffic control for the intersection and the traffic demand at the turn.

$$\text{storage length} = \text{braking distance} + \text{queue length}$$

Table 430-2. Braking Distance

POSTED or DESIGN SPEED (mph)	DESIRABLE		MINIMUM		
	BRAKING SPEED (mph)	BRAKING DISTANCE (feet)	ENTERING SPEED (mph)	BRAKING SPEED (mph)	BRAKING DISTANCE (feet)
30	29	80	20	20	20
35	34	115	25	25	40
40	38	150	30	29	50
45	43	200	35	34	85
50	47	245	40	38	120
55	52	300	45	42	145
60	56	360	50	47	200
65	60	415	55	52	265
70	64	490	60	56	315
75	70	585	65	61	400

The “Desirable” braking distance shown in Table 430-2 is based on the assumption that a vehicle will have lost a few miles per hour through retardation by the vehicle’s engine and drive train prior to braking and that braking will actually begin when the vehicle is fully into the turn lane. The “Minimum” braking distance shown is based on the assumption of: (a) a drop of 10 mph in the average speed of a vehicle by the time it begins to enter the opening or “gap” of the turn lane; (b) there will be a further reduction in speed through engine retardation while entering the turn lane; and (c) assumed braking will begin once the vehicle is 2/3 of the way into the turn lane (see Figure 430-C).

Exhibit 16-16
Generalized Daily Service
Volumes for Urban Street
Facilities

directions); and six combinations of the *K*-factor and *D*-factor. To use this table, analysts must select a combination of *K* and *D* appropriate for their locality.

The 30-mi/h values further assume an average traffic signal spacing of 1,050 ft and 20 access points/mi, while the 45-mi/h values assume an average traffic signal spacing of 1,500 ft and 10 access points/mi.

K-Factor	D-Factor	Daily Service Volume by Lanes, LOS, and Speed (1,000 veh/day)											
		Two-Lane Streets				Four-Lane Streets				Six-Lane Streets			
		LOS B	LOS C	LOS D	LOS E	LOS B	LOS C	LOS D	LOS E	LOS B	LOS C	LOS D	LOS E
Posted Speed = 30 mi/h													
0.09	0.55	NA	1.7	11.8	17.8	NA	2.2	24.7	35.8	NA	2.6	38.7	54.0
	0.60	NA	1.6	10.8	16.4	NA	2.0	22.7	32.8	NA	2.4	35.6	49.5
0.10	0.55	NA	1.6	10.7	16.1	NA	2.0	22.3	32.2	NA	2.4	34.9	48.6
	0.60	NA	1.4	9.8	14.7	NA	1.8	20.4	29.5	NA	2.2	32.0	44.5
0.11	0.55	NA	1.4	9.7	14.6	NA	1.8	20.3	29.3	NA	2.1	31.7	44.1
	0.60	NA	1.3	8.9	13.4	NA	1.7	18.6	26.9	NA	2.0	29.1	40.5
Posted Speed = 45 mi/h													
0.09	0.55	NA	7.7	15.9	18.3	NA	16.5	33.6	36.8	NA	25.4	51.7	55.3
	0.60	NA	7.1	14.5	16.8	NA	15.1	30.8	33.7	NA	23.4	47.4	50.7
0.10	0.55	NA	7.0	14.3	16.5	NA	14.9	30.2	33.1	NA	23.0	46.5	49.7
	0.60	NA	6.4	13.1	15.1	NA	13.6	27.7	30.3	NA	21.0	42.7	45.6
0.11	0.55	NA	6.3	13.0	15.0	NA	13.5	27.5	30.1	NA	20.9	42.3	45.2
	0.60	NA	5.8	11.9	13.8	NA	12.4	25.2	27.6	NA	19.1	38.8	41.5

Notes: NA = not applicable; LOS cannot be achieved with the stated assumptions.
General assumptions include no roundabouts or all-way STOP-controlled intersections along the facility; coordinated, semiactuated traffic signals; Arrival Type 4; 120-s cycle time; protected left-turn phases; 0.45 weighted average *g/C* ratio; exclusive left-turn lanes with adequate queue storage provided at traffic signals; no exclusive right-turn lanes provided; no restrictive median; 2-mi facility length; 10% of traffic turns left and 10% turns right at each traffic signal; peak hour factor = 0.92; and base saturation flow rate = 1,900 pc/h/ln.
Additional assumptions for 30-mi/h facilities: signal spacing = 1,050 ft and 20 access points/mi.
Additional assumptions for 45-mi/h facilities: signal spacing = 1,500 ft and 10 access points/mi.

Exhibit 16-16 is provided for general planning use and should *not* be used to analyze any specific urban street facility or to make final decisions on important design features. A full operational analysis using this chapter's methodology is required for such specific applications.

The exhibit is useful in evaluating the overall performance of a large number of urban streets within a jurisdiction, as a first pass to determine where problems might exist or arise, or in determining where improvements might be needed. However, any urban street identified as likely to experience problems or need improvement should be subjected to a full operational analysis before any decisions on implementing specific improvements are made.

Daily service volumes are strongly affected by the *K*- and *D*-factors chosen as typical for the analysis. The values used for the facilities under study should be reasonable. Also, if any characteristic is significantly different from the typical values used to develop Exhibit 16-16, particularly the weighted average *g/C* ratio and traffic signal spacing, the values taken from this exhibit will not be representative of the study facilities. In such cases, analysts are advised to develop their own generalized service volume tables by using representative local values or to proceed to a full operational analysis.

Appendix 6. Existing Signal Timings

Intersection: **SR80 @ US191 (WEST)**MP: **364**Location: **Douglas**MU #: **0050Q**Warrant: **UPDATE TIMING**Timing As Of: **8/27/2010**

	PH 1	PH 2	PH 3	PH 4	PH 5	PH 6	PH 7	PH 8
Mvmnt	--	E/W	--	SB	--	--	--	--
Min Green	--	10	--	6	--	--	--	--
Veh Ext	--	6.0	--	1.5	--	--	--	--
Max 1	--	60	--	25	--	--	--	--
Max 2	--	--	--	--	--	--	--	--
Max 3	--	--	--	--	--	--	--	--
Walk	--	--	--	--	--	--	--	--
Ped Clr	--	--	--	--	--	--	--	--
Max Init	--	40	--	--	--	--	--	--
Sec Act	--	2.0	--	--	--	--	--	--
TBR	--	--	--	--	--	--	--	--
TTR	--	--	--	--	--	--	--	--
Min Gap	--	--	--	--	--	--	--	--
Guar Pass	--	ON	--	--	--	--	--	--
Yellow	--	5.0	--	4.3	--	--	--	--
Red Clr	--	1.1	--	2.2	--	--	--	--
CNA	--	--	--	--	--	--	--	--
Det Memory	--	ON	--	--	--	--	--	--
Dual Entry	--	--	--	--	--	--	--	--
Recall Mode	--	MinV	--	--	--	--	--	--
Ext Start	--	YEL	--	--	--	--	--	--

TIME OF DAY FUNCTIONS

PGM	Funct'n	On	Off	Skip Days

VEHICLE DETECTOR DELAY/EXTEND TIMING

Phase(s)	Ctrl/Amp	Type	Sec
4 (RT)	Video	DELAY	8
4 (LT)	Video	DELAY	8

OVERLAPS

TIMING OPTIONAL

O/L(Phases)	Grn	Yel	Red
(A)	--	--	--
(B)	--	--	--
(C)	--	--	--
(D)	--	--	--

PHASE SEQ:

R1) 2,4

PROTECTED LEFT TURN PHASES:

PROT-PRM LEFT TURN PHASES:

RAILROAD PRE-EMPTION: ☐

VIDEO: ☒

EMERGENCY VEHICLE PRE-EMPTION: ☐

LOOPS: ☒

COORDINATION: ☐

Intersection: **SR80 @ US191 (WEST)**

MP: **364**

Location: **Douglas**

MU #: **0050Q**

Warrant: **NEW SIGNAL**

Timing As Of: **5/21/2008**

	PH 1	PH 2	PH 3	PH 4	PH 5	PH 6	PH 7	PH 8
Mvmnt	--	E/W	--	SB	--	--	--	--
Min Green	--	30	--	6	--	--	--	--
Veh Ext	--	6.0	--	1.5	--	--	--	--
Max 1	--	40	--	20	--	--	--	--
Max 2	--	--	--	--	--	--	--	--
Max 3	--	--	--	--	--	--	--	--
Walk	--	--	--	--	--	--	--	--
Ped Clr	--	--	--	--	--	--	--	--
Max Init	--	40	--	--	--	--	--	--
Sec Act	--	2.0	--	--	--	--	--	--
TBR	--	--	--	--	--	--	--	--
TTR	--	--	--	--	--	--	--	--
Min Gap	--	--	--	--	--	--	--	--
Guar Pass	--	ON	--	--	--	--	--	--
Yellow	--	5.0	--	4.3	--	--	--	--
Red Clr	--	1.1	--	2.2	--	--	--	--
CNA	--	--	--	--	--	--	--	--
Det Memory	--	ON	--	--	--	--	--	--
Dual Entry	--	--	--	--	--	--	--	--
Recall Mode	--	MinV	--	--	--	--	--	--
Ext Start	--	YEL	--	--	--	--	--	--

TIME OF DAY FUNCTIONS

PGM	Funct'n	On	Off	Skip Days

VEHICLE DETECTOR DELAY/EXTEND TIMING

Phase(s)	Ctrl/Amp	Type	Sec
4 (RT)	Video	DELAY	8
4 (LT)	Video	DELAY	3

OVERLAPS

TIMING OPTIONAL

O/L(Phases)		Grn	Yel	Red
	--	--	--	
	--	--	--	
	--	--	--	
	--	--	--	

PHASE SEQ:

R1) 2,4

PROTECTED LEFT TURN PHASES:

PROT-PRM LEFT TURN PHASES:

RAILROAD PRE-EMPTION: ☐

VIDEO: ☒

EMERGENCY VEHICLE PRE-EMPTION: ☐







LOOPS: ☒

COORDINATION: ☐

Appendix 7. Synchro and Rodel Output Reports
(Existing, 2028/2050 No-Build, 2028/2050 Build, Grade Separation Sensitivity Analysis)

HCM 6th TWSC
1: James Ranch Rd & SR 80







Existing AM







Intersection												
Int Delay, s/veh	0.3											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	1	111	1	1	264	1	1	1	1	1	1	1
Future Vol, veh/h	1	111	1	1	264	1	1	1	1	1	1	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	105	-	-	105	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	75	75	75	87	87	87	50	50	50	50	50	50
Heavy Vehicles, %	2	11	2	2	11	2	2	2	2	2	2	2
Mvmt Flow	1	148	1	1	303	1	2	2	2	2	2	2







Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	304	0	0	149	0	0	306	457	75	383	457	152
Stage 1	-	-	-	-	-	-	151	151	-	306	306	-
Stage 2	-	-	-	-	-	-	155	306	-	77	151	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	1254	-	-	1430	-	-	623	498	971	550	498	867
Stage 1	-	-	-	-	-	-	836	771	-	679	660	-
Stage 2	-	-	-	-	-	-	832	660	-	923	771	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1254	-	-	1430	-	-	619	497	971	547	497	867
Mov Cap-2 Maneuver	-	-	-	-	-	-	619	497	-	547	497	-
Stage 1	-	-	-	-	-	-	835	770	-	678	659	-
Stage 2	-	-	-	-	-	-	827	659	-	918	770	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.1			0			10.6			11.1		
HCM LOS							B			B		







Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	644	1254	-	-	1430	-	-	601
HCM Lane V/C Ratio	0.009	0.001	-	-	0.001	-	-	0.01
HCM Control Delay (s)	10.6	7.9	-	-	7.5	-	-	11.1
HCM Lane LOS	B	A	-	-	A	-	-	B
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0

Intersection												
Int Delay, s/veh	0.3											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	1	267	1	1	204	1	1	1	1	1	1	1
Future Vol, veh/h	1	267	1	1	204	1	1	1	1	1	1	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	105	-	-	105	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	85	85	85	50	50	50	50	50	50
Heavy Vehicles, %	2	11	2	2	11	2	2	2	2	2	2	2
Mvmt Flow	1	287	1	1	240	1	2	2	2	2	2	2
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	241	0	0	288	0	0	413	533	144	390	533	121
Stage 1	-	-	-	-	-	-	290	290	-	243	243	-
Stage 2	-	-	-	-	-	-	123	243	-	147	290	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	1323	-	-	1271	-	-	523	451	877	543	451	908
Stage 1	-	-	-	-	-	-	694	671	-	739	703	-
Stage 2	-	-	-	-	-	-	868	703	-	841	671	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1323	-	-	1271	-	-	519	450	877	539	450	908
Mov Cap-2 Maneuver	-	-	-	-	-	-	519	450	-	539	450	-
Stage 1	-	-	-	-	-	-	693	670	-	738	702	-
Stage 2	-	-	-	-	-	-	863	702	-	836	670	-
Approach	EB		WB				NB		SB			
HCM Control Delay, s	0		0				11.4		11.3			
HCM LOS							B		B			
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	567	1323	-	-	1271	-	-	579				
HCM Lane V/C Ratio	0.011	0.001	-	-	0.001	-	-	0.01				
HCM Control Delay (s)	11.4	7.7	-	-	7.8	-	-	11.3				
HCM Lane LOS	B	A	-	-	A	-	-	B				
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0				

Intersection												
Int Delay, s/veh	0.9											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	5	125	5	5	297	5	5	5	5	5	5	5
Future Vol, veh/h	5	125	5	5	297	5	5	5	5	5	5	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	105	-	-	105	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	80	80	80	80	85	85	80	80	80	80	80	80
Heavy Vehicles, %	2	11	47	25	15	2	20	2	36	2	2	2
Mvmt Flow	6	156	6	6	349	6	6	6	6	6	6	6
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	355	0	0	162	0	0	361	538	81	457	538	178
Stage 1	-	-	-	-	-	-	171	171	-	364	364	-
Stage 2	-	-	-	-	-	-	190	367	-	93	174	-
Critical Hdwy	4.14	-	-	4.6	-	-	7.9	6.54	7.62	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.9	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.9	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.45	-	-	3.7	4.02	3.66	3.52	4.02	3.32
Pot Cap-1 Maneuver	1200	-	-	1262	-	-	527	448	863	487	448	834
Stage 1	-	-	-	-	-	-	764	756	-	627	622	-
Stage 2	-	-	-	-	-	-	744	621	-	904	754	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1200	-	-	1262	-	-	514	444	863	475	444	834
Mov Cap-2 Maneuver	-	-	-	-	-	-	514	444	-	475	444	-
Stage 1	-	-	-	-	-	-	760	752	-	624	619	-
Stage 2	-	-	-	-	-	-	727	618	-	886	750	-
Approach	EB		WB				NB			SB		
HCM Control Delay, s	0.3		0.1				11.7			11.9		
HCM LOS							B			B		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	560	1200	-	-	1262	-	-	540				
HCM Lane V/C Ratio	0.033	0.005	-	-	0.005	-	-	0.035				
HCM Control Delay (s)	11.7	8	-	-	7.9	-	-	11.9				
HCM Lane LOS	B	A	-	-	A	-	-	B				
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0.1				

Intersection												
Int Delay, s/veh	0.8											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	5	301	5	5	230	5	5	5	5	5	5	5
Future Vol, veh/h	5	301	5	5	230	5	5	5	5	5	5	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	105	-	-	105	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	80	85	85	80	85	85	80	80	80	80	80	80
Heavy Vehicles, %	2	11	65	32	16	2	20	2	27	2	2	2
Mvmt Flow	6	354	6	6	271	6	6	6	6	6	6	6
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	277	0	0	360	0	0	520	658	180	478	658	139
Stage 1	-	-	-	-	-	-	369	369	-	286	286	-
Stage 2	-	-	-	-	-	-	151	289	-	192	372	-
Critical Hdwy	4.14	-	-	4.74	-	-	7.9	6.54	7.44	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.9	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.9	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.52	-	-	3.7	4.02	3.57	3.52	4.02	3.32
Pot Cap-1 Maneuver	1283	-	-	1006	-	-	401	383	759	470	383	884
Stage 1	-	-	-	-	-	-	576	619	-	697	674	-
Stage 2	-	-	-	-	-	-	786	672	-	791	617	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1283	-	-	1006	-	-	390	379	759	456	379	884
Mov Cap-2 Maneuver	-	-	-	-	-	-	390	379	-	456	379	-
Stage 1	-	-	-	-	-	-	573	616	-	694	670	-
Stage 2	-	-	-	-	-	-	769	668	-	773	614	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.1			0.2			13.2			12.4		
HCM LOS							B			B		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	460	1283	-	-	1006	-	-	503				
HCM Lane V/C Ratio	0.041	0.005	-	-	0.006	-	-	0.037				
HCM Control Delay (s)	13.2	7.8	-	-	8.6	-	-	12.4				
HCM Lane LOS	B	A	-	-	A	-	-	B				
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0.1				











Intersection												
Int Delay, s/veh	1.5											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↰↱		↰	↰↱			↱			↱	
Traffic Vol, veh/h	10	193	10	10	460	10	10	10	10	10	10	10
Future Vol, veh/h	10	193	10	10	460	10	10	10	10	10	10	10
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	105	-	-	105	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	80	85	85	80	85	85	80	80	80	80	80	80
Heavy Vehicles, %	2	11	33	22	15	2	20	2	27	2	2	2
Mvmt Flow	13	227	12	13	541	12	13	13	13	13	13	13
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	553	0	0	239	0	0	562	838	120	719	838	277
Stage 1	-	-	-	-	-	-	259	259	-	573	573	-
Stage 2	-	-	-	-	-	-	303	579	-	146	265	-
Critical Hdwy	4.14	-	-	4.54	-	-	7.9	6.54	7.44	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.9	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.9	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.42	-	-	3.7	4.02	3.57	3.52	4.02	3.32
Pot Cap-1 Maneuver	1013	-	-	1191	-	-	373	301	835	316	301	720
Stage 1	-	-	-	-	-	-	675	692	-	472	502	-
Stage 2	-	-	-	-	-	-	634	499	-	842	688	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1013	-	-	1191	-	-	348	294	835	296	294	720
Mov Cap-2 Maneuver	-	-	-	-	-	-	348	294	-	296	294	-
Stage 1	-	-	-	-	-	-	666	683	-	466	496	-
Stage 2	-	-	-	-	-	-	601	494	-	804	679	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.4			0.2			14.9			15.9		
HCM LOS							B			C		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	401	1013	-	-	1191	-	-	367				
HCM Lane V/C Ratio	0.094	0.012	-	-	0.01	-	-	0.102				
HCM Control Delay (s)	14.9	8.6	-	-	8.1	-	-	15.9				
HCM Lane LOS	B	A	-	-	A	-	-	C				
HCM 95th %tile Q(veh)	0.3	0	-	-	0	-	-	0.3				

Intersection												
Int Delay, s/veh	1.5											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	10	465	10	10	355	10	10	10	10	10	10	10
Future Vol, veh/h	10	465	10	10	355	10	10	10	10	10	10	10
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	105	-	-	105	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	80	85	85	80	85	85	80	80	80	80	80	80
Heavy Vehicles, %	2	11	46	25	16	2	20	2	23	2	2	2
Mvmt Flow	13	547	12	13	418	12	13	13	13	13	13	13

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	430	0	0	559	0	0	821	1035	280	756	1035	215
Stage 1	-	-	-	-	-	-	579	579	-	450	450	-
Stage 2	-	-	-	-	-	-	242	456	-	306	585	-
Critical Hdwy	4.14	-	-	4.6	-	-	7.9	6.54	7.36	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.9	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.9	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.45	-	-	3.7	4.02	3.53	3.52	4.02	3.32
Pot Cap-1 Maneuver	1126	-	-	865	-	-	238	230	658	297	230	790
Stage 1	-	-	-	-	-	-	426	499	-	558	570	-
Stage 2	-	-	-	-	-	-	691	567	-	679	496	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1126	-	-	865	-	-	220	224	658	273	224	790
Mov Cap-2 Maneuver	-	-	-	-	-	-	220	224	-	273	224	-
Stage 1	-	-	-	-	-	-	421	493	-	551	561	-
Stage 2	-	-	-	-	-	-	655	558	-	642	490	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.2			0.3			19.5			17.8		
HCM LOS							C			C		












Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	285	1126	-	-	865	-	-	319
HCM Lane V/C Ratio	0.132	0.011	-	-	0.014	-	-	0.118
HCM Control Delay (s)	19.5	8.2	-	-	9.2	-	-	17.8
HCM Lane LOS	C	A	-	-	A	-	-	C
HCM 95th %tile Q(veh)	0.4	0	-	-	0	-	-	0.4

Intersection												
Int Delay, s/veh	5.8											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	5	125	59	268	312	5	23	5	162	5	5	5
Future Vol, veh/h	5	125	59	268	312	5	23	5	162	5	5	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	105	-	150	105	-	-	150	-	0	150	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	80	85	85	85	85	85	80	80	85	80	80	80
Heavy Vehicles, %	2	11	47	25	15	2	20	2	36	2	2	2
Mvmt Flow	6	147	69	315	367	6	29	6	191	6	6	6

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	373	0	0	216	0	0	976	1162	74	1089	1228	187
Stage 1	-	-	-	-	-	-	159	159	-	1000	1000	-
Stage 2	-	-	-	-	-	-	817	1003	-	89	228	-
Critical Hdwy	4.14	-	-	4.6	-	-	7.9	6.54	7.62	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.9	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.9	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.45	-	-	3.7	4.02	3.66	3.52	4.02	3.32
Pot Cap-1 Maneuver	1182	-	-	1199	-	-	181	194	873	170	177	823
Stage 1	-	-	-	-	-	-	778	765	-	261	319	-
Stage 2	-	-	-	-	-	-	300	318	-	908	714	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1182	-	-	1199	-	-	138	142	873	102	130	823
Mov Cap-2 Maneuver	-	-	-	-	-	-	138	142	-	102	130	-
Stage 1	-	-	-	-	-	-	774	761	-	260	235	-
Stage 2	-	-	-	-	-	-	214	234	-	700	710	-











Approach	EB	WB	NB	SB
HCM Control Delay, s	0.2	4.2	14.4	28.8
HCM LOS			B	D

Minor Lane/Major Mvmt	NBLn1	NBLn2	NBLn3	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	138	142	873	1182	-	-	1199	-	-	102	225
HCM Lane V/C Ratio	0.208	0.044	0.218	0.005	-	-	0.263	-	-	0.061	0.056
HCM Control Delay (s)	37.8	31.5	10.3	8.1	-	-	9.1	-	-	42.6	21.9
HCM Lane LOS	E	D	B	A	-	-	A	-	-	E	C
HCM 95th %tile Q(veh)	0.7	0.1	0.8	0	-	-	1.1	-	-	0.2	0.2

Intersection												
Int Delay, s/veh	7.3											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	5	301	32	118	245	5	56	5	348	5	5	5
Future Vol, veh/h	5	301	32	118	245	5	56	5	348	5	5	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	105	-	150	105	-	-	150	-	0	150	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	80	85	85	85	85	85	80	80	90	80	80	80
Heavy Vehicles, %	2	11	65	32	16	2	20	2	27	2	2	2
Mvmt Flow	6	354	38	139	288	6	70	6	387	6	6	6
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	294	0	0	392	0	0	791	938	177	761	973	147
Stage 1	-	-	-	-	-	-	366	366	-	569	569	-
Stage 2	-	-	-	-	-	-	425	572	-	192	404	-
Critical Hdwy	4.14	-	-	4.74	-	-	7.9	6.54	7.44	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.9	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.9	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.52	-	-	3.7	4.02	3.57	3.52	4.02	3.32
Pot Cap-1 Maneuver	1264	-	-	975	-	-	251	263	763	295	251	873
Stage 1	-	-	-	-	-	-	579	621	-	474	504	-
Stage 2	-	-	-	-	-	-	532	502	-	791	598	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1264	-	-	975	-	-	216	224	763	127	214	873
Mov Cap-2 Maneuver	-	-	-	-	-	-	216	224	-	127	214	-
Stage 1	-	-	-	-	-	-	576	618	-	472	432	-
Stage 2	-	-	-	-	-	-	446	430	-	384	595	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.1			3			16.9			22.2		
HCM LOS							C			C		
Minor Lane/Major Mvmt	NBLn1	NBLn2	NBLn3	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2	
Capacity (veh/h)	216	224	763	1264	-	-	975	-	-	127	344	
HCM Lane V/C Ratio	0.324	0.028	0.507	0.005	-	-	0.142	-	-	0.049	0.036	
HCM Control Delay (s)	29.5	21.5	14.5	7.9	-	-	9.3	-	-	34.8	15.9	
HCM Lane LOS	D	C	B	A	-	-	A	-	-	D	C	
HCM 95th %tile Q(veh)	1.3	0.1	2.9	0	-	-	0.5	-	-	0.2	0.1	

HCM 6th TWSC
1: James Ranch Rd & SR 80

Horizon Year AM

Intersection																	
Int Delay, s/veh	13.6																
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR					
Lane Configurations																	
Traffic Vol, veh/h	10	193	166	855	479	10	76	10	471	10	10	10					
Future Vol, veh/h	10	193	166	855	479	10	76	10	471	10	10	10					
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0					
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop					
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None					
Storage Length	105	-	150	105	-	-	150	-	0	150	-	-					
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-					
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-					
Peak Hour Factor	80	85	85	90	85	85	85	85	90	80	80	80					
Heavy Vehicles, %	2	11	33	22	15	2	20	2	27	2	2	2					
Mvmt Flow	13	227	195	950	564	12	89	12	523	13	13	13					
Major/Minor	Major1			Major2			Minor1			Minor2							
Conflicting Flow All	576	0	0	422	0	0	2442	2729	114	2616	2918	288					
Stage 1	-	-	-	-	-	-	253	253	-	2470	2470	-					
Stage 2	-	-	-	-	-	-	2189	2476	-	146	448	-					
Critical Hdwy	4.14	-	-	4.54	-	-	7.9	6.54	7.44	7.54	6.54	6.94					
Critical Hdwy Stg 1	-	-	-	-	-	-	6.9	5.54	-	6.54	5.54	-					
Critical Hdwy Stg 2	-	-	-	-	-	-	6.9	5.54	-	6.54	5.54	-					
Follow-up Hdwy	2.22	-	-	2.42	-	-	3.7	4.02	3.57	3.52	4.02	3.32					
Pot Cap-1 Maneuver	993	-	-	1003	-	-	~ 13	20	843	~ 12	15	709					
Stage 1	-	-	-	-	-	-	680	696	-	31	59	-					
Stage 2	-	-	-	-	-	-	~ 37	59	-	842	571	-					
Platoon blocked, %		-	-		-	-											
Mov Cap-1 Maneuver	993	-	-	1003	-	-	-	~ 1	843	-	~ 1	709					
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	~ 1	-	-	~ 1	-					
Stage 1	-	-	-	-	-	-	671	687	-	31	~ 3	-					
Stage 2	-	-	-	-	-	-	-	~ 3	-	310	564	-					
Approach	EB			WB			NB			SB							
HCM Control Delay, s	0.2			23.4													
HCM LOS							-			-							
Minor Lane/Major Mvmt	NBLn1			NBLn2			NBLn3			EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	-			1			843			993	-	-	1003	-	-	-	2
HCM Lane V/C Ratio	-			11.765			0.621			0.013	-	-	0.947	-	-	-	12.5
HCM Control Delay (s)	\$ 11019.6			16			8.7			-	-	37.6	-	-	\$ 8493.7		
HCM Lane LOS	-			F			C			A	-	-	E	-	-	-	F
HCM 95th %tile Q(veh)	-			2.9			4.4			0	-	-	15.9	-	-	-	4.8
Notes																	
~: Volume exceeds capacity		\$: Delay exceeds 300s				+: Computation Not Defined						*: All major volume in platoon					

HCM 6th TWSC
1: James Ranch Rd & SR 80

Horizon Year PM

Intersection												
Int Delay, s/veh	415.8											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↗	↘	↰	↗		↰	↗	↘	↰	↗	
Traffic Vol, veh/h	10	465	78	355	374	10	185	10	1091	10	10	10
Future Vol, veh/h	10	465	78	355	374	10	185	10	1091	10	10	10
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	105	-	150	105	-	-	150	-	0	150	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	80	85	85	90	85	85	85	85	90	80	80	80
Heavy Vehicles, %	2	11	46	25	16	2	20	2	23	2	2	2
Mvmt Flow	13	547	92	394	440	12	218	12	1212	13	13	13
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	452	0	0	639	0	0	1588	1813	274	1540	1899	226
Stage 1	-	-	-	-	-	-	573	573	-	1234	1234	-
Stage 2	-	-	-	-	-	-	1015	1240	-	306	665	-
Critical Hdwy	4.14	-	-	4.6	-	-	7.9	6.54	7.36	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.9	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.9	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.45	-	-	3.7	4.02	3.53	3.52	4.02	3.32
Pot Cap-1 Maneuver	1105	-	-	801	-	-	~ 61	78	~ 664	79	69	777
Stage 1	-	-	-	-	-	-	429	502	-	187	247	-
Stage 2	-	-	-	-	-	-	224	245	-	679	456	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1105	-	-	801	-	-	~ 27	39	~ 664	-	35	777
Mov Cap-2 Maneuver	-	-	-	-	-	-	~ 27	39	-	-	35	-
Stage 1	-	-	-	-	-	-	424	496	-	185	125	-
Stage 2	-	-	-	-	-	-	~ 101	124	-	-	451	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.2			6.4			\$ 854.6					
HCM LOS							F			-		
Minor Lane/Major Mvmt	NBLn1	NBLn2	NBLn3	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2	
Capacity (veh/h)	27	39	664	1105	-	-	801	-	-	-	-	67
HCM Lane V/C Ratio	8.061	0.302	1.826	0.011	-	-	0.492	-	-	-	-	0.373
HCM Control Delay (s)	\$ 3461.3	133.1	\$ 393.6	8.3	-	-	13.8	-	-	-	-	87.7
HCM Lane LOS	F	F	F	A	-	-	B	-	-	-	-	F
HCM 95th %tile Q(veh)	26.9	1	74.6	0	-	-	2.8	-	-	-	-	1.4
Notes												
-: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon												

Timing Report, Sorted By Phase

Opening Year AM

1: James Ranch Rd & AZ 80

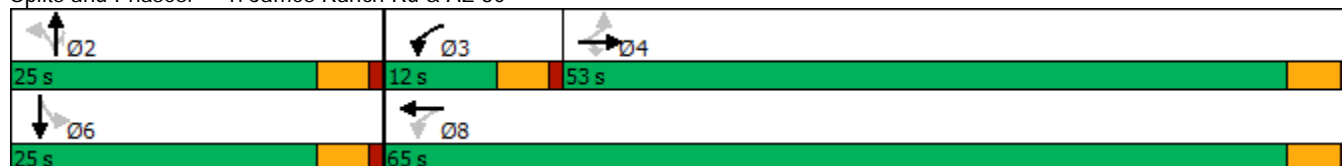


Phase Number	2	3	4	6	8
Movement	NBTL	WBL	EBTL	SBTL	WBTL
Lead/Lag		Lead	Lag		
Lead-Lag Optimize					
Recall Mode	None	Min	Min	None	Min
Maximum Split (s)	25	12	53	25	65
Maximum Split (%)	27.8%	13.3%	58.9%	27.8%	72.2%
Minimum Split (s)	22.5	9.5	22.5	22.5	22.5
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1	1	1	1	1
Minimum Initial (s)	5	5	5	5	5
Vehicle Extension (s)	3	3	3	3	3
Minimum Gap (s)	3	3	3	3	3
Time Before Reduce (s)	0	0	0	0	0
Time To Reduce (s)	0	0	0	0	0
Walk Time (s)	7		7	7	7
Flash Dont Walk (s)	11		11	11	11
Dual Entry	Yes	No	Yes	Yes	Yes
Inhibit Max	Yes	Yes	Yes	Yes	Yes
Start Time (s)	0	25	37	0	25
End Time (s)	25	37	0	25	0
Yield/Force Off (s)	20.5	32.5	85.5	20.5	85.5
Yield/Force Off 170(s)	9.5	32.5	85.5	9.5	85.5
Local Start Time (s)	0	25	37	0	25
Local Yield (s)	20.5	32.5	85.5	20.5	85.5
Local Yield 170(s)	9.5	32.5	85.5	9.5	85.5

Intersection Summary

Cycle Length	90
Control Type	Actuated-Uncoordinated
Natural Cycle	55























Splits and Phases: 1: James Ranch Rd & AZ 80



HCM 6th Signalized Intersection Summary

Opening Year AM

1: James Ranch Rd & AZ 80

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	5	125	59	268	312	5	23	5	162	5	5	5
Future Volume (veh/h)	5	125	59	268	312	5	23	5	162	5	5	5
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1870	1737	1203	1530	1678	1870	1604	1870	1366	1870	1870	1870
Adj Flow Rate, veh/h	6	156	74	315	367	6	29	0	195	6	6	6
Peak Hour Factor	0.80	0.80	0.80	0.85	0.85	0.85	0.80	0.85	0.85	0.80	0.80	0.80
Percent Heavy Veh, %	2	11	47	25	15	2	20	2	36	2	2	2
Cap, veh/h	442	595	184	1284	1679	27	436	0	353	441	131	131
Arrive On Green	0.18	0.18	0.18	0.18	0.52	0.52	0.15	0.00	0.15	0.15	0.15	0.15
Sat Flow, veh/h	1009	3300	1020	2826	3210	52	1202	0	2316	1188	858	858
Grp Volume(v), veh/h	6	156	74	315	182	191	29	0	195	6	0	12
Grp Sat Flow(s),veh/h/ln	1009	1650	1020	1413	1594	1668	1202	0	1158	1188	0	1716
Q Serve(g_s), s	0.1	1.1	1.8	2.0	1.7	1.7	0.6	0.0	2.2	0.1	0.0	0.2
Cycle Q Clear(g_c), s	0.1	1.1	1.8	2.0	1.7	1.7	0.8	0.0	2.2	0.1	0.0	0.2
Prop In Lane	1.00		1.00	1.00		0.03	1.00		1.00	1.00		0.50
Lane Grp Cap(c), veh/h	442	595	184	1284	834	873	436	0	353	441	0	261
V/C Ratio(X)	0.01	0.26	0.40	0.25	0.22	0.22	0.07	0.00	0.55	0.01	0.00	0.05
Avail Cap(c_a), veh/h	2026	5773	1784	1539	3478	3640	1141	0	1713	1138	0	1269
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	9.4	9.8	10.0	5.2	3.6	3.6	10.4	0.0	10.9	10.0	0.0	10.0
Incr Delay (d2), s/veh	0.0	0.2	1.4	0.1	0.1	0.1	0.1	0.0	1.4	0.0	0.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.0	0.4	0.5	0.1	0.1	0.1	0.2	0.0	0.6	0.0	0.0	0.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	9.4	10.0	11.5	5.3	3.7	3.7	10.4	0.0	12.2	10.0	0.0	10.1
LnGrp LOS	A	B	B	A	A	A	B	A	B	B	A	B
Approach Vol, veh/h	236			688			224			18		
Approach Delay, s/veh	10.4			4.4			12.0			10.1		
Approach LOS	B			A			B			B		
Timer - Assigned Phs	2		3	4		6		8				
Phs Duration (G+Y+Rc), s	8.7		9.5	9.5		8.7		19.0				
Change Period (Y+Rc), s	4.5		4.5	4.5		4.5		4.5				
Max Green Setting (Gmax), s	20.5		7.5	48.5		20.5		60.5				
Max Q Clear Time (g_c+I1), s	4.2		4.0	3.8		2.2		3.7				
Green Ext Time (p_c), s	0.8		0.4	1.1		0.0		1.9				
Intersection Summary												
HCM 6th Ctrl Delay	7.2											
HCM 6th LOS	A											
Notes												

Timing Report, Sorted By Phase

Opening Year PM

1: James Ranch Rd & AZ 80

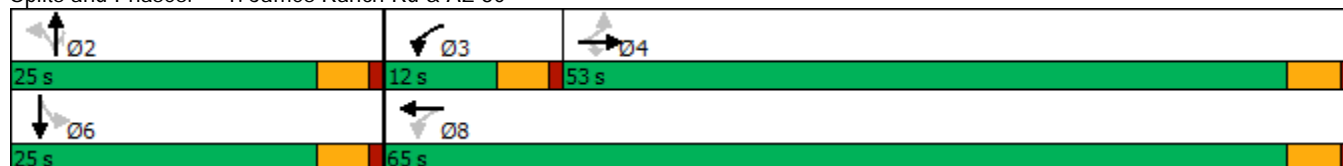


Phase Number	2	3	4	6	8
Movement	NBTL	WBL	EBTL	SBTL	WBTL
Lead/Lag		Lead	Lag		
Lead-Lag Optimize					
Recall Mode	None	Min	Min	None	Min
Maximum Split (s)	25	12	53	25	65
Maximum Split (%)	27.8%	13.3%	58.9%	27.8%	72.2%
Minimum Split (s)	22.5	9.5	22.5	22.5	22.5
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1	1	1	1	1
Minimum Initial (s)	5	5	5	5	5
Vehicle Extension (s)	3	3	3	3	3
Minimum Gap (s)	3	3	3	3	3
Time Before Reduce (s)	0	0	0	0	0
Time To Reduce (s)	0	0	0	0	0
Walk Time (s)	7		7	7	7
Flash Dont Walk (s)	11		11	11	11
Dual Entry	Yes	No	Yes	Yes	Yes
Inhibit Max	Yes	Yes	Yes	Yes	Yes
Start Time (s)	0	25	37	0	25
End Time (s)	25	37	0	25	0
Yield/Force Off (s)	20.5	32.5	85.5	20.5	85.5
Yield/Force Off 170(s)	9.5	32.5	85.5	9.5	85.5
Local Start Time (s)	0	25	37	0	25
Local Yield (s)	20.5	32.5	85.5	20.5	85.5
Local Yield 170(s)	9.5	32.5	85.5	9.5	85.5

Intersection Summary

Cycle Length	90
Control Type	Actuated-Uncoordinated
Natural Cycle	55
























Splits and Phases: 1: James Ranch Rd & AZ 80



HCM 6th Signalized Intersection Summary

Opening Year PM

1: James Ranch Rd & AZ 80

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	5	301	32	118	245	5	56	5	348	5	5	5
Future Volume (veh/h)	5	301	32	118	245	5	56	5	348	5	5	5
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1870	1737	937	1426	1663	1870	1604	1870	1500	1870	1870	1870
Adj Flow Rate, veh/h	6	354	40	148	288	6	70	0	413	6	6	6
Peak Hour Factor	0.80	0.85	0.80	0.80	0.85	0.85	0.80	0.85	0.85	0.80	0.80	0.80
Percent Heavy Veh, %	2	11	65	32	16	2	20	2	27	2	2	2
Cap, veh/h	443	716	172	973	1552	32	502	0	637	451	215	215
Arrive On Green	0.22	0.22	0.22	0.14	0.49	0.49	0.25	0.00	0.25	0.25	0.25	0.25
Sat Flow, veh/h	1085	3300	794	2634	3165	66	1202	0	2542	973	858	858
Grp Volume(v), veh/h	6	354	40	148	144	150	70	0	413	6	0	12
Grp Sat Flow(s),veh/h/ln	1085	1650	794	1317	1580	1651	1202	0	1271	973	0	1716
Q Serve(g_s), s	0.2	3.3	1.4	1.2	1.8	1.8	1.6	0.0	5.0	0.2	0.0	0.2
Cycle Q Clear(g_c), s	0.2	3.3	1.4	1.2	1.8	1.8	1.8	0.0	5.0	0.2	0.0	0.2
Prop In Lane	1.00		1.00	1.00		0.04	1.00		1.00	1.00		0.50
Lane Grp Cap(c), veh/h	443	716	172	973	775	810	502	0	637	451	0	430
V/C Ratio(X)	0.01	0.49	0.23	0.15	0.19	0.19	0.14	0.00	0.65	0.01	0.00	0.03
Avail Cap(c_a), veh/h	1722	4608	1108	1163	2751	2876	910	0	1500	782	0	1013
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	10.7	11.9	11.2	6.7	5.0	5.0	10.5	0.0	11.6	9.8	0.0	9.8
Incr Delay (d2), s/veh	0.0	0.5	0.7	0.1	0.1	0.1	0.1	0.0	1.1	0.0	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.0	1.4	0.3	0.2	0.3	0.3	0.6	0.0	1.6	0.0	0.0	0.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	10.7	12.5	11.9	6.7	5.1	5.1	10.6	0.0	12.8	9.8	0.0	9.8
LnGrp LOS	B	B	B	A	A	A	B	A	B	A	A	A
Approach Vol, veh/h	400			442			483			18		
Approach Delay, s/veh	12.4			5.6			12.5			9.8		
Approach LOS	B			A			B			A		
Timer - Assigned Phs	2		3	4		6		8				
Phs Duration (G+Y+Rc), s	13.2		9.5	12.0		13.2		21.5				
Change Period (Y+Rc), s	4.5		4.5	4.5		4.5		4.5				
Max Green Setting (Gmax), s	20.5		7.5	48.5		20.5		60.5				
Max Q Clear Time (g_c+I1), s	7.0		3.2	5.3		2.2		3.8				
Green Ext Time (p_c), s	1.7		0.2	2.3		0.0		1.5				
Intersection Summary												
HCM 6th Ctrl Delay	10.2											
HCM 6th LOS	B											
Notes												

Timing Report, Sorted By Phase

Horizon Year AM

1: James Ranch Rd & AZ 80



Phase Number	2	3	4	6	8
Movement	NBTL	WBL	EBTL	SBTL	WBT
Lead/Lag		Lead	Lag		
Lead-Lag Optimize					
Recall Mode	None	Min	Min	None	Min
Maximum Split (s)	25	27	38	25	65
Maximum Split (%)	27.8%	30.0%	42.2%	27.8%	72.2%
Minimum Split (s)	22.5	9.5	22.5	22.5	22.5
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1	1	1	1	1
Minimum Initial (s)	5	5	5	5	5
Vehicle Extension (s)	3	3	3	3	3
Minimum Gap (s)	3	3	3	3	3
Time Before Reduce (s)	0	0	0	0	0
Time To Reduce (s)	0	0	0	0	0
Walk Time (s)	7		7	7	7
Flash Dont Walk (s)	11		11	11	11
Dual Entry	Yes	No	Yes	Yes	Yes
Inhibit Max	Yes	Yes	Yes	Yes	Yes
Start Time (s)	0	25	52	0	25
End Time (s)	25	52	0	25	0
Yield/Force Off (s)	20.5	47.5	85.5	20.5	85.5
Yield/Force Off 170(s)	9.5	47.5	85.5	9.5	85.5
Local Start Time (s)	0	25	52	0	25
Local Yield (s)	20.5	47.5	85.5	20.5	85.5
Local Yield 170(s)	9.5	47.5	85.5	9.5	85.5

Intersection Summary

Cycle Length	90
Control Type	Actuated-Uncoordinated
Natural Cycle	80
























Splits and Phases: 1: James Ranch Rd & AZ 80



HCM 6th Signalized Intersection Summary

Horizon Year AM

1: James Ranch Rd & AZ 80

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	10	193	166	855	479	10	76	10	471	10	10	10
Future Volume (veh/h)	10	193	166	855	479	10	76	10	471	10	10	10
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1870	1737	1411	1574	1678	1870	1604	1870	1500	1870	1870	1870
Adj Flow Rate, veh/h	12	227	195	950	564	12	95	0	507	12	12	12
Peak Hour Factor	0.80	0.85	0.85	0.90	0.85	0.85	0.80	0.85	0.85	0.80	0.80	0.80
Percent Heavy Veh, %	2	11	33	22	15	2	20	2	27	2	2	2
Cap, veh/h	287	701	254	993	1986	42	383	0	613	324	207	207
Arrive On Green	0.21	0.21	0.21	0.34	0.62	0.62	0.24	0.00	0.24	0.24	0.24	0.24
Sat Flow, veh/h	837	3300	1196	2908	3191	68	1189	0	2542	892	858	858
Grp Volume(v), veh/h	12	227	195	950	281	295	95	0	507	12	0	24
Grp Sat Flow(s),veh/h/ln	837	1650	1196	1454	1594	1665	1189	0	1271	892	0	1716
Q Serve(g_s), s	0.8	3.8	10.1	21.0	5.3	5.3	4.4	0.0	12.5	0.7	0.0	0.7
Cycle Q Clear(g_c), s	0.8	3.8	10.1	21.0	5.3	5.3	5.1	0.0	12.5	0.7	0.0	0.7
Prop In Lane	1.00		1.00	1.00		0.04	1.00		1.00	1.00		0.50
Lane Grp Cap(c), veh/h	287	701	254	993	992	1036	383	0	613	324	0	414
V/C Ratio(X)	0.04	0.32	0.77	0.96	0.28	0.28	0.25	0.00	0.83	0.04	0.00	0.06
Avail Cap(c_a), veh/h	535	1679	608	993	1464	1530	467	0	791	387	0	534
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	20.7	21.9	24.4	21.2	5.7	5.7	21.2	0.0	23.7	19.2	0.0	19.2
Incr Delay (d2), s/veh	0.1	0.3	4.9	18.9	0.2	0.1	0.3	0.0	5.7	0.0	0.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.2	2.3	5.0	13.0	1.9	1.9	2.1	0.0	6.5	0.2	0.0	0.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	20.8	22.2	29.3	40.1	5.9	5.9	21.5	0.0	29.4	19.3	0.0	19.3
LnGrp LOS	C	C	C	D	A	A	C	A	C	B	A	B
Approach Vol, veh/h	434			1526			602			36		
Approach Delay, s/veh	25.3			27.2			28.2			19.3		
Approach LOS	C			C			C			B		
Timer - Assigned Phs	2		3	4		6		8				
Phs Duration (G+Y+Rc), s	20.4		27.0	18.5		20.4		45.5				
Change Period (Y+Rc), s	4.5		4.5	4.5		4.5		4.5				
Max Green Setting (Gmax), s	20.5		22.5	33.5		20.5		60.5				
Max Q Clear Time (g_c+I1), s	14.5		23.0	12.1		2.7		7.3				
Green Ext Time (p_c), s	1.4		0.0	1.9		0.1		3.2				
Intersection Summary												
HCM 6th Ctrl Delay				27.0								
HCM 6th LOS				C								
Notes												

Timing Report, Sorted By Phase

Horizon Year PM

1: James Ranch Rd & AZ 80

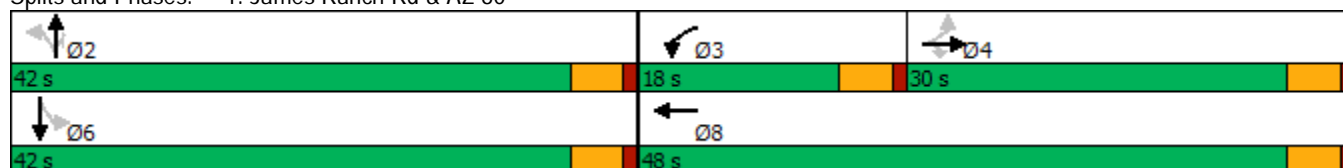


Phase Number	2	3	4	6	8
Movement	NBTL	WBL	EBTL	SBTL	WBT
Lead/Lag		Lead	Lag		
Lead-Lag Optimize					
Recall Mode	None	Min	Min	None	Min
Maximum Split (s)	42	18	30	42	48
Maximum Split (%)	46.7%	20.0%	33.3%	46.7%	53.3%
Minimum Split (s)	22.5	9.5	22.5	22.5	22.5
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1	1	1	1	1
Minimum Initial (s)	5	5	5	5	5
Vehicle Extension (s)	3	3	3	3	3
Minimum Gap (s)	3	3	3	3	3
Time Before Reduce (s)	0	0	0	0	0
Time To Reduce (s)	0	0	0	0	0
Walk Time (s)	7		7	7	7
Flash Dont Walk (s)	11		11	11	11
Dual Entry	Yes	No	Yes	Yes	Yes
Inhibit Max	Yes	Yes	Yes	Yes	Yes
Start Time (s)	0	42	60	0	42
End Time (s)	42	60	0	42	0
Yield/Force Off (s)	37.5	55.5	85.5	37.5	85.5
Yield/Force Off 170(s)	26.5	55.5	85.5	26.5	85.5
Local Start Time (s)	0	42	60	0	42
Local Yield (s)	37.5	55.5	85.5	37.5	85.5
Local Yield 170(s)	26.5	55.5	85.5	26.5	85.5

Intersection Summary

Cycle Length	90
Control Type	Actuated-Uncoordinated
Natural Cycle	70
























Splits and Phases: 1: James Ranch Rd & AZ 80



HCM 6th Signalized Intersection Summary

Horizon Year PM

1: James Ranch Rd & AZ 80

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	10	465	78	355	374	10	185	10	1091	10	10	10
Future Volume (veh/h)	10	465	78	355	374	10	185	10	1091	10	10	10
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1870	1737	1218	1530	1663	1870	1604	1870	1559	1870	1870	1870
Adj Flow Rate, veh/h	12	547	98	418	440	12	218	0	1098	12	12	12
Peak Hour Factor	0.80	0.85	0.80	0.85	0.85	0.85	0.85	0.90	0.90	0.80	0.80	0.80
Percent Heavy Veh, %	2	11	46	25	16	2	20	2	23	2	2	2
Cap, veh/h	292	708	222	477	1382	38	613	0	1182	320	384	384
Arrive On Green	0.21	0.21	0.21	0.17	0.44	0.44	0.45	0.00	0.45	0.45	0.45	0.45
Sat Flow, veh/h	939	3300	1032	2826	3142	86	1189	0	2643	514	858	858
Grp Volume(v), veh/h	12	547	98	418	221	231	218	0	1098	12	0	24
Grp Sat Flow(s),veh/h/ln	939	1650	1032	1413	1580	1647	1189	0	1321	514	0	1716
Q Serve(g_s), s	0.8	12.5	6.6	11.5	7.3	7.3	10.1	0.0	31.4	1.1	0.0	0.6
Cycle Q Clear(g_c), s	0.8	12.5	6.6	11.5	7.3	7.3	10.7	0.0	31.4	1.1	0.0	0.6
Prop In Lane	1.00		1.00	1.00		0.05	1.00		1.00	1.00		0.50
Lane Grp Cap(c), veh/h	292	708	222	477	695	725	613	0	1182	320	0	768
V/C Ratio(X)	0.04	0.77	0.44	0.88	0.32	0.32	0.36	0.00	0.93	0.04	0.00	0.03
Avail Cap(c_a), veh/h	390	1053	329	477	860	897	639	0	1240	331	0	805
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	25.0	29.5	27.2	32.4	14.6	14.6	15.4	0.0	20.9	12.5	0.0	12.4
Incr Delay (d2), s/veh	0.1	2.1	1.4	16.5	0.3	0.3	0.3	0.0	11.9	0.0	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.3	8.1	2.8	8.2	4.0	4.2	4.7	0.0	14.8	0.2	0.0	0.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	25.0	31.6	28.6	48.9	14.8	14.8	15.7	0.0	32.7	12.5	0.0	12.4
LnGrp LOS	C	C	C	D	B	B	B	A	C	B	A	B
Approach Vol, veh/h	657			870			1316			36		
Approach Delay, s/veh	31.0			31.2			29.9			12.4		
Approach LOS	C			C			C			B		
Timer - Assigned Phs	2		3	4		6		8				
Phs Duration (G+Y+Rc), s	40.3		18.0	21.7		40.3		39.7				
Change Period (Y+Rc), s	4.5		4.5	4.5		4.5		4.5				
Max Green Setting (Gmax), s	37.5		13.5	25.5		37.5		43.5				
Max Q Clear Time (g_c+I1), s	33.4		13.5	14.5		3.1		9.3				
Green Ext Time (p_c), s	2.4		0.0	2.7		0.2		2.3				
Intersection Summary												
HCM 6th Ctrl Delay	30.3											
HCM 6th LOS	C											
Notes												

Timing Report, Sorted By Phase

1: James Ranch Rd & SR 80

TI Sensitivity Analysis AM



Phase Number	2	3	4	6	8
Movement	NBTL	WBL	EBTL	SBTL	WBT
Lead/Lag		Lead	Lag		
Lead-Lag Optimize					
Recall Mode	None	Min	Min	None	Min
Maximum Split (s)	23	44	23	23	67
Maximum Split (%)	25.6%	48.9%	25.6%	25.6%	74.4%
Minimum Split (s)	22.5	9.5	22.5	22.5	22.5
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1	1	1	1	1
Minimum Initial (s)	5	5	5	5	5
Vehicle Extension (s)	3	3	3	3	3
Minimum Gap (s)	3	3	3	3	3
Time Before Reduce (s)	0	0	0	0	0
Time To Reduce (s)	0	0	0	0	0
Walk Time (s)	7		7	7	7
Flash Dont Walk (s)	11		11	11	11
Dual Entry	Yes	No	Yes	Yes	Yes
Inhibit Max	Yes	Yes	Yes	Yes	Yes
Start Time (s)	0	23	67	0	23
End Time (s)	23	67	0	23	0
Yield/Force Off (s)	18.5	62.5	85.5	18.5	85.5
Yield/Force Off 170(s)	7.5	62.5	85.5	7.5	85.5
Local Start Time (s)	0	23	67	0	23
Local Yield (s)	18.5	62.5	85.5	18.5	85.5
Local Yield 170(s)	7.5	62.5	85.5	7.5	85.5

Intersection Summary

Cycle Length	90
Control Type	Actuated-Uncoordinated
Natural Cycle	90























Splits and Phases: 1: James Ranch Rd & SR 80



HCM 6th Signalized Intersection Summary

TI Sensitivity Analysis AM

1: James Ranch Rd & SR 80

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	10	193	166	855	479	10	76	10	471	10	10	10
Future Volume (veh/h)	10	193	166	855	479	10	76	10	471	10	10	10
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1870	1737	1411	1574	1678	1870	1604	1870	1500	1870	1870	1870
Adj Flow Rate, veh/h	16	295	254	1235	733	15	124	16	720	16	16	16
Peak Hour Factor	0.80	0.85	0.85	0.90	0.85	0.85	0.80	0.80	0.85	0.80	0.80	0.80
Percent Heavy Veh, %	2	11	33	22	15	2	20	2	27	2	2	2
Cap, veh/h	229	686	249	1281	2233	46	299	374	1433	220	171	171
Arrive On Green	0.21	0.21	0.21	0.44	0.70	0.70	0.20	0.20	0.20	0.20	0.20	0.20
Sat Flow, veh/h	713	3300	1196	2908	3194	65	1181	1870	2237	722	858	858
Grp Volume(v), veh/h	16	295	254	1235	366	382	124	16	720	16	0	32
Grp Sat Flow(s),veh/h/ln	713	1650	1196	1454	1594	1666	1181	1870	1119	722	0	1716
Q Serve(g_s), s	1.6	6.9	18.5	36.7	8.0	8.0	8.5	0.6	15.2	1.6	0.0	1.4
Cycle Q Clear(g_c), s	1.6	6.9	18.5	36.7	8.0	8.0	9.9	0.6	15.2	2.2	0.0	1.4
Prop In Lane	1.00		1.00	1.00		0.04	1.00		1.00	1.00		0.50
Lane Grp Cap(c), veh/h	229	686	249	1281	1114	1165	299	374	1433	220	0	343
V/C Ratio(X)	0.07	0.43	1.02	0.96	0.33	0.33	0.41	0.04	0.50	0.07	0.00	0.09
Avail Cap(c_a), veh/h	229	686	249	1291	1120	1170	308	389	1451	226	0	357
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	28.6	30.6	35.2	24.2	5.2	5.2	33.0	28.7	8.5	29.6	0.0	29.0
Incr Delay (d2), s/veh	0.1	0.4	62.8	17.1	0.2	0.2	0.9	0.0	0.3	0.1	0.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.5	4.6	14.4	19.6	3.0	3.1	4.4	0.5	4.7	0.5	0.0	1.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	28.7	31.1	98.0	41.3	5.4	5.4	34.0	28.8	8.8	29.8	0.0	29.1
LnGrp LOS	C	C	F	D	A	A	C	C	A	C	A	C
Approach Vol, veh/h	565			1983			860			48		
Approach Delay, s/veh	61.1			27.7			12.8			29.4		
Approach LOS	E			C			B			C		
Timer - Assigned Phs	2		3	4		6		8				
Phs Duration (G+Y+Rc), s	22.3		43.7	23.0		22.3		66.7				
Change Period (Y+Rc), s	4.5		4.5	4.5		4.5		4.5				
Max Green Setting (Gmax), s	18.5		39.5	18.5		18.5		62.5				
Max Q Clear Time (g_c+I1), s	17.2		38.7	20.5		4.2		10.0				
Green Ext Time (p_c), s	0.6		0.4	0.0		0.1		4.4				
Intersection Summary												
HCM 6th Ctrl Delay	29.5											
HCM 6th LOS	C											

Timing Report, Sorted By Phase

TI Sensitivity Analysis PM

1: James Ranch Rd & SR 80

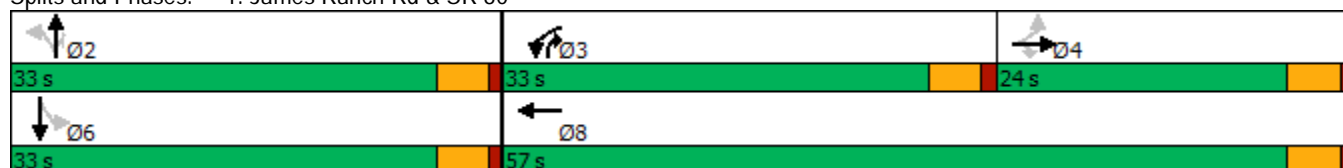


Phase Number	2	3	4	6	8
Movement	NBTL	WBL	EBTL	SBTL	WBT
Lead/Lag		Lead	Lag		
Lead-Lag Optimize					
Recall Mode	None	Min	Min	None	Min
Maximum Split (s)	33	33	24	33	57
Maximum Split (%)	36.7%	36.7%	26.7%	36.7%	63.3%
Minimum Split (s)	22.5	9.5	22.5	22.5	22.5
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1	1	1	1	1
Minimum Initial (s)	5	5	5	5	5
Vehicle Extension (s)	3	3	3	3	3
Minimum Gap (s)	3	3	3	3	3
Time Before Reduce (s)	0	0	0	0	0
Time To Reduce (s)	0	0	0	0	0
Walk Time (s)	7		7	7	7
Flash Dont Walk (s)	11		11	11	11
Dual Entry	Yes	No	Yes	Yes	Yes
Inhibit Max	Yes	Yes	Yes	Yes	Yes
Start Time (s)	0	33	66	0	33
End Time (s)	33	66	0	33	0
Yield/Force Off (s)	28.5	61.5	85.5	28.5	85.5
Yield/Force Off 170(s)	17.5	61.5	85.5	17.5	85.5
Local Start Time (s)	0	33	66	0	33
Local Yield (s)	28.5	61.5	85.5	28.5	85.5
Local Yield 170(s)	17.5	61.5	85.5	17.5	85.5

Intersection Summary

Cycle Length	90
Control Type	Actuated-Uncoordinated
Natural Cycle	100
























Splits and Phases: 1: James Ranch Rd & SR 80



HCM 6th Signalized Intersection Summary

TI Sensitivity Analysis PM

1: James Ranch Rd & SR 80

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	10	465	78	355	374	10	185	10	1091	10	10	10
Future Volume (veh/h)	10	465	78	355	374	10	185	10	1091	10	10	10
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1870	1737	1218	1530	1663	1870	1604	1870	1559	1870	1870	1870
Adj Flow Rate, veh/h	16	711	127	543	572	15	283	16	1576	16	16	16
Peak Hour Factor	0.80	0.85	0.80	0.85	0.85	0.85	0.85	0.80	0.90	0.80	0.80	0.80
Percent Heavy Veh, %	2	11	46	25	16	2	20	2	23	2	2	2
Cap, veh/h	290	793	248	646	1654	43	502	674	1370	205	309	309
Arrive On Green	0.24	0.24	0.24	0.23	0.53	0.53	0.36	0.36	0.36	0.36	0.36	0.36
Sat Flow, veh/h	829	3300	1032	2826	3145	82	1181	1870	2325	320	858	858
Grp Volume(v), veh/h	16	711	127	543	287	300	283	16	1576	16	0	32
Grp Sat Flow(s),veh/h/ln	829	1650	1032	1413	1580	1648	1181	1870	1163	320	0	1716
Q Serve(g_s), s	1.2	16.5	8.4	14.5	8.3	8.3	16.3	0.4	28.5	2.7	0.0	1.0
Cycle Q Clear(g_c), s	1.2	16.5	8.4	14.5	8.3	8.3	17.2	0.4	28.5	3.1	0.0	1.0
Prop In Lane	1.00		1.00	1.00		0.05	1.00		1.00	1.00		0.50
Lane Grp Cap(c), veh/h	290	793	248	646	831	867	502	674	1370	205	0	618
V/C Ratio(X)	0.06	0.90	0.51	0.84	0.35	0.35	0.56	0.02	1.15	0.08	0.00	0.05
Avail Cap(c_a), veh/h	295	814	255	1018	1048	1094	502	674	1370	205	0	618
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	23.3	29.1	26.0	29.1	10.9	10.9	22.1	16.3	16.3	17.3	0.0	16.5
Incr Delay (d2), s/veh	0.1	12.5	1.6	3.7	0.2	0.2	1.5	0.0	76.6	0.2	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.4	11.5	3.5	8.2	4.1	4.3	7.9	0.3	33.7	0.4	0.0	0.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	23.4	41.5	27.7	32.8	11.1	11.1	23.6	16.3	92.9	17.5	0.0	16.5
LnGrp LOS	C	D	C	C	B	B	C	B	F	B	A	B
Approach Vol, veh/h	854			1130			1875			48		
Approach Delay, s/veh	39.1			21.6			81.8			16.9		
Approach LOS	D			C			F			B		
Timer - Assigned Phs	2		3		4		6		8			
Phs Duration (G+Y+Rc), s	33.0		22.6		23.5		33.0		46.1			
Change Period (Y+Rc), s	4.5		4.5		4.5		4.5		4.5			
Max Green Setting (Gmax), s	28.5		28.5		19.5		28.5		52.5			
Max Q Clear Time (g_c+I1), s	30.5		16.5		18.5		5.1		10.3			
Green Ext Time (p_c), s	0.0		1.6		0.5		0.4		3.2			
Intersection Summary												
HCM 6th Ctrl Delay	54.2											
HCM 6th LOS	D											

Scheme Summary

Control Data

Control Data and Model Parameters

Douglas IPOE	2028 PHF Flow Profile (veh)
2028 Roundabout, NBR Bypass	7.5 min Time Slice
Rodel-Win1	Control Delays (sec)
Right Hand Drive	Daylight conditions
AM Peak Hour	Peak 60/15 min Results
Full Geometry	Output flows: Vehicles
English Units (ft)	50% Confidence Level

Operational Data

Main Geometry (ft)

Approach and Entry Geometry

Leg	Leg Names	Approach Bearing (deg)	Grade Separation G	Half Width V	Approach Lanes n	Entry Width E	Entry Lanes n	Flare Length L'	Entry Radius R	Entry Angle Phi
1	James Ranch Road	0	0	24.00	2	24.00	2	0.00	90.00	40.00
2	SR 80	83	0	24.00	2	24.00	2	0.00	90.00	40.00
3	James Ranch Road	180	0	12.00	1	12.00	1	0.00	90.00	40.00
4	SR 80	263	0	24.00	2	24.00	2	0.00	90.00	40.00

Circulating and Exit Geometry

Leg	Leg Names	Inscribed Diameter D	Circulating Width C	Circulating Lanes nc	Exit Width Ex	Exit Lanes nex	Exit Half Width Vx	Exit Half Width Lanes nvx
1	James Ranch Road	200.00	30.00	2	24.00	2	24.00	2
2	SR 80	200.00	30.00	2	24.00	2	24.00	2
3	James Ranch Road	200.00	30.00	2	13.00	1	12.00	1
4	SR 80	200.00	30.00	2	24.00	2	24.00	2

Capacity Modifiers and Capacity Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Entry Calibration		Approach Road			Exit Road		
		Capacity + or -	XWalk Factor	Intercept + or -	Slope Factor	V (ft)	Default Capacity	Calib Capacity	V (ft)	Default Capacity	Calib Capacity
1	James Ranch Road	0	1.000	0	1.000	36.00	5377	0	24.00	3584	0
2	SR 80	0	1.000	0	1.000	20.00	3584	0	24.00	3584	0
3	James Ranch Road	0	1.000	0	1.000	20.00	1792	0	12.00	1792	0
4	SR 80	0	1.000	0	1.000	20.00	3584	0	24.00	3584	0

Bypass Geometry

Bypass Approach Geometry (ft)

Leg	Leg Names	Bypass Type	Bypass Flows	V	nv	Vb	nvb	Vt	nvt
1	James Ranch Road	Free	162	24	2	12	1	36	3

Bypass Entry and Exit Geometry (ft)

Leg	Leg Names	Entry Geometry						Leg	Leg Names	Exit Lanes	
		Eb	neb	Lb	Lt	Rb	Phib			nex	Nmx
1	James Ranch Road	12	1	0	130	120.000 1958	30	2	SR 80	2	2

Bypass Entry Capacity Modifiers and Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Calibration	
		Capacity + or -	Cross Walk Factor	Intercept + or -	Slope Factor
1	James Ranch Road	0	1.000	0	1.000

Traffic Flow Data (veh/hr)

2028 AM Peak Peak Hour Flows

Leg	Leg Names	Turning Flows					Flow Modifiers		
		U-Turn	Exit-3	Exit-2	Exit-1	Bypass	Trucks %	Flow Factor	Peak Hour Factor
1	James Ranch Road	0	23	5	0	162	30.0	1.00	0.850
2	SR 80	0	268	312	5	0	21.0	1.00	0.850
3	James Ranch Road	0	5	5	5	0	2.0	1.00	0.800
4	SR 80	0	5	125	59	0	18.0	1.00	0.850

Operational Results

2028 AM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	James Ranch Road	Free	28	162	135	0	332	1225	1054	0.0228	0.1537
2	SR 80	None	585		33		292	1464		0.3995	
3	James Ranch Road	None	15		603		15	823		0.0182	
4	SR 80	None	189		278		340	1408		0.1342	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	James Ranch Road	Free	2.97	1.54	1.75	0.07	0.00	A	A	A
2	SR 80	None	8.19		8.19	2.98		A		A
3	James Ranch Road	None	4.49		4.49	0.06		A		A
4	SR 80	None	4.74		4.74	0.60		A		A

Global Results

Performance and Accidents

2028 AM Peak Global Performance

Parameter	Units	Entries	Bypasses	Total
Arrive Flows	veh/hr	817	162	979
Capacity	veh/hr	4921	1054	5975
Average Delay	sec/veh	6.27	0.77	5.36
L.O.S. (Signal)	A – F	A	A	A
L.O.S. (Unsig)	A – F	A	A	A
Total Delay	veh.hrs	1.42	0.03	1.46

Scheme Summary

Control Data

Control Data and Model Parameters

Douglas IPOE	2028 PHF Flow Profile (veh)
2028 Roundabout, NBR Bypass	7.5 min Time Slice
Rodel-Win1	Control Delays (sec)
Right Hand Drive	Nighttime conditions
PM Peak Hour	Peak 60/15 min Results
Full Geometry	Output flows: Vehicles
English Units (ft)	50% Confidence Level

Operational Data

Main Geometry (ft)

Approach and Entry Geometry

Leg	Leg Names	Approach Bearing (deg)	Grade Separation G	Half Width V	Approach Lanes n	Entry Width E	Entry Lanes n	Flare Length L'	Entry Radius R	Entry Angle Phi
1	James Ranch Road	0	0	24.00	2	24.00	2	0.00	90.00	40.00
2	SR 80	83	0	24.00	2	24.00	2	0.00	90.00	40.00
3	James Ranch Road	180	0	12.00	1	12.00	1	0.00	90.00	40.00
4	SR 80	263	0	24.00	2	24.00	2	0.00	90.00	40.00

Circulating and Exit Geometry

Leg	Leg Names	Inscribed Diameter D	Circulating Width C	Circulating Lanes nc	Exit Width Ex	Exit Lanes nex	Exit Half Width Vx	Exit Half Width Lanes nvx
1	James Ranch Road	200.00	30.00	2	24.00	2	24.00	2
2	SR 80	200.00	30.00	2	24.00	2	24.00	2
3	James Ranch Road	200.00	30.00	2	13.00	1	12.00	1
4	SR 80	200.00	30.00	2	24.00	2	24.00	2

Capacity Modifiers and Capacity Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Entry Calibration		Approach Road			Exit Road		
		Capacity + or -	XWalk Factor	Intercept + or -	Slope Factor	V (ft)	Default Capacity	Calib Capacity	V (ft)	Default Capacity	Calib Capacity
1	James Ranch Road	0	1.000	0	1.000	36.00	5377	0	24.00	3584	0
2	SR 80	0	1.000	0	1.000	20.00	3584	0	24.00	3584	0
3	James Ranch Road	0	1.000	0	1.000	20.00	1792	0	12.00	1792	0
4	SR 80	0	1.000	0	1.000	20.00	3584	0	24.00	3584	0

Bypass Geometry

Bypass Approach Geometry (ft)

Leg	Leg Names	Bypass Type	Bypass Flows	V	nv	Vb	nvb	Vt	nvt
1	James Ranch Road	Free	348	24	2	12	1	36	3

Bypass Entry and Exit Geometry (ft)

Leg	Leg Names	Entry Geometry						Leg	Leg Names	Exit Lanes	
		Eb	neb	Lb	Lt	Rb	Phib			nex	Nmx
1	James Ranch Road	12	1	0	130	120.000 288	30	2	SR 80	2	2

Bypass Entry Capacity Modifiers and Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Calibration	
		Capacity + or -	Cross Walk Factor	Intercept + or -	Slope Factor
1	James Ranch Road	0	1.000	0	1.000

Traffic Flow Data (veh/hr)

2028 PM Peak Peak Hour Flows

Leg	Leg Names	Turning Flows					Flow Modifiers		
		U-Turn	Exit-3	Exit-2	Exit-1	Bypass	Trucks %	Flow Factor	Peak Hour Factor
1	James Ranch Road	0	56	5	0	348	30.0	1.00	0.850
2	SR 80	0	118	245	5	0	21.0	1.00	0.850
3	James Ranch Road	0	5	5	5	0	2.0	1.00	0.800
4	SR 80	0	5	301	32	0	18.0	1.00	0.850

Operational Results

2028 PM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	James Ranch Road	Free	61	348	311	0	155	1084	1001	0.0563	0.3475
2	SR 80	None	368		66		654	1372		0.2683	
3	James Ranch Road	None	15		419		15	837		0.0179	
4	SR 80	None	338		128		306	1412		0.2394	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	James Ranch Road	Free	3.35	2.74	2.83	0.16	0.00	A	A	A
2	SR 80	None	6.16		6.16	1.35		A		A
3	James Ranch Road	None	4.41		4.41	0.06		A		A
4	SR 80	None	4.97		4.97	0.91		A		A

Global Results

Performance and Accidents

2028 PM Peak Global Performance

Parameter	Units	Entries	Bypasses	Total
Arrive Flows	veh/hr	782	348	1130
Capacity	veh/hr	4705	1001	5706
Average Delay	sec/veh	4.47	1.74	3.63
L.O.S. (Signal)	A – F	A	A	A
L.O.S. (Unsig)	A – F	A	A	A
Total Delay	veh.hrs	0.97	0.17	1.14

Scheme Summary

Control Data

Control Data and Model Parameters

Douglas IPOE	2050 PHF Flow Profile (veh)
2050 Roundabout, NBR Bypass	7.5 min Time Slice
Rodel-Win1	Control Delays (sec)
Right Hand Drive	Daylight conditions
AM Peak Hour	Peak 60/15 min Results
Full Geometry	Output flows: Vehicles
English Units (ft)	50% Confidence Level

Operational Data

Main Geometry (ft)

Approach and Entry Geometry

Leg	Leg Names	Approach Bearing (deg)	Grade Separation G	Half Width V	Approach Lanes n	Entry Width E	Entry Lanes n	Flare Length L'	Entry Radius R	Entry Angle Phi
1	James Ranch Road	0	0	24.00	2	24.00	2	0.00	90.00	40.00
2	SR 80	83	0	24.00	2	24.00	2	0.00	90.00	40.00
3	James Ranch Road	180	0	12.00	1	12.00	1	0.00	90.00	40.00
4	SR 80	263	0	24.00	2	24.00	2	0.00	90.00	40.00

Circulating and Exit Geometry

Leg	Leg Names	Inscribed Diameter D	Circulating Width C	Circulating Lanes nc	Exit Width Ex	Exit Lanes nex	Exit Half Width Vx	Exit Half Width Lanes nvx
1	James Ranch Road	200.00	30.00	2	24.00	2	24.00	2
2	SR 80	200.00	30.00	2	24.00	2	24.00	2
3	James Ranch Road	200.00	30.00	2	13.00	1	12.00	1
4	SR 80	200.00	30.00	2	24.00	2	24.00	2

Capacity Modifiers and Capacity Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Entry Calibration		Approach Road			Exit Road		
		Capacity + or -	XWalk Factor	Intercept + or -	Slope Factor	V (ft)	Default Capacity	Calib Capacity	V (ft)	Default Capacity	Calib Capacity
1	James Ranch Road	0	1.000	0	1.000	36.00	5377	0	24.00	3584	0
2	SR 80	0	1.000	0	1.000	20.00	3584	0	24.00	3584	0
3	James Ranch Road	0	1.000	0	1.000	20.00	1792	0	12.00	1792	0
4	SR 80	0	1.000	0	1.000	20.00	3584	0	24.00	3584	0

Bypass Geometry

Bypass Approach Geometry (ft)

Leg	Leg Names	Bypass Type	Bypass Flows	V	nv	Vb	nvb	Vt	nvt
1	James Ranch Road	Free	471	24	2	12	1	36	3

Bypass Entry and Exit Geometry (ft)

Leg	Leg Names	Entry Geometry						Leg	Leg Names	Exit Lanes	
		Eb	neb	Lb	Lt	Rb	Phib			nex	Nmx
1	James Ranch Road	12	1	0	130	120.000 1344	30	2	SR 80	2	2

Bypass Entry Capacity Modifiers and Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Calibration	
		Capacity + or -	Cross Walk Factor	Intercept + or -	Slope Factor
1	James Ranch Road	0	1.000	0	1.000

Traffic Flow Data (veh/hr)

2050 AM Peak Peak Hour Flows

Leg	Leg Names	Turning Flows					Flow Modifiers		
		U-Turn	Exit-3	Exit-2	Exit-1	Bypass	Trucks %	Flow Factor	Peak Hour Factor
1	James Ranch Road	0	76	10	0	471	24.0	1.00	0.850
2	SR 80	0	855	479	10	0	20.0	1.00	0.900
3	James Ranch Road	0	10	10	10	0	2.0	1.00	0.800
4	SR 80	0	10	193	166	0	17.0	1.00	0.850

Operational Results

2050 AM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	James Ranch Road	Free	86	471	213	0	1024	1311	1105	0.0656	0.4262
2	SR 80	None	1344		96		674	1456		0.9233	
3	James Ranch Road	None	30		1399		30	536		0.0559	
4	SR 80	None	369		868		561	1110		0.3324	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	James Ranch Road	Free	3.21	3.13	3.14	0.20	0.00	A	A	A
2	SR 80	None	18.87		18.87	18.43		C		C
3	James Ranch Road	None	7.45		7.45	0.21		A		A
4	SR 80	None	9.37		9.37	2.45		A		A

Global Results

Performance and Accidents

2050 AM Peak Global Performance

Parameter	Units	Entries	Bypasses	Total
Arrive Flows	veh/hr	1829	471	2300
Capacity	veh/hr	4413	1105	5518
Average Delay	sec/veh	15.08	2.13	12.43
L.O.S. (Signal)	A – F	B	A	B
L.O.S. (Unsig)	A – F	C	A	B
Total Delay	veh.hrs	7.66	0.28	7.94

Scheme Summary

Control Data

Control Data and Model Parameters

Douglas IPOE	2050 PHF Flow Profile (veh)
2050 Roundabout, NBR Bypass	7.5 min Time Slice
Rodel-Win1	Control Delays (sec)
Right Hand Drive	Nighttime conditions
PM Peak Hour	Peak 60/15 min Results
Full Geometry	Output flows: Vehicles
English Units (ft)	50% Confidence Level

Operational Data

Main Geometry (ft)

Approach and Entry Geometry

Leg	Leg Names	Approach Bearing (deg)	Grade Separation G	Half Width V	Approach Lanes n	Entry Width E	Entry Lanes n	Flare Length L'	Entry Radius R	Entry Angle Phi
1	James Ranch Road	0	0	24.00	2	24.00	2	0.00	90.00	40.00
2	SR 80	83	0	24.00	2	24.00	2	0.00	90.00	40.00
3	James Ranch Road	180	0	12.00	1	12.00	1	0.00	90.00	40.00
4	SR 80	263	0	24.00	2	24.00	2	0.00	90.00	40.00

Circulating and Exit Geometry

Leg	Leg Names	Inscribed Diameter D	Circulating Width C	Circulating Lanes nc	Exit Width Ex	Exit Lanes nex	Exit Half Width Vx	Exit Half Width Lanes nvx
1	James Ranch Road	200.00	30.00	2	24.00	2	24.00	2
2	SR 80	200.00	30.00	2	24.00	2	24.00	2
3	James Ranch Road	200.00	30.00	2	13.00	1	12.00	1
4	SR 80	200.00	30.00	2	24.00	2	24.00	2

Capacity Modifiers and Capacity Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Entry Calibration		Approach Road			Exit Road		
		Capacity + or -	XWalk Factor	Intercept + or -	Slope Factor	V (ft)	Default Capacity	Calib Capacity	V (ft)	Default Capacity	Calib Capacity
1	James Ranch Road	0	1.000	0	1.000	36.00	5377	0	24.00	3584	0
2	SR 80	0	1.000	0	1.000	20.00	3584	0	24.00	3584	0
3	James Ranch Road	0	1.000	0	1.000	20.00	1792	0	12.00	1792	0
4	SR 80	0	1.000	0	1.000	20.00	3584	0	24.00	3584	0

Bypass Geometry

Bypass Approach Geometry (ft)

Leg	Leg Names	Bypass Type	Bypass Flows	V	nv	Vb	nvb	Vt	nvt
1	James Ranch Road	Free	1091	24	2	12	1	36	3

Bypass Entry and Exit Geometry (ft)

Leg	Leg Names	Entry Geometry						Leg	Leg Names	Exit Lanes	
		Eb	neb	Lb	Lt	Rb	Phib			nex	Nmx
1	James Ranch Road	12	1	0	130	120.000 1152	30	2	SR 80	2	2

Bypass Entry Capacity Modifiers and Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Calibration	
		Capacity + or -	Cross Walk Factor	Intercept + or -	Slope Factor
1	James Ranch Road	0	1.000	0	1.000

Traffic Flow Data (veh/hr)

2050 PM Peak Peak Hour Flows

Leg	Leg Names	Turning Flows					Flow Modifiers		
		U-Turn	Exit-3	Exit-2	Exit-1	Bypass	Trucks %	Flow Factor	Peak Hour Factor
1	James Ranch Road	0	185	10	0	1091	24.0	1.00	0.900
2	SR 80	0	355	374	10	0	20.0	1.00	0.900
3	James Ranch Road	0	10	10	10	0	2.0	1.00	0.800
4	SR 80	0	10	465	78	0	17.0	1.00	0.850

Operational Results

2050 PM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	James Ranch Road	Free	195	1091	485	0	443	1109	1049	0.1759	1.0396
2	SR 80	None	739		205		1524	1322		0.5592	
3	James Ranch Road	None	30		914		30	658		0.0456	
4	SR 80	None	553		375		569	1302		0.4248	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	James Ranch Road	Free	4.77	23.33	20.51	0.54	40.81	A	C	C
2	SR 80	None	11.41		11.41	5.15		B		B
3	James Ranch Road	None	5.99		5.99	0.17		A		A
4	SR 80	None	7.10		7.10	2.29		A		A

Global Results

Performance and Accidents

2050 PM Peak Global Performance

Parameter	Units	Entries	Bypasses	Total
Arrive Flows	veh/hr	1517	1091	2608
Capacity	veh/hr	4391	1049	5440
Average Delay	sec/veh	7.91	22.33	13.94
L.O.S. (Signal)	A – F	A	C	B
L.O.S. (Unsig)	A – F	A	C	B
Total Delay	veh.hrs	3.33	6.77	10.10

Scheme Summary

Control Data

Control Data and Model Parameters

Douglas IPOE	2050 PHF Flow Profile (veh)
TI Sensitivity Roundabout, NBR Bypass	7.5 min Time Slice
Rodel-Win1	Control Delays (sec)
Right Hand Drive	Daylight conditions
AM Peak Hour	Peak 60/15 min Results
Full Geometry	Output flows: Vehicles
English Units (ft)	50% Confidence Level

Operational Data

Main Geometry (ft)

Approach and Entry Geometry

Leg	Leg Names	Approach Bearing (deg)	Grade Separation G	Half Width V	Approach Lanes n	Entry Width E	Entry Lanes n	Flare Length L'	Entry Radius R	Entry Angle Phi
1	James Ranch Road	0	0	24.00	2	24.00	2	0.00	90.00	40.00
2	SR 80	83	0	24.00	2	24.00	2	0.00	90.00	40.00
3	James Ranch Road	180	0	12.00	1	12.00	1	0.00	90.00	40.00
4	SR 80	263	0	24.00	2	24.00	2	0.00	90.00	40.00

Circulating and Exit Geometry

Leg	Leg Names	Inscribed Diameter D	Circulating Width C	Circulating Lanes nc	Exit Width Ex	Exit Lanes nex	Exit Half Width Vx	Exit Half Width Lanes nvx
1	James Ranch Road	200.00	30.00	2	24.00	2	24.00	2
2	SR 80	200.00	30.00	2	24.00	2	24.00	2
3	James Ranch Road	200.00	30.00	2	13.00	1	12.00	1
4	SR 80	200.00	30.00	2	24.00	2	24.00	2

Capacity Modifiers and Capacity Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Entry Calibration		Approach Road			Exit Road		
		Capacity + or -	XWalk Factor	Intercept + or -	Slope Factor	V (ft)	Default Capacity	Calib Capacity	V (ft)	Default Capacity	Calib Capacity
1	James Ranch Road	0	1.000	0	1.000	36.00	5377	0	24.00	3584	0
2	SR 80	0	1.000	0	1.000	20.00	3584	0	24.00	3584	0
3	James Ranch Road	0	1.000	0	1.000	20.00	1792	0	12.00	1792	0
4	SR 80	0	1.000	0	1.000	20.00	3584	0	24.00	3584	0

Bypass Geometry

Bypass Approach Geometry (ft)

Leg	Leg Names	Bypass Type	Bypass Flows	V	nv	Vb	nvb	Vt	nvt
1	James Ranch Road	Free	471	24	2	12	1	36	3

Bypass Entry and Exit Geometry (ft)

Leg	Leg Names	Entry Geometry						Leg	Leg Names	Exit Lanes	
		Eb	neb	Lb	Lt	Rb	Phib			nex	Nmx
1	James Ranch Road	12	1	0	130	120.000 3149	30	2	SR 80	2	2

Bypass Entry Capacity Modifiers and Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Calibration	
		Capacity + or -	Cross Walk Factor	Intercept + or -	Slope Factor
1	James Ranch Road	0	1.000	0	1.000

Traffic Flow Data (veh/hr)

2050 AM Peak Peak Hour Flows

Leg	Leg Names	Turning Flows					Flow Modifiers		
		U-Turn	Exit-3	Exit-2	Exit-1	Bypass	Trucks %	Flow Factor	Peak Hour Factor
1	James Ranch Road	0	76	10	0	471	24.0	1.20	0.850
2	SR 80	0	855	479	10	0	20.0	1.20	0.900
3	James Ranch Road	0	10	10	10	0	2.0	1.20	0.800
4	SR 80	0	10	193	166	0	17.0	1.20	0.850

Operational Results

2050 AM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	James Ranch Road	Free	103	565	256	0	1131	1290	1105	0.0800	0.5115
2	SR 80	None	1613		115		809	1445		1.1158	
3	James Ranch Road	None	36		1526		35	490		0.0734	
4	SR 80	None	443		943		618	1069		0.4142	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	James Ranch Road	Free	3.40	3.56	3.53	0.25	0.00	A	A	A
2	SR 80	None	46.76		46.76	77.26		E		E
3	James Ranch Road	None	8.32		8.32	0.26		A		A
4	SR 80	None	10.75		10.75	3.25		B		B

Global Results

Performance and Accidents

2050 AM Peak Global Performance

Parameter	Units	Entries	Bypasses	Total
Arrive Flows	veh/hr	2195	565	2760
Capacity	veh/hr	4295	1105	5400
Average Delay	sec/veh	35.86	2.56	29.04
L.O.S. (Signal)	A – F	D	A	C
L.O.S. (Unsig)	A – F	E	A	D
Total Delay	veh.hrs	21.86	0.40	22.27

Scheme Summary

Control Data

Control Data and Model Parameters

Douglas IPOE	2050 PHF Flow Profile (veh)
TI Sensitivity Roundabout, NBR Bypass	7.5 min Time Slice
Rodel-Win1	Control Delays (sec)
Right Hand Drive	Nighttime conditions
PM Peak Hour	Peak 60/15 min Results
Full Geometry	Output flows: Vehicles
English Units (ft)	50% Confidence Level

Operational Data

Main Geometry (ft)

Approach and Entry Geometry

Leg	Leg Names	Approach Bearing (deg)	Grade Separation G	Half Width V	Approach Lanes n	Entry Width E	Entry Lanes n	Flare Length L'	Entry Radius R	Entry Angle Phi
1	James Ranch Road	0	0	24.00	2	24.00	2	0.00	90.00	40.00
2	SR 80	83	0	24.00	2	24.00	2	0.00	90.00	40.00
3	James Ranch Road	180	0	12.00	1	12.00	1	0.00	90.00	40.00
4	SR 80	263	0	24.00	2	24.00	2	0.00	90.00	40.00

Circulating and Exit Geometry

Leg	Leg Names	Inscribed Diameter D	Circulating Width C	Circulating Lanes nc	Exit Width Ex	Exit Lanes nex	Exit Half Width Vx	Exit Half Width Lanes nvx
1	James Ranch Road	200.00	30.00	2	24.00	2	24.00	2
2	SR 80	200.00	30.00	2	24.00	2	24.00	2
3	James Ranch Road	200.00	30.00	2	13.00	1	12.00	1
4	SR 80	200.00	30.00	2	24.00	2	24.00	2

Capacity Modifiers and Capacity Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Entry Calibration		Approach Road			Exit Road		
		Capacity + or -	XWalk Factor	Intercept + or -	Slope Factor	V (ft)	Default Capacity	Calib Capacity	V (ft)	Default Capacity	Calib Capacity
1	James Ranch Road	0	1.000	0	1.000	36.00	5377	0	24.00	3584	0
2	SR 80	0	1.000	0	1.000	20.00	3584	0	24.00	3584	0
3	James Ranch Road	0	1.000	0	1.000	20.00	1792	0	12.00	1792	0
4	SR 80	0	1.000	0	1.000	20.00	3584	0	24.00	3584	0

Bypass Geometry

Bypass Approach Geometry (ft)

Leg	Leg Names	Bypass Type	Bypass Flows	V	nv	Vb	nvb	Vt	nvt
1	James Ranch Road	Free	1091	24	2	12	1	36	3

Bypass Entry and Exit Geometry (ft)

Leg	Leg Names	Entry Geometry						Leg	Leg Names	Exit Lanes	
		Eb	neb	Lb	Lt	Rb	Phib			nex	Nmx
1	James Ranch Road	12	1	0	130	120.000 3341	30	2	SR 80	2	2

Bypass Entry Capacity Modifiers and Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Calibration	
		Capacity + or -	Cross Walk Factor	Intercept + or -	Slope Factor
1	James Ranch Road	0	1.000	0	1.000

Traffic Flow Data (veh/hr)

2050 PM Peak Peak Hour Flows

Leg	Leg Names	Turning Flows					Flow Modifiers		
		U-Turn	Exit-3	Exit-2	Exit-1	Bypass	Trucks %	Flow Factor	Peak Hour Factor
1	James Ranch Road	0	185	10	0	1091	24.0	1.10	0.900
2	SR 80	0	355	374	10	0	20.0	1.10	0.900
3	James Ranch Road	0	10	10	10	0	2.0	1.10	0.800
4	SR 80	0	10	465	78	0	17.0	1.10	0.850

Operational Results

2050 PM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	James Ranch Road	Free	215	1200	533	0	487	1086	1049	0.1975	1.1436
2	SR 80	None	813		225		1572	1310		0.6203	
3	James Ranch Road	None	33		1005		33	625		0.0528	
4	SR 80	None	608		412		626	1281		0.4747	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	James Ranch Road	Free	5.08	60.97	52.50	0.63	69.53	A	F	F
2	SR 80	None	12.57		12.57	6.37		B		B
3	James Ranch Road	None	6.41		6.41	0.19		A		A
4	SR 80	None	7.71		7.71	2.80		A		A

Global Results

Performance and Accidents

2050 PM Peak Global Performance

Parameter	Units	Entries	Bypasses	Total
Arrive Flows	veh/hr	1669	1200	2869
Capacity	veh/hr	4303	1049	5352
Average Delay	sec/veh	8.73	59.97	30.17
L.O.S. (Signal)	A – F	A	E	C
L.O.S. (Unsig)	A – F	A	F	D
Total Delay	veh.hrs	4.05	19.99	24.04

Scheme Summary

Control Data

Control Data and Model Parameters

Douglas IPOE	2028 PHF Flow Profile (veh)
2028 Roundabout	7.5 min Time Slice
HCM 2010 Model	Control Delays (sec)
Right Hand Drive	Daylight conditions
AM Peak Hour	Peak 60/15 min Results
Full Geometry	Output flows: Vehicles
English Units (ft)	50% Confidence Level

Operational Data

HCM Lanes and Headways

HCM 2016 Bearings and Lanes

Leg	Leg Names	Bearing (deg)	Lanes			
			Approach Lanes	Entry Lanes	Circulating Lanes	Exit Lanes
1	James Ranch Road	0	2	2	2	2
2	SR 80	83	2	2	2	2
3	James Ranch Road	180	1	1	2	1
4	SR 80	263	2	2	2	2

HCM 2016 Default Headways (secs)

Lanes		Lane-1		Lane-2		Bypass Lane	
Entry	Circ	tf	tc	tf	tc	tf	tc
1	1			2.6087	4.9765	2.6087	4.9765
1	2			2.5352	4.3275	2.5352	4.3275
2	2	2.6667	4.6455	2.5352	4.3275		
2	1	2.5352	4.5435	2.5352	4.5435		

HCM 2016 Calibrated Headways (secs)

Lanes		Lane-1		Lane-2		Bypass Lane	
Entry	Circ	tf	tc	tf	tc	tf	tc
1	1			3.186	5.193	3.186	5.193
1	2			3.186	4.113	3.186	4.113
2	2	3.186	4.293	3.186	4.113		
2	1	3.186	5.193	3.186	5.193		

HCM 2016 Derived Intercept and Exponential for HCM or Calibration

Leg	Leg Names	Intercept (pcs/hr)				Exponent (×1000)			
		tf	L1	L2	Bp	tf, tc	L1	L2	Bp
1	James Ranch Road	HCM	1350	1420		HCM	0.92	0.85	
2	SR 80	HCM	1350	1420		HCM	0.92	0.85	
3	James Ranch Road	HCM		1420		HCM		0.85	
4	SR 80	HCM	1350	1420		HCM	0.92	0.85	

HCM 2016 Flow Profiles

Leg	Leg Names	Entry Lane Proportions		ByPass Capacity Modifiers (veh/hr)			Peak Hour Factor
		Left Lane	Right Lane	Bypass Type	Capacity + or -	Crosswalk Factor	
1	James Ranch Road	0.47	0.53	None	0	1.000	0.85
2	SR 80	0.47	0.53	None	0	1.000	0.85
3	James Ranch Road	0.00	1.00	None	0	1.000	0.80
4	SR 80	0.47	0.53	None	0	1.000	0.85

HCM 2016 Capacity and Volume Modifiers

Leg	Leg Names	Capacity Modifiers (veh/hr)		Volume Modifiers	
		Capacity + or -	Crosswalk Factor	Trucks %	Flow Factor
1	James Ranch Road	0	1.000	30.0	1.00
2	SR 80	0	1.000	21.0	1.00
3	James Ranch Road	0	1.000	2.0	1.00
4	SR 80	0	1.000	18.0	1.00

Traffic Flow Data (veh/hr)

2028 AM Peak Peak Hour Flows

Leg	Leg Names	Turning Flows					Flow Modifiers		
		U-Turn	Exit-3	Exit-2	Exit-1	Bypass	Trucks %	Flow Factor	Peak Hour Factor
1	James Ranch Road	0	23	5	162	0	30.0	1.00	0.850
2	SR 80	0	268	312	5	0	21.0	1.00	0.850
3	James Ranch Road	0	5	5	5	0	2.0	1.00	0.800
4	SR 80	0	5	125	59	0	18.0	1.00	0.850

Operational Results

HCM 2016 - 2028 AM Peak 60 minutes

Flows and Capacity

Leg	Leg Names	Flows (veh/hr)					Capacity (veh/hr)					
		Arrival Flow			Opposing Flow		Capacity			Average VCR		
		Left	Right	Bypass	Entry	Bypass	Left	Right	Bypass	Left	Right	Bypass
1	James Ranch Road	89	101		135		897	954		0.099	0.106	
2	SR 80	275	310		34		1072	1131		0.256	0.274	
3	James Ranch Road		15		603			747			0.020	
4	SR 80	89	100		278		841	906		0.106	0.110	

Delays, Queues and Level of Service

Leg	Leg Names	Average Delay (sec)				95% Queue (veh)			Level of Service			
		Left	Right	Bypass	Leg	Left	Right	Bypass	Left	Right	Bypass	Leg
1	James Ranch Road	5.0	4.7		4.8	0.3	0.4		A	A		A
2	SR 80	5.8	5.8		5.8	1.0	1.1		A	A		A
3	James Ranch Road		5.0		5.0		0.1			A		A
4	SR 80	5.3	5.0		5.2	0.4	0.4		A	A		A

Global Results

Performance and Accidents

2028 AM Peak Global Performance

Parameter	Units	Entries	Bypasses	Total
Arrive Flows	veh/hr	979		979
Capacity	veh/hr	6707		10466
Average Delay	sec/veh	10.85		10.85
L.O.S. (Signal)	A – F	B		B
L.O.S. (Unsig)	A – F	B		B
Total Delay	veh.hrs	2.95		2.95

Scheme Summary

Control Data

Control Data and Model Parameters

Douglas IPOE	2028 PHF Flow Profile (veh)
2028 Roundabout	7.5 min Time Slice
HCM 2010 Model	Control Delays (sec)
Right Hand Drive	Nighttime conditions
PM Peak Hour	Peak 60/15 min Results
Full Geometry	Output flows: Vehicles
English Units (ft)	50% Confidence Level

Operational Data

HCM Lanes and Headways

HCM 2016 Bearings and Lanes

Leg	Leg Names	Bearing (deg)	Lanes			
			Approach Lanes	Entry Lanes	Circulating Lanes	Exit Lanes
1	James Ranch Road	0	2	2	2	2
2	SR 80	83	2	2	2	2
3	James Ranch Road	180	1	1	2	1
4	SR 80	263	2	2	2	2

HCM 2016 Default Headways (secs)

Lanes		Lane-1		Lane-2		Bypass Lane	
Entry	Circ	tf	tc	tf	tc	tf	tc
1	1			2.6087	4.9765	2.6087	4.9765
1	2			2.5352	4.3275	2.5352	4.3275
2	2	2.6667	4.6455	2.5352	4.3275		
2	1	2.5352	4.5435	2.5352	4.5435		

HCM 2016 Calibrated Headways (secs)

Lanes		Lane-1		Lane-2		Bypass Lane	
Entry	Circ	tf	tc	tf	tc	tf	tc
1	1			3.186	5.193	3.186	5.193
1	2			3.186	4.113	3.186	4.113
2	2	3.186	4.293	3.186	4.113		
2	1	3.186	5.193	3.186	5.193		

HCM 2016 Derived Intercept and Exponential for HCM or Calibration

Leg	Leg Names	Intercept (pcs/hr)				Exponent (×1000)			
		tf	L1	L2	Bp	tf, tc	L1	L2	Bp
1	James Ranch Road	HCM	1350	1420		HCM	0.92	0.85	
2	SR 80	HCM	1350	1420		HCM	0.92	0.85	
3	James Ranch Road	HCM		1420		HCM		0.85	
4	SR 80	HCM	1350	1420		HCM	0.92	0.85	

HCM 2016 Flow Profiles

Leg	Leg Names	Entry Lane Proportions		ByPass Capacity Modifiers (veh/hr)			Peak Hour Factor
		Left Lane	Right Lane	Bypass Type	Capacity + or -	Crosswalk Factor	
1	James Ranch Road	0.47	0.53	None	0	1.000	0.85
2	SR 80	0.47	0.53	None	0	1.000	0.85
3	James Ranch Road	0.00	1.00	None	0	1.000	0.80
4	SR 80	0.47	0.53	None	0	1.000	0.85

HCM 2016 Capacity and Volume Modifiers

Leg	Leg Names	Capacity Modifiers (veh/hr)		Volume Modifiers	
		Capacity + or -	Crosswalk Factor	Trucks %	Flow Factor
1	James Ranch Road	0	1.000	30.0	1.00
2	SR 80	0	1.000	21.0	1.00
3	James Ranch Road	0	1.000	2.0	1.00
4	SR 80	0	1.000	18.0	1.00

Traffic Flow Data (veh/hr)

2028 PM Peak Peak Hour Flows

Leg	Leg Names	Turning Flows					Flow Modifiers		
		U-Turn	Exit-3	Exit-2	Exit-1	Bypass	Trucks %	Flow Factor	Peak Hour Factor
1	James Ranch Road	0	56	5	348	0	30.0	1.00	0.850
2	SR 80	0	118	245	5	0	21.0	1.00	0.850
3	James Ranch Road	0	5	5	5	0	2.0	1.00	0.800
4	SR 80	0	5	301	32	0	18.0	1.00	0.850

Operational Results

HCM 2016 - 2028 PM Peak 60 minutes

Flows and Capacity

Leg	Leg Names	Flows (veh/hr)					Capacity (veh/hr)					
		Arrival Flow			Opposing Flow		Capacity			Average VCR		
		Left	Right	Bypass	Entry	Bypass	Left	Right	Bypass	Left	Right	Bypass
1	James Ranch Road	192	217		311		704	760		0.273	0.285	
2	SR 80	173	195		67		979	1036		0.177	0.188	
3	James Ranch Road		15		419			856			0.018	
4	SR 80	159	179		128		944	1004		0.168	0.178	

Delays, Queues and Level of Service

Leg	Leg Names	Average Delay (sec)				95% Queue (veh)			Level of Service			
		Left	Right	Bypass	Leg	Left	Right	Bypass	Left	Right	Bypass	Leg
1	James Ranch Road	8.4	8.1		8.2	1.1	1.2		A	A		A
2	SR 80	5.3	5.2		5.3	0.6	0.7		A	A		A
3	James Ranch Road		4.4		4.4		0.1			A		A
4	SR 80	5.4	5.3		5.3	0.6	0.7		A	A		A

Global Results

Performance and Accidents

2028 PM Peak Global Performance

Parameter	Units	Entries	Bypasses	Total
Arrive Flows	veh/hr	1130		1130
Capacity	veh/hr	6481		10003
Average Delay	sec/veh	12.64		12.64
L.O.S. (Signal)	A – F	B		B
L.O.S. (Unsig)	A – F	B		B
Total Delay	veh.hrs	3.97		3.97

Scheme Summary

Control Data

Control Data and Model Parameters

Douglas IPOE	2050 PHF Flow Profile (veh)
2050 Roundabout	7.5 min Time Slice
HCM 2010 Model	Control Delays (sec)
Right Hand Drive	Daylight conditions
AM Peak Hour	Peak 60/15 min Results
Full Geometry	Output flows: Vehicles
English Units (ft)	50% Confidence Level

Available Data

Entry Capacity Calibrated	No
Entry Capacity Modified	No
Crosswalks	No
Flows Factored	No
Approach/Exit Road Capacity Calibrated	No
Accidents	No
Accident Costs	No
Bypass Model	No
Bypass Calibration	No
Global Results	Yes

Operational Data

HCM Lanes and Headways

HCM 2016 Bearings and Lanes

Leg	Leg Names	Bearing (deg)	Lanes			
			Approach Lanes	Entry Lanes	Circulating Lanes	Exit Lanes
1	James Ranch Road	0	2	2	2	2
2	SR 80	83	2	2	2	2
3	James Ranch Road	180	1	1	2	1
4	SR 80	263	2	2	2	2

HCM 2016 Default Headways (secs)

Lanes		Lane-1		Lane-2		Bypass Lane	
Entry	Circ	tf	tc	tf	tc	tf	tc
1	1			2.6087	4.9765	2.6087	4.9765
1	2			2.5352	4.3275	2.5352	4.3275
2	2	2.6667	4.6455	2.5352	4.3275		
2	1	2.5352	4.5435	2.5352	4.5435		

HCM 2016 Calibrated Headways (secs)

Lanes		Lane-1		Lane-2		Bypass Lane	
Entry	Circ	tf	tc	tf	tc	tf	tc
1	1			3.186	5.193	3.186	5.193
1	2			3.186	4.113	3.186	4.113
2	2	3.186	4.293	3.186	4.113		
2	1	3.186	5.193	3.186	5.193		

HCM 2016 Derived Intercept and Exponential for HCM or Calibration

Leg	Leg Names	Intercept (pcs/hr)				Exponent (×1000)			
		tf	L1	L2	Bp	tf, tc	L1	L2	Bp
1	James Ranch Road	HCM	1350	1420		HCM	0.92	0.85	
2	SR 80	HCM	1350	1420		HCM	0.92	0.85	
3	James Ranch Road	HCM		1420		HCM		0.85	
4	SR 80	HCM	1350	1420		HCM	0.92	0.85	

HCM 2016 Flow Profiles

Leg	Leg Names	Entry Lane Proportions		ByPass Capacity Modifiers (veh/hr)			Peak Hour Factor
		Left Lane	Right Lane	Bypass Type	Capacity + or -	Crosswalk Factor	
1	James Ranch Road	0.47	0.53	None	0	1.000	0.85
2	SR 80	0.47	0.53	None	0	1.000	0.90
3	James Ranch Road	0.00	1.00	None	0	1.000	0.80
4	SR 80	0.47	0.53	None	0	1.000	0.85

HCM 2016 Capacity and Volume Modifiers

Leg	Leg Names	Capacity Modifiers (veh/hr)		Volume Modifiers	
		Capacity + or -	Crosswalk Factor	Trucks %	Flow Factor
1	James Ranch Road	0	1.000	24.0	1.00
2	SR 80	0	1.000	20.0	1.00
3	James Ranch Road	0	1.000	2.0	1.00
4	SR 80	0	1.000	17.0	1.00

Traffic Flow Data (veh/hr)

2050 AM Peak Peak Hour Flows

Leg	Leg Names	Turning Flows					Flow Modifiers		
		U-Turn	Exit-3	Exit-2	Exit-1	Bypass	Trucks %	Flow Factor	Peak Hour Factor
1	James Ranch Road	0	76	10	471	0	24.0	1.00	0.850
2	SR 80	0	855	479	10	0	20.0	1.00	0.900
3	James Ranch Road	0	10	10	10	0	2.0	1.00	0.800
4	SR 80	0	10	193	166	0	17.0	1.00	0.850

Operational Results

HCM 2016 - 2050 AM Peak 60 minutes

Flows and Capacity

Leg	Leg Names	Flows (veh/hr)					Capacity (veh/hr)					
		Arrival Flow			Opposing Flow		Capacity			Average VCR		
		Left	Right	Bypass	Entry	Bypass	Left	Right	Bypass	Left	Right	Bypass
1	James Ranch Road	262	295		213		867	928		0.302	0.318	
2	SR 80	632	712		96		1009	1070		0.626	0.665	
3	James Ranch Road		30		1410			330			0.091	
4	SR 80	173	196		875		441	499		0.392	0.393	

Delays, Queues and Level of Service

Leg	Leg Names	Average Delay (sec)				95% Queue (veh)			Level of Service			
		Left	Right	Bypass	Leg	Left	Right	Bypass	Left	Right	Bypass	Leg
1	James Ranch Road	7.5	7.3		7.4	1.3	1.4		A	A		A
2	SR 80	12.6	13.3		13.0	4.9	5.8		B	B		B
3	James Ranch Road		12.5		12.5		0.3			B		B
4	SR 80	15.4	13.8		14.6	1.9	1.9		C	B		B

Global Results

Performance and Accidents

2050 AM Peak Global Performance

Parameter	Units	Entries	Bypasses	Total
Arrive Flows	veh/hr	2300		2300
Capacity	veh/hr	5190		8077
Average Delay	sec/veh	23.57		23.57
L.O.S. (Signal)	A – F	C		C
L.O.S. (Unsig)	A – F	C		C
Total Delay	veh.hrs	15.06		15.06

Scheme Summary

Control Data

Control Data and Model Parameters

Douglas IPOE	2050 PHF Flow Profile (veh)
2050 Roundabout	7.5 min Time Slice
HCM 2010 Model	Control Delays (sec)
Right Hand Drive	Nighttime conditions
PM Peak Hour	Peak 60/15 min Results
Full Geometry	Output flows: Vehicles
English Units (ft)	50% Confidence Level

Available Data

Entry Capacity Calibrated	No
Entry Capacity Modified	No
Crosswalks	No
Flows Factored	No
Approach/Exit Road Capacity Calibrated	No
Accidents	No
Accident Costs	No
Bypass Model	No
Bypass Calibration	No
Global Results	Yes

Operational Data

HCM Lanes and Headways

HCM 2016 Bearings and Lanes

Leg	Leg Names	Bearing (deg)	Lanes			
			Approach Lanes	Entry Lanes	Circulating Lanes	Exit Lanes
1	James Ranch Road	0	2	2	2	2
2	SR 80	83	2	2	2	2
3	James Ranch Road	180	1	1	2	1
4	SR 80	263	2	2	2	2

HCM 2016 Default Headways (secs)

Lanes		Lane-1		Lane-2		Bypass Lane	
Entry	Circ	tf	tc	tf	tc	tf	tc
1	1			2.6087	4.9765	2.6087	4.9765
1	2			2.5352	4.3275	2.5352	4.3275
2	2	2.6667	4.6455	2.5352	4.3275		
2	1	2.5352	4.5435	2.5352	4.5435		

HCM 2016 Calibrated Headways (secs)

Lanes		Lane-1		Lane-2		Bypass Lane	
Entry	Circ	tf	tc	tf	tc	tf	tc
1	1			3.186	5.193	3.186	5.193
1	2			3.186	4.113	3.186	4.113
2	2	3.186	4.293	3.186	4.113		
2	1	3.186	5.193	3.186	5.193		

HCM 2016 Derived Intercept and Exponential for HCM or Calibration

Leg	Leg Names	Intercept (pcs/hr)				Exponent (×1000)			
		tf	L1	L2	Bp	tf, tc	L1	L2	Bp
1	James Ranch Road	HCM	1350	1420		HCM	0.92	0.85	
2	SR 80	HCM	1350	1420		HCM	0.92	0.85	
3	James Ranch Road	HCM		1420		HCM		0.85	
4	SR 80	HCM	1350	1420		HCM	0.92	0.85	

HCM 2016 Flow Profiles

Leg	Leg Names	Entry Lane Proportions		ByPass Capacity Modifiers (veh/hr)			Peak Hour Factor
		Left Lane	Right Lane	Bypass Type	Capacity + or -	Crosswalk Factor	
1	James Ranch Road	0.47	0.53	None	0	1.000	0.90
2	SR 80	0.47	0.53	None	0	1.000	0.90
3	James Ranch Road	0.00	1.00	None	0	1.000	0.80
4	SR 80	0.47	0.53	None	0	1.000	0.85

HCM 2016 Capacity and Volume Modifiers

Leg	Leg Names	Capacity Modifiers (veh/hr)		Volume Modifiers	
		Capacity + or -	Crosswalk Factor	Trucks %	Flow Factor
1	James Ranch Road	0	1.000	24.0	1.00
2	SR 80	0	1.000	20.0	1.00
3	James Ranch Road	0	1.000	2.0	1.00
4	SR 80	0	1.000	17.0	1.00

Traffic Flow Data (veh/hr)

2050 PM Peak Peak Hour Flows

Leg	Leg Names	Turning Flows					Flow Modifiers		
		U-Turn	Exit-3	Exit-2	Exit-1	Bypass	Trucks %	Flow Factor	Peak Hour Factor
1	James Ranch Road	0	185	10	1091	0	24.0	1.00	0.900
2	SR 80	0	355	374	10	0	20.0	1.00	0.900
3	James Ranch Road	0	10	10	10	0	2.0	1.00	0.800
4	SR 80	0	10	465	78	0	17.0	1.00	0.850

Operational Results

HCM 2016 - 2050 PM Peak 60 minutes

Flows and Capacity

Leg	Leg Names	Flows (veh/hr)					Capacity (veh/hr)					
		Arrival Flow			Opposing Flow		Capacity			Average VCR		
		Left	Right	Bypass	Entry	Bypass	Left	Right	Bypass	Left	Right	Bypass
1	James Ranch Road	604	682		485		614	672		0.983	1.014	
2	SR 80	347	392		205		847	907		0.410	0.432	
3	James Ranch Road		30		914			517			0.058	
4	SR 80	260	293		375		727	789		0.358	0.371	

Delays, Queues and Level of Service

Leg	Leg Names	Average Delay (sec)				95% Queue (veh)			Level of Service			
		Left	Right	Bypass	Leg	Left	Right	Bypass	Left	Right	Bypass	Leg
1	James Ranch Road	98.4	122.8		111.4	27.6	34.5		F	F		F
2	SR 80	9.2	9.1		9.2	2.1	2.3		A	A		A
3	James Ranch Road		7.7		7.7		0.2			A		A
4	SR 80	9.5	9.1		9.3	1.7	1.8		A	A		A

Global Results

Performance and Accidents

2050 PM Peak Global Performance

Parameter	Units	Entries	Bypasses	Total
Arrive Flows	veh/hr	2608		2608
Capacity	veh/hr	5168		7909
Average Delay	sec/veh	118.35		118.35
L.O.S. (Signal)	A – F	F		F
L.O.S. (Unsig)	A – F	F		F
Total Delay	veh.hrs	85.74		85.74

Timing Report, Sorted By Phase

2: SR 80 & US 191

Existing AM



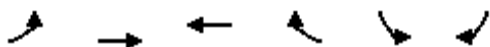
Phase Number	2	4	6
Movement	EBTL	SBL	WBT
Lead/Lag			
Lead-Lag Optimize			
Recall Mode	Min	None	Min
Maximum Split (s)	66.1	31.5	66.1
Maximum Split (%)	67.7%	32.3%	67.7%
Minimum Split (s)	24.1	24.5	24.1
Yellow Time (s)	5	4.3	5
All-Red Time (s)	1.1	2.2	1.1
Minimum Initial (s)	10	6	6
Vehicle Extension (s)	6	1.5	6
Minimum Gap (s)	3	3	3
Time Before Reduce (s)	0	0	0
Time To Reduce (s)	0	0	0
Walk Time (s)			
Flash Dont Walk (s)			
Dual Entry	Yes	Yes	Yes
Inhibit Max	Yes	Yes	Yes
Start Time (s)	0	66.1	0
End Time (s)	66.1	0	66.1
Yield/Force Off (s)	60	91.1	60
Yield/Force Off 170(s)	60	91.1	60
Local Start Time (s)	0	66.1	0
Local Yield (s)	60	91.1	60
Local Yield 170(s)	60	91.1	60
Intersection Summary			
Cycle Length	97.6		
Control Type	Actuated-Uncoordinated		
Natural Cycle	50		

Splits and Phases: 2: SR 80 & US 191



HCM 6th Signalized Intersection Summary 2: SR 80 & US 191

Existing AM



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	32	79	205	136	75	45
Future Volume (veh/h)	32	79	205	136	75	45
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No	No		No	
Adj Sat Flow, veh/h/ln	1737	1737	1737	1737	1737	1737
Adj Flow Rate, veh/h	43	105	223	148	88	56
Peak Hour Factor	0.75	0.75	0.92	0.92	0.85	0.80
Percent Heavy Veh, %	11	11	11	11	11	11
Cap, veh/h	583	1244	1244	555	245	218
Arrive On Green	0.38	0.38	0.38	0.38	0.15	0.15
Sat Flow, veh/h	939	3387	3387	1472	1654	1472
Grp Volume(v), veh/h	43	105	223	148	88	56
Grp Sat Flow(s),veh/h/ln	939	1650	1650	1472	1654	1472
Q Serve(g_s), s	0.9	0.5	1.2	1.8	1.3	0.9
Cycle Q Clear(g_c), s	2.0	0.5	1.2	1.8	1.3	0.9
Prop In Lane	1.00			1.00	1.00	1.00
Lane Grp Cap(c), veh/h	583	1244	1244	555	245	218
V/C Ratio(X)	0.07	0.08	0.18	0.27	0.36	0.26
Avail Cap(c_a), veh/h	2354	7466	7466	3330	1559	1387
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	6.2	5.3	5.5	5.7	10.2	10.0
Incr Delay (d2), s/veh	0.2	0.1	0.2	0.9	0.3	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.1	0.1	0.2	0.4	0.5	0.3
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	6.4	5.4	5.8	6.6	10.5	10.2
LnGrp LOS	A	A	A	A	B	B
Approach Vol, veh/h		148	371		144	
Approach Delay, s/veh		5.7	6.1		10.4	
Approach LOS		A	A		B	
Timer - Assigned Phs		2		4		6
Phs Duration (G+Y+Rc), s		16.1		10.4		16.1
Change Period (Y+Rc), s		* 6.1		* 6.5		* 6.1
Max Green Setting (Gmax), s		* 60		* 25		* 60
Max Q Clear Time (g_c+I1), s		4.0		3.3		3.8
Green Ext Time (p_c), s		2.2		0.1		5.4
Intersection Summary						
HCM 6th Ctrl Delay			7.0			
HCM 6th LOS			A			
Notes						
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.						

Timing Report, Sorted By Phase

2: SR 80 & US 191

Existing PM



Phase Number	2	4	6
Movement	EBTL	SBL	WBT
Lead/Lag			
Lead-Lag Optimize			
Recall Mode	Min	None	Min
Maximum Split (s)	66.1	31.5	66.1
Maximum Split (%)	67.7%	32.3%	67.7%
Minimum Split (s)	24.1	24.5	24.1
Yellow Time (s)	5	4.3	5
All-Red Time (s)	1.1	2.2	1.1
Minimum Initial (s)	10	6	6
Vehicle Extension (s)	6	1.5	6
Minimum Gap (s)	3	3	3
Time Before Reduce (s)	0	0	0
Time To Reduce (s)	0	0	0
Walk Time (s)			
Flash Dont Walk (s)			
Dual Entry	Yes	Yes	Yes
Inhibit Max	Yes	Yes	Yes
Start Time (s)	0	66.1	0
End Time (s)	66.1	0	66.1
Yield/Force Off (s)	60	91.1	60
Yield/Force Off 170(s)	60	91.1	60
Local Start Time (s)	0	66.1	0
Local Yield (s)	60	91.1	60
Local Yield 170(s)	60	91.1	60
Intersection Summary			
Cycle Length	97.6		
Control Type	Actuated-Uncoordinated		
Natural Cycle	50		

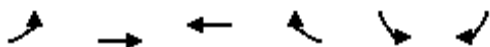
Splits and Phases: 2: SR 80 & US 191



HCM 6th Signalized Intersection Summary

2: SR 80 & US 191

Existing PM



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	76	191	158	105	85	51
Future Volume (veh/h)	76	191	158	105	85	51
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No	No		No	
Adj Sat Flow, veh/h/ln	1737	1737	1737	1737	1737	1737
Adj Flow Rate, veh/h	101	255	172	114	100	64
Peak Hour Factor	0.75	0.75	0.92	0.92	0.85	0.80
Percent Heavy Veh, %	11	11	11	11	11	11
Cap, veh/h	618	1269	1269	566	258	230
Arrive On Green	0.38	0.38	0.38	0.38	0.16	0.16
Sat Flow, veh/h	1015	3387	3387	1472	1654	1472
Grp Volume(v), veh/h	101	255	172	114	100	64
Grp Sat Flow(s),veh/h/ln	1015	1650	1650	1472	1654	1472
Q Serve(g_s), s	2.0	1.4	0.9	1.4	1.5	1.1
Cycle Q Clear(g_c), s	2.9	1.4	0.9	1.4	1.5	1.1
Prop In Lane	1.00			1.00	1.00	1.00
Lane Grp Cap(c), veh/h	618	1269	1269	566	258	230
V/C Ratio(X)	0.16	0.20	0.14	0.20	0.39	0.28
Avail Cap(c_a), veh/h	2450	7222	7222	3221	1508	1342
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	6.4	5.6	5.5	5.6	10.4	10.2
Incr Delay (d2), s/veh	0.4	0.3	0.2	0.6	0.4	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.3	0.3	0.2	0.3	0.6	0.4
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	6.9	5.9	5.7	6.3	10.7	10.4
LnGrp LOS	A	A	A	A	B	B
Approach Vol, veh/h		356	286		164	
Approach Delay, s/veh		6.2	5.9		10.6	
Approach LOS		A	A		B	
Timer - Assigned Phs		2		4		6
Phs Duration (G+Y+Rc), s		16.6		10.8		16.6
Change Period (Y+Rc), s		* 6.1		* 6.5		* 6.1
Max Green Setting (Gmax), s		* 60		* 25		* 60
Max Q Clear Time (g_c+I1), s		4.9		3.5		3.4
Green Ext Time (p_c), s		5.6		0.1		4.1
Intersection Summary						
HCM 6th Ctrl Delay			7.0			
HCM 6th LOS			A			
Notes						

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Timing Report, Sorted By Phase

2: SR 80 & US 191

2028 No-Build AM



Phase Number	2	4	6
Movement	EBTL	SBL	WBT
Lead/Lag			
Lead-Lag Optimize			
Recall Mode	Min	None	Min
Maximum Split (s)	66.1	31.5	66.1
Maximum Split (%)	67.7%	32.3%	67.7%
Minimum Split (s)	24.1	24.5	24.1
Yellow Time (s)	5	4.3	5
All-Red Time (s)	1.1	2.2	1.1
Minimum Initial (s)	10	6	6
Vehicle Extension (s)	6	1.5	6
Minimum Gap (s)	3	3	3
Time Before Reduce (s)	0	0	0
Time To Reduce (s)	0	0	0
Walk Time (s)			
Flash Dont Walk (s)			
Dual Entry	Yes	Yes	Yes
Inhibit Max	Yes	Yes	Yes
Start Time (s)	0	66.1	0
End Time (s)	66.1	0	66.1
Yield/Force Off (s)	60	91.1	60
Yield/Force Off 170(s)	60	91.1	60
Local Start Time (s)	0	66.1	0
Local Yield (s)	60	91.1	60
Local Yield 170(s)	60	91.1	60
Intersection Summary			
Cycle Length	97.6		
Control Type	Actuated-Uncoordinated		
Natural Cycle	50		

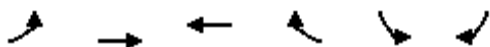
Splits and Phases: 2: SR 80 & US 191



HCM 6th Signalized Intersection Summary

2: SR 80 & US 191

2028 No-Build AM



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	36	89	230	154	84	50
Future Volume (veh/h)	36	89	230	154	84	50
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No	No		No	
Adj Sat Flow, veh/h/ln	1737	1737	1737	1737	1737	1737
Adj Flow Rate, veh/h	45	111	271	181	99	62
Peak Hour Factor	0.80	0.80	0.85	0.85	0.85	0.80
Percent Heavy Veh, %	11	11	11	11	11	11
Cap, veh/h	556	1311	1311	585	253	225
Arrive On Green	0.40	0.40	0.40	0.40	0.15	0.15
Sat Flow, veh/h	872	3387	3387	1472	1654	1472
Grp Volume(v), veh/h	45	111	271	181	99	62
Grp Sat Flow(s),veh/h/ln	872	1650	1650	1472	1654	1472
Q Serve(g_s), s	1.0	0.6	1.5	2.4	1.5	1.0
Cycle Q Clear(g_c), s	2.5	0.6	1.5	2.4	1.5	1.0
Prop In Lane	1.00			1.00	1.00	1.00
Lane Grp Cap(c), veh/h	556	1311	1311	585	253	225
V/C Ratio(X)	0.08	0.08	0.21	0.31	0.39	0.28
Avail Cap(c_a), veh/h	2077	7069	7069	3153	1476	1314
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	6.4	5.3	5.5	5.8	10.7	10.5
Incr Delay (d2), s/veh	0.2	0.1	0.3	1.1	0.4	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.2	0.1	0.3	0.6	0.6	0.4
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	6.6	5.4	5.8	6.9	11.1	10.7
LnGrp LOS	A	A	A	A	B	B
Approach Vol, veh/h		156	452		161	
Approach Delay, s/veh		5.7	6.3		10.9	
Approach LOS		A	A		B	
Timer - Assigned Phs		2		4		6
Phs Duration (G+Y+Rc), s		17.2		10.8		17.2
Change Period (Y+Rc), s		* 6.1		* 6.5		* 6.1
Max Green Setting (Gmax), s		* 60		* 25		* 60
Max Q Clear Time (g_c+I1), s		4.5		3.5		4.4
Green Ext Time (p_c), s		2.4		0.1		6.8
Intersection Summary						
HCM 6th Ctrl Delay			7.1			
HCM 6th LOS			A			
Notes						

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Timing Report, Sorted By Phase

2: SR 80 & US 191

2028 No-Build PM



Phase Number	2	4	6
Movement	EBTL	SBL	WBT
Lead/Lag			
Lead-Lag Optimize			
Recall Mode	Min	None	Min
Maximum Split (s)	66.1	31.5	66.1
Maximum Split (%)	67.7%	32.3%	67.7%
Minimum Split (s)	24.1	24.5	24.1
Yellow Time (s)	5	4.3	5
All-Red Time (s)	1.1	2.2	1.1
Minimum Initial (s)	10	6	6
Vehicle Extension (s)	6	1.5	6
Minimum Gap (s)	3	3	3
Time Before Reduce (s)	0	0	0
Time To Reduce (s)	0	0	0
Walk Time (s)			
Flash Dont Walk (s)			
Dual Entry	Yes	Yes	Yes
Inhibit Max	Yes	Yes	Yes
Start Time (s)	0	66.1	0
End Time (s)	66.1	0	66.1
Yield/Force Off (s)	60	91.1	60
Yield/Force Off 170(s)	60	91.1	60
Local Start Time (s)	0	66.1	0
Local Yield (s)	60	91.1	60
Local Yield 170(s)	60	91.1	60
Intersection Summary			
Cycle Length	97.6		
Control Type	Actuated-Uncoordinated		
Natural Cycle	50		

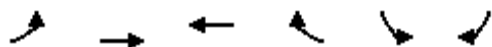
Splits and Phases: 2: SR 80 & US 191



HCM 6th Signalized Intersection Summary

2: SR 80 & US 191

2028 No-Build PM



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	86	215	178	118	95	57
Future Volume (veh/h)	86	215	178	118	95	57
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No	No		No	
Adj Sat Flow, veh/h/ln	1737	1737	1737	1737	1737	1737
Adj Flow Rate, veh/h	101	253	209	139	112	71
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.80
Percent Heavy Veh, %	11	11	11	11	11	11
Cap, veh/h	591	1290	1290	575	268	239
Arrive On Green	0.39	0.39	0.39	0.39	0.16	0.16
Sat Flow, veh/h	959	3387	3387	1472	1654	1472
Grp Volume(v), veh/h	101	253	209	139	112	71
Grp Sat Flow(s),veh/h/ln	959	1650	1650	1472	1654	1472
Q Serve(g_s), s	2.2	1.4	1.2	1.8	1.7	1.2
Cycle Q Clear(g_c), s	3.3	1.4	1.2	1.8	1.7	1.2
Prop In Lane	1.00			1.00	1.00	1.00
Lane Grp Cap(c), veh/h	591	1290	1290	575	268	239
V/C Ratio(X)	0.17	0.20	0.16	0.24	0.42	0.30
Avail Cap(c_a), veh/h	2259	7028	7028	3134	1468	1306
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(l)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	6.7	5.7	5.6	5.8	10.6	10.4
Incr Delay (d2), s/veh	0.5	0.3	0.2	0.8	0.4	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.4	0.3	0.2	0.4	0.7	0.4
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	7.2	5.9	5.8	6.6	11.0	10.6
LnGrp LOS	A	A	A	A	B	B
Approach Vol, veh/h		354	348		183	
Approach Delay, s/veh		6.3	6.1		10.9	
Approach LOS		A	A		B	
Timer - Assigned Phs		2		4		6
Phs Duration (G+Y+Rc), s		17.1		11.1		17.1
Change Period (Y+Rc), s		* 6.1		* 6.5		* 6.1
Max Green Setting (Gmax), s		* 60		* 25		* 60
Max Q Clear Time (g_c+l1), s		5.3		3.7		3.8
Green Ext Time (p_c), s		5.7		0.1		5.0
Intersection Summary						
HCM 6th Ctrl Delay			7.2			
HCM 6th LOS			A			
Notes						

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Timing Report, Sorted By Phase

2: SR 80 & US 191

2050 No-Build AM



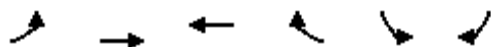
Phase Number	2	4	6
Movement	EBTL	SBL	WBT
Lead/Lag			
Lead-Lag Optimize			
Recall Mode	Min	None	Min
Maximum Split (s)	66.1	31.5	66.1
Maximum Split (%)	67.7%	32.3%	67.7%
Minimum Split (s)	24.1	24.5	24.1
Yellow Time (s)	5	4.3	5
All-Red Time (s)	1.1	2.2	1.1
Minimum Initial (s)	10	6	6
Vehicle Extension (s)	6	1.5	6
Minimum Gap (s)	3	3	3
Time Before Reduce (s)	0	0	0
Time To Reduce (s)	0	0	0
Walk Time (s)			
Flash Dont Walk (s)			
Dual Entry	Yes	Yes	Yes
Inhibit Max	Yes	Yes	Yes
Start Time (s)	0	66.1	0
End Time (s)	66.1	0	66.1
Yield/Force Off (s)	60	91.1	60
Yield/Force Off 170(s)	60	91.1	60
Local Start Time (s)	0	66.1	0
Local Yield (s)	60	91.1	60
Local Yield 170(s)	60	91.1	60
Intersection Summary			
Cycle Length	97.6		
Control Type	Actuated-Uncoordinated		
Natural Cycle	50		

Splits and Phases: 2: SR 80 & US 191



HCM 6th Signalized Intersection Summary 2: SR 80 & US 191

2050 No-Build AM



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	55	138	356	237	130	78
Future Volume (veh/h)	55	138	356	237	130	78
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No	No		No	
Adj Sat Flow, veh/h/ln	1737	1737	1737	1737	1737	1737
Adj Flow Rate, veh/h	69	172	419	279	153	92
Peak Hour Factor	0.80	0.80	0.85	0.85	0.85	0.85
Percent Heavy Veh, %	11	11	11	11	11	11
Cap, veh/h	494	1632	1632	728	253	225
Arrive On Green	0.49	0.49	0.49	0.49	0.15	0.15
Sat Flow, veh/h	694	3387	3387	1472	1654	1472
Grp Volume(v), veh/h	69	172	419	279	153	92
Grp Sat Flow(s),veh/h/ln	694	1650	1650	1472	1654	1472
Q Serve(g_s), s	2.3	1.0	2.6	4.2	3.1	2.0
Cycle Q Clear(g_c), s	4.9	1.0	2.6	4.2	3.1	2.0
Prop In Lane	1.00			1.00	1.00	1.00
Lane Grp Cap(c), veh/h	494	1632	1632	728	253	225
V/C Ratio(X)	0.14	0.11	0.26	0.38	0.60	0.41
Avail Cap(c_a), veh/h	1315	5536	5536	2469	1156	1029
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	6.7	4.8	5.2	5.6	14.1	13.7
Incr Delay (d2), s/veh	0.5	0.1	0.3	1.2	0.9	0.4
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.4	0.2	0.6	1.1	1.6	0.9
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	7.1	4.9	5.5	6.8	15.0	14.1
LnGrp LOS	A	A	A	A	B	B
Approach Vol, veh/h		241	698		245	
Approach Delay, s/veh		5.5	6.1		14.7	
Approach LOS		A	A		B	
Timer - Assigned Phs		2		4		6
Phs Duration (G+Y+Rc), s		23.8		12.0		23.8
Change Period (Y+Rc), s		* 6.1		* 6.5		* 6.1
Max Green Setting (Gmax), s		* 60		* 25		* 60
Max Q Clear Time (g_c+I1), s		6.9		5.1		6.2
Green Ext Time (p_c), s		4.1		0.2		11.5
Intersection Summary						
HCM 6th Ctrl Delay			7.7			
HCM 6th LOS			A			
Notes						

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Timing Report, Sorted By Phase

2: SR 80 & US 191

2050 No-Build PM



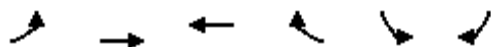
Phase Number	2	4	6
Movement	EBTL	SBL	WBT
Lead/Lag			
Lead-Lag Optimize			
Recall Mode	Min	None	Min
Maximum Split (s)	66.1	31.5	66.1
Maximum Split (%)	67.7%	32.3%	67.7%
Minimum Split (s)	24.1	24.5	24.1
Yellow Time (s)	5	4.3	5
All-Red Time (s)	1.1	2.2	1.1
Minimum Initial (s)	10	6	6
Vehicle Extension (s)	6	1.5	6
Minimum Gap (s)	3	3	3
Time Before Reduce (s)	0	0	0
Time To Reduce (s)	0	0	0
Walk Time (s)			
Flash Dont Walk (s)			
Dual Entry	Yes	Yes	Yes
Inhibit Max	Yes	Yes	Yes
Start Time (s)	0	66.1	0
End Time (s)	66.1	0	66.1
Yield/Force Off (s)	60	91.1	60
Yield/Force Off 170(s)	60	91.1	60
Local Start Time (s)	0	66.1	0
Local Yield (s)	60	91.1	60
Local Yield 170(s)	60	91.1	60
Intersection Summary			
Cycle Length	97.6		
Control Type	Actuated-Uncoordinated		
Natural Cycle	50		

Splits and Phases: 2: SR 80 & US 191



HCM 6th Signalized Intersection Summary 2: SR 80 & US 191

2050 No-Build PM



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	133	332	275	183	147	88
Future Volume (veh/h)	133	332	275	183	147	88
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No	No		No	
Adj Sat Flow, veh/h/ln	1737	1737	1737	1737	1737	1737
Adj Flow Rate, veh/h	156	391	324	215	173	104
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Percent Heavy Veh, %	11	11	11	11	11	11
Cap, veh/h	559	1671	1671	745	253	225
Arrive On Green	0.51	0.51	0.51	0.51	0.15	0.15
Sat Flow, veh/h	805	3387	3387	1472	1654	1472
Grp Volume(v), veh/h	156	391	324	215	173	104
Grp Sat Flow(s),veh/h/ln	805	1650	1650	1472	1654	1472
Q Serve(g_s), s	4.9	2.5	2.0	3.1	3.7	2.4
Cycle Q Clear(g_c), s	6.9	2.5	2.0	3.1	3.7	2.4
Prop In Lane	1.00			1.00	1.00	1.00
Lane Grp Cap(c), veh/h	559	1671	1671	745	253	225
V/C Ratio(X)	0.28	0.23	0.19	0.29	0.68	0.46
Avail Cap(c_a), veh/h	1457	5355	5355	2389	1118	995
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(l)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	6.9	5.1	5.0	5.3	14.8	14.3
Incr Delay (d2), s/veh	1.0	0.3	0.2	0.8	1.2	0.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.8	0.5	0.4	0.8	1.9	1.1
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	7.8	5.4	5.2	6.0	16.0	14.8
LnGrp LOS	A	A	A	A	B	B
Approach Vol, veh/h		547	539		277	
Approach Delay, s/veh		6.1	5.5		15.6	
Approach LOS		A	A		B	
Timer - Assigned Phs		2		4		6
Phs Duration (G+Y+Rc), s		24.8		12.2		24.8
Change Period (Y+Rc), s		* 6.1		* 6.5		* 6.1
Max Green Setting (Gmax), s		* 60		* 25		* 60
Max Q Clear Time (g_c+l1), s		8.9		5.7		5.1
Green Ext Time (p_c), s		9.9		0.2		8.3
Intersection Summary						
HCM 6th Ctrl Delay			7.8			
HCM 6th LOS			A			
Notes						
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.						

Timing Report, Sorted By Phase

2: US 191 & SR 80

Opening Year AM

























Phase Number	2	4	6	8
Movement	EBTL	SBTL	WBTL	NBTL
Lead/Lag				
Lead-Lag Optimize				
Recall Mode	Min	None	Min	None
Maximum Split (s)	66.1	31.5	66.1	31.5
Maximum Split (%)	67.7%	32.3%	67.7%	32.3%
Minimum Split (s)	24.1	24.5	24.1	24.5
Yellow Time (s)	5	4.3	5	4.3
All-Red Time (s)	1.1	2.2	1.1	2.2
Minimum Initial (s)	10	6	10	6
Vehicle Extension (s)	6	1.5	6	1.5
Minimum Gap (s)	3	3	3	3
Time Before Reduce (s)	0	0	0	0
Time To Reduce (s)	0	0	0	0
Walk Time (s)				
Flash Dont Walk (s)				
Dual Entry	Yes	Yes	Yes	Yes
Inhibit Max	Yes	Yes	Yes	Yes
Start Time (s)	0	66.1	0	66.1
End Time (s)	66.1	0	66.1	0
Yield/Force Off (s)	60	91.1	60	91.1
Yield/Force Off 170(s)	60	91.1	60	91.1
Local Start Time (s)	0	66.1	0	66.1
Local Yield (s)	60	91.1	60	91.1
Local Yield 170(s)	60	91.1	60	91.1
Intersection Summary				
Cycle Length	97.6			
Control Type	Actuated-Uncoordinated			
Natural Cycle	50			

Splits and Phases: 2: US 191 & SR 80



HCM 6th Signalized Intersection Summary 2: US 191 & SR 80

Opening Year AM

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	88	134	65	6	393	118	49	36	4	55	47	103
Future Volume (veh/h)	88	134	65	6	393	118	49	36	4	55	47	103
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No			No			No			No	
Adj Sat Flow, veh/h/ln	1189	1663	1870	1870	1663	1737	1870	1870	1870	1500	1870	1485
Adj Flow Rate, veh/h	104	168	81	8	462	139	61	45	5	69	55	121
Peak Hour Factor	0.85	0.80	0.80	0.80	0.85	0.85	0.80	0.80	0.80	0.80	0.85	0.85
Percent Heavy Veh, %	48	16	2	2	16	11	2	2	2	27	2	28
Cap, veh/h	389	1492	748	691	1492	695	311	322	36	377	101	223
Arrive On Green	0.47	0.47	0.47	0.47	0.47	0.47	0.19	0.19	0.19	0.19	0.19	0.19
Sat Flow, veh/h	520	3159	1585	1131	3159	1472	1209	1654	184	1087	520	1144
Grp Volume(v), veh/h	104	168	81	8	462	139	61	0	50	69	0	176
Grp Sat Flow(s),veh/h/ln	520	1580	1585	1131	1580	1472	1209	0	1837	1087	0	1664
Q Serve(g_s), s	5.8	1.1	1.1	0.2	3.4	2.1	1.8	0.0	0.9	2.1	0.0	3.6
Cycle Q Clear(g_c), s	9.3	1.1	1.1	1.3	3.4	2.1	5.4	0.0	0.9	3.0	0.0	3.6
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.10	1.00		0.69
Lane Grp Cap(c), veh/h	389	1492	748	691	1492	695	311	0	358	377	0	324
V/C Ratio(X)	0.27	0.11	0.11	0.01	0.31	0.20	0.20	0.00	0.14	0.18	0.00	0.54
Avail Cap(c_a), veh/h	968	5011	2514	1950	5011	2335	874	0	1214	884	0	1100
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	9.0	5.6	5.6	5.9	6.2	5.8	16.2	0.0	12.6	13.8	0.0	13.7
Incr Delay (d2), s/veh	1.3	0.1	0.2	0.0	0.4	0.5	0.1	0.0	0.1	0.1	0.0	0.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.8	0.3	0.3	0.0	0.9	0.6	0.7	0.0	0.5	0.7	0.0	1.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	10.4	5.7	5.8	5.9	6.6	6.3	16.3	0.0	12.7	13.9	0.0	14.2
LnGrp LOS	B	A	A	A	A	A	B	A	B	B	A	B
Approach Vol, veh/h		353			609			111			245	
Approach Delay, s/veh		7.1			6.5			14.6			14.2	
Approach LOS		A			A			B			B	
Timer - Assigned Phs		2		4		6		8				
Phs Duration (G+Y+Rc), s		24.0		13.9		24.0		13.9				
Change Period (Y+Rc), s		* 6.1		* 6.5		* 6.1		* 6.5				
Max Green Setting (Gmax), s		* 60		* 25		* 60		* 25				
Max Q Clear Time (g_c+I1), s		11.3		5.6		5.4		7.4				
Green Ext Time (p_c), s		6.6		0.5		10.2		0.1				
Intersection Summary												
HCM 6th Ctrl Delay				8.8								
HCM 6th LOS				A								
Notes												
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.												

Timing Report, Sorted By Phase

2: US 191 & SR 80

Opening Year PM

























Phase Number	2	4	6	8
Movement	EBTL	SBTL	WBTL	NBTL
Lead/Lag				
Lead-Lag Optimize				
Recall Mode	Min	None	Min	None
Maximum Split (s)	66.1	31.5	66.1	31.5
Maximum Split (%)	67.7%	32.3%	67.7%	32.3%
Minimum Split (s)	24.1	24.5	24.1	24.5
Yellow Time (s)	5	4.3	5	4.3
All-Red Time (s)	1.1	2.2	1.1	2.2
Minimum Initial (s)	10	6	10	6
Vehicle Extension (s)	6	1.5	6	1.5
Minimum Gap (s)	3	3	3	3
Time Before Reduce (s)	0	0	0	0
Time To Reduce (s)	0	0	0	0
Walk Time (s)				
Flash Dont Walk (s)				
Dual Entry	Yes	Yes	Yes	Yes
Inhibit Max	Yes	Yes	Yes	Yes
Start Time (s)	0	66.1	0	66.1
End Time (s)	66.1	0	66.1	0
Yield/Force Off (s)	60	91.1	60	91.1
Yield/Force Off 170(s)	60	91.1	60	91.1
Local Start Time (s)	0	66.1	0	66.1
Local Yield (s)	60	91.1	60	91.1
Local Yield 170(s)	60	91.1	60	91.1
Intersection Summary				
Cycle Length	97.6			
Control Type	Actuated-Uncoordinated			
Natural Cycle	55			

Splits and Phases: 2: US 191 & SR 80



HCM 6th Signalized Intersection Summary 2: US 191 & SR 80

Opening Year PM

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	166	370	113	10	212	82	51	37	5	32	82	87
Future Volume (veh/h)	166	370	113	10	212	82	51	37	5	32	82	87
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1426	1663	1870	1870	1693	1737	1870	1870	1870	1530	1870	1485
Adj Flow Rate, veh/h	195	435	133	12	249	96	64	46	6	40	96	102
Peak Hour Factor	0.85	0.85	0.85	0.80	0.85	0.85	0.80	0.80	0.80	0.80	0.85	0.85
Percent Heavy Veh, %	32	16	2	2	14	11	2	2	2	25	2	28
Cap, veh/h	543	1694	850	592	1724	789	264	324	42	346	166	176
Arrive On Green	0.54	0.54	0.54	0.54	0.54	0.54	0.20	0.20	0.20	0.20	0.20	0.20
Sat Flow, veh/h	790	3159	1585	954	3216	1472	1185	1621	211	1106	830	882
Grp Volume(v), veh/h	195	435	133	12	249	96	64	0	52	40	0	198
Grp Sat Flow(s),veh/h/ln	790	1580	1585	954	1608	1472	1185	0	1832	1106	0	1712
Q Serve(g_s), s	7.9	3.5	2.0	0.3	1.9	1.5	2.5	0.0	1.1	1.5	0.0	5.0
Cycle Q Clear(g_c), s	9.7	3.5	2.0	3.9	1.9	1.5	7.5	0.0	1.1	2.6	0.0	5.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.12	1.00		0.52
Lane Grp Cap(c), veh/h	543	1694	850	592	1724	789	264	0	366	346	0	342
V/C Ratio(X)	0.36	0.26	0.16	0.02	0.14	0.12	0.24	0.00	0.14	0.12	0.00	0.58
Avail Cap(c_a), veh/h	1113	3973	1993	1279	4044	1851	648	0	960	705	0	897
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	8.0	6.0	5.6	7.0	5.6	5.5	20.7	0.0	15.7	16.8	0.0	17.3
Incr Delay (d2), s/veh	1.5	0.3	0.3	0.0	0.1	0.2	0.2	0.0	0.1	0.1	0.0	0.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	1.6	1.1	0.7	0.1	0.6	0.5	1.1	0.0	0.8	0.6	0.0	2.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	9.5	6.2	5.9	7.0	5.7	5.7	20.8	0.0	15.8	16.8	0.0	17.9
LnGrp LOS	A	A	A	A	A	A	C	A	B	B	A	B
Approach Vol, veh/h	763			357			116			238		
Approach Delay, s/veh	7.0			5.8			18.6			17.7		
Approach LOS	A			A			B			B		
Timer - Assigned Phs	2			4			6			8		
Phs Duration (G+Y+Rc), s	31.7			16.0			31.7			16.0		
Change Period (Y+Rc), s	* 6.1			* 6.5			* 6.1			* 6.5		
Max Green Setting (Gmax), s	* 60			* 25			* 60			* 25		
Max Q Clear Time (g_c+I1), s	11.7			7.0			5.9			9.5		
Green Ext Time (p_c), s	13.9			0.5			5.4			0.2		
Intersection Summary												
HCM 6th Ctrl Delay	9.3											
HCM 6th LOS	A											
Notes												

Timing Report, Sorted By Phase

2: US 191 & SR 80

Horizon Year AM



Phase Number	1	2	4	5	6	8
Movement	WBL	EBTL	SBTL	EBL	WBTL	NBTL
Lead/Lag	Lead	Lag		Lead	Lag	
Lead-Lag Optimize	Yes	Yes		Yes	Yes	
Recall Mode	None	Min	None	None	Min	None
Maximum Split (s)	12	50	28	17	45	28
Maximum Split (%)	13.3%	55.6%	31.1%	18.9%	50.0%	31.1%
Minimum Split (s)	9.5	24.1	24.5	9.5	24.1	24.5
Yellow Time (s)	3.5	5	4.3	3.5	5	4.3
All-Red Time (s)	1	1.1	2.2	1	1.1	2.2
Minimum Initial (s)	5	10	6	5	10	6
Vehicle Extension (s)	3	6	1.5	3	6	1.5
Minimum Gap (s)	3	3	3	3	3	3
Time Before Reduce (s)	0	0	0	0	0	0
Time To Reduce (s)	0	0	0	0	0	0
Walk Time (s)						
Flash Dont Walk (s)						
Dual Entry	No	Yes	Yes	No	Yes	Yes
Inhibit Max	Yes	Yes	Yes	Yes	Yes	Yes
Start Time (s)	0	12	62	0	17	62
End Time (s)	12	62	0	17	62	0
Yield/Force Off (s)	7.5	55.9	83.5	12.5	55.9	83.5
Yield/Force Off 170(s)	7.5	55.9	83.5	12.5	55.9	83.5
Local Start Time (s)	78	0	50	78	5	50
Local Yield (s)	85.5	43.9	71.5	0.5	43.9	71.5
Local Yield 170(s)	85.5	43.9	71.5	0.5	43.9	71.5

Intersection Summary























Cycle Length	90
Control Type	Actuated-Uncoordinated
Natural Cycle	75

Splits and Phases: 2: US 191 & SR 80



HCM 6th Signalized Intersection Summary 2: US 191 & SR 80

Horizon Year AM

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	162	402	100	9	987	182	76	55	7	80	73	222
Future Volume (veh/h)	162	402	100	9	987	182	76	55	7	80	73	222
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1307	1633	1870	1870	1648	1737	1870	1870	1870	1544	1870	1544
Adj Flow Rate, veh/h	191	473	118	11	1097	214	89	69	9	94	86	261
Peak Hour Factor	0.85	0.85	0.85	0.80	0.90	0.85	0.85	0.80	0.80	0.85	0.85	0.85
Percent Heavy Veh, %	40	18	2	2	17	11	2	2	2	24	2	24
Cap, veh/h	254	1637	836	471	1370	644	144	414	54	328	104	317
Arrive On Green	0.10	0.53	0.53	0.01	0.44	0.44	0.26	0.26	0.26	0.26	0.26	0.26
Sat Flow, veh/h	1245	3103	1585	1781	3131	1472	1034	1621	211	1091	408	1239
Grp Volume(v), veh/h	191	473	118	11	1097	214	89	0	78	94	0	347
Grp Sat Flow(s),veh/h/ln	1245	1552	1585	1781	1566	1472	1034	0	1832	1091	0	1647
Q Serve(g_s), s	6.6	7.1	3.2	0.3	25.5	8.0	4.8	0.0	2.8	6.2	0.0	16.7
Cycle Q Clear(g_c), s	6.6	7.1	3.2	0.3	25.5	8.0	21.5	0.0	2.8	9.0	0.0	16.7
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.12	1.00		0.75
Lane Grp Cap(c), veh/h	254	1637	836	471	1370	644	144	0	468	328	0	421
V/C Ratio(X)	0.75	0.29	0.14	0.02	0.80	0.33	0.62	0.00	0.17	0.29	0.00	0.82
Avail Cap(c_a), veh/h	310	1637	836	606	1448	681	144	0	468	328	0	421
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	17.2	11.1	10.1	12.8	20.5	15.6	40.5	0.0	24.3	27.8	0.0	29.5
Incr Delay (d2), s/veh	8.0	0.4	0.3	0.0	4.5	1.1	5.7	0.0	0.1	0.2	0.0	11.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	3.5	3.7	1.7	0.2	13.4	4.5	3.6	0.0	2.0	2.7	0.0	11.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	25.2	11.4	10.4	12.8	25.0	16.7	46.2	0.0	24.4	28.0	0.0	41.3
LnGrp LOS	C	B	B	B	C	B	D	A	C	C	A	D
Approach Vol, veh/h	782			1322			167			441		
Approach Delay, s/veh	14.6			23.5			36.0			38.5		
Approach LOS	B			C			D			D		
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	5.6	50.5		28.0	13.2	42.9		28.0				
Change Period (Y+Rc), s	4.5	* 6.1		* 6.5	4.5	* 6.1		* 6.5				
Max Green Setting (Gmax), s	7.5	* 44		* 22	12.5	* 39		* 22				
Max Q Clear Time (g_c+I1), s	2.3	9.1		18.7	8.6	27.5		23.5				
Green Ext Time (p_c), s	0.0	9.0		0.4	0.2	9.3		0.0				
Intersection Summary												
HCM 6th Ctrl Delay	24.2											
HCM 6th LOS	C											
Notes												

Timing Report, Sorted By Phase

2: US 191 & SR 80

Horizon Year PM



Phase Number	1	2	4	5	6	8
Movement	WBL	EBTL	SBTL	EBL	WBTL	NBTL
Lead/Lag	Lead	Lag		Lead	Lag	
Lead-Lag Optimize	Yes	Yes		Yes	Yes	
Recall Mode	None	Min	None	None	Min	None
Maximum Split (s)	12	48	30	20	40	30
Maximum Split (%)	13.3%	53.3%	33.3%	22.2%	44.4%	33.3%
Minimum Split (s)	9.5	24.1	24.5	9.5	24.1	24.5
Yellow Time (s)	3.5	5	4.3	3.5	5	4.3
All-Red Time (s)	1	1.1	2.2	1	1.1	2.2
Minimum Initial (s)	5	10	6	5	10	6
Vehicle Extension (s)	3	6	1.5	3	6	1.5
Minimum Gap (s)	3	3	3	3	3	3
Time Before Reduce (s)	0	0	0	0	0	0
Time To Reduce (s)	0	0	0	0	0	0
Walk Time (s)						
Flash Dont Walk (s)						
Dual Entry	No	Yes	Yes	No	Yes	Yes
Inhibit Max	Yes	Yes	Yes	Yes	Yes	Yes
Start Time (s)	0	12	60	0	20	60
End Time (s)	12	60	0	20	60	0
Yield/Force Off (s)	7.5	53.9	83.5	15.5	53.9	83.5
Yield/Force Off 170(s)	7.5	53.9	83.5	15.5	53.9	83.5
Local Start Time (s)	78	0	48	78	8	48
Local Yield (s)	85.5	41.9	71.5	3.5	41.9	71.5
Local Yield 170(s)	85.5	41.9	71.5	3.5	41.9	71.5

Intersection Summary























Cycle Length	90
Control Type	Actuated-Uncoordinated
Natural Cycle	70

Splits and Phases: 2: US 191 & SR 80



HCM 6th Signalized Intersection Summary 2: US 191 & SR 80

Horizon Year PM

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	332	1050	174	16	478	126	78	57	7	44	127	157
Future Volume (veh/h)	332	1050	174	16	478	126	78	57	7	44	127	157
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1485	1633	1870	1870	1663	1737	1870	1870	1870	1559	1870	1530
Adj Flow Rate, veh/h	391	1167	205	20	562	148	92	71	9	55	149	185
Peak Hour Factor	0.85	0.90	0.85	0.80	0.85	0.85	0.85	0.80	0.80	0.80	0.85	0.85
Percent Heavy Veh, %	28	18	2	2	16	11	2	2	2	23	2	25
Cap, veh/h	455	1496	764	210	992	462	204	464	59	366	216	269
Arrive On Green	0.19	0.48	0.48	0.02	0.31	0.31	0.29	0.29	0.29	0.29	0.29	0.29
Sat Flow, veh/h	1414	3103	1585	1781	3159	1472	1046	1627	206	1099	759	942
Grp Volume(v), veh/h	391	1167	205	20	562	148	92	0	80	55	0	334
Grp Sat Flow(s),veh/h/ln	1414	1552	1585	1781	1580	1472	1046	0	1833	1099	0	1701
Q Serve(g_s), s	14.6	25.4	6.3	0.6	12.1	6.2	7.0	0.0	2.7	3.2	0.0	14.2
Cycle Q Clear(g_c), s	14.6	25.4	6.3	0.6	12.1	6.2	21.2	0.0	2.7	5.9	0.0	14.2
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.11	1.00		0.55
Lane Grp Cap(c), veh/h	455	1496	764	210	992	462	204	0	523	366	0	485
V/C Ratio(X)	0.86	0.78	0.27	0.10	0.57	0.32	0.45	0.00	0.15	0.15	0.00	0.69
Avail Cap(c_a), veh/h	455	1599	817	335	1317	614	208	0	530	370	0	491
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	15.4	17.5	12.5	19.0	23.3	21.3	35.3	0.0	21.7	23.9	0.0	25.9
Incr Delay (d2), s/veh	15.1	3.6	0.7	0.2	1.8	1.4	0.6	0.0	0.0	0.1	0.0	3.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	9.3	12.6	3.5	0.4	7.5	3.7	3.2	0.0	2.0	1.4	0.0	9.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	30.6	21.1	13.2	19.2	25.1	22.7	35.8	0.0	21.8	24.0	0.0	29.1
LnGrp LOS	C	C	B	B	C	C	D	A	C	C	A	C
Approach Vol, veh/h	1763				730				172		389	
Approach Delay, s/veh	22.3				24.5				29.3		28.4	
Approach LOS	C				C				C		C	
Timer - Assigned Phs	1	2	4		5	6	8					
Phs Duration (G+Y+Rc), s	6.3	45.3	29.7		20.0	31.6	29.7					
Change Period (Y+Rc), s	4.5	* 6.1	* 6.5		4.5	* 6.1	* 6.5					
Max Green Setting (Gmax), s	7.5	* 42	* 24		15.5	* 34	* 24					
Max Q Clear Time (g_c+I1), s	2.6	27.4	16.2		16.6	14.1	23.2					
Green Ext Time (p_c), s	0.0	11.8	0.6		0.0	8.5	0.0					
Intersection Summary												
HCM 6th Ctrl Delay	24.0											
HCM 6th LOS	C											
Notes												

Draft

PM₁₀ Quantitative Hot-Spot Air Quality Technical Report

City of Douglas Land Port of Entry Connector Road

Cochise County, Arizona

Federal Project No. 999-A(561)T
ADOT Project No. F0534 01L

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Arizona Department of Transportation
Environmental Planning

ADOT

October 2024

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APPENDIX B – City of Douglas International Port of Entry Connector Road Final Traffic Report

APPENDIX C – Agency Comments and Responses

APPENDIX D – PM₁₀ Modeling Results by Receptor

APPENDIX E – PM₁₀ Hot Spot Air Quality Memorandum - City of Douglas Commercial Land Port of Entry (LPOE)

APPENDIX F – PM₁₀ MOVES and AERMOD Modeling Files

EXECUTIVE SUMMARY

This Air Quality Technical Report supports the City of Douglas Land Port of Entry Connector Road project, which connects the proposed Commercial Land Port of Entry (LPOE) west of the City of Douglas to State Route (SR) 80. The report analyses the project's potential particulate matter (PM₁₀) impacts and evaluates whether the project would contribute to the study area exceeding the National Ambient Air Quality Standards (NAAQS). The report also analyses the project's potential impacts on carbon monoxide (CO), mobile source air toxics (MSAT), and greenhouse gases (GHG). Based on the analysis, the project is not expected to contribute to a violation of the NAAQS for PM₁₀.

1 INTRODUCTION

This Project Level PM₁₀ Quantitative Hot-Spot Analysis Technical Report has been developed to support the Design Concept Report (DCR) for a connector road between the proposed City of Douglas Commercial LPOE at the United States (US)-Mexico border and SR 80. The project is in the Arizona Department of Transportation (ADOT) Southeast District in Cochise County west of Douglas, Arizona and is anticipated to open in 2028. The impacts to air quality were evaluated based on traffic data presented in the project's Final Traffic Report (Kimley-Horn, 2024) and additional modeling developed in the Paul Spur / Douglas April 2024 Regional Conformity Analysis.

ADOT is preparing an Environmental Assessment (EA) for the project. There are three alignment alternatives currently being considered for the proposed connector road west of United States Route 191 (US 191), two of which intersect SR 80 at James Ranch Road and one of which intersects SR 80 at Brooks Road. The project vicinity is shown in *Figure 1*, and the three alignment alternatives are shown in *Figure 2*. For the purposes of this analysis, the preferred alignment alternative (Alternative 1) for the connector road is assumed to intersect SR 80 at the existing SR 80 / James Ranch Road intersection. The results of the analysis at the SR 80 / James Ranch Road intersection are anticipated to be similar at the SR 80 / Brooks Road intersection if the preferred alignment alternative for the connector road intersects SR 80 at Brooks Road instead of James Ranch Road.



Figure 1: Project Vicinity Map

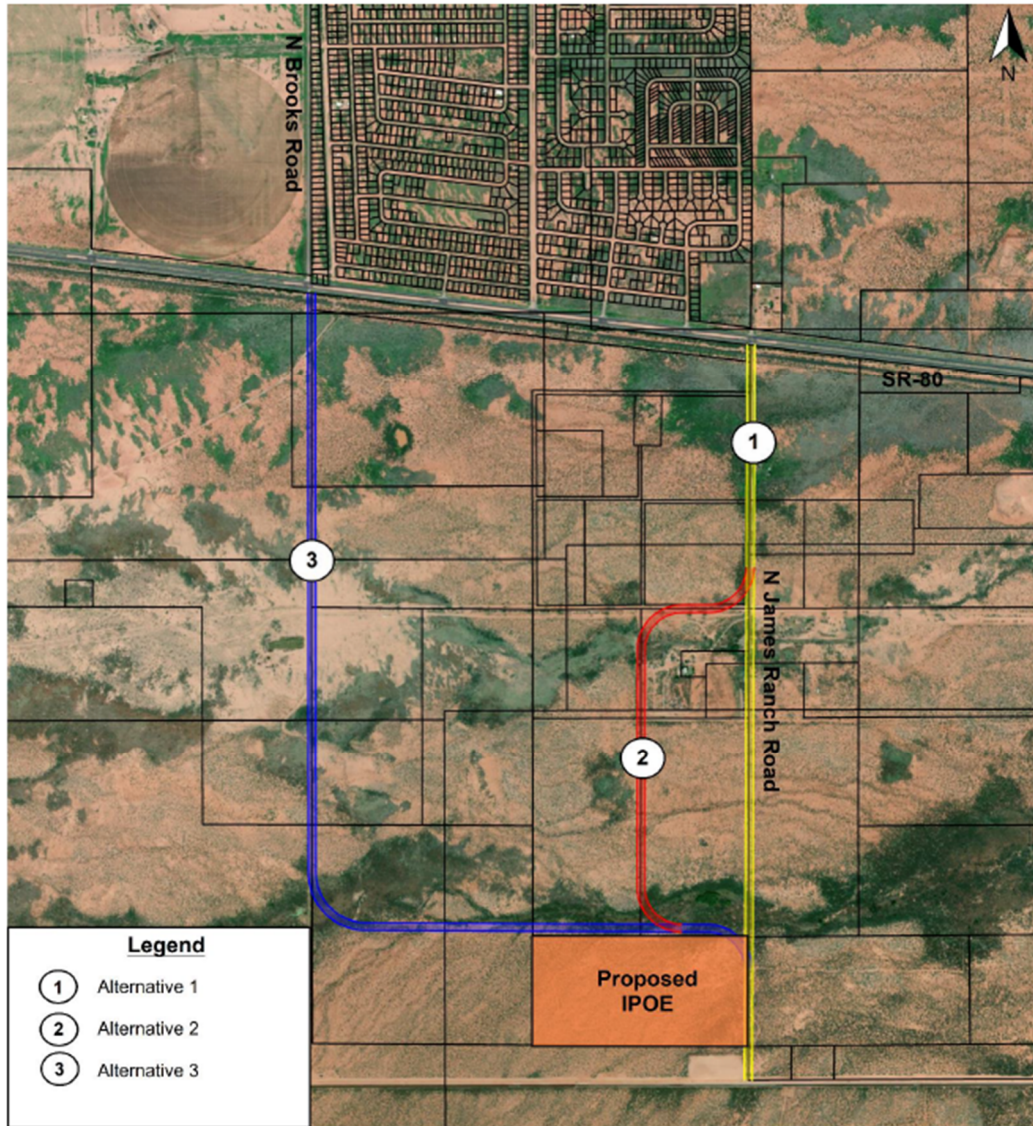


Figure 2: Connector Road Alignment Alternatives Map

The primary goal of the proposed LPOE is to move commercial vehicle traffic away from the existing LPOE in the City of Douglas and US 191 to a location west of the City of Douglas. The proposed LPOE will only accommodate commercial vehicle traffic. This will help to improve operations at the existing LPOE and reduce congestion on US 191 south of SR 80. Commercial Vehicles will still have to stop at the ADOT Commercial Weigh Station on the northeast corner of SR 80 and US 191. after crossing the US-Mexico border, but the new route will allow for fewer impacts of commercial vehicles on the residents of the City of Douglas. The current route has 10 schools, 1 healthcare facility, and 7 parks, as well as numerous playgrounds and civic uses within a one-mile radius. *Figure 3* shows the route between the current LPOE and the ADOT Commercial Weigh Station. The proposed connector road falls entirely outside the Douglas municipal limits. One school and one healthcare facility fall within a one-mile radius of the proposed route. *Figure 4* shows the route between the proposed connector road and the ADOT Commercial Weigh Station.



Figure 3: Existing Truck Traffic Route

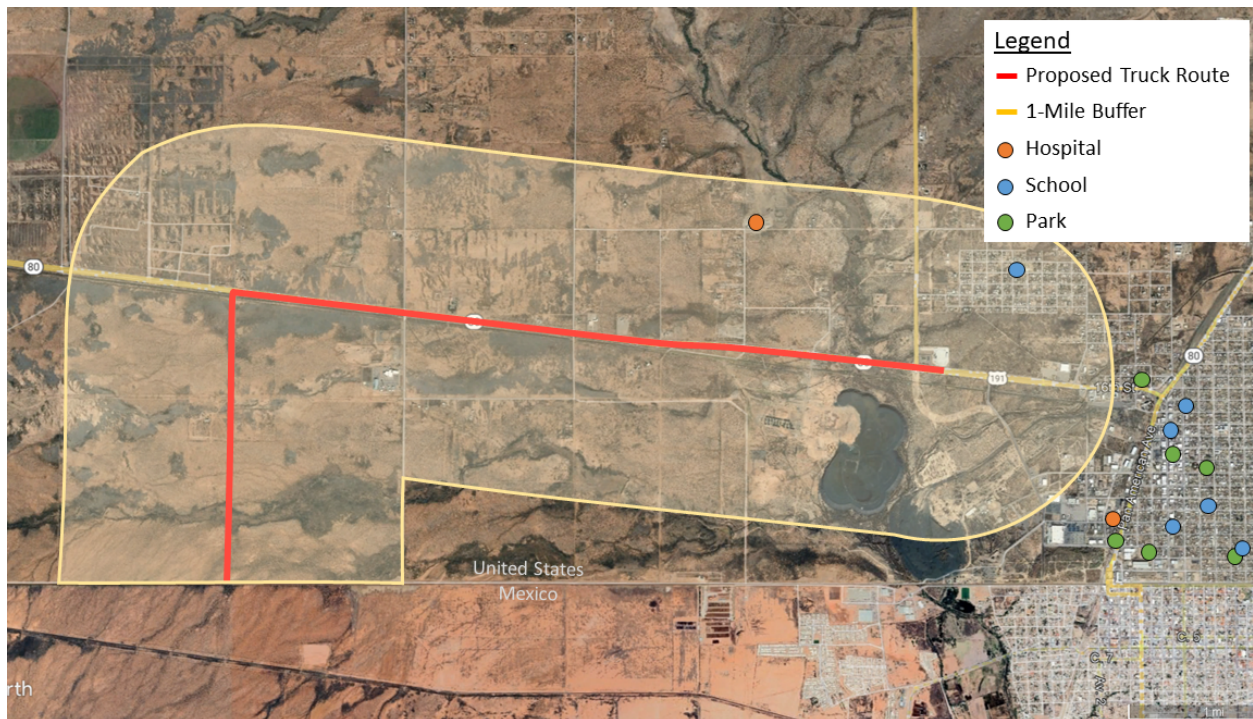


Figure 4: Proposed Truck Traffic Route

On March 10, 2006, the U.S. Environmental Protection Agency (EPA) published a Final Rule (71 FR 12468) that establishes transportation conformity criteria and procedures for determining which transportation projects must be analyzed for local air quality impacts in PM_{2.5} and PM₁₀ nonattainment and maintenance areas. A quantitative PM hot-spot analysis using EPA's MOVES emission model is required for those projects that are identified as projects of local air quality

concern. Quantitative PM hot-spot analyses are not required for other projects. The interagency consultation process plays an important role in evaluating which projects require quantitative hot-spot analyses and determining the methods and procedures for such analyses. An interagency consultation group was established to help guide the development of the air quality analysis, consisting of members from:

- Arizona Department of Transportation (ADOT)
- Arizona Department of Environmental Quality (ADEQ)
- Federal Highway Administration (FHWA)
- Environmental Protection Agency (EPA)
- The City of Douglas
- The Southeastern Arizona Governments Organization (SEAGO)
- General Services Administration (GSA)
- Customs and Border Protection (CBP)

This air quality analysis includes modeling techniques to estimate project-specific emission factors from vehicle exhaust and local PM₁₀ concentrations due to project operation. Emissions and dispersion modeling techniques were consistent with the EPA quantitative PM hot-spot analysis guidance, “*Transportation Conformity Guidance for Quantitative Hot-spot Analysis in PM_{2.5} and PM₁₀ Nonattainment and Maintenance Areas*” that was released in October 2021.¹

2 AFFECTED ENVIRONMENT

2.1 Regional Climate

The project is located in rural Cochise County in the southeastern corner of the state. A large portion of Arizona is classified as semiarid, and long periods of time often occur with little or no precipitation. The average annual precipitation in Cochise County is 14 inches. The air is generally dry and clear, with low relative humidity and a high percentage of sunshine. Cochise County has a hot desert climate with long, extremely hot summers with temperatures exceeding 90 degrees Fahrenheit and short, mild to warm winters with temperatures ranging from 50 to 60 degrees Fahrenheit.

2.2 National Ambient Air Quality Standards

As required by the Clean Air Act (CAA), NAAQS have been established for six major air pollutants: carbon monoxide, nitrogen dioxide, ozone, particulate matter (PM₁₀ and PM_{2.5}), sulfur dioxide, and lead. These standards are summarized in *Table 1* along with the current attainment status of Cochise County. “Primary” standards have been established to protect the public health; “secondary” standards are intended to protect the nation's welfare and account for air pollutant effects on soil, water, visibility, materials, vegetation, and other aspects of the general welfare. Brief descriptions of those criteria pollutants relevant to transportation projects (carbon monoxide, particulate matter, nitrogen dioxide, and ozone) are provided in the following sections.

¹ <https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockkey=P1013C6A.pdf>

Table 1: National Ambient Air Quality Standards²

Pollutant		Primary / Secondary	Averaging Time	Level	Form	Attainment Status
Ozone (O ₃) ¹		Primary & Secondary	1-hour	0.070 ppm	Annual fourth-highest daily maximum 8-hour concentration, averaged over 3 years	Attainment
Carbon Monoxide (CO)		Primary	8 hours	9 ppm	Not to be exceeded more than once per year	Attainment
			1 hour	35 ppm		Attainment
Nitrogen Dioxide (NO ₂)		Primary	1 hour	100 ppb	98 th percentile of 1-hour daily maximum concentrations, averaged over 3 years	Attainment
		Primary & Secondary	1 year	53 ppb	Annual Mean	Attainment
Particulate Pollution (PM)	PM _{2.5}	Primary	1 year	12 µg/m ³	Annual Mean, averaged over 3 years	Attainment
		Secondary	Annual	15.0 µg/m ³	Annual Mean, averaged over 3 years	Attainment
		Primary & Secondary	24 hours	35 µg/m ³	98 th percentile, averaged over 3 years	Attainment
	PM ₁₀	Primary & Secondary	24 hours	150 µg/m ³	Not to be exceeded more than once per year on average over 3 years	Moderate Non-Attainment
Sulfur Dioxide (SO ₂)		Primary	1 hour	75 ppb	98 th percentile of 1-hour daily maximum concentrations, averaged over 3 years	Attainment
		Secondary	3 hour	0.5 ppm	Not to be exceeded more than once per year	Attainment

1. In areas designated nonattainment for the Pb standards prior to the promulgation of the current (2008) standards, and for which implementation plans to attain or maintain the current (2008) standards have not been submitted and approved, the previous standards (1.5 µg/m³ as a calendar quarter average) also remain in effect.

2. The level of the annual NO₂ standard is 0.053 ppm. It is shown here in terms of ppb for the purposes of clearer comparison to the 1-hour standard level.

3. Final rule signed October 1, 2015, and effective December 28, 2015. The previous (2008) O₃ standards are not revoked and remain in effect for designated areas. Additionally, some areas may have certain continuing implementation obligations under the prior revoked 1-hour (1979) and 8-hour (1997) O₃ standards.

4. The previous SO₂ standards (0.14 ppm 24-hour and 0.03 ppm annual) will additionally remain in effect in certain areas: 1) any area for which it is not yet 1 year since the effective date of designation under the current (2010) standards, and 2) any area for which an implementation plan providing for attainment of the current (2010) standard has not been submitted and approved and which is designated nonattainment under the previous SO₂ standards or is not meeting the requirements of a SIP call under the previous SO₂ standards (40 CFR 50.4(3)). A SIP call is an EPA action requiring a state to resubmit all or part of its State Implementation Plan to demonstrate attainment of the required NAAQS.

² <https://www.epa.gov/criteria-air-pollutants/naaqs-table>

2.2.1 Carbon Monoxide

EPA defines Carbon Monoxide (CO) as a colorless, odorless gas that is emitted when the carbon in fuel is not burned completely³. The largest source of CO is vehicle exhaust from on-road motor vehicles. CO is sensitive to variations in temperature and vehicle speeds. CO emissions are higher in winter months than during the summer. CO emissions also decrease with an increase in speed, so idling and low speeds produce the highest levels of CO. Health issues related to prolonged CO exposure include dizziness, confusion, and unconsciousness due to a reduction of the amount of oxygen being transported to vital organs. The national trend in average CO concentrations shows a substantial improvement over the past 40 years, as seen in *Figure 5*. Similarly, trends in the Southwest Region show a 34% decrease in CO concentrations since 2010, as seen in *Figure 6*. This trend is primarily the result of stricter regulations on motor vehicle exhaust.

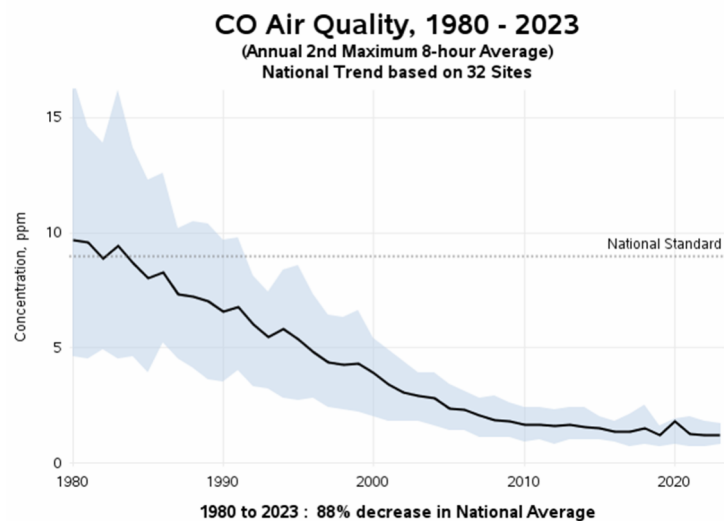


Figure 5: National Trend in CO Concentrations⁴

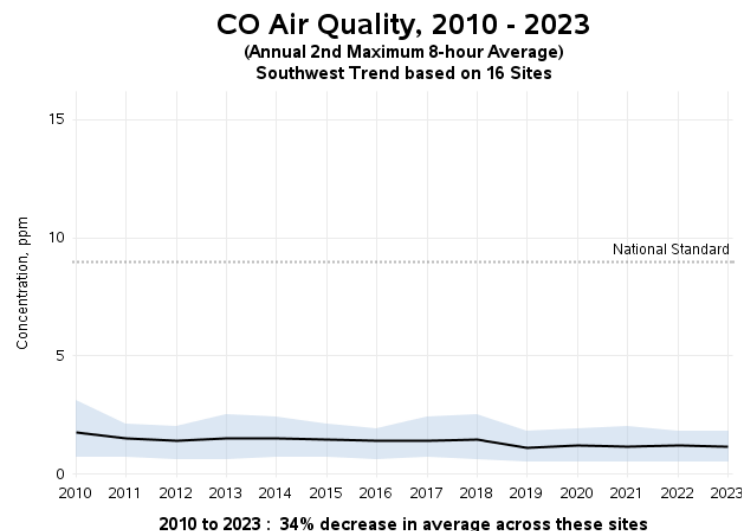


Figure 6: Southwest Regional Trend in CO Concentrations⁴

³<https://www.epa.gov/co-pollution/basic-information-about-carbon-monoxide-co-outdoor-air-pollution#What%20is%20CO>

⁴ <https://www.epa.gov/air-trends/carbon-monoxide-trends>

2.2.2 Particulate Matter

Particle pollution is a term used to describe particles suspended in the air including dust, dirt, soot, smoke, and liquid droplets. Another name for this is particulate matter, or PM. PM can be emitted directly from sources such as motor vehicles, construction activities, and unpaved roads, or it can be formed in the air through reactions involving chemicals, sunlight, and water vapor. There are two main types of PM that are of particular concern: PM₁₀, which includes coarse particles with diameters of 10 micrometers and smaller, and PM_{2.5} which includes fine particles with diameters of 2.5 micrometers and smaller. The size of these particles can be seen in *Figure 7* below compared to other small materials⁵. Exposure to PM can cause various health problems because the particles are inhaled during regular breathing and can end up in the lungs. Some of these health problems include decreased lung function, asthma, other respiratory issues, irregular heartbeat, and heart attacks. PM_{2.5} is also one of the leading causes of haze in parts of the U.S. Additionally, wind can carry these particles large distances before they settle on the ground, which could impact various environmental features such as changing nutrients balance in soil and coastal waters, increasing acidity in waterways, harming forests and crops, and contributing to acid rain.⁶

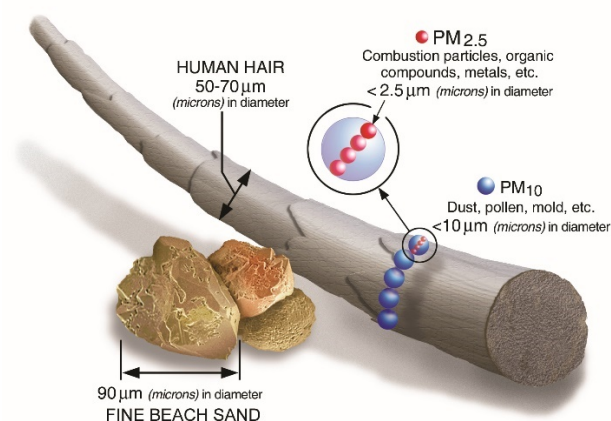


Figure 7: Particulate Matter Size Comparison⁵

National trends in PM show a general decrease in both PM₁₀ and PM_{2.5} since 2000 as shown in Figure 8 and Figure 10, respectively. Southwest regional trends show a slightly different situation, however, where PM₁₀ has actually increased by 14% and PM_{2.5} has decreased by 14% since 2010 as seen in Figure 9 and Figure 11, respectively. The PM₁₀ data shows that there have been a few spikes in concentration between 2011-2013 and in 2018 where it was at or above the national standard. Since the spike in 2018, the PM₁₀ concentration has leveled out and the 2023 data reported one of the lowest concentrations during the time frame.

⁵ <https://www.epa.gov/pm-pollution/particulate-matter-pm-basics>

⁶ <https://www.epa.gov/pm-pollution/health-and-environmental-effects-particulate-matter-pm>

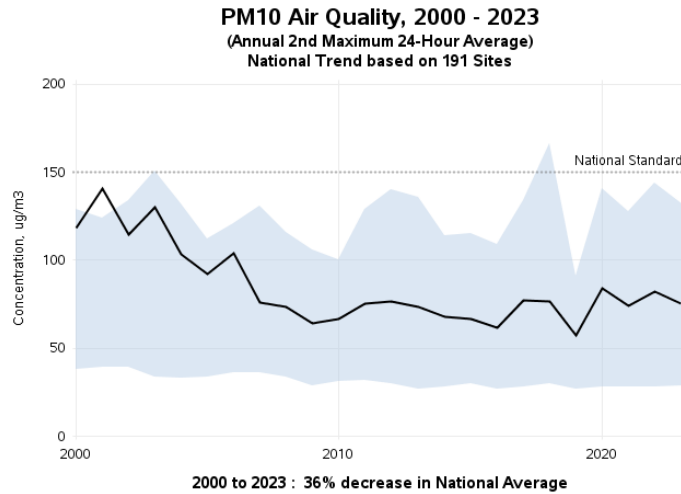


Figure 8: National Trend in PM_{10} Concentrations⁷

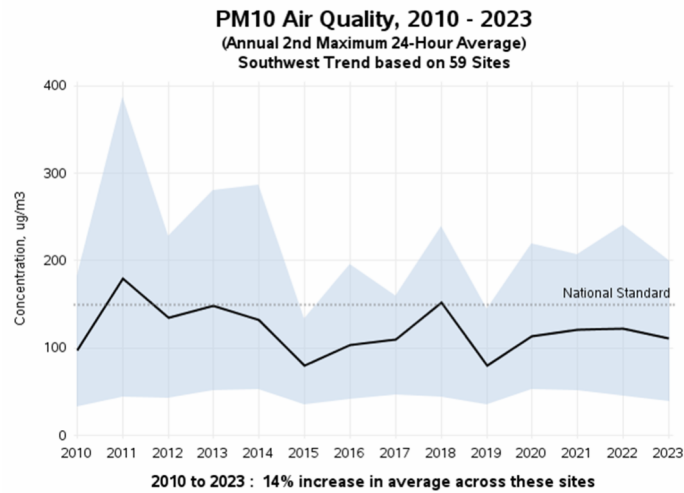


Figure 9: Southwest Regional Trend in PM_{10} Concentrations⁷

⁷ <https://www.epa.gov/air-trends/particulate-matter-pm10-trends>

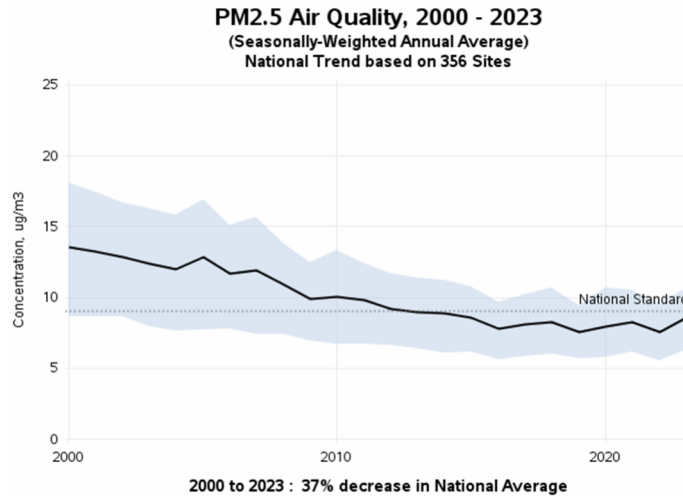


Figure 10: National Trend in $PM_{2.5}$ Concentrations⁸

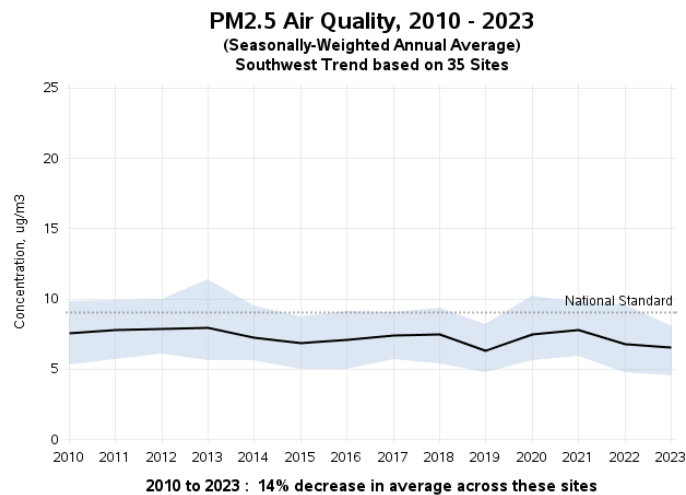


Figure 11: Southwest Regional Trend in $PM_{2.5}$ Concentrations⁸

2.2.3 Nitrogen Dioxide

Nitrogen oxides (NO_x) are a group of highly reactive gases. One of these, Nitrogen Dioxide (NO_2), is emitted from the burning of fuel. The primary sources of NO_2 include motor vehicles, power plants, and industrial and commercial equipment. Respiratory issues like coughing, wheezing, difficulty breathing, and asthma are the primary health issues related to breathing air with high concentrations of NO_2 . Ozone and particulate matter are formed when NO_x , specifically NO_2 , reacts with other chemicals, so NO_2 is considered a precursor of each criteria pollutant. Environmental effects from high concentrations of NO_2 in the air include the development of acid rain, haze, and nutrient pollution in coastal waters.⁹ The national trend in average NO_2 concentrations shows a substantial improvement over the past 40 years, as seen in Figure 12. Similarly, trends in the Southwest Region show a 17% decrease in NO_2 concentrations since 2010, as seen in Figure 13.

⁸ <https://www.epa.gov/air-trends/particulate-matter-pm25-trends>

⁹ <https://www.epa.gov/no2-pollution/basic-information-about-no2>

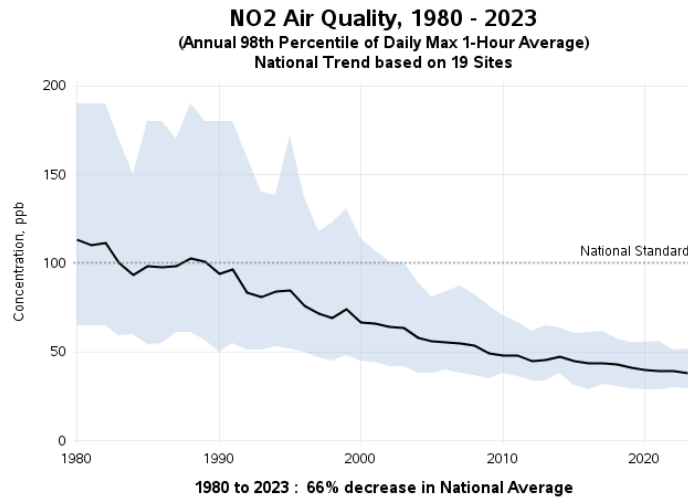


Figure 12: National Trend in NO₂ Concentrations¹⁰

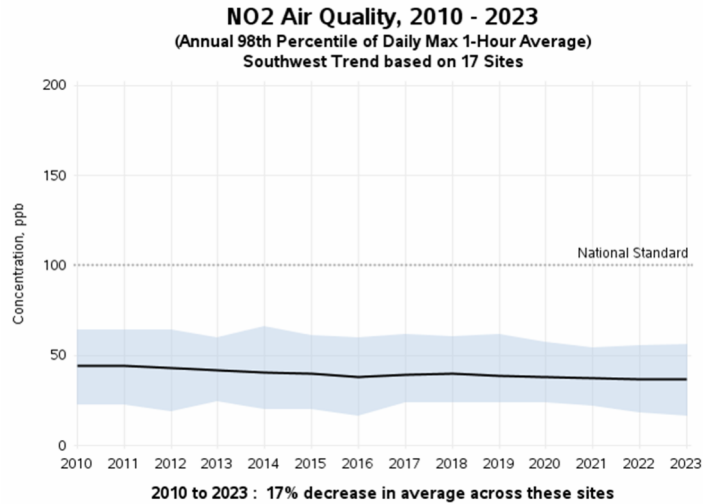


Figure 13: Southwest Regional Trend in NO₂ Concentrations¹⁰

2.2.4 Ozone

Ozone (O₃) is a gas that can be both naturally occurring and human made. O₃ is naturally occurring in the Earth's atmosphere and protects the Earth from the sun's ultraviolet rays. O₃ at the ground-level is a harmful pollutant that is formed through chemical reactions between NO_x and volatile organic compounds (VOC) in the presence of sunlight. NO_x, as mentioned previously, and VOC are pollutants emitted by motor vehicles and industrial sources. O₃ is generally a concern during hot summer months in urban areas due to the steady presence of heat, sunlight, and pollutants¹¹. Figure 14 gives a visual representation of how ground-level O₃ is created.

¹⁰ <https://www.epa.gov/air-trends/nitrogen-dioxide-trends>

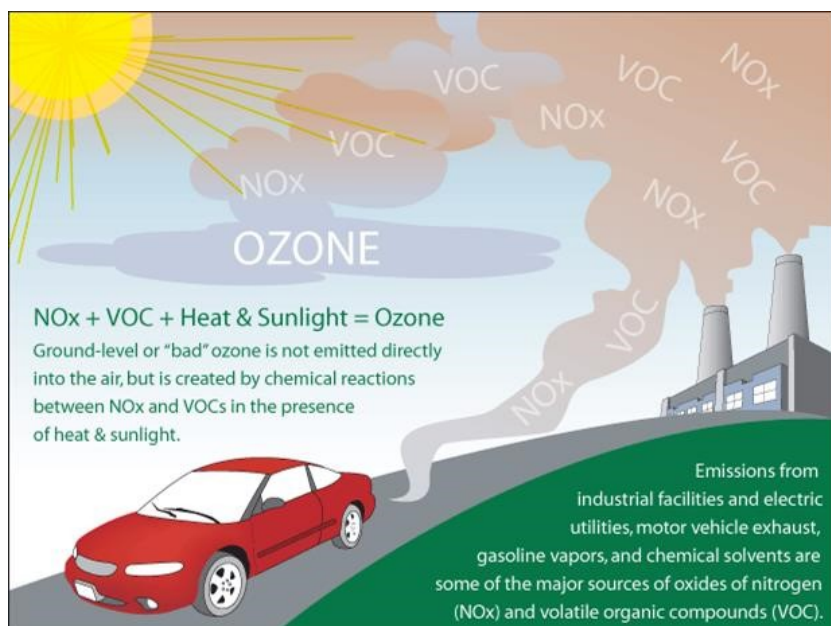


Figure 14: Formation of Ozone¹¹

O₃ is the primary component of smog. When O₃ reaches unhealthy levels, it can contribute to various health issues such as breathing problems, inflammation in the respiratory system, coughing, sore throat, and can increase or aggravate existing conditions like asthma.¹² O₃ can also have negative effects on sensitive vegetation and ecosystems by slowing plant growth and making them more susceptible to disease and insects.¹³ The national trend in average O₃ concentrations shows a gradual improvement over the past 40 years, but has leveled off since 2013 as seen in Figure 15. Similarly, trends in the Southwest Region show a steady level of O₃ concentrations since 2010, as seen in Figure 16.

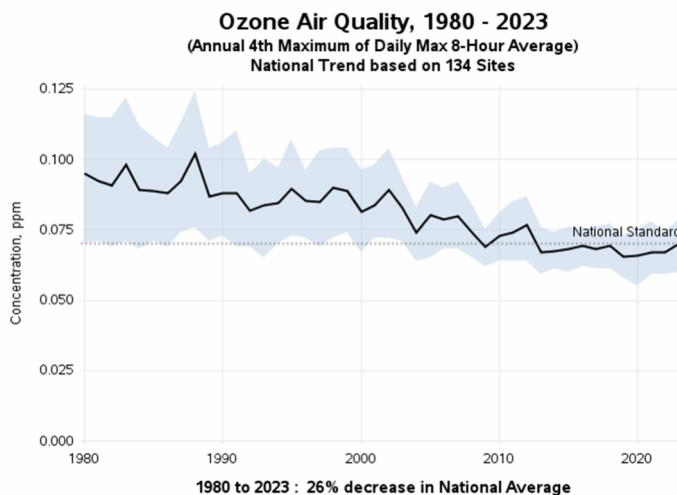


Figure 15: National Trend in O3 Concentrations¹⁴

¹¹ <https://www.epa.gov/ground-level-ozone-pollution/ground-level-ozone-basics>

¹² <https://www.epa.gov/ground-level-ozone-pollution/health-effects-ozone-pollution>

¹³ <https://www.epa.gov/ground-level-ozone-pollution/ecosystem-effects-ozone-pollution>

¹⁴ <https://www.epa.gov/air-trends/ozone-trends>

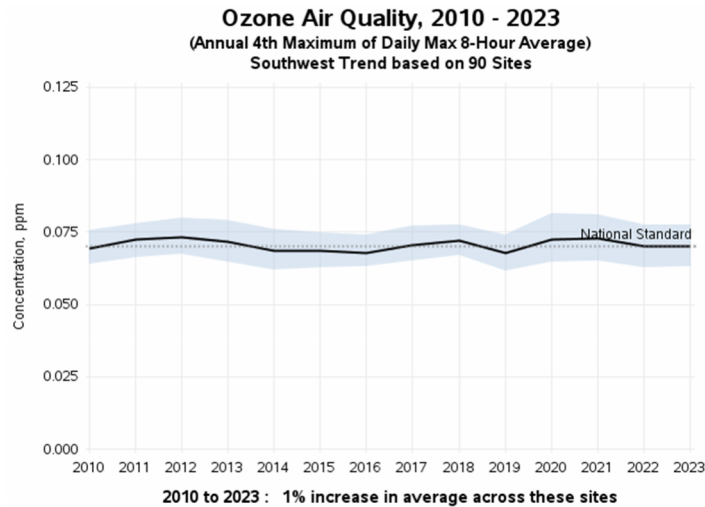


Figure 16: Southwest Regional Trend in O₃ Concentrations¹⁴

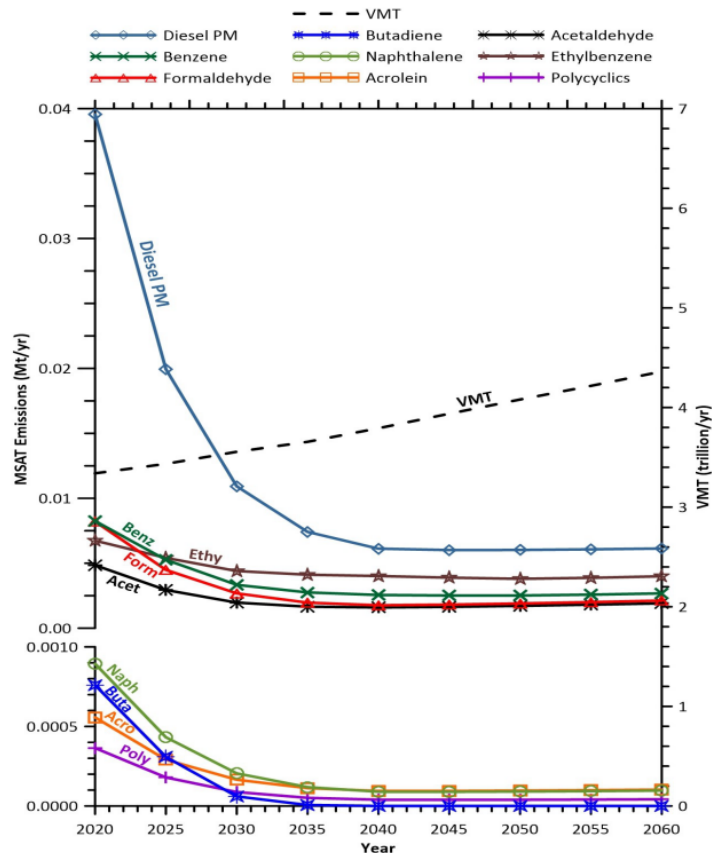
2.3 Mobile Source Air Toxics

Although not a criteria pollutant under the NAAQS, mobile source air toxics (MSAT) are also regulated by EPA. Many air toxics are formed from human made sources such as motor vehicles, dry cleaners, and other industrial and commercial sources. Controlling air toxic emissions became a national priority with the passage of the CAAA, whereby Congress mandated that the EPA regulate 188 air toxics, also known as hazardous air pollutants. The EPA assessed this expansive list in its rule on the Control of Hazardous Air Pollutants from Mobile Sources (Federal Register, Vol 72, No. 37, page 8430, February 26, 2007), and identified a group of 93 compounds emitted from mobile sources that are part of EPA's Integrated Risk Information System (IRIS)¹⁵. In addition, EPA identified nine compounds with significant contributions from mobile sources that are among the national and regional-scale cancer risk drivers or contributors and non-cancer hazard contributors from the 2014 National Air Toxics Assessment (NATA)¹⁶. These are 1,3-butadiene, acetaldehyde, acrolein, benzene, diesel particulate matter (diesel PM), ethylbenzene, formaldehyde, naphthalene, and polycyclic organic matter. While FHWA considers these the priority MSAT, the list is subject to change and may be adjusted in consideration of future EPA rules.

Using EPA's MOVES3 model, as shown below in *Figure 17*, FHWA estimates that even if VMT increases by 31 percent from 2020 to 2060 as forecast, a combined reduction of 76 percent in the total annual emissions for the priority MSAT is projected for the same time period. This substantial decrease in emissions is primarily due to the strict regulations on fuels and motor vehicles that were required under the EPA's 2007 rule.

¹⁵ <https://www.epa.gov/iris>

¹⁶ <https://www.epa.gov/national-air-toxics-assessment/2014-nata-assessment-results>



Notes: Trends for specific locations may be different, depending on locally derived information representing vehicle-miles travelled, vehicle speeds, vehicle mix, fuels, emission control programs, meteorology, and other factors.

Source: EPA MOVES3 model runs conducted by FHWA in March 2021¹⁷

Figure 17: FHWA Projected National MSAT Emission Trends 2020-2060 for Vehicles Operating on Roadways

2.4 Attainment Status

The project is located within the Paul Spur/Douglas planning area, which is currently in nonattainment for large particulates, otherwise known as PM₁₀, and in attainment for all other pollutants as noted previously in Table 1. The Paul Spur/Douglas PM₁₀ nonattainment area is located along the Mexico-United States border in Cochise County, as shown in Fig X. The Paul Spur/Douglas area was designated as a nonattainment area under the 1987 24-hour PM₁₀ standard, which was retained under the Environmental Protection Agency's (EPA's) 2006 PM National Ambient Air Quality Standards (NAAQS) review (effective December 18, 2006). The area is classified as a "moderate" nonattainment area. As an isolated rural nonattainment area, the Paul Spur/Douglas planning area is subject to a regional air quality conformity process. Arizona Department of Environmental Quality (ADEQ) is in the process of developing a nonattainment State Implementation Plan (SIP) which will include an emission inventory, modeling demonstration, strategy for Exceptional Events, and requirements for PM₁₀ controls. ADEQ identifies six sources of PM₁₀ for the area – agricultural

¹⁷https://www.fhwa.dot.gov/Environment/air_quality/air_toxics/policy_and_guidance/msat/fhwa_nepa_msat_memorandum_2023.pdf

activities, unpaved roads, cleared areas/vacant lots, open burning and wildfires, windblown dust, and emissions coming across the border from areas outside the U.S. border¹⁸.

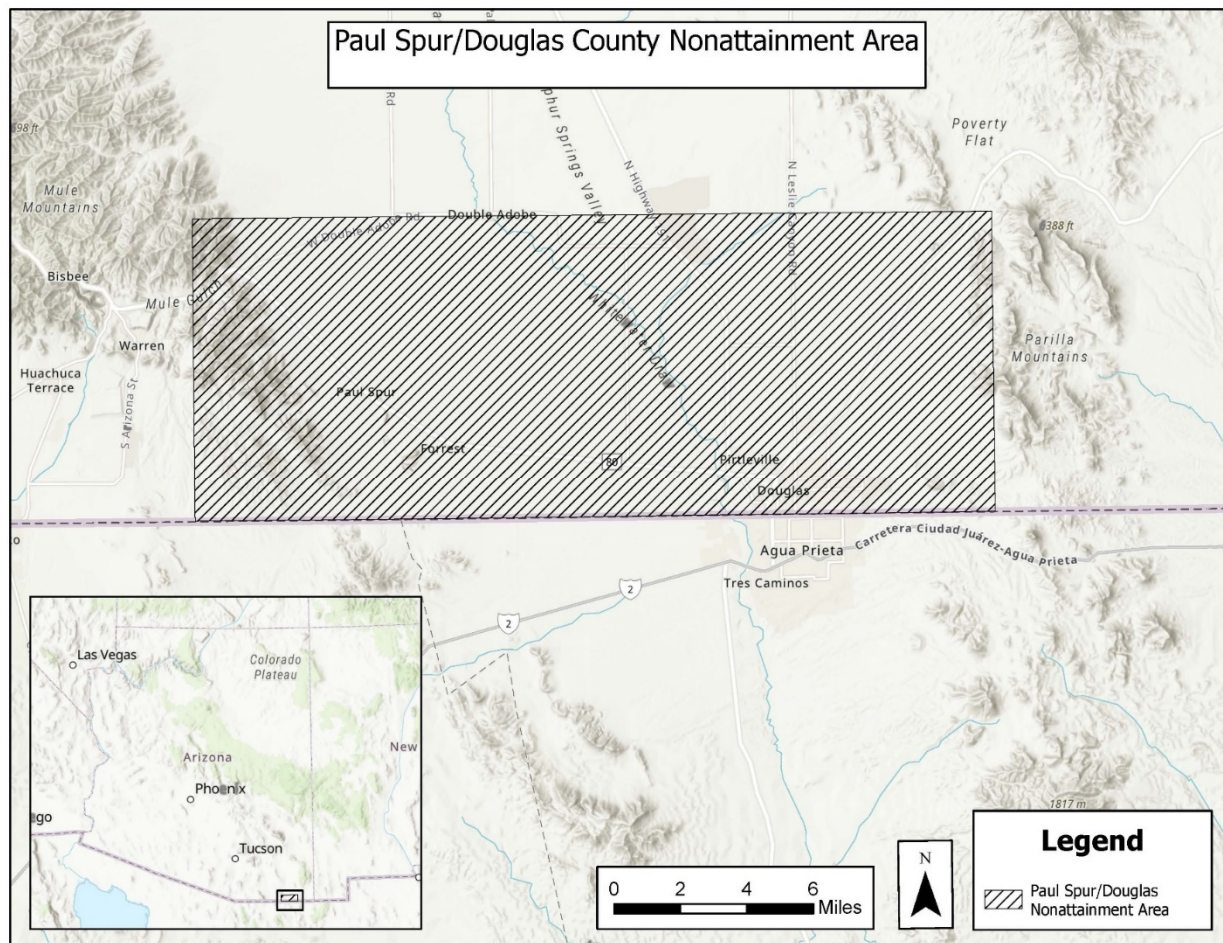


Figure 18: Paul Spur/Douglas Nonattainment Area

¹⁸ <https://azdeq.gov/paul-spurdouglas-pm-10-nonattainment-area>

3 PM10 HOT-SPOT ANALYSIS

3.1 Overview of Analysis Approach

The project study area is located in the Paul Spur/Douglas PM₁₀ nonattainment area. The project was presented to the interagency consultation group, which classified it as a project of air quality concern. Therefore, PM₁₀ hot-spot analysis was conducted.

EPA released guidance for quantifying the local air quality impacts of certain transportation projects for the PM_{2.5} and PM₁₀ NAAQS in October, 2021.¹ This guidance must be used by state and local agencies to conduct quantitative hot-spot analyses for new or expanded highway or transit projects with significant increases in diesel traffic in nonattainment or maintenance areas.

The steps required to complete a quantitative PM hot-spot analysis are summarized in Figure 19. The hot-spot analysis compares the air quality concentrations with the proposed project PM₁₀ NAAQS. These air quality concentrations are determined by calculating a future design value, which is a statistic that describes a future air quality concentration in the project area that can be compared to a particular NAAQS. This report serves as documentation of the methodology for the PM hot-spot analysis.

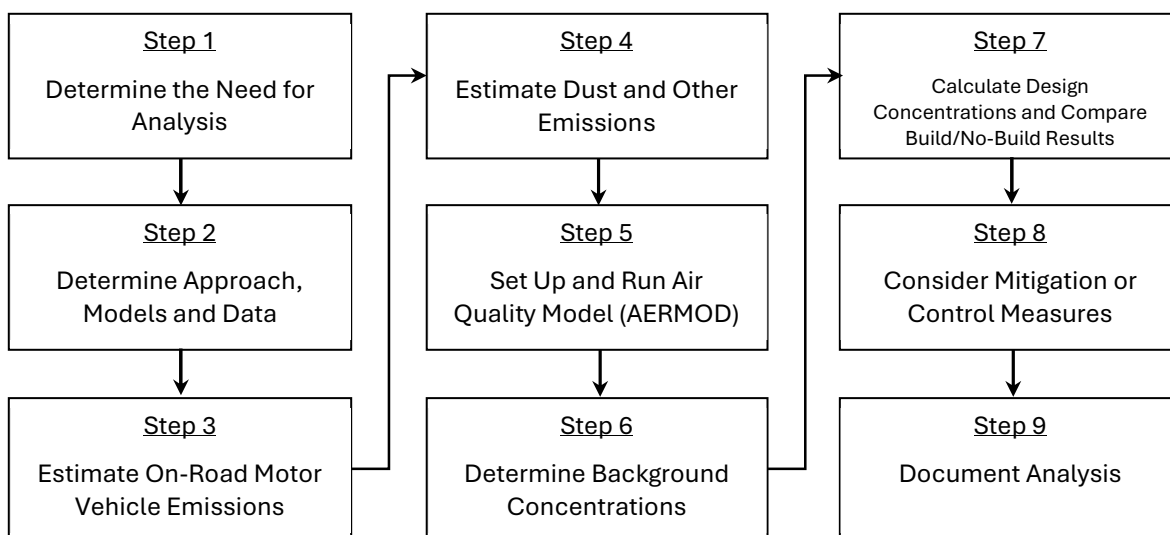


Figure 19: EPA's PM Hot-spot Analysis Process

Determine Need for Hotspot Analysis

Section 93.109(b) of the conformity rule outlines the requirements for project-level conformity determinations. A PM₁₀ hot-spot analysis is required for projects of local air quality concern, per Section 93.123(b)(1). The need for a quantitative PM₁₀ analysis for the project was discussed by the interagency consultation group. The group agreed that this project is considered a Project of Air Quality Concern (POAQC) due to the increase in diesel truck traffic to the area and therefore a project level hot-spot analysis would be required for the project.

Determine Approach, Model, and Data

The PM₁₀ hot-spot analysis methodology and modeling files were presented to the interagency consultation group through multiple meetings over a period ending on September 6, 2024. Based on guidance in Section 3.3.2 of EPA's PM Hot-Spot Guidance document,¹ and in consultation with

FHWA, EPA, and other agencies, the intersection of James Ranch Road and SR 80 was chosen for the purpose of demonstrating conformity. This intersection represents the location with the largest traffic volumes, lowest speeds due to the installation of a traffic signal, and most overall delay along the project. While the focus is on the intersection, the limits of the Connector Road/James Ranch Road extend to the entrance to the proposed LPOE and the limits of SR 80 extend roughly ½ mile in each direction.

The MOVES on-road vehicle emissions model requires a variety of data to accurately develop emission factors for project. This data was gathered from the Paul Spur/Douglas Regional Conformity Analysis and the Final Traffic Report for the project and formed into input files for use in the MOVES software.

The AERMOD dispersion model requires meteorological data to predict pollutant concentrations at receptors within the project area. Five years of meteorological data files were provided by Arizona DEQ based on observed surface data and upper air data from Bisbee-Douglas Airport for the 5-year period from 2015 through 2019. This meteorological data was determined to be representative of the project area conditions because of its proximity to the project site (7 miles), similarity in land use and terrain, and the data meets the completeness requirements of Section 5.3.2 of EPA's *Meteorological Monitoring Guidance for Regulatory Modeling Applications*.¹⁹ Information from ADEQ that describes the processing steps and summarizes completeness determination is included in Appendix A.

All model inputs and assumptions are included in Appendix A.

Estimate On-Road Vehicle Emissions

On-road vehicle emissions were estimated using EPA's MOVES3.1 software. MOVES uses a variety of input files to determine project level emissions. These input files were developed using different sources including data from the Paul Spur/Douglas Regional Conformity Analysis, the Final Traffic Report for the Connector Road, and default data from MOVES. Vehicle age distribution and meteorological data were developed during the Regional Conformity Analysis and were carried over into this analysis. Default fuel specifications from MOVES were used in the absence of any additional local data. MOVES requires link specific data to estimate emissions at the project level. The intersection of the Connector Road/James Ranch Road and SR 80 was broken down into 22 links depending on movement (left turn, through, right turn) and link type (acceleration, cruise, queue). Link specific information was derived from a combination of data from the Traffic Report for the project and information from the Regional Conformity Analysis. Link information included link length, total volume, average speed, and road grade. A unique vehicle mix was also calculated for each link based on the volumes of three vehicle types (passenger, medium vehicle, and heavy vehicle) provided in the traffic data. Within each of the vehicle types, the volumes were allocated to the associated MOVES source types using the distribution of vehicle population from the Regional Conformity Analysis. Each input is described further in Appendix A and the Traffic Report is provided in Appendix B.

PM₁₀ emission factors were developed for an analysis year of 2050, which represents the year with the highest vehicle volume along the Connector Road due to the proposed LPOE and potential development in the area. Therefore, 2050 will also contain the highest levels of road dust, which is the largest contributor to PM₁₀ emissions. PM₁₀ emissions also vary by time of day and month. The Traffic Report contains volumes for the AM and PM peak hours but does not have volumes for midday

¹⁹ U.S. EPA, *Meteorological Monitoring Guidance for Regulatory Modeling Applications*, February 2002. https://www.epa.gov/sites/default/files/2020-10/documents/mmgrma_0.pdf, accessed June 2024.

or overnight time periods. Therefore, to be conservative, the AM volumes were used for both the midday and overnight time periods. Speed data was calculated for each link based on the link's characteristics, including speed limits, average acceleration rate, and factors related to proposed signal timing at the intersection. The Traffic Report did not associate any seasonality with the developed traffic data. A preliminary default MOVES model run was conducted to determine the month of highest emissions rates from each of the four seasons (January, April, July, and October), based on the seasonal fuel specifications. From this model run, the highest emissions occurred in July. MOVES was then run for July for each of the four time periods (AM peak, midday, PM peak, and overnight). These runs resulted in each link having a set of 4 emission factors in units of grams per hour for the year 2050. The project links are shown in *Figure 20* and *Figure 21*.

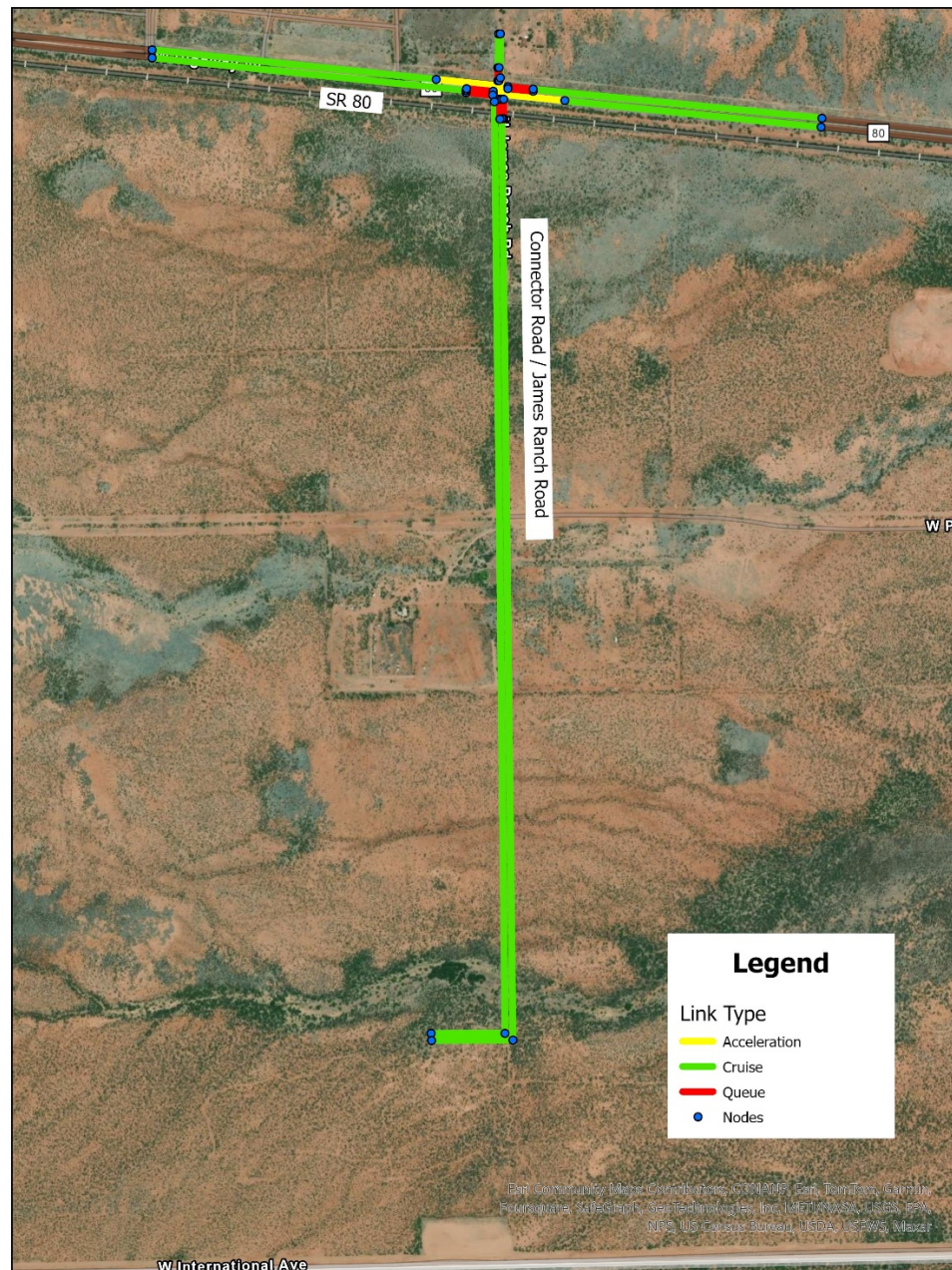


Figure 20: Project Links

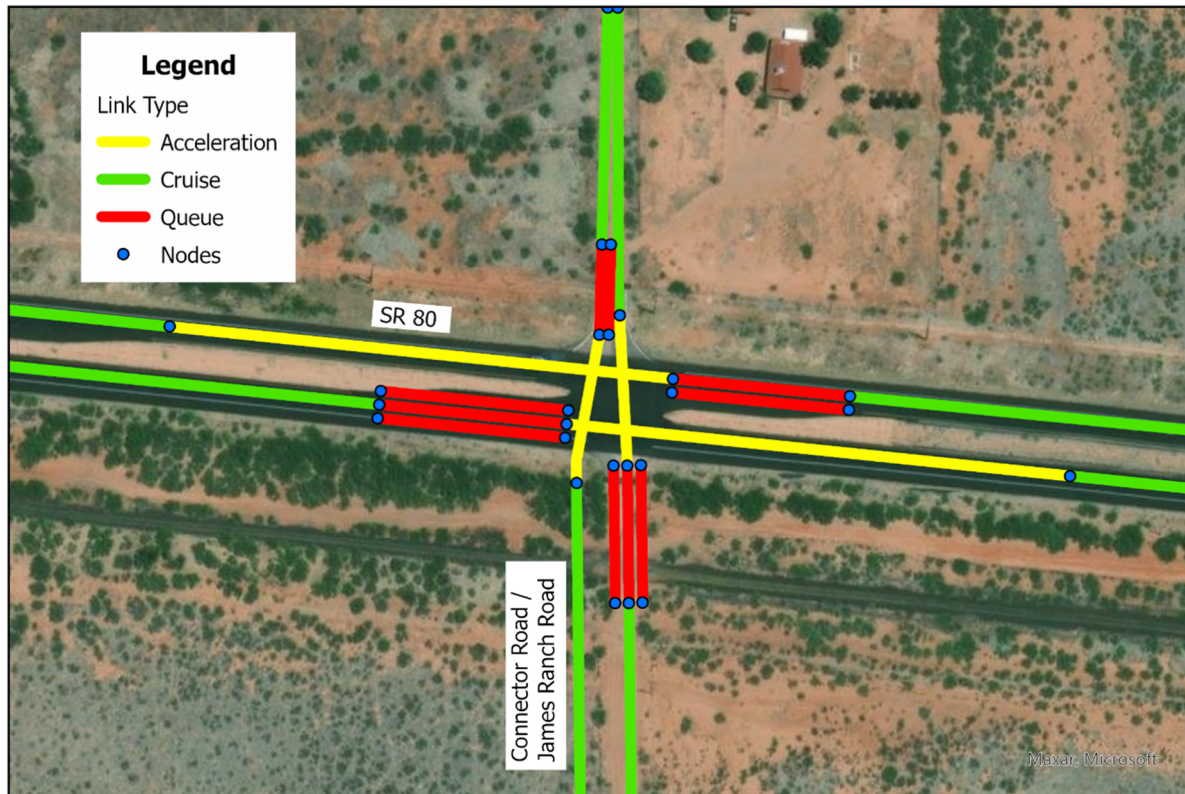


Figure 21: Project Links Intersection Zoom

Estimate Emissions from Road Dust, Construction and Additional Sources

Re-entrained road dust must be included in all PM_{10} hot-spot analyses. Section 13.2.1 of AP-42 provides a method for estimating emissions of re-entrained road dust using local values for precipitation, average vehicle weight, and silt loading.²⁰ In the Regional Conformity Analysis, re-entrained road dust was calculated based on factors supplied by the 2020 National Emissions Inventory (NEI). The 2020 NEI documentation provides a table for silt loading based on FHWA road type and average daily traffic volumes, as well as a table for average vehicle weights by FHWA vehicle class.²¹ Using this same methodology, emission factors for road dust were developed for each segment of the Connector Road/James Ranch Road and SR 80 intersection. This data is provided below in *Table 2*.

²⁰ https://www.epa.gov/sites/default/files/2020-10/documents/13.2.1_paved_roads.pdf

²¹ https://www.epa.gov/system/files/documents/2023-03/NEI2020_TSD_Section23_Dust_PavedRoads.pdf

Table 2: Road Dust Emissions Factors

Facility	ADT	K	W (tons)	sL (g/m ²)	E (g/VMT)
SR 80 (West of James Ranch Rd)	23,168	1	4.56	0.015	0.102857
SR 80 (East of James Ranch Rd)	49,580	1	5.17	0.015	0.117018
James Ranch Rd (North of SR 80)	1,440	1	1.99	0.2	0.467048
James Ranch Rd (South of SR 80)	38,676	1	6.20	0.03	0.264481

Emission factors for road dust were added to the emission factors generated for each link by MOVES for use in the AERMOD dispersion model.

Construction emissions were not included because construction will not occur at any individual location for more than five years. EPA guidance requires nearby sources of PM₁₀ emissions to be included in air quality modeling when those sources are not appropriately reflected in the background data or would be affected by the project. The potential PM₁₀ impacts associated with the idling activities at the LPOE were analyzed in detail in the *PM₁₀ Hot Spot Air Quality Memorandum – City of Douglas Commercial Land Port of Entry (POE)* (Kimley-Horn, 2024), which is provided in Appendix E. *Figure 22* displays the PM₁₀ concentrations at the LPOE respective to the proposed Connector Road with the receptor with the 6th highest concentration denoted by a star. From this gradient, the total concentrations for the LPOE have a de minimis impact to the background emissions along the proposed Connector Road. The maximum predicted 24-hour concentrations for this receptor and the receptor at the driveway from the LPOE to the proposed Connector Road are shown in *Table 3* relative to the background concentration in the area.

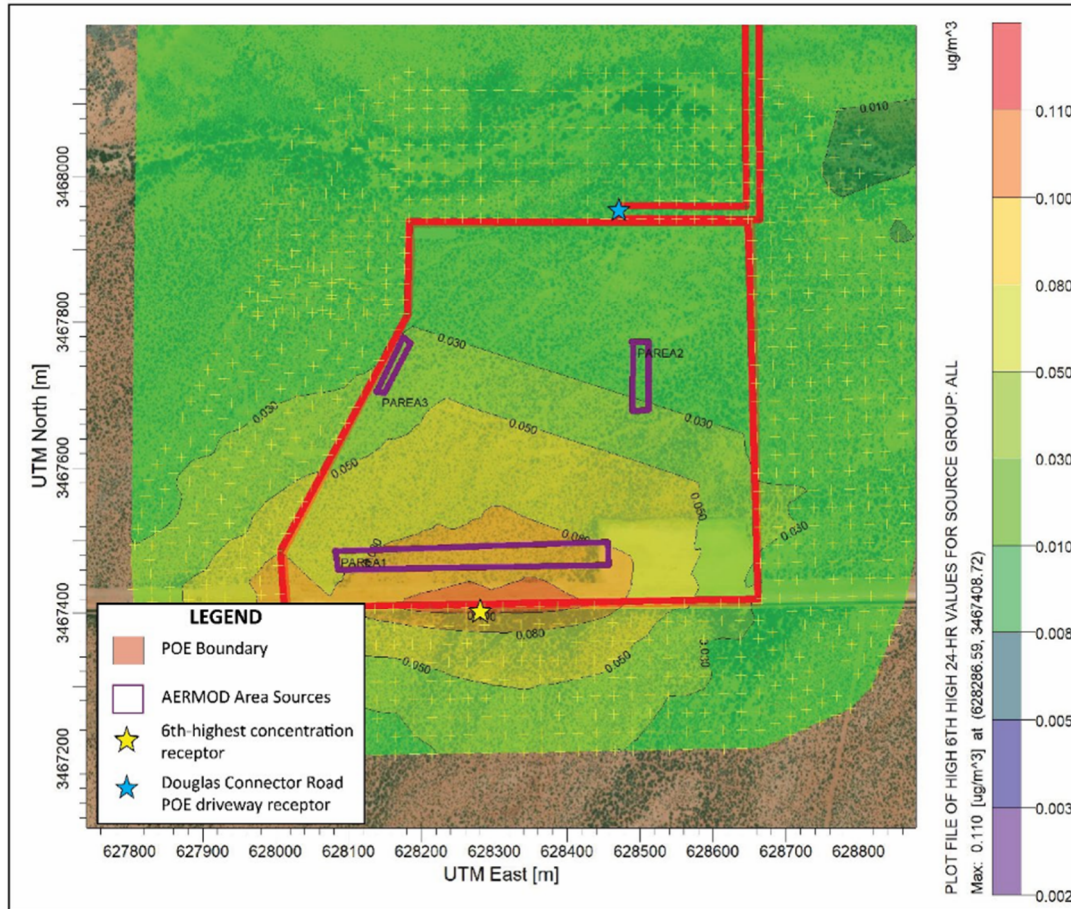


Figure 22: PM10 Concentrations at the LPOE

Table 3: Predicted PM10 Concentrations from the LPOE

Location	6 th Highest PM ¹⁰ Value (µg/m ³)	Background PM ¹⁰ Value (µg/m ³) ¹	Total Concentration (µg/m ³)
6 th -highest maximum concentration receptor	0.11	107	107.11
Driveway at the Proposed Connector Road receptor	0.02	107	107.02

Notes:

1. Background values taken from the fourth highest concentration from three years of monitoring data from the Douglas Red Cross monitor (discussed further in this section).
2. PM₁₀ concentrations at the receptors decrease with increasing distance from the source, as PM₁₀ disperses and dilutes with distance.

It is assumed that PM₁₀ concentrations due to any other nearby emissions sources are included in the ambient monitor values used for background concentrations. In addition, this project is not expected to result in changes to emissions from nearby sources.

Set Up and Run Air Dispersion Model (AERMOD)

EPA's AERMOD (version 23132) air dispersion model was used to estimate concentrations of PM₁₀ due to the project. The model uses traffic data, emission factor data, and meteorological data to estimate ground-level concentrations of PM₁₀ at a series of receptors. The model setup included a series of sources representing the roadway links provided by MOVES. The links were represented in AERMOD using a series of line sources. Link specific inputs included source location, source length and width, emission rate, release height, and initial vertical dimension.

AERMOD was run using five years of meteorological data provided by ADEQ, based on observed surface data and upper air data from Bisbee-Douglas Airport for the 5-year period from 2015 through 2019. This data meets EPA completeness criteria for dispersion modeling and is considered representative of the project area.

Receptors were placed to estimate the highest concentrations of PM₁₀ in the study area to determine any possible violations of the NAAQS. The highest concentrations are expected to occur near the links with the highest estimated daily volume. Receptors were placed starting five meters from the roadway edge, extending up to 105 meters away with a spacing of 25 meters. Receptors were placed at a height of 1.8 meters. Locations where the public does not have access cannot be determined at this time because the proposed roadway is located in a rural, undeveloped area. As a result, receptors were placed at all possible locations. The receptor grid is shown below in *Figure 23*.

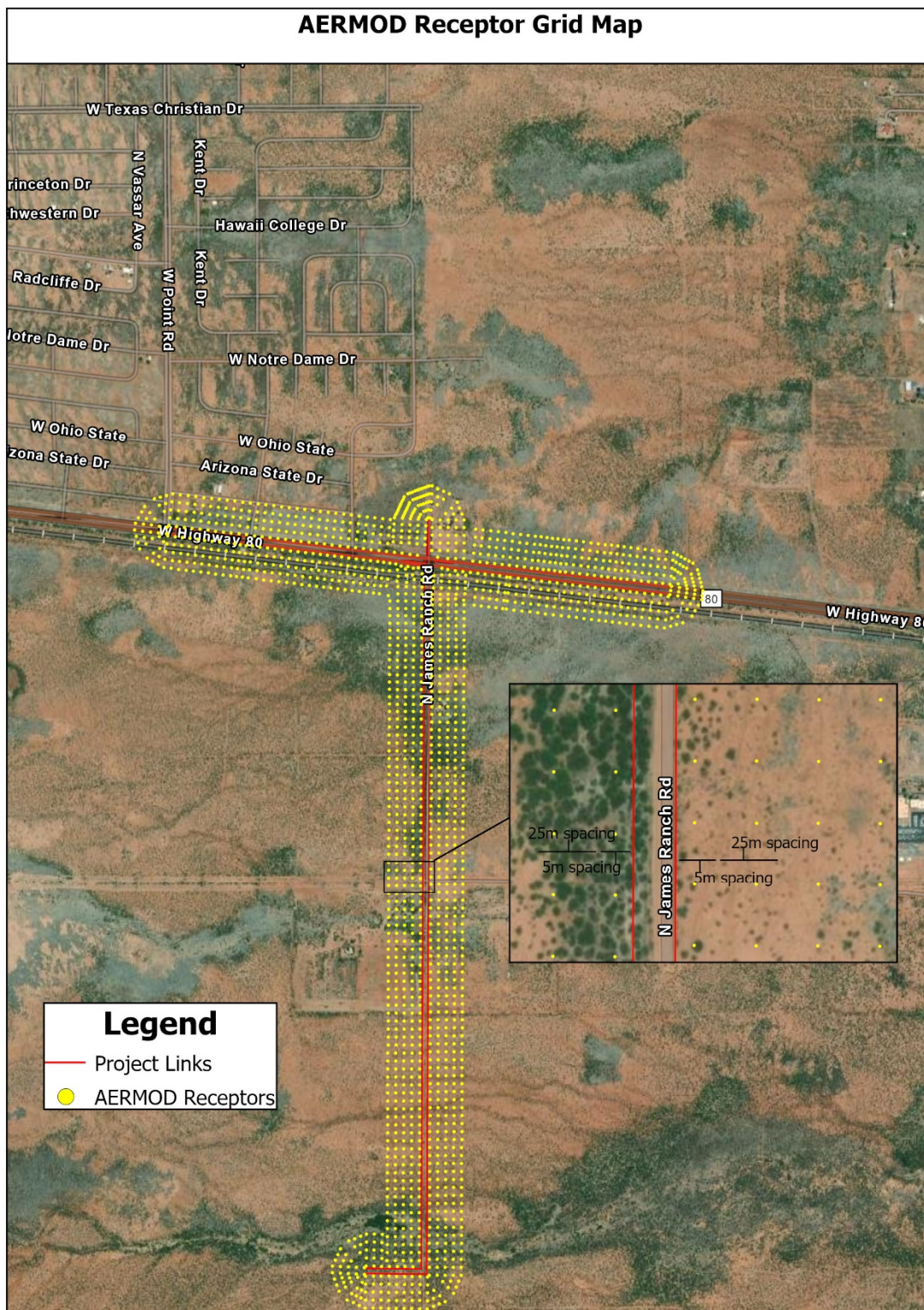


Figure 23: AERMOD Receptor Locations

Determine Background Concentrations

The Arizona Department of Environmental Quality (ADEQ) maintains two active air quality monitoring stations in the Paul Spur/Douglas PM₁₀ nonattainment area:

- AQS Site ID 04-003-0011 – Paul Spur Chemical Lime Plant
- AQS Site ID 04-003-1005 – Douglas Red Cross

The locations of the two PM₁₀ monitoring stations are shown in Figure 24. *Table 4* shows the 24-hour PM₁₀ monitoring data for the last three full years for 2021 through 2023.



Figure 24: PM₁₀ Air Quality Monitor Locations

Table 4: Paul Spur/Douglas PM₁₀ Monitoring Data (2021-2023)²²

Year	PM ₁₀ Maximum Concentration (µg/m ³)		Number of Days Exceeding NAAQS	
	Paul Spur	Douglas	Paul Spur	Douglas
2021	161	107	1	0
2022	91	130	0	0
2023	99	155	0	1

²² <https://www.epa.gov/outdoor-air-quality-data/interactive-map-air-quality-monitors>

Annual mean PM₁₀ concentrations for both the Paul Spur Chemical Lime Plant (ID 04-003-0011) and the Douglas Red Cross (ID 04-003-1005) monitoring stations have followed a similar trend with concentrations decreasing from 2021 to 2022 and then increasing slightly from 2022 to 2023. Each monitoring station had one day of exceedance of the National Ambient Air Quality Standards (NAAQS) for PM₁₀ over the three-year period with max concentrations of 161 µg/m³ at the Paul Spur station in 2021 and 155 µg/m³ at the Douglas Red Cross station in 2023.

The fourth highest concentrations from three years of monitoring data for each monitor is 107 µg/m³ for the Douglas Red Cross monitor and 93 µg/m³ for the Paul Spur monitor. The proposed Connector Road is roughly halfway between the two monitors, so to be conservative, the fourth highest concentration at the Douglas Red Cross monitor was chosen as the background concentration and approved during the interagency consultation process.

The background value was added to the AERMOD modeled values for comparison to the PM₁₀ NAAQS of 150 µg/m³. The background values are conservative, because it is expected that ambient PM concentrations will be lower in future years as a result of the State Implementation Plan currently in development and the general trend in declining vehicle emissions due to technological advances. It is assumed that emissions from other nearby sources are already included in the ambient monitoring data.

Calculate Design Values and Determine Conformity

The model results were added to the background concentrations to calculate the design values. To determine the 24-hour PM₁₀ design value, the following steps were used, as outlined in the guidance:

1. From the air quality modeling results from the build scenario, identify the sixth highest 24-hour concentration for each receptor. AERMOD output provides the sixth-highest modeled concentration from the 5-year period for each receptor.
2. Identify the receptor with the highest sixth-highest 24-hour concentration.
3. Identify the appropriate 24-hour background concentration from the three most recent years of air quality monitoring data. This value is 135 µg/m³, as described above.
4. For the receptor identified in Step 2, add the sixth-highest 24-hour modeled concentration to the appropriate 24-hour background concentration (from Step 3).
5. Round to the nearest 10 µg/m³. The result is the highest 24-hour PM₁₀ design value in the build scenario. The final results are summarized in *Table 5*.

Consider Mitigation or Control Measures

If the total concentration of the highest 24-hour PM₁₀ design value is greater than the PM₁₀ NAAQS, mitigation or control measures would need to be considered to reduce emissions in the project area.

Document Analysis

This Air Quality Report documents the PM hot-spot results from the project.

3.2 PM₁₀ Modeling Results

The modeled concentrations, including background, were compared to the PM₁₀ NAAQS. The receptor with the 6th-highest maximum concentration was located along the proposed Douglas Connector Road. *Figure 25* shows the receptor concentrations at the intersection with the maximum value denoted by a star.

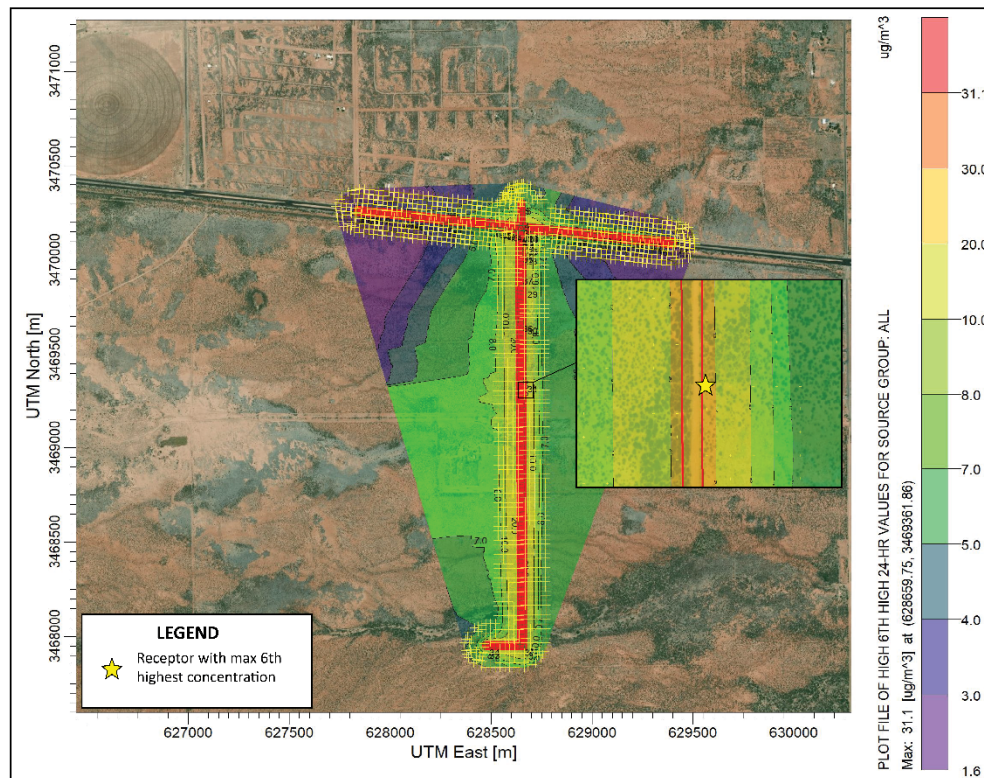


Figure 25: AERMOD PM₁₀ Model Results

Table 5 presents the values used to determine the maximum predicted 24-hour PM₁₀ concentrations for the intersection. The total concentrations for the project do not exceed the PM₁₀ NAAQS when rounded to the nearest 10 $\mu\text{g}/\text{m}^3$. Therefore, the project meets conformity requirements. Mitigation or control measures to reduce emissions in the project area do not need to be considered by the project sponsors. Modeling files are available by request.

Table 5: Predicted Project PM₁₀ Concentration

Modeled Group	6 th Highest PM ₁₀ Value ($\mu\text{g}/\text{m}^3$)	Background PM ₁₀ Value ¹ ($\mu\text{g}/\text{m}^3$)	Total Concentration ($\mu\text{g}/\text{m}^3$)	Total Concentration Rounded to the nearest 10 $\mu\text{g}/\text{m}^3$	PM ₁₀ NAAQS ($\mu\text{g}/\text{m}^3$)
All Project Level Links	31.06	107	138.06	140	150

Notes:

1. Background values taken from the fourth high concentration from three years of monitoring data from the Douglas Red Cross monitor.

3.3 Conformity

Section 176c of the CAA requires that transportation projects conform to the approved air quality State Implementation Plan (SIP) for meeting federal air quality standards. Conformity requirements were made substantially more rigorous in the CAA Amendments. The conformity determinations for federal actions related to transportation projects must meet the requirements of 40 CFR Parts 51 and 93. This project is not likely to cause or contribute to the severity or number of violations of the NAAQS. As an isolated rural nonattainment area, the Paul Spur/Douglas planning area is subject to

a regional air quality conformity process. The planned Douglas Commercial Port of Entry Connector Road is likely to be classified as regionally significant and is not within a conforming Transportation Improvement Program (TIP). This project is included in the Southeastern Arizona Governments Organization (SEAGO) FY 2024-2028 Transportation Improvement Program.

3.4 Public Involvement

Public meetings were held on April 27 and August 3, 2023, to provide information on the project's purpose and need and to present the alternatives being evaluated, respectively. The study timeline of 24 months was also presented to inform the meeting attendees of how long it would take to prepare a Design Concept Report and an Environmental Assessment to gain project approval by ADOT. Approximately 75 comments were received at these meetings. No comments were received regarding air quality.

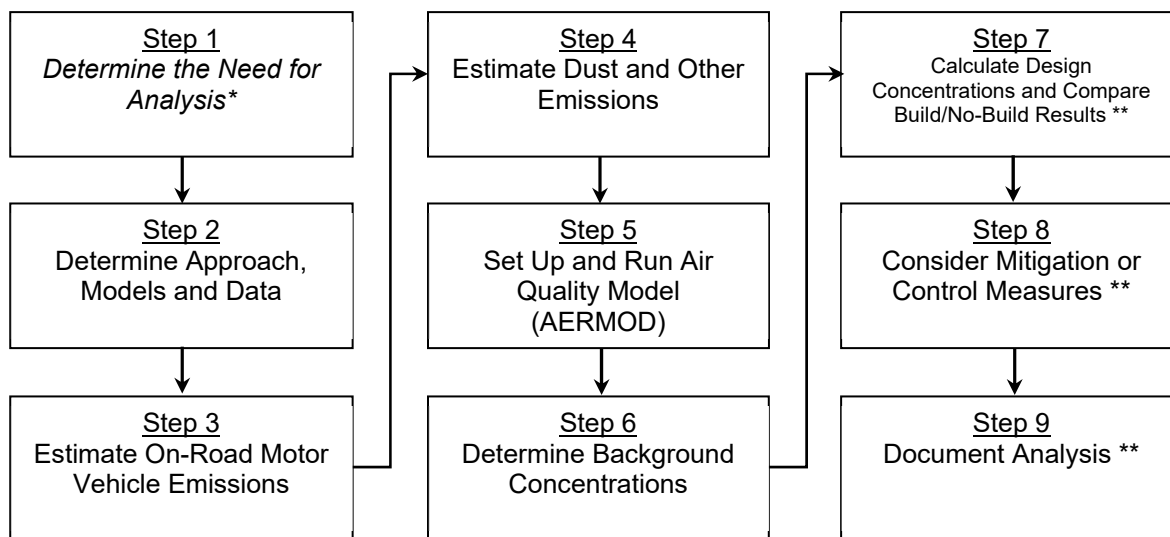
The Draft Air Quality Report was published on ADOT's website on MONTH DAY, YEAR, with the latest modeling assumptions updated on MONTH DAY, with no additional modeling change. Comments from the Interagency Consultation group and the public are welcome through MONTH DAY, YEAR. The Interagency Consultation group was notified by email with a link to the Draft Air Quality Report for their review. No comments or requests for additional information were received from the public. Interagency Consultation Documentation is available in Appendix A.

**Appendix A: Project Level PM Quantitative Hot-Spot Analysis -
Consultation Document for Project of Air Quality Concern**

Project Level PM Quantitative Hot-Spot Analysis – Consultation Document for Project of Air Quality Concern

Completing a Particulate Matter (PM) Hot-Spot Analysis

The general steps required to complete a quantitative PM hot-spot analysis are outlined below and described in detail in the EPA Office of Transportation and Air Quality guidance document “Transportation Conformity Guidance for Quantitative Hot-spot Analyses in PM_{2.5} and PM₁₀ Nonattainment and Maintenance Areas” EPA-420-B-15-084, November 2015.



* Described in Attachment A (Air Quality Concern Questionnaire).

** These Steps will be described and documented in a final air quality analysis report.

Step 2: Determine the Approach, Models, and Data

- Describe the project area (area substantially affected by the project, 58 FR 62212) and emission sources.
- Determine general approach and analysis year(s) – year(s) of peak emissions during the time frame of the transportation plan (69 FR 40056).
- Determine National Ambient Air Quality Standards (NAAQS) and PM types to be evaluated.
- Select emissions and dispersion models and methods to be used.
- Obtain project-specific data (e.g., fleet mix, peak-hour volumes and average speed).

Step 3: Estimate On-Road Motor Vehicle Emissions

- Estimate on-road motor vehicle emissions using MOVES.

Step 4: Estimate Dust and Other Emissions

- Estimate road dust emissions using AP-42 Paved Roads.
- Do emissions from other sources (e.g., locomotives) need to be considered?

Step 5: Set Up and Run Air Quality Model (AERMOD)

- a. Obtain and input required site data (e.g., meteorological).
- b. Input MOVES and AP-42 outputs (emission factors).
- c. Determine number and location of receptors, roadway links, and signal timing.
- d. Run air quality dispersion model and obtain concentration results.

Step 6: Determine Background Concentrations

- a. Determine background concentrations from nearby and other emission sources excluding the emissions from the project itself.

Step 7: Calculate Design Concentrations and Compare Build/No-Build Results

- a. Add step 5 results to background concentrations to obtain values for the Build scenario.
- b. Determine if the design values allow the project to conform.

Step 8: Consider Mitigation or Control Measures

- a. Consider measures to reduce emissions and redo the analysis. If mitigation measures are required for project conformity, they must be included in the applicable SIP and be enforceable.
- b. Determine if the design values from allow the project to conform after implementing mitigation or control measures.

Step 9: Document Analysis

- a. Determine if the project conforms or not based on the results of step 7 or step 8.
To support the conclusion that a project meets conformity under 40 CFR 93.116 and 93.123, at a minimum the documentation will include:
 - Description of proposed project, when it is expected to open, and projected travel activity data.
 - Analysis year(s) examined and factors considering in determining year(s) of peak emissions.
 - Emissions modeling data, model used with inputs and results, and how characterization of project links.
 - Model inputs and results for road dust, construction emissions, and emissions from other source if needed.
 - Air Quality modeling data, included model used, inputs and results and receptors.
 - How background concentrations were determined.
 - Any mitigation and control measures implemented, including public involvement or consultation if needed.
 - How interagency and public participation requirements were met.
 - Conclusion that the proposed project meets conformity requirements.
 - Sources of data for modeling.

Interagency Consultation

ADOT will circulate the following Tables along with the *Project Level Conformity – Particulate Matter Project of Air Quality Concern Questionnaire* to describe in detail how the steps listed in EPA hot spot guidance will be followed. It is requested that consulted parties provide comments or questions on the methods, models and assumptions within 30 business days, a non-response will be interpreted to mean that the party concurs with the planning assumptions as describe in the Table. Table 1 includes ADOT's recommended methods, models, and assumptions, while Table 2 displays proposed inputs, parameters, and data sources for the project.

Table 1. Methods, Models and Assumptions

Estimate On-Road Motor Vehicle Emissions (Step 3) – Modeling highways and/or intersections for PM10 (Contact ADOT if modeling off-network data such as terminals and parking lots or performing a PM2.5 analysis)		
MOVES3.1	Description	Reference
Scale	<i>Onroad, Project Scale and Inventory</i>	EPA Hot Spot Guidance Section 4.4.2
Time Spans	<i>4-weekday runs for each of the following months January (Quarter 1), April (Quarter 2), July (Quarter 3); October (Quarter 4) for each year. Each of these 4 runs will further be split by Morning peak hours, Midday Emissions, Evening Peak and Overnight hours as defined by TDM model.</i>	EPA Hot Spot Guidance Sections 2.8, 4.3 & 4.4.3
Geographic Bounds	<i>County (If a project spans multiple counties, see the EPA Guidance)</i>	EPA Hot Spot Guidance Section 4.4.4
Onroad Vehicles	<i>All Fuels and Source Use Types will be selected.</i>	EPA Hot Spot Guidance Section 4.4.5
Road Type	<i>Based on the project location</i>	EPA Hot Spot Guidance Section 4.4.6
Pollutants and Processes	<i>Primary Exhaust PM10-Total(for Running Exhaust and Crankcase Running Exhaust), Break Wear Particulate, Tire Wear Particulate</i>	EPA Hot Spot Guidance Sections 2.5 & 4.4.7
General Output and Output Emissions Detail	<i>Database will be created, Grams, Joules, Miles, Distance Traveled, Population will be selected. Output Aggregation is set to Hour and Link by default and the “for All Vehicle/Equipment Categories” and “Onroad” selections are optional in the Output Emissions Detail. After running MOVES3.1 for a particular hour/day/month scenario, the PM10_Grams_Per_Veh_Hour script (for Inventory mode) can be run on the output database.</i>	EPA Hot Spot Guidance Section 4.4.8, 4.4.9 & 4.6
Create Input Database	<i>Input database will be created and modified for Project level using required Regional Inputs from latest Regional Conformity Analysis.</i>	EPA Hot Spot Guidance Section 4.4.10 and See Project Data Manager below
Project Data Manager	<i>Database will be created and MOVES3.1 templates will be created to include local project data and information provided by xx, e.g., Fuel, Age Distribution, Meteorology Data, to be consistent with the regional model. Links and Link Source Type will be specific to project as provided by the traffic study, any missing information will use default MOVES3.1 data.</i>	EPA Hot Spot Guidance Sections 4.5 & Appendix D
Meteorology	<i>Same for build and no-build scenarios. A minimum of four hours (AM, PM, MD & ON), for one day (weekday) and for January, April, July and October is required. May use the County meteorology file for the county</i>	EPA Hot Spot Guidance Section 4.5.1

	<i>used in the latest SIP or regional conformity analysis.</i>	
Age Distribution	<i>Same for build and no-build scenarios, unless something about the project would change them.</i>	EPA Hot Spot Guidance Section 4.5.2
Fuel	<i>Same for build and no-build scenarios. Fuel files should be consistent with those used in the latest SIP or regional conformity analysis if local information is available. Otherwise, MOVES default fuel supply and formulation information can be used.</i>	EPA Hot Spot Guidance Section 4.5.3, PM hot-spot training slides Module 2
I/M Programs	<i>No impact on PM emissions.</i>	EPA Hot Spot Guidance Section 4.5.4
Retrofit Data	<i>If necessary. For example, a bus terminal project might include plans to mitigate emissions by retrofitting the bus fleet.</i>	Project specific modeling EPA Hot Spot Guidance Section 4.5.5
Links	<i>Unique inputs needed for each run. Requires information on each link's length (in miles), traffic volume (vehicle per hour), average speed (miles per hour) and road grade (percent).</i>	EPA Hot Spot Guidance Section 4.5.6 & Appendix D
Link Source Types	<i>Unique inputs needed for each run. Project-specific data are preferred. If the source type distribution can be represented by that of the regional fleet, the data used in the latest regional emissions analysis can be provided.</i>	EPA Hot Spot Guidance Section 4.5.7
Link Drive Schedules, Operating Mode Distribution	<i>Unique inputs needed for each run. Three options are available: 1. Provide average speed and road type through the Links Importer; 2. Provide a link drive schedule using the Link Drive Schedule Importer; 3. Provide a detailed operation distribution for the link.</i>	EPA Hot Spot Guidance Section 4.5.8
Off-Network, Hotelling, Generic	<i>If necessary. For example, a project analysis includes areas where vehicles are not driving on the project links, but still contributing to the project's emissions.</i>	EPA Hot Spot Guidance Section 4.5.9
Estimate Dust and Other Emissions (Step 4) (AP-42 emission factors below should be based on SIP or Regional Conformity Analysis provided by ADEQ, MAG, PAG or YMPO depending on the project's location)		
AP-42, Fifth Edition, 2011	Description	Reference
Average Weight Vehicles	<i>All roads xx Ton, Freeway xx Ton, Arterials xx Ton</i>	Source of Data TIP or RTP, Regional Conformity Analysis
Silt Loading	<i>Section 13.2.1 Paved Roads from AP 42 will be used, consistent with the Regional analysis from xx. Emission factors for road and construction dust should be added to the emission factors generated for each link by MOVES3.1. Ex. Silt loading – Freeways .02 g/m², Arterials >10,000 ADT .067g/m², Low traffic roads <10,000 ADT .23g/m².</i>	EPA Hot Spot Guidance Section 6, When estimating emissions of re-entrained road dust from paved roads, site-specific silt loading data must be consistent with the data used for the project's county in the regional emissions analysis (40 CFR 93.123(c)(3)).

Construction Dust	<i>If Construction Dust is temporary, it will not be included. If there are other sources (e.g., locomotives), they need to be considered.</i>	EPA Hot Spot Guidance Section 6.5
Precipitation	<i>In xxx SIP/Regional Conformity used average of xx days with at least .01 inch of precipitation County</i>	Source of Data TIP or RTP, Regional Conformity Analysis, SIP
Set Up and Run Air Quality Model (AERMOD) (Step 5)		
AERMOD v.23132	Description	Reference
Model Setup (CO Pathway)	<i>Control Pathway defines the primary model settings.</i>	EPA Hot Spot Guidance Section 7.1, 7.2 & Appendix J, AERMOD User's Guide Section 2.3.2 & 3.2
TITLEONE	<i>Model title</i>	
MODELOPT	<i>CONC FLAT (Use IAC if modeling nearby elevated source)</i>	Modeling Concentrations and Flat Terrain
AVERTIME	24	Average across each 24-hour period from the available met data
URBANOPT	<i>Population for Urban Area</i>	
FLAGPOLE	1.8	
POLLUTID	PM10	
Source Types and Characters (SO Pathway)	<i>For highway and interaction sources, characterize area sources with the LINE source keyword (Use IAC if volume sources are needed).</i>	EPA Hot Spot Guidance Section 7.3, 7.4 & Appendix J.2, J.3, AERMOD User's Guide Section 2.3.3 & 3.3
LOCATION	<i>Srcid Srctyp (LINE)</i>	
SRCPARAM	<i>Srcid Lnemis Relhgt Width Szinit</i>	LINE Source parameters See EPA Hot Spot Guidance Appendix J.3.1
URBANSRC	<i>Srcid</i>	Urban source IDs
EMISFACT	<i>Emission rate=1, Use SEASHR</i>	Total 16 MOVES run=4 seasons x 4 time periods to 96 factors (4 seasons/24 hours) See PM hot-spot training slides (FHWA, 2022)
SRCGROUP	<i>GroupID or All</i>	
Meteorological Data (ME Pathway)	<i>The meteorological data will be based on the pre-processed met files from ADEQ or the met files produced by AERMET program.</i>	EPA Hot Spot Guidance Section 7.5, Appendix J.4, AERMOD User's Guide Section 2.3.5 & 3.5
SURFFILE	<i>Surface file name</i>	*.sfc
PROFFILE	<i>Profile (upper air) file name</i>	*.pfl
SURFDATA	<i>Surface data station</i>	
UAIRDATA	<i>Upper air data station</i>	
PROFBASE	<i>Met data station elevation</i>	
Run Met Pre-Processor	<i>If necessary</i>	AERMET User's Guide (for AERMOD)
Urban or Rural Sources	<i>Specifications for URBANOPT (CO Pathway) and URBANSRC (SO Pathway)</i>	EPA Hot Spot Guidance Section 7.5.5 & Appendix J.4, AERMOD Implementation Guide,

		Section 7.2.3 of Appendix W to 40 CFR Part 51
Receptors (RE Pathway)	<i>Receptors should begin 5 m from roadway edge, extending up to 105 m (or further if needed). Spacing of 25 m is typically sufficient.</i>	EPA Hot Spot Guidance Section 7.6, AERMOD User's Guide Section 2.3.4 & 3.4, Section 7.2.2 of Appendix W to 40 CFR Part 51, See PM hot-spot training slides
DISCCART	X Y (Z)	Z is optional if FLAGPOLE is already defined in CO Pathway.
GRIDCART	<i>Use a 3rd party program if available.</i>	e.g., AERMOD View
Output (OU Pathway)	<i>PLOTFILE and/or POSTFILE will be generated if necessary.</i>	EPA Hot Spot Guidance Appendix J.6, AERMOD User's Guide Section 2.3.6 & 3.7
RECTABLE	24 6th	Since PM should be one or less exceedance per year, with 5 years of met data, the 6 th highest concentration at each receptor
PLOTFILE	<i>Optional</i>	
POSTFILE	<i>Optional</i>	
Model Runs	<i>Use AERMOD User's Guide Appendix B to decode and correct errors.</i>	EPA Hot Spot Guidance Section 7.7, AERMOD User's Guide Section 2.3.7, 2.3.8, 3.8 & Appendix B
Determine Background Concentrations (Step 6)		
Source Type	Description	Reference
Nearby Sources	<i>If necessary</i>	EPA Hot Spot Guidance Section 8.2
Other Sources (Ambient Monitoring Data)	<i>Using a Single Monitor (Most likely option) or Interpolating Between Several Monitors. When using a single monitor: Select a monitor with similar land use to the project, upwind from project, and isn't impacted by Exceptional Events. Three years of monitoring data (20xx-20xx) using the 4th highest readings based on total number of sampling days of 1076 days, the 4th highest monitor value over these three years is xxx. To estimate the sixth-highest concentration, for each receptor, the six highest 24-hour concentrations from each quarter and year of meteorological data will be arrayed together and ranked, then added to the xxx monitor value.</i>	EPA Hot Spot Guidance Section 8.3, PM hot-spot training slides Module 5 & 6

Table 2. Proposed Inputs, Parameters and Data Sources

Estimate On-Road Motor Vehicle Emissions (Step 3)		
MOVES3.1	Input	Data Source/Detail
Scale	Onroad, Project Scale and Inventory	Paul Spur/Douglas Regional Conformity Data (April 2024)
Time Spans	July 2050, 4 runs	2050 represents the year with the highest vehicle volume along the Connector Road due to the proposed POE and potential development in the area. Therefore, 2050 will also contain the highest levels of road dust, which is the largest contributor to PM10 emissions. Because there is no seasonality associated with the traffic data developed in the Traffic Study, preliminary runs were conducted for each season (Jan, Apr, July & Oct) with July having the highest emissions. 4 weekday time periods (6-9AM, 9AM-4PM, 4-7PM & 7PM-6AM) will be analyzed for July 2050.
Geographic Bounds	Cochise County, Arizona	EPA Hot Spot Guidance Section 4.4.4
Onroad Vehicles	All Fuels and Source Use Types will be selected.	EPA Hot Spot Guidance Section 4.4.5
Road Type	Rural Unrestricted Access	EPA Hot Spot Guidance Section 4.4.6
Pollutants and Processes	Primary Exhaust PM10-Total (for Running Exhaust and Crankcase Running Exhaust), Break Wear Particulate, Tire Wear Particulate	EPA Hot Spot Guidance Sections 2.5 & 4.4.7
General Output and Output Emissions Detail	Database will be created, Grams, Joules, Miles, Distance Traveled, Population will be selected. Output Aggregation is set to Hour and Link by default and Source Use Type is selected in the "Onroad" selection. All other items in the "for All Vehicle/Equipment Categories" and "Onroad" selections are left unchecked in the Output Emissions Detail. After running MOVES3.1 for a particular hour/day/month scenario, the PM10_Grams_Per_Veh_Hour script can be run on the output database.	EPA Hot Spot Guidance Section 4.4.8, 4.4.9 & 4.6
Create Input Database	Input database will be created and modified for Project level using required Regional Inputs from latest Regional Conformity Analysis.	EPA Hot Spot Guidance Section 4.4.10 and See Project Data Manager below
Project Data Manager	Database will be created and MOVES3.1 templates will be created to include local	EPA Hot Spot Guidance Sections 4.5 & Appendix D

	project data and information, e.g., Fuel, Age Distribution, Meteorology Data, to be consistent with the Regional Conformity Analysis. Links and Link Source Type will be specific to project as provided by the traffic study, any missing information will use default MOVES3.1 data.	
Meteorology	2019 Data from Douglas-Bisbee Airport	NOAA, Paul Spur/Douglas Regional Conformity Data (April 2024) EPA Hot Spot Guidance Section 4.5.1
Age Distribution	2020 Data from ADOT MVD Reports for Cochise County Projected to Year 2050 from EPA's Age Distribution Projection Tool.	ADOT, Paul Spur/Douglas Regional Conformity Data (April 2024) EPA Hot Spot Guidance Section 4.5.2
Fuel	Default fuel information provided by MOVES3.1 will be used for all fuel inputs.	MOVES Default Data EPA Hot Spot Guidance Section 4.5.3, PM hot-spot training slides Module 2
I/M Programs	No I/M Program active for the project area.	ADOT EPA Hot Spot Guidance Section 4.5.4
Retrofit Data	Not applicable for this project.	Project specific modeling EPA Hot Spot Guidance Section 4.5.5
Links	Unique inputs to be used for each run based on each link's length (miles), volume (vehicles/hour) average speed (miles/hour), and road grade (%). The proposed links are shown in Attachment B.	EPA Hot Spot Guidance Section 4.5.6 & Appendix D
Link Source Types	Unique inputs to be used for each run, based on project specific data from the Traffic Study. The distribution of passenger, medium, and heavy vehicles was available from the Study. The vehicles in these three source types were allocated to the associated MOVES source types using the SourceTypePopulation breakdown from the Regional Conformity Analysis.	EPA Hot Spot Guidance Section 4.5.7 City of Douglas International Port of Entry Connector Road Traffic Study Section 3.4.4, Section 7.1, and Section 7.2. Paul Spur/Douglas Regional Conformity Data (April 2024)
Link Drive Schedules, Operating Mode Distribution	Average speed and road type will be provided through the Links Importer. Precise drive schedules and operating mode distributions are not available based on information developed in the Traffic Study.	EPA Hot Spot Guidance Section 4.5.8 City of Douglas International Port of Entry Connector Road Traffic Study analysis files

Off-Network, Hotelling	This project analysis focuses on the Connector Road and its intersection with SR 80. There are no sources of off-network or hotelling emissions that are affected by the project.	EPA Hot Spot Guidance Section 4.5.9
Estimate Dust and Other Emissions (Step 4)		
AP-42, Fifth Edition, 2011	Parameter	Data Source/Detail
Average Weight Vehicles	Average Weight of Vehicles to be determined using the average vehicle weights from MOVES used in the Regional Conformity Analysis	Paul Spur/Douglas Regional Conformity Data (April 2024)
Silt Loading	Silt loading values for each road will be consistent with the Regional Conformity Analysis based on daily traffic volume	Paul Spur/Douglas Regional Conformity Data (April 2024)
Construction Dust	Construction Dust is temporary and not included	EPA Hot Spot Guidance Section 6.5
Precipitation	Cochise County has an average of 60 days with at least 0.01 inch of precipitation	Figure 13.2.1-2 of Section 13.2.1 of AP-42
Set Up and Run Air Quality Model (AERMOD) (Step 5)		
AERMOD v.23132	Parameter	Data Source/Detail
Model Setup (CO Pathway)		EPA Hot Spot Guidance Section 7.1, 7.2 & Appendix J, AERMOD User's Guide Section 2.3.2 & 3.2
TITLEONE	Douglas Connector Road_PM10	
MODELOPT	Non-Default - CONC FLAT	Modeling Concentrations and Flat Terrain per EPA Hotspot Guidance Section J.5
AVERTIME	24-hour	Average across each 24-hour period from the available met data
URBANOPT	Population for Urban Area - 125,663	
FLAGPOLE	Flagpole receptor heights of 1.8 m will be used.	
POLLUTID	PM10	
Source Types and Characters (SO Pathway)	Line Source	EPA Hot Spot Guidance Section 7.3, 7.4 & Appendix J.2, J.3, AERMOD User's Guide Section 2.3.3 & 3.3
LOCATION	Srcid: LINE Srctyp ALINE	
SRCPARAM	Srcid: LINE Lnemis: TBD Relhgt: Szinit*0.5 Width: The width of the traveled way (all travel lanes) + 6 meters Szinit: optional	LINE Source parameters See EPA Hot Spot Guidance Appendix J.3.1
URBANSRC	Srcid	Urban source IDs
EMISFACT	Emission rate=TBD	Total 16 MOVES run=4 seasons x 4 time periods to 96 factors (4 seasons/24 hours)
SRCGROUP	GroupID or All	

Meteorological Data (ME Pathway)	The meteorological data for the Bisbee-Douglas International Airport will be based on the pre-processed met files from ADEQ or the met files produced by AERMET program	EPA Hot Spot Guidance Section 7.5, Appendix J.4, AERMOD User's Guide Section 2.3.5 & 3.5
SURFFILE	Douglas2015-2019	*.sfc
PROFFILE	Douglas2015-2019	*.pfl
SURFDATA	Surface data station: 93026 2015 Bisbee-Douglas	
UAIRDATA	Upper air station: 93026 2015 Bisbee-Douglas	
PROFBASE	Met data station elevation: 1,270 m	
Run Met Pre-Processor	N/A	
Urban or Rural Sources	Specifications for RURALOPT (CO Pathway) and RURALSRC (SO Pathway)	EPA Hot Spot Guidance Section 7.5.5 & Appendix J.4, AERMOD Implementation Guide, Section 7.2.3 of Appendix W to 40 CFR Part 51
Receptors (RE Pathway)	Receptors begin 5 m from roadway edge, extending up to 105 m with a spacing of 25 m. Please refer to AERMOD Receptor Grid Figure in Attachment B.	EPA Hot Spot Guidance Section 7.6, AERMOD User's Guide Section 2.3.4 & 3.4, Section 7.2.2 of Appendix W to 40 CFR Part 51, See PM hot-spot training slides
DISCCART	X Y	
GRIDCART	Using AERMOD View	
Output (OU Pathway)	PLOTFILE and/or POSTFILE will be generated if necessary.	EPA Hot Spot Guidance Appendix J.6, AERMOD User's Guide Section 2.3.6 & 3.7
RECTABLE	24 6th	Since PM should be one or less exceedance per year, with 5 years of met data, the 6 th highest concentration at each receptor
PLOTFILE	Optional	
POSTFILE	Optional	
Model Runs		
Determine Background Concentrations (Step 6)		
Source Type	Description	Data Source/Detail
Nearby Sources	If necessary	EPA Hot Spot Guidance Section 8.2
Other Sources (Ambient Monitoring Data)	Background concentrations will be taken from AQS Site ID 04-003-0011 – Paul Spur Chemical Lime Plant. Selection of Paul Spur Chemical Lime Plant is based on highest upwind wind speeds from the monitor in relation to the project site. Refer to Figure 5 of the PM Questionnaire (Attachment A of this document) for the locations of the monitoring site.	

	As stated above, meteorological data will be taken from the Bisbee-Douglas International Airport, please refer to Attachment B for location and wind rose.	
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References

PM Hot-spot guidance, EPA-420-B-21-037, October 2021.

User's Guide for the AMS/EPA Regulatory Model (AERMOD), EPA-454/B-21-001, April 2021.

AERMOD Implementation Guide, EPA-454/B-21-006, July 2021.

User's Guide for the AERMOD Meteorological Preprocessor (AERMET), EPA-454/B-22-006, June 2022.

Completing Quantitative PM Hot-spot Analyses: 3-Day Course, FHWA, October 2022.

**Attachment A: Project Level PM Quantitative Hot-Spot
Analysis - Project of Air Quality Concern Questionnaire**

Project Level PM Quantitative Hot-Spot Analysis – Project of Air Quality Concern Questionnaire

To: Beverly Chenausky, Assistant Environmental Administrator
Arizona Department of Transportation (ADOT)

From: Allison Fluitt, P.E., AICP
Kimley-Horn and Associates, Inc.

Date: June 4, 2024

Subject: Douglas Commercial International Port of Entry Connector Road
Federal Project No.: 999-A(561)T
ADOT Project No.: 103686

The Arizona Department of Transportation (ADOT) developed the following questionnaire to aid in determining if a project that is administered using Federal Highway Administration (FHWA) and/or Federal Transit Administration (FTA) funding requires a quantitative PM hot-spot analysis. The responses to the questionnaire are intended to be used for interagency consultation purposes only.

Project Setting and Description

This PM Questionnaire was developed to support the Design Concept Report (DCR) for a connector road between the proposed Douglas Commercial International Port of Entry (IPOE) at the United States (U.S.)-Mexico border and Arizona State Route 80 (SR 80). The project is in the ADOT Southeast District in Cochise County west of Douglas, Arizona and is anticipated to open in 2028.

There are three alignment alternatives currently being considered for the proposed connector road west of United States Route 191 (US 191), two of which intersect SR 80 at James Ranch Road and one of which intersects SR 80 at Brooks Road. The project vicinity is shown in **Figure 1**, and the three alignment alternatives are shown in **Figure 2**. For the purposes of this report, the preferred alignment alternative for the connector road is assumed to intersect SR 80 at the existing SR 80 / James Ranch Road intersection. The results of the analysis at the SR 80 / James Ranch Road intersection are anticipated to be similar at the SR 80 / Brooks Road intersection if the preferred alignment alternative for the connector road intersects SR 80 at Brooks Road instead of James Ranch Road.



Figure 1. Project Vicinity Map

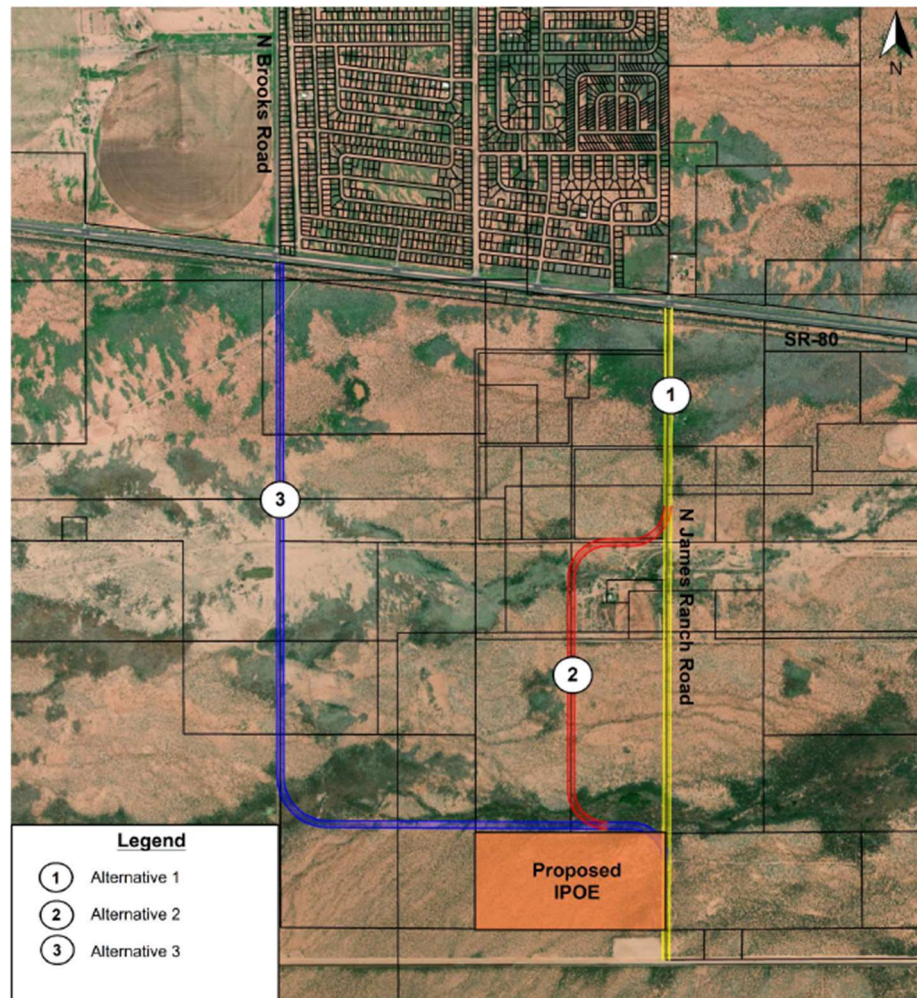


Figure 2. Connector Road Alignment Alternatives Map

The existing IPOE accommodates both commercial and passenger traffic. Trucks entering or exiting the existing IPOE must travel through the City of Douglas on US 191. The current route has 10 schools, 1 healthcare facility, and 7 parks, as well as numerous playgrounds and civic uses within a one-mile radius.

Figure 3 shows the route between the current commercial IPOE and the ADOT Commercial Weigh Station.

The proposed Douglas Commercial IPOE Connector Road falls entirely outside the Douglas municipal limits. One school and one healthcare facility fall within a one-mile radius of the proposed facility. As a result of the relocated Commercial IPOE and the proposed connector road, there will not be any commercial traffic going through the IPOE within the City of Douglas, with all commercial traffic redirected to a rural area. The routing of commercial traffic onto this proposed connector road will result in a reduction in congestion on US 191 through the City of Douglas.

Figure 4 shows the route between the proposed connector road and the ADOT Commercial Weigh Station.



Figure 3. Existing Truck Traffic Route

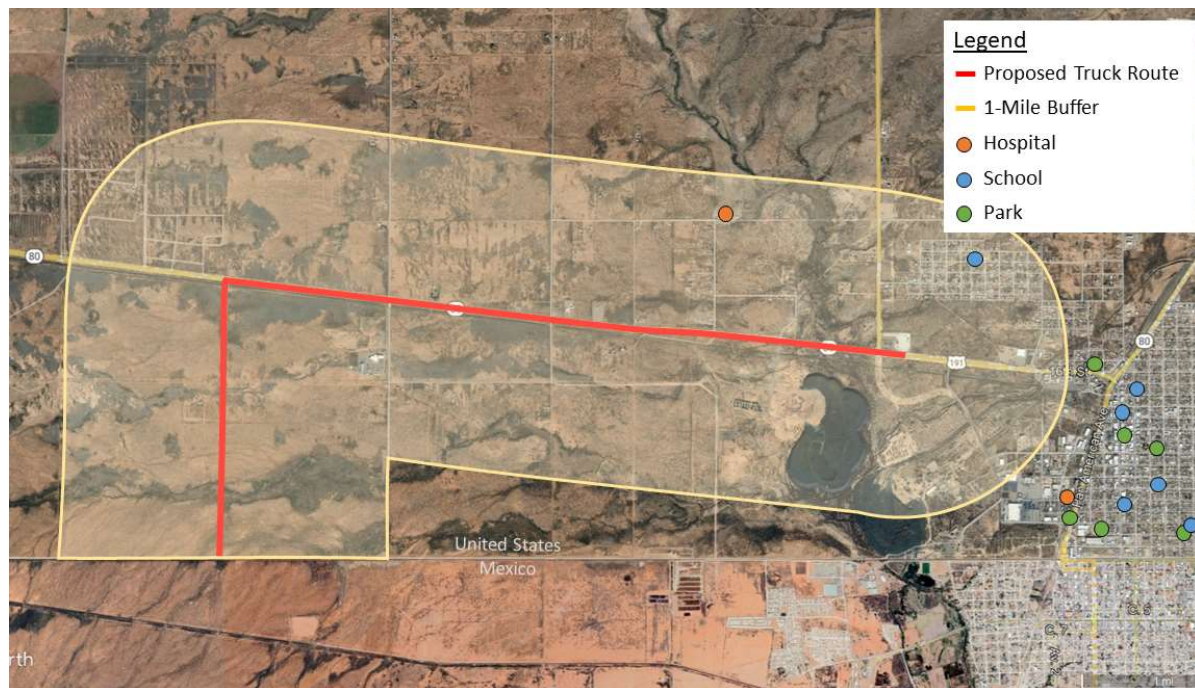


Figure 4. Proposed Truck Traffic Route

The Paul Spur/Douglas planning area is currently in nonattainment for large particulates, otherwise known as PM10. This area was designated as a moderate nonattainment area on Oct. 31, 1990 ([55 FR 45799](#)). The Paul Spur/Douglas PM10 nonattainment area is located along the Mexico-United States border in Cochise County. The Arizona Department of Environmental Quality (ADEQ) maintains two active air quality monitoring stations in the Paul Spur/Douglas PM10 nonattainment area:

- AQS Site ID 04-003-0011 – Paul Spur Chemical Lime Plant
- AQS Site ID 04-003-1005 – Douglas Red Cross

The Paul Spur/Douglas PM10 nonattainment area and the locations of the two PM10 monitoring stations are shown in **Figure 5. Table 1** shows the 24-hour PM10 monitoring data for the last three full years for 2020 through 2022 and 2023 through September 30, 2023.



Figure 5. PM10 Monitoring Station Locations

Table 1: Paul Spur/Douglas PM10 Monitoring Data (2020-2023)

Year	PM10 Annual Mean Concentration (ug/m ³)		PM10 Maximum Concentration (ug/m ³)		Number of Days Exceeding NAAQS	
	Paul Spur	Douglas	Paul Spur	Douglas	Paul Spur	Douglas
2020	22.4	28.7	154	129	1	0
2021	21.3	31.9	161	107	1	0
2022	18.8	26.2	91	130	0	0
2023 ¹	19.0	27.7	99	155	0	1

1 – Partial year data through September 30, 2023

Source: <https://www.epa.gov/outdoor-air-quality-data/interactive-map-air-quality-monitors>

Annual and maximum PM10 concentrations for the Paul Spur Chemical Lime Plant monitoring station (ID 04-003-0011) have generally decreased over the past four years. The average PM10 concentration for the Douglas Red Cross monitoring station (ID 04-003-1005) has been steady over time, ranging between 26.3 and 31.9 ug/m³. The maximum concentration for this monitoring station was steady for 2020 through 2022 but had one day of exceedance of the NAAQS for PM10 in 2023.

As an isolated rural nonattainment area, the Paul Spur/Douglas planning area is subject to a regional air quality conformity process. The planned Douglas Commercial Port of Entry Connector Road is likely to be classified as regionally significant and is not within a conforming Transportation Improvement Program (TIP). The area also does not have motor vehicle emissions budgets (MVEBs) established within the State Implementation Plan (SIP). An interagency consultation group was established to help guide the development of the air quality analysis, consisting of members from:

- Arizona Department of Transportation (ADOT)
- Arizona Department of Environmental Quality (ADEQ)
- Federal Highway Administration (FHWA)
- Environmental Protection Agency (EPA)
- General Services Administration (GSA)
- Customs and Border Protection (CBP)

Project Assessment

There are six project types for which ADOT requires a quantitative hot-spot analysis of local particulate emissions in nonattainment or maintenance areas. The following compares the proposed Douglas Commercial Port of Entry Connector Road project to these six project types to determine if a hot-spot analysis is required. If the proposed project is not considered a project of local air quality concern and a hot-spot analysis is not required for the proposed project, a qualitative analysis will be completed instead.

New Highway Capacity

Is this a new highway project that has a significant number of diesel vehicles?

The proposed project includes a new roadway that connects the proposed Douglas Commercial IPOE to SR 80 at the existing intersection with James Ranch Road. In the summary tables and traffic study, the new roadway is referred to as James Ranch Road. Based on the traffic study completed for the

proposed project, the average annual daily traffic (AADT) on the new roadway is projected to be 6,300 in 2028 and 19,200 in 2050. The projected truck percentages for 2028 and 2050 are 30% and 24%, respectively. The truck percentages and corresponding AADT volumes are provided in **Table 2** through **Table 5**. This proposed commercial IPOE will relocate trucks from the existing Douglas Port of Entry within the Douglas city limits to the proposed location outside the city. In both 2028 and 2050, the introduction of this project results in no more than a 10% increase in truck volumes to the existing network. As a result of the relocation of commercial trips to the new Commercial IPOE, this project will move truck traffic from relatively high-density populated areas within the Douglas city limits to a rural location west of the city.

Table 2: Existing and 2028 Truck Percentages for SR 80/James Ranch Road

Location	Existing				No-Build (2028)				Build (2028)				Difference (2028 Build - No-Build)			
		Total Truck %	Medium Vehicle %	Heavy Vehicle %		Total Truck %	Medium Vehicle %	Heavy Vehicle %		Total Truck %	Medium Vehicle %	Heavy Vehicle %		Total Truck %	Medium Vehicle %	Heavy Vehicle %
James Ranch Road south of SR 80		0%	0%	0%		2%	0%	2%		30%	5%	25%		28%	5%	23%
James Ranch Road north of SR 80		0%	0%	0%		2%	0%	2%		2%	0%	2%		0%	0%	0%
SR 80 west of James Ranch Road		11%	6%	5%		11%	6%	5%		18%	6%	12%		7%	0%	7%
SR 80 east of James Ranch Road		11%	6%	5%		11%	6%	5%		21%	5%	15%		10%	-1%	10%

Source: *City of Douglas International Port of Entry Connector Road Final Traffic Report*, prepared in June 2023 by Kimley-Horn, and associated traffic analysis.

Table 3: Existing and 2028 AADT for SR 80/James Ranch Road

Location	Existing				No-Build (2028)				Build (2028)				Difference (2028 Build - No-Build)			
	AADT	Total Trucks	Medium Vehicles	Heavy Vehicles	AADT	Total Trucks	Medium Vehicles	Heavy Vehicles	AADT	Total Trucks	Medium Vehicles	Heavy Vehicles	AADT	Total Trucks	Medium Vehicles	Heavy Vehicles
James Ranch Road south of SR 80	0	0	0	0	300	6	0	6	6,300	1,883	322	1,561	6,000	1,877	322	1,555
James Ranch Road north of SR 80	0	0	0	0	300	6	0	6	300	6	0	6	0	0	0	0
SR 80 west of James Ranch Road	5,667	623	340	283	6,700	705	381	324	8,000	1,407	441	966	1,300	702	60	642
SR 80 east of James Ranch Road	5,667	623	340	283	6,700	715	387	328	13,200	2,713	725	1,988	6,500	1,998	338	1,660

Source: *City of Douglas International Port of Entry Connector Road Final Traffic Report*, prepared in June 2023 by Kimley-Horn, and associated traffic analysis.

Table 4: 2050 Truck Percentages for SR 80/James Ranch Road

Location	No-Build (2050)				Build (2050)				Difference (2050 Build - No-Build)			
		Total Truck %	Medium Vehicle %	Heavy Vehicle %		Total Truck %	Medium Vehicle %	Heavy Vehicle %		Total Truck %	Medium Vehicle %	Heavy Vehicle %
James Ranch Road south of SR 80		2%	0%	2%		24%	6%	19%		22%	6%	17%
James Ranch Road north of SR 80		2%	0%	2%		2%	0%	2%		0%	0%	0%
SR 80 west of James Ranch Road		10%	6%	5%		17%	6%	11%		7%	0%	6%
SR 80 east of James Ranch Road		11%	6%	5%		20%	6%	14%		9%	0%	9%

Source: *City of Douglas International Port of Entry Connector Road Final Traffic Report*, prepared in June 2023 by Kimley-Horn, and associated traffic analysis.

Table 5: 2050 AADT for SR 80/James Ranch Road

Location	No-Build (2050)				Build (2050)				Difference (2050 Build - No-Build)			
	AADT	Total Trucks	Medium Vehicles	Heavy Vehicles	AADT	Total Trucks	Medium Vehicles	Heavy Vehicles	AADT	Total Trucks	Medium Vehicles	Heavy Vehicles
James Ranch Road south of SR 80	700	14	0	14	19,200	4,629	1,075	3,554	18,500	4,615	1,075	3,540
James Ranch Road north of SR 80	700	14	0	14	700	14	0	14	0	0	0	0
SR 80 west of James Ranch Road	10,500	1,091	587	504	14,100	2,381	790	1,591	3,600	1,290	203	1,087
SR 80 east of James Ranch Road	10,500	1,110	600	510	30,500	5,989	1,730	4,259	20,000	4,879	1,130	3,749

Source: *City of Douglas International Port of Entry Connector Road Final Traffic Report*, prepared in June 2023 by Kimley-Horn, and associated traffic analysis.

Expanded Highway Capacity

Is this an expanded highway project that has a significant increase in the number of diesel vehicles?

It is expected that all commercial vehicles entering the United States will be required to go through the ADOT Commercial Inspection Facility. This facility is currently located on the northeast corner of the intersection of SR 80 and US 191, which is east of the connector road. Therefore, this project is expected to increase the AADT and truck percentage on SR 80 between the proposed connector road and US 191. The AADT on SR 80 is projected to increase from 6,400 to 12,600 in 2028 and from 10,000 to 29,500 in 2050 from No-Build to Build. The Existing and No-Build truck percentage on

SR 80 is 11%. In the Build scenarios, the truck percentages are project to increase to 23% in 2028 and 21% in 2050. The truck percentages and corresponding AADT volumes are provided in **Table 6** through **Table 9**. SR 80 has sufficient capacity for the No-Build and Build scenarios and no improvements are recommended to expand the capacity as part of this project. The increase in truck volumes on SR 80 between the connector road and the ADOT Commercial Inspection Facility will correspond to fewer truck volumes at the existing port and within the Douglas city limits.

Table 6: Existing and 2028 Truck Percentages for SR 80/US 191

Location	Existing				No-Build (2028)				Build (2028)				Difference (2028 Build - No-Build)			
		Total Truck %	Medium Vehicle %	Heavy Vehicle %		Total Truck %	Medium Vehicle %	Heavy Vehicle %		Total Truck %	Medium Vehicle %	Heavy Vehicle %		Total Truck %	Medium Vehicle %	Heavy Vehicle %
Chino Road south of SR 80		0%	0%	0%		0%	0%	0%		5%	0%	5%		5%	0%	5%
US 191 north of SR 80		11%	7%	4%		11%	7%	4%		27%	6%	21%		16%	-1%	17%
SR 80 west of US 191		11%	7%	4%		11%	7%	4%		23%	6%	17%		12%	-1%	13%
SR 80 east of US 191		11%	7%	4%		11%	7%	4%		15%	8%	7%		4%	1%	3%

Source: *City of Douglas International Port of Entry Connector Road Final Traffic Report*, prepared in June 2023 by Kimley-Horn, and associated traffic analysis.

Table 7: Existing and 2028 AADT for SR 80/US 191

Location	Existing				No-Build (2028)				Build (2028)				Difference (2028 Build - No-Build)			
	AADT	Total Trucks	Medium Vehicles	Heavy Vehicles	AADT	Total Trucks	Medium Vehicles	Heavy Vehicles	AADT	Total Trucks	Medium Vehicles	Heavy Vehicles	AADT	Total Trucks	Medium Vehicles	Heavy Vehicles
Chino Road south of SR 80	0	0	0	0	0	0	0	0	3,500	167	0	167	3,500	167	0	167
US 191 north of SR 80	3,681	405	221	184	5,000	550	350	200	6,900	1,841	395	1,446	1,900	1,291	45	1,246
SR 80 west of US 191	5,667	623	340	283	6,400	704	448	256	12,600	2,849	750	2,099	6,200	2,145	302	1,843
SR 80 east of US 191	8,941	984	805	179	9,400	1034	658	376	11,900	1,829	962	867	2,500	795	304	491

Source: *City of Douglas International Port of Entry Connector Road Final Traffic Report*, prepared in June 2023 by Kimley-Horn, and associated traffic analysis.

Table 8: 2050 Truck Percentages for SR 80/US 191

Location	No-Build (2050)				Build (2050)				Difference (2050 Build - No-Build)			
		Total Truck %	Medium Vehicle %	Heavy Vehicle %		Total Truck %	Medium Vehicle %	Heavy Vehicle %		Total Truck %	Medium Vehicle %	Heavy Vehicle %
Chino Road south of SR 80		0%	0%	0%		5%	0%	5%		5%	0%	5%
US 191 north of SR 80		11%	7%	4%		24%	6%	18%		13%	-1%	14%
SR 80 west of US 191		11%	7%	4%		21%	6%	15%		10%	-1%	11%
SR 80 east of US 191		11%	7%	4%		17%	8%	9%		6%	1%	5%

Source: *City of Douglas International Port of Entry Connector Road Final Traffic Report*, prepared in June 2023 by Kimley-Horn, and associated traffic analysis.

Table 9: 2050 AADT for SR 80/US 191

Location	No-Build (2050)				Build (2050)				Difference (2050 Build - No-Build)			
	AADT	Total Trucks	Medium Vehicles	Heavy Vehicles	AADT	Total Trucks	Medium Vehicles	Heavy Vehicles	AADT	Total Trucks	Medium Vehicles	Heavy Vehicles
Chino Road south of SR 80	0	0	0	0	5,400	257	0	257	5,400	257	0	257
US 191 north of SR 80	7,700	847	539	308	11,900	2,844	704	2,140	4,200	1,997	165	1,832
SR 80 west of US 191	10,000	1,100	700	400	29,500	6,185	1,777	4,408	19,500	5,085	1,077	4,008
SR 80 east of US 191	14,500	1,595	1,015	580	28,000	4,667	2,102	2,564	13,500	3,072	1,087	1,984

Source: *City of Douglas International Port of Entry Connector Road Final Traffic Report*, prepared in June 2023 by Kimley-Horn, and associated traffic analysis.

Projects with Congested Intersections

Is this a project that affects a congested intersection (LOS D or greater) that has a significant number of diesel trucks, OR will change LOS to D or greater because of an increase in traffic volumes from a significant number of diesel trucks related to the project?

The existing intersection of SR 80 and James Ranch Road has two-way stop control (TWSC) for James Ranch Road. In the Existing and 2028 No-Build scenarios, the worst movement at this intersection operates at a level of service (LOS) B. After reviewing the results of the traffic analysis and considering other potential factors, ADOT determined that signalized traffic control is the preferred intersection alternative in the 2028 Build and 2050 Build scenarios. Diagrams showing the

signalized intersection geometry with 2050 Build AM and PM peak hour traffic volumes are shown in **Figure 6** and **Figure 7**, respectively. In all Build scenarios, the intersection is expected to operate at LOS C or better.

All intersections on James Ranch Road south of SR 80 associated with the proposed commercial IPOE are anticipated to operate as well as or better than the intersection of SR 80 and James Ranch Road due to the lower traffic volumes expected at these intersections.

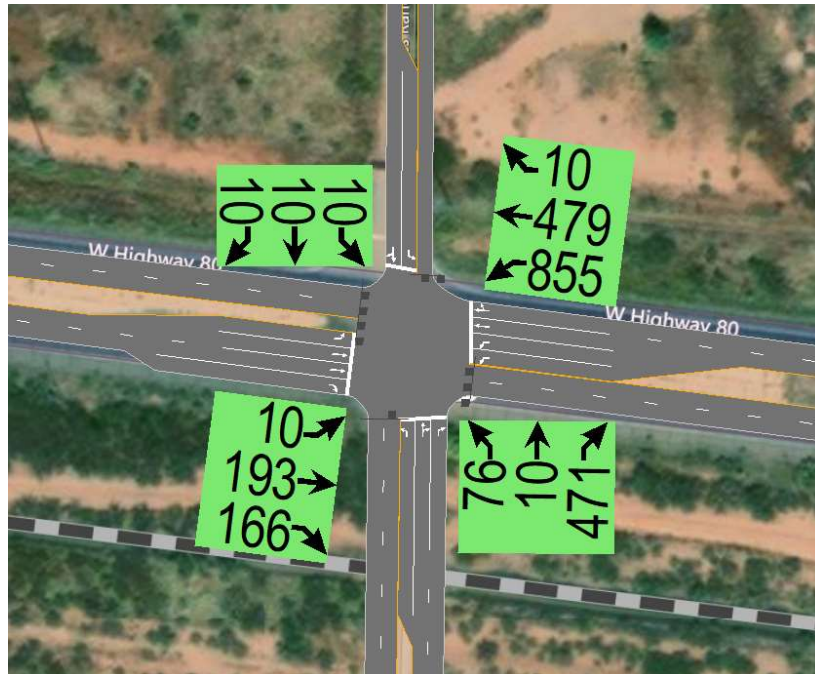


Figure 6. 2050 Build AM Signalized Intersection Alternative

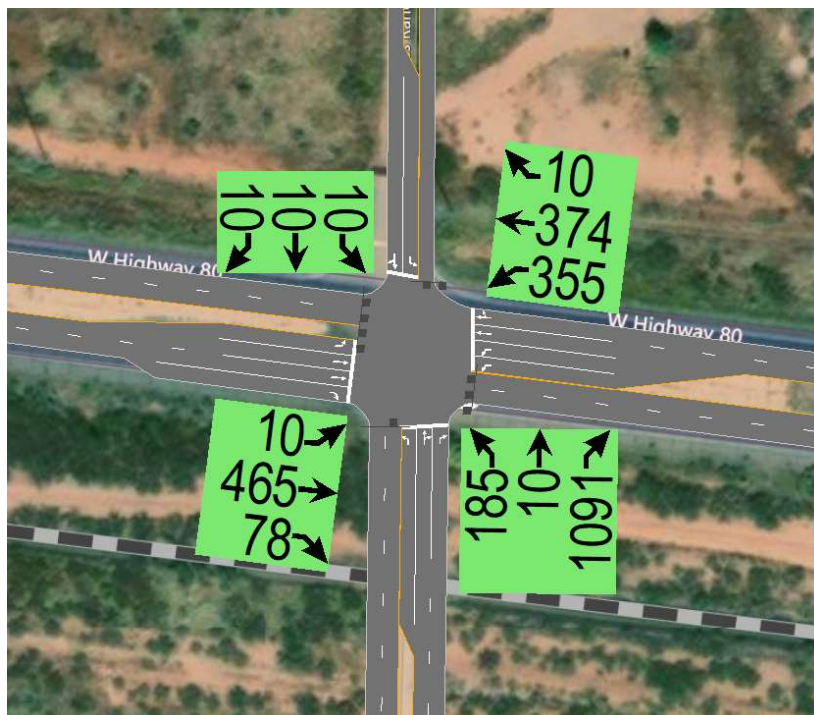


Figure 7. 2050 Build PM Signalized Intersection Alternative

The intersection of SR 80 and US 191/Chino Road is signalized and operates/is expected to operate at LOS A in all scenarios except the 2050 Build scenario, where it is expected to operate at LOS C.

The existing, 2028 No-Build, and 2028 Build LOS fall below (i.e., are less congested than) LOS defined as congested by the EPA. Intersection LOS by scenario is shown in **Table 10** and **Table 11**.

Table 10: SR 80 at James Ranch Road Intersection Level of Service by Scenario

Intersection	Existing (TWSC)*		No-Build TWSC (2028)*		No-Build TWSC (2050)*		Build Signalized (2028)		Build Signalized (2050)	
	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak
	LOS	LOS	LOS	LOS	LOS	LOS	LOS	LOS	LOS	LOS
SR 80 at James Ranch Road	B	B	B	B	C	C	A	B	C	C

* TWSC values represent worst movement LOS instead of overall intersection LOS

Source: City of Douglas International Port of Entry Connector Road Final Traffic Report, prepared in June 2023 by Kimley-Horn, and associated traffic analysis.

Table 11: SR 80 at US 191/Chino Road Intersection Level of Service by Scenario

Intersection	Existing		No-Build (2028)		No-Build (2050)		Build (2028)		Build (2050)	
	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak	AM Peak	PM Peak
	LOS	LOS	LOS	LOS	LOS	LOS	LOS	LOS	LOS	LOS
SR 80 at US 191/Chino Road	A	A	A	A	A	A	A	A	C	C

Source: City of Douglas International Port of Entry Connector Road Final Traffic Report, prepared in June 2023 by Kimley-Horn, and associated traffic analysis.

New Bus and Rail Terminals

Does the project involve construction of a new bus or intermodal terminal that accommodates a significant number of diesel vehicles?

This project does not involve construction of a new bus or intermodal terminal.

Expanded Bus and Rail Terminals

Does the project involve an existing bus or intermodal terminal that has a large vehicle fleet where the number of diesel buses (or trains) increases by 50% or more, as measured by arrivals?

This project does not involve an existing bus or intermodal terminal.

Projects Affecting PM Sites of Violation or Possible Violation

Does the project affect locations, areas or categories of sites that are identified in the PM10 or PM2.5 applicable plan or implementation plan submissions, as appropriate, as sites of violation or potential violation?

There is no established implementation plan for this area. Therefore, this project does not affect locations, areas, or categories of sites of violation or potential violation.

POAQC Determination

Based on the initial consultation with the Interagency Consultation Group, this project is considered a Project of Air Quality Concern (POAQC) due to the increase in diesel truck traffic to the area.

**Attachment B: Additional MOVES and AERMOD Modeling
Data**

Modeling Extent

EPA's PM Hot-Spot Guidance Section 3.3.2 states that it may be appropriate to only analyze locations that would have the highest emissions concentrations. If conformity is met at these specific locations, then conformity throughout the project can be assumed.

The location with the highest concentration of PM emissions for the project is likely the intersection of the Connector Road/James Ranch Road and SR 80. This location represented the area with the highest traffic volumes (more than three times the entering volume of the next busiest intersection along the Connector Road/James Ranch Road), lowest speeds (due to the presence of a traffic signal), and most overall delay for the Connector Road/James Ranch Road (due to intersecting with the higher-volume SR 80). Attachment A of this document contains background information from the Traffic Study. Tables 3 and 5 display the existing and projected volumes at the intersection, while Tables 2 and 4 provide the existing and projected truck percentages. Table 10 shows the projected LOS for the intersection for each scenario.

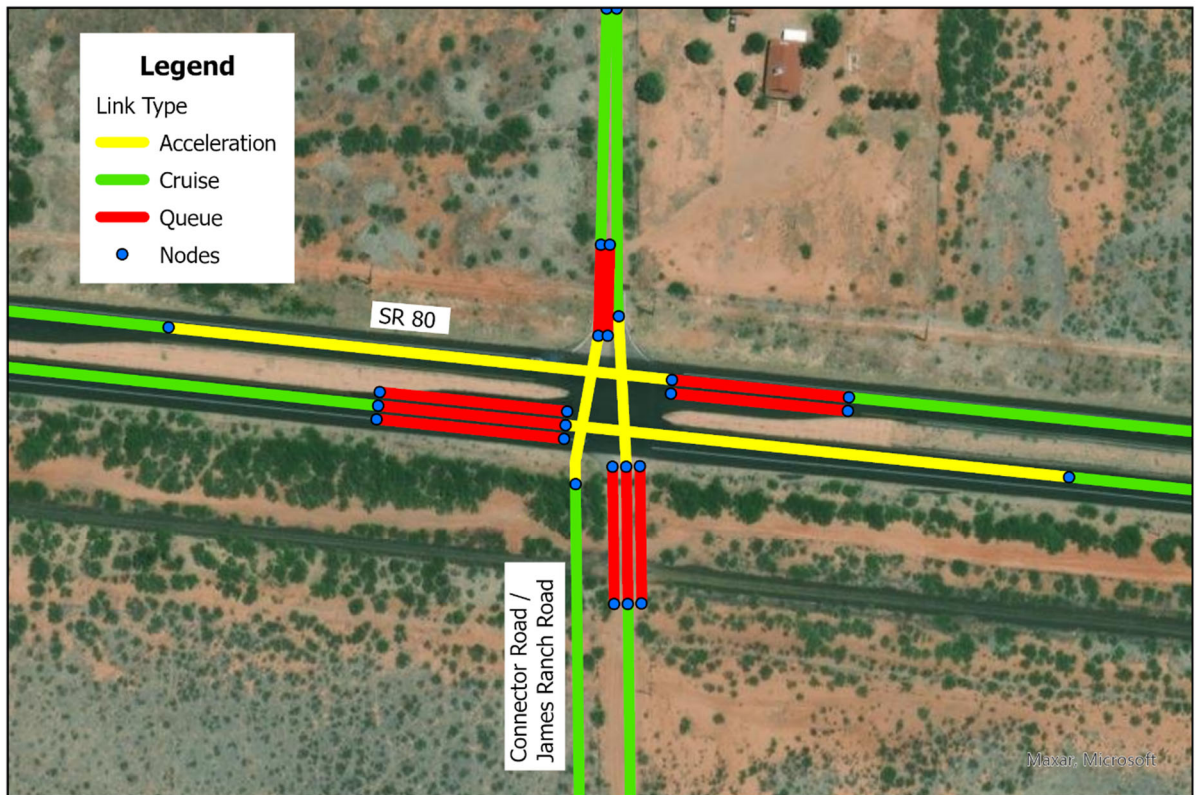
In addition, it should be noted that the proposed Commercial Land Port of Entry adjacent to the Connector Road has previously been studied under a general conformity analysis in the Environmental Impact Statement (EIS) for the Proposed Commercial Land Port of Entry (January 2023) developed by GSA.

The following figures illustrate the proposed project-level links and receptors for this analysis, as well as the location and wind rose information for the Bisbee-Douglas International Airport Meteorological Station.

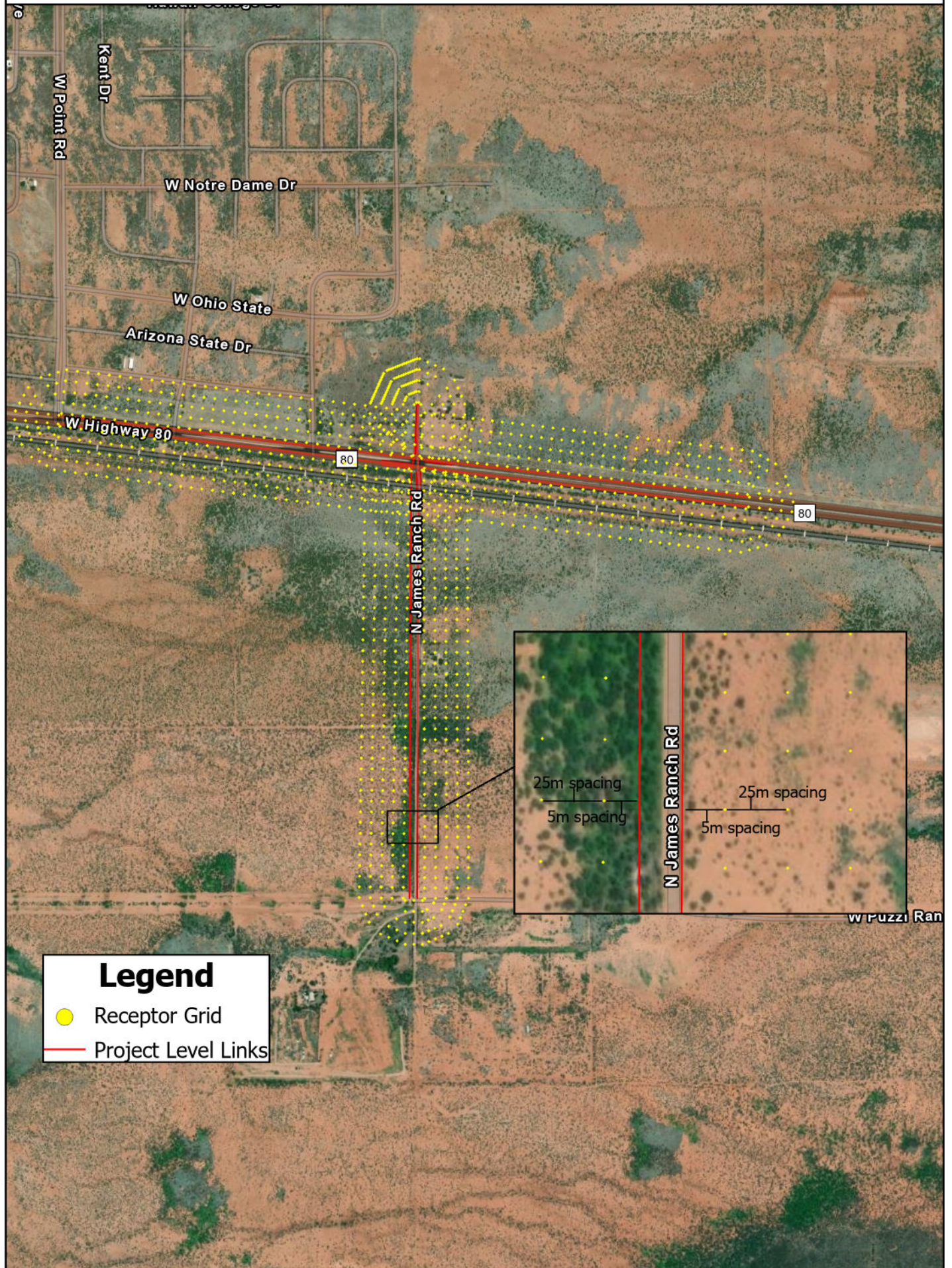
Project Links (Connector Road / James Ranch Road & SR 80)



Project Links Zoomed In View (Intersection of Connector Road / James Ranch Road & SR 80)



AERMOD Receptor Grid Map



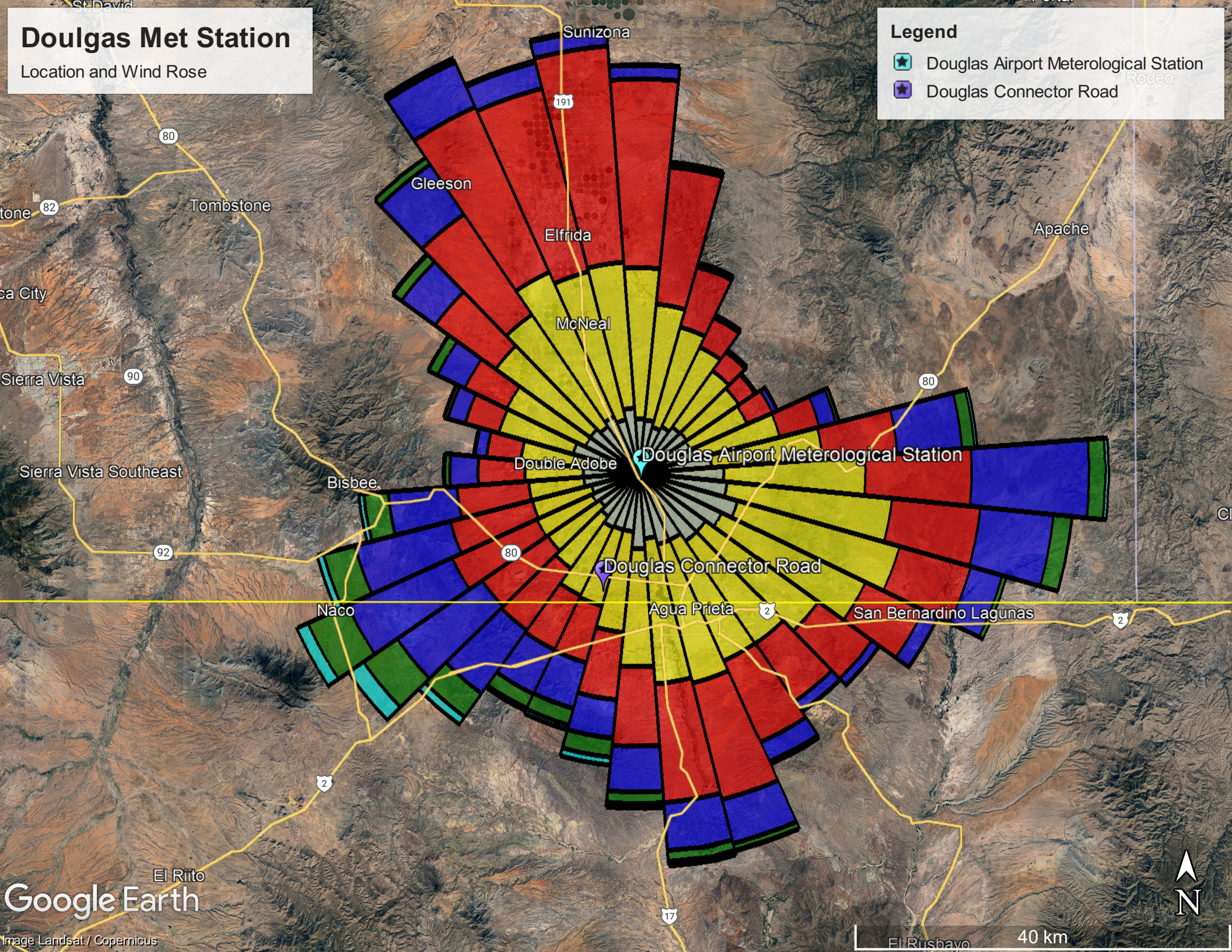
Douglas Met Station

Location and Wind Rose

Legend

 Douglas Airport Meterological Station

 Douglas Connector Road

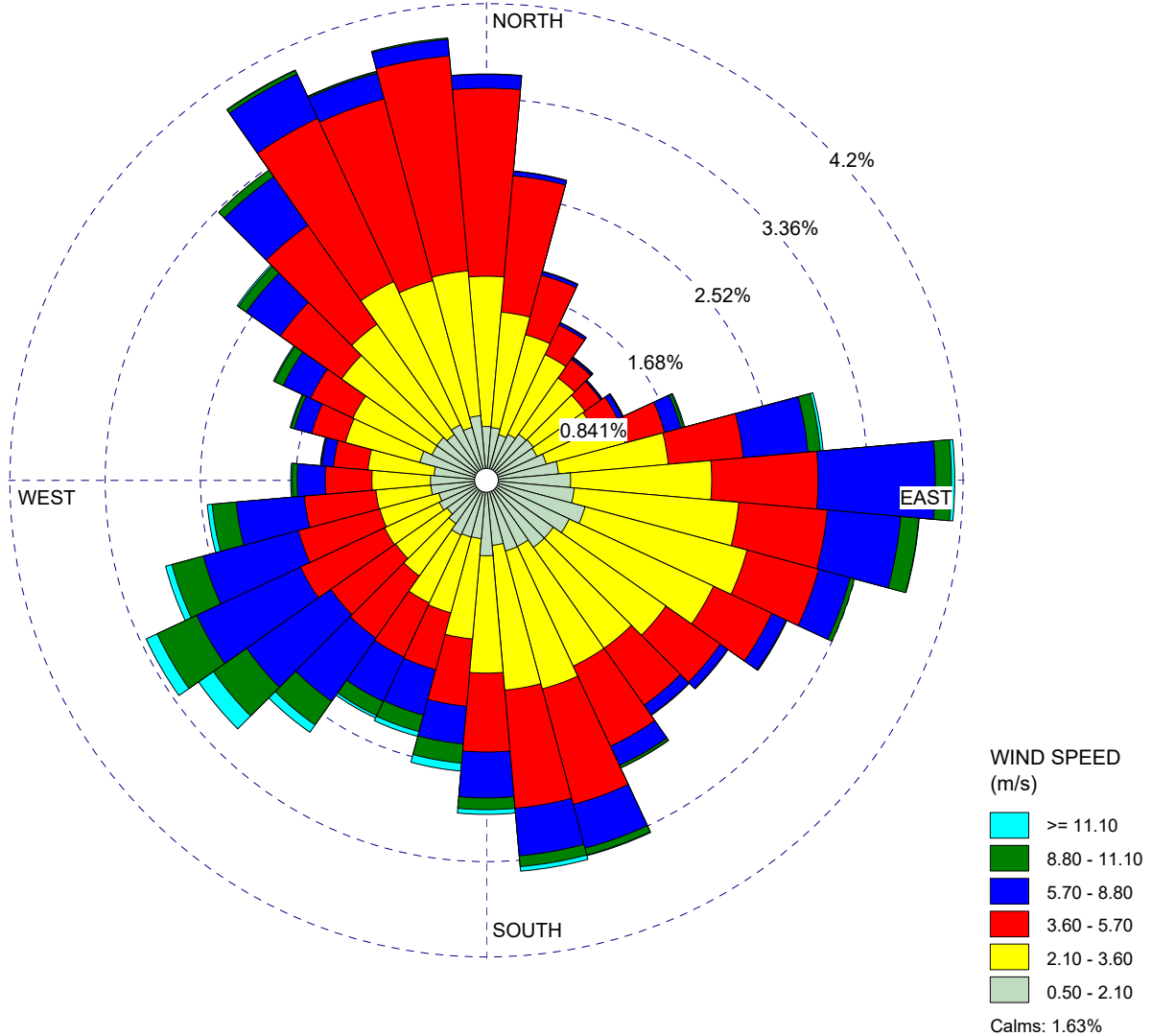


WIND ROSE PLOT:

Station #93026

DISPLAY:

**Wind Speed
Direction (blowing from)**



COMMENTS:

DATA PERIOD:

**Start Date: 1/1/2015 - 00:00
End Date: 12/31/2019 - 23:59**

COMPANY NAME:

MODELER:

CALM WINDS:

1.63%

TOTAL COUNT:

43127 hrs.

AVG. WIND SPEED:

3.79 m/s

DATE:

7/15/2024

PROJECT NO.:

**Attachment C: Agency Comments and Responses from
Consultation**

FHWA Comments on Initial Consultation Document (Received 6/21/2024)

- General comment – As FHWA mentioned on our recent call, it appears modeling is being done only for the intersection of Connector Road/James Ranch Road and SR 80. Please add discussion about why this is the likely area of highest concentration. Typically, you would need to model the entire project. So make sure you can justify the decision to limit the scope (which does seem to make sense – most delay/lowest speeds/highest volumes, etc. at that location).
 - Response: Justification will be added to the consultation document. EPA's PM Hot-Spot Guidance Section 3.3.2 states that it may be appropriate to only analyze locations that would have the highest emissions concentrations. If conformity is met at these specific locations, then conformity throughout the project can be assumed. The location with the highest concentration of PM emissions for the project is likely the intersection of the Connector Road/James Ranch Road and SR 80. This location represented the area with the highest traffic volumes, lowest speeds, and most overall delay for the Connector Road. Tables for traffic volumes, intersection level of service, and truck percentages for the intersection are found in Attachment A of the consultation document. Attachment B contains a more detailed explanation of the modeling extent.
- Pg 3 – Can you clarify what is meant by “each of these 4 runs will be further split...” under time spans? Assuming you mean the appropriate hour within each of these periods is selected in the MOVES timespans panel.
 - Response: This is in the ADOT draft text Table (Table 1). The proposed inputs and assumptions for this analysis are in Table 2 starting on page 7. This text was referring to having 4 time period runs (6-9AM, 9AM-4PM, 4-7PM & 7PM-6AM) for each season (Jan, Apr, July, Oct). After our discussion, only 1 season will be analyzed. Preliminary model runs were completed for each season to determine the month with the highest emissions rates, which was July. So, there will now be a total of 4 runs, instead of the original 16. The consultation document will be updated to include this change.
- Pg 5 – Please use the latest version of AERMOD (23132)
 - Response: The latest version of AERMOD will be used.
- Pg 7 – Explain why 2050 was selected as the year with highest emissions (e.g., road dust dominant – highest VMT will result in maximum emissions in 2050)
 - Response: Justification will be added to the consultation document. 2050 was selected as the analysis year because this will be the peak year for emissions from the project. 2050 will contain the highest vehicle volumes for the project, and therefore, the highest levels of road dust which is the largest contributor to PM10 emissions.
- Pg 9 – Use flagpole receptor heights of 1.8 m (or make sure they're set at 1.8 meter under RE pathway)
 - Response: Flagpole receptor heights of 1.8 m will be used.

- Pg 9 – Confirm with ADEQ that Nogales met data is appropriate for the project area (based on their permitting website, it appears this is indeed the closest surface met monitor to Douglas).
 - Response: After discussing with ADEQ, met data from the Bisbee-Douglas Airport was found to be available. ADEQ had not previously processed this data or made it available on their website. ADEQ was able to process it and provide it for our use. There were issues with missing data for recent years so the years 2015-2019 were selected for use.
- Pg 9 – Why is the PROFFILE data set labeled as “Nogales2017-2021” when it seems to be coming from the Tucson airport?
 - Response: This will be changed to reference the Douglas dataset.
- Pg 10 – Our understanding is that the project area is quite rural and does not experience urban heat island met effects. Is there a reason why the URBAN option is being selected?
 - Response: This will be switched to RURAL.
- Pg 10 – Please add some discussion about why the Paul Spur Chemical Lime Plant monitor was selected. Is it the closest? Similar land-use/source mix? Up-wind?
 - Response: The use of a single monitor versus the use of interpolation between two monitors was discussed at the Interagency Coordination Call on August 8, 2024. Based on the recommendation from FHWA during this meeting, we revisited our approach to determine if the use of a single monitor was viable. To do this, we compared the Douglas Airport Meteorological Station wind speeds and direction to the locations of the two air quality monitors in the region and the project site. Based on this comparison, the Paul Spur Chemical Lime Plant exhibits higher wind speeds that are upwind from the project site. Therefore, this monitor is the most appropriate monitor to use in this exercise.

EPA Comments on Initial Consultation Document (Received 7/23/2024)

- Comment 1: The EPA agrees with, and would like to reiterate the Federal Highway Administration (FHWA)'s comments on the MOVES & AERMOD modeling.
 - Response: FHWA's comments have been integrated into the revised consultation document.
- Comment 2: Please provide justification as to why the Nogales met data best represents the project area and confirm five years of data is being used as per the *PM Hotspot Guidance, Section 7.5.3*. Table 2 (pg. 7) lists the met data as just "2019 Data from Douglas-Bisbee Airport."
 - Response: After discussing with ADEQ, met data from the Bisbee-Douglas Airport was found to be available. ADEQ had not previously processed this data or made it available on their website. ADEQ was able to process it and provide it for our use. There were issues with missing data for recent years so the years 2015-2019 were selected for use.
- Comment 3: As stated in ADOT's June 4, 2024 Memorandum "*Project Level PM Quantitative Hot-Spot Analyses – Project of Air Quality Concern Questionnaire*," the City of Douglas IPOE Connector Road is being developed to connect the proposed Douglas IPOE at the U.S.-Mexico Border and Arizona State Route 80 (SR 80).

On June 13, 2024, ADOT proposed modeling for this PM Hotspot Analysis for the intersection of James Ranch Road & SR 80 as well as the entirety of the Douglas Connector Road. On July 10, 2024, ADOT stated that at the advice of interagency partners was to narrow the study area to focus on the intersection of the Douglas Connector Road and SR 80 since the area represents the worst case conditions.

As per EPA's "*Transportation Conformity Guidance for Quantitative Hot-Spot Analyses in PM_{2.5} and PM₁₀ Nonattainment and Maintenance Areas*" (PM Hotspot Guidance), Section 3.3.2:

- Hot-spot analyses must include the entire project (40 CFR 93.123(c)(2)). However, it may be appropriate in some cases to focus the PM hot-spot analysis only on the locations of highest air quality concentrations.
- Note that interagency consultation should be used to help identify the appropriate receptor locations in the area substantially affected by the project.

Additionally, as per the EPA's *PM Hotspot Guidance*, Section 7.6.2:

- Receptors should be sited at all locations at which high concentrations may occur, rather than simply focusing on the expected worst-case location.
- Receptors should be placed to capture the impacts of the project and any nearby source that needs to be modeled.

The EPA recognizes that according to the U.S General Services Administration's (GSA's) "*Final Environmental Impact Statement for the Expansion and Modernization of the Raul Hector Castro Land Port of Entry and Proposed Commercial Land Port of Entry in Douglas Arizona*," (EIS) the proposed, commercial IPOE would include commercial vehicle inspection lanes, commercial vehicle inspection, and a commercial inspection building. The GSA's EIS further notes:

- Air Quality and Greenhouse Gas Impacts:
 - "Operation: For both sites, long-term, minor adverse impact on air quality due to emissions from onsite equipment and increased commuter vehicles."
- Traffic and congestion:
 - "Operation: Overall, long-term, minor adverse impacts to transportation resources (SR-80 and US-191)."

The EPA would like to see traffic, queuing, and idling impacts from the IPOE on the connector road considered in the PM Hotspot Analysis, and for receptors to be placed adjacent to the proposed IPOE and the U.S.-Mexico border. Alternatively, the EPA would like to see a detailed justification as to why this section of the connector road is not considered an area of high concentration as per the *PM Hotspot Guidance* Sections 3.3.2 and 7.6.2.

- Response: Additional information has been provided in the consultation document to address the proposed modeling extent to justify just including the intersection of the Connector Road/James Ranch Road and SR 80. Tables for traffic volumes, intersection level of service, and truck percentages for the intersection are found in Attachment A of the consultation document. Attachment B contains a more detailed explanation of the modeling extent.

**Appendix B: City of Douglas International Port of Entry
Connector Road Final Traffic Report**

FINAL TRAFFIC REPORT

CITY OF DOUGLAS INTERNATIONAL PORT OF ENTRY CONNECTOR ROAD
ADOT SOUTHEAST DISTRICT/COCHISE COUNTY

ADOT CONTRACT NO. 2023-003
ADOT PROJECT NO. F0534 01L
FEDERAL PROJECT NO. 999-A(561)T

Prepared For:



ARIZONA DEPARTMENT OF TRANSPORTATION
MULTIMODAL PLANNING DIVISION
CORRIDOR PLANNING GROUP

Prepared By:

Kimley»Horn

REVISED APRIL 2024



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1. INTRODUCTION

This Final Traffic Report has been developed to support the Design Concept Report (DCR) for a connector road between the proposed Douglas Commercial International Port of Entry (proposed commercial IPOE) at the United States (U.S.)-Mexico border and Arizona State Route 80 (SR 80). The project is located in the Arizona Department of Transportation (ADOT) Southeast District in Cochise County west of Douglas, Arizona and is anticipated to open in 2028. The project location and vicinity maps are shown in **Figure 1.1** and **Figure 1.2**, respectively.

There are three alignment alternatives currently being considered for the proposed connector road west of United States Route 191 (US 191), two of which intersect SR 80 at James Ranch Road and one of which intersects SR 80 at Brooks Road. The three alignment alternatives are shown in **Figure 1.3**. For the purposes of this report, the preferred alignment alternative for the connector road is assumed to intersect SR 80 at the existing SR 80 / James Ranch Road intersection. The results of the analysis at the SR 80 / James Ranch Road intersection are anticipated to be similar at the SR 80 / Brooks Road intersection if the preferred alignment alternative for the connector road intersects SR 80 at Brooks Road instead of James Ranch Road.

The purpose of this report is to document the existing safety and operational characteristics of the SR 80 / James Ranch Road intersection, develop and evaluate intersection configuration alternatives at the SR 80 / James Ranch Road intersection, identify appropriate roadway geometry for the connector road, and provide recommendations for improvements within the study area that provide acceptable future traffic operations, promote safety, and enhance regional mobility.

The traffic analysis includes the evaluation of the following intersection configuration alternatives at the intersection of SR 80 / James Ranch Road:

- Two-Way Stop Control (TWSC)
- Traffic Signal Control
- Roundabout

Additionally, it is anticipated that all truck traffic entering the U.S. will continue to be required to travel to the ADOT Commercial Inspection Facility, which is currently located on the northeast corner of the intersection of SR 80 / US 191, for additional processing. Because the location of the proposed commercial IPOE would change the travel patterns of commercial trucks accessing the ADOT Commercial Inspection Facility, the intersection of SR 80 / US 191 was also studied in this analysis to determine the necessary lane configuration and signal phasing at the intersection. No changes in intersection control type were analyzed for this intersection.

The two proposed intersections adjacent to the proposed commercial IPOE ("proposed IPOE intersections") were also analyzed in this report to determine appropriate lane geometry and traffic control at the intersections.

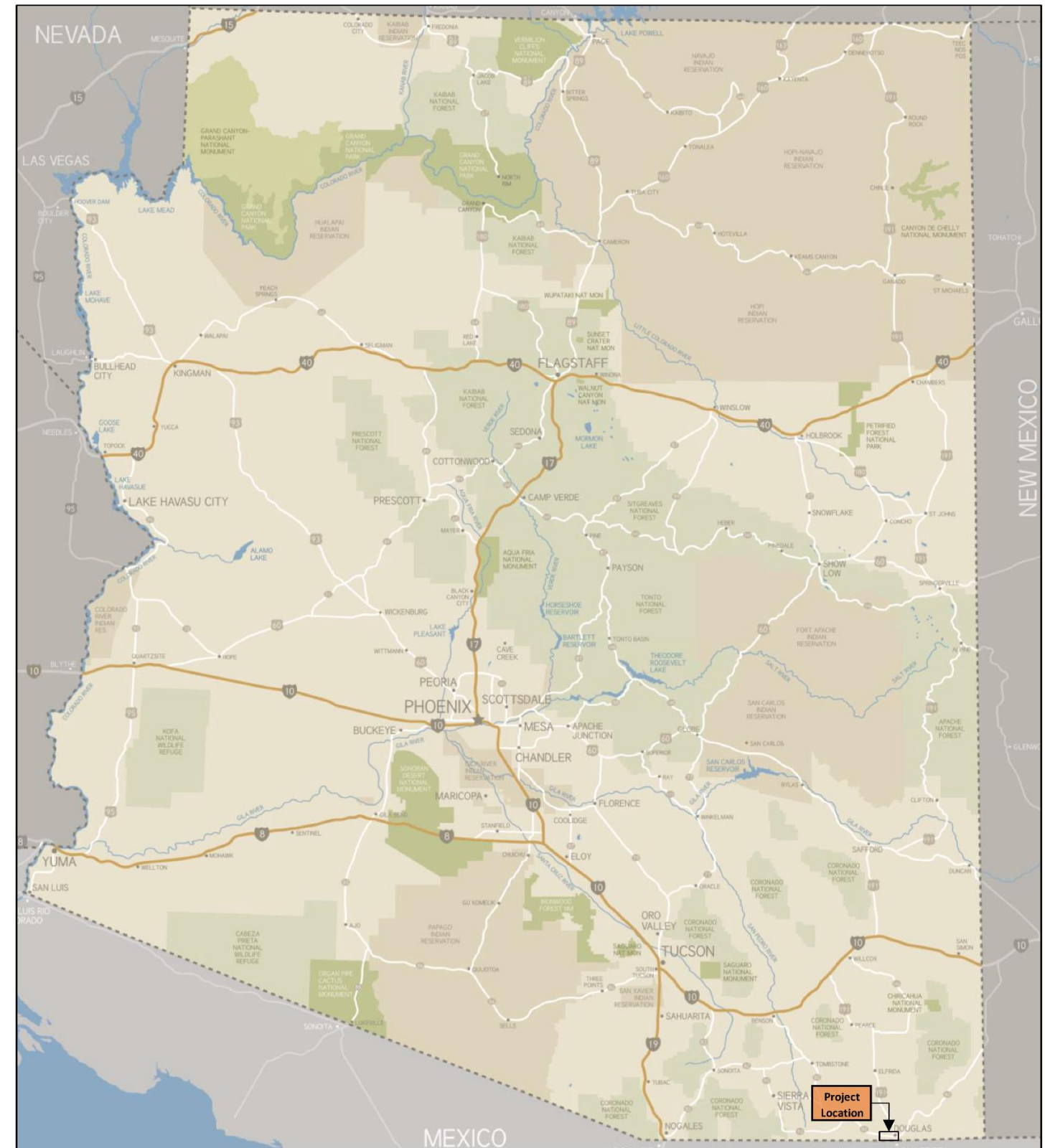


Figure 1.1 – Project Location Map

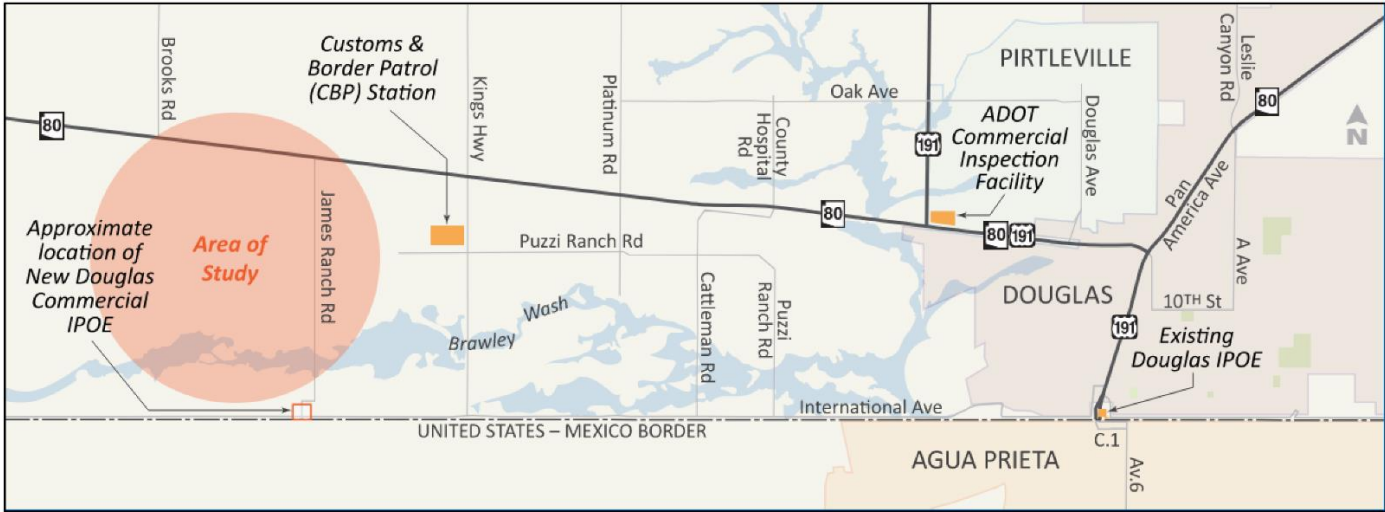


Figure 1.2 – Project Vicinity Map

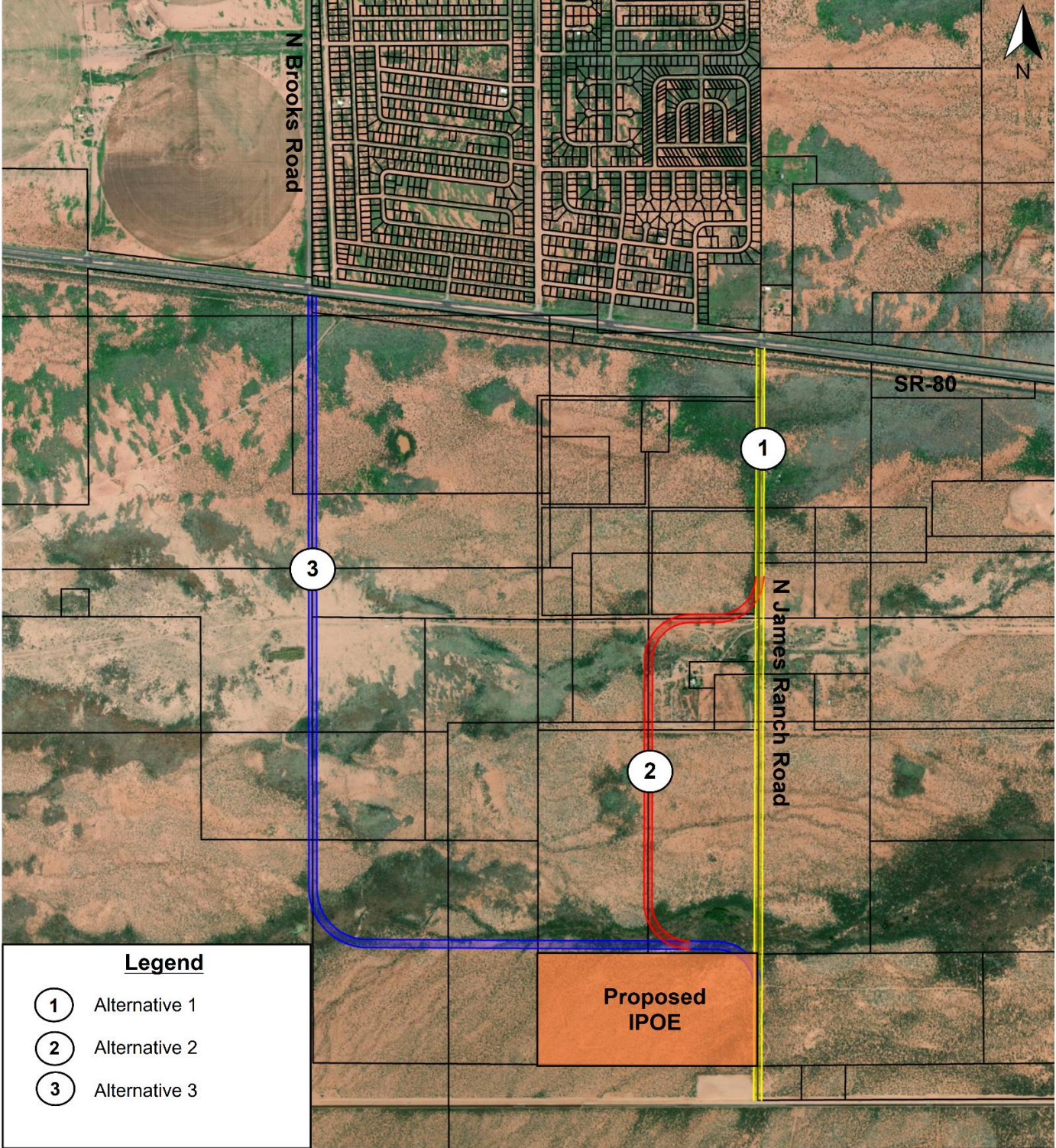


Figure 1.3 – Connector Road Alignment Alternatives Map

2. EXISTING CONDITIONS

2.1 Transportation System Overview

The existing roadway system within the study area includes SR 80, US 191, and James Ranch Road. Other notable roadways in the project vicinity include US 191 Business (Pan American Avenue) and Chino Road. This report analyzes the intersections of SR 80 / James Ranch Road and SR 80 / US 191.

2.1.1 Regional Roadway Network

SR 80 generally runs east-west in the study area and is owned, operated, and maintained by ADOT. Per the ADOT “Arizona Roads by Federal Functional Classifications” GIS map, ADOT classifies SR 80 as an “urban principal arterial – other” roadway within the study area. The posted speed limit on SR 80 is 65 miles per hour (mph) in the vicinity of James Ranch Road and is 55 mph in the vicinity of US 191. The existing SR 80 roadway section in the study area typically includes two 12-foot-wide through lanes in both the eastbound (EB) and westbound (WB) directions. An approximately 28-foot-wide median separates the EB and WB through lanes. The median is generally unpaved except for raised medians for left-turn lanes at intersections and bridge crossings. Inside paved shoulders are typically four feet wide or less and outside paved shoulders are typically ten feet wide.

US 191 generally runs north-south in the study area and is owned, operated, and maintained by ADOT. US 191 extends north from SR 80 approximately four miles east of James Ranch Road and approximately 1.5 miles west of US 191 Business (Pan American Avenue) in Douglas. ADOT classifies US 191 as an “urban minor arterial” roadway within the study area. The posted speed limit on US 191 is 45 mph within the study area. The existing US 191 roadway section in the study area typically includes one 12-foot-wide through lane in both the northbound (NB) and southbound (SB) directions separated by a 12-foot-wide two-way left-turn lane (TWLTL) that converts to an exclusive SB left-turn lane approaching SR 80.

US 191 Business (also known as Pan American Avenue) is located outside the study area but is notable because it serves as a connector road between SR 80 and the existing Raul H. Castro IPOE (RHC IPOE). US 191 Business generally runs north-south and is owned, operated, and maintained by the City of Douglas. US 191 Business goes from the U.S.-Mexico border to where SR 80 has a 90-degree bend in Douglas. The existing Raul H. Castro IPOE (RHC IPOE) is located at the southern terminus of US 191 Business at the U.S.-Mexico border. ADOT classifies US 191 Business as an “urban principal arterial – other” roadway between SR 80 and the U.S.-Mexico border. The posted speed limit on US 191 Business is 35 mph. The existing US 191 Business roadway section includes two through lanes in both the NB and SB directions, separated by a TWLTL, along with curb/gutter, sidewalk, and a shared use path on the west side.

2.1.2 Local Roadway Network

James Ranch Road runs north-south in the study area and is currently a privately-owned unpaved two-lane local roadway. James Ranch Road is anticipated to serve as the connector road between the proposed commercial IPOE at the U.S.-Mexico border and SR 80 (assuming that James Ranch Road is the preferred alignment alternative for the connector road). The parcels along the James Ranch Road alignment south of SR 80 are zoned as “C-Developing” by Cochise County and are anticipated to contain industrial and/or commercial land uses in the future when the proposed commercial IPOE connector road is constructed.

Chino Road is currently located outside the study area but is notable because it serves as a connector road between SR 80 and US 191 Business. Chino Road generally runs north-south and is owned, operated, and maintained by the City of Douglas. Chino Road currently intersects SR 80 approximately 0.45 miles east of US 191 and intersects US 191 Business approximately 0.15 miles north of the RHC IPOE. ADOT classifies Chino Road as an “urban minor arterial” roadway. The existing Chino Road roadway section near SR 80 includes one through lane in both the NB and SB directions along with paved shoulders that vary from one foot to eight feet in width. The City of Douglas is planning to realign Chino Road to tie into the currently barricaded south leg of the intersection of SR 80 / US 191 by 2028 but this improvement is not yet funded.

2.1.3 Intersections

The TWSC intersection of **SR 80 / James Ranch Road** is located near milepost 360.6 along SR 80. The EB and WB approaches to the intersection each have a left-turn lane, a through lane, and a shared through/right-turn lane. The NB and SB approaches each have a shared left-turn/through/right-turn lane. The existing SR 80 / James Ranch Road intersection lane geometry is shown in **Figure 2.1**. The area surrounding the SR 80 / James Ranch Road intersection is largely undeveloped. A single-family residence is located near the northeast corner of the intersection and some other structures exist to the east and west of the road south of SR 80.

The signalized intersection of **SR 80 / US 191** is located near milepost 364.7 along SR 80. The intersection is currently constructed as a four-legged intersection but functions as a three-legged T-intersection because the south leg is barricaded. As mentioned previously, the City of Douglas is planning to realign Chino Road by 2028 to tie into the currently barricaded south leg of the intersection of SR 80 / US 191. The EB and WB approaches to the intersection each have a left-turn lane, two through lanes, and a right-turn lane. The NB and SB approaches each have a left-turn lane and a shared through/right-turn lane. The existing SR 80 / US 191 intersection lane geometry is shown in **Figure 2.2**. Three quadrants of the SR 80 / US 191 intersection are undeveloped. The ADOT Commercial Inspection Facility and an ADOT Motor Vehicle Division Customer Service Center are located on the northeast corner of the intersection.

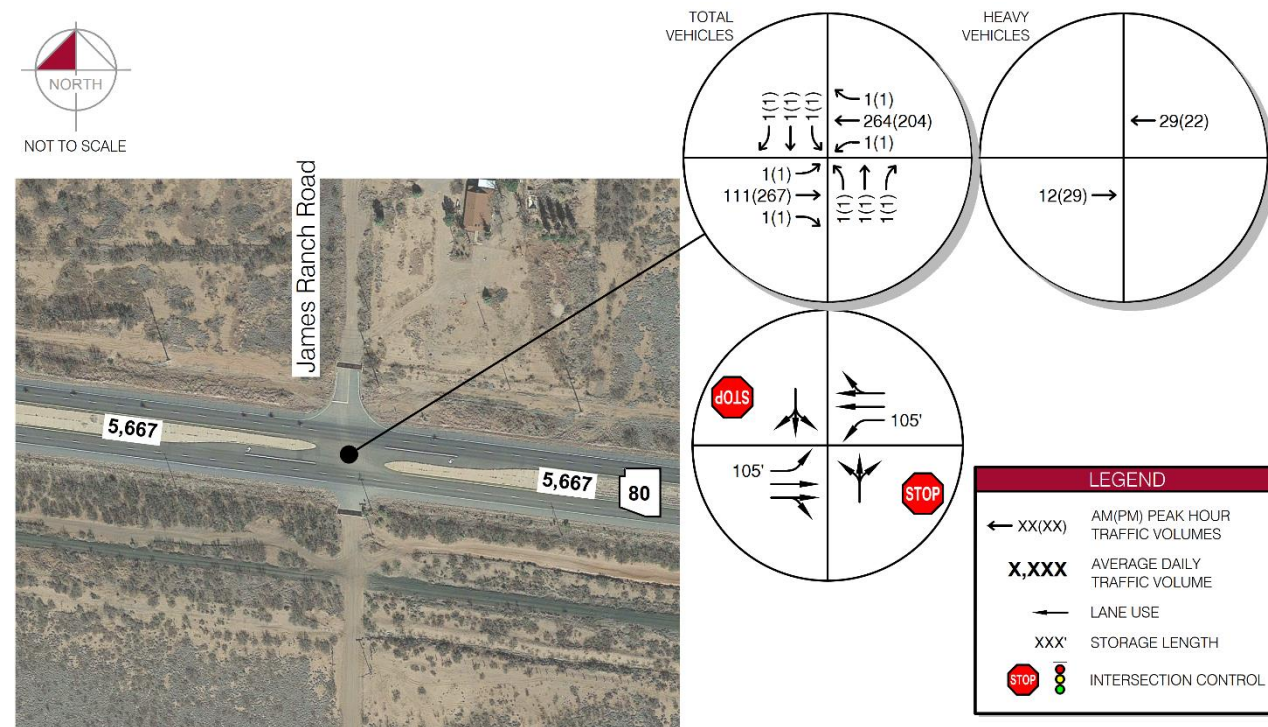


Figure 2.1 – Existing Conditions: SR 80 / James Ranch Road Intersection

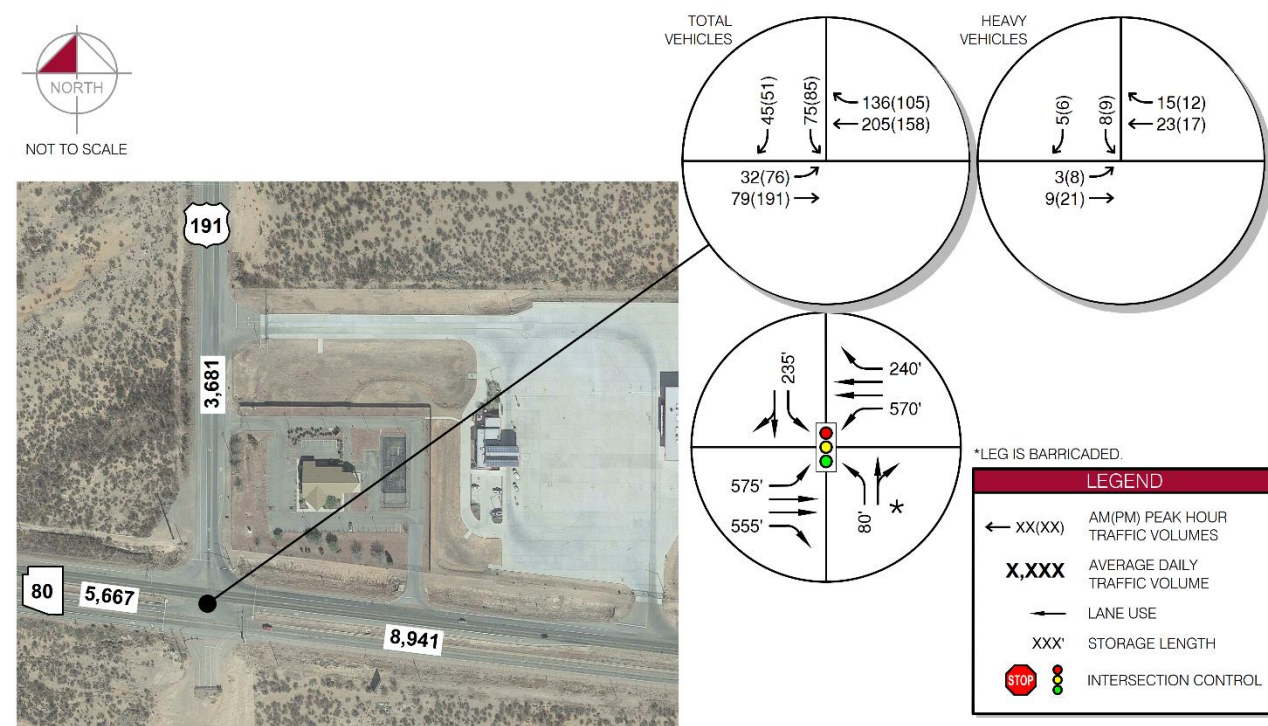


Figure 2.2 – Existing Conditions: SR 80 / US 191 Intersection

2.1.4 Transit and Active Transportation

The City of Douglas currently has bus routes that run along SR 80 between the RHC IPOE east of the study area and Cochise College, located approximately 2.5 miles west of James Ranch Road. Current pedestrian traffic is estimated to be very low along SR 80, US 191, and James Ranch Road in the study area due to the study area's distance from the City of Douglas, minimal adjacent development, and lack of pedestrian accommodations. Bicyclists are currently accommodated along SR 80 by the approximately ten-foot-wide paved outside shoulders in each travel direction.

2.2 Existing Ports of Entry

The existing RHC IPOE located along the U.S.-Mexico border at the southern terminus of US 191 Business (Pan American Avenue) is open from 9 AM to 5 PM daily. The RHC IPOE has seven lanes that process vehicular traffic entering the United States. One of these lanes is a designated Secure Electronic Network for Travelers Rapid Inspection (SENTRI) lane that allows expedited processing for pre-approved travelers. The number of dedicated commercial vehicle lanes varies, with a maximum of two lanes dedicated to commercial vehicles at a time. Per information provided by ADOT staff, all commercial vehicles entering the United States at the RHC IPOE are required to continue to the ADOT Commercial Inspection Facility on the northeast corner of the intersection of SR 80 / US 191 for additional processing before traveling to their ultimate destination. The RHC IPOE also has a facility east of the vehicle lanes to process pedestrian traffic. The facility has three booths for processing pedestrians; however, not all booths are open at all times.

The existing ADOT Commercial Inspection Facility on the northeast corner of the SR 80 / US 191 intersection is typically open the same hours as the RHC IPOE (9AM to 5PM daily). All inbound commercial vehicles from Mexico, as well as commercial vehicles traveling in both directions on US 191 and SR 80, are required to be processed at the ADOT Commercial Inspection Facility when it is open. The ADOT Commercial Inspection Facility has one driveway on SR 80 and one driveway on US 191. Internal site circulation follows a counterclockwise direction. Access at the SR 80 driveway is restricted to right-in/right-out movements due to the presence of the median on SR 80.

2.3 Existing Traffic Volumes and Operations

2.3.1 Truck Traffic at the Ports of Entry

Existing truck traffic volume data at the RHC IPOE was obtained from the Douglas Arizona Regional Feasibility Study prepared by Stantec in June 2018 (Stantec Study). The study obtained traffic data from the U.S. Customs and Border Patrol (CBP) collected from February 2017 to January 2018 for vehicles entering the United States. The collected vehicle data differentiated between passenger cars, also referred to as personally-owned vehicles (POVs), and trucks, also referred to as commercially-operated vehicles (COVs). The peak number of trucks processed at the RHC IPOE was 24 trucks per hour, with a total estimated

demand of 31 trucks per hour. The truck volumes reported by the Stantec Study were utilized to represent anticipated truck volumes at the proposed commercial IPOE as detailed in Section 3.4.2 of this report.

ADOT provided 2021 and 2022 monthly statistics for processing of trucks at the ADOT Commercial Inspection Facility. This data indicates that truck volumes vary over time throughout the year, but the data is not broken out by hour or direction of travel.

Relevant excerpts from the Stantec Study and ADOT annual volume data from the Douglas State POE are included in **Appendix 1** and **Appendix 2**, respectively.

2.3.2 Intersection and Roadway Traffic Volumes

Existing (2021) morning (AM) and afternoon (PM) peak period turning movement counts (TMCs) were estimated at the intersections of SR 80 / James Ranch Road and SR 80 / US 191 based on bi-directional average daily traffic (ADT) counts from the ADOT Transportation Data Management System (TDMS) and from the Southeastern Arizona Governments Organization (SEAGO) TDMS. Details regarding the ADOT and SEAGO counts are provided in **Appendix 3**.

The EB and WB through volumes at the intersection of SR 80 / James Ranch Road were estimated using the total AM and PM peak hour volumes from the ADOT TDMS counts. Existing volumes on James Ranch Road are anticipated to be very low due to the lack of development along the existing unpaved roadway. Therefore, a small volume was assumed on all movements other than the SR 80 mainline through traffic movements for the purposes of obtaining existing level of service (LOS) results.

Turning movement volumes at the existing intersection of SR 80 / US 191 were estimated based on the relative proportion of ADT volumes on each intersection leg.

The peak hour and ADT volumes at the existing intersections are shown in the previously referenced **Figure 2.1**. Existing traffic volume calculations are included in **Appendix 4**.

The EB and WB through volumes on SR 80 are heavily directional in the AM peak hour and moderately directional in the PM peak hour. The WB volumes are over 100 percent greater than the EB approach volumes in the AM peak hour, and the EB volumes are about 30 percent greater than the WB volumes in the PM peak hour. Daily EB and WB volumes on SR 80 are approximately equal.

Existing medium and heavy vehicle (truck) percentages along the study area roadways were obtained from the 2021 ADOT Average Annual Daily Traffic Reports.

Table 2.1 summarizes the existing ADT, K-factors (design peak hour percentage of daily volume), D-factors (directional split), T-factors (truck percentage), and percent medium and heavy vehicles (per the Federal Highway Administration [FHWA] 13-Class classification scheme detailed later in Section 7.1 of this report) obtained from the ADOT TDMS for the

study area roadways. More information on existing TDMS traffic data can be found in **Appendix 3**.

Table 2.1 – Existing Traffic Data Summary

Input	SR 80 west of James Ranch Road	SR 80 / US 191			
		North Leg	South Leg	East Leg	West Leg
ADT (vpd)	5,667	3,681	-	8,941	5,667
K-Factor	9%	9%	-	8%	9%
D-Factor	59%	60%	-	54%	59%
T-Factor	11%	11%	-	11%	11%
Medium Vehicle %	6%	7%	-	9%	6%
Heavy Vehicle %	5%	4%	-	2%	5%

3. FUTURE TRAFFIC VOLUMES ANALYSIS AND ALTERNATIVES

3.1 Available Future Conditions Models and Data

Future conditions data was obtained from the following travel demand models:

- ADOT statewide model
- Sierra Vista Metropolitan Planning Organization (SVMPO) model

Upon initial analysis of both models, neither was found to adequately predict future traffic conditions within the study area. The ADOT statewide model has not been updated or calibrated for this area in many years and the model volumes and projected growth rates on SR 80 do not appear reasonable compared to existing counted volumes and expected growth rates. The SVMPO model extents are somewhat close to, but do not include, the study area. Information from the SVMPO model end links is not applicable as there are several roadway network connections between the edge of the SVMPO model and the study area. Therefore, neither travel demand model was used to determine future traffic conditions. The ADOT and SVMPO model outputs are included in **Appendix 3** for reference.

Instead of using model projections, 2040 annual average daily traffic (AADT) projections from the ADOT TDMS were used to calculate an average annual growth rate for the study roadway segments. Based on the existing and 2040 AADT projections, a growth rate of two percent per year was applied to the existing traffic volumes on SR 80 and US 191 to estimate opening year 2028 and horizon year 2050 daily and peak hour traffic volumes. Detailed volume calculations can be found in **Appendix 4**.

3.2 Future Build Analysis Alternatives

The following intersection configuration alternatives were analyzed at the study intersection of SR 80 / James Ranch Road under the opening year 2028 Build and horizon year 2050 Build conditions (see illustrations of the general intersection configurations, control types, and control locations shown in **Figure 3.1**):

- TWSC
- Traffic Signal Control
- Roundabout

The TWSC configuration assumes the existing northbound/southbound stop control on James Ranch Road remains; however, different lane geometry than existing was considered in the future analyses. The traffic signal control configuration assumes the installation of a traffic

signal at the study intersection. The roundabout configuration assumes the installation of a two-lane roundabout at the study intersection.

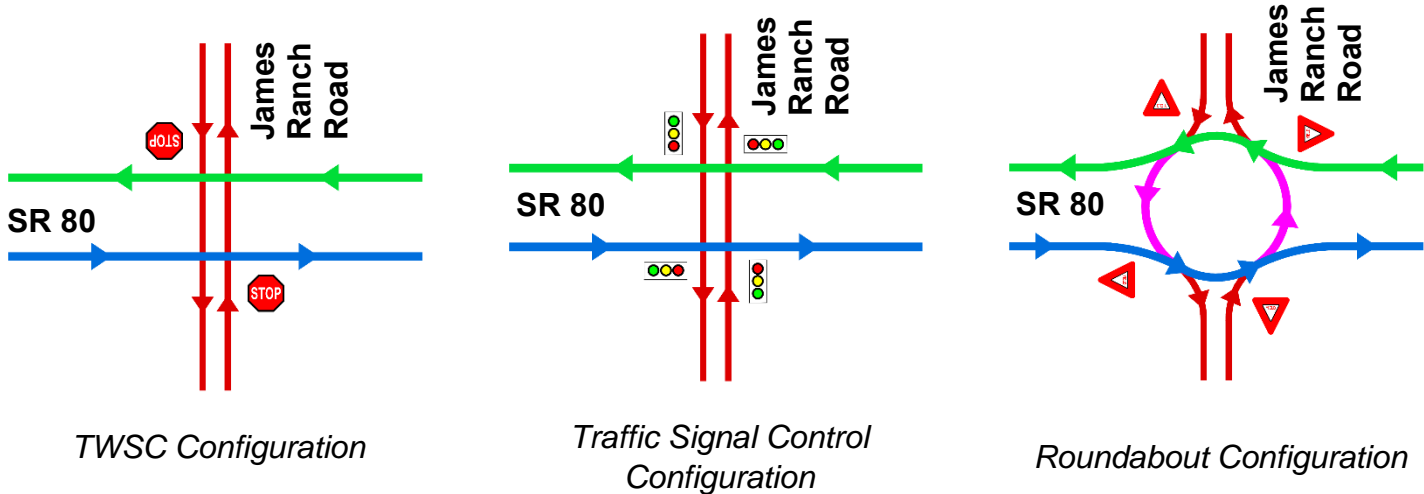
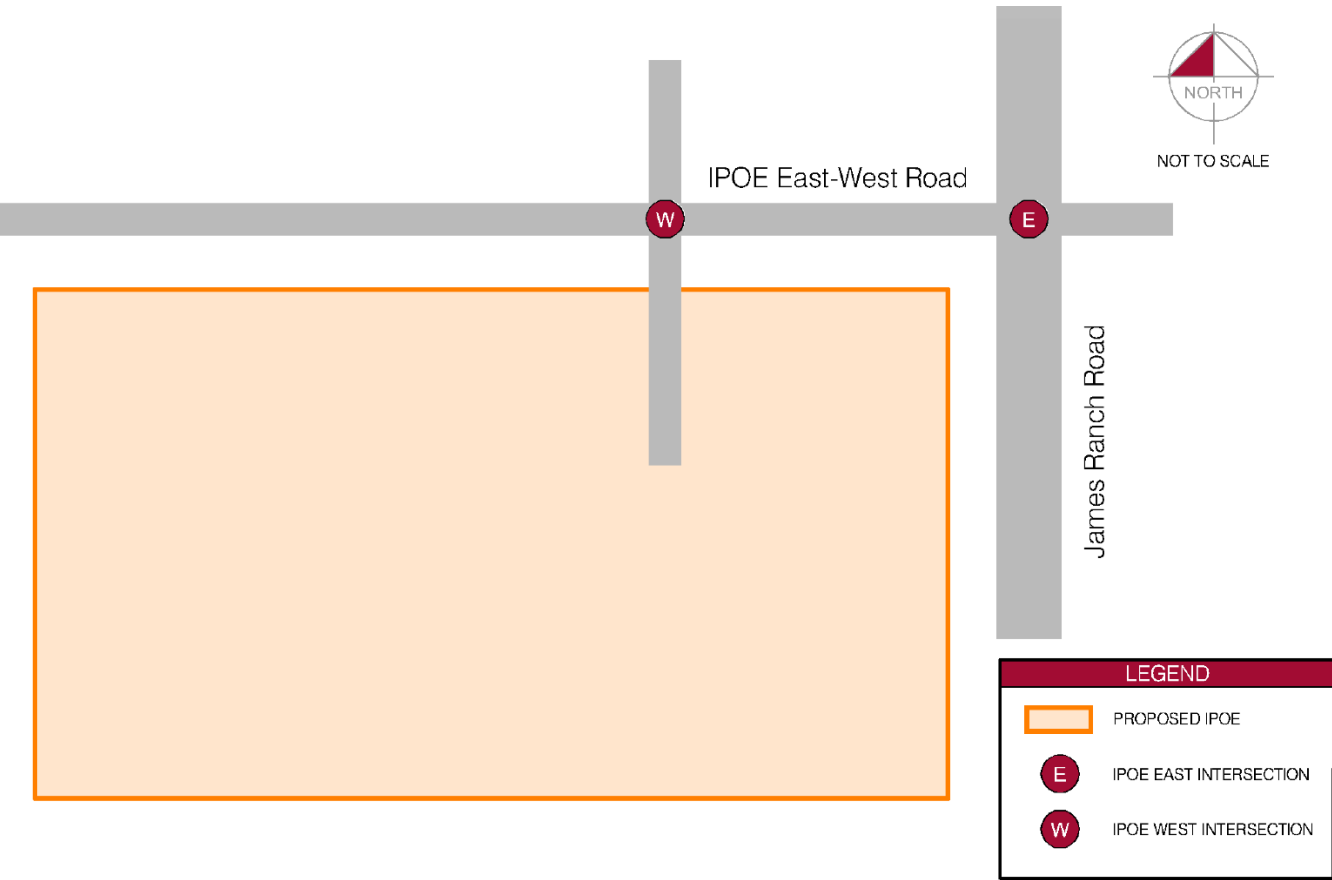


Figure 3.1 – Intersection Configuration Alternatives

Additionally, the SR 80 / US 191 intersection was analyzed for all scenarios to identify how the intersection will be affected by the change in truck traffic routing from the proposed commercial IPOE and other traffic growth. The intersection was analyzed with its current lane geometry in the existing and 2028/2050 No-Build scenarios. The Chino Road reroute described in Section 2.1.2 was assumed to occur in the 2028/2050 Build scenarios; therefore, the currently barricaded south leg of the intersection was analyzed as being open in these scenarios.

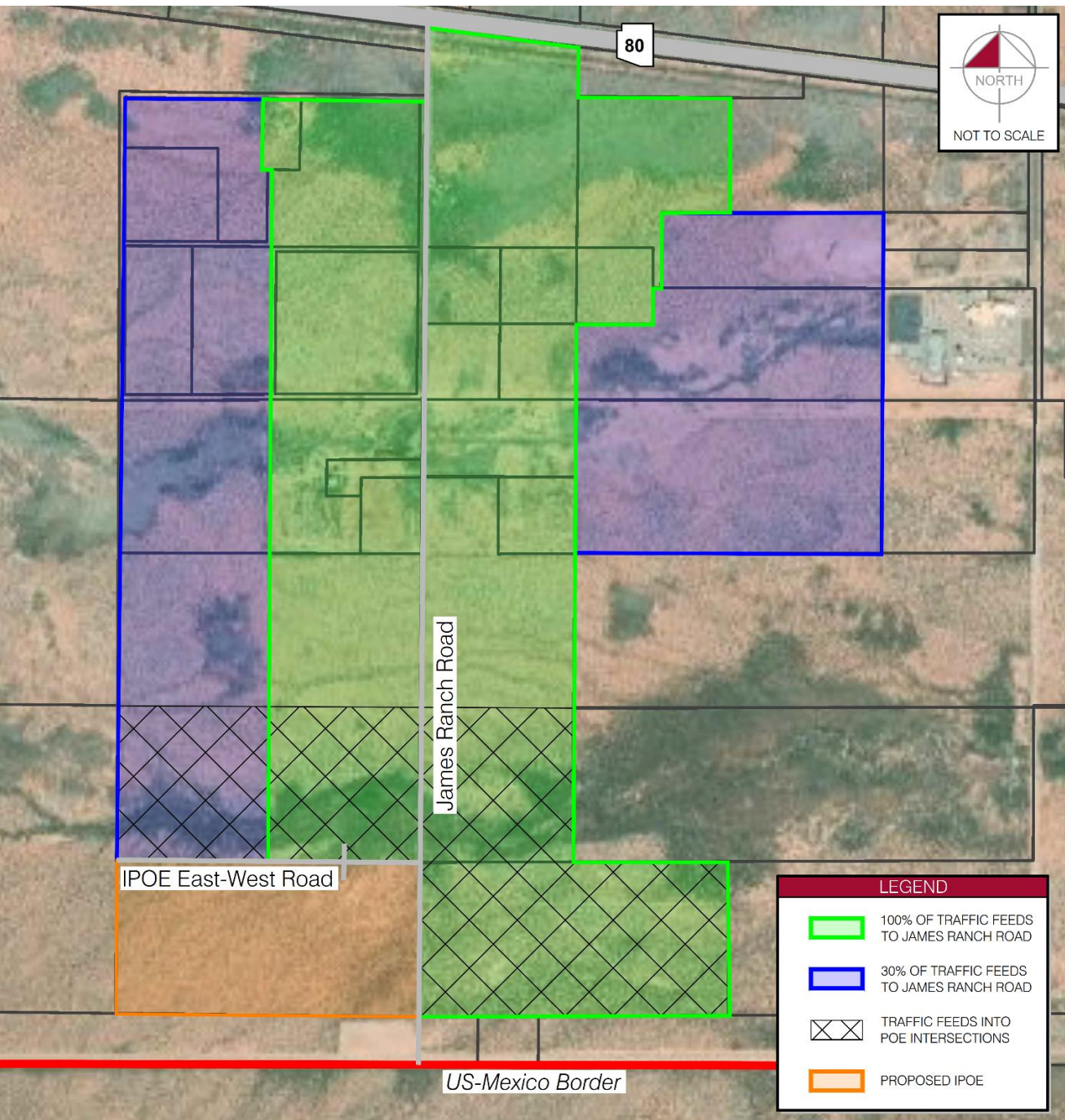
Two new intersections are anticipated to be constructed with the proposed IPOE as shown in **Figure 3.2**. These intersections are referred to as the IPOE East and IPOE West intersections in this report and are approximately 570 feet apart from each other measured between the centers of each intersection. Per coordination with ADOT, these intersections are anticipated to have all-way stop control in the opening year 2028 and roundabout traffic control by the horizon year 2050.



3.3 Future Land Use Forecast

The parcels along the James Ranch Road alignment south of SR 80 are zoned as “C-Developing” by Cochise County and are anticipated to contain commercial and/or industrial land uses. Because no detailed land use plans were available at the time of this report, it was assumed that the parcels fronting James Ranch Road and a portion of other parcels near James Ranch Road will contribute traffic to the proposed connector road. The parcels that were assumed to contribute to traffic on James Ranch Road are shown in **Figure 3.3**. It was assumed that all traffic from the parcels outlined in green and 30 percent of all traffic from the parcels outlined in blue would utilize James Ranch Road to get to and from SR 80. To estimate a leasable floor area for each parcel, a floor-area ratio (FAR) of 0.25 was assumed for all parcels. Additionally, it was assumed that 30 percent of the total adjacent parcel area would be developed by opening year 2028 and 100 percent of the total adjacent parcel area would be developed by horizon year 2050.

To estimate traffic at the new intersections adjacent to the proposed IPOE intersections, it was assumed that all traffic generated by the cross-hatched area in **Figure 3.3** would feed exclusively into the proposed IPOE intersections.



3.4 Future Traffic Volumes

3.4.1 Growth of Existing Traffic

Existing traffic on SR 80 and US 191 was grown based on a comparison of the existing and 2040 projected ADT volumes from the ADOT TDMS. From these volumes, an average annual growth rate of two percent per year was determined. This rate was applied to the existing volumes along SR 80, US 191, and Chino Road to obtain opening year 2028 and horizon year 2050 traffic volumes. Like the existing conditions analysis, small traffic volumes were also assumed for movements at the study intersections that are not anticipated to be affected by development along James Ranch Road south of SR 80 or the proposed IPOE to obtain LOS results. This assumed volume was increased in each successive analysis year to account for potential growth.

3.4.2 Proposed Commercial IPOE Traffic Volumes

Future commercial volumes generated by the proposed commercial IPOE were estimated based on the existing traffic count data collected at the RHC IPOE from the Stantec Study previously described in Section 2.2. The study utilized the peak volume day of the 90th percentile peak volume week to determine daily and hourly passenger vehicle and heavy vehicle volumes. From this data, a daily heavy vehicle peak hour volume was determined, and a demand factor of 1.3 was applied to account for additional traffic demand that arrived within the peak hour but was not processed. The same peak hour heavy vehicle demand volume was assumed for the proposed commercial IPOE's trip generation for both trips entering and exiting the United States during both the AM and PM peak hours and represents a conservative estimate of expected traffic. Relevant excerpts from the Stantec Study are included in **Appendix 1**.

The proposed commercial IPOE trip generation was then distributed to the roadway network based on existing and anticipated traffic patterns in the study area. It is anticipated that all truck traffic entering the U.S. will be required to travel to the ADOT Commercial Inspection Facility located on the northeast corner of the intersection of SR 80 / US 191 for additional processing. Therefore, traffic entering the U.S. was first routed to the ADOT Commercial Inspection Facility before being distributed east and west along SR 80 and north on US 191. Entering and exiting traffic was distributed based on existing and anticipated traffic patterns on SR 80 and US 191.

The proposed commercial IPOE traffic assignment was grown based on the average annual growth rate used in the Stantec Study. The Stantec Study analyzed historical inbound volumes processed at the RHC IPOE between 2011 and 2017 and calculated an average annual growth rate of 1.1 percent per year. The proposed commercial IPOE traffic was assumed to grow at this annual rate to the opening year 2028 and horizon year 2050. Future traffic volume calculations for the proposed commercial IPOE are included in **Appendix 4**.

Additionally, proposed commercial IPOE employee traffic volumes were estimated based on projected staffing requirements and shift times provided by the U.S. General Services Administration (GSA). An estimated 50 employees will enter the site in both the AM and PM shift, and 50 employees will leave the site at the end of the AM shift, which is also the start of the PM shift. These shifts were assumed to start during the AM and PM peak hours to present a conservative estimate of traffic at the proposed IPOE intersections. All employee traffic was assumed to utilize the proposed parking lot located south of the proposed IPOE east-west road. The additional employee traffic at the study intersections on SR 80 is assumed to be included within the projected adjacent development traffic volumes discussed below.

3.4.3 Adjacent Development Traffic Volumes

Volumes were estimated for the future developments along James Ranch Road south of US 80 using the Institute of Transportation Engineers (ITE) *Trip Generation Manual, 11th Edition*. Trip generation was calculated using the "peak hour of generator" rates for ITE Land Use 150, Warehousing, to provide an estimate of peak hour traffic that could be generated by the future developments. The land use assumptions for the parcels anticipated to contribute traffic to the connector road and proposed IPOE intersections are described previously in Section 3.3.

These adjacent development trips were distributed to the roadway network based on anticipated traffic patterns to and from the developments. Because most peak hour trips to and from warehousing land uses are commuters to and from residential areas, traffic is anticipated to be weighted heavily in the direction of Douglas. Therefore, it was estimated that 85 percent of traffic would travel to and from the east and 15 percent of traffic would travel to and from the west on SR 80. Trip generation calculations for the adjacent developments are shown in **Appendix 4**.

Heavy vehicle/truck percentages for the adjacent development traffic assignment were estimated based on Appendix I of the ITE *Trip Generation Handbook, 3rd Edition* and a comparison of the heavy vehicle and total vehicle trip generation rates in the ITE *Trip Generation Manual*. Based on the data, 20 percent of trips to and from the adjacent developments were assumed to be heavy vehicles.

3.4.4 Future Volumes and Lane Configuration Summary

The calculated average annual growth rates discussed in Section 3.4.1 were applied to the existing traffic volumes to obtain traffic volumes for the opening year 2028 and horizon year 2050 No-Build scenarios. The No-Build scenarios assume that the proposed commercial IPOE and the future warehousing developments along James Ranch Road are not constructed and that no changes are made to existing roadway geometry.

To determine future Build condition traffic volumes, the existing traffic volumes and the proposed commercial IPOE volumes were grown by the average annual growth rates discussed in Section 3.4.1 and Section 3.4.2, respectively. The grown existing volumes, the

adjacent development volumes discussed in Section 3.4.3, and the grown proposed commercial IPOE traffic volumes were added together to obtain the total traffic volumes for the opening year 2028 and horizon year 2050 Build scenarios. In addition to the geometric improvements of the future Build analysis alternatives, the Build condition assumes that the Chino Road re-route described in Section 2.1.2 is completed by 2028. The No-Build condition was not analyzed at the proposed IPOE intersections because they would not be constructed in the No-Build condition.

The lane configurations at the proposed IPOE intersections were assumed based on preliminary intersection plans and the lane geometry required to provide acceptable LOS and queueing results at the intersections.

The resultant 2028 and 2050 traffic volumes and lane configurations for the different SR 80 / James Ranch Road intersection configurations, the SR 80 / US 191 intersection, and the proposed IPOE intersections are presented in the following figures:

SR 80 / James Ranch Road:

- 2028 No-Build – **Figure 3.4**
- 2028 Build – **Figure 3.5**
- 2050 No-Build – **Figure 3.6**
- 2050 Build – **Figure 3.7**

SR 80 / US 191:

- 2028 No-Build – **Figure 3.8**
- 2028 Build – **Figure 3.9**
- 2050 No-Build – **Figure 3.10**
- 2050 Build – **Figure 3.11**

IPOE East Intersection:

- 2028 Build – **Figure 3.12**
- 2050 Build – **Figure 3.13**

IPOE West Intersection:

- 2028 Build – **Figure 3.14**
- 2050 Build – **Figure 3.15**

Note that the proposed IPOE intersections were analyzed with four legs at each intersection. The potential future east leg of the IPOE East Intersection and north leg of the IPOE West Intersection were included in the analysis to provide a conservative analysis of intersection operations with future development traffic. These legs may be installed after the proposed IPOE buildout if the proposed IPOE is completed prior to development in the area.

Table 3.1, Table 3.2, Table 3.3, and Table 3.4 summarize the opening year 2028 and horizon year 2050 ADTs, K-factors, D-factors, and T-factors for each leg of the SR 80 / James Ranch Road, SR 80 / US 191/Chino Road, IPOE East, and IPOE West intersections, respectively.

Table 3.1 – SR 80 / James Ranch Road Future Traffic Summary

Input	North Leg	South Leg	East Leg	West Leg
2028 ADT (vpd)	300	6,300	13,200	8,000
2050 ADT (vpd)	700	19,200	30,500	14,100
AM (PM) K-Factor	9% (9%)	9% (9%)	7% (8%)	7% (8%)
D-Factor	50%	55%	51%	56%
2028 T-Factor	2%	30%	21%	18%
2050 T-Factor	2%	24%	20%	17%

Table 3.2 – SR 80 / US 191/ Chino Road Future Traffic Summary

Input	North Leg	South Leg	East Leg	West Leg
2028 ADT (vpd)	6,900	3,500	11,900	12,600
2050 ADT (vpd)	11,900	5,400	28,000	29,500
AM (PM) K-Factor	6% (8%)	7% (7%)	7% (8%)	6% (7%)
D-Factor	56%	63%	57%	50%
2028 T-Factor	27%	5%	15%	23%
2050 T-Factor	24%	5%	17%	21%

Table 3.3 – IPOE East Intersection Future Traffic Summary

Input	North Leg	South Leg	East Leg	West Leg
2028 ADT (vpd)	3,600	1,300	1,300	1,600
2050 ADT (vpd)	7,900	1,600	4,000	3,600
AM (PM) K-Factor	9% (9%)	9% (9%)	9% (9%)	9% (9%)
D-Factor	51%	60%	53%	55%
2028 T-Factor	32%	2%	17%	54%
2050 T-Factor	29%	2%	18%	39%

Table 3.4 – IPOE West Intersection Future Traffic Summary

Input	North Leg	South Leg	East Leg	West Leg
2028 ADT (vpd)	400	1,000	1,600	800
2050 ADT (vpd)	900	1,400	3,600	2,200
AM (PM) K-Factor	9% (9%)	9% (9%)	9% (9%)	9% (9%)
D-Factor	52%	50%	55%	53%
2028 T-Factor	37%	100%	54%	29%
2050 T-Factor	36%	100%	39%	27%

Note that the K-factors used in the future analysis differ from the existing K-factors from the ADOT TDMS. For the future volumes analysis, these values were recalculated from the hourly TDMS volume data for both the AM and PM peak hours separately to provide an estimate that better reflects the available data for future traffic conditions. Additionally, T-factors were applied per turning movement instead of per approach in the analysis. The approach T-factors reported above represent the weighted average truck percentages by movement volume and are provided for reference.

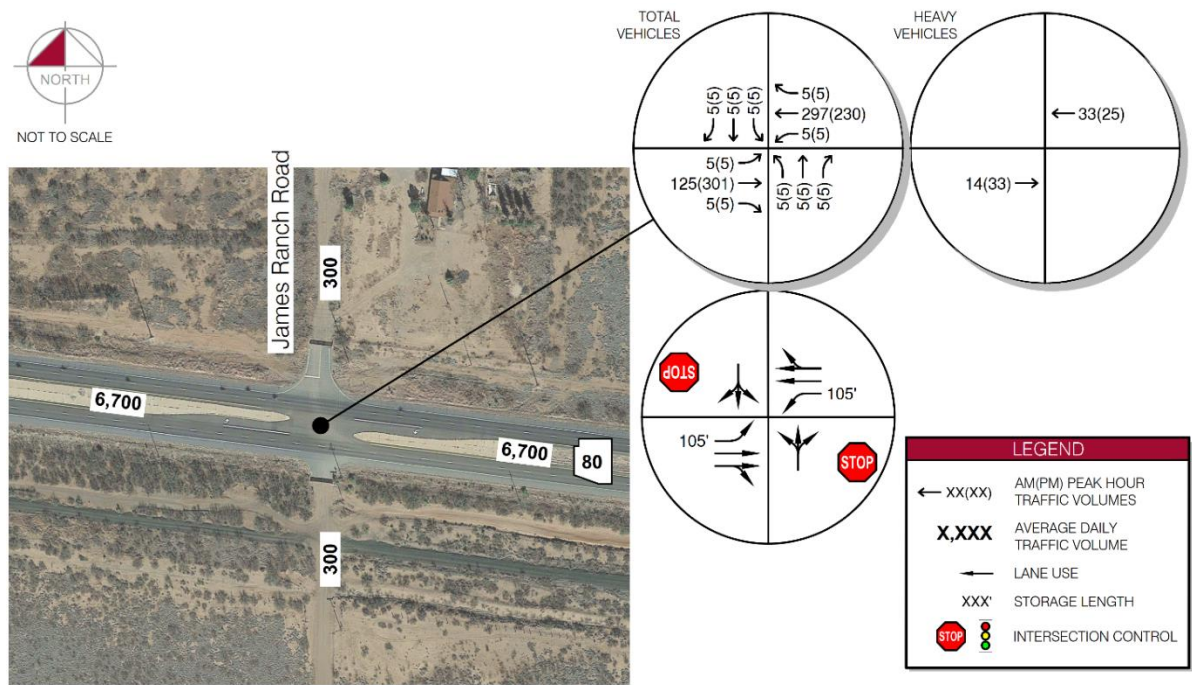


Figure 3.4 – SR 80 / James Ranch Road: 2028 No-Build Traffic Volumes & Lane Configuration

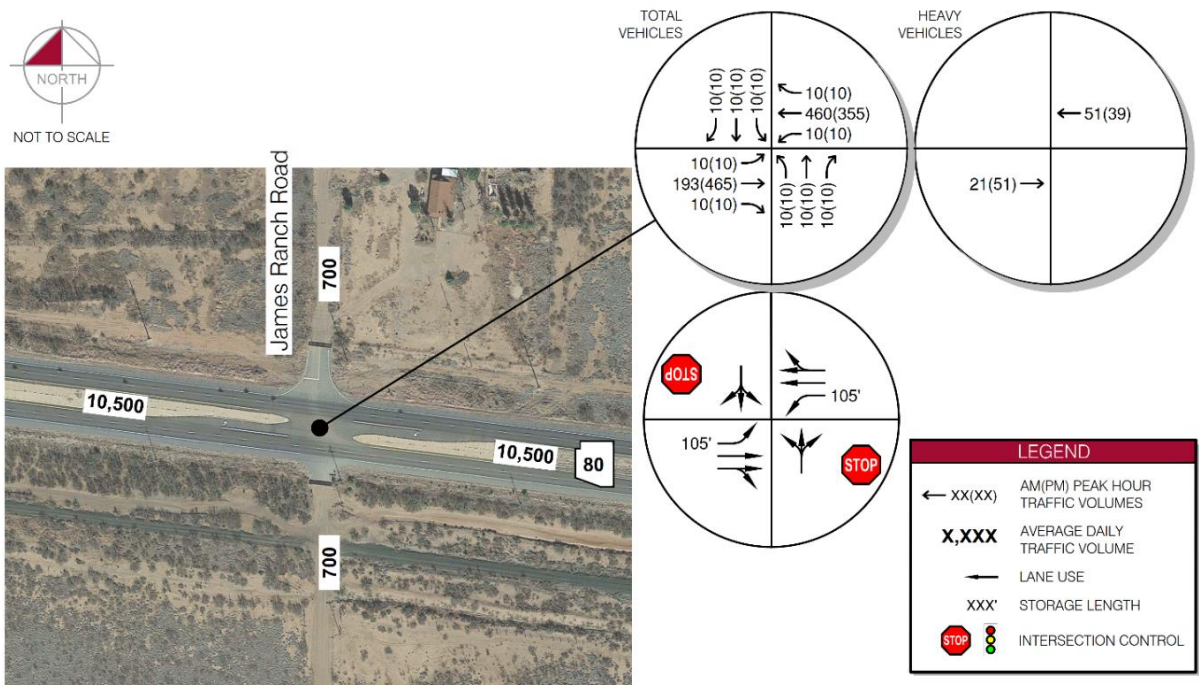


Figure 3.6 – SR 80 / James Ranch Road: 2050 No-Build Traffic Volumes & Lane Configuration

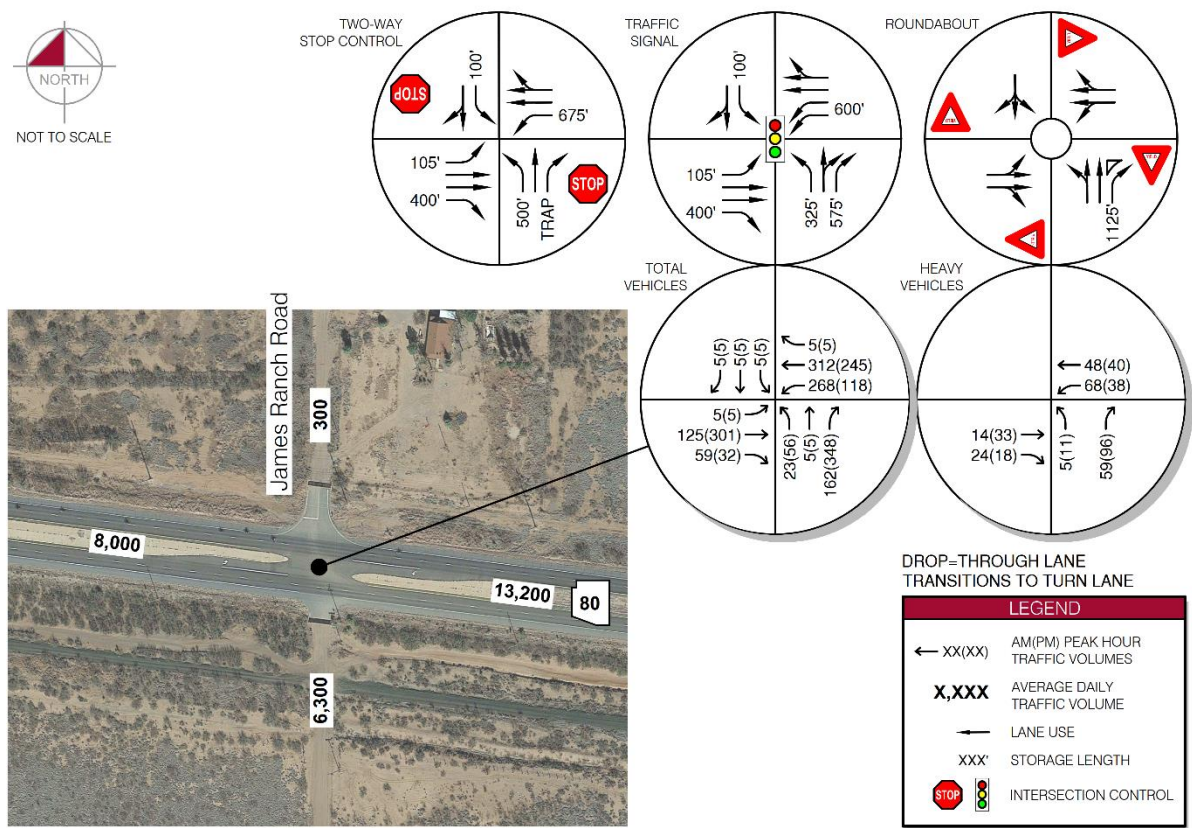


Figure 3.5 – SR 80 / James Ranch Road: 2028 Build Traffic Volumes & Lane Configuration

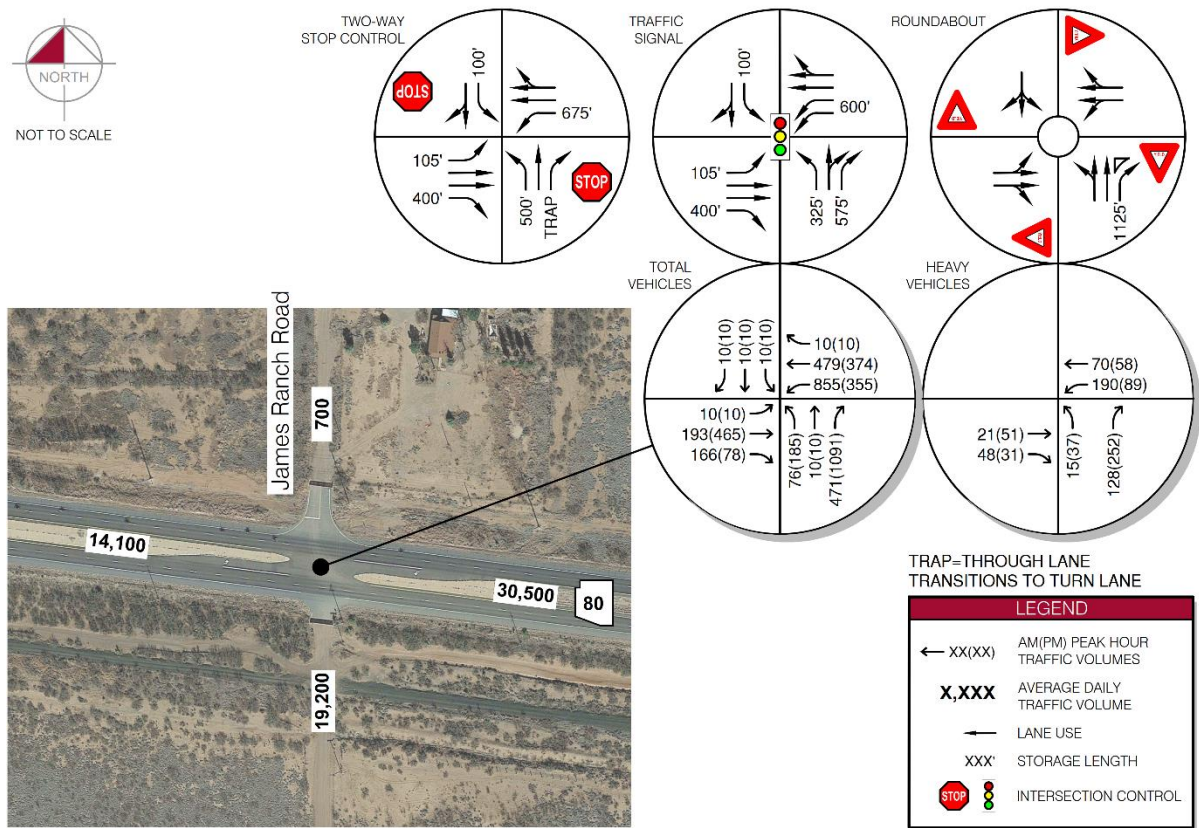


Figure 3.7 – SR 80 / James Ranch Road: 2050 Build Traffic Volumes & Lane Configuration

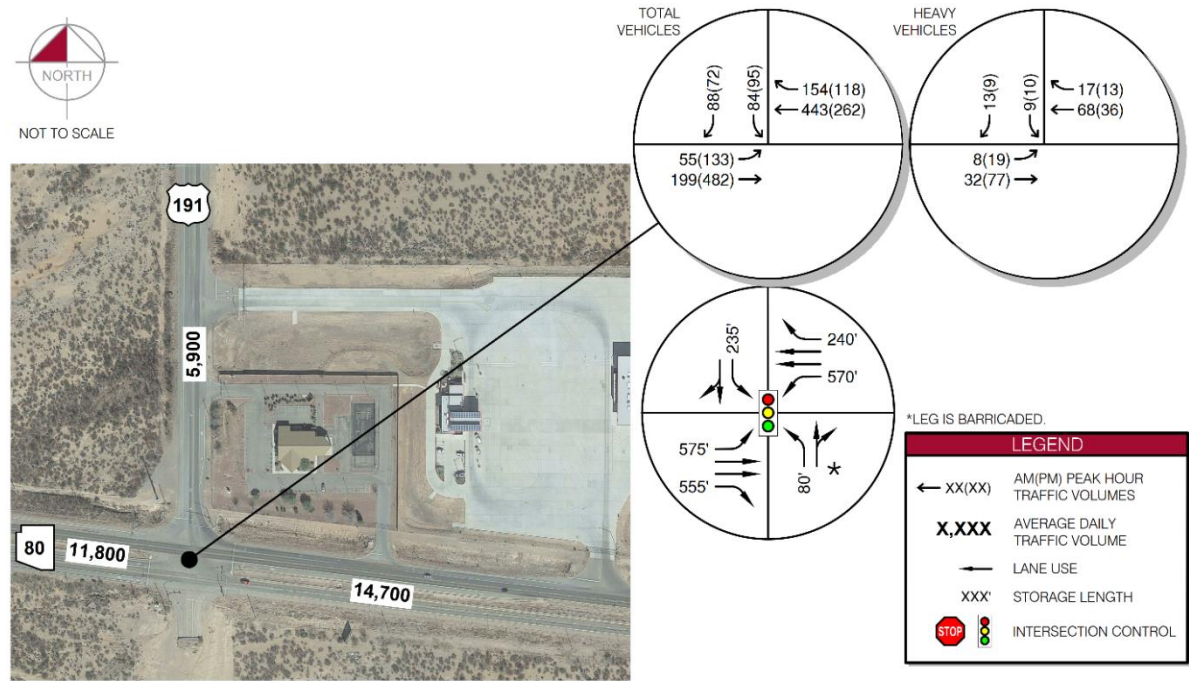


Figure 3.8 – SR 80 / US 191: 2028 No-Build Traffic Volumes & Lane Configuration

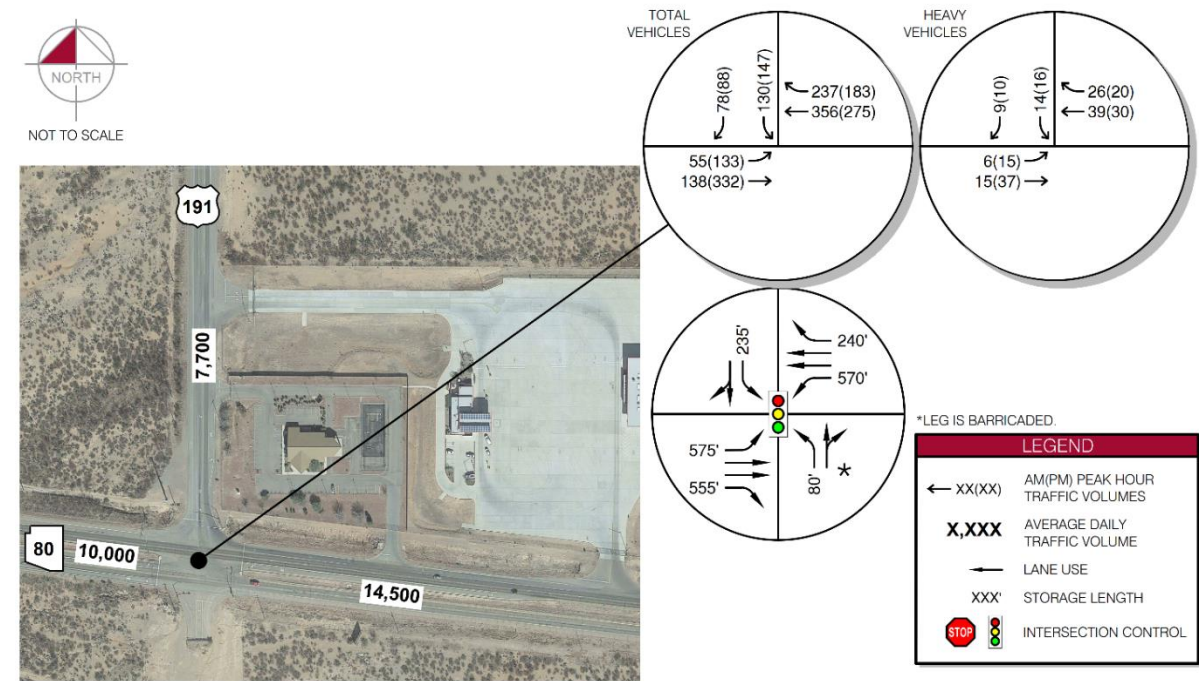


Figure 3.10 – SR 80 / US 191: 2050 No-Build Traffic Volumes & Lane Configuration

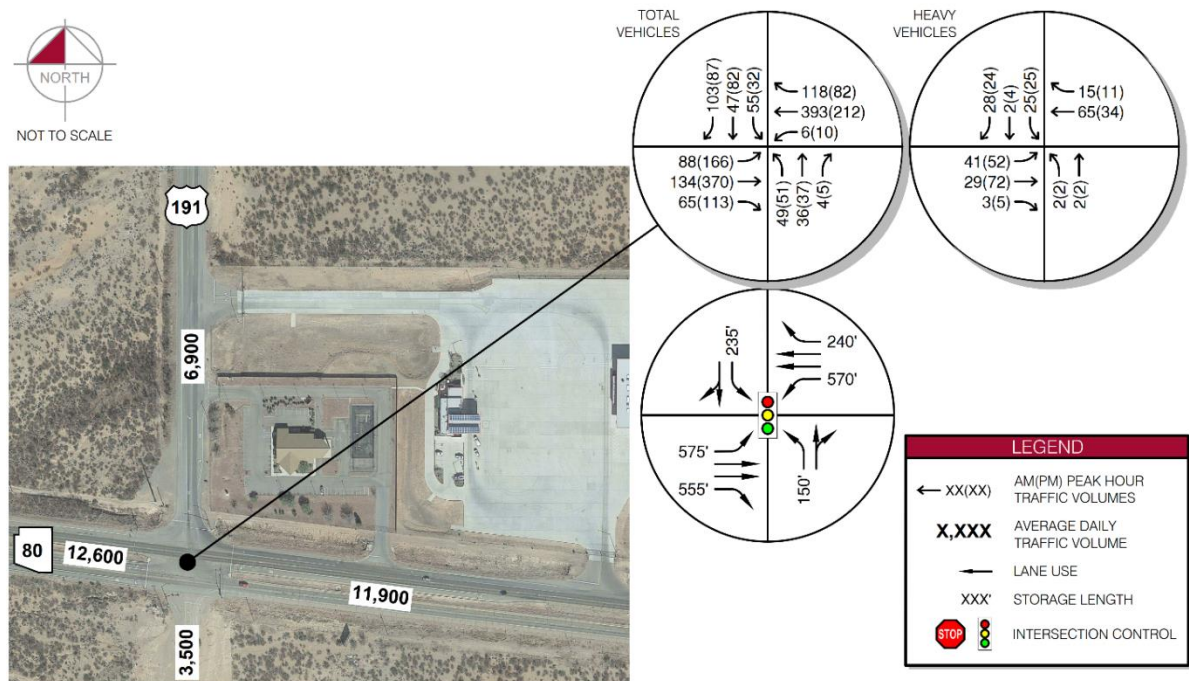


Figure 3.9 – SR 80 / US 191: 2028 Build Traffic Volumes & Lane Configuration

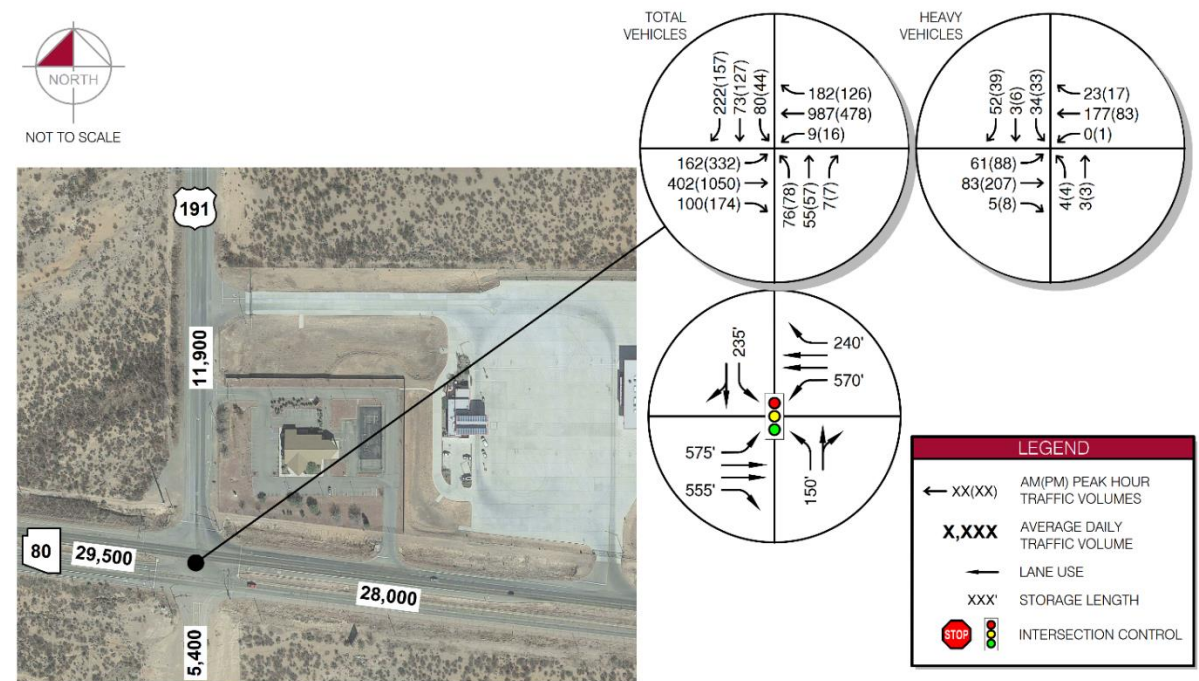


Figure 3.11 – SR 80 / US 191: 2050 Build Traffic Volumes & Lane Configuration

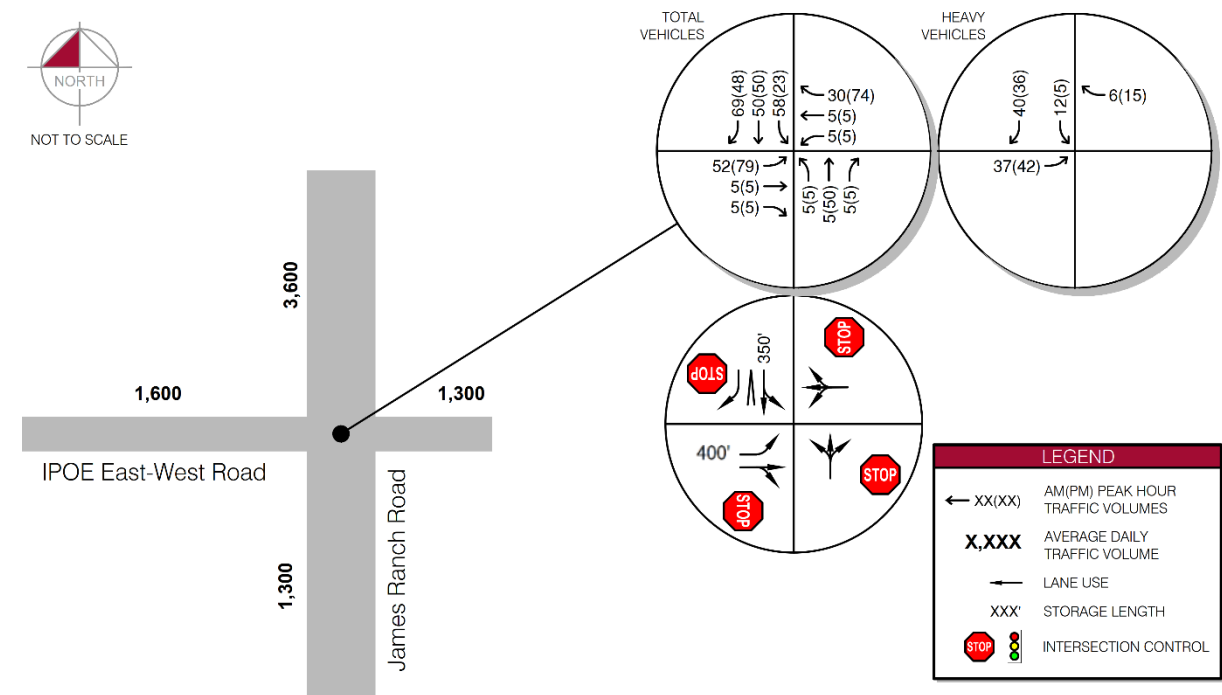


Figure 3.12 – IPOE East Intersection: 2028 Build Traffic Volumes & Lane Configuration

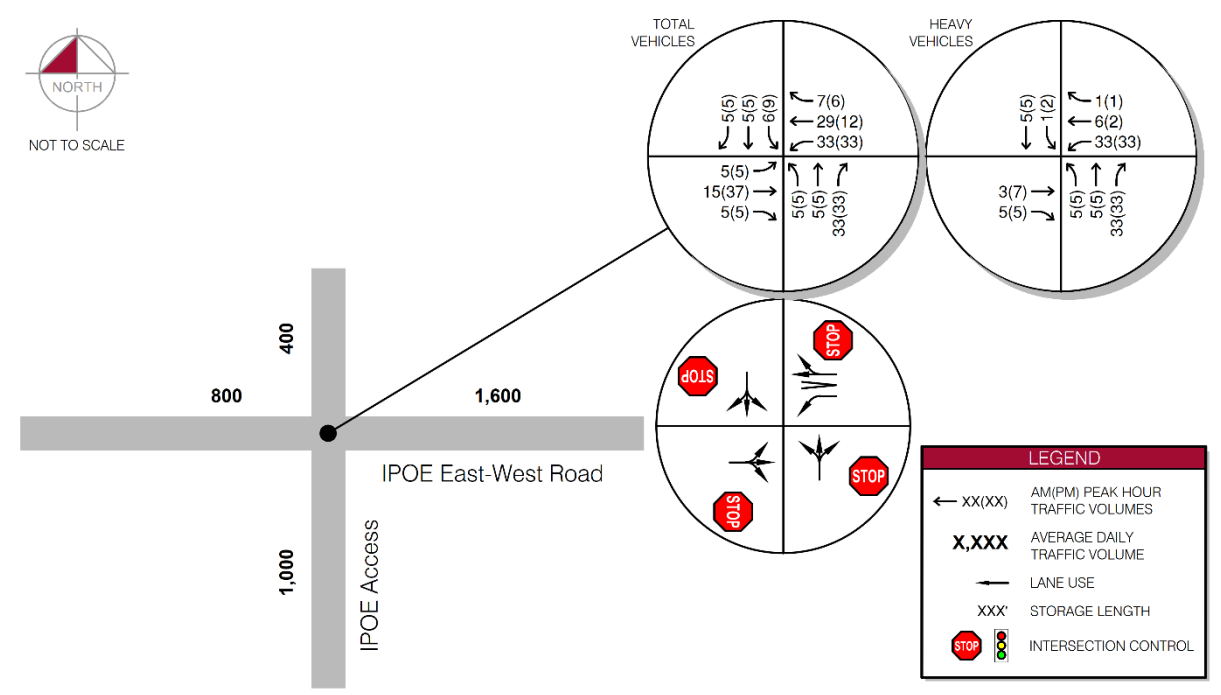


Figure 3.14 – IPOE West Intersection: 2028 Build Traffic Volumes & Lane Configuration

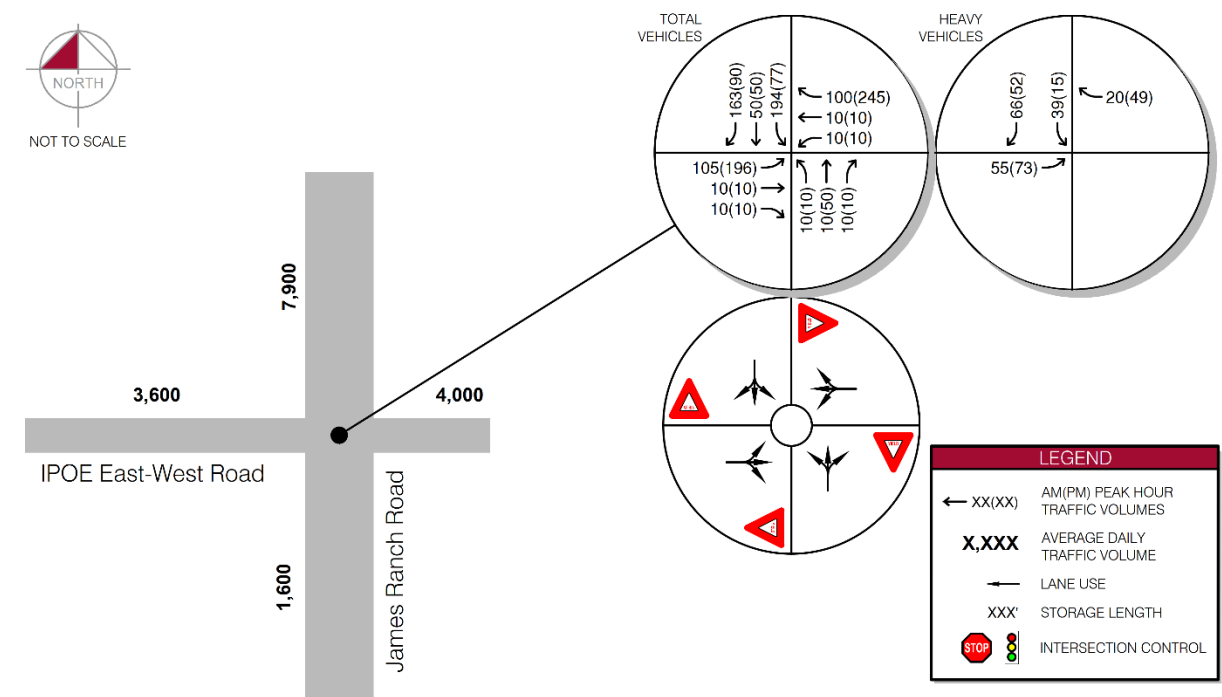


Figure 3.13 – IPOE East Intersection: 2050 Build Traffic Volumes & Lane Configuration

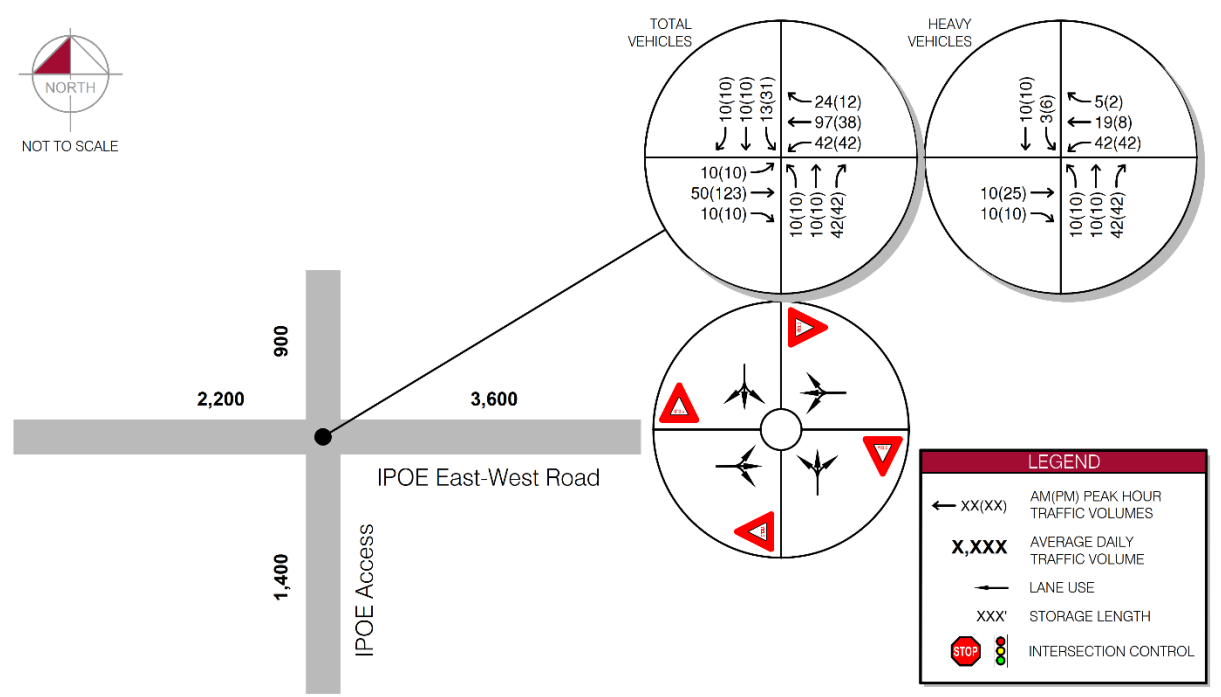


Figure 3.15 – IPOE West Intersection: 2050 Build Traffic Volumes & Lane Configuration

The recommended storage lengths shown in **Figure 3.5** through **Figure 3.15** were determined using the methodology outlined in ADOT Traffic Guidelines and Processes (TGP) Section 430. Tables 430-1 and 430-2 from the TGP were used to select an appropriate gap and braking distance, respectively. The 95th percentile queues from the different operational analyses presented in Section 5 of this report were used as the queue portion of the storage described in TGP 430.

Per ADOT TGP 245, an exclusive EB right-turn lane is warranted at the intersection of SR 80 / James Ranch Road based on projected 2028 and 2050 peak hour turning movement volumes.

Relevant excerpts from TGP 430 and TGP 245 are included in **Appendix 5**.

4. CRASH SUMMARY

A crash summary was conducted for crashes occurring along SR 80 between approximately 1,5 miles west of James Ranch Road and 1.0 mile east of James Ranch Road to identify any crash patterns or trends that may be present within the study area.

Crash data was obtained from ADOT for the dates between January 1, 2017, and December 31, 2021, the five most current full years available.

Nineteen total crashes were reported along this SR 80 study segment. Of the 19 total crashes, there were two angle crashes (11 percent of total crashes). One angle crash occurred at the driveway on SR 80 approximately 1.5 miles west of James Ranch Road and the other occurred at the intersection of SR 80 / Kings Highway (1.0 mile east of James Ranch Road). The crash reported west of James Ranch Road resulted in a suspected serious injury, while the crash east of James Ranch Road resulted in no injury.

The remaining 17 crashes were all single-vehicle crashes along SR 80 (89 percent of total crashes). Of these crashes, 12 crashes involved an animal, 3 crashes involved an object, and 2 crashes were rollovers. Of the single-vehicle crashes, 13 crashes resulted in no injuries, 2 crashes resulted in possible injury, and 2 crashes resulted in suspected minor injury.

Overall, 12 of the 19 total crashes occurred in dark, not lighted conditions (63 percent), 1 occurred during dusk (5 percent), 1 occurred in dark, lighted conditions (5 percent), and 5 occurred in daylight (27 percent). This may indicate lighting issues on SR 80.

Summaries of the total crashes and crash severity by year are shown in **Figure 4.1** and **Figure 4.2**, respectively. **Figure 4.3** shows the locations of all crashes within the study period by injury severity. Note that in these figures, the crash type of one crash is classified as “other”. This crash was described as occurring with an “other non-fixed object” and was therefore included as a single-vehicle crash for the purposes of this analysis.

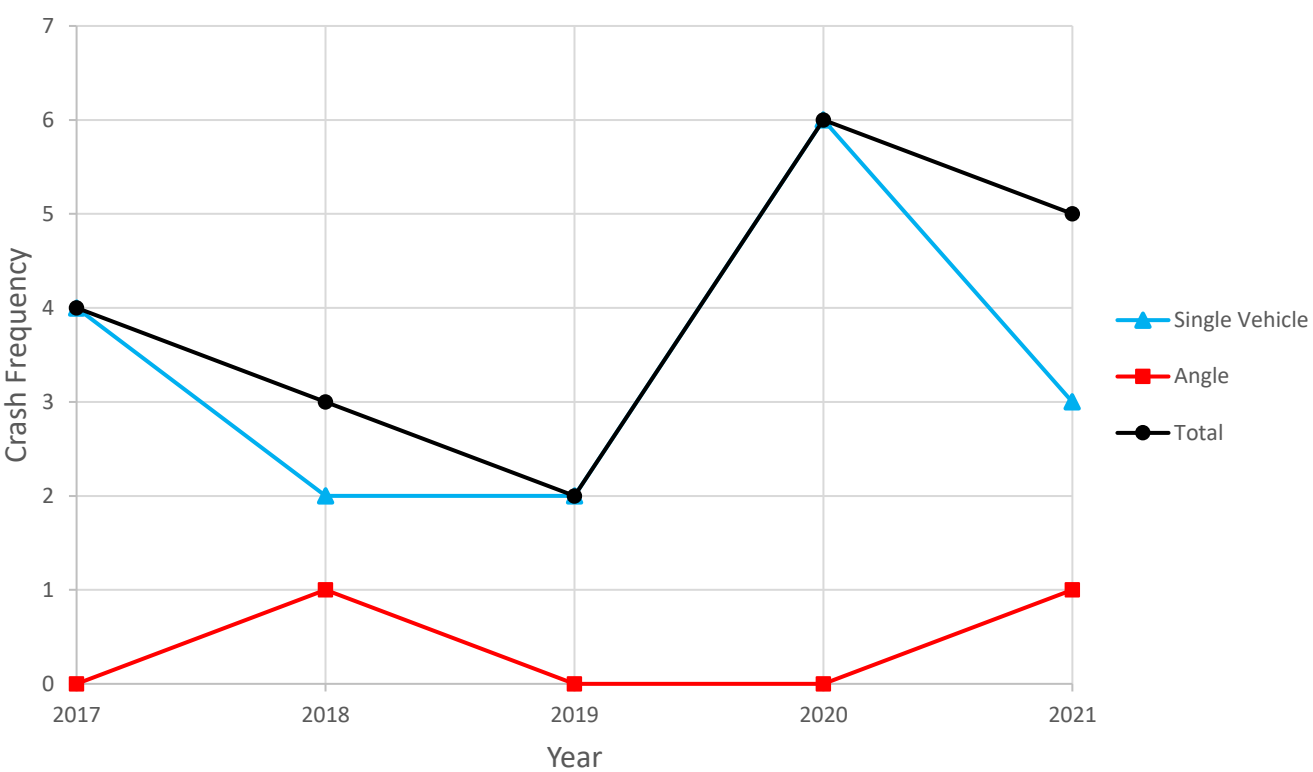


Figure 4.1 – Crash Type by Year

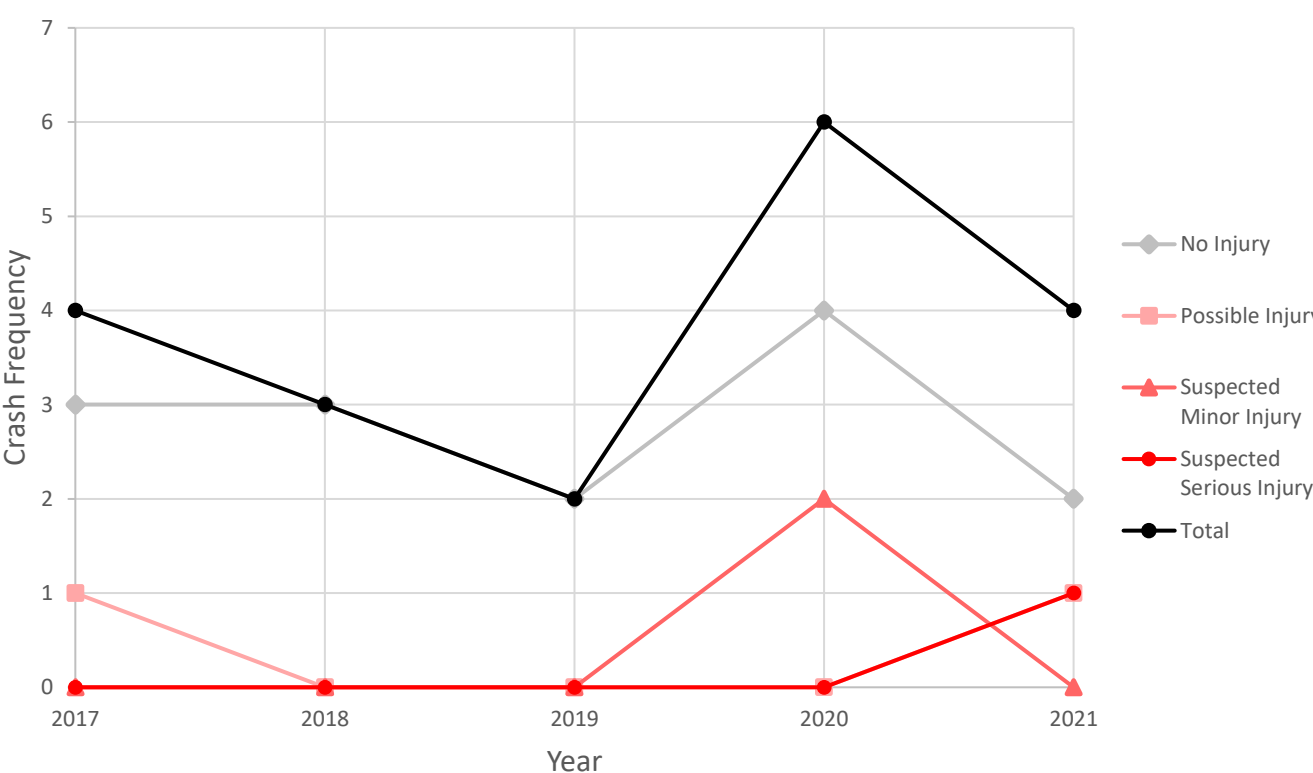
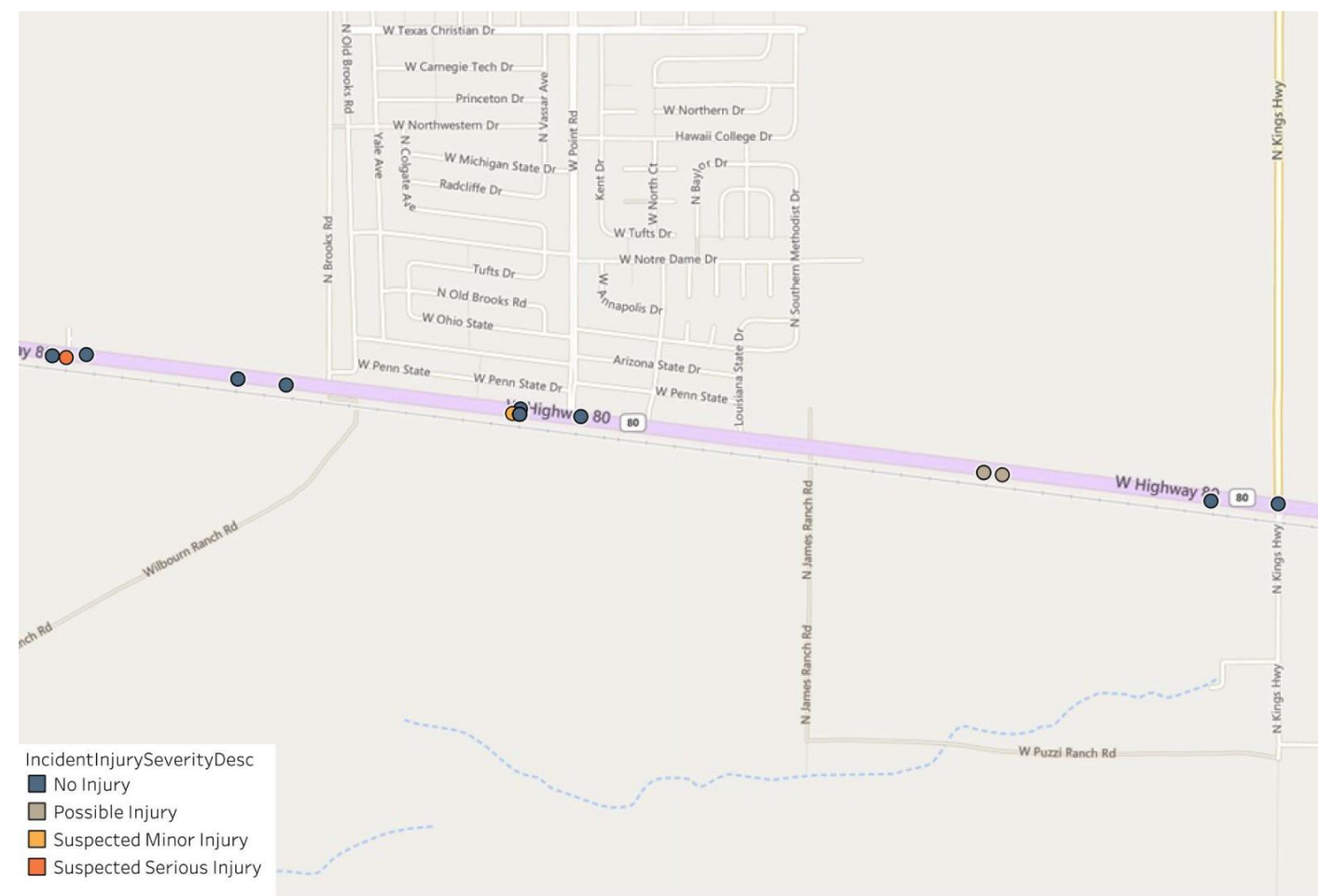


Figure 4.2 – Crash Severity by Year



Source: ADOT

Figure 4.3 – Crash Map

5. OPERATIONAL ANALYSIS

5.1 Intersection Analysis Methodology

An intersection operational analysis was performed at the intersections of SR 80 / James Ranch Road and SR 80 / US 191 for the Existing, 2028 No-Build, 2050 No-Build, 2028 Build, and 2050 Build conditions (for the previously mentioned potential intersection configuration alternatives). The level of service (LOS) and queueing analyses for the TWSC and traffic signal control alternatives were completed using the Highway Capacity Manual, 6th Edition (HCM 6) methodology via Synchro 11 analysis software. Existing signal timing data provided by ADOT at the SR 80 / US 191 intersection were used in the existing and future analyses. The analysis of the Roundabout alternative was completed using Rodel 1.96 analysis software.

An intersection operational analysis was also performed at the proposed IPOE intersections for the 2028 and 2050 Build conditions using the HCM 6 methodology for all-way stop-controlled intersections and roundabouts.

Each intersection, approach, or movement is given a letter designation from LOS A to LOS F. LOS A represents operational conditions with minimal delay and traffic volumes significantly less than available capacity (volume-to-capacity ratio $v/c < 1$). LOS F represents poor operational conditions with a high degree of delay and/or traffic volumes greater than the available capacity ($v/c > 1$). Each LOS grade represents a range of operational conditions. **Table 5.1** shows the average vehicle delay ranges for signalized and unsignalized intersections (including roundabouts) that correspond with each LOS letter grade. Note that the HCM methodology does not provide an overall intersection LOS for TWSC intersections.

Table 5.1 – Level of Service Thresholds for Signalized and Unsignalized Intersections

Level of Service	Control Delay (s/veh)	
	Signalized Intersections	Unsignalized Intersections
A	≤ 10	≤ 10
B	> 10 and ≤ 20	> 10 and ≤ 15
C	> 20 and ≤ 35	> 15 and ≤ 25
D	> 35 and ≤ 55	> 25 and ≤ 35
E	> 55 and ≤ 80	> 35 and ≤ 50
F	> 80 or $v/c > 1.0^*$	> 50 or $v/c > 1.0^*$

* v/c = volume-to-capacity ratio
Source: HCM 6th Edition

The existing peak hour factors (PHF) were adjusted in all future analysis scenarios based on the projected traffic demand and proposed lane geometry in accordance with the following guidelines from the ADOT TGP Section 240 for future PHFs:

- PHF = 0.80 for < 75 vehicles per hour (vph) per lane
- PHF = 0.85 for 75 - 300 vph per lane
- PHF = 0.90 for > 300 vph per lane

5.2 Existing Intersection Conditions

The LOS, delay, and 95th percentile queues at the existing study area intersections were evaluated using the existing traffic volumes and lane geometry described previously in Section 2. The SR 80 / US 191 intersection was analyzed using current signal timings provided by ADOT. Existing signal timing inputs are provided in **Appendix 6**. The results of the Existing AM and Existing PM intersection capacity analyses are shown in **Table 5.2** and **Table 5.3**, respectively. The Synchro output reports for the Existing analysis scenarios are provided in **Appendix 7**.

Table 5.2 – Existing Intersection Capacity Analysis Results: AM Peak Hour

Intersection	NB Approach			SB Approach			EB Approach			WB Approach			Overall
	L	T	R	L	T	R	L	T	R	L	T	R	
SR 80 / James Ranch Road													
LOS	B			B			A	-		A	-		
Average Delay (s)	11			11			8	-		8	-		
95 th Percentile Queue (ft)	0			0			0	-		0	-		
SR 80 / US 191													
LOS				B		B	A	A			A	A	A
Average Delay (s)				11		10	6	5			6	7	7
95 th Percentile Queue (ft)				25		25	25	25			25	25	-

All movements at the study area intersections under existing conditions operate at LOS B or better in the AM peak hour with reported 95th percentile queues no greater than 25 feet long.

Table 5.3 – Existing Intersection Capacity Analysis Results: PM Peak Hour

Intersection	NB Approach			SB Approach			EB Approach			WB Approach			Overall
	L	T	R	L	T	R	L	T	R	L	T	R	
SR 80 / James Ranch Road													
LOS	B			B			A	-		A	-		
Average Delay (s)	11			11			8	-		8	-		
95 th Percentile Queue (ft)	0			0			0	-		0	-		
SR 80 / US 191													
LOS				B		B	A	A			A	A	A
Average Delay (s)				11		10	7	6			6	6	7
95 th Percentile Queue (ft)				25		25	25	25			25	25	-

All movements at the study area intersections under existing conditions operate at LOS B or better in the PM peak hour with reported 95th percentile queues no greater than 25 feet long.

5.3 No-Build Intersection Analysis

The 2028 and 2050 No-Build LOS, delay, and 95th percentile queues at the study area intersections were evaluated using the 2028 and 2050 No-Build volumes and the existing geometry described previously in Section 2. The No-Build scenarios assume existing lane geometry, including the existing Chino Road alignment, and do not include proposed commercial IPOE or warehousing traffic volumes. The results of the 2028 No-Build AM, 2028 No-Build PM, 2050 No-Build AM and 2050 No-Build PM intersection capacity analyses are shown in **Table 5.4**, **Table 5.5**, **Table 5.6**, and **Table 5.7**, respectively. The Synchro output reports for the No-Build scenarios are provided in **Appendix 7**.

Table 5.4 – 2028 No-Build Capacity Analysis Results: AM Peak Hour

Intersection	NB Approach			SB Approach			EB Approach			WB Approach			Overall
	L	T	R	L	T	R	L	T	R	L	T	R	
SR 80 / James Ranch Road													
LOS	B			B			A	-		A	-		
Average Delay (s)	12			12			8	-		8	-		
95 th Percentile Queue (ft)	25			25			0	-		0	-		
SR 80 / US 191													
LOS				B		B	A	A			A	A	A
Average Delay (s)				11		11	7	5			6	7	7
95 th Percentile Queue (ft)				25		25	25	25			25	25	-

All movements at the study area intersections are expected to operate at LOS B or better in the 2028 No-Build scenario in the AM peak hour with 95th percentile queues no greater than 25 feet long.

Table 5.5 – 2028 No-Build Capacity Analysis Results: PM Peak Hour

Intersection	NB Approach			SB Approach			EB Approach			WB Approach			Overall
	L	T	R	L	T	R	L	T	R	L	T	R	
SR 80 / James Ranch Road													
LOS	B			B			A	-		A	-		
Average Delay (s)	13			12			8	-		9	-		
95 th Percentile Queue (ft)	25			25			0	-		0	-		
SR 80 / US 191													
LOS				B		B	A	A			A	A	A
Average Delay (s)				11		11	7	6			6	7	7
95 th Percentile Queue (ft)				25		25	25	25			25	25	-

All movements at the study area intersections are expected to operate at LOS B or better in the 2028 No-Build scenario in the PM peak hour with 95th percentile queues no greater than 25 feet long.

Table 5.6 – 2050 No-Build Capacity Analysis Results: AM Peak Hour

Intersection	NB Approach			SB Approach			EB Approach			WB Approach			Overall	
	L	T	R	L	T	R	L	T	R	L	T	R		
SR 80 / James Ranch Road														
LOS	B			C			A	-			A	-		
Average Delay (s)	15			16			9	-			8	-		
95 th Percentile Queue (ft)	25			25			0	-			0	-		
SR 80 / US 191														
LOS				B		B	A	A			A	A	A	
Average Delay (s)				15		14	7	5			6	7	8	
95 th Percentile Queue (ft)				50		25	25	25			25	50	-	

All movements at the study area intersections are expected to operate at LOS C or better in the 2050 No-Build scenario in the AM peak hour with 95th percentile queues no greater than 50 feet long.

Table 5.7 – 2050 No-Build Capacity Analysis Results: PM Peak Hour

Intersection	NB Approach			SB Approach			EB Approach			WB Approach			Overall	
	L	T	R	L	T	R	L	T	R	L	T	R		
SR 80 / James Ranch Road														
LOS	C			C			A	-		A	-			
Average Delay (s)	20			18			8	-		9	-			
95 th Percentile Queue (ft)	25			25			0	-		0	-			
SR 80 / US 191														
LOS				B		B	A	A			A	A	A	
Average Delay (s)				16		15	8	5			5	6	8	
95 th Percentile Queue (ft)				50		50	25	25			25	25	-	

All movements at the study area intersections are expected to operate at LOS C or better in the 2050 No-Build scenario in the PM peak hour with 95th percentile queues no greater than 50 feet long.

5.4 SR 80 / James Ranch Road Future Build Analysis

The 2028 and 2050 Build LOS, delay, and 95th percentile queues at the SR 80 / James Ranch Road intersection were evaluated using the 2028 and 2050 Build volumes and the TWSC, traffic signal control, and roundabout intersection configuration alternatives described previously in Section 3 of this report.

5.4.1 Two-Way Stop Controlled Intersection Capacity Analysis Results

An intersection diagram extracted from Synchro showing the TWSC lane geometry used in the 2028 and 2050 Build analyses is presented in **Figure 5.1**. The results of the 2028 Build AM, 2028 Build PM, 2050 Build AM and 2050 Build PM intersection capacity analyses with the TWSC configuration are shown in **Table 5.8**, **Table 5.9**, **Table 5.10**, and **Table 5.11**, respectively. The Synchro output reports for the TWSC configuration are provided in **Appendix 7**.

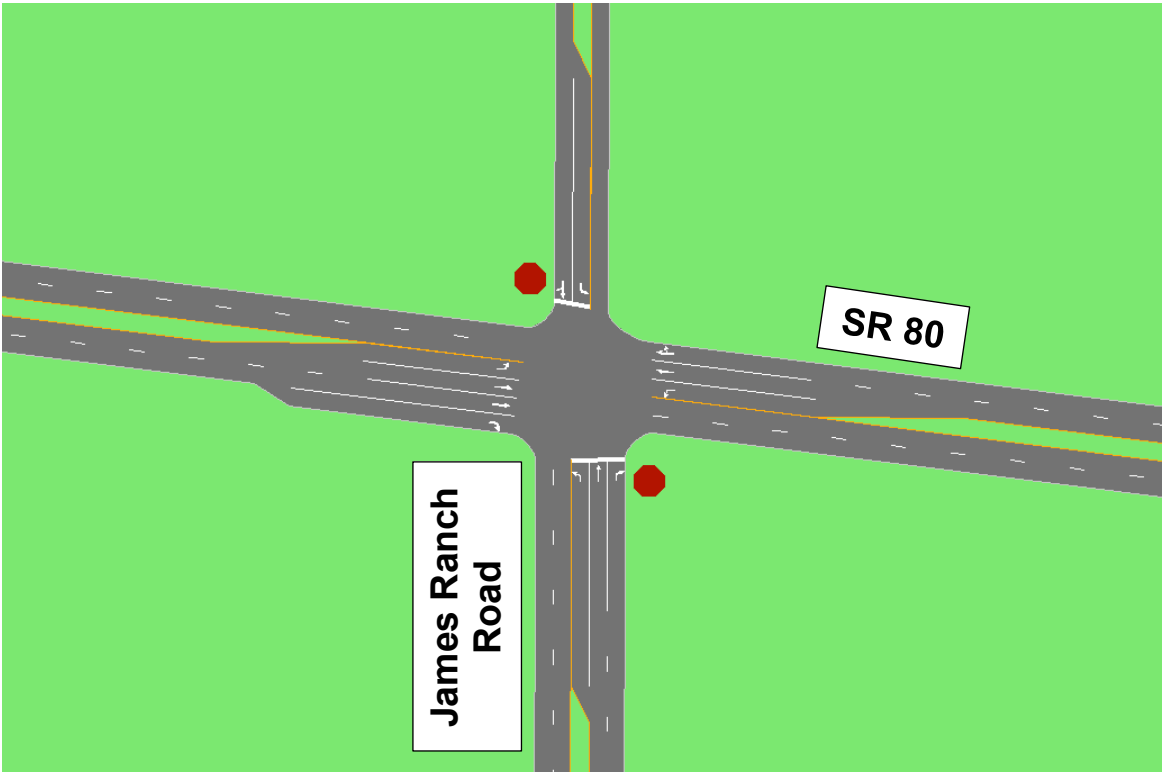


Figure 5.1 – SR 80 / James Ranch Road - TWSC Intersection Diagram

Table 5.8 – SR 80 / James Ranch Road - 2028 Build with TWSC Capacity Analysis
Results: AM Peak Hour

Intersection	NB Approach			SB Approach			EB Approach			WB Approach		
	L	T	R	L	T	R	L	T	R	L	T	R
LOS	E	D	B	E	C		A	-		A	-	
Average Delay (s)	38	32	10	43	22		8	-		9	-	
95 th Percentile Queue (ft)	25	25	25	25	25		0	-		0	-	

The NB and SB left-turn movements at the SR 80 / James Ranch Road intersection are anticipated to operate at LOS E in the 2028 Build with TWSC scenario during the AM peak hour. All other movements are anticipated to operate at LOS D or better. All movements are anticipated to have 95th percentile queues no greater than 25 feet long.

Table 5.9 – SR 80 / James Ranch Road - 2028 Build with TWSC Capacity Analysis
Results: PM Peak Hour

Intersection	NB Approach			SB Approach			EB Approach			WB Approach		
	L	T	R	L	T	R	L	T	R	L	T	R
LOS	D	C	B	D	C		A	-		A	-	
Average Delay (s)	30	22	15	35	16		8	-		9	-	
95 th Percentile Queue (ft)	50	25	75	25	25		0	-		25	-	

All movements at the SR 80 / James Ranch Road intersection are anticipated to operate at LOS D or better in the 2028 Build with TWSC scenario during the PM peak hour. All movements are anticipated to have 95th percentile queues no greater than 75 feet long.

Table 5.10 – SR 80 / James Ranch Road - 2050 Build with TWSC Capacity Analysis
Results: AM Peak Hour

Intersection	NB Approach			SB Approach			EB Approach			WB Approach		
	L	T	R	L	T	R	L	T	R	L	T	R
LOS	F	F	C	F	F		A	-		E	-	
Average Delay (s)	*	*	16	*	*		9	-		38	-	
95 th Percentile Queue (ft)	*	75	125	*	125		0	-		400	-	

* Value not reported due to HCM limitations. Significant delays and queueing anticipated.

The NB and SB left-turn movements, the NB through movement, and the SB through/right-turn movement at the SR 80 / James Ranch Road intersection are anticipated to operate at LOS F in the 2050 Build with TWSC scenario during the AM peak hour. The WB left-turn movement is anticipated to operate at LOS E. All other movements at the study area intersections are anticipated to operate at LOS C or better. Significant queueing is expected on the NB and SB left-turn movements. The WB left-turn movement experiences a 95th

percentile queue of 400 feet, which exceeds the existing storage length. All other movements are anticipated to have 95th percentile queues no greater than 125 feet long.

Table 5.11 – SR 80 / James Ranch Road - 2050 Build with TWSC Capacity Analysis Results: PM Peak Hour

Intersection	NB Approach			SB Approach			EB Approach			WB Approach		
	L	T	R	L	T	R	L	T	R	L	T	R
LOS	F	F	F	F	F	F	A	-	-	B	-	-
Average Delay (s)	*	133	*	*	88	8	8	-	-	14	-	-
95 th Percentile Queue (ft)	*	25	*	*	50	0	-	-	-	75	-	-

* Value not reported due to HCM limitations. Significant delays and queueing anticipated.

The NB and SB left-turn movements, the NB through and right-turn movements, and the SB through/right-turn movement at the SR 80 / James Ranch Road intersection are anticipated to operate at LOS F in the 2050 Build with TWSC scenario during the PM peak hour. All other movements at the study area intersections are anticipated to operate at LOS B or better. Significant queueing is expected on the NB and SB left-turn movements and the NB right-turn movement. All other movements are anticipated to have 95th percentile queues no greater than 75 feet long.

5.4.2 Signalized Intersection Capacity Analysis Results

An intersection diagram extracted from Synchro showing the signalized intersection lane geometry used in the 2028 and 2050 Build analyses is presented in **Figure 5.2**. The results of the 2028 Build AM, 2028 Build PM, 2050 Build AM and 2050 Build PM intersection capacity analyses with the signalized configuration are shown in **Table 5.12**, **Table 5.13**, **Table 5.14**, and **Table 5.15**, respectively. The Synchro output reports for the signalized configuration are provided in **Appendix 7**.

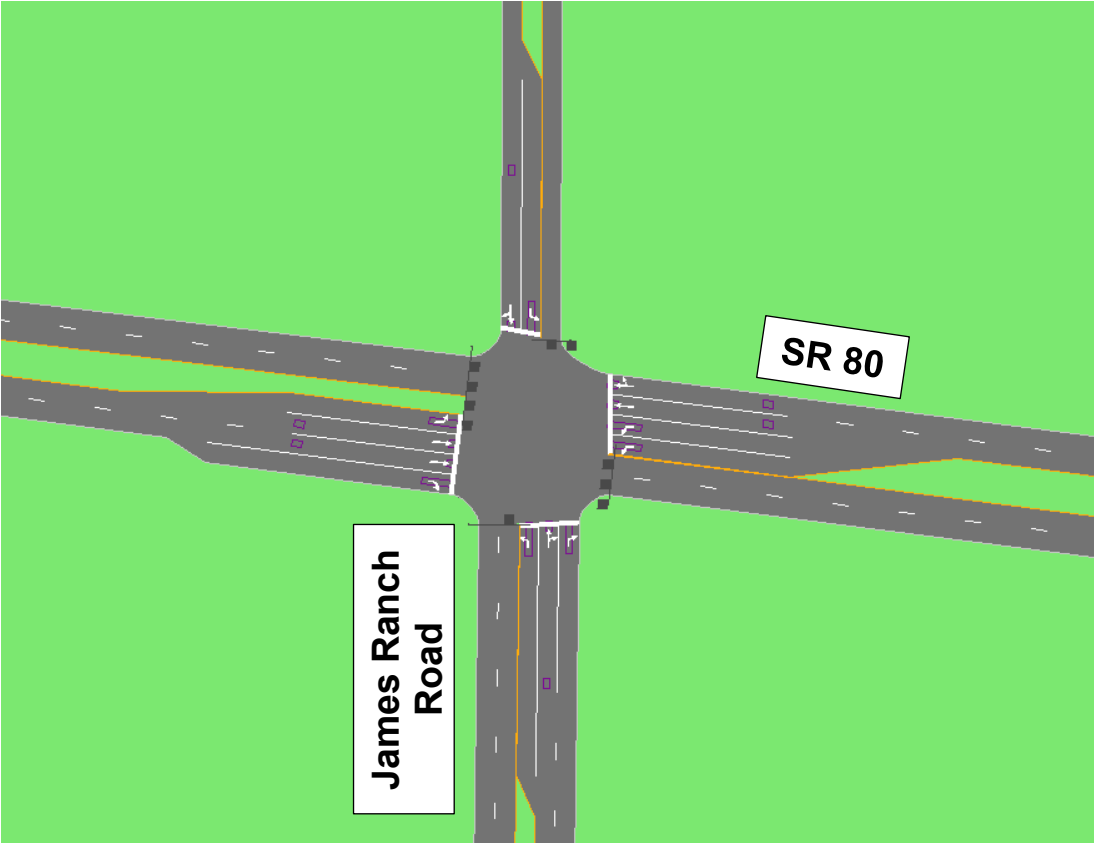


Figure 5.2 – SR 80 / James Ranch Road - Signalized Intersection Diagram

Table 5.12 – SR 80 / James Ranch Road - 2028 Build with Traffic Signal Capacity Analysis Results: AM Peak Hour

Intersection	NB Approach			SB Approach			EB Approach			WB Approach			Overall
	L	T	R	L	T	R	L	T	R	L	T	R	
LOS	B	B	B	B	B	B	A	B	B	A	A	A	A
Average Delay (s)	10	12	10	10	10	9	9	10	12	5	4	4	7
95 th Percentile Queue (ft)	25	25	0	25	0	25	0	25	25	25	25	25	-

The SR 80 / James Ranch Road intersection is anticipated to operate at an overall LOS A in the 2028 Build with traffic signal scenario during the AM peak hour. All movements are anticipated to operate at LOS B or better, with 95th percentile queues no greater than 25 feet long.

Table 5.13 – SR 80 / James Ranch Road - 2028 Build with Traffic Signal Capacity
Analysis Results: PM Peak Hour

Intersection	NB Approach			SB Approach			EB Approach			WB Approach			Overall
	L	T	R	L	T	R	L	T	R	L	T	R	
LOS	B		B	A		A	B	B	B	A		A	B
Average Delay (s)	11		13	10		10	11	13	12	7		5	10
95 th Percentile Queue (ft)	25		25	0		25	0	50	25	25		25	-

The SR 80 / James Ranch Road intersection is anticipated to operate at an overall LOS B in the 2028 Build with traffic signal scenario during the PM peak hour. All movements are anticipated to operate at LOS B or better, with 95th percentile queues no greater than 50 feet long.

Table 5.14 – SR 80 / James Ranch Road - 2050 Build with Traffic Signal Capacity
Analysis Results: AM Peak Hour

Intersection	NB Approach			SB Approach			EB Approach			WB Approach			Overall
	L	T	R	L	T	R	L	T	R	L	T	R	
LOS	C		C	B		B	C	C	C	D		A	C
Average Delay (s)	22		29	19		19	21	22	29	40		6	27
95 th Percentile Queue (ft)	75		175	25		25	25	75	125	325		50	-

The SR 80 / James Ranch Road intersection is anticipated to operate at an overall LOS C in the 2050 Build with traffic signal scenario during the AM peak hour. All movements are anticipated to operate at LOS D or better, with 95th percentile queues no greater than 325 feet long.

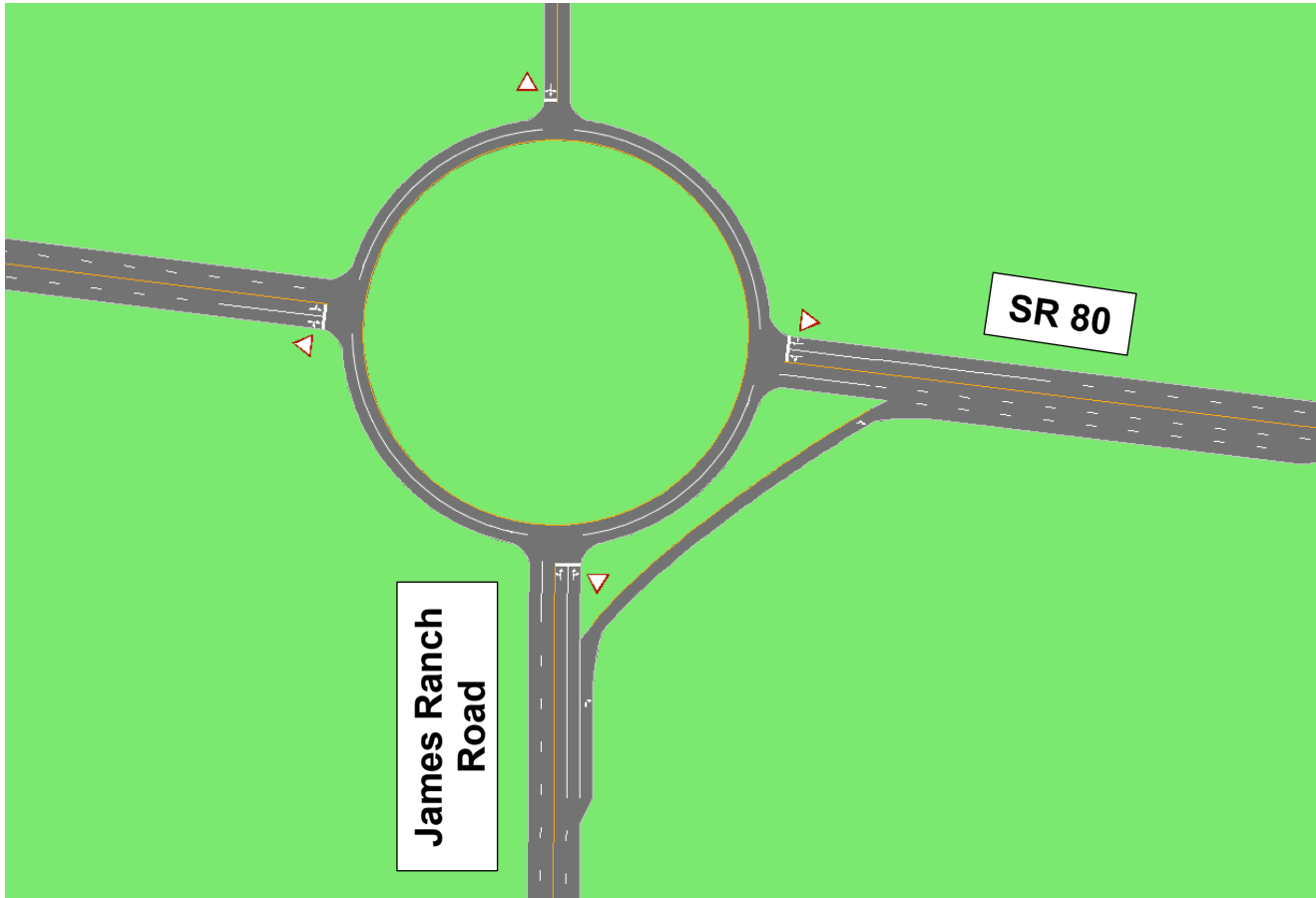
Table 5.15 – SR 80 / James Ranch Road - 2050 Build with Traffic Signal Capacity
Analysis Results: PM Peak Hour

Intersection	NB Approach			SB Approach			EB Approach			WB Approach			Overall
	L	T	R	L	T	R	L	T	R	L	T	R	
LOS	B		C	B		B	C	C	C	D		B	C
Average Delay (s)	16		33	13		12	25	32	29	49		15	30
95 th Percentile Queue (ft)	125		375	25		25	25	225	75	225		125	-

The SR 80 / James Ranch Road intersection is anticipated to operate at an overall LOS C in the 2050 Build with traffic signal scenario during the PM peak hour. All movements are anticipated to operate at LOS D or better, with 95th percentile queues no greater than 375 feet long.

5.4.3 Roundabout Capacity Analysis Results

An intersection diagram extracted from Synchro showing the roundabout lane geometry used in the 2028 and 2050 Build analyses is presented in Figure 5.3.



Note: Synchro diagram not to scale and shown for visual purposes only. Analysis done using Rodel.

Figure 5.3 – SR 80 / James Ranch Road - Roundabout Diagram

The roundabout geometry was initially analyzed without a NB right-turn bypass lane and was found to provide poor LOS during the 2050 PM peak scenario. Therefore, the roundabout analysis was modified to include a NB right-turn bypass lane, which provides increased capacity.

The results of the 2028 Build AM, 2028 Build PM, 2050 Build AM and 2050 Build PM intersection capacity analyses with the roundabout configuration are shown in Table 5.16, Table 5.17, Table 5.18, and Table 5.19, respectively. The Rodel output reports for the roundabout configuration (both with and without the NB right-turn bypass lane) are provided in Appendix 7.

Table 5.16 – SR 80 / James Ranch Road - 2028 Build with Roundabout Capacity Analysis
Results: AM Peak Hour

Intersection	NB Approach			SB Approach			EB Approach			WB Approach			Overall
	L	T	R	L	T	R	L	T	R	L	T	R	
LOS	A			A			A			A			A
Average Delay (s)	3			2			4			5			5
95 th Percentile Queue (ft)	25			0			25			25			-

The SR 80 / James Ranch Road intersection is anticipated to operate at an overall LOS A in the 2028 Build with roundabout scenario during the AM peak hour. All movements are anticipated to operate at LOS A, with 95th percentile queues no greater than 75 feet long.

Table 5.17 – SR 80 / James Ranch Road - 2028 Build with Roundabout Capacity Analysis
Results: PM Peak Hour

Intersection	NB Approach			SB Approach			EB Approach			WB Approach			Overall
	L	T	R	L	T	R	L	T	R	L	T	R	
LOS	A			A			A			A			A
Average Delay (s)	3			3			4			5			4
95 th Percentile Queue (ft)	25			0			25			25			-

The SR 80 / James Ranch Road intersection is anticipated to operate at an overall LOS A in the 2028 Build with roundabout scenario during the PM peak hour. All movements are anticipated to operate at LOS A, with 95th percentile queues no greater than 50 feet long.

Table 5.18 – SR 80 / James Ranch Road - 2050 Build with Roundabout Capacity Analysis
Results: AM Peak Hour

Intersection	NB Approach			SB Approach			EB Approach			WB Approach			Overall
	L	T	R	L	T	R	L	T	R	L	T	R	
LOS	A			A			A			C			B
Average Delay (s)	3			3			7			9			12
95 th Percentile Queue (ft)	25			0			25			50			-

The SR 80 / James Ranch Road intersection is anticipated to operate at an overall LOS B in the 2050 Build with roundabout scenario during the AM peak hour. All movements are anticipated to operate at LOS C or better, with 95th percentile queues no greater than 450 feet long.

Table 5.19 – SR 80 / James Ranch Road - 2050 Build with Roundabout Capacity Analysis
Results: PM Peak Hour

Intersection	NB Approach			SB Approach			EB Approach			WB Approach			Overall
	L	T	R	L	T	R	L	T	R	L	T	R	
LOS	A			C			A			A			B
Average Delay (s)	5			23			6			7			14
95 th Percentile Queue (ft)	25			1,025			25			75			-

The SR 80 / James Ranch Road intersection is anticipated to operate at an overall LOS B in the 2050 Build with roundabout scenario during the PM peak hour. All movements are anticipated to operate at LOS C or better. The NB right-turn movement has a 95th percentile queue length of 1,025 feet. All other 95th percentile queues are no greater than 125 feet long.

5.5 SR 80 / US 191 Future Build Analysis

The 2028 and 2050 Build LOS, delay, and 95th percentile queues at the SR 80 / US 191 intersection were evaluated using the 2028 and 2050 Build volumes and the existing intersection geometry described previously in Section 3 of this report. The Chino Road realignment (which is planned but not funded) was assumed to be complete in the 2028 and 2050 Build analyses; therefore, the south leg of the SR 80 / US 191 intersection was assumed to be open using its currently barricaded geometry except with an extended NB left-turn lane storage length. Signal timing and phasing were optimized at the intersection.

An intersection diagram extracted from Synchro showing the lane geometry is presented in **Figure 5.4**. The results of the 2028 Build AM, 2028 Build PM, 2050 Build AM and 2050 Build PM intersection capacity analyses with the existing traffic signal configuration are shown in **Table 5.20**, **Table 5.21**, **Table 5.22**, and **Table 5.23**, respectively. The Synchro output reports for the SR 80 / US 191 intersection are provided in **Appendix 7**.

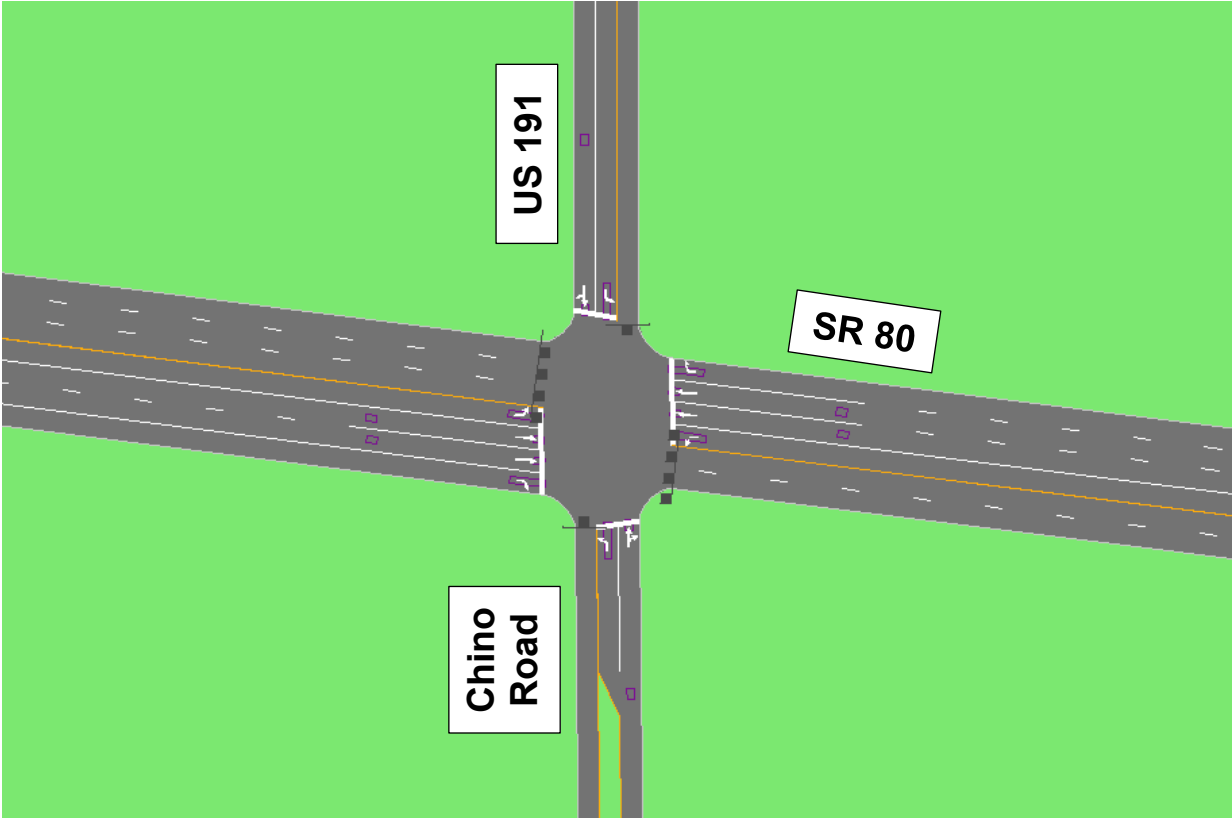


Figure 5.4 – SR 80 / US 191 – Future Intersection Diagram

Table 5.20 – SR 80 / US 191 - 2028 Build Capacity Analysis Results: AM Peak Hour

Intersection	NB Approach			SB Approach			EB Approach			WB Approach			Overall
	L	T	R	L	T	R	L	T	R	L	T	R	
LOS	B	B		B	B		B	A	A	A	A	A	A
Average Delay (s)	16	13		14	14		10	6	6	6	7	6	9
95 th Percentile Queue (ft)	25	25		25	50		25	25	25	0	25	25	-

The SR 80 / US 191 intersection is anticipated to operate at an overall LOS A in the 2028 Build scenario during the AM peak hour with current signal timing and phasing provisions. All movements are anticipated to operate at LOS B or better with 95th percentile queues no greater than 50 feet long.

Table 5.21 – SR 80 / US 191 - 2028 Build Capacity Analysis Results: PM Peak Hour

Intersection	NB Approach			SB Approach			EB Approach			WB Approach			Overall
	L	T	R	L	T	R	L	T	R	L	T	R	
LOS	C	B		B	B		A	A	A	A	A	A	A
Average Delay (s)	21	16		17	18		10	6	6	7	6	6	9
95 th Percentile Queue (ft)	50	25		25	75		50	50	25	25	25	25	-

The SR 80 / US 191 intersection is anticipated to operate at an overall LOS A in the 2028 Build scenario during the PM peak hour. All movements are anticipated to operate at LOS C or better, with 95th percentile queues no greater than 75 feet long.

Table 5.22 – SR 80 / US 191 - 2050 Build Capacity Analysis Results: AM Peak Hour

Intersection	NB Approach			SB Approach			EB Approach			WB Approach			Overall
	L	T	R	L	T	R	L	T	R	L	T	R	
LOS	D	C		C	D		C	B	B	B	C	B	C
Average Delay (s)	46	24		28	41		25	11	10	13	25	17	24
95 th Percentile Queue (ft)	100	50		75	300		100	100	50	25	350	125	-

The SR 80 / US 191 intersection is anticipated to operate at an overall LOS C in the 2050 Build scenario during the AM peak hour, with protected-permitted EB and WB left-turn signal phasing added, which is anticipated to allow all movements to operate at LOS D or better with 95th percentile queues no greater than 350 feet long. All turn lane queues are anticipated to fit within existing storage provisions.

Table 5.23 – SR 80 / US 191 - 2050 Build Capacity Analysis Results: PM Peak Hour

Intersection	NB Approach			SB Approach			EB Approach			WB Approach			Overall
	L	T	R	L	T	R	L	T	R	L	T	R	
LOS	D	C		C	C		C	C	B	B	C	C	C
Average Delay (s)	36	22		24	29		31	21	13	19	25	23	24
95 th Percentile Queue (ft)	100	50		50	250		250	325	100	25	200	100	-

The SR 80 / US 191 intersection is anticipated to operate at an overall LOS C in the 2050 Build scenario during the PM peak hour, with protected-permitted EB and WB left-turn signal phasing added, which is anticipated to allow all movements to operate at LOS D or better with 95th percentile queues no greater than 325 feet long. All turn lane queues are anticipated to fit within existing storage provisions.

5.6 Proposed IPOE Intersections Future Build Analysis

The 2028 and 2050 Build LOS, delay, and 95th percentile queues at the proposed IPOE intersections were evaluated using the 2028 and 2050 Build volumes and the proposed intersection geometry described previously in Section 3 of this report.

5.6.1 2028 Build Capacity Analysis Results

Intersection diagrams extracted from Synchro showing the assumed 2028 Build lane geometry at the IPOE East and West intersections are presented in **Figure 5.5** and **Figure 5.6**, respectively. The results of the 2028 Build AM and 2028 Build PM intersection capacity analyses with the proposed all-way stop-controlled configuration are shown in **Table 5.24**

and **Table 5.25**, respectively. The Synchro output reports for the proposed IPOE intersections are provided in **Appendix 7**.

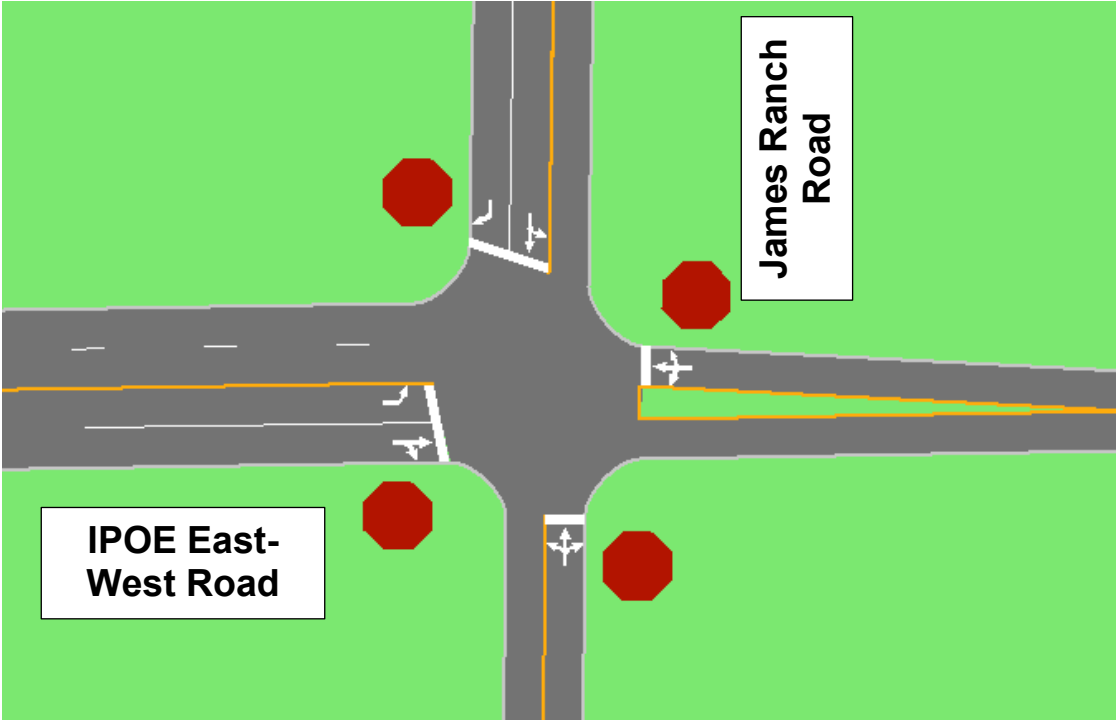


Figure 5.5 – IPOE East Intersection Diagram - 2028 Build

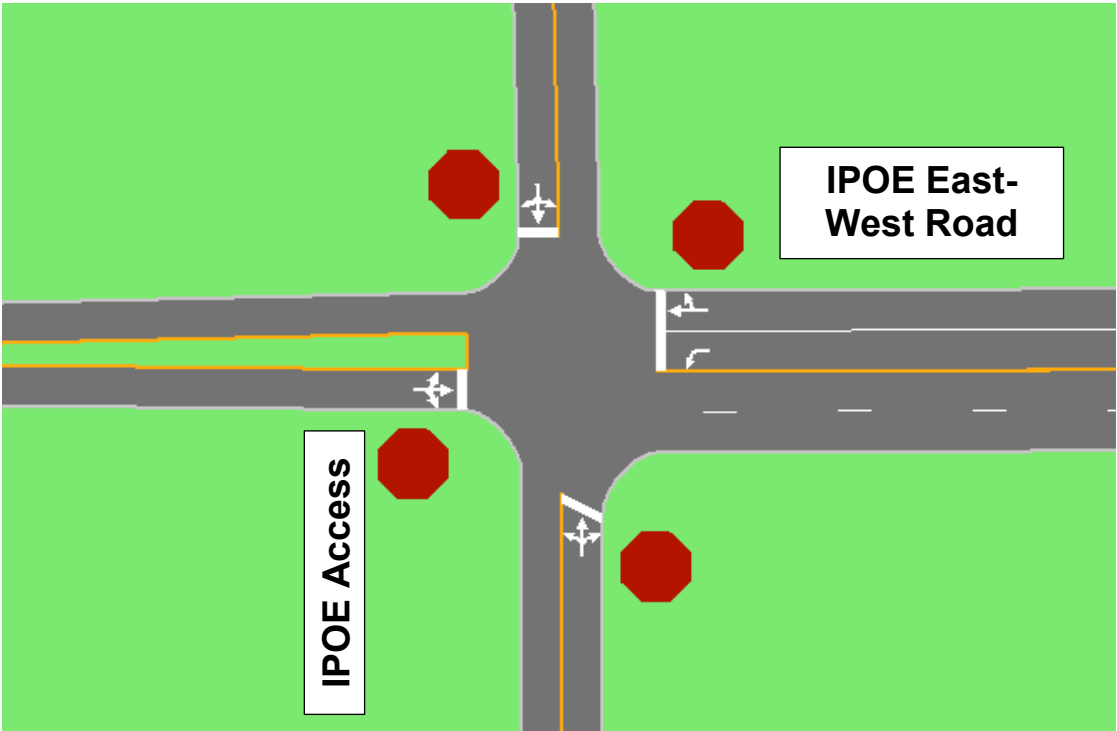


Figure 5.6 – IPOE West Intersection Diagram - 2028 Build

Table 5.24 – Proposed IPOE Intersections - 2028 Build Capacity Analysis Results: AM Peak Hour

Intersection	NB Approach			SB Approach			EB Approach			WB Approach		
	L	T	R	L	T	R	L	T	R	L	T	R
IPOE East Intersection												
LOS	A			A	A	B	A			A		
Average Delay (s)	8			10	7	11	8			8		
95 th Percentile Queue (ft)	25			25	25	25	25			25		
IPOE West Intersection												
LOS	A			A		A			B	A		
Average Delay (s)	9			8		7			10	8		
95 th Percentile Queue (ft)	25			25		25			25	25		

All movements at the proposed IPOE intersections are expected to operate at LOS B or better in the 2028 Build scenario in the AM peak hour with 95th percentile queues no greater than 25 feet long.

Table 5.25 – Proposed IPOE Intersections - 2028 Build Capacity Analysis Results: PM Peak Hour

Intersection	NB Approach			SB Approach			EB Approach			WB Approach		
	L	T	R	L	T	R	L	T	R	L	T	R
IPOE East Intersection												
LOS	A			A	A	B	A			A		
Average Delay (s)	9			9	8	11	8			9		
95 th Percentile Queue (ft)	25			25	25	25	25			25		
IPOE West Intersection												
LOS	A			A			A			B	A	
Average Delay (s)	9			8			8			10	8	
95 th Percentile Queue (ft)	25			25			25			25	25	

All movements at the proposed IPOE intersections are expected to operate at LOS B or better in the 2028 Build scenario in the PM peak hour with 95th percentile queues no greater than 25 feet long.

5.6.2 2050 Build Capacity Analysis Results

An intersection diagram extracted from Synchro showing the assumed 2050 Build lane geometry at both the IPOE East and West intersections is presented in **Figure 5.7**. The results of the 2050 Build AM and 2050 Build PM intersection capacity analyses with the proposed roundabout configuration are shown in **Table 5.26** and **Table 5.27**, respectively. The Synchro output reports for the proposed IPOE intersections are provided in **Appendix 7**.

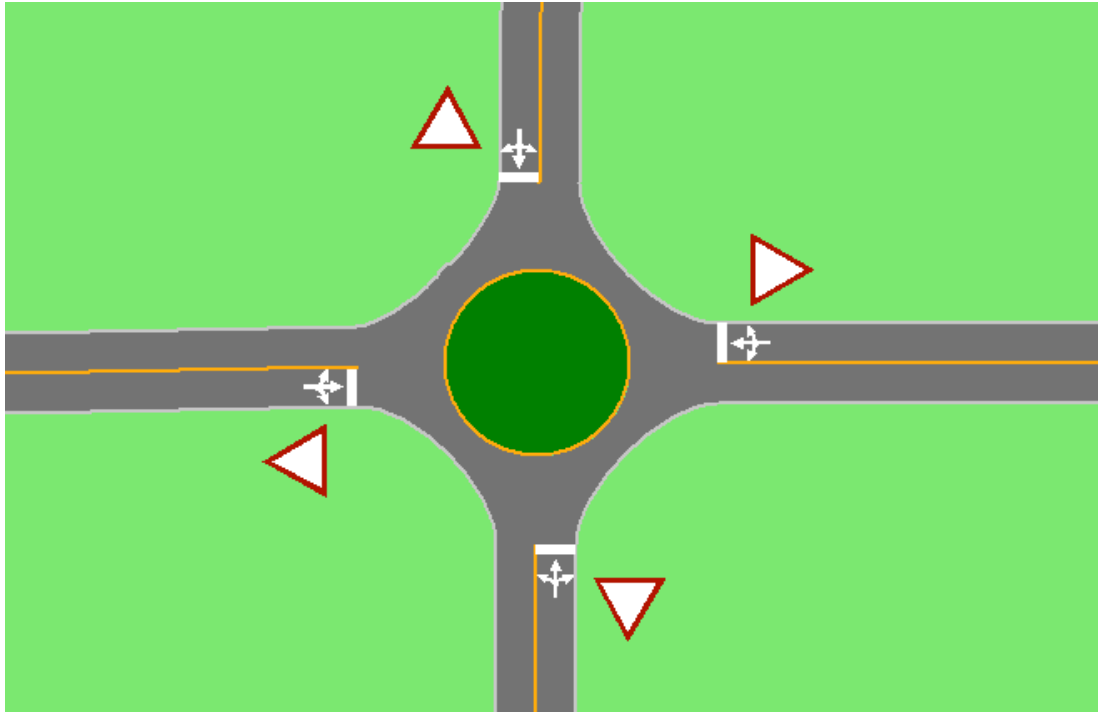


Figure 5.7 – IPOE East/West Intersection Diagram - 2050 Build

Table 5.26 – Proposed IPOE Intersections - 2050 Build Capacity Analysis Results: AM Peak Hour

Intersection	NB Approach			SB Approach			EB Approach			WB Approach		
	L	T	R	L	T	R	L	T	R	L	T	R
IPOE East Intersection												
LOS	A			A			A			A		
Average Delay (s)	5			8			8			5		
95 th Percentile Queue (ft)	25			50			25			25		
IPOE West Intersection												
LOS	A			A			A			A		
Average Delay (s)	7			5			5			6		
95 th Percentile Queue (ft)	25			25			25			25		

All movements at the proposed IPOE intersections are expected to operate at LOS A in the 2050 Build scenario in the AM peak hour with 95th percentile queues no greater than 50 feet long.

Table 5.27 – Proposed IPOE Intersections - 2050 Build Capacity Analysis Results: PM Peak Hour

Intersection	NB Approach			SB Approach			EB Approach			WB Approach		
	L	T	R	L	T	R	L	T	R	L	T	R
IPOE East Intersection												
LOS	A			A			A			A		
Average Delay (s)	5			6			7			10		
95 th Percentile Queue (ft)	25			25			25			50		
IPOE West Intersection												
LOS	A			A			A			A		
Average Delay (s)	8			5			5			6		
95 th Percentile Queue (ft)	25			25			25			25		

All movements at the proposed IPOE intersections are expected to operate at LOS A in the 2050 Build scenario in the PM peak hour with 95th percentile queues no greater than 50 feet long.

5.7 Grade Separation Sensitivity Analysis

Grade separation (i.e., a bridge) is not anticipated to be necessary at the SR 80 / James Ranch Road intersection by the horizon year 2050 based on the at-grade intersection analyses. However, a sensitivity analysis was performed to approximate at what point grade separation may need to be considered at the intersection. The signalized intersection LOS was analyzed using HCM 6 methodology via Synchro 11 analysis software, and the roundabout LOS was analyzed using Rodel 2017 methodology. Queue lengths at the signalized intersection were observed using SimTraffic traffic simulation software to be able to observe queue build-ups over time during the peak hours.

Total 2050 volumes were grown incrementally to determine the traffic level at which the at-grade intersection operations fail. Reasonable improvements were assumed for the signalized intersection alternative, including dedicated dual northbound right-turn lanes, northbound right-turn overlap phasing, an extension to the WB left-turn storage length, and signal timing modifications.

The analysis results show that grade separation may be needed if future traffic volumes at the signalized intersection alternative are more than 30 percent higher than the 2050 traffic volumes projected in this report. This equates to approximately 700 to 800 more vehicles entering the intersection during the peak hour. For the roundabout alternative, grade separation may be needed if future traffic volumes are more than 10 to 20 percent higher than the 2050 traffic volumes projected in this report. This equates to approximately 300 to 500 more vehicles entering the roundabout during the peak hour. The Synchro and Rodel output reports for the SR 80 / James Ranch Road intersection with the traffic volume increases are provided in **Appendix 7**.

5.8 Connector Road Cross-Section Analysis

Projected daily traffic volumes on the connector road were analyzed to determine an appropriate roadway cross-section in the horizon year 2050. The connector roadway was analyzed as an urban roadway because many driveways and intersections are anticipated along the roadway to service future development. Exhibit 16-16 of the HCM 6 gives generalized daily service volumes of urban roadway facilities based on number of travel lanes, K-factor, D-factor, and desired LOS. Based on the projected 2050 volumes (up to 19,200 vehicles per day), it is anticipated that a four-lane cross-section (two through lanes in each direction) will provide LOS D or better on the connector road. Exhibit 16-16 of the HCM 6 is included in **Appendix 5**.

Projected daily traffic volumes on the connector road were also analyzed using the same methodology to determine the appropriate time to widen the connector road from the interim two-lane cross-section (one through lane in each direction and a raised median) to the ultimate four-lane cross-section (two through lanes in each direction and a raised median). Based on an interpolation of the projected 2028 and 2050 volumes, it is anticipated that a two-lane cross-section will provide LOS D or better on the connector road until approximately 80 percent of the

traffic from the surrounding developments is realized. This is estimated to occur around the year 2044.

6. OTHER TRAFFIC CONSIDERATIONS

Other traffic-related considerations besides traffic operations should be evaluated when determining the advantages and disadvantages of various intersection configuration alternatives at the intersection of SR 80 / James Ranch Road. These include motorist safety, intersection type familiarity, oversize vehicle accommodation, and pedestrian and bicyclist accommodation and safety. Additionally, other traffic-related considerations should be evaluated when determining the design of the connector roadway, including transit accommodation, access, truck parking, and intelligent transportation system (ITS) devices.

6.1 Motorist Safety

One measure of motorist safety for intersection configurations is the number of vehicle conflict points, where vehicles may collide if travel right-of-way rules are not observed. Of particular concern are vehicle crossing points, where vehicles traveling different directions could potentially collide (such as in an angle or left-turn crash). These types of crashes are more likely to cause severe injury to vehicle occupants than vehicles traveling the same general direction (such as sideswipe crashes). Perpendicular crossing points have a high potential for severe injury to vehicle occupants.

A standard four-legged intersection (signalized or TWSC) has 32 conflict points, including 16 crossing points (4 of which are perpendicular). A standard four-legged two-lane roundabout has 24 conflict points, including 8 crossing points (none of which are perpendicular).

Head-on/wrong-way crashes have a high potential for severe injury to vehicle occupants. Head-on/wrong-way travel is prohibited only by signage in the TWSC and signalized intersection alternatives, whereas raised curbs and the angles of intersecting lanes make it more difficult to have head-on/wrong-way travel in the roundabout alternative.

Vehicle speeds in the TWSC and signalized intersection alternatives are controlled only by traffic signals and signage, whereas raised curbs and roadway geometry help reduce vehicle speeds in the roundabout alternative. This reduces the likelihood of severe injury to vehicle occupants in the event of a crash.

The TWSC alternative requires drivers on the minor roadway to judge safe gaps in major roadway traffic to safely turn onto or cross the mainline. Improper judgments may lead to crashes involving crossing conflicts, which tend to be more dangerous (as described previously). The signalized alternative allocates dedicated right-of-way cycle time to each movement, removing the need to judge safe gaps in opposing traffic (barring permissive turning movements). However, failure to properly yield right-of-way at the signalized alternative may still lead to severe crashes as the number of crossing conflict points is the same as the TWSC alternative. The roundabout alternative requires all drivers entering the roundabout to yield to traffic inside the roundabout. While drivers must judge safe gaps in traffic, vehicle speeds within a roundabout tend to be much lower than those on mainline roadways. The reduced speeds

combined with the lack of crossing conflict points in a roundabout causes crash at roundabouts to be less severe on average.

6.2 Intersection Type Familiarity

Drivers are likely very familiar with the TWSC and signalized intersection configurations as these traffic control types are very common throughout the U.S. and Mexico. Drivers may be less familiar with how a roundabout operates. While roundabout intersections have become much more prevalent over the last 20 years, they are far less common than TWSC or signalized intersections.

6.3 Oversize Vehicle Accommodation

SR 80 and James Ranch Road are anticipated to be used as routes for oversize vehicles. The SR 80 / James Ranch Road intersection should be designed to accommodate oversize vehicles where feasible. This includes providing adequate vertical clearance and turning radii.

The TWSC intersection alternative can be configured to accommodate oversize vehicles because there are no major horizontal or vertical restrictions. The TWSC intersection alternative can typically be designed to provide adequate turning radii for oversize vehicles.

The signalized intersection alternative can be configured to accommodate oversize vehicles as long as major horizontal and vertical restrictions such as signal poles and mast arms are placed at the correct height and far enough from curbs. The signalized intersection alternative can typically be designed to provide adequate turning radii for oversize vehicles. Because the northbound right-turn movement is anticipated to experience high heavy vehicle traffic volumes, a channelized right-turn bypass lane may be desirable to provide oversize vehicles with a larger turn radius and allow them to bypass the intersection. The bypass lane can be designed as free-flow, yield, or stop-controlled, which eliminates the height restrictions of a traffic signal mast arm.

The roundabout alternative can typically be designed to provide adequate turning radii for oversize vehicles by providing a truck apron and mountable curbs for the central island. However, navigating roundabouts may be difficult for some low-clearance oversize vehicles because of the varying elevation of the intersection from the curbs and islands present. Because the northbound right-turn movement is anticipated to experience high vehicle traffic volumes, a channelized right-turn bypass lane should be considered to provide oversize vehicles with a larger turn radius and allow them to bypass the roundabout.

Vehicle requirements should be coordinated with ADOT's Statewide Permit Services Supervisor during final design to make sure the proper design vehicle is being used.

6.4 Pedestrian and Bicyclist Accommodation and Safety

The TWSC alternative can provide pedestrian crossings on the north and south legs of the intersection but likely cannot accommodate pedestrians crossing SR 80 (unless some kind of

signalized crossing is provided, such as a pedestrian hybrid beacon, or a grade-separated crossing). No pedestrian indications are present, which can make it particularly challenging for those with disabilities to cross.

The signalized alternative can provide pedestrian crossings and crossing indications on all legs of the intersection. Crossing indications can be both visual and audible.

Because the roundabout alternative is yield-controlled, there are typically no signalized crossings for pedestrians, which can make it challenging for those with disabilities to cross. This may be offset to some degree, however, by the lower speed of vehicles at the crossings, as lower vehicle speeds reduce the likelihood of severe injury to pedestrians. Pedestrian-actuated signals or pedestrian hybrid beacons could be added to address this issue but doing so will impede traffic movements entering and exiting the roundabout when the signals/beacons are activated. Grade-separated pedestrian crossings could also be considered.

The TWSC and signalized alternatives typically provide separate facilities for pedestrians (sidewalk) and bicyclists (bike lanes or paved shoulders) on and along each approach. Roundabouts do not typically include bike lanes within the circulating area due to safety concerns. The roundabout alternative could include ramps for bicyclists to transition between the bike lane or paved shoulder and the sidewalk at the intersection.

The design of the connector road should also consider accommodations for pedestrians and bicyclists such as sidewalks and bike lanes due to the anticipated warehousing land uses and other developments along and near the roadway.

6.5 Transit Accommodation

Future bus stops should be considered along or near the connector road to accommodate commuter traffic generated by the anticipated warehousing land uses and other developments along and near the roadway.

6.6 Access

Future access points along the connector road should including adequate access spacing and turning radii should be designed to accommodate heavy vehicles.

6.7 Truck Parking

Truck parking needs should be considered when designing the connector road due to the anticipated high truck volumes utilizing the roadway and the fact that trucks may have to wait to cross the border if it is not open yet.

6.8 ITS Devices

ADOT has indicated there is the potential for the ADOT Commercial Inspection Facility to be relocated from the northeast corner of the intersection of SR 80 / US 191 to a location along the

connector roadway north of the proposed commercial IPOE. The need for ITS devices should be considered when deciding whether/where to relocate the facility. If the ADOT Commercial Inspection Facility stays in its current location, additional cameras, weigh-in-motion sensors, and dynamic message signs may need to be placed east and west of the intersection of SR 80 / James Ranch Road to alert ADOT to heavy vehicles that do not go to the ADOT Commercial Inspection Facility for inspection (i.e., “port runners”). If the ADOT Commercial Inspection Facility is relocated along the connector road, fewer ITS devices may be needed because trucks will have to pass through the inspection station before continuing along their route. ITS devices along SR 80 may still be desirable to detect “port runners” and overweight vehicles.

6.9 Proposed IPOE Intersection Queue Accommodation

The 2028 and 2050 Build analyses at the proposed IPOE intersections did not identify any potential queueing issues at the intersections. However, the previously referenced Stantec Study reported a potential queue of approximately 250 feet for heavy vehicles crossing at the existing RHC IPOE from the U.S. to Mexico based on a Vissim traffic model analysis of 2018 traffic. The proposed westbound left-turn lane into the IPOE West intersection has a storage length of approximately 400 feet which is sufficient to accommodate the aforementioned potential queue of 250 feet during operating hours.

Past experience at the existing RHC IPOE as well as other commercial IPOEs suggests trucks desiring to exit the U.S. may arrive prior to the IPOE opening in the morning and begin to queue. To avoid truck queues backing up onto the existing roadway awaiting the opening of the IPOE, it is recommended that a minimum 10-foot-wide paved shoulder be provided adjacent to the southbound approach of the IPOE East intersection for at least 500 feet to allow trucks to park and queue outside the traveled way until the IPOE opens.

7. ENVIRONMENTAL REPORT DATA SUMMARY

ADOT requires a Noise Report and Air Quality Report as part of the Environmental Planning process, which include documentation of vehicle classifications, traffic projections and intersection LOS analysis at the major study intersections for the Existing, 2028/2050 No-Build, and 2028/2050 Build scenarios. The following section summarizes these results for use in the Noise Report and Air Quality Report.

7.1 Noise Report Data Summary

For the purposes of this analysis, vehicle volumes were divided into the following three vehicle classification categories:

- Passenger cars;
- Medium vehicles; and
- Heavy vehicles.

Traffic volumes were categorically classified using the FHWA 13-Class classification scheme, where passenger cars are in FHWA Classes 1-4, medium vehicles are in FHWA Class 5, and heavy vehicles are in FHWA Classes 6-13. **Table 7.1**, **Table 7.2**, **Table 7.3**, and **Table 7.4** summarize the approximate weighted average percentages of passenger cars, medium vehicles, and heavy vehicles by total traffic volume on each leg of the study area intersections in the No-Build and Build scenarios, respectively.

All vehicles coming to and from the proposed commercial IPOE and all truck volumes on the north leg of SR 80 / James Ranch Road and the south leg of SR 80 / US 191 (Chino Road) were assumed to be heavy vehicles to provide a conservative analysis as detailed truck classification data were not available for these approaches. Additionally, truck trips generated by the adjacent warehousing developments were assumed to be comprised of 30 percent medium vehicles and 70 percent heavy vehicles to provide a conservative analysis.

Table 7.1 – 2028 / 2050 No-Build Noise Report Vehicle Classification Percentages

Roadway Segment	Passenger Cars	Medium Vehicles	Heavy Vehicles
James Ranch Road south of SR 80	98%	0%	2%
James Ranch Road north of SR 80	98%	0%	2%
SR 80 west of James Ranch Road	89%	6%	5%
SR 80 east of James Ranch Road	89%	6%	5%
US 191 south of SR 80	-	-	-
US 191 north of SR 80	89%	7%	4%
SR 80 west of US 191	89%	7%	4%
SR 80 east of US 191	89%	7%	4%

Table 7.2 – 2050 No-Build Noise Report Vehicle Classification Percentages

Roadway Segment	Passenger Cars	Medium Vehicles	Heavy Vehicles
James Ranch Road south of SR 80	98%	0%	2%
James Ranch Road north of SR 80	98%	0%	2%
SR 80 west of James Ranch Road	89%	6%	5%
SR 80 east of James Ranch Road	89%	6%	5%
US 191 south of SR 80	-	-	-
US 191 north of SR 80	89%	7%	4%
SR 80 west of US 191	89%	7%	4%
SR 80 east of US 191	89%	7%	4%

Table 7.3 – 2028 Build Noise Report Vehicle Classification Percentages

Roadway Segment	Passenger Cars	Medium Vehicles	Heavy Vehicles
James Ranch Road south of SR 80	70%	5%	25%
James Ranch Road north of SR 80	98%	0%	2%
SR 80 west of James Ranch Road	82%	6%	12%
SR 80 east of James Ranch Road	79%	5%	15%
Chino Road south of SR 80	95%	0%	5%
US 191 north of SR 80	73%	6%	21%
SR 80 west of US 191	77%	6%	17%
SR 80 east of US 191	85%	8%	7%

Table 7.4 – 2050 Build Noise Report Vehicle Classification Percentages

Roadway Segment	Passenger Cars	Medium Vehicles	Heavy Vehicles
James Ranch Road south of SR 80	76%	6%	19%
James Ranch Road north of SR 80	98%	0%	2%
SR 80 west of James Ranch Road	83%	6%	11%
SR 80 east of James Ranch Road	80%	6%	14%
Chino Road south of SR 80	95%	0%	5%
US 191 north of SR 80	76%	6%	18%
SR 80 west of US 191	79%	6%	15%
SR 80 east of US 191	83%	8%	9%

Table 7.5 and **Table 7.6** summarize the bidirectional ADT volumes and peak hour volumes on each leg of the intersections of SR 80 / James Ranch Road and SR 80 / US 191, respectively. The bidirectional peak hour volumes were calculated using the peak hour volumes shown in **Figure 3.4** through **Figure 3.11** and the vehicle classification percentages shown in the previously referenced **Table 2.1**, **Table 7.1**, and **Table 7.2**.

Table 7.5 – SR 80 / James Ranch Road Noise Report Traffic Volumes

	Roadway Segment	ADT Volume (vpd)	Peak Hour Volume (vph)			
			Total	Passenger Cars	Medium Vehicles	Heavy Vehicles
Existing	James Ranch Road south of SR 80	0	0	0	0	0
	James Ranch Road north of SR 80	0	0	0	0	0
	SR 80 west of James Ranch Road	5,667	475	423	29	24
	SR 80 east of James Ranch Road	5,667	475	423	29	24
2028 No-Build	James Ranch Road south of SR 80	300	30	29	0	1
	James Ranch Road north of SR 80	300	30	29	0	1
	SR 80 west of James Ranch Road	6,700	550	493	31	27
	SR 80 east of James Ranch Road	6,700	550	492	32	27
2050 No-Build	James Ranch Road south of SR 80	700	60	59	0	1
	James Ranch Road north of SR 80	700	60	59	0	1
	SR 80 west of James Ranch Road	10,500	860	771	48	41
	SR 80 east of James Ranch Road	10,500	860	769	49	42
2028 Build	James Ranch Road south of SR 80	6,300	563	395	29	140
	James Ranch Road north of SR 80	300	30	29	0	1
	SR 80 west of James Ranch Road	8,000	643	530	35	78
	SR 80 east of James Ranch Road	13,200	1021	811	56	154
2050 Build	James Ranch Road south of SR 80	19,200	1,728	1,312	97	320
	James Ranch Road north of SR 80	700	60	59	0	1
	SR 80 west of James Ranch Road	14,100	1,122	932	63	127
	SR 80 east of James Ranch Road	30,500	2305	1,852	131	322

Table 7.6 – SR 80 / US 191 Noise Report Traffic Volumes

	Roadway Segment	ADT Volume (vpd)	Peak Hour Volume (vph)			
			Total	Passenger Cars	Medium Vehicles	Heavy Vehicles
Existing	Chino Rd south of SR 80	0	0	0	0	0
	US 191 north of SR 80	3,681	317	282	19	16
	SR 80 west of US 191	5,667	476	423	29	24
	SR 80 east of US 191	8,941	538	479	48	11
2028 No-Build	Chino Rd south of SR 80	0	0	0	0	0
	US 191 north of SR 80	5,000	357	318	25	14
	SR 80 west of US 191	6,400	536	477	37	21
	SR 80 east of US 191	9,400	606	540	42	24
2050 No-Build	Chino Rd south of SR 80	0	0	0	0	0
	US 191 north of SR 80	7,700	552	491	39	22
	SR 80 west of US 191	10,000	828	737	58	33
	SR 80 east of US 191	14,500	937	834	66	37
2028 Build	Chino Rd south of SR 80	3,500	297	282	0	14
	US 191 north of SR 80	6,900	485	356	28	102
	SR 80 west of US 191	12,600	998	772	59	166
	SR 80 east of US 191	11,900	711	601	57	52
2050 Build	Chino Rd south of SR 80	5,400	459	437	0	22
	US 191 north of SR 80	11,900	843	642	50	152
	SR 80 west of US 191	29,500	2,270	1,794	137	339
	SR 80 east of US 191	28,000	1,721	1,434	129	158

7.2 Air Quality Report Data Summary

Table 7.7 and **Table 7.8** summarize the ADTs for all vehicles, ADTs for trucks (includes the combination of medium and heavy vehicles), and truck percentages (both medium and heavy vehicles) on each leg of the intersections of SR 80 / James Ranch Road and SR 80 / US 191, respectively.

Table 7.7 – SR 80 / James Ranch Road Air Quality Report Daily Traffic Volumes and Truck Percentages

	Existing	2028 No-Build	2028 Build	Difference (2028 Build vs. No-Build)	2050 No-Build	2050 Build	Difference (2050 Build vs. No-Build)
James Ranch Road south of SR 80							
Total ADT	0	300	6,300	6,000	700	19,200	18,500
Truck ADT	0	1	168	168	1	417	415
Truck %	0%	2%	30%	28%	2%	24%	22%
James Ranch Road north of SR 80							
Total ADT	0	300	300	0	700	700	0
Truck ADT	0	1	1	0	1	1	0
Truck %	0%	2%	2%	0%	2%	2%	0%
SR 80 west of James Ranch Road							
Total ADT	5,667	6,700	8,000	1,300	10,500	14,100	3,600
Truck ADT	52	58	113	55	89	189	100
Truck %	11%	11%	18%	7%	10%	17%	6%
SR 80 east of James Ranch Road							
Total ADT	5,667	6,700	13,200	6,500	10,500	30,500	20,000
Truck ADT	52	59	210	151	91	453	362
Truck %	11%	11%	21%	10%	11%	20%	9%

Table 7.8 – SR 80 / US 191 Air Quality Report Daily Traffic Volumes and Truck Percentages

	Existing	2028 No-Build	2028 Build	Difference (2028 Build vs. No-Build)	2050 No-Build	2050 Build	Difference (2050 Build vs. No-Build)
Chino Rd south of SR 80							
Total ADT	0	0	3,500	3,500	0	5,400	5,400
Truck ADT	0	0	14	14	0	22	22
Truck %	0%	0%	5%	5%	0%	5%	5%
US 191 north of SR 80							
Total ADT	3,681	5,000	6,900	1,900	7,700	11,900	4,200
Truck ADT	35	39	129	90	61	201	141
Truck %	11%	11%	27%	16%	11%	24%	13%
SR 80 west of US 191							
Total ADT	5,667	6,400	12,600	6,200	10,000	29,500	19,500
Truck ADT	52	59	226	167	91	476	385
Truck %	11%	11%	23%	12%	11%	21%	10%
SR 80 east of US 191							
Total ADT	8,941	9,400	11,900	2,500	14,500	28,000	13,500
Truck ADT	59	67	109	43	103	287	184
Truck %	11%	11%	15%	4%	11%	17%	6%

Table 7.9 summarizes the overall intersection LOS for scenarios with signalized and roundabout intersections or the worst movement LOS for TWSC scenarios at each study intersection during the AM and PM peak hours.

Table 7.9 – Air Quality Report Overall Intersection Level of Service by Scenario

Intersection	Scenario	LOS	
		AM	PM
SR 80 / James Ranch Road	Existing TWSC^	B	B
	2028 No-Build TWSC^	B	B
	2050 No-Build TWSC^	C	C
	2028 Build TWSC^	E	D
	2050 Build TWSC^	F	F
	2028 Build Signalized	A	B
	2050 Build Signalized	C	C
	2028 Build Roundabout	A	A
	2050 Build Roundabout	B	B
SR 80 / US 191/ Chino Road	Existing	A	A
	2028 No-Build	A	A
	2050 No-Build	A	A
	2028 Build	A	A
	2050 Build	C	C

^TWSC values represent worst movement LOS instead of overall intersection LOS.

8. SUMMARY

The principal findings of the traffic analysis are summarized below:

SR 80 / James Ranch Road

- The existing TWSC intersection provides LOS B in Existing and 2028 No-Build traffic conditions and LOS C or better in 2050 No-Build traffic conditions on the NB and SB approaches with current intersection geometry.
- The TWSC intersection alternative provides LOS E or better in 2028 Build traffic conditions and LOS F in 2050 Build traffic conditions on the NB and SB approaches, even with an exclusive NB right-turn lane provided.
- The signalized intersection alternative provides overall LOS C or better in 2028 and 2050 Build traffic conditions as long as an exclusive NB right-turn lane with an overlap right-turn signal phase and dual westbound left-turn lanes are provided.
- The roundabout intersection alternative provides overall LOS B or better in 2028 and 2050 Build traffic conditions as long as an exclusive free-flow NB right-turn bypass lane is provided.

SR 80 / US 191

- The existing signalized intersection provides overall LOS A in Existing and 2028 No-Build traffic conditions, and overall LOS B in 2050 No-Build traffic conditions, with current intersection geometry and optimized traffic signal timing.
- The existing signalized intersection provides overall LOS A in 2028 Build traffic conditions and LOS C in 2050 Build traffic conditions with current intersection geometry and the opening of the south leg for the realigned Chino Road as long as protected-permitted left-turn EB and WB signal phasing is provided by 2050.

Proposed IPOE Intersections

- The proposed IPOE East and IPOE West intersections provide LOS B or better for all movements with all-way stop control in 2028 Build traffic conditions.
- The proposed IPOE East and IPOE West intersections provide LOS A for all movements with roundabout control in 2050 Build traffic conditions.

Table 8.1 summarizes the overall intersection LOS for scenarios with signalized and roundabout intersections or the worst movement LOS for TWSC scenarios at each study intersection during the AM and PM peak hours. The longest queue at the intersection is also reported.

Table 8.1 – Overall Level of Service/Longest Queue by Scenario

Intersection	Scenario	LOS / Queue	
		AM	PM
SR 80 / James Ranch Road	Existing TWSC^	B / 0'	B / 0'
	2028 No-Build TWSC^	B / 25'	B / 25'
	2050 No-Build TWSC^	C / 50'	C / 50'
	2028 Build TWSC^	E / 25'	D / 75'
	2050 Build TWSC^	F / *	F / *
	2028 Build Signalized	A / 25'	B / 25'
	2050 Build Signalized	C / 325'	C / 375'
	2028 Build Roundabout	A / 75'	A / 50'
	2050 Build Roundabout	B / 450'	B / 1,025'
SR 80 / US 191/Chino Road	Existing	A / 25'	A / 25'
	2028 No-Build	A / 25'	A / 25'
	2050 No-Build	A / 50'	A / 50'
	2028 Build	A / 50'	A / 75'
	2050 Build	C / 350'	C / 325'
IPOE East Intersection	2028 Build^	B / 25'	B / 25'
	2050 Build^	A / 50'	A / 50'
IPOE West Intersection	2028 Build^	B / 25'	B / 25'
	2050 Build^	A / 25'	A / 25'

* Value not reported due to HCM limitations. Significant delays/queueing anticipated.
^LOS values represent worst movement LOS instead of overall intersection LOS.

Comparison of SR 80 / James Ranch Road Intersection Configuration Alternatives

The various SR 80 / James Ranch Road intersection configuration alternatives (TWSC, Traffic Signal Control, and Roundabout) were compared to each other using several different evaluation criteria. Some of the evaluation criteria used do not lend themselves to numerical quantification, so the evaluation was performed on a “qualitative” basis using the following descriptors to describe the relative impacts of each of the alternatives:

- Strong Advantage;
- Advantage;
- Neutral;
- Disadvantage; and
- Strong Disadvantage.

The Strong Advantage and Advantage descriptors apply when implementation of an alternative is anticipated to result in a positive change or improvement compared to the other alternatives. The Strong Disadvantage and Disadvantage descriptors apply when implementation of an alternative is anticipated to result in a negative change or worsening compared to the other alternatives. The Neutral descriptor applies when implementation of an alternative is anticipated to have no impact or result in both positive and negative changes that effectively cancel each other out.

Table 8.2 summarizes the relative advantages and disadvantages of the alternatives.

Table 8.2 – Intersection Configuration Alternatives Evaluation Matrix - SR 80 / James Ranch Road

Evaluation Criteria	No-Build (TWSC)	Two-Way Stop Control (TWSC)	Traffic Signal Control	Roundabout
Traffic Operations (2050 AM/PM)	● - LOS C/C - Maximum queues of 50/50 feet	● - LOS F/F - Significant queueing expected	● - LOS C/C - Maximum queues of 325/375 feet	● - LOS B/B - Maximum queues of 450/1,025 feet
Motorist Safety	● - 32 conflict points, 16 crossing points (4 perpendicular) - Speed and wrong-way control by signs only	● - 32 conflict points, 16 crossing points (4 perpendicular) - Speed and wrong-way control by signs only	● - 32 conflict points, 16 crossing points (4 perpendicular) - Speed and wrong-way control by signals and signs	● - 24 conflict points, 8 crossing points (0 perpendicular) - Speed and wrong-way control by curbs and roadway geometry
Driver Familiarity	● - Very common configuration	● - Very common configuration	● - Very common configuration	● - Somewhat common configuration
Oversize Vehicle Accommodation	● - Open geometry with no major horizontal or vertical restrictions	● - Open geometry with no major horizontal or vertical restrictions	● - Open geometry; vertical restrictions due to signal mast arms	● - Restricted geometry; option for large-radius bypass lanes
Pedestrian and Bicyclist Accommodation and Safety	● - No pedestrian accommodations - Paved shoulders for cyclists - High vehicle speeds negatively affect pedestrian and bicyclist safety and comfort	● - At-grade crossings can be provided on stop-controlled legs - Signalized or grade-separated crossing required to cross SR 80 - Includes standard pedestrian and bicyclist facilities - High vehicle speeds negatively affect pedestrian and bicyclist safety and comfort	○ - At-grade crossings can be provided on all 4 legs; all signalized - Includes standard pedestrian and bicyclist facilities - High vehicle speeds negatively affect pedestrian and bicyclist safety and comfort	● - At-grade crossings can be provided on all 4 legs - Includes standard pedestrian and bicyclist facilities - Moderate vehicle speeds somewhat affect pedestrian and bicyclist safety and comfort - Cyclists must transition from roadway to sidewalk

Legend

Strong Advantage ● Advantage ● Neutral ○ Disadvantage ● Strong Disadvantage ●

Findings from SR 80 / James Ranch Road Alternatives Evaluation

- If the proposed commercial IPOE and connector road are not built, the existing TWSC configuration is expected to provide acceptable traffic operations through 2050 at SR 80 / James Ranch Road.
- The TWSC alternative likely will not provide acceptable traffic operations where the connector road for the proposed commercial IPOE intersects with SR 80.
- The roundabout alternative provides the most benefit at the SR 80 / James Ranch Road intersection in terms of safety and LOS but will likely have a much longer queue than the signalized alternative.
- Drivers are most familiar with the TWSC and signalized alternatives and may be less familiar with the roundabout alternative.
- Oversize vehicles can most easily be accommodated by the TWSC alternative, followed by the signalized alternative; the roundabout alternative can be challenging for oversize vehicles to navigate if not designed specifically to accommodate oversize vehicles.
- Other factors besides traffic considerations (e.g., right-of-way impacts, cost, etc.) should be considered before determining the preferred intersection configuration at SR 80 / James Ranch Road.

Recommended Intersection Control and Geometry

Table 8.3 summarizes the recommended intersection control and geometry at each study intersection. The table includes references to the corresponding figures in Section 5 above.

Note that the proposed IPOE East and IPOE West intersections were analyzed with four legs at each intersection. The potential future east leg of the IPOE East Intersection and north leg of the IPOE West Intersection were included in the analysis to provide a conservative analysis of intersection operations with future development traffic. These legs may be installed after the proposed IPOE buildout if the proposed IPOE is completed prior to development in the area.

Table 8.3 – Recommended Intersection Control and Geometry

Intersection	2028 Build	2050 Build
SR 80 / James Ranch Road	(See Figure 3.5) <ul style="list-style-type: none">Traffic signal control<u>NB Approach</u>: left-turn lane (325 feet of storage), shared through/right-turn lane, right-turn lane (575 feet of storage)<u>SB Approach</u>: left-turn lane (100 feet of storage), shared through/right-turn lane<u>EB Approach</u>: left-turn lane (maintain existing storage length), dual through lanes, right-turn lane (400 feet of storage)<u>WB Approach</u>: dual left-turn lanes (600 feet of storage), through lane, shared through/right-turn lane	(See Figure 3.7) <ul style="list-style-type: none">Maintain 2028 Build recommendations
SR 80 / US 191	(See Figure 3.9) <ul style="list-style-type: none">Traffic signal control<u>NB Approach</u>: left-turn lane (150 feet of storage), shared through/right-turn lane<u>SB/EB/WB Approaches</u>: maintain existing lane geometry	(See Figure 3.11) <ul style="list-style-type: none">Maintain 2028 Build recommendations
IPOE East Intersection	(See Figure 3.12) <ul style="list-style-type: none">All-way stop control<u>NB/WB Approaches</u>: shared left-turn/through/right-turn lane<u>SB Approach</u>: shared left-turn/through lane (350 feet of storage), trap right-turn lane<u>EB Approach</u>: trap left-turn lane, shared through/right-turn lane	(See Figure 3.13) <ul style="list-style-type: none">Roundabout<u>All Approaches</u>: shared left-turn/through/right-turn laneOptional channelized SB right-turn bypass lane
IPOE West Intersection	(See Figure 3.14) <ul style="list-style-type: none">All-way stop control<u>NB/SB/EB Approaches</u>: shared left-turn/through/right-turn lane<u>WB Approach</u>: trap left-turn lane, shared through/right-turn lane	(See Figure 3.15) <ul style="list-style-type: none">Roundabout<u>All Approaches</u>: shared left-turn/through/right-turn lane

Traffic-Related Considerations for the Connector Road

- Future bus stops should be considered along or near the connector road to accommodate commuter traffic generated by the anticipated warehousing land uses and other developments along and near the roadway.
- Future access points along the connector road should including adequate access spacing and turning radii should be designed to accommodate heavy vehicles.
- Truck parking needs should be considered when designing the connector road due to the anticipated high truck volumes utilizing the roadway and the fact that trucks may have to wait to cross the border if it is not open yet.
- If the ADOT Commercial Inspection Facility stays in its current location, ITS devices such as additional cameras, weigh-in-motion sensors, and dynamic message signs may need to be placed east and west of the intersection of SR 80 / James Ranch Road to alert ADOT to heavy vehicles that do not go to the ADOT Commercial Inspection Facility for inspection (i.e., “port runners”). If the ADOT Commercial Inspection Facility is relocated along the connector road, fewer ITS devices may be needed because trucks will have to pass through the inspection station before continuing along their route. ITS devices along SR 80 may still be desirable to detect “port runners” and overweight vehicles.

- It is anticipated that a two-lane cross-section on the connector road will provide LOS D or better on the connector road until approximately 80 percent of the traffic from the surrounding developments is realized. This is estimated to occur around the year 2044.

Traffic-Related Considerations for the Proposed IPOE Intersections

- To avoid truck queues backing up onto the existing roadway while awaiting the opening of the IPOE, it is recommended that a minimum 10-foot-wide paved shoulder be provided adjacent to the southbound approach of the IPOE East intersection for at least 500 feet to allow trucks to park and queue outside the traveled way until the IPOE opens.
- It is recommended that the all-way stop control at both proposed IPOE intersections in the 2028 Build condition be replaced with roundabouts when the connector road is widened to a four-lane cross-section to help manage speeds and promote safety. This is estimated to occur around the year 2044.
- If desired by ADOT, a SB right-turn bypass lane could be considered in the 2050 Build condition at the IPOE East Intersection roundabout to improve the truck turn radius and reduce circulating volumes within the roundabout.

Appendix 1. Stantec 2018 *Douglas Arizona Regional Feasibility Study* Excerpts



**Douglas Arizona Regional
Feasibility Study**

Traffic Study for the Raul Hector Castro
Land Port of Entry in Douglas, Arizona

June 29, 2018

Prepared for:

General Services Administration

Prepared by:

Stantec Consulting

1.0 DETERMINING BASELINE FUNCTIONS

1.1 VEHICLE VOLUMES

Stantec was provided traffic data by the U.S. Customs and Border Protection (CBP). This data included time-stamped volumes passing through the facility for a 12-month period (February 2017 to January 2018). The 90th percentile weekly volume was recommended for determining volumes to use in the baseline Scenario.

The study team determined that the volumes of both Personally Owned Vehicles (POVs) and Commercially Operated Vehicles (COVs) are the driving factors that affect traffic flow, queues, and wait time. The number of POVs and COVs were therefore combined to determine the peak week.

The 90th percentile peak week for both personal and commercial vehicles was found to be from October 18th to October 24th, 2017, with a total of 37,551 vehicles (POVs and COVs) passing through the facility during this week (see **Figure A**). This 90th percentile volume, which was identified as the 47th highest volume by week, was found using the following method:

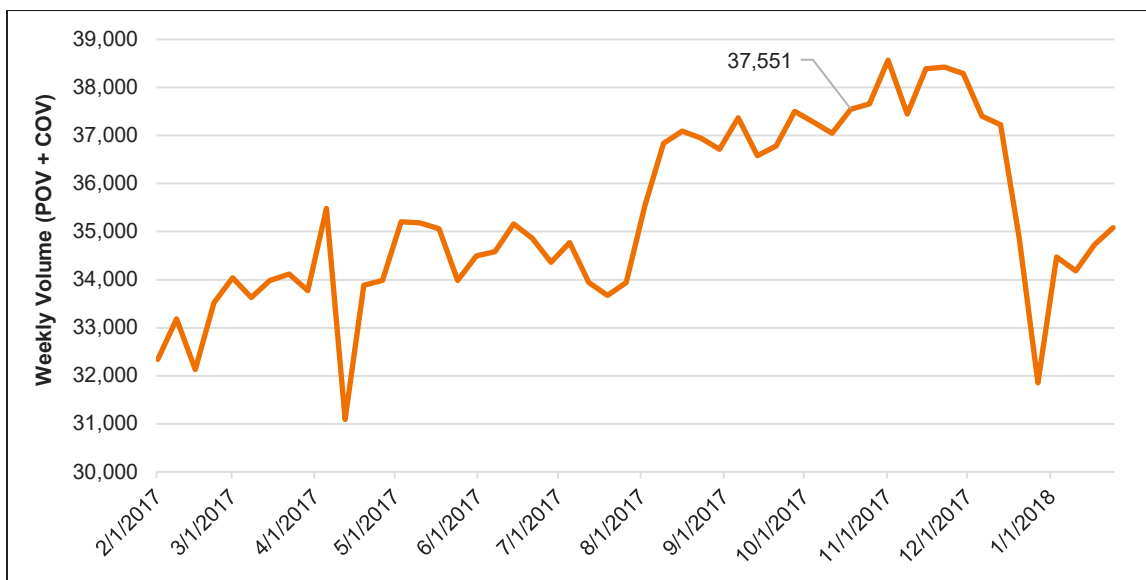
To find the 90th percentile weekly volume:

n = number of weeks = 52

p = percentile = 0.90

$n \times p = 52 \times 0.90 = 46.8$ – or the **47th highest volume week**

Figure A: Weekly Combined POV and COV Volumes (February 2017 to January 2018)



Furthermore, it was determined that the highest-volume day of that peak week was Thursday, October 19, 2017, with a total of 5,504 POVs and 129 COVs entering the facility (see **Table 1.1**).

Table 1.1: Daily POV and COV Volumes during the 90th Percentile Peak Week

Date	# POVs	# COVs	Combined Total
Wednesday, October 18, 2017	5,307	106	5,413
Thursday, October 19, 2017	5,504	129	5,633
Friday, October 20, 2017	5,376	117	5,493
Saturday, October 21, 2017	4,957	24	4,981
Sunday, October 22, 2017	5,119	-	5,119
Monday, October 23, 2017	5,305	118	5,423
Tuesday, October 24, 2017	5,381	108	5,489

1.1.1 Peak Period

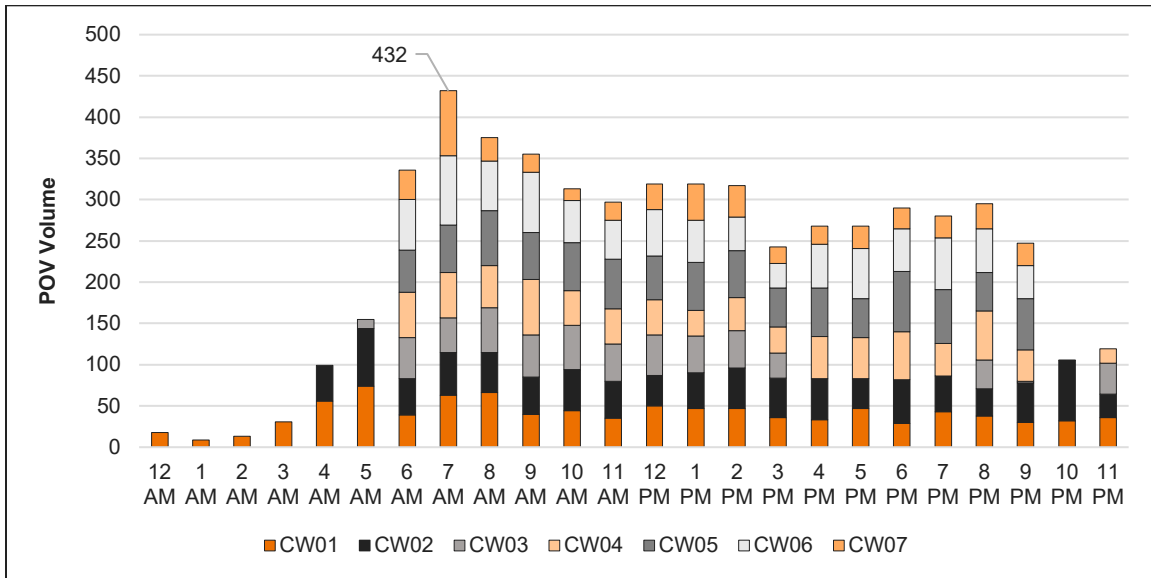
In analyzing the time-stamped processing times for October 19, 2017, the volume of vehicles that pass through each of the seven POV booths can be determined. The booths are referred to as CW01 on the far-right to CW07 at far-left. One can see from **Figure B** that typically all seven booths are open during the peak period. The far-left booth (CW07) is allocated for SENTRI vehicles.

Figure B: Aerial Image Looking Northbound from Mexico at the Douglas LPOE
(Date and Time Unknown)



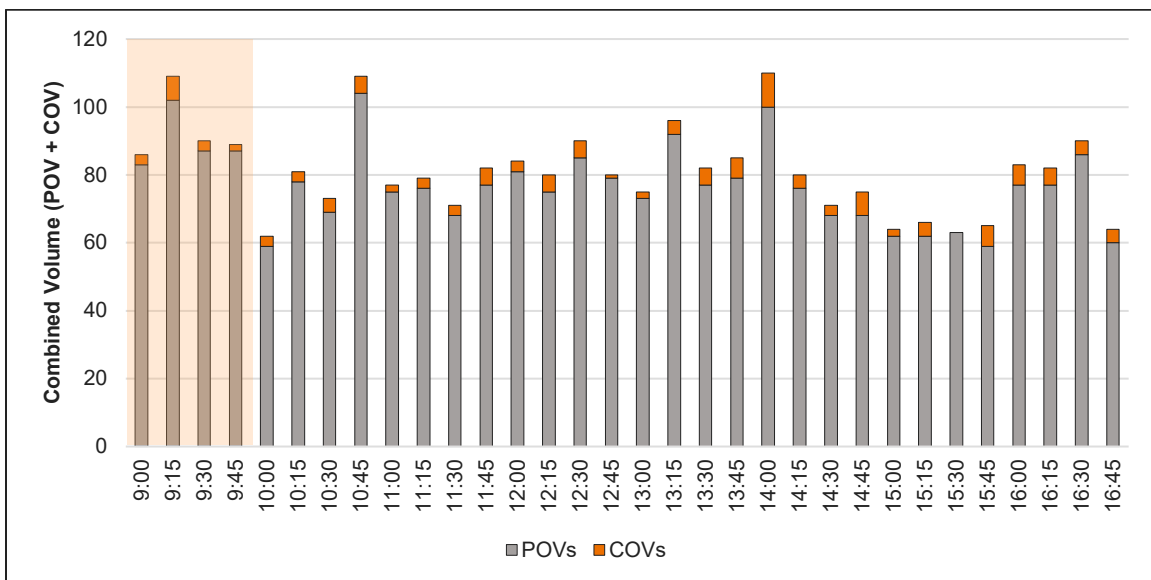
It can be determined from the data that the peak period for POVs is from 7am to 8am, with 432 vehicles processed during that hour on October 19, 2017 (see **Figure C**). This peak hour also represents the highest volume of SENTRI vehicles that pass through booth CW07.

Figure C: Hourly POV Volumes by Booth on October 19, 2017



However, in an effort to capture the peak time window for both POVs and COVs, it is necessary to focus on the hours between 9am and 5pm, when the COV processing facility is open. The volumes processed during those eight hours were isolated for analysis. **Figure D**, below, displays the 15-minute volumes counted between 9am and 5pm for POVs and COVs combined. When the 15-minute volumes are summed for each hour, the combined peak hour is identified as 9am to 10am, with 374 total vehicles entering the facility during this hour (359 POVs and 15 COVs).

Figure D: 15-minute Volumes for 9am to 5pm on October 19, 2017

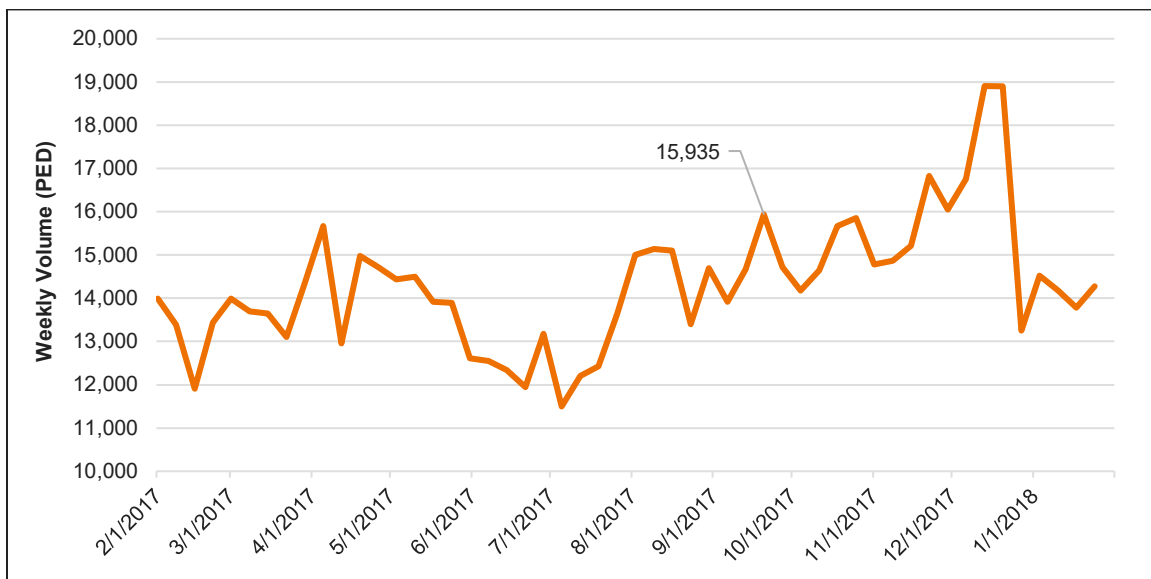


1.2 PEDESTRIAN VOLUMES

Pedestrian (PED) volumes were analyzed separately since they have their own processing facility and booths that are detached from the vehicle processing area. Currently, once processed, pedestrians that wish to access the building facility are required to cross the street where POVs drive through either to exit the facility or to park for secondary inspection. It is recommended that any new facility design allows for minimal interaction between pedestrians and vehicles to avoid conflicts.

Figure E shows the weekly PED volumes that entered the facility from February 2017 to January 2018. Although one can see a significant peak during the month of December, the 90th percentile peak week for pedestrians was found to be from September 20th to September 26th, 2017, with a total of 15,935 pedestrians entering the facility during that week. This 90th percentile volume was identified using the same methodology discussed in **Section 1.1**.

Figure E: Weekly PED Volumes (February 2017 to January 2018)



Furthermore, it was determined that the highest day of that peak week was Friday, September 22, 2017, with a total of 2,467 PEDs entering the facility (see **Table 1.4**).

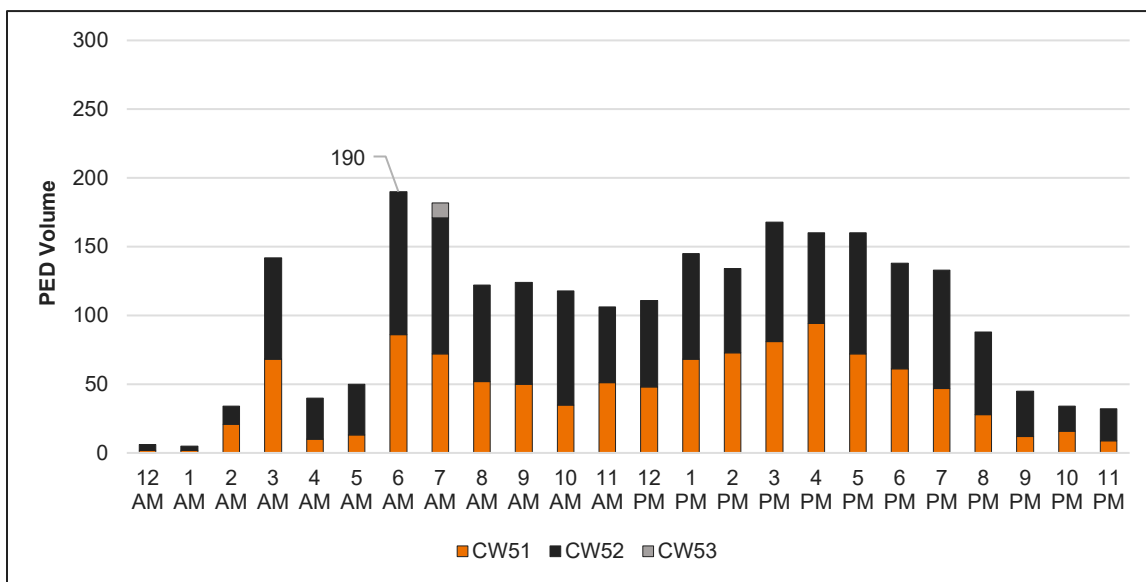
Table 1.4: Daily PED Volumes during the 90th Percentile Peak Week

Date	# PEDs	Weekly Total
Wednesday, September 20, 2017	2,159	15,935
Thursday, September 21, 2017	2,422	
Friday, September 22, 2017	2,467	
Saturday, September 23, 2017	2,457	
Sunday, September 24, 2017	1,917	
Monday, September 25, 2017	2,347	
Tuesday, September 26, 2017	2,166	

1.2.1 Peak Period

A closer look at the pedestrian crossing data for September 22, 2017 shows a peak from 6am to 7am, with 190 PEDs entering the facility (see **Figure F**). There are three processing booths for pedestrians. However, booth CW53 was in operation for only seven minutes on September 22nd, and processed 11 pedestrians from 7:39am to 7:46am.

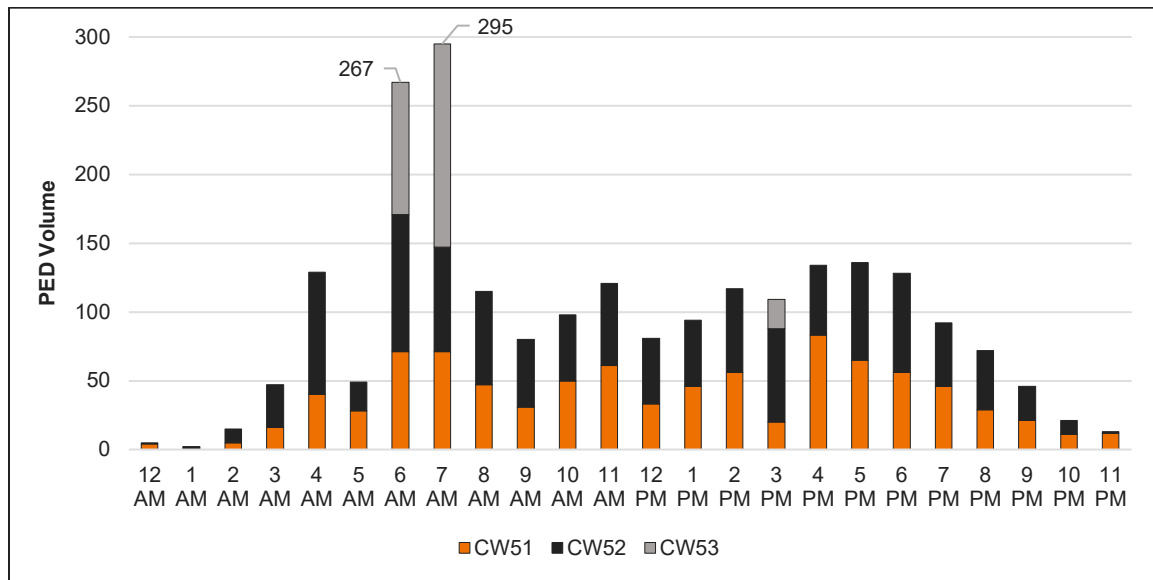
Figure F: Hourly PED Volumes by Booth on September 22, 2017



It is clear from the data for September 22, 2017 that not all three booths are in operation simultaneously all the time. In comparison, on October 19, 2017, which was the day chosen to model baseline behavior for vehicles, all three booths were in operation for a longer period of time. On that day, all three booths operated from 6am to 8am, and again from 3pm to 4pm (see **Figure G**). The total volume of PEDs entering the facility that day was 2,266, with

volumes of 267 from 6am to 7am and 295 from 7am to 8am. This higher-volume period was utilized going forward to provide a more conservative view of the operations of the pedestrian processing facility.

Figure G: Hourly PED Volumes by Booth on October 19, 2017



1.2.2 Pedestrian Processing Times

Just like vehicles, pedestrians entering the facility are also required to pass through a booth for admittance into the USA. **Table 1.5**, below, shows the processing times by booth from 6am to 8am on October 19, 2017. The average PED processing time was determined to be 29 seconds.

Table 1.5: PED Processing Times by Booth for 6am to 8am on October 19, 2017

Time (min:sec)	CW51	CW52	CW53	Average (CW51 – CW53)
Min Time	00:05	00:04	00:04	00:04
50 th Percentile	00:33	00:27	00:10	00:23
90 th Percentile	01:37	01:35	00:34	01:15
Max Time	06:02	03:58	06:34	05:31

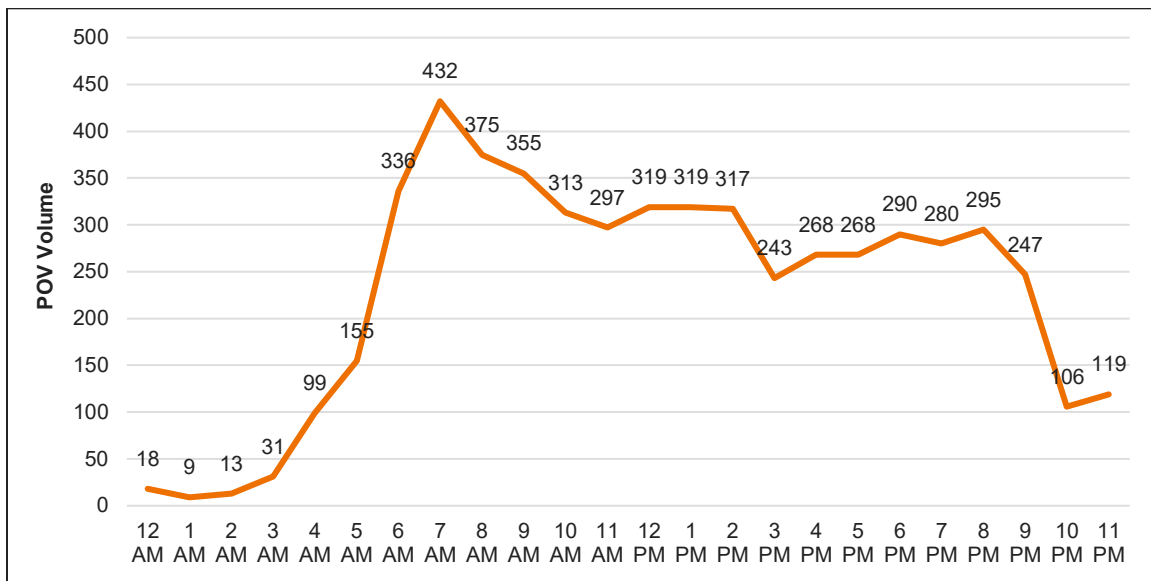
1.2.3 Pedestrian Admittance

The data from CBP also provides insight into the percentage of pedestrians admitted into the USA versus not admitted. An average of 97.38% of PEDs entering the facility pass through into the USA, while 2.62% of PEDs are not admitted.

2.0 DETERMINING DEMAND

To better understand the daily demand for POVs that enter the Douglas LPOE facility, the total number of POVs that passed through on the baseline scenario peak day of October 19, 2017 was assessed. On that day, a total of 5,504 POVs entered the facility through the seven POV booths. **Figure H** shows the flux of volume by hour.

Figure H: Hourly POV Volumes on October 19, 2017



To capture both POV and COV performance in the VISSIM model, the time window between 9am and 3pm was coded into the model. However, without any data regarding arrival information for POVs entering the queue – the actual hourly demand – traffic engineering judgement had to be used to determine the demand. An assumed factor of 1.3 times the actual processed volume was used to calculate a higher demand volume. For consistency, the same methodology was used for POVs, COVs, and PEDs.

Table 2.1 displays the actual volumes of processed POVs per hour on October 19, 2017, as well as the estimated demand volume calculated by applying the factor of 1.3, for all hours between 9am and 3pm. **Table 2.2** shows the same for COVs. **Table 2.3** shows the actual volume of processed PEDs during the peak hour on October 19, 2017, and the demand volume calculated by applying the factor of 1.3.

Table 2.1: Hourly POV Volumes on October 19, 2017

Time Frame	Processed Volume	Demand Volume
9am-10am	359	467
10am-11am	310	403
11am-12pm	296	385
12pm-1pm	320	416
1pm-2pm	321	417
2pm-3pm	313	407

Table 2.2: Hourly COV Volumes on October 19, 2017

Time Frame	Processed Volume	Demand Volume
9am-10am	15	20
10am-11am	15	20
11am-12pm	13	17
12pm-1pm	14	18
1pm-2pm	17	22
2pm-3pm	24	31

Table 2.3: Hourly PED Volumes on October 19, 2017

Time Frame	Processed Volume	Demand Volume
7am-8am	295	384

2.1.1 Computing Growth Rates

The next step in the analysis is determining growth rates to calculate projected volumes for 2018 and 2043.

Using total yearly volumes from 2011 through 2017 for each mode of transportation as shown in **Table 2.4**, a cumulative compound annual growth rate (CAGR) was determined for use in projecting future volumes.

Table 2.4: Yearly Inbound Processed Volumes

Travel Mode	2011	2012	2013	2014	2015	2016	2017
POV	1,393,181	1,405,122	1,470,933	1,571,929	1,716,303	1,614,882	1,765,505
COV	29,883	31,636	32,497	33,104	34,545	30,815	30,649
PED	1,030,357	1,198,838	1,804,110	1,011,564	1,121,717	851,997	854,502
Total	2,453,421	2,635,596	3,307,540	2,616,597	2,872,565	2,497,694	2,650,656

To find the compound annual growth rate (CAGR):

$$V_f = \text{final volume} = 2,650,656$$

$$V_i = \text{initial volume} = 2,453,421$$

$$N = \text{number of years} = 7$$

$$\text{CAGR} = (V_f/V_i)^{(1/N)} - 1 = (2,650,656 / 2,453,421)^{(1/7)} - 1 = 0.011 - \text{or } 1.1\%$$

The same growth rate of 1.1% is assumed for all modes: PED, POV, and COV.

2.1.2 Determining 2018 Baseline Demand

After converting the 2017 processed volumes to 2017 demand volumes using the factor of 1.3, the CAGR of 1.1% can be used to calculate the projected 2018 demand volumes using the peak day of October 19, 2017 as a baseline.

Table 2.5 displays side-by-side the daily 2017 processed volumes, 2017 demand volumes, and 2018 demand volumes for all modes.

Table 2.5: Inbound Daily Border Crossing Volumes

Travel Mode	2017 Processed Volume	2017 Demand Volume	2018 Demand Volume
POV	5,504	7,155	7,234
COV	129	168	170
PED	2,266	2,946	2,978

Focusing in on the peak period used in the VISSIM model for the 2018 Baseline Scenario, the CAGR was applied to the hourly 2017 demand volumes previously discussed in **Section 2.0**. These new hourly 2018 demand volumes are presented below in **Table 2.6** for 9am to 3pm for POVs and COVs and for the single peak hour for PEDs.

Table 2.6: Hourly Volumes for 2018 Baseline Scenario for All Modes

Time Frame	POV Demand Volume	COV Demand Volume	PED Demand Volume
7am-8am	N/A	N/A	388
9am-10am	472	20	N/A
10am-11am	407	20	N/A
11am-12pm	389	17	N/A
12pm-1pm	421	18	N/A
1pm-2pm	422	22	N/A
2pm-3pm	411	32	N/A

2.1.3 VISSIM Model Outputs

The inputs provided in **Appendix A** were used to create a VISSIM model for the Douglas LPOE project location.

Table 2.7 and **Table 2.8**, below, present summarized outputs for inbound and outbound movements, respectively, for both POVs and COVs in the 2018 Baseline Scenario.

Table 2.7: 2018 Baseline Scenario VISSIM Model Outputs – Inbound (Entry to the USA)

VISSIM Outputs	POV	SENTRI	COV
Average Number of vehicles processed in primary station (vehicles/hour)	357	N/A	17
Average Number of vehicles processed in secondary station (vehicles/hour)	10	N/A	16
Maximum Queue Length (before primary inspection) (feet)	3979	N/A	3484
Minimum Wait Time (before primary inspection and booth dwell time) (min:sec)	11:41	12:35	15:51
Average Wait Time (before primary inspection) (min:sec)	34:12	20:11	26:27
Maximum Wait Time (before primary inspection) (min:sec)	52:35	30:20	42:49

Table 2.8: 2018 Baseline Scenario VISSIM Model Outputs – Outbound (Entry to Mexico)

VISSIM Outputs	POV	COV
Average Number of vehicles processed in primary station (vehicles/hour)	159	66
Maximum Queue Length (before primary inspection) (feet)	2435	239
Minimum Wait Time (before primary inspection) (min:sec)	01:09	10:55
Average Wait Time (before primary inspection) (min:sec)	01:19	19:41
Maximum Wait Time (before primary inspection) (min:sec)	01:25	21:47

Figure J: 22-Year Inbound COV Processing Trends

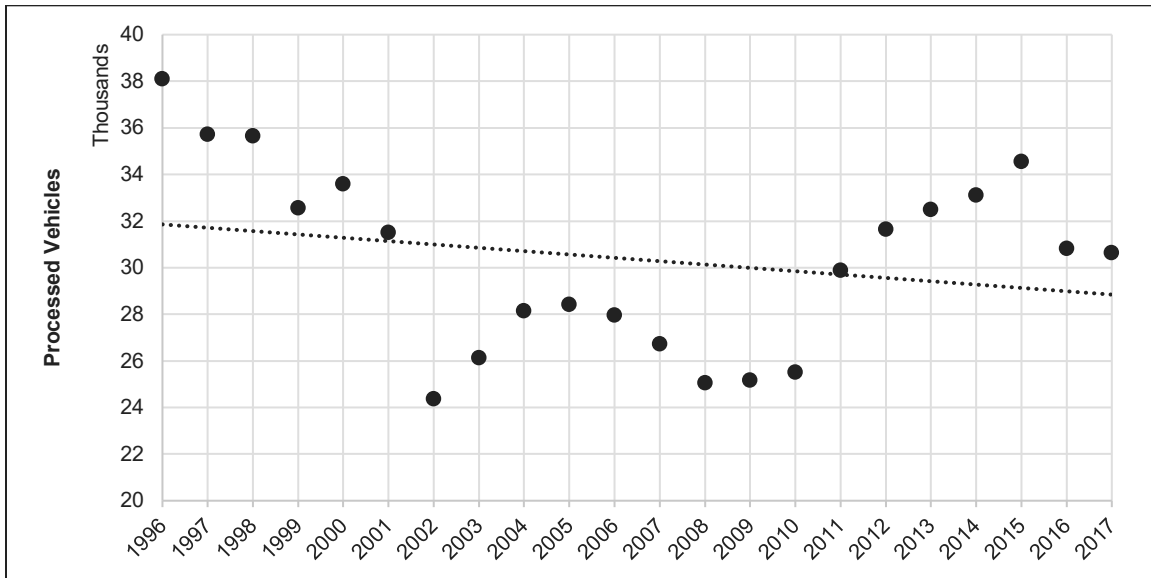
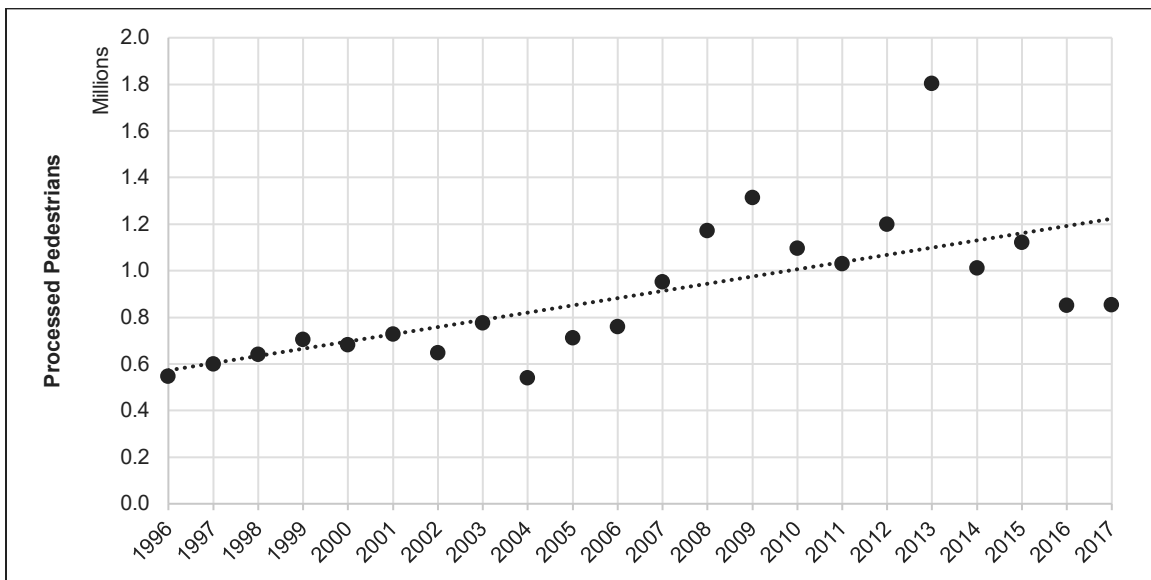


Figure K: 22-Year Inbound PED Processing Trends



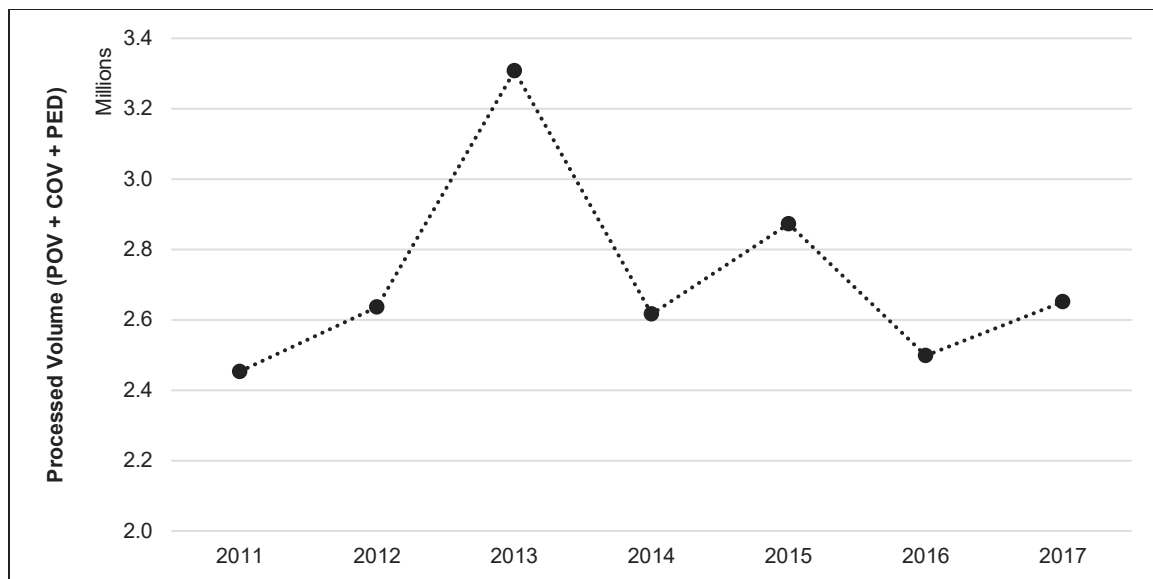
3.1.2 Growth Trends

Results from the 1996 to 2017 border crossing data yielded negative growth for both POV's and COV's. Volumes decreased significantly during the early 2000's which led to skewed data. Various historical events could be seen as large contributing factors to the decline in the three modes of transportation (POV, COV, and PED) during this time.

In December of 2006, Mexican President Felipe Calderon deployed troops to the City of Michoacan, in hopes of regaining control over the area and fighting back against Mexican drug cartels. Although this was the first time that war was officially declared, violence due to drug related matters had begun to surge a couple years earlier. As this issue became recognized worldwide, overall travel into and out of Mexico subsequently dropped (*"Mexico's war on drugs: what has it achieved and how is the US involved"*, *The Guardian*, *Nina Lakhani*, Dec 8 2016).

Given this major impact on the observed volumes, only the years between 2011-2017 were used to compute future growth rates, as described in Section 2.1.1). Since this seven-year period is the most recent data set showing growth, it was determined to be the most pertinent to this study. When these seven years are isolated, growth was noticed amongst all modes. The figure below represents the actual inbound combined total volume of POVs, COVs, and PEDs that entered the USA via the Douglas LPOE from 2011 to 2017.

Figure L: 7-Year Inbound Combined Processing Trends



The CAGR of 1.1% can be applied to the previously determined daily 2017 processed volumes from October 19, 2017 to calculate volumes for POVs, COVs, and PEDs for the horizon year 2043. These estimated future processing volumes are shown below in **Table 3.1**.

Table 3.1: Present and Future Year Inbound Daily Processing Volumes (not Demand)

Travel Mode	October 19, 2017	Projected 2018	Projected 2043	% Growth (2017 – 2043)
POV	5,504	5,565	7,315	32.9%
COV	129	130	171	
PED	2,266	2,291	3,012	

Appendix 2. ADOT Commercial Inspection Facility Data

Douglas State Port Of Entry Stats

January - December 2020

Permits:

Number of Trucks: 2578

Total CVSA inspections for the year: 72

CVSA Inspection: January: 8
February: 30
March: 0
April: 1
May: 0
June: 1
July: 9
August: 6
September: 6
October: 5
November: 4
December: 2

January - December 2021

Permits: 21

Number of Trucks: 2992

Total CVSA inspections for the year: 115

Number of Trucks: January: 391
February: 267
March: 312
April: 375
May: 178
June: 303
July: 242
August: 254
September: 152
October: 233
November: 117
December: 168

CVSA Inspection: January: 1
February: 10
March: 16
April: 15
May: 10

June: 15
July: 14
August: 12
September: 9
October: 5
November: 5
December: 3

January - December 2022

Permits: 6
Number of Trucks: 1816
Total CVSA inspections for the year: 80

Number of trucks: January: 227
February: 229
March: 253
April: 242
May: 153
June: 223
July: 188
August: 132
September: 104
October: 169
November: 27
December: 70

CVSA Inspection: January: 6
February: 13
March: 10
April: 3
May: 5
June: 12
July: 6
August: 10
September: 6
October: 5
November: 2
December: 2

Appendix 3. Collected Traffic Volume Data

Location Info					Count Data Info	
Location ID	100871				Start Date	12/7/2021
Type	LINK				End Date	12/8/2021
Functional Class	3				Start Time	12:00 AM
Located On	SR 80				End Time	12:00 AM
Between	Paul Spur Rd AND US 191 - West of Douglas				Direction	
Direction	2-WAY				Notes	adot
Community	Cochise				Count Source	DOUGLAS00000
MPO_ID	1				File Name	
HPMS ID					Weather	
Agency	Arizona Department of Transportation				Study	
					Owner	adot
					QC Status	Accepted
Interval: 15 mins						
Time	15 Min				Hourly Count	
	1st	2nd	3rd	4th		
00:00 - 01:00	7	11	7	9	34	
01:00 - 02:00	2	2	4	0	8	
02:00 - 03:00	3	3	0	2	8	
03:00 - 04:00	7	4	6	16	33	
04:00 - 05:00	11	19	16	19	65	
05:00 - 06:00	32	51	78	58	219	
06:00 - 07:00	51	82	71	60	264	
07:00 - 08:00	78	84	100	113	375	
08:00 - 09:00	77	77	85	110	349	
09:00 - 10:00	128	72	79	78	357	
10:00 - 11:00	85	69	99	90	343	
11:00 - 12:00	83	67	76	104	330	
12:00 - 13:00	98	83	72	106	359	
13:00 - 14:00	94	104	116	84	398	
14:00 - 15:00	119	81	99	104	403	
15:00 - 16:00	128	113	120	110	471	
16:00 - 17:00	107	111	113	112	443	
17:00 - 18:00	99	132	94	73	398	
18:00 - 19:00	54	51	63	54	222	
19:00 - 20:00	62	45	34	34	175	
20:00 - 21:00	45	42	33	28	148	
21:00 - 22:00	18	35	38	24	115	
22:00 - 23:00	33	21	18	16	88	
23:00 - 24:00	22	17	14	9	62	
TOTAL					5667	

Location Info				
Location ID	102213			
Type	LINK			
Functional Class	4			
Located On	US 191			
Between	SR 80 AND Glenn Rd			
Direction	2-WAY			
Community	Cochise			
MPO_ID	0			
HPMS ID				
Agency	Arizona Department of Transportation			

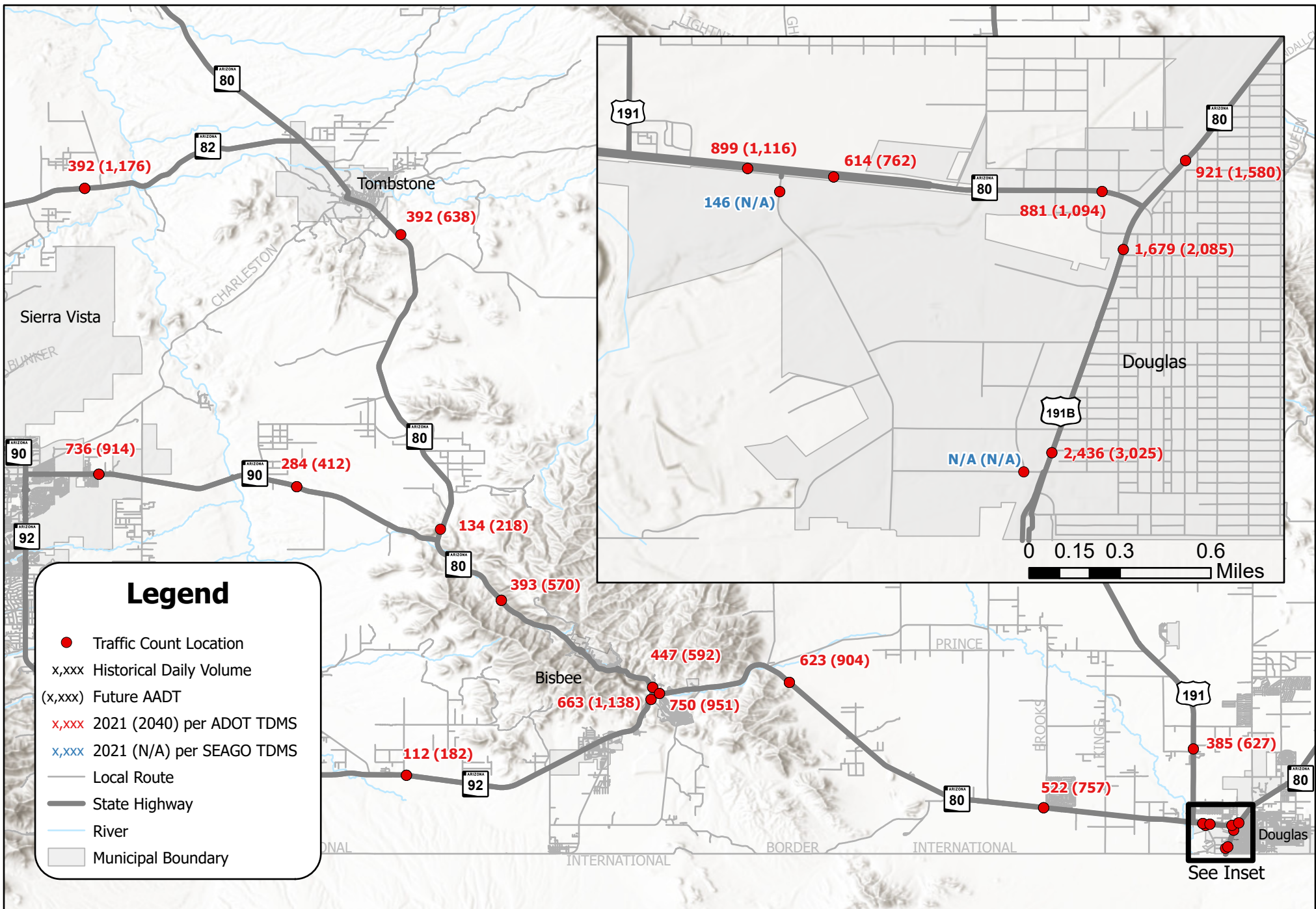
Location Info					
Location ID	100872				
Type	LINK				
Functional Class	3				
Located On	SR 80				
Between	US 191 - West of Douglas AND Chino Rd				
Direction	2-WAY				
Community	Cochise				
MPO_ID	0				
HPMS ID	VHKCRHTC2014				
Agency	Arizona Department of Transportation				
Interval: 15 mins					
Time	15 Min				Hourly Count
	1st	2nd	3rd	4th	
00:00 - 01:00	9	15	9	8	41
01:00 - 02:00	6	16	11	2	35
02:00 - 03:00	8	13	11	22	54
03:00 - 04:00	26	14	24	44	108
04:00 - 05:00	48	33	42	50	173
05:00 - 06:00	68	132	101	89	390
06:00 - 07:00	101	108	130	143	482
07:00 - 08:00	114	115	150	154	533
08:00 - 09:00	101	110	107	110	428
09:00 - 10:00	103	140	125	110	478
10:00 - 11:00	120	135	125	108	488
11:00 - 12:00	126	138	165	151	580
12:00 - 13:00	149	149	152	158	608
13:00 - 14:00	159	146	178	162	645
14:00 - 15:00	192	177	175	179	723
15:00 - 16:00	164	147	156	145	612
16:00 - 17:00	171	166	154	167	658
17:00 - 18:00	186	152	126	134	598
18:00 - 19:00	101	98	77	75	351
19:00 - 20:00	69	57	61	68	255
20:00 - 21:00	64	53	55	54	226
21:00 - 22:00	56	70	48	40	214
22:00 - 23:00	74	34	35	22	165
23:00 - 24:00	31	33	12	20	96
TOTAL					8941

Count Data Info	
Start Date	7/13/2021
End Date	7/14/2021
Start Time	12:30 PM
End Time	12:30 PM
Direction	2-WAY
Notes	adot
Count Source	1.47734E+11
File Name	
Weather	
Study	
Owner	adot
QC Status	Accepted

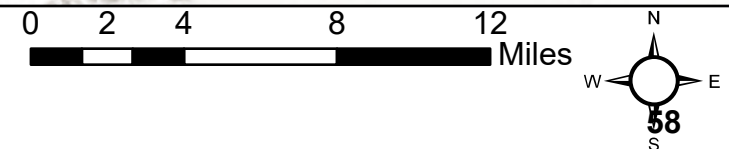
Location Info					
Location ID	100876				
Type	LINK				
Functional Class	4				
Located On	SR 80				
Between	US 191B / G Ave - Douglas AND A Ave / Leslie Canyon / Fairgrounds Rd				
Direction	2-WAY				
Community	DOUGLAS				
MPO_ID	0				
HPMS ID	S00004883101				
Agency	Arizona Department of Transportation				
Interval: 15 mins					
Time	15 Min				Hourly Count
	1st	2nd	3rd	4th	
00:00 - 01:00	8	5	2	6	21
01:00 - 02:00	5	6	3	1	15
02:00 - 03:00	1	1	2	4	8
03:00 - 04:00	13	0	2	10	25
04:00 - 05:00	4	4	11	8	27
05:00 - 06:00	22	22	19	33	96
06:00 - 07:00	21	24	24	29	98
07:00 - 08:00	23	25	27	48	123
08:00 - 09:00	33	53	46	50	182
09:00 - 10:00	44	34	47	52	177
10:00 - 11:00	35	46	30	41	152
11:00 - 12:00	39	45	43	40	167
12:00 - 13:00	56	42	43	69	210
13:00 - 14:00	72	62	56	60	250
14:00 - 15:00	51	49	60	47	207
15:00 - 16:00	51	45	37	40	173
16:00 - 17:00	44	46	51	68	209
17:00 - 18:00	57	36	57	46	196
18:00 - 19:00	40	39	36	29	144
19:00 - 20:00	36	31	29	23	119
20:00 - 21:00	37	30	23	29	119
21:00 - 22:00	29	33	24	31	117
22:00 - 23:00	18	11	11	11	51
23:00 - 24:00	13	13	7	7	40
TOTAL					2926

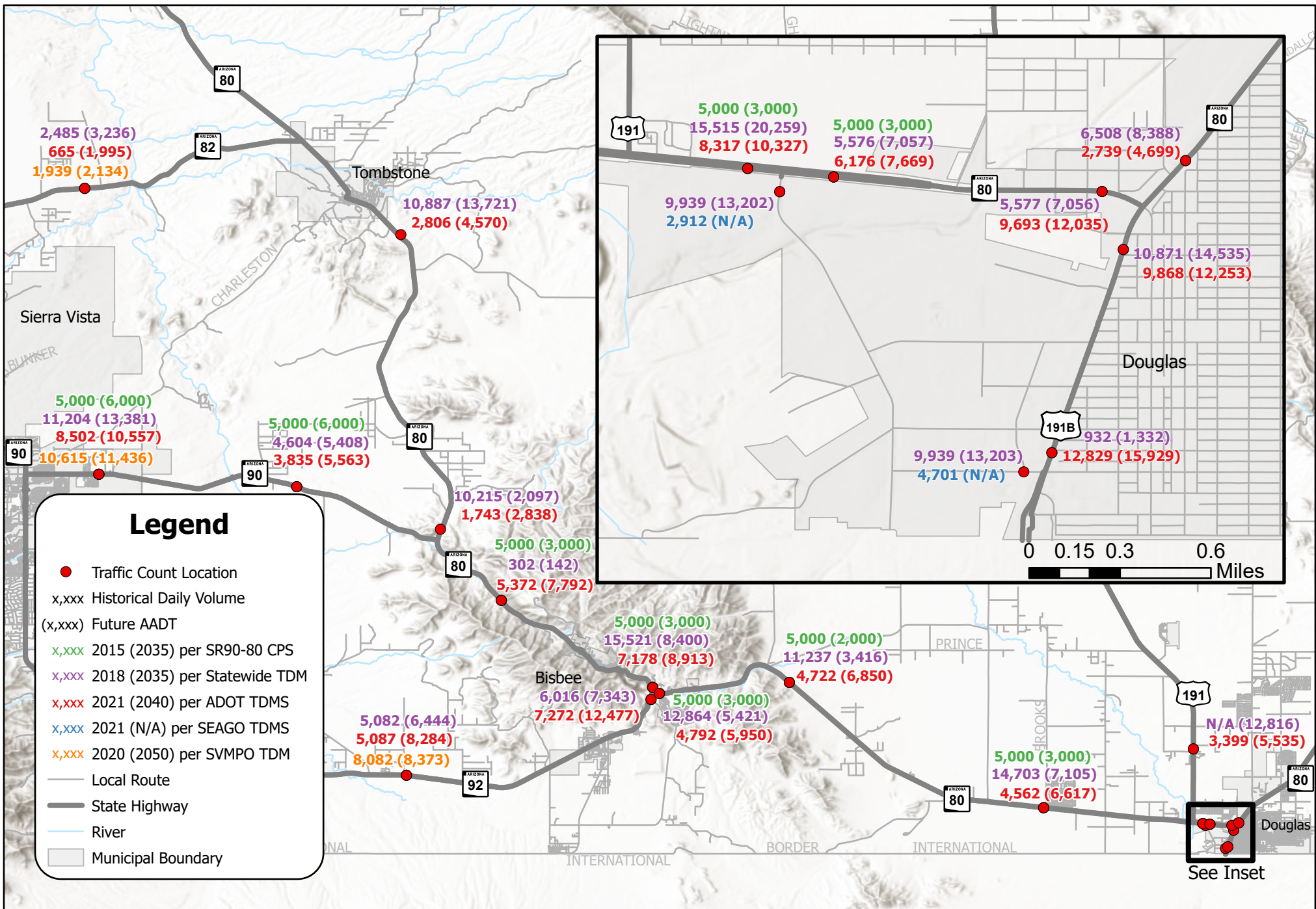
Count Data Info	
Start Date	7/13/2021
End Date	7/14/2021
Start Time	1:30 PM
End Time	1:30 PM
Direction	
Notes	adot
Count Source	1.36973E+11
File Name	
Weather	
Study	
Owner	adot
QC Status	Accepted

Location Info					Count Data Info	
Location ID	c02234				Start Date	6/5/2018
Type	I-SECTION				End Date	6/6/2018
Functional Class	4				Start Time	12:00 AM
Located On	N Chino Rd				End Time	12:00 AM
BETWEEN	W Highway 80 EB				Direction	2-WAY
Direction	2-WAY				Notes	seago
Community	Douglas West				Count Source	2234
MPO_ID					File Name	c02234_vol.prn
HPMS ID					Weather	
Agency	SouthEastern Arizona Governments Organization				Study	
					Owner	adam
					QC Status	Accepted
Interval: 15 mins						
Time	15 Min				Hourly Count	
	1st	2nd	3rd	4th		
00:00 - 01:00	8	2	4	3	17	
01:00 - 02:00	3	4	3	1	11	
02:00 - 03:00	1	2	1	3	7	
03:00 - 04:00	1	2	3	2	8	
04:00 - 05:00	5	5	7	10	27	
05:00 - 06:00	19	11	14	20	64	
06:00 - 07:00	12	24	22	24	82	
07:00 - 08:00	44	34	45	41	164	
08:00 - 09:00	49	32	57	31	169	
09:00 - 10:00	36	40	30	40	146	
10:00 - 11:00	35	42	58	45	180	
11:00 - 12:00	39	52	47	45	183	
12:00 - 13:00	62	62	44	47	215	
13:00 - 14:00	52	48	35	39	174	
14:00 - 15:00	45	43	63	44	195	
15:00 - 16:00	69	56	46	46	217	
16:00 - 17:00	45	40	50	54	189	
17:00 - 18:00	60	55	63	64	242	
18:00 - 19:00	42	36	35	32	145	
19:00 - 20:00	33	37	38	31	139	
20:00 - 21:00	26	22	33	21	102	
21:00 - 22:00	29	28	25	15	97	
22:00 - 23:00	35	15	20	5	75	
23:00 - 24:00	9	8	4	2	23	
TOTAL					2871	

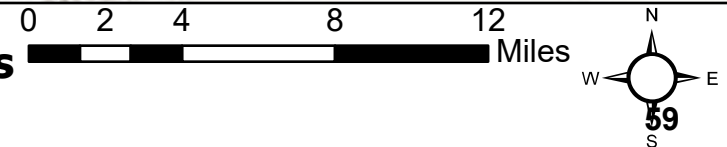


Existing and Projected Future Truck Volumes





Existing and Projected Future Daily Vehicle Volumes

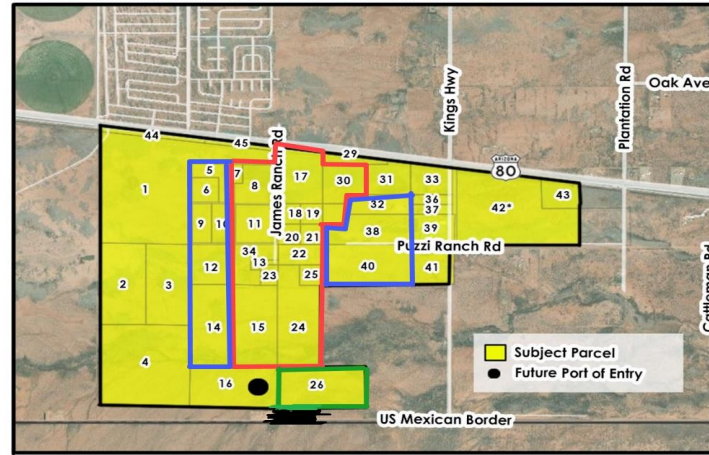


Appendix 4. Volume Development Calculations

JRR & SR 80		TOTAL AREA (ACRES):	
		100%	30%
		82.45	81.22
		92.09	54.59
		10.17	29.17
		20.4	80.33
		10.06	40.11
		10.05	17.25
		10.05	20.22
		10.04	15
		10.03	19.69
		55.41	
		36.01	
		80.6	
		8.03	
		28.3	
		4.01	
		34.9	
		33.96	
		4.62	
TOTAL AC		541.18	357.58
TOTAL SF		23573800.8	15576184.8
ADJUSTED SF		23573800.8	4672855.44
FAR			0.25
FLOOR AREA		5893450.2	1168213.86
GRAND TOTAL SF		7061664.06	7061.664<- (KSF)

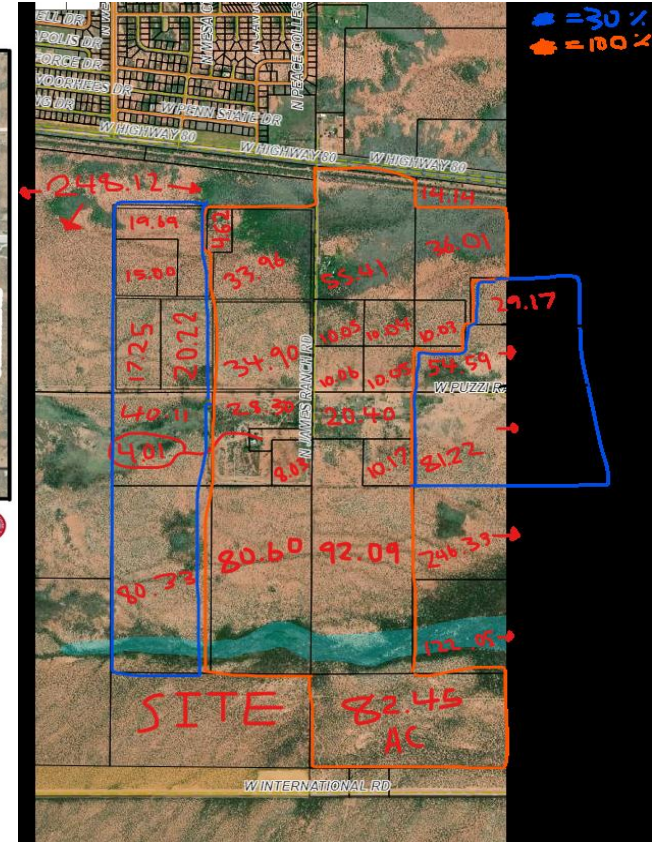
JRR & POE E		West Area:	East Area:
		40.17	82.45
		40.30	46.05
TOTAL AC		80.47	128.50
TOTAL SF		3505055	5597242
FAR			0.25
FLOOR AREA		876264	1399311
(KSF)		876	1399
GRAND TOTAL SF		2275574	2275.574<- (KSF)

Figure 2: Subject Parcels Map



Land Use Map Amendment Boundaries
CPA 22-01

100% of Red/Green + 30% of blue assumed



Trip Generation Planner (ITE 11th Edition) - Summary Report

Weekday Trip Generation
Trips Based on Average Rates/Equations

Project Name Douglas IPOE Connector Road
Project Number 096552002

ITE Code	Internal Capture Land Use	Land Use Description	Independent Variable	Setting/Location	No. of Units	Avg Rate or Eq	Rates			Total Trips						
							Daily Rate	AM Rate	PM Rate	Daily Trips	AM Trips	PM Trips	AM Trips In	AM Trips Out	PM Trips In	PM Trips Out
ACCESSING JAMES RANCH ROAD & SR 80 INTERSECTION																
150	Select Use	Warehousing	1,000 Sq Ft	General Urban/Suburban	7061.7	Avg	1.71	0.21	0.23	12,076	1,483	1,624	979	504	390	1,234

ACCESSING POE INTERSECTIONS

West of James Ranch Road

150	Select Use	Warehousing	1,000 Sq Ft	General Urban/Suburban	876.26	Avg	1.71	0.21	0.23	1,500	184	202	121	63	48	154
-----	------------	-------------	-------------	------------------------	--------	-----	------	------	------	-------	-----	-----	-----	----	----	-----

East of James Ranch Road

150	Select Use	Warehousing	1,000 Sq Ft	General Urban/Suburban	1399.3	Avg	1.71	0.21	0.23	2,394	294	322	194	100	77	245
-----	------------	-------------	-------------	------------------------	--------	-----	------	------	------	-------	-----	-----	-----	-----	----	-----

Data from Stantec Report

Overall Daily Peak Hr

Daily Peak Hr within open hrs (9am-5pm)

Daily Peak Hr Passenger Cars (POVs)

Daily Peak Hr Trucks (COVs)

Truck Daily Peak Hr

Daily Peak Hr within open hrs (9am-5pm)

Daily Peak Hr Passenger Cars (POVs)

Daily Peak Hr Trucks (COVs)

DEMAND FACTOR:

(Trips *entering* USA)

9-10am

Processed Demand

374 486

15 20

2-3pm

Processed Demand

313 407

24 31 <- trips generated by POE will be trucks only

1.3

Adjacent Site Trip Generation

ITE LU 150 (Warehousing)

*AM/PM Peak Hour of Generator

Land Use Summary (see Adjacent Site Trip Gen spreadsheet for details)

Total Acres (adjusted) 648.454 AC

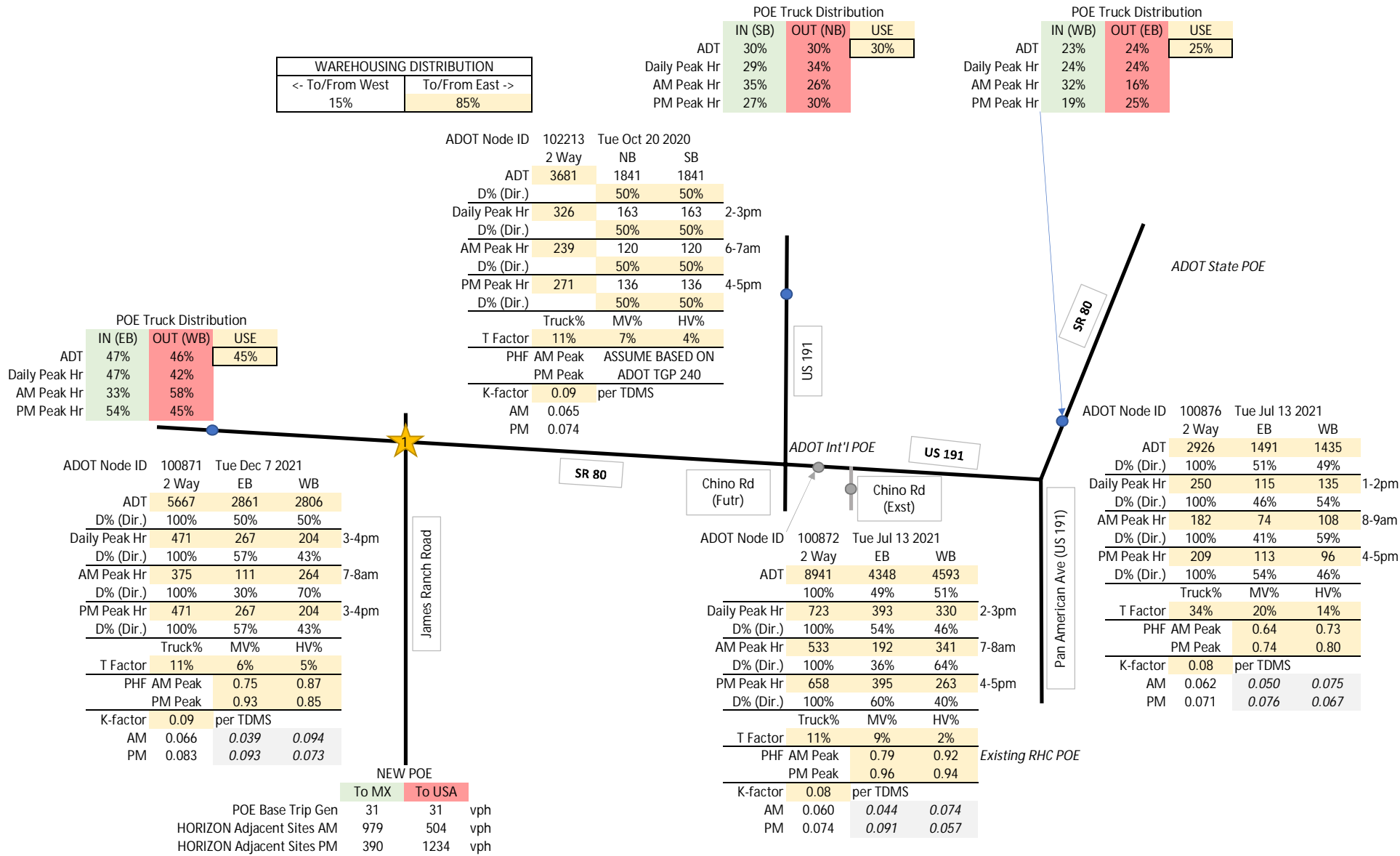
FAR 0.25

Total Building Area 7061.664 KSF

HORIZON TRIP GEN:	In	Out	Total
AM	979	504	1483
PM	390	1234	1624
Daily	6038	6037	12075

	Rate	% In	% Out
AM	0.21	0.66	0.34
PM	0.23	0.24	0.76
Daily	1.71	0.5	0.5

Estimated Total Intersection Hourly Volume														Factors	Notes	
James Ranch Rd & SR 80 (Intersection 1)	NB			SB			EB			WB						
	L	T	R	L	T	R	L	T	R	L	T	R				
AM Peak Hr Existing Tfc	0	0	0	0	0	0	0	111	0	0	264	0				
PM Peak Hr Existing Tfc	0	0	0	0	0	0	0	267	0	0	204	0				
POE Peak Hr Asmt (To ADOT Int'l POE)				31							14					
POE Peak Hr Asmt (Remainder)	0				0							14	17			
Adjacent Site Asmt - AM Opening	23				129							44	250			
Adjacent Site Asmt - PM Opening	56				315							18	99			
Adjacent Site Asmt - AM Horizon	76				428							147	832			
Adjacent Site Asmt - PM Horizon	185				1049							59	332			



OPENING Adjacent site vols accessing POE intersections				
	AM in	AM out	PM in	PM out
West of JRR	36	19	14	46
East of JRR	58	30	23	74

HORIZON Adjacent site vols accessing POE intersections				
	AM in	AM out	PM in	PM out
West of JRR	121	63	48	154
East of JRR	194	100	77	245

Estimated Total Intersection Hourly Volume														Factors	Notes
US 191 & SR 80 (Intersection 2)	NB			SB			EB			WB					
	L	T	R	L	T	R	L	T	R	L	T	R			
	AM Peak Hr Existing Tfc	0	0	0	75	0	45	32	79	0	0	205	136		
	PM Peak Hr Existing Tfc	0	0	0	85	0	51	76	191	0	0	158	105		
	POE Peak Hr Asmt (To ADOT Int'l POE)	0	0	0	17	0	14	31	0	0	0	0	0		
	Adjacent Site Asmt - AM Opening	0	0	0	0	0	37	19	109	0	0	212	0		
	Adjacent Site Asmt - PM Opening	0	0	0	0	0	15	47	267	0	0	85	0		
	Adjacent Site Asmt - AM Horizon	0	0	0	0	0	125	64	364	0	0	707	0		
	Adjacent Site Asmt - PM Horizon	0	0	0	0	0	50	157	892	0	0	282	0		
Chino Rd Rerouting AM	42	30	4	-40	40	0	0	-55	55	5	-42	-30			
Chino Rd Rerouting PM	43	31	4	-69	69	0	0	-95	95	9	-43	-31			

WAREHOUSING DISTRIBUTION	
To/From US 191	To/From US 80
15%	85%

	Distribution		
	IN (SB)	OUT (NB)	USE
	ADT	20%	20%
	Daily Peak Hr	21%	21%
	AM Peak Hr	21%	21%

	Distribution		
	IN (WB)	OUT (EB)	USE
	ADT	49%	48%
	Daily Peak Hr	43%	52%
	AM Peak Hr	60%	33%

SEAGO Node ID	c02234	Tue Jun 5 2018*		*2018 volumes grown to match 2022 ADT:		
	2 Way	NB	SB	2018 ADT	2022 ADT	Growth Factor
ADT	2976	1305	1671	2871	2976	1.037
	100%	44%	56%			
Daily Peak Hr	251	78	173			5-6pm
D% (Dir.)	100%	31%	69%			
AM Peak Hr	175	76	100			8-9am
D% (Dir.)	100%	43%	57%			
PM Peak Hr	251	78	173			5-6pm
D% (Dir.)	100%	31%	69%			
Truck%						
T Factor	5%					
PHF AM Peak		0.79	0.71			
PM Peak		0.99	0.93			
K-factor	0.09	per TDMS				
AM	0.059	0.058	0.060			
PM	0.084	0.060	0.104			
Split %:	NBL	NBT	NBR			
	55%	40%	5%			

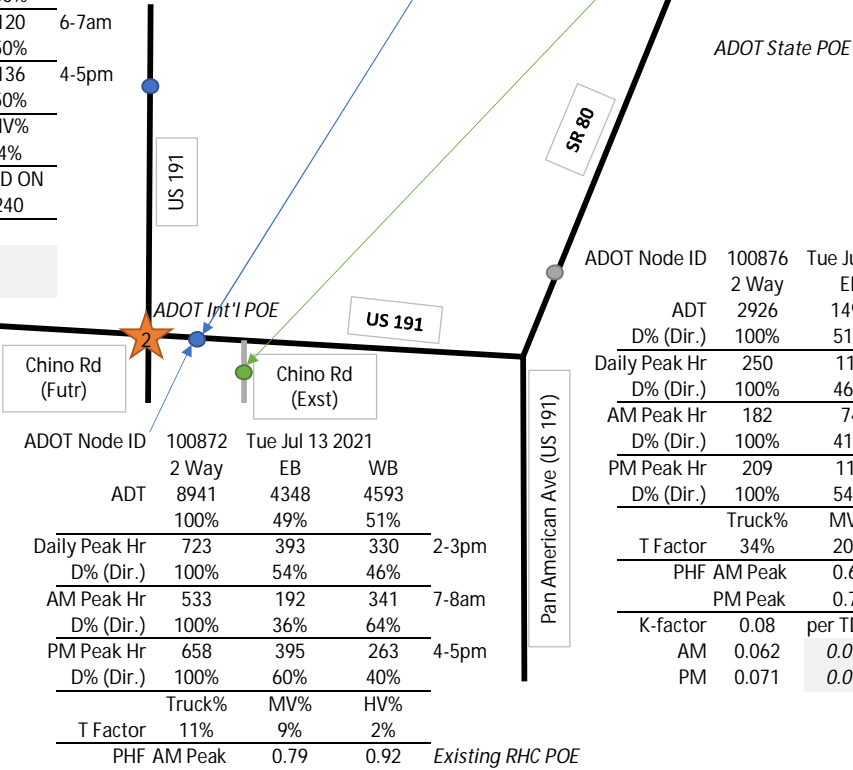
	Distribution		
	IN (EB)	OUT (WB)	USE
	ADT	31%	31%
	Daily Peak Hr	35%	27%
	AM Peak Hr	19%	46%

ADOT Node ID	102213	Tue Oct 20 2020	
	2 Way	NB	SB
ADT	3681	1841	1841
D% (Dir.)	50%	50%	50%
Daily Peak Hr	326	163	163
D% (Dir.)	50%	50%	50%
AM Peak Hr	239	120	120
D% (Dir.)	50%	50%	50%
PM Peak Hr	271	136	136
D% (Dir.)	50%	50%	50%
Truck%		MV%	HV%
T Factor	11%	7%	4%
PHF AM Peak		ASSUME BASED ON	
PM Peak		ADOT TGP 240	
K-factor	0.09	per TDMS	
AM	0.065		
PM	0.074		

ADOT Node ID	100876	Tue Jul 13 2021	
	2 Way	EB	WB
ADT	2926	1491	1435
D% (Dir.)	100%	51%	49%
Daily Peak Hr	250	115	135
D% (Dir.)	100%	46%	54%
AM Peak Hr	182	74	108
D% (Dir.)	100%	41%	59%
PM Peak Hr	209	113	96
D% (Dir.)	100%	54%	46%
Truck%		MV%	HV%
T Factor	34%	20%	14%
PHF AM Peak		0.64	0.73
PM Peak		0.74	0.80
K-factor	0.08	per TDMS	
AM	0.062	0.050	0.075
PM	0.071	0.076	0.067

ADOT Node ID	100871	Tue Dec 7 2021	
	2 Way	EB	WB
ADT	5667	2861	2806
D% (Dir.)	100%	50%	50%
Daily Peak Hr	471	267	204
D% (Dir.)	100%	57%	43%
AM Peak Hr	375	111	264
D% (Dir.)	100%	30%	70%
PM Peak Hr	471	267	204
D% (Dir.)	100%	57%	43%
Truck%		MV%	HV%
T Factor	11%	6%	5%
PHF AM Peak		0.75	0.87
PM Peak		0.93	0.85
K-factor	0.09	per TDMS	
AM	0.066	0.039	0.094
PM	0.083	0.093	0.073

ADOT Node ID	100872	Tue Jul 13 2021	
	2 Way	EB	WB
ADT	8941	4348	4593
D% (Dir.)	100%	49%	51%
Daily Peak Hr	723	393	330
D% (Dir.)	100%	54%	46%
AM Peak Hr	533	192	341
D% (Dir.)	100%	36%	64%
PM Peak Hr	658	395	263
D% (Dir.)	100%	60%	40%
Truck%		MV%	HV%
T Factor	11%	9%	2%
PHF AM Peak		0.79	0.92
PM Peak		0.96	0.94
K-factor	0.08	per TDMS	
AM	0.060	0.044	0.074



Truck % by Movement												
James Ranch Rd & SR 80 (Intersection 1)	NB			SB			EB			WB		
	L	T	R	L	T	R	L	T	R	L	T	R
AM Peak Hr Existing Tfc	2%	2%	2%	2%	2%	2%	2%	11%	2%	2%	11%	2%
PM Peak Hr Existing Tfc	2%	2%	2%	2%	2%	2%	2%	11%	2%	2%	11%	2%
POE Peak Hr Asmt (To ADOT Int'l POE)	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
POE Peak Hr Asmt (Remainder)	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Adjacent Site Asmt - AM Opening	20%	2%	20%	2%	2%	2%	2%	2%	20%	20%	2%	2%
Adjacent Site Asmt - PM Opening	20%	2%	20%	2%	2%	2%	2%	2%	20%	20%	2%	2%
Adjacent Site Asmt - AM Horizon	20%	2%	20%	2%	2%	2%	2%	2%	20%	20%	2%	2%
Adjacent Site Asmt - PM Horizon	20%	2%	20%	2%	2%	2%	2%	2%	20%	20%	2%	2%
US 191 & SR 80 (Intersection 2)	NB			SB			EB			WB		
	L	T	R	L	T	R	L	T	R	L	T	R
AM Peak Hr Existing Tfc	5%	5%	5%	11%	5%	11%	11%	5%	5%	11%	11%	11%
PM Peak Hr Existing Tfc	5%	5%	5%	11%	5%	11%	11%	11%	5%	5%	11%	11%
POE Peak Hr Asmt (To ADOT Int'l POE)	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Adjacent Site Asmt - AM Opening	2%	2%	2%	20%	2%	20%	20%	2%	2%	2%	20%	20%
Adjacent Site Asmt - PM Opening	2%	2%	2%	20%	2%	20%	20%	2%	2%	2%	20%	20%
Adjacent Site Asmt - AM Horizon	2%	2%	2%	20%	2%	20%	20%	2%	2%	2%	20%	20%
Adjacent Site Asmt - PM Horizon	2%	2%	2%	20%	2%	20%	20%	2%	2%	2%	20%	20%
James Ranch Rd & POE Intersection 1 (Intersection 101)	NB			SB			EB			WB		
	L	T	R	L	T	R	L	T	R	L	T	R
Adjacent Site Asmt - AM Opening	2%	2%	2%	20%	2%	20%	20%	2%	2%	2%	2%	20%
Adjacent Site Asmt - PM Opening	2%	2%	2%	20%	2%	20%	20%	2%	2%	2%	2%	20%
Adjacent Site Asmt - AM Horizon	2%	2%	2%	20%	2%	20%	20%	2%	2%	2%	2%	20%
Adjacent Site Asmt - PM Horizon	2%	2%	2%	20%	2%	20%	20%	2%	2%	2%	2%	20%
James Ranch Rd & POE Intersection 2 (Intersection 201)	NB			SB			EB			WB		
	L	T	R	L	T	R	L	T	R	L	T	R
Adjacent Site Asmt - AM Opening	2%	2%	2%	20%	2%	2%	2%	20%	2%	2%	20%	20%
Adjacent Site Asmt - PM Opening	2%	2%	2%	20%	2%	2%	2%	20%	2%	2%	20%	20%
Adjacent Site Asmt - AM Horizon	2%	2%	2%	20%	2%	2%	2%	20%	2%	2%	20%	20%
Adjacent Site Asmt - PM Horizon	2%	2%	2%	20%	2%	2%	2%	20%	2%	2%	20%	20%

Medium Vehicle % by Movement												
James Ranch Rd & SR 80 (Intersection 1)	NB			SB			EB			WB		
	L	T	R	L	T	R	L	T	R	L	T	R
AM Peak Hr Existing Tfc								6%			6%	
PM Peak Hr Existing Tfc								6%			6%	
POE Peak Hr Asmt (To ADOT Int'l POE)												
POE Peak Hr Asmt (Remainder)												
Adjacent Site Asmt - AM Opening	6%		6%						6%	6%		
Adjacent Site Asmt - PM Opening	6%		6%						6%	6%		
Adjacent Site Asmt - AM Horizon	6%		6%						6%	6%		
Adjacent Site Asmt - PM Horizon	6%		6%						6%	6%		
US 191 & SR 80 (Intersection 2)	NB			SB			EB			WB		
	L	T	R	L	T	R	L	T	R	L	T	R
AM Peak Hr Existing Tfc				7%		7%	7%	7%		7%	7%	
PM Peak Hr Existing Tfc				7%		7%	7%	7%		7%	7%	
POE Peak Hr Asmt (To ADOT Int'l POE)												
Adjacent Site Asmt - AM Opening				6%		6%	6%	6%		6%	6%	
Adjacent Site Asmt - PM Opening				6%		6%	6%	6%		6%	6%	
Adjacent Site Asmt - AM Horizon				6%		6%	6%	6%		6%	6%	
Adjacent Site Asmt - PM Horizon				6%		6%	6%	6%		6%	6%	
James Ranch Rd & POE Intersection 1 (Intersection 101)	NB			SB			EB			WB		
	L	T	R	L	T	R	L	T	R	L	T	R
Adjacent Site Asmt - AM Opening				6%		6%	6%					6%
Adjacent Site Asmt - PM Opening				6%		6%	6%					6%
Adjacent Site Asmt - AM Horizon				6%		6%	6%					6%
Adjacent Site Asmt - PM Horizon				6%		6%	6%					6%
James Ranch Rd & POE Intersection 2 (Intersection 201)	NB			SB			EB			WB		
	L	T	R	L	T	R	L	T	R	L	T	R
Adjacent Site Asmt - AM Opening				6%		6%	6%			6%	6%	
Adjacent Site Asmt - PM Opening				6%		6%	6%			6%	6%	
Adjacent Site Asmt - AM Horizon				6%		6%	6%			6%	6%	
Adjacent Site Asmt - PM Horizon				6%		6%	6%			6%	6%	

Heavy Vehicle % by Movement												
James Ranch Rd & SR 80 (Intersection 1)	NB			SB			EB			WB		
	L	T	R	L	T	R	L	T	R	L	T	R
AM Peak Hr Existing Tfc	2%	2%	2%	2%	2%	2%	2%	5%	2%	2%	5%	2%
PM Peak Hr Existing Tfc	2%	2%	2%	2%	2%	2%	2%	5%	2%	2%	5%	2%
POE Peak Hr Asmt (To ADOT Int'l POE)	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
POE Peak Hr Asmt (Remainder)	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Adjacent Site Asmt - AM Opening	14%	2%	14%	2%	2%	2%	2%	14%	14%	2%	2%	2%
Adjacent Site Asmt - PM Opening	14%	2%	14%	2%	2%	2%	2%	14%	14%	2%	2%	2%
Adjacent Site Asmt - AM Horizon	14%	2%	14%	2%	2%	2%	2%	14%	14%	2%	2%	2%
Adjacent Site Asmt - PM Horizon	14%	2%	14%	2%	2%	2%	2%	14%	14%	2%	2%	2%
US 191 & SR 80 (Intersection 2)	NB			SB			EB			WB		
	L	T	R	L	T	R	L	T	R	L	T	R
AM Peak Hr Existing Tfc	5%	5%	5%	4%	5%	4%	4%	4%	5%	5%	4%	4%
PM Peak Hr Existing Tfc	5%	5%	5%	4%	5%	4%	4%	4%	5%	5%	4%	4%
POE Peak Hr Asmt (To ADOT Int'l POE)	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Adjacent Site Asmt - AM Opening	2%	2%	2%	14%	2%	14%	14%	14%	2%	2%	14%	14%
Adjacent Site Asmt - PM Opening	2%	2%	2%	14%	2%	14%	14%	14%	2%	2%	14%	14%
Adjacent Site Asmt - AM Horizon	2%	2%	2%	14%	2%	14%	14%	14%	2%	2%	14%	14%
Adjacent Site Asmt - PM Horizon	2%	2%	2%	14%	2%	14%	14%	14%	2%	2%	14%	14%
James Ranch Rd & POE Intersection 1 (Intersection 101)	NB			SB			EB			WB		
	L	T	R	L	T	R	L	T	R	L	T	R
Adjacent Site Asmt - AM Opening	2%	2%	2%	14%	2%	14%	14%	2%	2%	2%	2%	14%
Adjacent Site Asmt - PM Opening	2%	2%	2%	14%	2%	14%	14%	2%	2%	2%	2%	14%
Adjacent Site Asmt - AM Horizon	2%	2%	2%	14%	2%	14%	14%	2%	2%	2%	2%	14%
Adjacent Site Asmt - PM Horizon	2%	2%	2%	14%	2%	14%	14%	2%	2%	2%	2%	14%
James Ranch Rd & POE Intersection 2 (Intersection 201)	NB			SB			EB			WB		
	L	T	R	L	T	R	L	T	R	L	T	R
Adjacent Site Asmt - AM Opening	2%	2%	2%	14%	2%	2%	14%	2%	2%	14%	14%	
Adjacent Site Asmt - PM Opening	2%	2%	2%	14%	2%	2%	14%	2%	2%	14%	14%	
Adjacent Site Asmt - AM Horizon	2%	2%	2%	14%	2%	2%	14%	2%	2%	14%	14%	
Adjacent Site Asmt - PM Horizon	2%	2%	2%	14%	2%	2%	14%	2%	2%	14%	14%	

ITE LU 150 Truck % Data:
11.2% = % of bidirectional truck traffic during truck peak @ 11AM-12PM
9.0% = % of bidirectional vehicle traffic during peak @ 3-4PM
7.3% = % of bidirectional vehicle traffic during truck peak @ 11AM-12PM
20% = ITE LU 150 truck % at one observed location (Trip Gen Handbook Appendix I)
35% = ITE TGM truck ADT rate vs all vehicles ADT rate
29% = ITE TGM truck AM Generator rate vs all vehicles AM Generator rate
26% = ITE TGM truck PM Generator rate vs all vehicles PM Generator rate
USE: 20%

Min Truck Percentage:
2% (per volume methodology email chain)

Additional Truck Data:
Node Truck % Notes
100870 13% SR80 west of site (Near Double Adobe Rd)
100868 16% SR80 - Lowell east of roundabout before meeting SR92
100867 7% SR80 - Lowell north of roundabout after meeting SR92
100865 7% SR80 west of Bisbee
100863 14% SR80 south of Tombstone
100859 20% SR80 in St David
100857 16% SR80 north of St David
101743 14% SR80 just before merging with I-10
-> moderate to high truck % on SR80 west of site

102213 9% US191 north of node 102213 (data we used)
102216 19% US191 north of McNeal
102217 30% US191 north of Elfrida
102219 17% US191 west of Kansas Settlement Rd
102221 27% US191 north of Dragon Rd (last count before I-10)
-> high truck % on US191

100879 11% SR80 east of Washington Ave
-> moderate truck % on SR80 east of site

MV% Ratio
30%

Instructions

-Save each green/blue tab as a separate "Text (Tab Delimited) file"

-Use the "Convert to CSV.xlsm" to convert the .txt files to necessary Synchro/Traffig .csv files (Use the "Convert Both" button)

Analysis Year

Existing	2022
Opening	2028
Future	2050

Growth Rate

	SR80 Traffic	POE Traffic	US191 Traffic
Existing -> Opening (Growth Factor)	2.0%	1.1%	2.0%
Existing -> Horizon (Growth Factor)	1.126	1.068	1.126
Existing -> Horizon (Growth Factor)	1.741	1.358	1.741

*No growth for warehousing site traffic

Low Vol Movement Adjustments:

Exst	1	Assumed all adjustments = passenger cars EXCEPT to/from proposed IPOE (Intersection 201)
Opening	5	
Horizon	10	

JAMES RANCH RD & SR 80 (INTERSECTION 1)

Passenger Cars	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Existing AM	1	1	1	1	1	1	1	99	1	1	235	1
Existing PM	1	1	1	1	1	1	1	238	1	1	182	1
Opening AM	18	5	103	5	5	5	5	111	35	200	265	5
Opening PM	44	5	252	5	5	5	5	111	14	80	204	5
Horizon AM	60	10	343	10	10	10	10	172	117	666	409	10
Horizon PM	148	10	839	10	10	10	10	414	47	265	316	10
2028 No-Build AM	5	5	5	5	5	5	5	111	5	5	265	5
2028 No-Build PM	5	5	5	5	5	5	5	268	5	5	204	5
2050 No-Build AM	10	10	10	10	10	10	10	172	10	10	409	10
2050 No-Build PM	10	10	10	10	10	10	10	414	10	10	316	10

Medium Vehicles	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Existing AM	0	0	0	0	0	0	0	7	0	0	16	0
Existing PM	0	0	0	0	0	0	0	16	0	0	12	0
Opening AM	1	0	8	0	0	0	0	8	3	15	18	0
Opening PM	3	0	19	0	0	0	0	18	1	6	14	0
Horizon AM	5	0	26	0	0	0	0	12	9	50	28	0
Horizon PM	11	0	63	0	0	0	0	28	4	20	21	0
2028 No-Build AM	0	0	0	0	0	0	0	8	0	0	18	0
2028 No-Build PM	0	0	0	0	0	0	0	18	0	0	14	0
2050 No-Build AM	0	0	0	0	0	0	0	12	0	0	28	0
2050 No-Build PM	0	0	0	0	0	0	0	28	0	0	21	0

Heavy Vehicles	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Existing AM	0	0	0	0	0	0	0	6	0	0	13	0
Existing PM	0	0	0	0	0	0	0	13	0	0	10	0
Opening AM	3	0	51	0	0	0	0	6	21	53	30	0
Opening PM	8	0	77	0	0	0	0	15	17	32	26	0
Horizon AM	11	0	102	0	0	0	0	10	40	140	42	0
Horizon PM	26	0	189	0	0	0	0	23	27	70	37	0
2028 No-Build AM	0	0	0	0	0	0	0	6	0	0	15	0
2028 No-Build PM	0	0	0	0	0	0	0	15	0	0	11	0
2050 No-Build AM	0	0	0	0	0	0	0	10	0	0	23	0
2050 No-Build PM	0	0	0	0	0	0	0	23	0	0	18	0

TOTAL	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Existing AM	1	1	1	1	1	1	1	111	1	1	264	1
Existing PM	1	1	1	1	1	1	1	267	1	1	204	1
Opening AM	23	5	162	5	5	5	5	125	59	268	312	5
Opening PM	56	5	348	5	5	5	5	301	32	118	245	5
Horizon AM	76	10	471	10	10	10	10	193	166	855	479	10
Horizon PM	185	10	1091	10	10	10	10	465	78	355	374	10
2028 No-Build AM	5	5	5	5	5	5	5	125	5	5	297	5
2028 No-Build PM	5	5	5	5	5	5	5	301	5	5	230	5
2050 No-Build AM	10	10	10	10	10	10	10	193	10	10	460	10
2050 No-Build PM	10	10	10	10	10	10	10	465	10	10	355	10

PC %	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Existing AM	98%	98%	98%	98%	98%	98%	98%	89%	98%	98%	89%	98%
Existing PM	98%	98%	98%	98%	98%	98%	98%	89%	98%	98%	89%	98%
Opening AM	80%	98%	64%	98%	98%	98%	98%	89%	60%	75%	85%	98%
Opening PM	80%	98%	72%	98%	98%	98%	98%	89%	43%	68%	84%	98%
Horizon AM	80%	98%	73%	98%	98%	98%	98%	89%	71%	78%	85%	98%
Horizon PM	80%	98%	77%	98%	98%	98%	98%	89%	60%	75%	84%	98%
2028 No-Build AM	98%	98%	98%	98%	98%	98%	98%	89%	98%	98%	89%	98%
2028 No-Build PM	98%	98%	98%	98%	98%	98%	98%	89%	98%	98%	89%	98%
2050 No-Build AM	98%	98%	98%	98%	98%	98%	98%	89%	98%	98%	89%	98%
2050 No-Build PM	98%	98%	98%	98%	98%	98%	98%	89%	98%	98%	89%	98%

MV %	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Existing AM	0%	0%	0%	0%	0%	0%	0%	6%	0%	0%	6%	0%
Existing PM	0%	0%	0%	0%	0%	0%	0%	6%	0%	0%	6%	0%
Opening AM	6%	0%	5%	0%	0%	0%	0%	6%	4%	6%	6%	0%
Opening PM	6%	0%	5%	0%	0%	0%	0%	6%	3%	5%	6%	0%
Horizon AM	6%	0%	5%	0%	0%	0%	0%	6%	5%	6%	6%	0%
Horizon PM	6%	0%	6%	0%	0%	0%	0%	6%	5%	6%	6%	0%
2028 No-Build AM	0%	0%	0%	0%	0%	0%	0%	6%	0%	0%	6%	0%
2028 No-Build PM	0%	0%	0%	0%	0%	0%	0%	6%	0%	0%	6%	0%
2050 No-Build AM	0%	0%	0%	0%	0%	0%	0%	6%	0%	0%	6%	0%
2050 No-Build PM	0%	0%	0%	0%	0%	0%	0%	6%	0%	0%	6%	0%

HV %	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Existing AM	2%	2%	2%	2%	2%	2%	2%	5%	2%	2%	5%	2%
Existing PM	2%	2%	2%	2%	2%	2%	2%	5%	2%	2%	5%	2%
Opening AM	14%	2%	32%	2%	2%	2%	2%	5%	36%	20%	10%	2%
Opening PM	14%	2%	22%	2%	2%	2%	2%	5%	54%	27%	11%	2%
Horizon AM	14%	2%	22%	2%	2%	2%	2%	5%	24%	16%	9%	2%
Horizon PM	14%	2%	17%	2%	2%	2%	2%	5%	35%	20%	10%	2%
2028 No-Build AM	2%	2%	2%	2%	2%	2%	2%	5%	2%	2%	5%	2%
2028 No-Build PM	2%	2%	2%	2%	2%	2%	2%	5%	2%	2%	5%	2%
2050 No-Build AM	2%	2%	2%	2%	2%	2%	2%	5%	2%	2%	5%	2%
2050 No-Build PM	2%	2%	2%	2%	2%	2%	2%	5%	2%	2%	5%	2%

Truck %	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Existing AM	2%	2%	2%	2%	2%	2%	2%	11%	2%	2%	11%	2%
Existing PM	2%	2%	2%	2%	2%	2%	2%	11%	2%	2%	11%	2%
Opening AM	20%	2%	36%	2%	2%	2%	2%	11%	40%	25%	15%	2%
Opening PM	20%	2%	28%	2%	2%	2%	2%	11%	57%	32%	16%	2%
Horizon AM	20%	2%	27%	2%	2%	2%	2%	11%	29%	22%	15%	2%
Horizon PM	20%	2%	23%	2%	2%	2%	2%	11%	40%	25%	16%	2%
2028 No-Build AM	2%	2%	2%	2%	2%	2%	2%	11%	2%	2%	11%	2%
2028 No-Build PM	2%	2%	2%	2%	2%	2%	2%	11%	2%	2%	11%	2%
2050 No-Build AM	2%	2%	2%	2%	2%	2%	2%	11%	2%	2%	11%	2%
2050 No-Build PM	2%	2%	2%	2%	2%	2%	2%	11%	2%	2%	11%	2%

Total * PC%	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Opening AM	18	5	103	5	5	5	5	111	35	200	265	5
Opening PM	44	5	252	5	5	5	5	268	14	80	204	5
Horizon AM	60	10	343	10	10	10	10	172	117	666	409	10
Horizon PM	148	10	839	10	10	10	10	414	47	265	316	10
2028 No-Build AM	5	5	5	5	5	5	5	111	5	5	265	5
2028 No-Build PM	5	5	5	5	5	5	5	268	5	5	204	5
2050 No-Build AM	10	10	10	10	10	10	10	172	10	10	409	10
2050 No-Build PM	10	10	10	10	10	10	10	414	10	10	316	10

PC Weighted Avg	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Opening AM	66%				98%			80%			80%	
Opening PM	74%				98%			85%			79%	
Horizon AM	74%				98%			81%			81%	
Horizon PM	78%				98%			85%			80%	
2028 No-Build AM	98%				98%			90%			89%	
2028 No-Build PM	98%				98%			89%			89%	
2050 No-Build AM	98%				98%			90%			89%	
2050 No-Build PM	98%				98%			89%			89%	

Total * MV%	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Opening AM	1	0	8	0	0	0	0	8	3	15	18	0
Opening PM	3	0	19	0	0	0	0	18	1	6	14	0
Horizon AM	5	0	26	0	0	0	0	12	9	50	28	0
Horizon PM	11	0	63	0	0	0	0	28	4	20	21	0
2028 No-Build AM	0	0	0	0	0	0	0	8	0	0	18	0
2028 No-Build PM	0	0	0	0	0	0	0	18	0	0	14	0
2050 No-Build AM	0	0	0	0	0	0	0	12	0	0	28	0
2050 No-Build PM	0	0	0	0	0	0	0	28	0	0	21	0

MV Weighted Avg	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Opening AM	5%				0%			5%			6%	
Opening PM	5%				0%			6%			5%	
Horizon AM	5%				0%			6%			6%	
Horizon PM	6%				0%			6%			6%	
2028 No-Build AM	0%				0%			6%			6%	
2028 No-Build PM	0%				0%			6%			6%	
2050 No-Build AM	0%				0%			5%			6%	
2050 No-Build PM	0%				0%			6%			6%	

Total * HV%	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Opening AM	3	0	51	0	0	0	0	6	21	53	30	0
Opening PM	8	0	72	0	0	0	0	15	17	32	26	0
Horizontal AM	11	0	107	0	0	0	0	10	40	140	42	0
Horizontal PM	26	0	189	0	0	0	0	23	27	70	37	0
2028 No-Build AM	0	0	0	0	0	0	0	6	0	0	15	0
2028 No-Build PM	0	0	0	0	0	0	0	15	0	0	11	0
2050 No-Build AM	0	0	0	0	0	0	0	10	0	0	23	0
2050 No-Build PM	0	0	0	0	0	0	0	23	0	0	18	0

JAMES RANCH RD & SR 80 VOLS W/O ADJACENT SITES												
Passenger Cars	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Existing AM	1	1	1	1	1	1	1	99	1	1	235	1
Existing PM	1	1	1	1	1	1	1	238	1	1	182	1
Opening AM	5	5	5	5	5	5	5	111	5	5	265	5
Opening PM	5	5	5	5	5	5	5	268	5	5	204	5
Horizon AM	10	10	10	10	10	10	10	172	10	10	409	10
Horizon PM	10	10	10	10	10	10	10	414	10	10	316	10
2028 No-Build AM	5	5	5	5	5	5	5	111	5	5	265	5
2028 No-Build PM	5	5	5	5	5	5	5	268	5	5	204	5
2050 No-Build AM	10	10	10	10	10	10	10	172	10	10	409	10
2050 No-Build PM	10	10	10	10	10	10	10	414	10	10	316	10
Medium Vehicles	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Existing AM	0	0	0	0	0	0	0	7	0	0	16	0
Existing PM	0	0	0	0	0	0	0	16	0	0	12	0
Opening AM	0	0	0	0	0	0	0	8	0	0	18	0
Opening PM	0	0	0	0	0	0	0	18	0	0	14	0
Horizon AM	0	0	0	0	0	0	0	12	0	0	28	0
Horizon PM	0	0	0	0	0	0	0	28	0	0	21	0
2028 No-Build AM	0	0	0	0	0	0	0	8	0	0	18	0
2028 No-Build PM	0	0	0	0	0	0	0	18	0	0	14	0
2050 No-Build AM	0	0	0	0	0	0	0	12	0	0	28	0
2050 No-Build PM	0	0	0	0	0	0	0	28	0	0	21	0
Heavy Vehicles	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Existing AM	0	0	0	0	0	0	0	6	0	0	13	0
Existing PM	0	0	0	0	0	0	0	13	0	0	10	0
Opening AM	0	0	33	0	0	0	0	6	15	18	30	0
Opening PM	0	0	33	0	0	0	0	15	15	18	26	0
Horizon AM	0	0	42	0	0	0	0	10	19	23	42	0
Horizon PM	0	0	42	0	0	0	0	23	19	23	37	0
2028 No-Build AM	0	0	0	0	0	0	0	6	0	0	15	0
2028 No-Build PM	0	0	0	0	0	0	0	15	0	0	11	0
2050 No-Build AM	0	0	0	0	0	0	0	10	0	0	23	0
2050 No-Build PM	0	0	0	0	0	0	0	23	0	0	18	0
TOTAL	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Existing AM	1	1	1	1	1	1	1	111	1	1	264	1
Existing PM	1	1	1	1	1	1	1	267	1	1	204	1
Opening AM	5	5	38	5	5	5	5	125	20	23	312	5
Opening PM	5	5	38	5	5	5	5	301	20	23	245	5
Horizon AM	10	10	52	10	10	10	10	193	29	33	479	10
Horizon PM	10	10	52	10	10	10	10	465	29	33	374	10
2028 No-Build AM	5	5	5	5	5	5	5	125	5	5	297	5
2028 No-Build PM	5	5	5	5	5	5	5	301	5	5	230	5
2050 No-Build AM	10	10	10	10	10	10	10	193	10	10	460	10
2050 No-Build PM	10	10	10	10	10	10	10	465	10	10	355	10
PC %	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Existing AM	98%	98%	98%	98%	98%	98%	98%	89%	98%	98%	89%	98%
Existing PM	98%	98%	98%	98%	98%	98%	98%	89%	98%	98%	89%	98%
Opening AM	98%	98%	13%	98%	98%	98%	98%	89%	25%	22%	85%	98%
Opening PM	98%	98%	13%	98%	98%	98%	98%	89%	25%	22%	84%	98%
Horizon AM	98%	98%	19%	98%	98%	98%	98%	89%	34%	30%	85%	98%
Horizon PM	98%	98%	19%	98%	98%	98%	98%	89%	34%	30%	84%	98%
2028 No-Build AM	98%	98%	98%	98%	98%	98%	98%	89%	98%	98%	89%	98%
2028 No-Build PM	98%	98%	98%	98%	98%	98%	98%	89%	98%	98%	89%	98%
2050 No-Build AM	98%	98%	98%	98%	98%	98%	98%	89%	98%	98%	89%	98%
2050 No-Build PM	98%	98%	98%	98%	98%	98%	98%	89%	98%	98%	89%	98%
MV %	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Existing AM	0%	0%	0%	0%	0%	0%	0%	6%	0%	0%	6%	0%
Existing PM	0%	0%	0%	0%	0%	0%	0%	6%	0%	0%	6%	0%
Opening AM	0%	0%	0%	0%	0%	0%	0%	6%	0%	0%	6%	0%
Opening PM	0%	0%	0%	0%	0%	0%	0%	6%	0%	0%	6%	0%
Horizon AM	0%	0%	0%	0%	0%	0%	0%	6%	0%	0%	6%	0%
Horizon PM	0%	0%	0%	0%	0%	0%	0%	6%	0%	0%	6%	0%
2028 No-Build AM	0%	0%	0%	0%	0%	0%	0%	6%	0%	0%	6%	0%
2028 No-Build PM	0%	0%	0%	0%	0%	0%	0%	6%	0%	0%	6%	0%
2050 No-Build AM	0%	0%	0%	0%	0%	0%	0%	6%	0%	0%	6%	0%
2050 No-Build PM	0%	0%	0%	0%	0%	0%	0%	6%	0%	0%	6%	0%
HV %	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Existing AM	2%	2%	2%	2%	2%	2%	2%	5%	2%	2%	5%	2%
Existing PM	2%	2%	2%	2%	2%	2%	2%	5%	2%	2%	5%	2%
Opening AM	2%	2%	87%	2%	2%	2%	2%	5%	75%	78%	10%	2%
Opening PM	2%	2%	87%	2%	2%	2%	2%	5%	75%	78%	11%	2%
Horizon AM	2%	2%	81%	2%	2%	2%	2%	5%	66%	70%	9%	2%
Horizon PM	2%	2%	81%	2%	2%	2%	2%	5%	66%	70%	10%	2%
2028 No-Build AM	2%	2%	2%	2%	2%	2%	2%	5%	2%	2%	5%	2%
2028 No-Build PM	2%	2%	2%	2%	2%	2%	2%	5%	2%	2%	5%	2%
2050 No-Build AM	2%	2%	2%	2%	2%	2%	2%	5%	2%	2%	5%	2%
2050 No-Build PM	2%	2%	2%	2%	2%	2%	2%	5%	2%	2%	5%	2%
Truck %	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Existing AM	2%	2%	2%	2%	2%	2%	2%	11%	2%	2%	11%	2%
Existing PM	2%	2%	2%	2%	2%	2%	2%	11%	2%	2%	11%	2%
Opening AM	2%	2%	87%	2%	2%	2%	2%	11%	75%	78%	15%	2%
Opening PM	2%	2%	87%	2%	2%	2%	2%	11%	75%	78%	16%	2%
Horizon AM	2%	2%	81%	2%	2%	2%	2%	11%	66%	70%	15%	2%
Horizon PM	2%	2%	81%	2%	2%	2%	2%	11%	66%	70%	16%	2%
2028 No-Build AM	2%	2%	2%	2%	2%	2%	2%	11%	2%	2%	11%	2%
2028 No-Build PM	2%	2%	2%	2%	2%	2%	2%	11%	2%	2%	11%	2%
2050 No-Build AM	2%	2%	2%	2%	2%	2%	2%	11%	2%	2%	11%	2%
2050 No-Build PM	2%	2%	2%	2%	2%	2%	2%	11%	2%	2%	11%	2%
Total * PC%	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Opening AM	5	5	5	5	5	5	5	111	5	5	265	5
Opening PM	5	5	5	5	5	5	5	268	5	5	204	5
Horizon AM	10	10	10	10	10	10	10	172	10	10	409	10
Horizon PM	10	10	10	10	10	10	10	414	10	10	316	10
2028 No-Build AM	5	5	5	5	5	5	5	111	5	5	265	5
2028 No-Build PM	5	5	5	5	5	5	5	268	5	5	204	5
2050 No-Build AM	10	10	10	10	10	10	10	172	10	10	409	10
2050 No-Build PM	10	10	10	10	10	10	10	414	10	10	316	10
PC Weighted Avg	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Opening AM		31%			98%			81%			81%	
Opening PM		31%			98%			85%			79%	
Horizon AM		41%			98%			83%			82%	
Horizon PM		41%			98%			86%			81%	
2028 No-Build AM		98%			98%			90%			89%	
2028 No-Build PM		98%			98%			89%			89%	
2050 No-Build AM		98%			98%			90%			89%	
2050 No-Build PM		98%			98%			89%			89%	
Total * MV%	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Opening AM	0	0	0	0	0	0	0	8	0	0	18	0
Opening PM	0	0	0	0	0	0	0	18	0	0	14	0
Horizon AM	0	0	0	0	0	0	0	12	0	0	28	0
Horizon PM	0	0	0	0	0	0	0	28	0	0	21	0
2028 No-Build AM	0	0	0	0	0	0	0	8	0	0	18	0
2028 No-Build PM	0	0	0	0	0	0	0	18	0	0	14	0
2050 No-Build AM	0	0	0	0	0	0	0	12	0	0	28	0
2050 No-Build PM	0	0	0	0	0	0	0	28	0	0	21	0
MV Weighted Avg	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Opening AM		0%			0%			5%			5%	
Opening PM		0%			0%			6%			5%	
Horizon AM		0%			0%			5%			5%	
Horizon PM		0%			0%			6%			5%	
2028 No-Build AM		0%			0%			6%			6%	
2028 No-Build PM		0%			0%			6%			6%	
2050 No-Build AM		0%			0%			5%			6%	
2050 No-Build PM		0%			0%			6%			6%	
Total * HV%	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Opening AM	0	0	33	0	0	0	0	6	15	18	30	0
Opening PM	0	0	33	0	0	0	0	15	15	18	26	0
Horizon AM	0	0	42	0	0	0	0	10	19	23	42	0
Horizon PM	0	0	42	0	0	0	0	23	19	23	37	0
2028 No-Build AM	0	0	0	0	0	0	0	6	0	0	15	0
2028 No-Build PM	0	0	0	0	0	0	0	15	0	0	11	0
2050 No-Build AM	0	0	0	0	0	0	0	10	0	0	23	0
2050 No-Build PM	0	0	0	0	0	0	0	23	0	0	18	0
HV Weighted Avg	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Opening AM		69%			2%			14%			14%	
Opening PM		69%			2%							

JAMES RANCH RD & POE INTERSECTION 1 (INTERSECTION 101) - EMPLOYEES												
Passenger Cars	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Existing AM	0	0	0	0	0	0	0	0	0	0	0	0
Existing PM	0	0	0	0	0	0	0	0	0	0	0	0
Opening AM	0	0	0	0	50	0	0	0	0	0	0	0
Opening PM	0	50	0	0	50	0	0	0	0	0	0	0
Horizon AM	0	0	0	0	50	0	0	0	0	0	0	0
Horizon PM	0	50	0	0	50	0	0	0	0	0	0	0
2028 No-Build AM	0	0	0	0	0	0	0	0	0	0	0	0
2028 No-Build PM	0	0	0	0	0	0	0	0	0	0	0	0
2050 No-Build AM	0	0	0	0	0	0	0	0	0	0	0	0
2050 No-Build PM	0	0	0	0	0	0	0	0	0	0	0	0
Medium Vehicles	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Existing AM	0	0	0	0	0	0	0	0	0	0	0	0
Existing PM	0	0	0	0	0	0	0	0	0	0	0	0
Opening AM	0	0	0	0	0	0	0	0	0	0	0	0
Opening PM	0	0	0	0	0	0	0	0	0	0	0	0
Horizon AM	0	0	0	0	0	0	0	0	0	0	0	0
Horizon PM	0	0	0	0	0	0	0	0	0	0	0	0
2028 No-Build AM	0	0	0	0	0	0	0	0	0	0	0	0
2028 No-Build PM	0	0	0	0	0	0	0	0	0	0	0	0
2050 No-Build AM	0	0	0	0	0	0	0	0	0	0	0	0
2050 No-Build PM	0	0	0	0	0	0	0	0	0	0	0	0
Heavy Vehicles	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Existing AM	0	0	0	0	0	0	0	0	0	0	0	0
Existing PM	0	0	0	0	0	0	0	0	0	0	0	0
Opening AM	0	0	0	0	0	0	0	0	0	0	0	0
Opening PM	0	0	0	0	0	0	0	0	0	0	0	0
Horizon AM	0	0	0	0	0	0	0	0	0	0	0	0
Horizon PM	0	0	0	0	0	0	0	0	0	0	0	0
2028 No-Build AM	0	0	0	0	0	0	0	0	0	0	0	0
2028 No-Build PM	0	0	0	0	0	0	0	0	0	0	0	0
2050 No-Build AM	0	0	0	0	0	0	0	0	0	0	0	0
2050 No-Build PM	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Existing AM	0	0	0	0	0	0	0	0	0	0	0	0
Existing PM	0	0	0	0	0	0	0	0	0	0	0	0
Opening AM	0	0	0	0	50	0	0	0	0	0	0	0
Opening PM	0	50	0	0	50	0	0	0	0	0	0	0
Horizon AM	0	0	0	0	50	0	0	0	0	0	0	0
Horizon PM	0	50	0	0	50	0	0	0	0	0	0	0
2028 No-Build AM	0	0	0	0	0	0	0	0	0	0	0	0
2028 No-Build PM	0	0	0	0	0	0	0	0	0	0	0	0
2050 No-Build AM	0	0	0	0	0	0	0	0	0	0	0	0
2050 No-Build PM	0	0	0	0	0	0	0	0	0	0	0	0

JAMES RANCH RD & POE INTERSECTION 1 (INTERSECTION 101) - ADJACENT SITES ONLY												
Passenger Cars	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Existing AM	0	0	0	0	0	0	0	0	0	0	0	0
Existing PM	0	0	0	0	0	0	0	0	0	0	0	0
Opening AM	0	0	0	47	0	29	15	0	0	0	0	24
Opening PM	0	0	0	18	0	12	37	0	0	0	0	59
Horizon AM	0	0	0	155	0	97	50	0	0	0	0	80
Horizon PM	0	0	0	62	0	38	123	0	0	0	0	196
2028 No-Build AM	0	0	0	0	0	0	0	0	0	0	0	0
2028 No-Build PM	0	0	0	0	0	0	0	0	0	0	0	0
2050 No-Build AM	0	0	0	0	0	0	0	0	0	0	0	0
2050 No-Build PM	0	0	0	0	0	0	0	0	0	0	0	0
Medium Vehicles	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Existing AM	0	0	0	0	0	0	0	0	0	0	0	0
Existing PM	0	0	0	0	0	0	0	0	0	0	0	0
Opening AM	0	0	0	3	0	2	1	0	0	0	0	2
Opening PM	0	0	0	1	0	1	3	0	0	0	0	4
Horizon AM	0	0	0	12	0	7	4	0	0	0	0	6
Horizon PM	0	0	0	5	0	3	9	0	0	0	0	15
2028 No-Build AM	0	0	0	0	0	0	0	0	0	0	0	0
2028 No-Build PM	0	0	0	0	0	0	0	0	0	0	0	0
2050 No-Build AM	0	0	0	0	0	0	0	0	0	0	0	0
2050 No-Build PM	0	0	0	0	0	0	0	0	0	0	0	0
Heavy Vehicles	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Existing AM	0	0	0	0	0	0	0	0	0	0	0	0
Existing PM	0	0	0	0	0	0	0	0	0	0	0	0
Opening AM	0	0	0	8	0	5	3	0	0	0	0	4
Opening PM	0	0	0	3	0	2	6	0	0	0	0	10
Horizon AM	0	0	0	27	0	17	9	0	0	0	0	14
Horizon PM	0	0	0	11	0	7	22	0	0	0	0	34
2028 No-Build AM	0	0	0	0	0	0	0	0	0	0	0	0
2028 No-Build PM	0	0	0	0	0	0	0	0	0	0	0	0
2050 No-Build AM	0	0	0	0	0	0	0	0	0	0	0	0
2050 No-Build PM	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Existing AM	0	0	0	0	0	0	0	0	0	0	0	0
Existing PM	0	0	0	0	0	0	0	0	0	0	0	0
Opening AM	0	0	0	58	0	36	19	0	0	0	0	30
Opening PM	0	0	0	23	0	14	46	0	0	0	0	74
Horizon AM	0	0	0	194	0	121	63	0	0	0	0	100
Horizon PM	0	0	0	77	0	48	154	0	0	0	0	245
2028 No-Build AM	0	0	0	0	0	0	0	0	0	0	0	0
2028 No-Build PM	0	0	0	0	0	0	0	0	0	0	0	0
2050 No-Build AM	0	0	0	0	0	0	0	0	0	0	0	0
2050 No-Build PM	0	0	0	0	0	0	0	0	0	0	0	0

JAMES RANCH RD & POE INTERSECTION 1 (INTERSECTION 101)												
Passenger Cars	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Existing AM	0	0	0	0	0	0	0	0	0	0	0	0
Existing PM	0	0	0	0	0	0	0	0	0	0	0	0
Opening AM	5	5	5	47	50	29	15	5	5	5	5	24
Opening PM	5	50	5	18	50	12	37	5	5	5	5	59
Horizon AM	10	10	10	155	50	97	50	10	10	10	10	80
Horizon PM	10	50	10	62	50	38	123	10	10	10	10	196
2028 No-Build AM	0	0	0	0	0	0	0	0	0	0	0	0
2028 No-Build PM	0	0	0	0	0	0	0	0	0	0	0	0
2050 No-Build AM	0	0	0	0	0	0	0	0	0	0	0	0
2050 No-Build PM	0	0	0	0	0	0	0	0	0	0	0	0
Medium Vehicles	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Existing AM	0	0	0	0	0	0	0	0	0	0	0	0
Existing PM	0	0	0	0	0	0	0	0	0	0	0	0
Opening AM	0	0	0	3	0	2	1	0	0	0	0	2
Opening PM	0	0	0	1	0	1	3	0	0	0	0	4
Horizon AM	0	0	0	12	0	7	4	0	0	0	0	6
Horizon PM	0	0	0	5	0	3	9	0	0	0	0	15
2028 No-Build AM	0	0	0	0	0	0	0	0	0	0	0	0
2028 No-Build PM	0	0	0	0	0	0	0	0	0	0	0	0
2050 No-Build AM	0	0	0	0	0	0	0	0	0	0	0	0
2050 No-Build PM	0	0	0	0	0	0	0	0	0	0	0	0
Heavy Vehicles	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Existing AM	0	0	0	0	0	0	0	0	0	0	0	0
Existing PM	0	0	0	0	0	0	0	0	0	0	0	0
Opening AM	0	0	0	8	0	38	36	0	0	0	0	4
Opening PM	0	0	0	3	0	35	40	0	0	0	0	10
Horizon AM	0	0	0	27	0	59	51	0	0	0	0	14
Horizon PM	0	0	0	11	0	49	64	0	0	0	0	34
2028 No-Build AM	0	0	0	0	0	0	0	0	0	0	0	0
2028 No-Build PM	0	0	0	0	0	0	0	0	0	0	0	0
2050 No-Build AM	0	0	0	0	0	0	0	0	0	0	0	0
2050 No-Build PM	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Existing AM	0	0	0	0	0	0	0	0	0	0	0	0
Existing PM	0	0	0	0	0	0	0	0	0	0	0	0
Opening AM	5	5	5	58	50	69	52	5	5	5	5	30
Opening PM	5	50	5	23	50	48	79	5	5	5	5	74
Horizon AM	10	10	10	194	50	163	105	10	10	10	10	100
Horizon PM	10	50	10	77	50	90	196	10	10	10	10	245
2028 No-Build AM	0	0	0	0	0	0	0	0	0	0	0	0
2028 No-Build PM	0	0	0	0	0	0	0	0	0	0	0	0
2050 No-Build AM	0	0	0	0	0	0	0	0	0	0	0	0
2050 No-Build PM	0	0	0	0	0	0	0	0	0	0	0	0
PC %	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Existing AM	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Existing PM	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Opening AM	98%	98%	98%	80%	98%	42%	29%	98%	98%	98%	98%	80%
Opening PM	98%	98%	98%	80%	98%	24%	47%	98%	98%	98%	98%	80%
Horizon AM	98%	98%	98%	80%	98%	59%	48%	98%	98%	98%	98%	80%
Horizon PM	98%	98%	98%	80%	98%	43%	63%	98%	98%	98%	98%	80%
2028 No-Build AM	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
2028 No-Build PM	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
2050 No-Build AM	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
2050 No-Build PM	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
MV %	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Existing AM	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Existing PM	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Opening AM	0%	0%	0%	6%	0%	3%	2%	0%	0%	0%	0%	6%
Opening PM	0%	0%	0%	6%	0%	2%	3%	0%	0%	0%	0%	6%
Horizon AM	0%	0%	0%	6%	0%	4%	4%	0%	0%	0%	0%	6%
Horizon PM	0%	0%	0%	6%	0%	3%	5%	0%	0%	0%	0%	6%
2028 No-Build AM	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
2028 No-Build PM	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
2050 No-Build AM	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
2050 No-Build PM	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
HV %	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Existing AM	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Existing PM	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Opening AM	2%	2%	2%	14%	2%	55%	69%	2%	2%	2%	2%	14%
Opening PM	2%	2%	2%	14%	2%	74%	50%	2%	2%	2%	2%	14%
Horizon AM	2%	2%	2%	14%	2%	36%	48%	2%	2%	2%	2%	14%
Horizon PM	2%	2%	2%	14%	2%	54%	32%	2%	2%	2%	2%	14%
2028 No-Build AM	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
2028 No-Build PM	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
2050 No-Build AM	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
2050 No-Build PM	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Truck %	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Existing AM	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Existing PM	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Opening AM	2%	2%	2%	20%	2%	58%	71%	2%	2%	2%	2%	20%
Opening PM	2%	2%	2%	20%	2%	76%	53%	2%	2%	2%	2%	20%
Horizon AM	2%	2%	2%	20%	2%	41%	52%	2%	2%	2%	2%	20%
Horizon PM	2%	2%	2%	20%	2%	57%	37%	2%	2%	2%	2%	20%
2028 No-Build AM	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
2028 No-Build PM	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
2050 No-Build AM	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
2050 No-Build PM	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Total * PC%	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Opening AM	5	5	5	47	49	29	15	5	5	5	5	24
Opening PM	5	49	5	18	49	12	37	5	5	5	5	59
Horizon AM	10	10	10	155	49	97	50	10	10	10	10	80
Horizon PM	10	49	10	62	49	38	123	10	10	10	10	196
2028 No-Build AM	0	0	0	0	0	0	0	0	0	0	0	0
2028 No-Build PM	0	0	0	0	0	0	0	0	0	0	0	0
2050 No-Build AM	0	0	0	0	0	0	0	0	0	0	0	0
2050 No-Build PM	0	0	0	0	0	0	0	0	0	0	0	0
PC Weighted Avg	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Opening AM	98%				70%			40%			85%	
Opening PM	98%				66%			52%			82%	
Horizon AM	98%				74%			56%			83%	
Horizon PM	98%				69%			66%			81%	
2028 No-Build AM	0%				0%			0%			0%	
2028 No-Build PM	0%				0%			0%			0%	
2050 No-Build AM	0%				0%			0%			0%	
2050 No-Build PM	0%				0%			0%			0%	
Total * MV%	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Opening AM	0	0	0	3	0	2	1	0	0	0	0	2
Opening PM	0	0	0	1	0	1	3	0	0	0	0	4
Horizon AM	0	0	0	12	0	7	4	0	0	0	0	6
Horizon PM	0	0	0	5	0	3	9	0	0	0	0	15
2028 No-Build AM	0	0	0	0	0	0	0	0	0	0	0	0
2028 No-Build PM	0	0	0	0	0	0	0	0	0	0	0	0
2050 No-Build AM	0	0	0	0	0	0	0	0	0	0	0	0
2050 No-Build PM	0	0	0	0	0	0	0	0	0	0	0	0
MV Weighted Avg	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Opening AM	0%				3%			2%			5%	
Opening PM	0%				2%			3%			5%	
Horizon AM	0%				5%			3%			5%	
Horizon PM	0%				3%			4%			6%	
2028 No-Build AM	0%				0%			0%			0%	
2028 No-Build PM	0%				0%			0%			0%	
2050 No-Build AM	0%				0%			0%			0%	
2050 No-Build PM	0%				0%			0%			0%	
Total * HV%	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Opening AM	0	0	0	8	1	38	36	0	0	0	0	4
Opening PM	0	1	0	3	1	35	40	0	0	0	0	10
Horizon AM	0	0	0	27	1	59	51	0	0	0	0	14
Horizon PM	0	1	0	11	1	49	64	0	0	0	0	34
2028 No-Build AM	0	0	0	0	0	0	0	0	0	0	0	0
2028 No-Build PM	0	0	0	0	0	0	0	0	0	0	0	0
2050 No-Build AM	0	0	0	0	0	0	0	0	0	0	0	0
2050 No-Build PM	0	0	0	0	0	0	0	0	0	0	0	0
HV Weighted Avg	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Opening AM	2%				27%			58%			71%	
Opening PM	2%				33%			45%			73%	
Horizon AM	2%				21%			41%			72%	
Horizon PM	2%				28%			30%			73%	
2028 No-Build AM	0%				0%			0%			0%	
2028 No-Build PM												

JAMES RANCH RD & POE INTERSECTION 2 (INTERSECTION 201) - ADJACENT SITES ONLY												
Passenger Cars	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Existing AM	0	0	0	0	0	0	0	0	0	0	0	0
Existing PM	0	0	0	0	0	0	0	0	0	0	0	0
Opening AM	0	0	0	3	0	0	0	12	0	0	23	6
Opening PM	0	0	0	7	0	0	0	30	0	0	9	2
Horizon AM	0	0	0	10	0	0	0	40	0	0	77	19
Horizon PM	0	0	0	25	0	0	0	99	0	0	31	8
2028 No-Build AM	0	0	0	0	0	0	0	0	0	0	0	0
2028 No-Build PM	0	0	0	0	0	0	0	0	0	0	0	0
2050 No-Build AM	0	0	0	0	0	0	0	0	0	0	0	0
2050 No-Build PM	0	0	0	0	0	0	0	0	0	0	0	0
Medium Vehicles	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Existing AM	0	0	0	0	0	0	0	0	0	0	0	0
Existing PM	0	0	0	0	0	0	0	0	0	0	0	0
Opening AM	0	0	0	0	0	0	0	1	0	0	2	0
Opening PM	0	0	0	1	0	0	0	2	0	0	1	0
Horizon AM	0	0	0	1	0	0	0	3	0	0	6	1
Horizon PM	0	0	0	2	0	0	0	7	0	0	2	1
2028 No-Build AM	0	0	0	0	0	0	0	0	0	0	0	0
2028 No-Build PM	0	0	0	0	0	0	0	0	0	0	0	0
2050 No-Build AM	0	0	0	0	0	0	0	0	0	0	0	0
2050 No-Build PM	0	0	0	0	0	0	0	0	0	0	0	0
Heavy Vehicles	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Existing AM	0	0	0	0	0	0	0	0	0	0	0	0
Existing PM	0	0	0	0	0	0	0	0	0	0	0	0
Opening AM	0	0	0	1	0	0	0	2	0	0	4	1
Opening PM	0	0	0	1	0	0	0	5	0	0	2	0
Horizon AM	0	0	0	2	0	0	0	7	0	0	14	3
Horizon PM	0	0	0	4	0	0	0	17	0	0	5	1
2028 No-Build AM	0	0	0	0	0	0	0	0	0	0	0	0
2028 No-Build PM	0	0	0	0	0	0	0	0	0	0	0	0
2050 No-Build AM	0	0	0	0	0	0	0	0	0	0	0	0
2050 No-Build PM	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Existing AM	0	0	0	0	0	0	0	0	0	0	0	0
Existing PM	0	0	0	0	0	0	0	0	0	0	0	0
Opening AM	0	0	0	4	0	0	0	15	0	0	29	7
Opening PM	0	0	0	9	0	0	0	37	0	0	12	3
Horizon AM	0	0	0	13	0	0	0	50	0	0	97	24
Horizon PM	0	0	0	31	0	0	0	123	0	0	38	10
2028 No-Build AM	0	0	0	0	0	0	0	0	0	0	0	0
2028 No-Build PM	0	0	0	0	0	0	0	0	0	0	0	0
2050 No-Build AM	0	0	0	0	0	0	0	0	0	0	0	0
2050 No-Build PM	0	0	0	0	0	0	0	0	0	0	0	0

% to/from north	20%
% to/from west	80%

JAMES RANCH RD & POE INTERSECTION 2 (INTERSECTION 201)												
Passenger Cars	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Existing AM	0	0	0	0	0	0	0	0	0	0	0	0
Existing PM	0	0	0	0	0	0	0	0	0	0	0	0
Opening AM	0	0	0	5	0	5	5	12	0	0	23	6
Opening PM	0	0	0	7	0	5	5	30	0	0	9	5
Horizon AM	0	0	0	10	0	10	10	40	0	0	77	19
Horizon PM	0	0	0	25	0	10	10	99	0	0	31	10
2028 No-Build AM	0	0	0	0	0	0	0	0	0	0	0	0
2028 No-Build PM	0	0	0	0	0	0	0	0	0	0	0	0
2050 No-Build AM	0	0	0	0	0	0	0	0	0	0	0	0
2050 No-Build PM	0	0	0	0	0	0	0	0	0	0	0	0
Medium Vehicles	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Existing AM	0	0	0	0	0	0	0	0	0	0	0	0
Existing PM	0	0	0	0	0	0	0	0	0	0	0	0
Opening AM	0	0	0	0	0	0	0	1	0	0	2	0
Opening PM	0	0	0	1	0	0	0	2	0	0	1	0
Horizon AM	0	0	0	1	0	0	0	3	0	0	6	1
Horizon PM	0	0	0	2	0	0	0	7	0	0	2	1
2028 No-Build AM	0	0	0	0	0	0	0	0	0	0	0	0
2028 No-Build PM	0	0	0	0	0	0	0	0	0	0	0	0
2050 No-Build AM	0	0	0	0	0	0	0	0	0	0	0	0
2050 No-Build PM	0	0	0	0	0	0	0	0	0	0	0	0
Heavy Vehicles	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Existing AM	0	0	0	0	0	0	0	0	0	0	0	0
Existing PM	0	0	0	0	0	0	0	0	0	0	0	0
Opening AM	5	5	33	1	5	0	0	2	5	33	4	1
Opening PM	5	5	33	1	5	0	0	5	5	33	2	0
Horizon AM	10	10	42	2	10	0	0	7	10	42	14	3
Horizon PM	10	10	42	4	10	0	0	17	10	42	5	1
2028 No-Build AM	0	0	0	0	0	0	0	0	0	0	0	0
2028 No-Build PM	0	0	0	0	0	0	0	0	0	0	0	0
2050 No-Build AM	0	0	0	0	0	0	0	0	0	0	0	0
2050 No-Build PM	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Existing AM	0	0	0	0	0	0	0	0	0	0	0	0
Existing PM	0	0	0	0	0	0	0	0	0	0	0	0
Opening AM	5	5	33	6	5	5	5	15	5	33	29	7
Opening PM	5	5	33	9	5	5	5	37	5	33	12	6
Horizon AM	10	10	42	13	10	10	10	50	10	42	97	24
Horizon PM	10	10	42	31	10	10	10	123	10	42	38	12
2028 No-Build AM	0	0	0	0	0	0	0	0	0	0	0	0
2028 No-Build PM	0	0	0	0	0	0	0	0	0	0	0	0
2050 No-Build AM	0	0	0	0	0	0	0	0	0	0	0	0
2050 No-Build PM	0	0	0	0	0	0	0	0	0	0	0	0

PC %	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Existing AM	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Existing PM	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Opening AM	0%	0%	0%	87%	0%	98%	98%	80%	0%	0%	80%	80%
Opening PM	0%	0%	0%	80%	0%	98%	98%	80%	0%	0%	80%	90%
Horizon AM	0%	0%	0%	80%	0%	98%	98%	80%	0%	0%	80%	80%
Horizon PM	0%	0%	0%	80%	0%	98%	98%	80%	0%	0%	80%	84%
2028 No-Build AM	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
2028 No-Build PM	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
2050 No-Build AM	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
2050 No-Build PM	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

MV %	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Existing AM	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Existing PM	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Opening AM	0%	0%	0%	4%	0%	0%	0%	6%	0%	0%	6%	6%
Opening PM	0%	0%	0%	6%	0%	0%	0%	6%	0%	0%	6%	3%
Horizon AM	0%	0%	0%	6%	0%	0%	0%	6%	0%	0%	6%	6%
Horizon PM	0%	0%	0%	6%	0%	0%	0%	6%	0%	0%	6%	5%
2028 No-Build AM	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
2028 No-Build PM	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
2050 No-Build AM	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
2050 No-Build PM	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

HV %	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Existing AM	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Existing PM	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Opening AM	100%	100%	100%	9%	100%	2%	2%	14%	100%	100%	14%	14%
Opening PM	100%	100%	100%	14%	100%	2%	2%	14%	100%	100%	14%	7%
Horizon AM	100%	100%	100%	14%	100%	2%	2%	14%	100%	100%	14%	14%
Horizon PM	100%	100%	100%	14%	100%	2%	2%	14%	100%	100%	14%	11%
2028 No-Build AM	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
2028 No-Build PM	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
2050 No-Build AM	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
2050 No-Build PM	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

Truck %	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Existing AM	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Existing PM	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Opening AM	100%	100%	100%	13%	100%	2%	2%	20%	100%	100%	20%	20%
Opening PM	100%	100%	100%	20%	100%	2%	2%	20%	100%	100%	20%	10%
Horizon AM	100%	100%	100%	20%	100%	2%	2%	20%	100%	100%	20%	20%
Horizon PM	100%	100%	100%	20%	100%	2%	2%	20%	100%	100%	20%	16%
2028 No-Build AM	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
2028 No-Build PM	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
2050 No-Build AM	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
2050 No-Build PM	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

Total * PC%	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL
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Total Volumes by Movement	JAMES RANCH RD & SR 80 (INTERSECTION 1)												
		NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
	Existing AM	1	1	1	1	1	1	1	111	1	1	264	1
	Existing PM	1	1	1	1	1	1	1	267	1	1	204	1
	Opening AM	23	5	162	5	5	5	5	125	59	268	312	5
	Opening PM	56	5	348	5	5	5	5	301	32	118	245	5
	Horizon AM	76	10	471	10	10	10	10	193	166	855	479	10
	Horizon PM	185	10	1091	10	10	10	10	465	78	355	374	10
	2028 No-Build AM	5	5	5	5	5	5	5	125	5	5	297	5
	2028 No-Build PM	5	5	5	5	5	5	5	301	5	5	230	5
	2050 No-Build AM	10	10	10	10	10	10	10	193	10	10	460	10
2050 No-Build PM	10	10	10	10	10	10	10	465	10	10	355	10	

Total Volumes by Approach		SOUTH LEG			NORTH LEG			WEST LEG			EAST LEG		
		NB	SB	TOTAL	SB	NB	TOTAL	EB	WB	TOTAL	WB	EB	TOTAL
	Existing AM	3	3	6	3	3	6	113	266	379	266	113	379
	Existing PM	3	3	6	3	3	6	269	206	475	206	269	475
	Opening AM	189	332	521	15	15	30	189	340	529	585	292	877
	Opening PM	408	155	563	15	15	30	338	305	643	367	653	1021
	Horizon AM	556	1031	1587	30	30	60	369	564	933	1344	674	2018
	Horizon PM	1286	442	1728	30	30	60	552	569	1122	739	1566	2305
	2028 No-Build AM	15	15	30	15	15	30	135	307	442	307	135	442
	2028 No-Build PM	15	15	30	15	15	30	311	240	550	240	311	550
	2050 No-Build AM	30	30	60	30	30	60	213	480	693	480	213	693
	2050 No-Build PM	30	30	60	30	30	60	485	375	860	375	485	860

K-Factor	AM	0.09			0.09			0.066			0.066		
	PM	0.09			0.09			0.083			0.083		

Estimated ADT (Raw)		SOUTH LEG			NORTH LEG			WEST LEG			EAST LEG		
		NB	SB	TOTAL	SB	NB	TOTAL	EB	WB	TOTAL	WB	EB	TOTAL
	Existing AM	33	33	67	33	33	67	1708	4020	5727	4020	1708	5727
	Existing PM	33	33	67	33	33	67	3237	2479	5715	2479	3237	5715
	Opening AM	2103	3687	5790	167	167	333	2856	5136	7993	8841	4407	13248
	Opening PM	4537	1723	6260	167	167	333	4069	3672	7741	4419	7862	12281
	Horizon AM	6179	11457	17636	333	333	667	5578	8526	14104	20308	10182	30490
	Horizon PM	14290	4912	19202	333	333	667	6646	6849	13495	8888	18840	27728
	2028 No-Build AM	167	167	333	167	167	333	2040	4644	6684	4644	2040	6684
	2028 No-Build PM	167	167	333	167	167	333	3738	2884	6623	2884	3738	6623
	2050 No-Build AM	333	333	667	333	333	667	3223	7248	10471	7248	3223	10471
	2050 No-Build PM	333	333	667	333	333	667	5834	4514	10348	4514	5834	10348

Estimated ADT (Rounded)		SOUTH LEG			NORTH LEG			WEST LEG			EAST LEG		
		NB	SB	TOTAL	SB	NB	TOTAL	EB	WB	TOTAL	WB	EB	TOTAL
	Existing AM	0	0	100	0	0	100	1700	4000	5700	4000	1700	5700
	Existing PM	0	0	100	0	0	100	3200	2500	5700	2500	3200	5700
	Opening AM	2100	3700	5800	200	200	300	2900	5100	8000	8800	4400	13200
	Opening PM	4500	1700	6300	200	200	300	4100	3700	7700	4400	7900	12300
	Horizon AM	6200	11500	17600	300	300	700	5600	8500	14100	20300	10200	30500
	Horizon PM	14300	4900	19200	300	300	700	6600	6800	13500	8900	18800	27700
	2028 No-Build AM	200	200	300	200	200	300	2000	4600	6700	4600	2000	6700
	2028 No-Build PM	200	200	300	200	200	300	3700	2900	6600	2900	3700	6600
	2050 No-Build AM	300	300	700	300	300	700	3200	7200	10500	7200	3200	10500
	2050 No-Build PM	300	300	700	300	300	700	5800	4500	10300	4500	5800	10300

Round to nearest:

100

Green

 =max ADT value of the AM/PM estimates

Calculated D-Factors		SOUTH LEG			NORTH LEG			WEST LEG			EAST LEG		
		NB	SB		SB	NB		EB	WB		WB	EB	
	Opening	55%	45%		50%	50%		44%	56%		52%	48%	
	Horizon	56%	44%		50%	50%		44%	56%		50%	50%	
	Average	55%	45%	100%	50%	50%	100%	44%	56%	100%	51%	49%	100%

US 191 & SR 80 (INTERSECTION 2)												
	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Existing AM	0	0	0	75	0	45	32	79	0	0	205	136
Existing PM	0	0	0	85	0	51	76	191	0	0	158	105
Opening AM	49	36	4	55	47	103	88	134	65	6	393	118
Opening PM	51	37	5	32	82	87	166	370	113	10	212	82
Horizon AM	76	55	7	80	73	222	162	402	100	9	987	182
Horizon PM	78	57	7	44	127	157	332	1050	174	16	478	126
2028 No-Build AM	0	0	0	84	0	50	36	89	0	0	230	154
2028 No-Build PM	0	0	0	95	0	57	86	215	0	0	178	118
2050 No-Build AM	0	0	0	130	0	78	55	138	0	0	356	237
2050 No-Build PM	0	0	0	147	0	88	133	332	0	0	275	183

	SOUTH LEG			NORTH LEG			WEST LEG			EAST LEG		
	NB	SB	TOTAL	SB	NB	TOTAL	EB	WB	TOTAL	WB	EB	TOTAL
Existing AM	0	0	0	120	168	288	111	249	360	341	154	495
Existing PM	0	0	0	136	181	317	267	209	476	263	275	538
Opening AM	89	118	207	205	242	447	287	545	832	517	194	711
Opening PM	92	205	297	201	285	485	648	349	998	304	406	710
Horizon AM	138	182	320	375	399	774	664	1285	1949	1179	489	1668
Horizon PM	142	316	459	328	515	843	1556	714	2270	620	1101	1721
2028 No-Build AM	0	0	0	135	189	324	125	281	406	384	173	557
2028 No-Build PM	0	0	0	153	204	357	301	235	536	296	310	606
2050 No-Build AM	0	0	0	208	293	501	193	434	627	594	268	862
2050 No-Build PM	0	0	0	236	316	552	465	363	828	458	479	937

AM K Factor:	0.059			0.065			0.066			0.060		
PM K Factor:	0.084			0.074			0.083			0.074		

	SOUTH LEG			NORTH LEG			WEST LEG			EAST LEG		
	NB	SB	TOTAL	SB	NB	TOTAL	EB	WB	TOTAL	WB	EB	TOTAL
Existing AM	0	0	0	1841	2589	4430	1677	3769	5447	5720	2583	8303
Existing PM	0	0	0	1841	2465	4306	3213	2510	5722	3574	3742	7316
Opening AM	1520	1999	3519	3159	3723	6882	4332	8242	12574	8674	3247	11921
Opening PM	1091	2428	3519	2725	3867	6592	7802	4202	12005	4126	5516	9642
Horizon AM	2350	3090	5440	5775	6146	11922	10031	19424	29455	19773	8211	27983
Horizon PM	1686	3754	5440	4452	7001	11453	18720	8587	27306	8431	14956	23387
2028 No-Build AM	0	0	0	2073	2916	4989	1889	4245	6134	6442	2909	9351
2028 No-Build PM	0	0	0	2073	2776	4849	3618	2827	6444	4025	4214	8239
2050 No-Build AM	0	0	0	3204	4508	7712	2920	6562	9483	9959	4497	14456
2050 No-Build PM	0	0	0	3204	4292	7496	5593	4370	9963	6222	6515	12737

	SOUTH LEG			NORTH LEG			WEST LEG			EAST LEG		
	NB	SB	TOTAL	SB	NB	TOTAL	EB	WB	TOTAL	WB	EB	TOTAL
Existing AM	0	0	0	1800	2600	4400	1700	3800	5400	5700	2600	8300
Existing PM	0	0	0	1800	2500	4300	3200	2500	5700	3600	3700	7300
Opening AM	1500	2000	3500	3200	3700	6900	4300	8200	12600	8700	3200	11900
Opening PM	1100	2400	3500	2700	3900	6600	7800	4200	12000	4100	5500	9600
Horizon AM	2300	3100	5400	5800	6100	11900	10000	19400	29500	19800	8200	28000
Horizon PM	1700	3800	5400	4500	7000	11500	18700	8600	27300	8400	15000	23400
2028 No-Build AM	0	0	0	2100	2900	5000	1900	4200	6100	6400	2900	9400
2028 No-Build PM	0	0	0	2100	2800	4800	3600	2800	6400	4000	4200	8200
2050 No-Build AM	0	0	0	3200	4500	7700	2900	6600	9500	10000	4500	14500
2050 No-Build PM	0	0	0	3200	4300	7500	5600	4400	10000	6200	6500	12700

JAMES RANCH RD & SR 80 VOLS W/O ADJACENT SITES													
Total Volumes by Movement		NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
	Existing AM	1	1	1	1	1	1	1	99	1	1	235	1
	Existing PM	1	1	1	1	1	1	1	238	1	1	182	1
	Opening AM	5	5	5	5	5	5	5	111	5	5	265	5
	Opening PM	5	5	5	5	5	5	5	268	5	5	204	5
	Horizon AM	10	10	10	10	10	10	10	172	10	10	409	10
	Horizon PM	10	10	10	10	10	10	10	414	10	10	316	10
	2028 No-Build AM	5	5	5	5	5	5	5	111	5	5	265	5
	2028 No-Build PM	5	5	5	5	5	5	5	268	5	5	204	5
2050 No-Build AM	10	10	10	10	10	10	10	172	10	10	409	10	
2050 No-Build PM	10	10	10	10	10	10	10	414	10	10	316	10	
Total Volumes by Approach		SOUTH LEG			NORTH LEG			WEST LEG			EAST LEG		
		NB	SB	TOTAL	SB	NB	TOTAL	EB	WB	TOTAL	WB	EB	TOTAL
	Existing AM	3	3	6	3	3	6	101	237	338	237	101	338
	Existing PM	3	3	6	3	3	6	240	184	423	184	240	423
	Opening AM	15	15	30	15	15	30	121	275	396	275	121	396
	Opening PM	15	15	30	15	15	30	278	214	492	214	278	492
	Horizon AM	30	30	60	30	30	60	192	429	621	429	192	621
	Horizon PM	30	30	60	30	30	60	434	336	770	336	434	770
	2028 No-Build AM	15	15	30	15	15	30	121	275	396	275	121	396
2028 No-Build PM	15	15	30	15	15	30	278	214	492	214	278	492	
2050 No-Build AM	30	30	60	30	30	60	192	429	621	429	192	621	
2050 No-Build PM	30	30	60	30	30	60	434	336	770	336	434	770	
K-Factor	AM	0.09			0.09			0.066			0.066		
	PM	0.09			0.09			0.083			0.083		
Estimated ADT (Raw)		SOUTH LEG			NORTH LEG			WEST LEG			EAST LEG		
		NB	SB	TOTAL	SB	NB	TOTAL	EB	WB	TOTAL	WB	EB	TOTAL
	Existing AM	33	33	67	33	33	67	1523	3581	5104	3581	1523	5104
	Existing PM	33	33	67	33	33	67	2883	2209	5092	2209	2883	5092
	Opening AM	167	167	333	167	167	333	1832	4150	5982	4150	1832	5982
	Opening PM	167	167	333	167	167	333	3340	2580	5921	2580	3340	5921
	Horizon AM	333	333	667	333	333	667	2901	6484	9386	6484	2901	9386
	Horizon PM	333	333	667	333	333	667	5218	4044	9262	4044	5218	9262
	2028 No-Build AM	167	167	333	167	167	333	1832	4150	5982	4150	1832	5982
2028 No-Build PM	167	167	333	167	167	333	3340	2580	5921	2580	3340	5921	
2050 No-Build AM	333	333	667	333	333	667	2901	6484	9386	6484	2901	9386	
2050 No-Build PM	333	333	667	333	333	667	5218	4044	9262	4044	5218	9262	
Estimated ADT (Rounded)		SOUTH LEG			NORTH LEG			WEST LEG			EAST LEG		
		NB	SB	TOTAL	SB	NB	TOTAL	EB	WB	TOTAL	WB	EB	TOTAL
	Existing AM	0	0	100	0	0	100	1500	3600	5100	3600	1500	5100
	Existing PM	0	0	100	0	0	100	2900	2200	5100	2200	2900	5100
	Opening AM	200	200	300	200	200	300	1800	4100	6000	4100	1800	6000
	Opening PM	200	200	300	200	200	300	3300	2600	5900	2600	3300	5900
	Horizon AM	300	300	700	300	300	700	2900	6500	9400	6500	2900	9400
	Horizon PM	300	300	700	300	300	700	5200	4000	9300	4000	5200	9300
	2028 No-Build AM	200	200	300	200	200	300	1800	4100	6000	4100	1800	6000
2028 No-Build PM	200	200	300	200	200	300	3300	2600	5900	2600	3300	5900	
2050 No-Build AM	300	300	700	300	300	700	2900	6500	9400	6500	2900	9400	
2050 No-Build PM	300	300	700	300	300	700	5200	4000	9300	4000	5200	9300	
Calculated D-Factors		SOUTH LEG			NORTH LEG			WEST LEG			EAST LEG		
		NB	SB		SB	NB		EB	WB		WB	EB	
	Opening	50%	50%		50%	50%		43%	57%		57%	43%	
Horizon	50%	50%		50%	50%		44%	56%		56%	44%		

JAMES RANCH RD & POE INTERSECTION 1 (INTERSECTION 101)												
	NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
Existing AM	0	0	0	0	0	0	0	0	0	0	0	0
Existing PM	0	0	0	0	0	0	0	0	0	0	0	0
Opening AM	5	5	5	58	50	69	52	5	5	5	5	30
Opening PM	5	50	5	23	50	48	79	5	5	5	5	74
Horizon AM	10	10	10	194	50	163	105	10	10	10	10	100
Horizon PM	10	50	10	77	50	90	196	10	10	10	10	245
2028 No-Build AM	0	0	0	0	0	0	0	0	0	0	0	0
2028 No-Build PM	0	0	0	0	0	0	0	0	0	0	0	0
2050 No-Build AM	0	0	0	0	0	0	0	0	0	0	0	0
2050 No-Build PM	0	0	0	0	0	0	0	0	0	0	0	0
	SOUTH LEG			NORTH LEG			WEST LEG			EAST LEG		
	NB	SB	TOTAL	SB	NB	TOTAL	EB	WB	TOTAL	WB	EB	TOTAL
Existing AM	0	0	0	0	0	0	0	0	0	0	0	0
Existing PM	0	0	0	0	0	0	0	0	0	0	0	0
Opening AM	15	60	75	178	87	265	62	79	141	40	68	108
Opening PM	60	60	120	121	203	323	89	58	147	84	33	117
Horizon AM	30	70	100	407	215	622	125	183	308	120	214	334
Horizon PM	70	70	140	217	491	708	216	110	326	265	97	362
2028 No-Build AM	0	0	0	0	0	0	0	0	0	0	0	0
2028 No-Build PM	0	0	0	0	0	0	0	0	0	0	0	0
2050 No-Build AM	0	0	0	0	0	0	0	0	0	0	0	0
2050 No-Build PM	0	0	0	0	0	0	0	0	0	0	0	0
AM	0.09			0.09			0.09			0.09		
PM	0.09			0.09			0.09			0.09		
	SOUTH LEG			NORTH LEG			WEST LEG			EAST LEG		
	NB	SB	TOTAL	SB	NB	TOTAL	EB	WB	TOTAL	WB	EB	TOTAL
Existing AM	0	0	0	0	0	0	0	0	0	0	0	0
Existing PM	0	0	0	0	0	0	0	0	0	0	0	0
Opening AM	167	667	833	1973	967	2940	689	882	1571	444	758	1202
Opening PM	667	667	1333	1340	2253	3593	992	639	1631	928	368	1296
Horizon AM	333	778	1111	4523	2390	6914	1390	2035	3425	1333	2378	3711
Horizon PM	778	778	1556	2412	5457	7869	2401	1223	3625	2944	1078	4022
2028 No-Build AM	0	0	0	0	0	0	0	0	0	0	0	0
2028 No-Build PM	0	0	0	0	0	0	0	0	0	0	0	0
2050 No-Build AM	0	0	0	0	0	0	0	0	0	0	0	0
2050 No-Build PM	0	0	0	0	0	0	0	0	0	0	0	0
	SOUTH LEG			NORTH LEG			WEST LEG			EAST LEG		
	NB	SB	TOTAL	SB	NB	TOTAL	EB	WB	TOTAL	WB	EB	TOTAL
Existing AM	0	0	0	0	0	0	0	0	0	0	0	0
Existing PM	0	0	0	0	0	0	0	0	0	0	0	0
Opening AM	200	700	800	2000	1000	2900	700	900	1600	400	800	1200
Opening PM	700	700	1300	1300	2300	3600	1000	600	1600	900	400	1300
Horizon AM	300	800	1100	4500	2400	6900	1400	2000	3400	1300	2400	3700
Horizon PM	800	800	1600	2400	5500	7900	2400	1200	3600	2900	1100	4000
2028 No-Build AM	0	0	0	0	0	0	0	0	0	0	0	0
2028 No-Build PM	0	0	0	0	0	0	0	0	0	0	0	0
2050 No-Build AM	0	0	0	0	0	0	0	0	0	0	0	0
2050 No-Build PM	0	0	0	0	0	0	0	0	0	0	0	0
	SOUTH LEG			NORTH LEG			WEST LEG			EAST LEG		
	NB	SB		SB	NB		EB	WB		WB	EB	
Opening	38%	62%		51%	49%		52%	48%		55%	45%	
Horizon	42%	58%		47%	53%		54%	46%		55%	45%	

JAMES RANCH RD & POE INTERSECTION 2 (INTERSECTION 201)													
Total Volumes by Movement		NBL	NBT	NBR	SBL	SBT	SBR	EBL	EBT	EBR	WBL	WBT	WBR
	Existing AM	0	0	0	0	0	0	0	0	0	0	0	0
	Existing PM	0	0	0	0	0	0	0	0	0	0	0	0
	Opening AM	5	5	33	6	5	5	5	15	5	33	29	7
	Opening PM	5	5	33	9	5	5	5	37	5	33	12	6
	Horizon AM	10	10	42	13	10	10	10	50	10	42	97	24
	Horizon PM	10	10	42	31	10	10	10	123	10	42	38	12
	2028 No-Build AM	0	0	0	0	0	0	0	0	0	0	0	0
	2028 No-Build PM	0	0	0	0	0	0	0	0	0	0	0	0
	2050 No-Build AM	0	0	0	0	0	0	0	0	0	0	0	0
2050 No-Build PM	0	0	0	0	0	0	0	0	0	0	0	0	
Total Volumes by Approach		SOUTH LEG			NORTH LEG			WEST LEG			EAST LEG		
		NB	SB	TOTAL	SB	NB	TOTAL	EB	WB	TOTAL	WB	EB	TOTAL
	Existing AM	0	0	0	0	0	0	0	0	0	0	0	0
	Existing PM	0	0	0	0	0	0	0	0	0	0	0	0
	Opening AM	43	43	86	16	17	33	25	39	64	69	54	123
	Opening PM	43	43	86	19	16	35	47	22	68	50	79	130
	Horizon AM	62	62	124	33	44	77	70	117	187	163	105	268
	Horizon PM	62	62	124	51	32	83	143	58	202	92	196	289
	2028 No-Build AM	0	0	0	0	0	0	0	0	0	0	0	0
	2028 No-Build PM	0	0	0	0	0	0	0	0	0	0	0	0
2050 No-Build AM	0	0	0	0	0	0	0	0	0	0	0	0	
2050 No-Build PM	0	0	0	0	0	0	0	0	0	0	0	0	
K-Factor	AM	0.09			0.09			0.09			0.09		
	PM	0.09			0.09			0.09			0.09		
Estimated ADT (Raw)		SOUTH LEG			NORTH LEG			WEST LEG			EAST LEG		
		NB	SB	TOTAL	SB	NB	TOTAL	EB	WB	TOTAL	WB	EB	TOTAL
	Existing AM	0	0	0	0	0	0	0	0	0	0	0	0
	Existing PM	0	0	0	0	0	0	0	0	0	0	0	0
	Opening AM	479	479	958	175	192	367	279	434	713	771	600	1371
	Opening PM	479	479	958	214	173	387	522	239	761	558	881	1439
	Horizon AM	690	690	1380	362	491	853	782	1298	2080	1812	1168	2980
	Horizon PM	690	690	1380	564	355	919	1591	649	2240	1027	2179	3206
	2028 No-Build AM	0	0	0	0	0	0	0	0	0	0	0	0
	2028 No-Build PM	0	0	0	0	0	0	0	0	0	0	0	0
2050 No-Build AM	0	0	0	0	0	0	0	0	0	0	0	0	
2050 No-Build PM	0	0	0	0	0	0	0	0	0	0	0	0	
Estimated ADT (Rounded)		SOUTH LEG			NORTH LEG			WEST LEG			EAST LEG		
		NB	SB	TOTAL	SB	NB	TOTAL	EB	WB	TOTAL	WB	EB	TOTAL
	Existing AM	0	0	0	0	0	0	0	0	0	0	0	0
	Existing PM	0	0	0	0	0	0	0	0	0	0	0	0
	Opening AM	500	500	1000	200	200	400	300	400	700	800	600	1400
	Opening PM	500	500	1000	200	200	400	500	200	800	600	900	1400
	Horizon AM	700	700	1400	400	500	900	800	1300	2100	1800	1200	3000
	Horizon PM	700	700	1400	600	400	900	1600	600	2200	1000	2200	3200
	2028 No-Build AM	0	0	0	0	0	0	0	0	0	0	0	0
	2028 No-Build PM	0	0	0	0	0	0	0	0	0	0	0	0
2050 No-Build AM	0	0	0	0	0	0	0	0	0	0	0	0	
2050 No-Build PM	0	0	0	0	0	0	0	0	0	0	0	0	
Calculated D-Factors		SOUTH LEG			NORTH LEG			WEST LEG			EAST LEG		
		NB	SB		SB	NB		EB	WB		WB	EB	
	Opening	50%	50%		52%	48%		54%	46%		47%	53%	
	Horizon	50%	50%		52%	48%		55%	45%		46%	54%	
	Average	50%	50%	100%	52%	48%	100%	55%	45%	100%	47%	53%	100%

Appendix 5. Relevant Standards

- b. The specific assumptions and data sources used in deriving trip distribution and assignment shall be documented in the report.

(8) Capacity Analysis

- a. Level of service shall be computed for all signalized and unsignalized intersections within the study area in accordance with the latest edition of the Highway Capacity Manual or with any software that uses HCS methodology. The level of service shall be calculated and reported by intersection, intersection approach, and lane group within the approach.
- b. For signalized intersections, operational analyses shall be performed for time horizons up to five years. The planning method will be acceptable for time horizons beyond five years. Analyses may include modifications to the existing signal timing if the study area is within a coordinated signal system; Highway Capacity Manual signal timing methods should not be used for generating signal timing.
- c. Analyses may include an arterial analysis in accordance with the latest edition of the Highway Capacity Manual.
- d. Peak hour factors used for future conditions shall not exceed 0.90. The following peak hour factors shall be used unless otherwise directed by the Regional Traffic Engineer:

PHF = 0.80 for < 75 vph per lane
PHF = 0.85 for 75 - 300 vph per lane
PHF = 0.90 for > 300 vph per lane

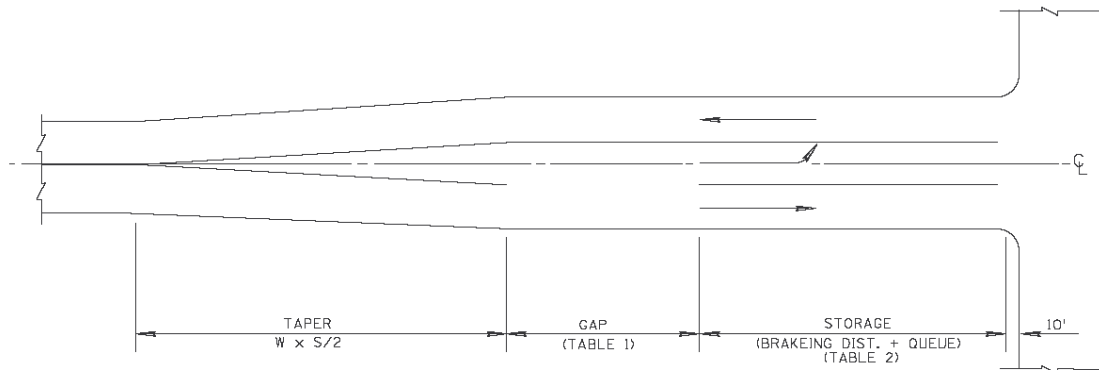
(9) Traffic Signal Needs Study

- a. A Traffic Signal Needs Study shall be conducted for all new proposed signals for the base year. If the warrants are not met for the base year, they should be evaluated for each year in the study horizon.
- b. A Traffic Signal Needs Study shall be conducted in accordance with ADOT Traffic Guidelines and Processes 611.
- c. Existing traffic signals adjacent to the development's access to the State highway shall be evaluated for continued signal warrants, phasing, timing, and coordination for each year in the study horizon, in accordance with Table 240-1.

(10) Crash Analysis

An analysis of three years of traffic crash data and crash prediction per HSM (if required); calculations shall be conducted to determine if the level of safety will deteriorate due to the addition of site traffic.

Figure 430-B. Left Turn Lane - Symmetrical Widening



Example: $W = 12'$ $Gap = 140'$ $Storage = 415' * + 50' = 465'$
 $S = 65 \text{ mph}$ (From Table 430-1)
 $T = \frac{12 \times 65}{2} = 390'$ * From Table 430-2
low ADT, minimum trucks
 $Total \text{ Length} = 390' + 140' + 465' = 995'$

Gap Length

Table 430-1 provides the length of the gap for left turn lanes. See Standard Drawing 4-M-1.03 for the turn lane standard.

Table 430-1. Left Turn Lane Gap Lengths

POSTED or DESIGN SPEED (mph)	GAP (feet)
< 40	60
40 - 50	90
> 50	140

Storage Length

The storage length is a combination of the braking distance (Table 430-2) and a queue length dependent on the anticipated traffic control for the intersection and the traffic demand at the turn.

$$\text{storage length} = \text{braking distance} + \text{queue length}$$

Table 430-2. Braking Distance

POSTED or DESIGN SPEED (mph)	DESIRABLE		MINIMUM		
	BRAKING SPEED (mph)	BRAKING DISTANCE (feet)	ENTERING SPEED (mph)	BRAKING SPEED (mph)	BRAKING DISTANCE (feet)
30	29	80	20	20	20
35	34	115	25	25	40
40	38	150	30	29	50
45	43	200	35	34	85
50	47	245	40	38	120
55	52	300	45	42	145
60	56	360	50	47	200
65	60	415	55	52	265
70	64	490	60	56	315
75	70	585	65	61	400

The “Desirable” braking distance shown in Table 430-2 is based on the assumption that a vehicle will have lost a few miles per hour through retardation by the vehicle’s engine and drive train prior to braking and that braking will actually begin when the vehicle is fully into the turn lane. The “Minimum” braking distance shown is based on the assumption of: (a) a drop of 10 mph in the average speed of a vehicle by the time it begins to enter the opening or “gap” of the turn lane; (b) there will be a further reduction in speed through engine retardation while entering the turn lane; and (c) assumed braking will begin once the vehicle is 2/3 of the way into the turn lane (see Figure 430-C).

Exhibit 16-16
Generalized Daily Service
Volumes for Urban Street
Facilities

directions); and six combinations of the *K*-factor and *D*-factor. To use this table, analysts must select a combination of *K* and *D* appropriate for their locality.

The 30-mi/h values further assume an average traffic signal spacing of 1,050 ft and 20 access points/mi, while the 45-mi/h values assume an average traffic signal spacing of 1,500 ft and 10 access points/mi.

K-Factor	D-Factor	Daily Service Volume by Lanes, LOS, and Speed (1,000 veh/day)											
		Two-Lane Streets				Four-Lane Streets				Six-Lane Streets			
		LOS B	LOS C	LOS D	LOS E	LOS B	LOS C	LOS D	LOS E	LOS B	LOS C	LOS D	LOS E
Posted Speed = 30 mi/h													
0.09	0.55	NA	1.7	11.8	17.8	NA	2.2	24.7	35.8	NA	2.6	38.7	54.0
	0.60	NA	1.6	10.8	16.4	NA	2.0	22.7	32.8	NA	2.4	35.6	49.5
0.10	0.55	NA	1.6	10.7	16.1	NA	2.0	22.3	32.2	NA	2.4	34.9	48.6
	0.60	NA	1.4	9.8	14.7	NA	1.8	20.4	29.5	NA	2.2	32.0	44.5
0.11	0.55	NA	1.4	9.7	14.6	NA	1.8	20.3	29.3	NA	2.1	31.7	44.1
	0.60	NA	1.3	8.9	13.4	NA	1.7	18.6	26.9	NA	2.0	29.1	40.5
Posted Speed = 45 mi/h													
0.09	0.55	NA	7.7	15.9	18.3	NA	16.5	33.6	36.8	NA	25.4	51.7	55.3
	0.60	NA	7.1	14.5	16.8	NA	15.1	30.8	33.7	NA	23.4	47.4	50.7
0.10	0.55	NA	7.0	14.3	16.5	NA	14.9	30.2	33.1	NA	23.0	46.5	49.7
	0.60	NA	6.4	13.1	15.1	NA	13.6	27.7	30.3	NA	21.0	42.7	45.6
0.11	0.55	NA	6.3	13.0	15.0	NA	13.5	27.5	30.1	NA	20.9	42.3	45.2
	0.60	NA	5.8	11.9	13.8	NA	12.4	25.2	27.6	NA	19.1	38.8	41.5

Notes: NA = not applicable; LOS cannot be achieved with the stated assumptions.
General assumptions include no roundabouts or all-way STOP-controlled intersections along the facility; coordinated, semiactuated traffic signals; Arrivals Type 4; 120-s cycle time; protected left-turn phases; 0.45 weighted average *g/C* ratio; exclusive left-turn lanes with adequate queue storage provided at traffic signals; no exclusive right-turn lanes provided; no restrictive median; 2-mi facility length; 10% of traffic turns left and 10% turns right at each traffic signal; peak hour factor = 0.92; and base saturation flow rate = 1,900 pc/h/ln.
Additional assumptions for 30-mi/h facilities: signal spacing = 1,050 ft and 20 access points/mi.
Additional assumptions for 45-mi/h facilities: signal spacing = 1,500 ft and 10 access points/mi.

Exhibit 16-16 is provided for general planning use and should *not* be used to analyze any specific urban street facility or to make final decisions on important design features. A full operational analysis using this chapter's methodology is required for such specific applications.

The exhibit is useful in evaluating the overall performance of a large number of urban streets within a jurisdiction, as a first pass to determine where problems might exist or arise, or in determining where improvements might be needed. However, any urban street identified as likely to experience problems or need improvement should be subjected to a full operational analysis before any decisions on implementing specific improvements are made.

Daily service volumes are strongly affected by the *K*- and *D*-factors chosen as typical for the analysis. The values used for the facilities under study should be reasonable. Also, if any characteristic is significantly different from the typical values used to develop Exhibit 16-16, particularly the weighted average *g/C* ratio and traffic signal spacing, the values taken from this exhibit will not be representative of the study facilities. In such cases, analysts are advised to develop their own generalized service volume tables by using representative local values or to proceed to a full operational analysis.

Appendix 6. Existing Signal Timings

Intersection: **SR80 @ US191 (WEST)**

MP: **364**

Location: **Douglas**

MU #: **0050Q**

Warrant: **UPDATE TIMING**

Timing As Of: **8/27/2010**

	PH 1	PH 2	PH 3	PH 4	PH 5	PH 6	PH 7	PH 8
Mvmnt	--	E/W	--	SB	--	--	--	--
Min Green	--	10	--	6	--	--	--	--
Veh Ext	--	6.0	--	1.5	--	--	--	--
Max 1	--	60	--	25	--	--	--	--
Max 2	--	--	--	--	--	--	--	--
Max 3	--	--	--	--	--	--	--	--
Walk	--	--	--	--	--	--	--	--
Ped Clr	--	--	--	--	--	--	--	--
Max Init	--	40	--	--	--	--	--	--
Sec Act	--	2.0	--	--	--	--	--	--
TBR	--	--	--	--	--	--	--	--
TTR	--	--	--	--	--	--	--	--
Min Gap	--	--	--	--	--	--	--	--
Guar Pass	--	ON	--	--	--	--	--	--
Yellow	--	5.0	--	4.3	--	--	--	--
Red Clr	--	1.1	--	2.2	--	--	--	--
CNA	--	--	--	--	--	--	--	--
Det Memory	--	ON	--	--	--	--	--	--
Dual Entry	--	--	--	--	--	--	--	--
Recall Mode	--	MinV	--	--	--	--	--	--
Ext Start	--	YEL	--	--	--	--	--	--

TIME OF DAY FUNCTIONS

PGM	Funct'n	On	Off	Skip Days

VEHICLE DETECTOR DELAY/EXTEND TIMING

Phase(s)	Ctrl/Amp	Type	Sec
4 (RT)	Video	DELAY	8
4 (LT)	Video	DELAY	8

OVERLAPS

TIMING OPTIONAL

O/L(Phases)	Grn	Yel	Red
(A)	--	--	--
(B)	--	--	--
(C)	--	--	--
(D)	--	--	--

PHASE SEQ:

R1) 2,4

PROTECTED LEFT TURN PHASES:

PROT-PRM LEFT TURN PHASES:

RAILROAD PRE-EMPTION: ☐

VIDEO: ☒

EMERGENCY VEHICLE PRE-EMPTION: ☐

LOOPS: ☒

COORDINATION: ☐

Intersection: **SR80 @ US191 (WEST)**

MP: **364**

Location: **Douglas**

MU #: **0050Q**

Warrant: **NEW SIGNAL**

Timing As Of: **5/21/2008**

	PH 1	PH 2	PH 3	PH 4	PH 5	PH 6	PH 7	PH 8
Mvmnt	--	E/W	--	SB	--	--	--	--
Min Green	--	30	--	6	--	--	--	--
Veh Ext	--	6.0	--	1.5	--	--	--	--
Max 1	--	40	--	20	--	--	--	--
Max 2	--	--	--	--	--	--	--	--
Max 3	--	--	--	--	--	--	--	--
Walk	--	--	--	--	--	--	--	--
Ped Clr	--	--	--	--	--	--	--	--
Max Init	--	40	--	--	--	--	--	--
Sec Act	--	2.0	--	--	--	--	--	--
TBR	--	--	--	--	--	--	--	--
TTR	--	--	--	--	--	--	--	--
Min Gap	--	--	--	--	--	--	--	--
Guar Pass	--	ON	--	--	--	--	--	--
Yellow	--	5.0	--	4.3	--	--	--	--
Red Clr	--	1.1	--	2.2	--	--	--	--
CNA	--	--	--	--	--	--	--	--
Det Memory	--	ON	--	--	--	--	--	--
Dual Entry	--	--	--	--	--	--	--	--
Recall Mode	--	MinV	--	--	--	--	--	--
Ext Start	--	YEL	--	--	--	--	--	--

TIME OF DAY FUNCTIONS

PGM	Func'tn	On	Off	Skip Days

VEHICLE DETECTOR DELAY/EXTEND TIMING

Phase(s)	Ctrl/Amp	Type	Sec
4 (RT)	Video	DELAY	8
4 (LT)	Video	DELAY	3

OVERLAPS

TIMING OPTIONAL

O/L(Phases)		Grn	Yel	Red
	--	--	--	
	--	--	--	
	--	--	--	
	--	--	--	

PHASE SEQ:

R1) 2,4

PROTECTED LEFT TURN PHASES:

PROT-PRM LEFT TURN PHASES:

RAILROAD PRE-EMPTION: ☐

VIDEO: ☒







EMERGENCY VEHICLE PRE-EMPTION: ☐

LOOPS: ☒

COORDINATION: ☐

Appendix 7. Synchro and Rodel Output Reports







***SR 80 / James Ranch Road Intersection
(Existing, 2028/2050 No-Build)***

Intersection												
Int Delay, s/veh	0.3											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	1	111	1	1	264	1	1	1	1	1	1	1
Future Vol, veh/h	1	111	1	1	264	1	1	1	1	1	1	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	105	-	-	105	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	75	75	75	87	87	87	50	50	50	50	50	50
Heavy Vehicles, %	2	11	2	2	11	2	2	2	2	2	2	2
Mvmt Flow	1	148	1	1	303	1	2	2	2	2	2	2

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	304	0	0	149	0	0	306	457	75	383	457	152
Stage 1	-	-	-	-	-	-	151	151	-	306	306	-
Stage 2	-	-	-	-	-	-	155	306	-	77	151	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	1254	-	-	1430	-	-	623	498	971	550	498	867
Stage 1	-	-	-	-	-	-	836	771	-	679	660	-
Stage 2	-	-	-	-	-	-	832	660	-	923	771	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1254	-	-	1430	-	-	619	497	971	547	497	867
Mov Cap-2 Maneuver	-	-	-	-	-	-	619	497	-	547	497	-
Stage 1	-	-	-	-	-	-	835	770	-	678	659	-
Stage 2	-	-	-	-	-	-	827	659	-	918	770	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.1			0			10.6			11.1		
HCM LOS							B			B		







Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	644	1254	-	-	1430	-	-	601
HCM Lane V/C Ratio	0.009	0.001	-	-	0.001	-	-	0.01
HCM Control Delay (s)	10.6	7.9	-	-	7.5	-	-	11.1
HCM Lane LOS	B	A	-	-	A	-	-	B
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0

Intersection												
Int Delay, s/veh	0.3											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	1	267	1	1	204	1	1	1	1	1	1	1
Future Vol, veh/h	1	267	1	1	204	1	1	1	1	1	1	1
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	105	-	-	105	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	93	93	93	85	85	85	50	50	50	50	50	50
Heavy Vehicles, %	2	11	2	2	11	2	2	2	2	2	2	2
Mvmt Flow	1	287	1	1	240	1	2	2	2	2	2	2







Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	241	0	0	288	0	0	413	533	144	390	533	121
Stage 1	-	-	-	-	-	-	290	290	-	243	243	-
Stage 2	-	-	-	-	-	-	123	243	-	147	290	-
Critical Hdwy	4.14	-	-	4.14	-	-	7.54	6.54	6.94	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.54	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.22	-	-	3.52	4.02	3.32	3.52	4.02	3.32
Pot Cap-1 Maneuver	1323	-	-	1271	-	-	523	451	877	543	451	908
Stage 1	-	-	-	-	-	-	694	671	-	739	703	-
Stage 2	-	-	-	-	-	-	868	703	-	841	671	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1323	-	-	1271	-	-	519	450	877	539	450	908
Mov Cap-2 Maneuver	-	-	-	-	-	-	519	450	-	539	450	-
Stage 1	-	-	-	-	-	-	693	670	-	738	702	-
Stage 2	-	-	-	-	-	-	863	702	-	836	670	-







Approach	EB			WB			NB			SB		
HCM Control Delay, s	0			0			11.4			11.3		
HCM LOS							B			B		

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	567	1323	-	-	1271	-	-	579
HCM Lane V/C Ratio	0.011	0.001	-	-	0.001	-	-	0.01
HCM Control Delay (s)	11.4	7.7	-	-	7.8	-	-	11.3
HCM Lane LOS	B	A	-	-	A	-	-	B
HCM 95th %tile Q(veh)	0	0	-	-	0	-	-	0

Intersection												
Int Delay, s/veh	0.9											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	5	125	5	5	297	5	5	5	5	5	5	5
Future Vol, veh/h	5	125	5	5	297	5	5	5	5	5	5	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	105	-	-	105	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	80	80	80	80	85	85	80	80	80	80	80	80
Heavy Vehicles, %	2	11	47	25	15	2	20	2	36	2	2	2
Mvmt Flow	6	156	6	6	349	6	6	6	6	6	6	6
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	355	0	0	162	0	0	361	538	81	457	538	178
Stage 1	-	-	-	-	-	-	171	171	-	364	364	-
Stage 2	-	-	-	-	-	-	190	367	-	93	174	-
Critical Hdwy	4.14	-	-	4.6	-	-	7.9	6.54	7.62	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.9	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.9	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.45	-	-	3.7	4.02	3.66	3.52	4.02	3.32
Pot Cap-1 Maneuver	1200	-	-	1262	-	-	527	448	863	487	448	834
Stage 1	-	-	-	-	-	-	764	756	-	627	622	-
Stage 2	-	-	-	-	-	-	744	621	-	904	754	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1200	-	-	1262	-	-	514	444	863	475	444	834
Mov Cap-2 Maneuver	-	-	-	-	-	-	514	444	-	475	444	-
Stage 1	-	-	-	-	-	-	760	752	-	624	619	-
Stage 2	-	-	-	-	-	-	727	618	-	886	750	-
Approach	EB		WB				NB			SB		
HCM Control Delay, s	0.3		0.1				11.7			11.9		
HCM LOS							B			B		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	560	1200	-	-	1262	-	-	540				
HCM Lane V/C Ratio	0.033	0.005	-	-	0.005	-	-	0.035				
HCM Control Delay (s)	11.7	8	-	-	7.9	-	-	11.9				
HCM Lane LOS	B	A	-	-	A	-	-	B				
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0.1				

Intersection												
Int Delay, s/veh	0.8											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↱↰		↰	↱↰			↱↰			↱↰	
Traffic Vol, veh/h	5	301	5	5	230	5	5	5	5	5	5	5
Future Vol, veh/h	5	301	5	5	230	5	5	5	5	5	5	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	105	-	-	105	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	80	85	85	80	85	85	80	80	80	80	80	80
Heavy Vehicles, %	2	11	65	32	16	2	20	2	27	2	2	2
Mvmt Flow	6	354	6	6	271	6	6	6	6	6	6	6
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	277	0	0	360	0	0	520	658	180	478	658	139
Stage 1	-	-	-	-	-	-	369	369	-	286	286	-
Stage 2	-	-	-	-	-	-	151	289	-	192	372	-
Critical Hdwy	4.14	-	-	4.74	-	-	7.9	6.54	7.44	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.9	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.9	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.52	-	-	3.7	4.02	3.57	3.52	4.02	3.32
Pot Cap-1 Maneuver	1283	-	-	1006	-	-	401	383	759	470	383	884
Stage 1	-	-	-	-	-	-	576	619	-	697	674	-
Stage 2	-	-	-	-	-	-	786	672	-	791	617	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1283	-	-	1006	-	-	390	379	759	456	379	884
Mov Cap-2 Maneuver	-	-	-	-	-	-	390	379	-	456	379	-
Stage 1	-	-	-	-	-	-	573	616	-	694	670	-
Stage 2	-	-	-	-	-	-	769	668	-	773	614	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.1			0.2			13.2			12.4		
HCM LOS							B			B		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	460	1283	-	-	1006	-	-	503				
HCM Lane V/C Ratio	0.041	0.005	-	-	0.006	-	-	0.037				
HCM Control Delay (s)	13.2	7.8	-	-	8.6	-	-	12.4				
HCM Lane LOS	B	A	-	-	A	-	-	B				
HCM 95th %tile Q(veh)	0.1	0	-	-	0	-	-	0.1				

Intersection												
Int Delay, s/veh	1.5											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	10	193	10	10	460	10	10	10	10	10	10	10
Future Vol, veh/h	10	193	10	10	460	10	10	10	10	10	10	10
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	105	-	-	105	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	80	85	85	80	85	85	80	80	80	80	80	80
Heavy Vehicles, %	2	11	33	22	15	2	20	2	27	2	2	2
Mvmt Flow	13	227	12	13	541	12	13	13	13	13	13	13
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	553	0	0	239	0	0	562	838	120	719	838	277
Stage 1	-	-	-	-	-	-	259	259	-	573	573	-
Stage 2	-	-	-	-	-	-	303	579	-	146	265	-
Critical Hdwy	4.14	-	-	4.54	-	-	7.9	6.54	7.44	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.9	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.9	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.42	-	-	3.7	4.02	3.57	3.52	4.02	3.32
Pot Cap-1 Maneuver	1013	-	-	1191	-	-	373	301	835	316	301	720
Stage 1	-	-	-	-	-	-	675	692	-	472	502	-
Stage 2	-	-	-	-	-	-	634	499	-	842	688	-
Platoon blocked, %		-	-		-	-						
Mov Cap-1 Maneuver	1013	-	-	1191	-	-	348	294	835	296	294	720
Mov Cap-2 Maneuver	-	-	-	-	-	-	348	294	-	296	294	-
Stage 1	-	-	-	-	-	-	666	683	-	466	496	-
Stage 2	-	-	-	-	-	-	601	494	-	804	679	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.4			0.2			14.9			15.9		
HCM LOS							B			C		
Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1				
Capacity (veh/h)	401	1013	-	-	1191	-	-	367				
HCM Lane V/C Ratio	0.094	0.012	-	-	0.01	-	-	0.102				
HCM Control Delay (s)	14.9	8.6	-	-	8.1	-	-	15.9				
HCM Lane LOS	B	A	-	-	A	-	-	C				
HCM 95th %tile Q(veh)	0.3	0	-	-	0	-	-	0.3				












Intersection												
Int Delay, s/veh	1.5											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	10	465	10	10	355	10	10	10	10	10	10	10
Future Vol, veh/h	10	465	10	10	355	10	10	10	10	10	10	10
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	105	-	-	105	-	-	-	-	-	-	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	80	85	85	80	85	85	80	80	80	80	80	80
Heavy Vehicles, %	2	11	46	25	16	2	20	2	23	2	2	2
Mvmt Flow	13	547	12	13	418	12	13	13	13	13	13	13











Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	430	0	0	559	0	0	821	1035	280	756	1035	215
Stage 1	-	-	-	-	-	-	579	579	-	450	450	-
Stage 2	-	-	-	-	-	-	242	456	-	306	585	-
Critical Hdwy	4.14	-	-	4.6	-	-	7.9	6.54	7.36	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.9	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.9	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.45	-	-	3.7	4.02	3.53	3.52	4.02	3.32
Pot Cap-1 Maneuver	1126	-	-	865	-	-	238	230	658	297	230	790
Stage 1	-	-	-	-	-	-	426	499	-	558	570	-
Stage 2	-	-	-	-	-	-	691	567	-	679	496	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1126	-	-	865	-	-	220	224	658	273	224	790
Mov Cap-2 Maneuver	-	-	-	-	-	-	220	224	-	273	224	-
Stage 1	-	-	-	-	-	-	421	493	-	551	561	-
Stage 2	-	-	-	-	-	-	655	558	-	642	490	-

Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.2			0.3			19.5			17.8		
HCM LOS							C			C		

Minor Lane/Major Mvmt	NBLn1	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1
Capacity (veh/h)	285	1126	-	-	865	-	-	319
HCM Lane V/C Ratio	0.132	0.011	-	-	0.014	-	-	0.118
HCM Control Delay (s)	19.5	8.2	-	-	9.2	-	-	17.8
HCM Lane LOS	C	A	-	-	A	-	-	C
HCM 95th %tile Q(veh)	0.4	0	-	-	0	-	-	0.4












***SR 80 / James Ranch Road Intersection
(2028/2050 TWSC/Signalized, TI Sensitivity Analysis)***

Intersection												
Int Delay, s/veh	5.8											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	5	125	59	268	312	5	23	5	162	5	5	5
Future Vol, veh/h	5	125	59	268	312	5	23	5	162	5	5	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	105	-	150	105	-	-	150	-	0	150	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	80	85	85	85	85	85	80	80	85	80	80	80
Heavy Vehicles, %	2	11	47	25	15	2	20	2	36	2	2	2
Mvmt Flow	6	147	69	315	367	6	29	6	191	6	6	6
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	373	0	0	216	0	0	976	1162	74	1089	1228	187
Stage 1	-	-	-	-	-	-	159	159	-	1000	1000	-
Stage 2	-	-	-	-	-	-	817	1003	-	89	228	-
Critical Hdwy	4.14	-	-	4.6	-	-	7.9	6.54	7.62	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.9	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.9	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.45	-	-	3.7	4.02	3.66	3.52	4.02	3.32
Pot Cap-1 Maneuver	1182	-	-	1199	-	-	181	194	873	170	177	823
Stage 1	-	-	-	-	-	-	778	765	-	261	319	-
Stage 2	-	-	-	-	-	-	300	318	-	908	714	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1182	-	-	1199	-	-	138	142	873	102	130	823
Mov Cap-2 Maneuver	-	-	-	-	-	-	138	142	-	102	130	-
Stage 1	-	-	-	-	-	-	774	761	-	260	235	-
Stage 2	-	-	-	-	-	-	214	234	-	700	710	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.2			4.2			14.4			28.8		
HCM LOS							B			D		
Minor Lane/Major Mvmt	NBLn1	NBLn2	NBLn3	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2	
Capacity (veh/h)	138	142	873	1182	-	-	1199	-	-	102	225	
HCM Lane V/C Ratio	0.208	0.044	0.218	0.005	-	-	0.263	-	-	0.061	0.056	
HCM Control Delay (s)	37.8	31.5	10.3	8.1	-	-	9.1	-	-	42.6	21.9	
HCM Lane LOS	E	D	B	A	-	-	A	-	-	E	C	
HCM 95th %tile Q(veh)	0.7	0.1	0.8	0	-	-	1.1	-	-	0.2	0.2	

Intersection												
Int Delay, s/veh	7.3											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	5	301	32	118	245	5	56	5	348	5	5	5
Future Vol, veh/h	5	301	32	118	245	5	56	5	348	5	5	5
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	105	-	150	105	-	-	150	-	0	150	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	80	85	85	85	85	85	80	80	90	80	80	80
Heavy Vehicles, %	2	11	65	32	16	2	20	2	27	2	2	2
Mvmt Flow	6	354	38	139	288	6	70	6	387	6	6	6
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	294	0	0	392	0	0	791	938	177	761	973	147
Stage 1	-	-	-	-	-	-	366	366	-	569	569	-
Stage 2	-	-	-	-	-	-	425	572	-	192	404	-
Critical Hdwy	4.14	-	-	4.74	-	-	7.9	6.54	7.44	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.9	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.9	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.52	-	-	3.7	4.02	3.57	3.52	4.02	3.32
Pot Cap-1 Maneuver	1264	-	-	975	-	-	251	263	763	295	251	873
Stage 1	-	-	-	-	-	-	579	621	-	474	504	-
Stage 2	-	-	-	-	-	-	532	502	-	791	598	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1264	-	-	975	-	-	216	224	763	127	214	873
Mov Cap-2 Maneuver	-	-	-	-	-	-	216	224	-	127	214	-
Stage 1	-	-	-	-	-	-	576	618	-	472	432	-
Stage 2	-	-	-	-	-	-	446	430	-	384	595	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.1			3			16.9			22.2		
HCM LOS							C			C		
Minor Lane/Major Mvmt	NBLn1	NBLn2	NBLn3	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2	
Capacity (veh/h)	216	224	763	1264	-	-	975	-	-	127	344	
HCM Lane V/C Ratio	0.324	0.028	0.507	0.005	-	-	0.142	-	-	0.049	0.036	
HCM Control Delay (s)	29.5	21.5	14.5	7.9	-	-	9.3	-	-	34.8	15.9	
HCM Lane LOS	D	C	B	A	-	-	A	-	-	D	C	
HCM 95th %tile Q(veh)	1.3	0.1	2.9	0	-	-	0.5	-	-	0.2	0.1	

HCM 6th TWSC
1: James Ranch Rd & SR 80

Horizon Year AM

Intersection												
Int Delay, s/veh	13.6											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	10	193	166	855	479	10	76	10	471	10	10	10
Future Vol, veh/h	10	193	166	855	479	10	76	10	471	10	10	10
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	105	-	150	105	-	-	150	-	0	150	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	80	85	85	90	85	85	85	85	90	80	80	80
Heavy Vehicles, %	2	11	33	22	15	2	20	2	27	2	2	2
Mvmt Flow	13	227	195	950	564	12	89	12	523	13	13	13

Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	576	0	0	422	0	0	2442	2729	114	2616	2918	288
Stage 1	-	-	-	-	-	-	253	253	-	2470	2470	-
Stage 2	-	-	-	-	-	-	2189	2476	-	146	448	-
Critical Hdwy	4.14	-	-	4.54	-	-	7.9	6.54	7.44	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.9	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.9	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.42	-	-	3.7	4.02	3.57	3.52	4.02	3.32
Pot Cap-1 Maneuver	993	-	-	1003	-	-	~ 13	20	843	~ 12	15	709
Stage 1	-	-	-	-	-	-	680	696	-	31	59	-
Stage 2	-	-	-	-	-	-	~ 37	59	-	842	571	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	993	-	-	1003	-	-	-	~ 1	843	-	~ 1	709
Mov Cap-2 Maneuver	-	-	-	-	-	-	-	~ 1	-	-	~ 1	-
Stage 1	-	-	-	-	-	-	671	687	-	31	~ 3	-
Stage 2	-	-	-	-	-	-	-	~ 3	-	310	564	-

Approach	EB	WB	NB	SB
HCM Control Delay, s	0.2	23.4		
HCM LOS			-	-

Minor Lane/Major Mvmt	NBLn1	NBLn2	NBLn3	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2
Capacity (veh/h)	-	1	843	993	-	-	1003	-	-	-	2
HCM Lane V/C Ratio	-	11.765	0.621	0.013	-	-	0.947	-	-	-	12.5
HCM Control Delay (s)	\$	11019.6	16	8.7	-	-	37.6	-	-	\$	8493.7
HCM Lane LOS	-	F	C	A	-	-	E	-	-	-	F
HCM 95th %tile Q(veh)	-	2.9	4.4	0	-	-	15.9	-	-	-	4.8

Notes											
-: Volume exceeds capacity		\$: Delay exceeds 300s		+: Computation Not Defined				*: All major volume in platoon			

HCM 6th TWSC
1: James Ranch Rd & SR 80

Horizon Year PM

Intersection												
Int Delay, s/veh	415.8											
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations	↰	↗	↘	↰	↗		↰	↗	↘	↰	↗	
Traffic Vol, veh/h	10	465	78	355	374	10	185	10	1091	10	10	10
Future Vol, veh/h	10	465	78	355	374	10	185	10	1091	10	10	10
Conflicting Peds, #/hr	0	0	0	0	0	0	0	0	0	0	0	0
Sign Control	Free	Free	Free	Free	Free	Free	Stop	Stop	Stop	Stop	Stop	Stop
RT Channelized	-	-	None	-	-	None	-	-	None	-	-	None
Storage Length	105	-	150	105	-	-	150	-	0	150	-	-
Veh in Median Storage, #	-	0	-	-	0	-	-	0	-	-	0	-
Grade, %	-	0	-	-	0	-	-	0	-	-	0	-
Peak Hour Factor	80	85	85	90	85	85	85	85	90	80	80	80
Heavy Vehicles, %	2	11	46	25	16	2	20	2	23	2	2	2
Mvmt Flow	13	547	92	394	440	12	218	12	1212	13	13	13
Major/Minor	Major1			Major2			Minor1			Minor2		
Conflicting Flow All	452	0	0	639	0	0	1588	1813	274	1540	1899	226
Stage 1	-	-	-	-	-	-	573	573	-	1234	1234	-
Stage 2	-	-	-	-	-	-	1015	1240	-	306	665	-
Critical Hdwy	4.14	-	-	4.6	-	-	7.9	6.54	7.36	7.54	6.54	6.94
Critical Hdwy Stg 1	-	-	-	-	-	-	6.9	5.54	-	6.54	5.54	-
Critical Hdwy Stg 2	-	-	-	-	-	-	6.9	5.54	-	6.54	5.54	-
Follow-up Hdwy	2.22	-	-	2.45	-	-	3.7	4.02	3.53	3.52	4.02	3.32
Pot Cap-1 Maneuver	1105	-	-	801	-	-	~ 61	78	~ 664	79	69	777
Stage 1	-	-	-	-	-	-	429	502	-	187	247	-
Stage 2	-	-	-	-	-	-	224	245	-	679	456	-
Platoon blocked, %	-	-	-	-	-	-	-	-	-	-	-	-
Mov Cap-1 Maneuver	1105	-	-	801	-	-	~ 27	39	~ 664	-	35	777
Mov Cap-2 Maneuver	-	-	-	-	-	-	~ 27	39	-	-	35	-
Stage 1	-	-	-	-	-	-	424	496	-	185	125	-
Stage 2	-	-	-	-	-	-	~ 101	124	-	-	451	-
Approach	EB			WB			NB			SB		
HCM Control Delay, s	0.2			6.4			\$ 854.6					
HCM LOS							F			-		
Minor Lane/Major Mvmt	NBLn1	NBLn2	NBLn3	EBL	EBT	EBR	WBL	WBT	WBR	SBLn1	SBLn2	
Capacity (veh/h)	27	39	664	1105	-	-	801	-	-	-	-	67
HCM Lane V/C Ratio	8.061	0.302	1.826	0.011	-	-	0.492	-	-	-	-	0.373
HCM Control Delay (s)	\$ 3461.3	133.1	\$ 393.6	8.3	-	-	13.8	-	-	-	-	87.7
HCM Lane LOS	F	F	F	A	-	-	B	-	-	-	-	F
HCM 95th %tile Q(veh)	26.9	1	74.6	0	-	-	2.8	-	-	-	-	1.4
Notes												
-: Volume exceeds capacity \$: Delay exceeds 300s +: Computation Not Defined *: All major volume in platoon												

Timing Report, Sorted By Phase

Opening Year AM

1: James Ranch Rd & AZ 80

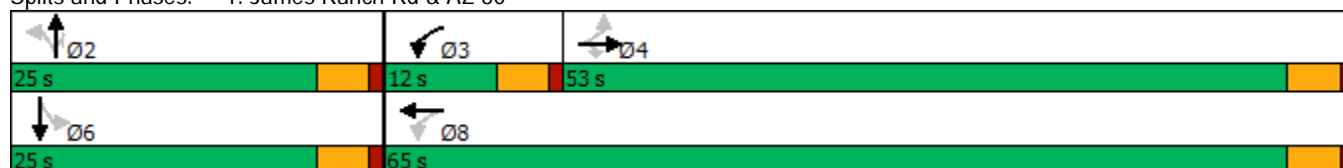


Phase Number	2	3	4	6	8
Movement	NBTL	WBL	EBTL	SBTL	WBTL
Lead/Lag		Lead	Lag		
Lead-Lag Optimize					
Recall Mode	None	Min	Min	None	Min
Maximum Split (s)	25	12	53	25	65
Maximum Split (%)	27.8%	13.3%	58.9%	27.8%	72.2%
Minimum Split (s)	22.5	9.5	22.5	22.5	22.5
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1	1	1	1	1
Minimum Initial (s)	5	5	5	5	5
Vehicle Extension (s)	3	3	3	3	3
Minimum Gap (s)	3	3	3	3	3
Time Before Reduce (s)	0	0	0	0	0
Time To Reduce (s)	0	0	0	0	0
Walk Time (s)	7		7	7	7
Flash Dont Walk (s)	11		11	11	11
Dual Entry	Yes	No	Yes	Yes	Yes
Inhibit Max	Yes	Yes	Yes	Yes	Yes
Start Time (s)	0	25	37	0	25
End Time (s)	25	37	0	25	0
Yield/Force Off (s)	20.5	32.5	85.5	20.5	85.5
Yield/Force Off 170(s)	9.5	32.5	85.5	9.5	85.5
Local Start Time (s)	0	25	37	0	25
Local Yield (s)	20.5	32.5	85.5	20.5	85.5
Local Yield 170(s)	9.5	32.5	85.5	9.5	85.5

Intersection Summary

Cycle Length	90
Control Type	Actuated-Uncoordinated
Natural Cycle	55
























Splits and Phases: 1: James Ranch Rd & AZ 80



HCM 6th Signalized Intersection Summary

Opening Year AM

1: James Ranch Rd & AZ 80

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	5	125	59	268	312	5	23	5	162	5	5	5
Future Volume (veh/h)	5	125	59	268	312	5	23	5	162	5	5	5
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No				No				No			
Adj Sat Flow, veh/h/ln	1870	1737	1203	1530	1678	1870	1604	1870	1366	1870	1870	1870
Adj Flow Rate, veh/h	6	156	74	315	367	6	29	0	195	6	6	6
Peak Hour Factor	0.80	0.80	0.80	0.85	0.85	0.85	0.80	0.85	0.85	0.80	0.80	0.80
Percent Heavy Veh, %	2	11	47	25	15	2	20	2	36	2	2	2
Cap, veh/h	442	595	184	1284	1679	27	436	0	353	441	131	131
Arrive On Green	0.18	0.18	0.18	0.18	0.52	0.52	0.15	0.00	0.15	0.15	0.15	0.15
Sat Flow, veh/h	1009	3300	1020	2826	3210	52	1202	0	2316	1188	858	858
Grp Volume(v), veh/h	6	156	74	315	182	191	29	0	195	6	0	12
Grp Sat Flow(s),veh/h/ln	1009	1650	1020	1413	1594	1668	1202	0	1158	1188	0	1716
Q Serve(g_s), s	0.1	1.1	1.8	2.0	1.7	1.7	0.6	0.0	2.2	0.1	0.0	0.2
Cycle Q Clear(g_c), s	0.1	1.1	1.8	2.0	1.7	1.7	0.8	0.0	2.2	0.1	0.0	0.2
Prop In Lane	1.00		1.00	1.00		0.03	1.00		1.00	1.00		0.50
Lane Grp Cap(c), veh/h	442	595	184	1284	834	873	436	0	353	441	0	261
V/C Ratio(X)	0.01	0.26	0.40	0.25	0.22	0.22	0.07	0.00	0.55	0.01	0.00	0.05
Avail Cap(c_a), veh/h	2026	5773	1784	1539	3478	3640	1141	0	1713	1138	0	1269
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	9.4	9.8	10.0	5.2	3.6	3.6	10.4	0.0	10.9	10.0	0.0	10.0
Incr Delay (d2), s/veh	0.0	0.2	1.4	0.1	0.1	0.1	0.1	0.0	1.4	0.0	0.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.0	0.4	0.5	0.1	0.1	0.1	0.2	0.0	0.6	0.0	0.0	0.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	9.4	10.0	11.5	5.3	3.7	3.7	10.4	0.0	12.2	10.0	0.0	10.1
LnGrp LOS	A	B	B	A	A	A	B	A	B	B	A	B
Approach Vol, veh/h	236				688				224			
Approach Delay, s/veh	10.4				4.4				12.0			
Approach LOS	B				A				B			
Timer - Assigned Phs	2		3	4		6		8				
Phs Duration (G+Y+Rc), s	8.7		9.5	9.5		8.7		19.0				
Change Period (Y+Rc), s	4.5		4.5	4.5		4.5		4.5				
Max Green Setting (Gmax), s	20.5		7.5	48.5		20.5		60.5				
Max Q Clear Time (g_c+l1), s	4.2		4.0	3.8		2.2		3.7				
Green Ext Time (p_c), s	0.8		0.4	1.1		0.0		1.9				
Intersection Summary												
HCM 6th Ctrl Delay	7.2											
HCM 6th LOS	A											
Notes												

Timing Report, Sorted By Phase

1: James Ranch Rd & AZ 80

Opening Year PM

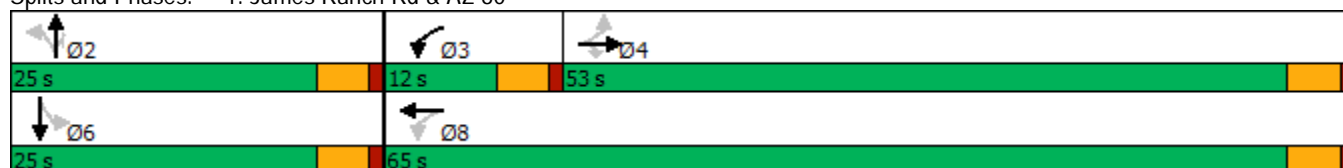


Phase Number	2	3	4	6	8
Movement	NBTL	WBL	EBTL	SBTL	WBTL
Lead/Lag		Lead	Lag		
Lead-Lag Optimize					
Recall Mode	None	Min	Min	None	Min
Maximum Split (s)	25	12	53	25	65
Maximum Split (%)	27.8%	13.3%	58.9%	27.8%	72.2%
Minimum Split (s)	22.5	9.5	22.5	22.5	22.5
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1	1	1	1	1
Minimum Initial (s)	5	5	5	5	5
Vehicle Extension (s)	3	3	3	3	3
Minimum Gap (s)	3	3	3	3	3
Time Before Reduce (s)	0	0	0	0	0
Time To Reduce (s)	0	0	0	0	0
Walk Time (s)	7		7	7	7
Flash Dont Walk (s)	11		11	11	11
Dual Entry	Yes	No	Yes	Yes	Yes
Inhibit Max	Yes	Yes	Yes	Yes	Yes
Start Time (s)	0	25	37	0	25
End Time (s)	25	37	0	25	0
Yield/Force Off (s)	20.5	32.5	85.5	20.5	85.5
Yield/Force Off 170(s)	9.5	32.5	85.5	9.5	85.5
Local Start Time (s)	0	25	37	0	25
Local Yield (s)	20.5	32.5	85.5	20.5	85.5
Local Yield 170(s)	9.5	32.5	85.5	9.5	85.5

Intersection Summary

Cycle Length	90
Control Type	Actuated-Uncoordinated
Natural Cycle	55
























Splits and Phases: 1: James Ranch Rd & AZ 80



HCM 6th Signalized Intersection Summary

Opening Year PM

1: James Ranch Rd & AZ 80

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	5	301	32	118	245	5	56	5	348	5	5	5
Future Volume (veh/h)	5	301	32	118	245	5	56	5	348	5	5	5
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1870	1737	937	1426	1663	1870	1604	1870	1500	1870	1870	1870
Adj Flow Rate, veh/h	6	354	40	148	288	6	70	0	413	6	6	6
Peak Hour Factor	0.80	0.85	0.80	0.80	0.85	0.85	0.80	0.85	0.85	0.80	0.80	0.80
Percent Heavy Veh, %	2	11	65	32	16	2	20	2	27	2	2	2
Cap, veh/h	443	716	172	973	1552	32	502	0	637	451	215	215
Arrive On Green	0.22	0.22	0.22	0.14	0.49	0.49	0.25	0.00	0.25	0.25	0.25	0.25
Sat Flow, veh/h	1085	3300	794	2634	3165	66	1202	0	2542	973	858	858
Grp Volume(v), veh/h	6	354	40	148	144	150	70	0	413	6	0	12
Grp Sat Flow(s),veh/h/ln	1085	1650	794	1317	1580	1651	1202	0	1271	973	0	1716
Q Serve(g_s), s	0.2	3.3	1.4	1.2	1.8	1.8	1.6	0.0	5.0	0.2	0.0	0.2
Cycle Q Clear(g_c), s	0.2	3.3	1.4	1.2	1.8	1.8	1.8	0.0	5.0	0.2	0.0	0.2
Prop In Lane	1.00		1.00	1.00		0.04	1.00		1.00	1.00		0.50
Lane Grp Cap(c), veh/h	443	716	172	973	775	810	502	0	637	451	0	430
V/C Ratio(X)	0.01	0.49	0.23	0.15	0.19	0.19	0.14	0.00	0.65	0.01	0.00	0.03
Avail Cap(c_a), veh/h	1722	4608	1108	1163	2751	2876	910	0	1500	782	0	1013
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	10.7	11.9	11.2	6.7	5.0	5.0	10.5	0.0	11.6	9.8	0.0	9.8
Incr Delay (d2), s/veh	0.0	0.5	0.7	0.1	0.1	0.1	0.1	0.0	1.1	0.0	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.0	1.4	0.3	0.2	0.3	0.3	0.6	0.0	1.6	0.0	0.0	0.1
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	10.7	12.5	11.9	6.7	5.1	5.1	10.6	0.0	12.8	9.8	0.0	9.8
LnGrp LOS	B	B	B	A	A	A	B	A	B	A	A	A
Approach Vol, veh/h	400			442			483			18		
Approach Delay, s/veh	12.4			5.6			12.5			9.8		
Approach LOS	B			A			B			A		
Timer - Assigned Phs	2		3	4		6		8				
Phs Duration (G+Y+Rc), s	13.2		9.5	12.0		13.2		21.5				
Change Period (Y+Rc), s	4.5		4.5	4.5		4.5		4.5				
Max Green Setting (Gmax), s	20.5		7.5	48.5		20.5		60.5				
Max Q Clear Time (g_c+I1), s	7.0		3.2	5.3		2.2		3.8				
Green Ext Time (p_c), s	1.7		0.2	2.3		0.0		1.5				
Intersection Summary												
HCM 6th Ctrl Delay	10.2											
HCM 6th LOS	B											
Notes												

Timing Report, Sorted By Phase

Horizon Year AM

1: James Ranch Rd & AZ 80



Phase Number	2	3	4	6	8
Movement	NBTL	WBL	EBTL	SBTL	WBT
Lead/Lag		Lead	Lag		
Lead-Lag Optimize					
Recall Mode	None	Min	Min	None	Min
Maximum Split (s)	25	27	38	25	65
Maximum Split (%)	27.8%	30.0%	42.2%	27.8%	72.2%
Minimum Split (s)	22.5	9.5	22.5	22.5	22.5
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1	1	1	1	1
Minimum Initial (s)	5	5	5	5	5
Vehicle Extension (s)	3	3	3	3	3
Minimum Gap (s)	3	3	3	3	3
Time Before Reduce (s)	0	0	0	0	0
Time To Reduce (s)	0	0	0	0	0
Walk Time (s)	7		7	7	7
Flash Dont Walk (s)	11		11	11	11
Dual Entry	Yes	No	Yes	Yes	Yes
Inhibit Max	Yes	Yes	Yes	Yes	Yes
Start Time (s)	0	25	52	0	25
End Time (s)	25	52	0	25	0
Yield/Force Off (s)	20.5	47.5	85.5	20.5	85.5
Yield/Force Off 170(s)	9.5	47.5	85.5	9.5	85.5
Local Start Time (s)	0	25	52	0	25
Local Yield (s)	20.5	47.5	85.5	20.5	85.5
Local Yield 170(s)	9.5	47.5	85.5	9.5	85.5

Intersection Summary

Cycle Length	90
Control Type	Actuated-Uncoordinated
Natural Cycle	80























Splits and Phases: 1: James Ranch Rd & AZ 80



HCM 6th Signalized Intersection Summary

Horizon Year AM

1: James Ranch Rd & AZ 80

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	10	193	166	855	479	10	76	10	471	10	10	10
Future Volume (veh/h)	10	193	166	855	479	10	76	10	471	10	10	10
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No				No				No			
Adj Sat Flow, veh/h/ln	1870	1737	1411	1574	1678	1870	1604	1870	1500	1870	1870	1870
Adj Flow Rate, veh/h	12	227	195	950	564	12	95	0	507	12	12	12
Peak Hour Factor	0.80	0.85	0.85	0.90	0.85	0.85	0.80	0.85	0.85	0.80	0.80	0.80
Percent Heavy Veh, %	2	11	33	22	15	2	20	2	27	2	2	2
Cap, veh/h	287	701	254	993	1986	42	383	0	613	324	207	207
Arrive On Green	0.21	0.21	0.21	0.34	0.62	0.62	0.24	0.00	0.24	0.24	0.24	0.24
Sat Flow, veh/h	837	3300	1196	2908	3191	68	1189	0	2542	892	858	858
Grp Volume(v), veh/h	12	227	195	950	281	295	95	0	507	12	0	24
Grp Sat Flow(s),veh/h/ln	837	1650	1196	1454	1594	1665	1189	0	1271	892	0	1716
Q Serve(g_s), s	0.8	3.8	10.1	21.0	5.3	5.3	4.4	0.0	12.5	0.7	0.0	0.7
Cycle Q Clear(g_c), s	0.8	3.8	10.1	21.0	5.3	5.3	5.1	0.0	12.5	0.7	0.0	0.7
Prop In Lane	1.00		1.00	1.00		0.04	1.00		1.00	1.00		0.50
Lane Grp Cap(c), veh/h	287	701	254	993	992	1036	383	0	613	324	0	414
V/C Ratio(X)	0.04	0.32	0.77	0.96	0.28	0.28	0.25	0.00	0.83	0.04	0.00	0.06
Avail Cap(c_a), veh/h	535	1679	608	993	1464	1530	467	0	791	387	0	534
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	20.7	21.9	24.4	21.2	5.7	5.7	21.2	0.0	23.7	19.2	0.0	19.2
Incr Delay (d2), s/veh	0.1	0.3	4.9	18.9	0.2	0.1	0.3	0.0	5.7	0.0	0.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.2	2.3	5.0	13.0	1.9	1.9	2.1	0.0	6.5	0.2	0.0	0.5
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	20.8	22.2	29.3	40.1	5.9	5.9	21.5	0.0	29.4	19.3	0.0	19.3
LnGrp LOS	C	C	C	D	A	A	C	A	C	B	A	B
Approach Vol, veh/h	434				1526				602			
Approach Delay, s/veh	25.3				27.2				28.2			
Approach LOS	C				C				C			
Timer - Assigned Phs	2		3	4		6		8				
Phs Duration (G+Y+Rc), s	20.4		27.0	18.5		20.4		45.5				
Change Period (Y+Rc), s	4.5		4.5	4.5		4.5		4.5				
Max Green Setting (Gmax), s	20.5		22.5	33.5		20.5		60.5				
Max Q Clear Time (g_c+I1), s	14.5		23.0	12.1		2.7		7.3				
Green Ext Time (p_c), s	1.4		0.0	1.9		0.1		3.2				
Intersection Summary												
HCM 6th Ctrl Delay	27.0											
HCM 6th LOS	C											
Notes												

Timing Report, Sorted By Phase

Horizon Year PM

1: James Ranch Rd & AZ 80

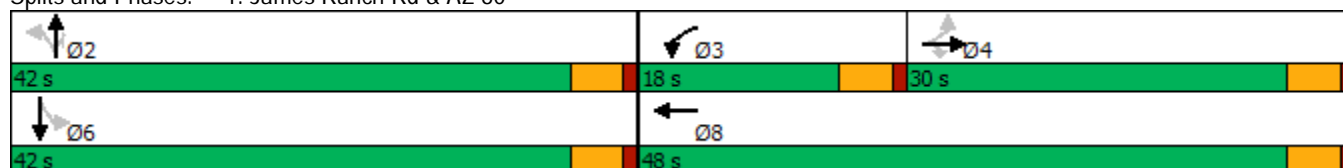


Phase Number	2	3	4	6	8
Movement	NBTL	WBL	EBTL	SBTL	WBT
Lead/Lag		Lead	Lag		
Lead-Lag Optimize					
Recall Mode	None	Min	Min	None	Min
Maximum Split (s)	42	18	30	42	48
Maximum Split (%)	46.7%	20.0%	33.3%	46.7%	53.3%
Minimum Split (s)	22.5	9.5	22.5	22.5	22.5
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1	1	1	1	1
Minimum Initial (s)	5	5	5	5	5
Vehicle Extension (s)	3	3	3	3	3
Minimum Gap (s)	3	3	3	3	3
Time Before Reduce (s)	0	0	0	0	0
Time To Reduce (s)	0	0	0	0	0
Walk Time (s)	7		7	7	7
Flash Dont Walk (s)	11		11	11	11
Dual Entry	Yes	No	Yes	Yes	Yes
Inhibit Max	Yes	Yes	Yes	Yes	Yes
Start Time (s)	0	42	60	0	42
End Time (s)	42	60	0	42	0
Yield/Force Off (s)	37.5	55.5	85.5	37.5	85.5
Yield/Force Off 170(s)	26.5	55.5	85.5	26.5	85.5
Local Start Time (s)	0	42	60	0	42
Local Yield (s)	37.5	55.5	85.5	37.5	85.5
Local Yield 170(s)	26.5	55.5	85.5	26.5	85.5

Intersection Summary

Cycle Length	90
Control Type	Actuated-Uncoordinated
Natural Cycle	70
























Splits and Phases: 1: James Ranch Rd & AZ 80



HCM 6th Signalized Intersection Summary

Horizon Year PM

1: James Ranch Rd & AZ 80

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	10	465	78	355	374	10	185	10	1091	10	10	10
Future Volume (veh/h)	10	465	78	355	374	10	185	10	1091	10	10	10
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1870	1737	1218	1530	1663	1870	1604	1870	1559	1870	1870	1870
Adj Flow Rate, veh/h	12	547	98	418	440	12	218	0	1098	12	12	12
Peak Hour Factor	0.80	0.85	0.80	0.85	0.85	0.85	0.85	0.90	0.90	0.80	0.80	0.80
Percent Heavy Veh, %	2	11	46	25	16	2	20	2	23	2	2	2
Cap, veh/h	292	708	222	477	1382	38	613	0	1182	320	384	384
Arrive On Green	0.21	0.21	0.21	0.17	0.44	0.44	0.45	0.00	0.45	0.45	0.45	0.45
Sat Flow, veh/h	939	3300	1032	2826	3142	86	1189	0	2643	514	858	858
Grp Volume(v), veh/h	12	547	98	418	221	231	218	0	1098	12	0	24
Grp Sat Flow(s),veh/h/ln	939	1650	1032	1413	1580	1647	1189	0	1321	514	0	1716
Q Serve(g_s), s	0.8	12.5	6.6	11.5	7.3	7.3	10.1	0.0	31.4	1.1	0.0	0.6
Cycle Q Clear(g_c), s	0.8	12.5	6.6	11.5	7.3	7.3	10.7	0.0	31.4	1.1	0.0	0.6
Prop In Lane	1.00		1.00	1.00		0.05	1.00		1.00	1.00		0.50
Lane Grp Cap(c), veh/h	292	708	222	477	695	725	613	0	1182	320	0	768
V/C Ratio(X)	0.04	0.77	0.44	0.88	0.32	0.32	0.36	0.00	0.93	0.04	0.00	0.03
Avail Cap(c_a), veh/h	390	1053	329	477	860	897	639	0	1240	331	0	805
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	25.0	29.5	27.2	32.4	14.6	14.6	15.4	0.0	20.9	12.5	0.0	12.4
Incr Delay (d2), s/veh	0.1	2.1	1.4	16.5	0.3	0.3	0.3	0.0	11.9	0.0	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.3	8.1	2.8	8.2	4.0	4.2	4.7	0.0	14.8	0.2	0.0	0.4
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	25.0	31.6	28.6	48.9	14.8	14.8	15.7	0.0	32.7	12.5	0.0	12.4
LnGrp LOS	C	C	C	D	B	B	B	A	C	B	A	B
Approach Vol, veh/h	657			870			1316			36		
Approach Delay, s/veh	31.0			31.2			29.9			12.4		
Approach LOS	C			C			C			B		
Timer - Assigned Phs	2		3	4		6		8				
Phs Duration (G+Y+Rc), s	40.3		18.0	21.7		40.3		39.7				
Change Period (Y+Rc), s	4.5		4.5	4.5		4.5		4.5				
Max Green Setting (Gmax), s	37.5		13.5	25.5		37.5		43.5				
Max Q Clear Time (g_c+I1), s	33.4		13.5	14.5		3.1		9.3				
Green Ext Time (p_c), s	2.4		0.0	2.7		0.2		2.3				
Intersection Summary												
HCM 6th Ctrl Delay	30.3											
HCM 6th LOS	C											
Notes												

Timing Report, Sorted By Phase

1: James Ranch Rd & SR 80

TI Sensitivity Analysis AM



Phase Number	2	3	4	6	8
Movement	NBTL	WBL	EBTL	SBTL	WBT
Lead/Lag		Lead	Lag		
Lead-Lag Optimize					
Recall Mode	None	Min	Min	None	Min
Maximum Split (s)	23	44	23	23	67
Maximum Split (%)	25.6%	48.9%	25.6%	25.6%	74.4%
Minimum Split (s)	22.5	9.5	22.5	22.5	22.5
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1	1	1	1	1
Minimum Initial (s)	5	5	5	5	5
Vehicle Extension (s)	3	3	3	3	3
Minimum Gap (s)	3	3	3	3	3
Time Before Reduce (s)	0	0	0	0	0
Time To Reduce (s)	0	0	0	0	0
Walk Time (s)	7		7	7	7
Flash Dont Walk (s)	11		11	11	11
Dual Entry	Yes	No	Yes	Yes	Yes
Inhibit Max	Yes	Yes	Yes	Yes	Yes
Start Time (s)	0	23	67	0	23
End Time (s)	23	67	0	23	0
Yield/Force Off (s)	18.5	62.5	85.5	18.5	85.5
Yield/Force Off 170(s)	7.5	62.5	85.5	7.5	85.5
Local Start Time (s)	0	23	67	0	23
Local Yield (s)	18.5	62.5	85.5	18.5	85.5
Local Yield 170(s)	7.5	62.5	85.5	7.5	85.5

Intersection Summary

Cycle Length	90
Control Type	Actuated-Uncoordinated
Natural Cycle	90























Splits and Phases: 1: James Ranch Rd & SR 80



HCM 6th Signalized Intersection Summary

TI Sensitivity Analysis AM

1: James Ranch Rd & SR 80

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	10	193	166	855	479	10	76	10	471	10	10	10
Future Volume (veh/h)	10	193	166	855	479	10	76	10	471	10	10	10
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1870	1737	1411	1574	1678	1870	1604	1870	1500	1870	1870	1870
Adj Flow Rate, veh/h	16	295	254	1235	733	15	124	16	720	16	16	16
Peak Hour Factor	0.80	0.85	0.85	0.90	0.85	0.85	0.80	0.80	0.85	0.80	0.80	0.80
Percent Heavy Veh, %	2	11	33	22	15	2	20	2	27	2	2	2
Cap, veh/h	229	686	249	1281	2233	46	299	374	1433	220	171	171
Arrive On Green	0.21	0.21	0.21	0.44	0.70	0.70	0.20	0.20	0.20	0.20	0.20	0.20
Sat Flow, veh/h	713	3300	1196	2908	3194	65	1181	1870	2237	722	858	858
Grp Volume(v), veh/h	16	295	254	1235	366	382	124	16	720	16	0	32
Grp Sat Flow(s),veh/h/ln	713	1650	1196	1454	1594	1666	1181	1870	1119	722	0	1716
Q Serve(g_s), s	1.6	6.9	18.5	36.7	8.0	8.0	8.5	0.6	15.2	1.6	0.0	1.4
Cycle Q Clear(g_c), s	1.6	6.9	18.5	36.7	8.0	8.0	9.9	0.6	15.2	2.2	0.0	1.4
Prop In Lane	1.00		1.00	1.00		0.04	1.00		1.00	1.00		0.50
Lane Grp Cap(c), veh/h	229	686	249	1281	1114	1165	299	374	1433	220	0	343
V/C Ratio(X)	0.07	0.43	1.02	0.96	0.33	0.33	0.41	0.04	0.50	0.07	0.00	0.09
Avail Cap(c_a), veh/h	229	686	249	1291	1120	1170	308	389	1451	226	0	357
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	28.6	30.6	35.2	24.2	5.2	5.2	33.0	28.7	8.5	29.6	0.0	29.0
Incr Delay (d2), s/veh	0.1	0.4	62.8	17.1	0.2	0.2	0.9	0.0	0.3	0.1	0.0	0.1
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.5	4.6	14.4	19.6	3.0	3.1	4.4	0.5	4.7	0.5	0.0	1.0
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	28.7	31.1	98.0	41.3	5.4	5.4	34.0	28.8	8.8	29.8	0.0	29.1
LnGrp LOS	C	C	F	D	A	A	C	C	A	C	A	C
Approach Vol, veh/h	565			1983			860			48		
Approach Delay, s/veh	61.1			27.7			12.8			29.4		
Approach LOS	E			C			B			C		
Timer - Assigned Phs	2			3			4			6		
Phs Duration (G+Y+Rc), s	22.3			43.7			23.0			22.3		
Change Period (Y+Rc), s	4.5			4.5			4.5			4.5		
Max Green Setting (Gmax), s	18.5			39.5			18.5			62.5		
Max Q Clear Time (g_c+I1), s	17.2			38.7			20.5			4.2		
Green Ext Time (p_c), s	0.6			0.4			0.0			0.1		
Intersection Summary												
HCM 6th Ctrl Delay	29.5											
HCM 6th LOS	C											

Timing Report, Sorted By Phase

1: James Ranch Rd & SR 80

TI Sensitivity Analysis PM

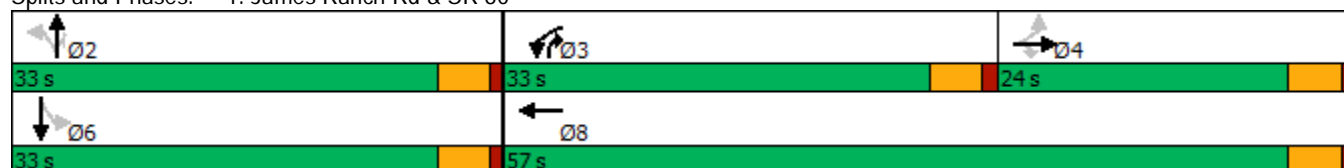


Phase Number	2	3	4	6	8
Movement	NBTL	WBL	EBTL	SBTL	WBT
Lead/Lag		Lead	Lag		
Lead-Lag Optimize					
Recall Mode	None	Min	Min	None	Min
Maximum Split (s)	33	33	24	33	57
Maximum Split (%)	36.7%	36.7%	26.7%	36.7%	63.3%
Minimum Split (s)	22.5	9.5	22.5	22.5	22.5
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	1	1	1	1	1
Minimum Initial (s)	5	5	5	5	5
Vehicle Extension (s)	3	3	3	3	3
Minimum Gap (s)	3	3	3	3	3
Time Before Reduce (s)	0	0	0	0	0
Time To Reduce (s)	0	0	0	0	0
Walk Time (s)	7		7	7	7
Flash Dont Walk (s)	11		11	11	11
Dual Entry	Yes	No	Yes	Yes	Yes
Inhibit Max	Yes	Yes	Yes	Yes	Yes
Start Time (s)	0	33	66	0	33
End Time (s)	33	66	0	33	0
Yield/Force Off (s)	28.5	61.5	85.5	28.5	85.5
Yield/Force Off 170(s)	17.5	61.5	85.5	17.5	85.5
Local Start Time (s)	0	33	66	0	33
Local Yield (s)	28.5	61.5	85.5	28.5	85.5
Local Yield 170(s)	17.5	61.5	85.5	17.5	85.5

Intersection Summary

Cycle Length	90
Control Type	Actuated-Uncoordinated
Natural Cycle	100
























Splits and Phases: 1: James Ranch Rd & SR 80



HCM 6th Signalized Intersection Summary

TI Sensitivity Analysis PM

1: James Ranch Rd & SR 80

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	10	465	78	355	374	10	185	10	1091	10	10	10
Future Volume (veh/h)	10	465	78	355	374	10	185	10	1091	10	10	10
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1870	1737	1218	1530	1663	1870	1604	1870	1559	1870	1870	1870
Adj Flow Rate, veh/h	16	711	127	543	572	15	283	16	1576	16	16	16
Peak Hour Factor	0.80	0.85	0.80	0.85	0.85	0.85	0.85	0.80	0.90	0.80	0.80	0.80
Percent Heavy Veh, %	2	11	46	25	16	2	20	2	23	2	2	2
Cap, veh/h	290	793	248	646	1654	43	502	674	1370	205	309	309
Arrive On Green	0.24	0.24	0.24	0.23	0.53	0.53	0.36	0.36	0.36	0.36	0.36	0.36
Sat Flow, veh/h	829	3300	1032	2826	3145	82	1181	1870	2325	320	858	858
Grp Volume(v), veh/h	16	711	127	543	287	300	283	16	1576	16	0	32
Grp Sat Flow(s),veh/h/ln	829	1650	1032	1413	1580	1648	1181	1870	1163	320	0	1716
Q Serve(g_s), s	1.2	16.5	8.4	14.5	8.3	8.3	16.3	0.4	28.5	2.7	0.0	1.0
Cycle Q Clear(g_c), s	1.2	16.5	8.4	14.5	8.3	8.3	17.2	0.4	28.5	3.1	0.0	1.0
Prop In Lane	1.00		1.00	1.00		0.05	1.00		1.00	1.00		0.50
Lane Grp Cap(c), veh/h	290	793	248	646	831	867	502	674	1370	205	0	618
V/C Ratio(X)	0.06	0.90	0.51	0.84	0.35	0.35	0.56	0.02	1.15	0.08	0.00	0.05
Avail Cap(c_a), veh/h	295	814	255	1018	1048	1094	502	674	1370	205	0	618
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	23.3	29.1	26.0	29.1	10.9	10.9	22.1	16.3	16.3	17.3	0.0	16.5
Incr Delay (d2), s/veh	0.1	12.5	1.6	3.7	0.2	0.2	1.5	0.0	76.6	0.2	0.0	0.0
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.4	11.5	3.5	8.2	4.1	4.3	7.9	0.3	33.7	0.4	0.0	0.7
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	23.4	41.5	27.7	32.8	11.1	11.1	23.6	16.3	92.9	17.5	0.0	16.5
LnGrp LOS	C	D	C	C	B	B	C	B	F	B	A	B
Approach Vol, veh/h	854			1130			1875			48		
Approach Delay, s/veh	39.1			21.6			81.8			16.9		
Approach LOS	D			C			F			B		
Timer - Assigned Phs	2			3			4			6		
Phs Duration (G+Y+Rc), s	33.0			22.6			23.5			33.0		
Change Period (Y+Rc), s	4.5			4.5			4.5			4.5		
Max Green Setting (Gmax), s	28.5			28.5			19.5			28.5		
Max Q Clear Time (g_c+I1), s	30.5			16.5			18.5			5.1		
Green Ext Time (p_c), s	0.0			1.6			0.5			0.4		
Intersection Summary												
HCM 6th Ctrl Delay	54.2											
HCM 6th LOS	D											

***SR 80 / James Ranch Road Intersection
(2028/2050 Roundabout)***

Scheme Summary

Control Data

Control Data and Model Parameters

Douglas IPOE	2028 PHF Flow Profile (veh)
2028 Roundabout, NBR Bypass	7.5 min Time Slice
Rodel-Win1	Control Delays (sec)
Right Hand Drive	Daylight conditions
AM Peak Hour	Peak 60/15 min Results
Full Geometry	Output flows: Vehicles
English Units (ft)	50% Confidence Level

Operational Data

Main Geometry (ft)

Approach and Entry Geometry

Leg	Leg Names	Approach Bearing (deg)	Grade Separation G	Half Width V	Approach Lanes n	Entry Width E	Entry Lanes n	Flare Length L'	Entry Radius R	Entry Angle Phi
1	James Ranch Road	0	0	24.00	2	24.00	2	0.00	90.00	40.00
2	SR 80	83	0	24.00	2	24.00	2	0.00	90.00	40.00
3	James Ranch Road	180	0	12.00	1	12.00	1	0.00	90.00	40.00
4	SR 80	263	0	24.00	2	24.00	2	0.00	90.00	40.00

Circulating and Exit Geometry

Leg	Leg Names	Inscribed Diameter D	Circulating Width C	Circulating Lanes nc	Exit Width Ex	Exit Lanes nex	Exit Half Width Vx	Exit Half Width Lanes nvx
1	James Ranch Road	200.00	30.00	2	24.00	2	24.00	2
2	SR 80	200.00	30.00	2	24.00	2	24.00	2
3	James Ranch Road	200.00	30.00	2	13.00	1	12.00	1
4	SR 80	200.00	30.00	2	24.00	2	24.00	2

Capacity Modifiers and Capacity Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Entry Calibration		Approach Road			Exit Road		
		Capacity + or -	XWalk Factor	Intercept + or -	Slope Factor	V (ft)	Default Capacity	Calib Capacity	V (ft)	Default Capacity	Calib Capacity
1	James Ranch Road	0	1.000	0	1.000	36.00	5377	0	24.00	3584	0
2	SR 80	0	1.000	0	1.000	20.00	3584	0	24.00	3584	0
3	James Ranch Road	0	1.000	0	1.000	20.00	1792	0	12.00	1792	0
4	SR 80	0	1.000	0	1.000	20.00	3584	0	24.00	3584	0

Bypass Geometry

Bypass Approach Geometry (ft)

Leg	Leg Names	Bypass Type	Bypass Flows	V	nv	Vb	nvb	Vt	nvt
1	James Ranch Road	Free	162	24	2	12	1	36	3

Bypass Entry and Exit Geometry (ft)

Leg	Leg Names	Entry Geometry						Leg	Leg Names	Exit Lanes	
		Eb	neb	Lb	Lt	Rb	Phib			nex	Nmx
1	James Ranch Road	12	1	0	130	120.000 1958	30	2	SR 80	2	2

Bypass Entry Capacity Modifiers and Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Calibration	
		Capacity + or -	Cross Walk Factor	Intercept + or -	Slope Factor
1	James Ranch Road	0	1.000	0	1.000

Traffic Flow Data (veh/hr)

2028 AM Peak Peak Hour Flows

Leg	Leg Names	Turning Flows					Flow Modifiers		
		U-Turn	Exit-3	Exit-2	Exit-1	Bypass	Trucks %	Flow Factor	Peak Hour Factor
1	James Ranch Road	0	23	5	0	162	30.0	1.00	0.850
2	SR 80	0	268	312	5	0	21.0	1.00	0.850
3	James Ranch Road	0	5	5	5	0	2.0	1.00	0.800
4	SR 80	0	5	125	59	0	18.0	1.00	0.850

Operational Results

2028 AM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	James Ranch Road	Free	28	162	135	0	332	1225	1054	0.0228	0.1537
2	SR 80	None	585		33		292	1464		0.3995	
3	James Ranch Road	None	15		603		15	823		0.0182	
4	SR 80	None	189		278		340	1408		0.1342	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	James Ranch Road	Free	2.97	1.54	1.75	0.07	0.00	A	A	A
2	SR 80	None	8.19		8.19	2.98		A		A
3	James Ranch Road	None	4.49		4.49	0.06		A		A
4	SR 80	None	4.74		4.74	0.60		A		A

Global Results

Performance and Accidents

2028 AM Peak Global Performance

Parameter	Units	Entries	Bypasses	Total
Arrive Flows	veh/hr	817	162	979
Capacity	veh/hr	4921	1054	5975
Average Delay	sec/veh	6.27	0.77	5.36
L.O.S. (Signal)	A – F	A	A	A
L.O.S. (Unsig)	A – F	A	A	A
Total Delay	veh.hrs	1.42	0.03	1.46

Scheme Summary

Control Data

Control Data and Model Parameters

Douglas IPOE	2028 PHF Flow Profile (veh)
2028 Roundabout, NBR Bypass	7.5 min Time Slice
Rodel-Win1	Control Delays (sec)
Right Hand Drive	Nighttime conditions
PM Peak Hour	Peak 60/15 min Results
Full Geometry	Output flows: Vehicles
English Units (ft)	50% Confidence Level

Operational Data

Main Geometry (ft)

Approach and Entry Geometry

Leg	Leg Names	Approach Bearing (deg)	Grade Separation G	Half Width V	Approach Lanes n	Entry Width E	Entry Lanes n	Flare Length L'	Entry Radius R	Entry Angle Phi
1	James Ranch Road	0	0	24.00	2	24.00	2	0.00	90.00	40.00
2	SR 80	83	0	24.00	2	24.00	2	0.00	90.00	40.00
3	James Ranch Road	180	0	12.00	1	12.00	1	0.00	90.00	40.00
4	SR 80	263	0	24.00	2	24.00	2	0.00	90.00	40.00

Circulating and Exit Geometry

Leg	Leg Names	Inscribed Diameter D	Circulating Width C	Circulating Lanes nc	Exit Width Ex	Exit Lanes nex	Exit Half Width Vx	Exit Half Width Lanes nvx
1	James Ranch Road	200.00	30.00	2	24.00	2	24.00	2
2	SR 80	200.00	30.00	2	24.00	2	24.00	2
3	James Ranch Road	200.00	30.00	2	13.00	1	12.00	1
4	SR 80	200.00	30.00	2	24.00	2	24.00	2

Capacity Modifiers and Capacity Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Entry Calibration		Approach Road			Exit Road		
		Capacity + or -	XWalk Factor	Intercept + or -	Slope Factor	V (ft)	Default Capacity	Calib Capacity	V (ft)	Default Capacity	Calib Capacity
1	James Ranch Road	0	1.000	0	1.000	36.00	5377	0	24.00	3584	0
2	SR 80	0	1.000	0	1.000	20.00	3584	0	24.00	3584	0
3	James Ranch Road	0	1.000	0	1.000	20.00	1792	0	12.00	1792	0
4	SR 80	0	1.000	0	1.000	20.00	3584	0	24.00	3584	0

Bypass Geometry

Bypass Approach Geometry (ft)

Leg	Leg Names	Bypass Type	Bypass Flows	V	nv	Vb	nvb	Vt	nvt
1	James Ranch Road	Free	348	24	2	12	1	36	3

Bypass Entry and Exit Geometry (ft)

Leg	Leg Names	Entry Geometry						Leg	Leg Names	Exit Lanes	
		Eb	neb	Lb	Lt	Rb	Phib			nex	Nmx
1	James Ranch Road	12	1	0	130	120.000 288	30	2	SR 80	2	2

Bypass Entry Capacity Modifiers and Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Calibration	
		Capacity + or -	Cross Walk Factor	Intercept + or -	Slope Factor
1	James Ranch Road	0	1.000	0	1.000

Traffic Flow Data (veh/hr)

2028 PM Peak Peak Hour Flows

Leg	Leg Names	Turning Flows					Flow Modifiers		
		U-Turn	Exit-3	Exit-2	Exit-1	Bypass	Trucks %	Flow Factor	Peak Hour Factor
1	James Ranch Road	0	56	5	0	348	30.0	1.00	0.850
2	SR 80	0	118	245	5	0	21.0	1.00	0.850
3	James Ranch Road	0	5	5	5	0	2.0	1.00	0.800
4	SR 80	0	5	301	32	0	18.0	1.00	0.850

Operational Results

2028 PM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	James Ranch Road	Free	61	348	311	0	155	1084	1001	0.0563	0.3475
2	SR 80	None	368		66		654	1372		0.2683	
3	James Ranch Road	None	15		419		15	837		0.0179	
4	SR 80	None	338		128		306	1412		0.2394	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	James Ranch Road	Free	3.35	2.74	2.83	0.16	0.00	A	A	A
2	SR 80	None	6.16		6.16	1.35		A		A
3	James Ranch Road	None	4.41		4.41	0.06		A		A
4	SR 80	None	4.97		4.97	0.91		A		A

Global Results

Performance and Accidents

2028 PM Peak Global Performance

Parameter	Units	Entries	Bypasses	Total
Arrive Flows	veh/hr	782	348	1130
Capacity	veh/hr	4705	1001	5706
Average Delay	sec/veh	4.47	1.74	3.63
L.O.S. (Signal)	A – F	A	A	A
L.O.S. (Unsig)	A – F	A	A	A
Total Delay	veh.hrs	0.97	0.17	1.14

Scheme Summary

Control Data

Control Data and Model Parameters

Douglas IPOE	2050 PHF Flow Profile (veh)
2050 Roundabout, NBR Bypass	7.5 min Time Slice
Rodel-Win1	Control Delays (sec)
Right Hand Drive	Daylight conditions
AM Peak Hour	Peak 60/15 min Results
Full Geometry	Output flows: Vehicles
English Units (ft)	50% Confidence Level

Operational Data

Main Geometry (ft)

Approach and Entry Geometry

Leg	Leg Names	Approach Bearing (deg)	Grade Separation G	Half Width V	Approach Lanes n	Entry Width E	Entry Lanes n	Flare Length L'	Entry Radius R	Entry Angle Phi
1	James Ranch Road	0	0	24.00	2	24.00	2	0.00	90.00	40.00
2	SR 80	83	0	24.00	2	24.00	2	0.00	90.00	40.00
3	James Ranch Road	180	0	12.00	1	12.00	1	0.00	90.00	40.00
4	SR 80	263	0	24.00	2	24.00	2	0.00	90.00	40.00

Circulating and Exit Geometry

Leg	Leg Names	Inscribed Diameter D	Circulating Width C	Circulating Lanes nc	Exit Width Ex	Exit Lanes nex	Exit Half Width Vx	Exit Half Width Lanes nvx
1	James Ranch Road	200.00	30.00	2	24.00	2	24.00	2
2	SR 80	200.00	30.00	2	24.00	2	24.00	2
3	James Ranch Road	200.00	30.00	2	13.00	1	12.00	1
4	SR 80	200.00	30.00	2	24.00	2	24.00	2

Capacity Modifiers and Capacity Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Entry Calibration		Approach Road			Exit Road		
		Capacity + or -	XWalk Factor	Intercept + or -	Slope Factor	V (ft)	Default Capacity	Calib Capacity	V (ft)	Default Capacity	Calib Capacity
1	James Ranch Road	0	1.000	0	1.000	36.00	5377	0	24.00	3584	0
2	SR 80	0	1.000	0	1.000	20.00	3584	0	24.00	3584	0
3	James Ranch Road	0	1.000	0	1.000	20.00	1792	0	12.00	1792	0
4	SR 80	0	1.000	0	1.000	20.00	3584	0	24.00	3584	0

Bypass Geometry

Bypass Approach Geometry (ft)

Leg	Leg Names	Bypass Type	Bypass Flows	V	nv	Vb	nvb	Vt	nvt
1	James Ranch Road	Free	471	24	2	12	1	36	3

Bypass Entry and Exit Geometry (ft)

Leg	Leg Names	Entry Geometry						Leg	Leg Names	Exit Lanes	
		Eb	neb	Lb	Lt	Rb	Phib			nex	Nmx
1	James Ranch Road	12	1	0	130	120.000 1344	30	2	SR 80	2	2

Bypass Entry Capacity Modifiers and Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Calibration	
		Capacity + or -	Cross Walk Factor	Intercept + or -	Slope Factor
1	James Ranch Road	0	1.000	0	1.000

Traffic Flow Data (veh/hr)

2050 AM Peak Peak Hour Flows

Leg	Leg Names	Turning Flows					Flow Modifiers		
		U-Turn	Exit-3	Exit-2	Exit-1	Bypass	Trucks %	Flow Factor	Peak Hour Factor
1	James Ranch Road	0	76	10	0	471	24.0	1.00	0.850
2	SR 80	0	855	479	10	0	20.0	1.00	0.900
3	James Ranch Road	0	10	10	10	0	2.0	1.00	0.800
4	SR 80	0	10	193	166	0	17.0	1.00	0.850

Operational Results

2050 AM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	James Ranch Road	Free	86	471	213	0	1024	1311	1105	0.0656	0.4262
2	SR 80	None	1344		96		674	1456		0.9233	
3	James Ranch Road	None	30		1399		30	536		0.0559	
4	SR 80	None	369		868		561	1110		0.3324	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	James Ranch Road	Free	3.21	3.13	3.14	0.20	0.00	A	A	A
2	SR 80	None	18.87		18.87	18.43		C		C
3	James Ranch Road	None	7.45		7.45	0.21		A		A
4	SR 80	None	9.37		9.37	2.45		A		A

Global Results

Performance and Accidents

2050 AM Peak Global Performance

Parameter	Units	Entries	Bypasses	Total
Arrive Flows	veh/hr	1829	471	2300
Capacity	veh/hr	4413	1105	5518
Average Delay	sec/veh	15.08	2.13	12.43
L.O.S. (Signal)	A – F	B	A	B
L.O.S. (Unsig)	A – F	C	A	B
Total Delay	veh.hrs	7.66	0.28	7.94

Scheme Summary

Control Data

Control Data and Model Parameters

Douglas IPOE	2050 PHF Flow Profile (veh)
2050 Roundabout, NBR Bypass	7.5 min Time Slice
Rodel-Win1	Control Delays (sec)
Right Hand Drive	Nighttime conditions
PM Peak Hour	Peak 60/15 min Results
Full Geometry	Output flows: Vehicles
English Units (ft)	50% Confidence Level

Operational Data

Main Geometry (ft)

Approach and Entry Geometry

Leg	Leg Names	Approach Bearing (deg)	Grade Separation G	Half Width V	Approach Lanes n	Entry Width E	Entry Lanes n	Flare Length L'	Entry Radius R	Entry Angle Phi
1	James Ranch Road	0	0	24.00	2	24.00	2	0.00	90.00	40.00
2	SR 80	83	0	24.00	2	24.00	2	0.00	90.00	40.00
3	James Ranch Road	180	0	12.00	1	12.00	1	0.00	90.00	40.00
4	SR 80	263	0	24.00	2	24.00	2	0.00	90.00	40.00

Circulating and Exit Geometry

Leg	Leg Names	Inscribed Diameter D	Circulating Width C	Circulating Lanes nc	Exit Width Ex	Exit Lanes nex	Exit Half Width Vx	Exit Half Width Lanes nvx
1	James Ranch Road	200.00	30.00	2	24.00	2	24.00	2
2	SR 80	200.00	30.00	2	24.00	2	24.00	2
3	James Ranch Road	200.00	30.00	2	13.00	1	12.00	1
4	SR 80	200.00	30.00	2	24.00	2	24.00	2

Capacity Modifiers and Capacity Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Entry Calibration		Approach Road			Exit Road		
		Capacity + or -	XWalk Factor	Intercept + or -	Slope Factor	V (ft)	Default Capacity	Calib Capacity	V (ft)	Default Capacity	Calib Capacity
1	James Ranch Road	0	1.000	0	1.000	36.00	5377	0	24.00	3584	0
2	SR 80	0	1.000	0	1.000	20.00	3584	0	24.00	3584	0
3	James Ranch Road	0	1.000	0	1.000	20.00	1792	0	12.00	1792	0
4	SR 80	0	1.000	0	1.000	20.00	3584	0	24.00	3584	0

Bypass Geometry

Bypass Approach Geometry (ft)

Leg	Leg Names	Bypass Type	Bypass Flows	V	nv	Vb	nvb	Vt	nvt
1	James Ranch Road	Free	1091	24	2	12	1	36	3

Bypass Entry and Exit Geometry (ft)

Leg	Leg Names	Entry Geometry						Leg	Leg Names	Exit Lanes	
		Eb	neb	Lb	Lt	Rb	Phib			nex	Nmx
1	James Ranch Road	12	1	0	130	120.000 1152	30	2	SR 80	2	2

Bypass Entry Capacity Modifiers and Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Calibration	
		Capacity + or -	Cross Walk Factor	Intercept + or -	Slope Factor
1	James Ranch Road	0	1.000	0	1.000

Traffic Flow Data (veh/hr)

2050 PM Peak Peak Hour Flows

Leg	Leg Names	Turning Flows					Flow Modifiers		
		U-Turn	Exit-3	Exit-2	Exit-1	Bypass	Trucks %	Flow Factor	Peak Hour Factor
1	James Ranch Road	0	185	10	0	1091	24.0	1.00	0.900
2	SR 80	0	355	374	10	0	20.0	1.00	0.900
3	James Ranch Road	0	10	10	10	0	2.0	1.00	0.800
4	SR 80	0	10	465	78	0	17.0	1.00	0.850

Operational Results

2050 PM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	James Ranch Road	Free	195	1091	485	0	443	1109	1049	0.1759	1.0396
2	SR 80	None	739		205		1524	1322		0.5592	
3	James Ranch Road	None	30		914		30	658		0.0456	
4	SR 80	None	553		375		569	1302		0.4248	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	James Ranch Road	Free	4.77	23.33	20.51	0.54	40.81	A	C	C
2	SR 80	None	11.41		11.41	5.15		B		B
3	James Ranch Road	None	5.99		5.99	0.17		A		A
4	SR 80	None	7.10		7.10	2.29		A		A

Global Results

Performance and Accidents

2050 PM Peak Global Performance

Parameter	Units	Entries	Bypasses	Total
Arrive Flows	veh/hr	1517	1091	2608
Capacity	veh/hr	4391	1049	5440
Average Delay	sec/veh	7.91	22.33	13.94
L.O.S. (Signal)	A – F	A	C	B
L.O.S. (Unsig)	A – F	A	C	B
Total Delay	veh.hrs	3.33	6.77	10.10

Scheme Summary

Control Data

Control Data and Model Parameters

Douglas IPOE	2050 PHF Flow Profile (veh)
TI Sensitivity Roundabout, NBR Bypass	7.5 min Time Slice
Rodel-Win1	Control Delays (sec)
Right Hand Drive	Daylight conditions
AM Peak Hour	Peak 60/15 min Results
Full Geometry	Output flows: Vehicles
English Units (ft)	50% Confidence Level

Operational Data

Main Geometry (ft)

Approach and Entry Geometry

Leg	Leg Names	Approach Bearing (deg)	Grade Separation G	Half Width V	Approach Lanes n	Entry Width E	Entry Lanes n	Flare Length L'	Entry Radius R	Entry Angle Phi
1	James Ranch Road	0	0	24.00	2	24.00	2	0.00	90.00	40.00
2	SR 80	83	0	24.00	2	24.00	2	0.00	90.00	40.00
3	James Ranch Road	180	0	12.00	1	12.00	1	0.00	90.00	40.00
4	SR 80	263	0	24.00	2	24.00	2	0.00	90.00	40.00

Circulating and Exit Geometry

Leg	Leg Names	Inscribed Diameter D	Circulating Width C	Circulating Lanes nc	Exit Width Ex	Exit Lanes nex	Exit Half Width Vx	Exit Half Width Lanes nvx
1	James Ranch Road	200.00	30.00	2	24.00	2	24.00	2
2	SR 80	200.00	30.00	2	24.00	2	24.00	2
3	James Ranch Road	200.00	30.00	2	13.00	1	12.00	1
4	SR 80	200.00	30.00	2	24.00	2	24.00	2

Capacity Modifiers and Capacity Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Entry Calibration		Approach Road			Exit Road		
		Capacity + or -	XWalk Factor	Intercept + or -	Slope Factor	V (ft)	Default Capacity	Calib Capacity	V (ft)	Default Capacity	Calib Capacity
1	James Ranch Road	0	1.000	0	1.000	36.00	5377	0	24.00	3584	0
2	SR 80	0	1.000	0	1.000	20.00	3584	0	24.00	3584	0
3	James Ranch Road	0	1.000	0	1.000	20.00	1792	0	12.00	1792	0
4	SR 80	0	1.000	0	1.000	20.00	3584	0	24.00	3584	0

Bypass Geometry

Bypass Approach Geometry (ft)

Leg	Leg Names	Bypass Type	Bypass Flows	V	nv	Vb	nvb	Vt	nvt
1	James Ranch Road	Free	471	24	2	12	1	36	3

Bypass Entry and Exit Geometry (ft)

Leg	Leg Names	Entry Geometry						Leg	Leg Names	Exit Lanes	
		Eb	neb	Lb	Lt	Rb	Phib			nex	Nmx
1	James Ranch Road	12	1	0	130	120.000 3149	30	2	SR 80	2	2

Bypass Entry Capacity Modifiers and Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Calibration	
		Capacity + or -	Cross Walk Factor	Intercept + or -	Slope Factor
1	James Ranch Road	0	1.000	0	1.000

Traffic Flow Data (veh/hr)

2050 AM Peak Peak Hour Flows

Leg	Leg Names	Turning Flows					Flow Modifiers		
		U-Turn	Exit-3	Exit-2	Exit-1	Bypass	Trucks %	Flow Factor	Peak Hour Factor
1	James Ranch Road	0	76	10	0	471	24.0	1.20	0.850
2	SR 80	0	855	479	10	0	20.0	1.20	0.900
3	James Ranch Road	0	10	10	10	0	2.0	1.20	0.800
4	SR 80	0	10	193	166	0	17.0	1.20	0.850

Operational Results

2050 AM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	James Ranch Road	Free	103	565	256	0	1131	1290	1105	0.0800	0.5115
2	SR 80	None	1613		115		809	1445		1.1158	
3	James Ranch Road	None	36		1526		35	490		0.0734	
4	SR 80	None	443		943		618	1069		0.4142	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	James Ranch Road	Free	3.40	3.56	3.53	0.25	0.00	A	A	A
2	SR 80	None	46.76		46.76	77.26		E		E
3	James Ranch Road	None	8.32		8.32	0.26		A		A
4	SR 80	None	10.75		10.75	3.25		B		B

Global Results

Performance and Accidents

2050 AM Peak Global Performance

Parameter	Units	Entries	Bypasses	Total
Arrive Flows	veh/hr	2195	565	2760
Capacity	veh/hr	4295	1105	5400
Average Delay	sec/veh	35.86	2.56	29.04
L.O.S. (Signal)	A – F	D	A	C
L.O.S. (Unsig)	A – F	E	A	D
Total Delay	veh.hrs	21.86	0.40	22.27

Scheme Summary

Control Data

Control Data and Model Parameters

Douglas IPOE	2050 PHF Flow Profile (veh)
TI Sensitivity Roundabout, NBR Bypass	7.5 min Time Slice
Rodel-Win1	Control Delays (sec)
Right Hand Drive	Nighttime conditions
PM Peak Hour	Peak 60/15 min Results
Full Geometry	Output flows: Vehicles
English Units (ft)	50% Confidence Level

Operational Data

Main Geometry (ft)

Approach and Entry Geometry

Leg	Leg Names	Approach Bearing (deg)	Grade Separation G	Half Width V	Approach Lanes n	Entry Width E	Entry Lanes n	Flare Length L'	Entry Radius R	Entry Angle Phi
1	James Ranch Road	0	0	24.00	2	24.00	2	0.00	90.00	40.00
2	SR 80	83	0	24.00	2	24.00	2	0.00	90.00	40.00
3	James Ranch Road	180	0	12.00	1	12.00	1	0.00	90.00	40.00
4	SR 80	263	0	24.00	2	24.00	2	0.00	90.00	40.00

Circulating and Exit Geometry

Leg	Leg Names	Inscribed Diameter D	Circulating Width C	Circulating Lanes nc	Exit Width Ex	Exit Lanes nex	Exit Half Width Vx	Exit Half Width Lanes nvx
1	James Ranch Road	200.00	30.00	2	24.00	2	24.00	2
2	SR 80	200.00	30.00	2	24.00	2	24.00	2
3	James Ranch Road	200.00	30.00	2	13.00	1	12.00	1
4	SR 80	200.00	30.00	2	24.00	2	24.00	2

Capacity Modifiers and Capacity Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Entry Calibration		Approach Road			Exit Road		
		Capacity + or -	XWalk Factor	Intercept + or -	Slope Factor	V (ft)	Default Capacity	Calib Capacity	V (ft)	Default Capacity	Calib Capacity
1	James Ranch Road	0	1.000	0	1.000	36.00	5377	0	24.00	3584	0
2	SR 80	0	1.000	0	1.000	20.00	3584	0	24.00	3584	0
3	James Ranch Road	0	1.000	0	1.000	20.00	1792	0	12.00	1792	0
4	SR 80	0	1.000	0	1.000	20.00	3584	0	24.00	3584	0

Bypass Geometry

Bypass Approach Geometry (ft)

Leg	Leg Names	Bypass Type	Bypass Flows	V	nv	Vb	nvb	Vt	nvt
1	James Ranch Road	Free	1091	24	2	12	1	36	3

Bypass Entry and Exit Geometry (ft)

Leg	Leg Names	Entry Geometry						Leg	Leg Names	Exit Lanes	
		Eb	neb	Lb	Lt	Rb	Phib			nex	Nmx
1	James Ranch Road	12	1	0	130	120.000 3341	30	2	SR 80	2	2

Bypass Entry Capacity Modifiers and Calibration (veh/hr)

Leg	Leg Names	Entry Capacity		Calibration	
		Capacity + or -	Cross Walk Factor	Intercept + or -	Slope Factor
1	James Ranch Road	0	1.000	0	1.000

Traffic Flow Data (veh/hr)

2050 PM Peak Peak Hour Flows

Leg	Leg Names	Turning Flows					Flow Modifiers		
		U-Turn	Exit-3	Exit-2	Exit-1	Bypass	Trucks %	Flow Factor	Peak Hour Factor
1	James Ranch Road	0	185	10	0	1091	24.0	1.10	0.900
2	SR 80	0	355	374	10	0	20.0	1.10	0.900
3	James Ranch Road	0	10	10	10	0	2.0	1.10	0.800
4	SR 80	0	10	465	78	0	17.0	1.10	0.850

Operational Results

2050 PM Peak - 60 minutes

Flows and Capacity

Leg	Leg Names	Bypass Type	Flows (veh/hr)					Capacity (veh/hr)			
			Arrival Flow		Opposing Flow		Exit Flow	Capacity		Average VCR	
			Entry	Bypass	Entry	Bypass		Entry	Bypass	Entry	Bypass
1	James Ranch Road	Free	215	1200	533	0	487	1086	1049	0.1975	1.1436
2	SR 80	None	813		225		1572	1310		0.6203	
3	James Ranch Road	None	33		1005		33	625		0.0528	
4	SR 80	None	608		412		626	1281		0.4747	

Delays, Queues and Level of Service

Leg	Leg Names	Bypass Type	Average Delay (sec)			95% Queue (veh)		Level of Service		
			Entry	Bypass	Leg	Entry	Bypass	Entry	Bypass	Leg
1	James Ranch Road	Free	5.08	60.97	52.50	0.63	69.53	A	F	F
2	SR 80	None	12.57		12.57	6.37		B		B
3	James Ranch Road	None	6.41		6.41	0.19		A		A
4	SR 80	None	7.71		7.71	2.80		A		A

Global Results

Performance and Accidents

2050 PM Peak Global Performance

Parameter	Units	Entries	Bypasses	Total
Arrive Flows	veh/hr	1669	1200	2869
Capacity	veh/hr	4303	1049	5352
Average Delay	sec/veh	8.73	59.97	30.17
L.O.S. (Signal)	A – F	A	E	C
L.O.S. (Unsig)	A – F	A	F	D
Total Delay	veh.hrs	4.05	19.99	24.04

Scheme Summary

Control Data

Control Data and Model Parameters

Douglas IPOE	2028 PHF Flow Profile (veh)
2028 Roundabout	7.5 min Time Slice
HCM 2010 Model	Control Delays (sec)
Right Hand Drive	Daylight conditions
AM Peak Hour	Peak 60/15 min Results
Full Geometry	Output flows: Vehicles
English Units (ft)	50% Confidence Level

Operational Data

HCM Lanes and Headways

HCM 2016 Bearings and Lanes

Leg	Leg Names	Bearing (deg)	Lanes			
			Approach Lanes	Entry Lanes	Circulating Lanes	Exit Lanes
1	James Ranch Road	0	2	2	2	2
2	SR 80	83	2	2	2	2
3	James Ranch Road	180	1	1	2	1
4	SR 80	263	2	2	2	2

HCM 2016 Default Headways (secs)

Lanes		Lane-1		Lane-2		Bypass Lane	
Entry	Circ	tf	tc	tf	tc	tf	tc
1	1			2.6087	4.9765	2.6087	4.9765
1	2			2.5352	4.3275	2.5352	4.3275
2	2	2.6667	4.6455	2.5352	4.3275		
2	1	2.5352	4.5435	2.5352	4.5435		

HCM 2016 Calibrated Headways (secs)

Lanes		Lane-1		Lane-2		Bypass Lane	
Entry	Circ	tf	tc	tf	tc	tf	tc
1	1			3.186	5.193	3.186	5.193
1	2			3.186	4.113	3.186	4.113
2	2	3.186	4.293	3.186	4.113		
2	1	3.186	5.193	3.186	5.193		

HCM 2016 Derived Intercept and Exponential for HCM or Calibration

Leg	Leg Names	Intercept (pcs/hr)				Exponent (×1000)			
		tf	L1	L2	Bp	tf, tc	L1	L2	Bp
1	James Ranch Road	HCM	1350	1420		HCM	0.92	0.85	
2	SR 80	HCM	1350	1420		HCM	0.92	0.85	
3	James Ranch Road	HCM		1420		HCM		0.85	
4	SR 80	HCM	1350	1420		HCM	0.92	0.85	

HCM 2016 Flow Profiles

Leg	Leg Names	Entry Lane Proportions		ByPass Capacity Modifiers (veh/hr)			Peak Hour Factor
		Left Lane	Right Lane	Bypass Type	Capacity + or -	Crosswalk Factor	
1	James Ranch Road	0.47	0.53	None	0	1.000	0.85
2	SR 80	0.47	0.53	None	0	1.000	0.85
3	James Ranch Road	0.00	1.00	None	0	1.000	0.80
4	SR 80	0.47	0.53	None	0	1.000	0.85

HCM 2016 Capacity and Volume Modifiers

Leg	Leg Names	Capacity Modifiers (veh/hr)		Volume Modifiers	
		Capacity + or -	Crosswalk Factor	Trucks %	Flow Factor
1	James Ranch Road	0	1.000	30.0	1.00
2	SR 80	0	1.000	21.0	1.00
3	James Ranch Road	0	1.000	2.0	1.00
4	SR 80	0	1.000	18.0	1.00

Traffic Flow Data (veh/hr)

2028 AM Peak Peak Hour Flows

Leg	Leg Names	Turning Flows					Flow Modifiers		
		U-Turn	Exit-3	Exit-2	Exit-1	Bypass	Trucks %	Flow Factor	Peak Hour Factor
1	James Ranch Road	0	23	5	162	0	30.0	1.00	0.850
2	SR 80	0	268	312	5	0	21.0	1.00	0.850
3	James Ranch Road	0	5	5	5	0	2.0	1.00	0.800
4	SR 80	0	5	125	59	0	18.0	1.00	0.850

Operational Results

HCM 2016 - 2028 AM Peak 60 minutes

Flows and Capacity

Leg	Leg Names	Flows (veh/hr)					Capacity (veh/hr)					
		Arrival Flow			Opposing Flow		Capacity			Average VCR		
		Left	Right	Bypass	Entry	Bypass	Left	Right	Bypass	Left	Right	Bypass
1	James Ranch Road	89	101		135		897	954		0.099	0.106	
2	SR 80	275	310		34		1072	1131		0.256	0.274	
3	James Ranch Road		15		603			747			0.020	
4	SR 80	89	100		278		841	906		0.106	0.110	

Delays, Queues and Level of Service

Leg	Leg Names	Average Delay (sec)				95% Queue (veh)			Level of Service			
		Left	Right	Bypass	Leg	Left	Right	Bypass	Left	Right	Bypass	Leg
1	James Ranch Road	5.0	4.7		4.8	0.3	0.4		A	A		A
2	SR 80	5.8	5.8		5.8	1.0	1.1		A	A		A
3	James Ranch Road		5.0		5.0		0.1			A		A
4	SR 80	5.3	5.0		5.2	0.4	0.4		A	A		A

Global Results

Performance and Accidents

2028 AM Peak Global Performance

Parameter	Units	Entries	Bypasses	Total
Arrive Flows	veh/hr	979		979
Capacity	veh/hr	6707		10466
Average Delay	sec/veh	10.85		10.85
L.O.S. (Signal)	A – F	B		B
L.O.S. (Unsig)	A – F	B		B
Total Delay	veh.hrs	2.95		2.95

Scheme Summary

Control Data

Control Data and Model Parameters

Douglas IPOE	2028 PHF Flow Profile (veh)
2028 Roundabout	7.5 min Time Slice
HCM 2010 Model	Control Delays (sec)
Right Hand Drive	Nighttime conditions
PM Peak Hour	Peak 60/15 min Results
Full Geometry	Output flows: Vehicles
English Units (ft)	50% Confidence Level

Operational Data

HCM Lanes and Headways

HCM 2016 Bearings and Lanes

Leg	Leg Names	Bearing (deg)	Lanes			
			Approach Lanes	Entry Lanes	Circulating Lanes	Exit Lanes
1	James Ranch Road	0	2	2	2	2
2	SR 80	83	2	2	2	2
3	James Ranch Road	180	1	1	2	1
4	SR 80	263	2	2	2	2

HCM 2016 Default Headways (secs)

Lanes		Lane-1		Lane-2		Bypass Lane	
Entry	Circ	tf	tc	tf	tc	tf	tc
1	1			2.6087	4.9765	2.6087	4.9765
1	2			2.5352	4.3275	2.5352	4.3275
2	2	2.6667	4.6455	2.5352	4.3275		
2	1	2.5352	4.5435	2.5352	4.5435		

HCM 2016 Calibrated Headways (secs)

Lanes		Lane-1		Lane-2		Bypass Lane	
Entry	Circ	tf	tc	tf	tc	tf	tc
1	1			3.186	5.193	3.186	5.193
1	2			3.186	4.113	3.186	4.113
2	2	3.186	4.293	3.186	4.113		
2	1	3.186	5.193	3.186	5.193		

HCM 2016 Derived Intercept and Exponential for HCM or Calibration

Leg	Leg Names	Intercept (pcs/hr)				Exponent (×1000)			
		tf	L1	L2	Bp	tf, tc	L1	L2	Bp
1	James Ranch Road	HCM	1350	1420		HCM	0.92	0.85	
2	SR 80	HCM	1350	1420		HCM	0.92	0.85	
3	James Ranch Road	HCM		1420		HCM		0.85	
4	SR 80	HCM	1350	1420		HCM	0.92	0.85	

HCM 2016 Flow Profiles

Leg	Leg Names	Entry Lane Proportions		ByPass Capacity Modifiers (veh/hr)			Peak Hour Factor
		Left Lane	Right Lane	Bypass Type	Capacity + or -	Crosswalk Factor	
1	James Ranch Road	0.47	0.53	None	0	1.000	0.85
2	SR 80	0.47	0.53	None	0	1.000	0.85
3	James Ranch Road	0.00	1.00	None	0	1.000	0.80
4	SR 80	0.47	0.53	None	0	1.000	0.85

HCM 2016 Capacity and Volume Modifiers

Leg	Leg Names	Capacity Modifiers (veh/hr)		Volume Modifiers	
		Capacity + or -	Crosswalk Factor	Trucks %	Flow Factor
1	James Ranch Road	0	1.000	30.0	1.00
2	SR 80	0	1.000	21.0	1.00
3	James Ranch Road	0	1.000	2.0	1.00
4	SR 80	0	1.000	18.0	1.00

Traffic Flow Data (veh/hr)

2028 PM Peak Peak Hour Flows

Leg	Leg Names	Turning Flows					Flow Modifiers		
		U-Turn	Exit-3	Exit-2	Exit-1	Bypass	Trucks %	Flow Factor	Peak Hour Factor
1	James Ranch Road	0	56	5	348	0	30.0	1.00	0.850
2	SR 80	0	118	245	5	0	21.0	1.00	0.850
3	James Ranch Road	0	5	5	5	0	2.0	1.00	0.800
4	SR 80	0	5	301	32	0	18.0	1.00	0.850

Operational Results

HCM 2016 - 2028 PM Peak 60 minutes

Flows and Capacity

Leg	Leg Names	Flows (veh/hr)					Capacity (veh/hr)					
		Arrival Flow			Opposing Flow		Capacity			Average VCR		
		Left	Right	Bypass	Entry	Bypass	Left	Right	Bypass	Left	Right	Bypass
1	James Ranch Road	192	217		311		704	760		0.273	0.285	
2	SR 80	173	195		67		979	1036		0.177	0.188	
3	James Ranch Road		15		419			856			0.018	
4	SR 80	159	179		128		944	1004		0.168	0.178	

Delays, Queues and Level of Service

Leg	Leg Names	Average Delay (sec)				95% Queue (veh)			Level of Service			
		Left	Right	Bypass	Leg	Left	Right	Bypass	Left	Right	Bypass	Leg
1	James Ranch Road	8.4	8.1		8.2	1.1	1.2		A	A		A
2	SR 80	5.3	5.2		5.3	0.6	0.7		A	A		A
3	James Ranch Road		4.4		4.4		0.1			A		A
4	SR 80	5.4	5.3		5.3	0.6	0.7		A	A		A

Global Results

Performance and Accidents

2028 PM Peak Global Performance

Parameter	Units	Entries	Bypasses	Total
Arrive Flows	veh/hr	1130		1130
Capacity	veh/hr	6481		10003
Average Delay	sec/veh	12.64		12.64
L.O.S. (Signal)	A – F	B		B
L.O.S. (Unsig)	A – F	B		B
Total Delay	veh.hrs	3.97		3.97

Scheme Summary

Control Data

Control Data and Model Parameters

Douglas IPOE	2050 PHF Flow Profile (veh)
2050 Roundabout	7.5 min Time Slice
HCM 2010 Model	Control Delays (sec)
Right Hand Drive	Daylight conditions
AM Peak Hour	Peak 60/15 min Results
Full Geometry	Output flows: Vehicles
English Units (ft)	50% Confidence Level

Available Data

Entry Capacity Calibrated	No
Entry Capacity Modified	No
Crosswalks	No
Flows Factored	No
Approach/Exit Road Capacity Calibrated	No
Accidents	No
Accident Costs	No
Bypass Model	No
Bypass Calibration	No
Global Results	Yes

Operational Data

HCM Lanes and Headways

HCM 2016 Bearings and Lanes

Leg	Leg Names	Bearing (deg)	Lanes			
			Approach Lanes	Entry Lanes	Circulating Lanes	Exit Lanes
1	James Ranch Road	0	2	2	2	2
2	SR 80	83	2	2	2	2
3	James Ranch Road	180	1	1	2	1
4	SR 80	263	2	2	2	2

HCM 2016 Default Headways (secs)

Lanes		Lane-1		Lane-2		Bypass Lane	
Entry	Circ	tf	tc	tf	tc	tf	tc
1	1			2.6087	4.9765	2.6087	4.9765
1	2			2.5352	4.3275	2.5352	4.3275
2	2	2.6667	4.6455	2.5352	4.3275		
2	1	2.5352	4.5435	2.5352	4.5435		

HCM 2016 Calibrated Headways (secs)

Lanes		Lane-1		Lane-2		Bypass Lane	
Entry	Circ	tf	tc	tf	tc	tf	tc
1	1			3.186	5.193	3.186	5.193
1	2			3.186	4.113	3.186	4.113
2	2	3.186	4.293	3.186	4.113		
2	1	3.186	5.193	3.186	5.193		

HCM 2016 Derived Intercept and Exponential for HCM or Calibration

Leg	Leg Names	Intercept (pcs/hr)				Exponent (×1000)			
		tf	L1	L2	Bp	tf, tc	L1	L2	Bp
1	James Ranch Road	HCM	1350	1420		HCM	0.92	0.85	
2	SR 80	HCM	1350	1420		HCM	0.92	0.85	
3	James Ranch Road	HCM		1420		HCM		0.85	
4	SR 80	HCM	1350	1420		HCM	0.92	0.85	

HCM 2016 Flow Profiles

Leg	Leg Names	Entry Lane Proportions		ByPass Capacity Modifiers (veh/hr)			Peak Hour Factor
		Left Lane	Right Lane	Bypass Type	Capacity + or -	Crosswalk Factor	
1	James Ranch Road	0.47	0.53	None	0	1.000	0.85
2	SR 80	0.47	0.53	None	0	1.000	0.90
3	James Ranch Road	0.00	1.00	None	0	1.000	0.80
4	SR 80	0.47	0.53	None	0	1.000	0.85

HCM 2016 Capacity and Volume Modifiers

Leg	Leg Names	Capacity Modifiers (veh/hr)		Volume Modifiers	
		Capacity + or -	Crosswalk Factor	Trucks %	Flow Factor
1	James Ranch Road	0	1.000	24.0	1.00
2	SR 80	0	1.000	20.0	1.00
3	James Ranch Road	0	1.000	2.0	1.00
4	SR 80	0	1.000	17.0	1.00

Traffic Flow Data (veh/hr)

2050 AM Peak Peak Hour Flows

Leg	Leg Names	Turning Flows					Flow Modifiers		
		U-Turn	Exit-3	Exit-2	Exit-1	Bypass	Trucks %	Flow Factor	Peak Hour Factor
1	James Ranch Road	0	76	10	471	0	24.0	1.00	0.850
2	SR 80	0	855	479	10	0	20.0	1.00	0.900
3	James Ranch Road	0	10	10	10	0	2.0	1.00	0.800
4	SR 80	0	10	193	166	0	17.0	1.00	0.850

Operational Results

HCM 2016 - 2050 AM Peak 60 minutes

Flows and Capacity

Leg	Leg Names	Flows (veh/hr)					Capacity (veh/hr)					
		Arrival Flow			Opposing Flow		Capacity			Average VCR		
		Left	Right	Bypass	Entry	Bypass	Left	Right	Bypass	Left	Right	Bypass
1	James Ranch Road	262	295		213		867	928		0.302	0.318	
2	SR 80	632	712		96		1009	1070		0.626	0.665	
3	James Ranch Road		30		1410			330			0.091	
4	SR 80	173	196		875		441	499		0.392	0.393	

Delays, Queues and Level of Service

Leg	Leg Names	Average Delay (sec)				95% Queue (veh)			Level of Service			
		Left	Right	Bypass	Leg	Left	Right	Bypass	Left	Right	Bypass	Leg
1	James Ranch Road	7.5	7.3		7.4	1.3	1.4		A	A		A
2	SR 80	12.6	13.3		13.0	4.9	5.8		B	B		B
3	James Ranch Road		12.5		12.5		0.3			B		B
4	SR 80	15.4	13.8		14.6	1.9	1.9		C	B		B

Global Results

Performance and Accidents

2050 AM Peak Global Performance

Parameter	Units	Entries	Bypasses	Total
Arrive Flows	veh/hr	2300		2300
Capacity	veh/hr	5190		8077
Average Delay	sec/veh	23.57		23.57
L.O.S. (Signal)	A – F	C		C
L.O.S. (Unsig)	A – F	C		C
Total Delay	veh.hrs	15.06		15.06

Scheme Summary

Control Data

Control Data and Model Parameters

Douglas IPOE	2050 PHF Flow Profile (veh)
2050 Roundabout	7.5 min Time Slice
HCM 2010 Model	Control Delays (sec)
Right Hand Drive	Nighttime conditions
PM Peak Hour	Peak 60/15 min Results
Full Geometry	Output flows: Vehicles
English Units (ft)	50% Confidence Level

Available Data

Entry Capacity Calibrated	No
Entry Capacity Modified	No
Crosswalks	No
Flows Factored	No
Approach/Exit Road Capacity Calibrated	No
Accidents	No
Accident Costs	No
Bypass Model	No
Bypass Calibration	No
Global Results	Yes

Operational Data

HCM Lanes and Headways

HCM 2016 Bearings and Lanes

Leg	Leg Names	Bearing (deg)	Lanes			
			Approach Lanes	Entry Lanes	Circulating Lanes	Exit Lanes
1	James Ranch Road	0	2	2	2	2
2	SR 80	83	2	2	2	2
3	James Ranch Road	180	1	1	2	1
4	SR 80	263	2	2	2	2

HCM 2016 Default Headways (secs)

Lanes		Lane-1		Lane-2		Bypass Lane	
Entry	Circ	tf	tc	tf	tc	tf	tc
1	1			2.6087	4.9765	2.6087	4.9765
1	2			2.5352	4.3275	2.5352	4.3275
2	2	2.6667	4.6455	2.5352	4.3275		
2	1	2.5352	4.5435	2.5352	4.5435		

HCM 2016 Calibrated Headways (secs)

Lanes		Lane-1		Lane-2		Bypass Lane	
Entry	Circ	tf	tc	tf	tc	tf	tc
1	1			3.186	5.193	3.186	5.193
1	2			3.186	4.113	3.186	4.113
2	2	3.186	4.293	3.186	4.113		
2	1	3.186	5.193	3.186	5.193		

HCM 2016 Derived Intercept and Exponential for HCM or Calibration

Leg	Leg Names	Intercept (pcs/hr)				Exponent (×1000)			
		tf	L1	L2	Bp	tf, tc	L1	L2	Bp
1	James Ranch Road	HCM	1350	1420		HCM	0.92	0.85	
2	SR 80	HCM	1350	1420		HCM	0.92	0.85	
3	James Ranch Road	HCM		1420		HCM		0.85	
4	SR 80	HCM	1350	1420		HCM	0.92	0.85	

HCM 2016 Flow Profiles

Leg	Leg Names	Entry Lane Proportions		ByPass Capacity Modifiers (veh/hr)			Peak Hour Factor
		Left Lane	Right Lane	Bypass Type	Capacity + or -	Crosswalk Factor	
1	James Ranch Road	0.47	0.53	None	0	1.000	0.90
2	SR 80	0.47	0.53	None	0	1.000	0.90
3	James Ranch Road	0.00	1.00	None	0	1.000	0.80
4	SR 80	0.47	0.53	None	0	1.000	0.85

HCM 2016 Capacity and Volume Modifiers

Leg	Leg Names	Capacity Modifiers (veh/hr)		Volume Modifiers	
		Capacity + or -	Crosswalk Factor	Trucks %	Flow Factor
1	James Ranch Road	0	1.000	24.0	1.00
2	SR 80	0	1.000	20.0	1.00
3	James Ranch Road	0	1.000	2.0	1.00
4	SR 80	0	1.000	17.0	1.00

Traffic Flow Data (veh/hr)

2050 PM Peak Peak Hour Flows

Leg	Leg Names	Turning Flows					Flow Modifiers		
		U-Turn	Exit-3	Exit-2	Exit-1	Bypass	Trucks %	Flow Factor	Peak Hour Factor
1	James Ranch Road	0	185	10	1091	0	24.0	1.00	0.900
2	SR 80	0	355	374	10	0	20.0	1.00	0.900
3	James Ranch Road	0	10	10	10	0	2.0	1.00	0.800
4	SR 80	0	10	465	78	0	17.0	1.00	0.850

Operational Results

HCM 2016 - 2050 PM Peak 60 minutes

Flows and Capacity

Leg	Leg Names	Flows (veh/hr)					Capacity (veh/hr)					
		Arrival Flow			Opposing Flow		Capacity			Average VCR		
		Left	Right	Bypass	Entry	Bypass	Left	Right	Bypass	Left	Right	Bypass
1	James Ranch Road	604	682		485		614	672		0.983	1.014	
2	SR 80	347	392		205		847	907		0.410	0.432	
3	James Ranch Road		30		914			517			0.058	
4	SR 80	260	293		375		727	789		0.358	0.371	

Delays, Queues and Level of Service

Leg	Leg Names	Average Delay (sec)				95% Queue (veh)			Level of Service			
		Left	Right	Bypass	Leg	Left	Right	Bypass	Left	Right	Bypass	Leg
1	James Ranch Road	98.4	122.8		111.4	27.6	34.5		F	F		F
2	SR 80	9.2	9.1		9.2	2.1	2.3		A	A		A
3	James Ranch Road		7.7		7.7		0.2			A		A
4	SR 80	9.5	9.1		9.3	1.7	1.8		A	A		A

Global Results

Performance and Accidents

2050 PM Peak Global Performance

Parameter	Units	Entries	Bypasses	Total
Arrive Flows	veh/hr	2608		2608
Capacity	veh/hr	5168		7909
Average Delay	sec/veh	118.35		118.35
L.O.S. (Signal)	A – F	F		F
L.O.S. (Unsig)	A – F	F		F
Total Delay	veh.hrs	85.74		85.74

***SR 80 / US 191 Intersection
(Existing, 2028/2050 No-Build, 2028/2050 Build)***

Timing Report, Sorted By Phase

2: SR 80 & US 191

Existing AM



Phase Number	2	4	6
Movement	EBTL	SBL	WBT
Lead/Lag			
Lead-Lag Optimize			
Recall Mode	Min	None	Min
Maximum Split (s)	66.1	31.5	66.1
Maximum Split (%)	67.7%	32.3%	67.7%
Minimum Split (s)	24.1	24.5	24.1
Yellow Time (s)	5	4.3	5
All-Red Time (s)	1.1	2.2	1.1
Minimum Initial (s)	10	6	6
Vehicle Extension (s)	6	1.5	6
Minimum Gap (s)	3	3	3
Time Before Reduce (s)	0	0	0
Time To Reduce (s)	0	0	0
Walk Time (s)			
Flash Dont Walk (s)			
Dual Entry	Yes	Yes	Yes
Inhibit Max	Yes	Yes	Yes
Start Time (s)	0	66.1	0
End Time (s)	66.1	0	66.1
Yield/Force Off (s)	60	91.1	60
Yield/Force Off 170(s)	60	91.1	60
Local Start Time (s)	0	66.1	0
Local Yield (s)	60	91.1	60
Local Yield 170(s)	60	91.1	60
Intersection Summary			
Cycle Length	97.6		
Control Type	Actuated-Uncoordinated		
Natural Cycle	50		

Splits and Phases: 2: SR 80 & US 191



HCM 6th Signalized Intersection Summary

2: SR 80 & US 191

Existing AM



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	32	79	205	136	75	45
Future Volume (veh/h)	32	79	205	136	75	45
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No	No		No	
Adj Sat Flow, veh/h/ln	1737	1737	1737	1737	1737	1737
Adj Flow Rate, veh/h	43	105	223	148	88	56
Peak Hour Factor	0.75	0.75	0.92	0.92	0.85	0.80
Percent Heavy Veh, %	11	11	11	11	11	11
Cap, veh/h	583	1244	1244	555	245	218
Arrive On Green	0.38	0.38	0.38	0.38	0.15	0.15
Sat Flow, veh/h	939	3387	3387	1472	1654	1472
Grp Volume(v), veh/h	43	105	223	148	88	56
Grp Sat Flow(s),veh/h/ln	939	1650	1650	1472	1654	1472
Q Serve(g_s), s	0.9	0.5	1.2	1.8	1.3	0.9
Cycle Q Clear(g_c), s	2.0	0.5	1.2	1.8	1.3	0.9
Prop In Lane	1.00			1.00	1.00	1.00
Lane Grp Cap(c), veh/h	583	1244	1244	555	245	218
V/C Ratio(X)	0.07	0.08	0.18	0.27	0.36	0.26
Avail Cap(c_a), veh/h	2354	7466	7466	3330	1559	1387
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	6.2	5.3	5.5	5.7	10.2	10.0
Incr Delay (d2), s/veh	0.2	0.1	0.2	0.9	0.3	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.1	0.1	0.2	0.4	0.5	0.3
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	6.4	5.4	5.8	6.6	10.5	10.2
LnGrp LOS	A	A	A	A	B	B
Approach Vol, veh/h		148	371		144	
Approach Delay, s/veh		5.7	6.1		10.4	
Approach LOS		A	A		B	
Timer - Assigned Phs		2		4		6
Phs Duration (G+Y+Rc), s		16.1		10.4		16.1
Change Period (Y+Rc), s		* 6.1		* 6.5		* 6.1
Max Green Setting (Gmax), s		* 60		* 25		* 60
Max Q Clear Time (g_c+I1), s		4.0		3.3		3.8
Green Ext Time (p_c), s		2.2		0.1		5.4
Intersection Summary						
HCM 6th Ctrl Delay			7.0			
HCM 6th LOS			A			
Notes						

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Timing Report, Sorted By Phase

2: SR 80 & US 191

Existing PM



Phase Number	2	4	6
Movement	EBTL	SBL	WBT
Lead/Lag			
Lead-Lag Optimize			
Recall Mode	Min	None	Min
Maximum Split (s)	66.1	31.5	66.1
Maximum Split (%)	67.7%	32.3%	67.7%
Minimum Split (s)	24.1	24.5	24.1
Yellow Time (s)	5	4.3	5
All-Red Time (s)	1.1	2.2	1.1
Minimum Initial (s)	10	6	6
Vehicle Extension (s)	6	1.5	6
Minimum Gap (s)	3	3	3
Time Before Reduce (s)	0	0	0
Time To Reduce (s)	0	0	0
Walk Time (s)			
Flash Dont Walk (s)			
Dual Entry	Yes	Yes	Yes
Inhibit Max	Yes	Yes	Yes
Start Time (s)	0	66.1	0
End Time (s)	66.1	0	66.1
Yield/Force Off (s)	60	91.1	60
Yield/Force Off 170(s)	60	91.1	60
Local Start Time (s)	0	66.1	0
Local Yield (s)	60	91.1	60
Local Yield 170(s)	60	91.1	60
Intersection Summary			
Cycle Length	97.6		
Control Type	Actuated-Uncoordinated		
Natural Cycle	50		

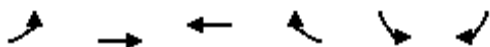
Splits and Phases: 2: SR 80 & US 191



HCM 6th Signalized Intersection Summary

2: SR 80 & US 191

Existing PM



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	76	191	158	105	85	51
Future Volume (veh/h)	76	191	158	105	85	51
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No	No		No	
Adj Sat Flow, veh/h/ln	1737	1737	1737	1737	1737	1737
Adj Flow Rate, veh/h	101	255	172	114	100	64
Peak Hour Factor	0.75	0.75	0.92	0.92	0.85	0.80
Percent Heavy Veh, %	11	11	11	11	11	11
Cap, veh/h	618	1269	1269	566	258	230
Arrive On Green	0.38	0.38	0.38	0.38	0.16	0.16
Sat Flow, veh/h	1015	3387	3387	1472	1654	1472
Grp Volume(v), veh/h	101	255	172	114	100	64
Grp Sat Flow(s),veh/h/ln	1015	1650	1650	1472	1654	1472
Q Serve(g_s), s	2.0	1.4	0.9	1.4	1.5	1.1
Cycle Q Clear(g_c), s	2.9	1.4	0.9	1.4	1.5	1.1
Prop In Lane	1.00			1.00	1.00	1.00
Lane Grp Cap(c), veh/h	618	1269	1269	566	258	230
V/C Ratio(X)	0.16	0.20	0.14	0.20	0.39	0.28
Avail Cap(c_a), veh/h	2450	7222	7222	3221	1508	1342
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(l)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	6.4	5.6	5.5	5.6	10.4	10.2
Incr Delay (d2), s/veh	0.4	0.3	0.2	0.6	0.4	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.3	0.3	0.2	0.3	0.6	0.4
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	6.9	5.9	5.7	6.3	10.7	10.4
LnGrp LOS	A	A	A	A	B	B
Approach Vol, veh/h		356	286		164	
Approach Delay, s/veh		6.2	5.9		10.6	
Approach LOS		A	A		B	
Timer - Assigned Phs		2		4		6
Phs Duration (G+Y+Rc), s		16.6		10.8		16.6
Change Period (Y+Rc), s		* 6.1		* 6.5		* 6.1
Max Green Setting (Gmax), s		* 60		* 25		* 60
Max Q Clear Time (g_c+l1), s		4.9		3.5		3.4
Green Ext Time (p_c), s		5.6		0.1		4.1
Intersection Summary						
HCM 6th Ctrl Delay			7.0			
HCM 6th LOS			A			
Notes						

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Timing Report, Sorted By Phase

2: SR 80 & US 191

2028 No-Build AM



Phase Number	2	4	6
Movement	EBTL	SBL	WBT
Lead/Lag			
Lead-Lag Optimize			
Recall Mode	Min	None	Min
Maximum Split (s)	66.1	31.5	66.1
Maximum Split (%)	67.7%	32.3%	67.7%
Minimum Split (s)	24.1	24.5	24.1
Yellow Time (s)	5	4.3	5
All-Red Time (s)	1.1	2.2	1.1
Minimum Initial (s)	10	6	6
Vehicle Extension (s)	6	1.5	6
Minimum Gap (s)	3	3	3
Time Before Reduce (s)	0	0	0
Time To Reduce (s)	0	0	0
Walk Time (s)			
Flash Dont Walk (s)			
Dual Entry	Yes	Yes	Yes
Inhibit Max	Yes	Yes	Yes
Start Time (s)	0	66.1	0
End Time (s)	66.1	0	66.1
Yield/Force Off (s)	60	91.1	60
Yield/Force Off 170(s)	60	91.1	60
Local Start Time (s)	0	66.1	0
Local Yield (s)	60	91.1	60
Local Yield 170(s)	60	91.1	60
Intersection Summary			
Cycle Length	97.6		
Control Type	Actuated-Uncoordinated		
Natural Cycle	50		

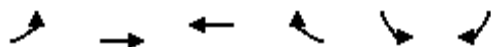
Splits and Phases: 2: SR 80 & US 191



HCM 6th Signalized Intersection Summary

2: SR 80 & US 191

2028 No-Build AM



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	36	89	230	154	84	50
Future Volume (veh/h)	36	89	230	154	84	50
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No	No		No	
Adj Sat Flow, veh/h/ln	1737	1737	1737	1737	1737	1737
Adj Flow Rate, veh/h	45	111	271	181	99	62
Peak Hour Factor	0.80	0.80	0.85	0.85	0.85	0.80
Percent Heavy Veh, %	11	11	11	11	11	11
Cap, veh/h	556	1311	1311	585	253	225
Arrive On Green	0.40	0.40	0.40	0.40	0.15	0.15
Sat Flow, veh/h	872	3387	3387	1472	1654	1472
Grp Volume(v), veh/h	45	111	271	181	99	62
Grp Sat Flow(s),veh/h/ln	872	1650	1650	1472	1654	1472
Q Serve(g_s), s	1.0	0.6	1.5	2.4	1.5	1.0
Cycle Q Clear(g_c), s	2.5	0.6	1.5	2.4	1.5	1.0
Prop In Lane	1.00			1.00	1.00	1.00
Lane Grp Cap(c), veh/h	556	1311	1311	585	253	225
V/C Ratio(X)	0.08	0.08	0.21	0.31	0.39	0.28
Avail Cap(c_a), veh/h	2077	7069	7069	3153	1476	1314
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(l)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	6.4	5.3	5.5	5.8	10.7	10.5
Incr Delay (d2), s/veh	0.2	0.1	0.3	1.1	0.4	0.2
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.2	0.1	0.3	0.6	0.6	0.4
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	6.6	5.4	5.8	6.9	11.1	10.7
LnGrp LOS	A	A	A	A	B	B
Approach Vol, veh/h		156	452		161	
Approach Delay, s/veh		5.7	6.3		10.9	
Approach LOS		A	A		B	
Timer - Assigned Phs		2		4		6
Phs Duration (G+Y+Rc), s		17.2		10.8		17.2
Change Period (Y+Rc), s		* 6.1		* 6.5		* 6.1
Max Green Setting (Gmax), s		* 60		* 25		* 60
Max Q Clear Time (g_c+l1), s		4.5		3.5		4.4
Green Ext Time (p_c), s		2.4		0.1		6.8
Intersection Summary						
HCM 6th Ctrl Delay			7.1			
HCM 6th LOS			A			
Notes						

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Timing Report, Sorted By Phase

2: SR 80 & US 191

2028 No-Build PM



Phase Number	2	4	6
Movement	EBTL	SBL	WBT
Lead/Lag			
Lead-Lag Optimize			
Recall Mode	Min	None	Min
Maximum Split (s)	66.1	31.5	66.1
Maximum Split (%)	67.7%	32.3%	67.7%
Minimum Split (s)	24.1	24.5	24.1
Yellow Time (s)	5	4.3	5
All-Red Time (s)	1.1	2.2	1.1
Minimum Initial (s)	10	6	6
Vehicle Extension (s)	6	1.5	6
Minimum Gap (s)	3	3	3
Time Before Reduce (s)	0	0	0
Time To Reduce (s)	0	0	0
Walk Time (s)			
Flash Dont Walk (s)			
Dual Entry	Yes	Yes	Yes
Inhibit Max	Yes	Yes	Yes
Start Time (s)	0	66.1	0
End Time (s)	66.1	0	66.1
Yield/Force Off (s)	60	91.1	60
Yield/Force Off 170(s)	60	91.1	60
Local Start Time (s)	0	66.1	0
Local Yield (s)	60	91.1	60
Local Yield 170(s)	60	91.1	60
Intersection Summary			
Cycle Length	97.6		
Control Type	Actuated-Uncoordinated		
Natural Cycle	50		

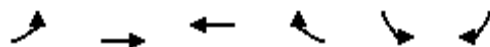
Splits and Phases: 2: SR 80 & US 191



HCM 6th Signalized Intersection Summary

2: SR 80 & US 191

2028 No-Build PM



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	86	215	178	118	95	57
Future Volume (veh/h)	86	215	178	118	95	57
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No	No		No	
Adj Sat Flow, veh/h/ln	1737	1737	1737	1737	1737	1737
Adj Flow Rate, veh/h	101	253	209	139	112	71
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.80
Percent Heavy Veh, %	11	11	11	11	11	11
Cap, veh/h	591	1290	1290	575	268	239
Arrive On Green	0.39	0.39	0.39	0.39	0.16	0.16
Sat Flow, veh/h	959	3387	3387	1472	1654	1472
Grp Volume(v), veh/h	101	253	209	139	112	71
Grp Sat Flow(s),veh/h/ln	959	1650	1650	1472	1654	1472
Q Serve(g_s), s	2.2	1.4	1.2	1.8	1.7	1.2
Cycle Q Clear(g_c), s	3.3	1.4	1.2	1.8	1.7	1.2
Prop In Lane	1.00			1.00	1.00	1.00
Lane Grp Cap(c), veh/h	591	1290	1290	575	268	239
V/C Ratio(X)	0.17	0.20	0.16	0.24	0.42	0.30
Avail Cap(c_a), veh/h	2259	7028	7028	3134	1468	1306
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(l)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	6.7	5.7	5.6	5.8	10.6	10.4
Incr Delay (d2), s/veh	0.5	0.3	0.2	0.8	0.4	0.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.4	0.3	0.2	0.4	0.7	0.4
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	7.2	5.9	5.8	6.6	11.0	10.6
LnGrp LOS	A	A	A	A	B	B
Approach Vol, veh/h		354	348		183	
Approach Delay, s/veh		6.3	6.1		10.9	
Approach LOS		A	A		B	
Timer - Assigned Phs		2		4		6
Phs Duration (G+Y+Rc), s		17.1		11.1		17.1
Change Period (Y+Rc), s		* 6.1		* 6.5		* 6.1
Max Green Setting (Gmax), s		* 60		* 25		* 60
Max Q Clear Time (g_c+l1), s		5.3		3.7		3.8
Green Ext Time (p_c), s		5.7		0.1		5.0
Intersection Summary						
HCM 6th Ctrl Delay			7.2			
HCM 6th LOS			A			
Notes						

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Timing Report, Sorted By Phase

2: SR 80 & US 191

2050 No-Build AM



Phase Number	2	4	6
Movement	EBTL	SBL	WBT
Lead/Lag			
Lead-Lag Optimize			
Recall Mode	Min	None	Min
Maximum Split (s)	66.1	31.5	66.1
Maximum Split (%)	67.7%	32.3%	67.7%
Minimum Split (s)	24.1	24.5	24.1
Yellow Time (s)	5	4.3	5
All-Red Time (s)	1.1	2.2	1.1
Minimum Initial (s)	10	6	6
Vehicle Extension (s)	6	1.5	6
Minimum Gap (s)	3	3	3
Time Before Reduce (s)	0	0	0
Time To Reduce (s)	0	0	0
Walk Time (s)			
Flash Dont Walk (s)			
Dual Entry	Yes	Yes	Yes
Inhibit Max	Yes	Yes	Yes
Start Time (s)	0	66.1	0
End Time (s)	66.1	0	66.1
Yield/Force Off (s)	60	91.1	60
Yield/Force Off 170(s)	60	91.1	60
Local Start Time (s)	0	66.1	0
Local Yield (s)	60	91.1	60
Local Yield 170(s)	60	91.1	60
Intersection Summary			
Cycle Length	97.6		
Control Type	Actuated-Uncoordinated		
Natural Cycle	50		

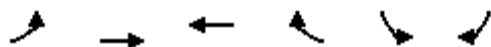
Splits and Phases: 2: SR 80 & US 191



HCM 6th Signalized Intersection Summary

2: SR 80 & US 191

2050 No-Build AM



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	55	138	356	237	130	78
Future Volume (veh/h)	55	138	356	237	130	78
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No	No		No	
Adj Sat Flow, veh/h/ln	1737	1737	1737	1737	1737	1737
Adj Flow Rate, veh/h	69	172	419	279	153	92
Peak Hour Factor	0.80	0.80	0.85	0.85	0.85	0.85
Percent Heavy Veh, %	11	11	11	11	11	11
Cap, veh/h	494	1632	1632	728	253	225
Arrive On Green	0.49	0.49	0.49	0.49	0.15	0.15
Sat Flow, veh/h	694	3387	3387	1472	1654	1472
Grp Volume(v), veh/h	69	172	419	279	153	92
Grp Sat Flow(s), veh/h/ln	694	1650	1650	1472	1654	1472
Q Serve(g_s), s	2.3	1.0	2.6	4.2	3.1	2.0
Cycle Q Clear(g_c), s	4.9	1.0	2.6	4.2	3.1	2.0
Prop In Lane	1.00			1.00	1.00	1.00
Lane Grp Cap(c), veh/h	494	1632	1632	728	253	225
V/C Ratio(X)	0.14	0.11	0.26	0.38	0.60	0.41
Avail Cap(c_a), veh/h	1315	5536	5536	2469	1156	1029
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	6.7	4.8	5.2	5.6	14.1	13.7
Incr Delay (d2), s/veh	0.5	0.1	0.3	1.2	0.9	0.4
Initial Q Delay(d3), s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%), veh/ln	0.4	0.2	0.6	1.1	1.6	0.9
Unsig. Movement Delay, s/veh						
LnGrp Delay(d), s/veh	7.1	4.9	5.5	6.8	15.0	14.1
LnGrp LOS	A	A	A	A	B	B
Approach Vol, veh/h		241	698		245	
Approach Delay, s/veh		5.5	6.1		14.7	
Approach LOS		A	A		B	
Timer - Assigned Phs		2		4		6
Phs Duration (G+Y+Rc), s		23.8		12.0		23.8
Change Period (Y+Rc), s		* 6.1		* 6.5		* 6.1
Max Green Setting (Gmax), s		* 60		* 25		* 60
Max Q Clear Time (g_c+I1), s		6.9		5.1		6.2
Green Ext Time (p_c), s		4.1		0.2		11.5
Intersection Summary						
HCM 6th Ctrl Delay			7.7			
HCM 6th LOS			A			
Notes						

* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.

Timing Report, Sorted By Phase

2: SR 80 & US 191

2050 No-Build PM



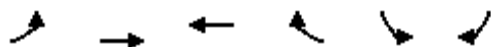
Phase Number	2	4	6
Movement	EBTL	SBL	WBT
Lead/Lag			
Lead-Lag Optimize			
Recall Mode	Min	None	Min
Maximum Split (s)	66.1	31.5	66.1
Maximum Split (%)	67.7%	32.3%	67.7%
Minimum Split (s)	24.1	24.5	24.1
Yellow Time (s)	5	4.3	5
All-Red Time (s)	1.1	2.2	1.1
Minimum Initial (s)	10	6	6
Vehicle Extension (s)	6	1.5	6
Minimum Gap (s)	3	3	3
Time Before Reduce (s)	0	0	0
Time To Reduce (s)	0	0	0
Walk Time (s)			
Flash Dont Walk (s)			
Dual Entry	Yes	Yes	Yes
Inhibit Max	Yes	Yes	Yes
Start Time (s)	0	66.1	0
End Time (s)	66.1	0	66.1
Yield/Force Off (s)	60	91.1	60
Yield/Force Off 170(s)	60	91.1	60
Local Start Time (s)	0	66.1	0
Local Yield (s)	60	91.1	60
Local Yield 170(s)	60	91.1	60
Intersection Summary			
Cycle Length	97.6		
Control Type	Actuated-Uncoordinated		
Natural Cycle	50		

Splits and Phases: 2: SR 80 & US 191



HCM 6th Signalized Intersection Summary 2: SR 80 & US 191

2050 No-Build PM



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	133	332	275	183	147	88
Future Volume (veh/h)	133	332	275	183	147	88
Initial Q (Qb), veh	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00			1.00	1.00	1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach		No	No		No	
Adj Sat Flow, veh/h/ln	1737	1737	1737	1737	1737	1737
Adj Flow Rate, veh/h	156	391	324	215	173	104
Peak Hour Factor	0.85	0.85	0.85	0.85	0.85	0.85
Percent Heavy Veh, %	11	11	11	11	11	11
Cap, veh/h	559	1671	1671	745	253	225
Arrive On Green	0.51	0.51	0.51	0.51	0.15	0.15
Sat Flow, veh/h	805	3387	3387	1472	1654	1472
Grp Volume(v), veh/h	156	391	324	215	173	104
Grp Sat Flow(s),veh/h/ln	805	1650	1650	1472	1654	1472
Q Serve(g_s), s	4.9	2.5	2.0	3.1	3.7	2.4
Cycle Q Clear(g_c), s	6.9	2.5	2.0	3.1	3.7	2.4
Prop In Lane	1.00			1.00	1.00	1.00
Lane Grp Cap(c), veh/h	559	1671	1671	745	253	225
V/C Ratio(X)	0.28	0.23	0.19	0.29	0.68	0.46
Avail Cap(c_a), veh/h	1457	5355	5355	2389	1118	995
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00
Uniform Delay (d), s/veh	6.9	5.1	5.0	5.3	14.8	14.3
Incr Delay (d2), s/veh	1.0	0.3	0.2	0.8	1.2	0.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.8	0.5	0.4	0.8	1.9	1.1
Unsig. Movement Delay, s/veh						
LnGrp Delay(d),s/veh	7.8	5.4	5.2	6.0	16.0	14.8
LnGrp LOS	A	A	A	A	B	B
Approach Vol, veh/h		547	539		277	
Approach Delay, s/veh		6.1	5.5		15.6	
Approach LOS		A	A		B	
Timer - Assigned Phs		2		4		6
Phs Duration (G+Y+Rc), s		24.8		12.2		24.8
Change Period (Y+Rc), s		* 6.1		* 6.5		* 6.1
Max Green Setting (Gmax), s		* 60		* 25		* 60
Max Q Clear Time (g_c+I1), s		8.9		5.7		5.1
Green Ext Time (p_c), s		9.9		0.2		8.3
Intersection Summary						
HCM 6th Ctrl Delay			7.8			
HCM 6th LOS			A			
Notes						
* HCM 6th computational engine requires equal clearance times for the phases crossing the barrier.						

Timing Report, Sorted By Phase

2: US 191 & SR 80

Opening Year AM

























Phase Number	2	4	6	8
Movement	EBTL	SBTL	WBTL	NBTL
Lead/Lag				
Lead-Lag Optimize				
Recall Mode	Min	None	Min	None
Maximum Split (s)	66.1	31.5	66.1	31.5
Maximum Split (%)	67.7%	32.3%	67.7%	32.3%
Minimum Split (s)	24.1	24.5	24.1	24.5
Yellow Time (s)	5	4.3	5	4.3
All-Red Time (s)	1.1	2.2	1.1	2.2
Minimum Initial (s)	10	6	10	6
Vehicle Extension (s)	6	1.5	6	1.5
Minimum Gap (s)	3	3	3	3
Time Before Reduce (s)	0	0	0	0
Time To Reduce (s)	0	0	0	0
Walk Time (s)				
Flash Dont Walk (s)				
Dual Entry	Yes	Yes	Yes	Yes
Inhibit Max	Yes	Yes	Yes	Yes
Start Time (s)	0	66.1	0	66.1
End Time (s)	66.1	0	66.1	0
Yield/Force Off (s)	60	91.1	60	91.1
Yield/Force Off 170(s)	60	91.1	60	91.1
Local Start Time (s)	0	66.1	0	66.1
Local Yield (s)	60	91.1	60	91.1
Local Yield 170(s)	60	91.1	60	91.1
Intersection Summary				
Cycle Length	97.6			
Control Type	Actuated-Uncoordinated			
Natural Cycle	50			

Splits and Phases: 2: US 191 & SR 80



HCM 6th Signalized Intersection Summary 2: US 191 & SR 80

Opening Year AM

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	88	134	65	6	393	118	49	36	4	55	47	103
Future Volume (veh/h)	88	134	65	6	393	118	49	36	4	55	47	103
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1189	1663	1870	1870	1663	1737	1870	1870	1870	1500	1870	1485
Adj Flow Rate, veh/h	104	168	81	8	462	139	61	45	5	69	55	121
Peak Hour Factor	0.85	0.80	0.80	0.80	0.85	0.85	0.80	0.80	0.80	0.80	0.85	0.85
Percent Heavy Veh, %	48	16	2	2	16	11	2	2	2	27	2	28
Cap, veh/h	389	1492	748	691	1492	695	311	322	36	377	101	223
Arrive On Green	0.47	0.47	0.47	0.47	0.47	0.47	0.19	0.19	0.19	0.19	0.19	0.19
Sat Flow, veh/h	520	3159	1585	1131	3159	1472	1209	1654	184	1087	520	1144
Grp Volume(v), veh/h	104	168	81	8	462	139	61	0	50	69	0	176
Grp Sat Flow(s),veh/h/ln	520	1580	1585	1131	1580	1472	1209	0	1837	1087	0	1664
Q Serve(g_s), s	5.8	1.1	1.1	0.2	3.4	2.1	1.8	0.0	0.9	2.1	0.0	3.6
Cycle Q Clear(g_c), s	9.3	1.1	1.1	1.3	3.4	2.1	5.4	0.0	0.9	3.0	0.0	3.6
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.10	1.00		0.69
Lane Grp Cap(c), veh/h	389	1492	748	691	1492	695	311	0	358	377	0	324
V/C Ratio(X)	0.27	0.11	0.11	0.01	0.31	0.20	0.20	0.00	0.14	0.18	0.00	0.54
Avail Cap(c_a), veh/h	968	5011	2514	1950	5011	2335	874	0	1214	884	0	1100
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	9.0	5.6	5.6	5.9	6.2	5.8	16.2	0.0	12.6	13.8	0.0	13.7
Incr Delay (d2), s/veh	1.3	0.1	0.2	0.0	0.4	0.5	0.1	0.0	0.1	0.1	0.0	0.5
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	0.8	0.3	0.3	0.0	0.9	0.6	0.7	0.0	0.5	0.7	0.0	1.8
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	10.4	5.7	5.8	5.9	6.6	6.3	16.3	0.0	12.7	13.9	0.0	14.2
LnGrp LOS	B	A	A	A	A	A	B	A	B	B	A	B
Approach Vol, veh/h	353			609			111			245		
Approach Delay, s/veh	7.1			6.5			14.6			14.2		
Approach LOS	A			A			B			B		
Timer - Assigned Phs	2			4			6			8		
Phs Duration (G+Y+Rc), s	24.0			13.9			24.0			13.9		
Change Period (Y+Rc), s	* 6.1			* 6.5			* 6.1			* 6.5		
Max Green Setting (Gmax), s	* 60			* 25			* 60			* 25		
Max Q Clear Time (g_c+I1), s	11.3			5.6			5.4			7.4		
Green Ext Time (p_c), s	6.6			0.5			10.2			0.1		
Intersection Summary												
HCM 6th Ctrl Delay	8.8											
HCM 6th LOS	A											
Notes												

Timing Report, Sorted By Phase

2: US 191 & SR 80

Opening Year PM



Phase Number	2	4	6	8
Movement	EBTL	SBTL	WBTL	NBTL
Lead/Lag				
Lead-Lag Optimize				
Recall Mode	Min	None	Min	None
Maximum Split (s)	66.1	31.5	66.1	31.5
Maximum Split (%)	67.7%	32.3%	67.7%	32.3%
Minimum Split (s)	24.1	24.5	24.1	24.5
Yellow Time (s)	5	4.3	5	4.3
All-Red Time (s)	1.1	2.2	1.1	2.2
Minimum Initial (s)	10	6	10	6
Vehicle Extension (s)	6	1.5	6	1.5
Minimum Gap (s)	3	3	3	3
Time Before Reduce (s)	0	0	0	0
Time To Reduce (s)	0	0	0	0
Walk Time (s)				
Flash Dont Walk (s)				
Dual Entry	Yes	Yes	Yes	Yes
Inhibit Max	Yes	Yes	Yes	Yes
Start Time (s)	0	66.1	0	66.1
End Time (s)	66.1	0	66.1	0
Yield/Force Off (s)	60	91.1	60	91.1
Yield/Force Off 170(s)	60	91.1	60	91.1
Local Start Time (s)	0	66.1	0	66.1
Local Yield (s)	60	91.1	60	91.1
Local Yield 170(s)	60	91.1	60	91.1
Intersection Summary				
Cycle Length	97.6			
Control Type	Actuated-Uncoordinated			
Natural Cycle	55			























Splits and Phases: 2: US 191 & SR 80



HCM 6th Signalized Intersection Summary

2: US 191 & SR 80

Opening Year PM

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	166	370	113	10	212	82	51	37	5	32	82	87
Future Volume (veh/h)	166	370	113	10	212	82	51	37	5	32	82	87
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1426	1663	1870	1870	1693	1737	1870	1870	1870	1530	1870	1485
Adj Flow Rate, veh/h	195	435	133	12	249	96	64	46	6	40	96	102
Peak Hour Factor	0.85	0.85	0.85	0.80	0.85	0.85	0.80	0.80	0.80	0.80	0.85	0.85
Percent Heavy Veh, %	32	16	2	2	14	11	2	2	2	25	2	28
Cap, veh/h	543	1694	850	592	1724	789	264	324	42	346	166	176
Arrive On Green	0.54	0.54	0.54	0.54	0.54	0.54	0.20	0.20	0.20	0.20	0.20	0.20
Sat Flow, veh/h	790	3159	1585	954	3216	1472	1185	1621	211	1106	830	882
Grp Volume(v), veh/h	195	435	133	12	249	96	64	0	52	40	0	198
Grp Sat Flow(s),veh/h/ln	790	1580	1585	954	1608	1472	1185	0	1832	1106	0	1712
Q Serve(g_s), s	7.9	3.5	2.0	0.3	1.9	1.5	2.5	0.0	1.1	1.5	0.0	5.0
Cycle Q Clear(g_c), s	9.7	3.5	2.0	3.9	1.9	1.5	7.5	0.0	1.1	2.6	0.0	5.0
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.12	1.00		0.52
Lane Grp Cap(c), veh/h	543	1694	850	592	1724	789	264	0	366	346	0	342
V/C Ratio(X)	0.36	0.26	0.16	0.02	0.14	0.12	0.24	0.00	0.14	0.12	0.00	0.58
Avail Cap(c_a), veh/h	1113	3973	1993	1279	4044	1851	648	0	960	705	0	897
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	8.0	6.0	5.6	7.0	5.6	5.5	20.7	0.0	15.7	16.8	0.0	17.3
Incr Delay (d2), s/veh	1.5	0.3	0.3	0.0	0.1	0.2	0.2	0.0	0.1	0.1	0.0	0.6
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	1.6	1.1	0.7	0.1	0.6	0.5	1.1	0.0	0.8	0.6	0.0	2.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	9.5	6.2	5.9	7.0	5.7	5.7	20.8	0.0	15.8	16.8	0.0	17.9
LnGrp LOS	A	A	A	A	A	A	C	A	B	B	A	B
Approach Vol, veh/h	763			357			116			238		
Approach Delay, s/veh	7.0			5.8			18.6			17.7		
Approach LOS	A			A			B			B		
Timer - Assigned Phs	2			4			6			8		
Phs Duration (G+Y+Rc), s	31.7			16.0			31.7			16.0		
Change Period (Y+Rc), s	* 6.1			* 6.5			* 6.1			* 6.5		
Max Green Setting (Gmax), s	* 60			* 25			* 60			* 25		
Max Q Clear Time (g_c+I1), s	11.7			7.0			5.9			9.5		
Green Ext Time (p_c), s	13.9			0.5			5.4			0.2		
Intersection Summary												
HCM 6th Ctrl Delay	9.3											
HCM 6th LOS	A											
Notes												

Timing Report, Sorted By Phase

2: US 191 & SR 80

Horizon Year AM



Phase Number	1	2	4	5	6	8
Movement	WBL	EBTL	SBTL	EBL	WBTL	NBTL
Lead/Lag	Lead	Lag		Lead	Lag	
Lead-Lag Optimize	Yes	Yes		Yes	Yes	
Recall Mode	None	Min	None	None	Min	None
Maximum Split (s)	12	50	28	17	45	28
Maximum Split (%)	13.3%	55.6%	31.1%	18.9%	50.0%	31.1%
Minimum Split (s)	9.5	24.1	24.5	9.5	24.1	24.5
Yellow Time (s)	3.5	5	4.3	3.5	5	4.3
All-Red Time (s)	1	1.1	2.2	1	1.1	2.2
Minimum Initial (s)	5	10	6	5	10	6
Vehicle Extension (s)	3	6	1.5	3	6	1.5
Minimum Gap (s)	3	3	3	3	3	3
Time Before Reduce (s)	0	0	0	0	0	0
Time To Reduce (s)	0	0	0	0	0	0
Walk Time (s)						
Flash Dont Walk (s)						
Dual Entry	No	Yes	Yes	No	Yes	Yes
Inhibit Max	Yes	Yes	Yes	Yes	Yes	Yes
Start Time (s)	0	12	62	0	17	62
End Time (s)	12	62	0	17	62	0
Yield/Force Off (s)	7.5	55.9	83.5	12.5	55.9	83.5
Yield/Force Off 170(s)	7.5	55.9	83.5	12.5	55.9	83.5
Local Start Time (s)	78	0	50	78	5	50
Local Yield (s)	85.5	43.9	71.5	0.5	43.9	71.5
Local Yield 170(s)	85.5	43.9	71.5	0.5	43.9	71.5

Intersection Summary























Cycle Length	90
Control Type	Actuated-Uncoordinated
Natural Cycle	75

Splits and Phases: 2: US 191 & SR 80



HCM 6th Signalized Intersection Summary 2: US 191 & SR 80

Horizon Year AM

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	162	402	100	9	987	182	76	55	7	80	73	222
Future Volume (veh/h)	162	402	100	9	987	182	76	55	7	80	73	222
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1307	1633	1870	1870	1648	1737	1870	1870	1870	1544	1870	1544
Adj Flow Rate, veh/h	191	473	118	11	1097	214	89	69	9	94	86	261
Peak Hour Factor	0.85	0.85	0.85	0.80	0.90	0.85	0.85	0.80	0.80	0.85	0.85	0.85
Percent Heavy Veh, %	40	18	2	2	17	11	2	2	2	24	2	24
Cap, veh/h	254	1637	836	471	1370	644	144	414	54	328	104	317
Arrive On Green	0.10	0.53	0.53	0.01	0.44	0.44	0.26	0.26	0.26	0.26	0.26	0.26
Sat Flow, veh/h	1245	3103	1585	1781	3131	1472	1034	1621	211	1091	408	1239
Grp Volume(v), veh/h	191	473	118	11	1097	214	89	0	78	94	0	347
Grp Sat Flow(s),veh/h/ln	1245	1552	1585	1781	1566	1472	1034	0	1832	1091	0	1647
Q Serve(g_s), s	6.6	7.1	3.2	0.3	25.5	8.0	4.8	0.0	2.8	6.2	0.0	16.7
Cycle Q Clear(g_c), s	6.6	7.1	3.2	0.3	25.5	8.0	21.5	0.0	2.8	9.0	0.0	16.7
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.12	1.00		0.75
Lane Grp Cap(c), veh/h	254	1637	836	471	1370	644	144	0	468	328	0	421
V/C Ratio(X)	0.75	0.29	0.14	0.02	0.80	0.33	0.62	0.00	0.17	0.29	0.00	0.82
Avail Cap(c_a), veh/h	310	1637	836	606	1448	681	144	0	468	328	0	421
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	17.2	11.1	10.1	12.8	20.5	15.6	40.5	0.0	24.3	27.8	0.0	29.5
Incr Delay (d2), s/veh	8.0	0.4	0.3	0.0	4.5	1.1	5.7	0.0	0.1	0.2	0.0	11.8
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	3.5	3.7	1.7	0.2	13.4	4.5	3.6	0.0	2.0	2.7	0.0	11.9
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	25.2	11.4	10.4	12.8	25.0	16.7	46.2	0.0	24.4	28.0	0.0	41.3
LnGrp LOS	C	B	B	B	C	B	D	A	C	C	A	D
Approach Vol, veh/h	782		1322			167			441			
Approach Delay, s/veh	14.6		23.5			36.0			38.5			
Approach LOS	B		C			D			D			
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	5.6	50.5		28.0	13.2	42.9		28.0				
Change Period (Y+Rc), s	4.5	* 6.1		* 6.5	4.5	* 6.1		* 6.5				
Max Green Setting (Gmax), s	7.5	* 44		* 22	12.5	* 39		* 22				
Max Q Clear Time (g_c+I1), s	2.3	9.1		18.7	8.6	27.5		23.5				
Green Ext Time (p_c), s	0.0	9.0		0.4	0.2	9.3		0.0				
Intersection Summary												
HCM 6th Ctrl Delay			24.2									
HCM 6th LOS			C									
Notes												

Timing Report, Sorted By Phase

2: US 191 & SR 80

Horizon Year PM



Phase Number	1	2	4	5	6	8
Movement	WBL	EBTL	SBTL	EBL	WBTL	NBTL
Lead/Lag	Lead	Lag		Lead	Lag	
Lead-Lag Optimize	Yes	Yes		Yes	Yes	
Recall Mode	None	Min	None	None	Min	None
Maximum Split (s)	12	48	30	20	40	30
Maximum Split (%)	13.3%	53.3%	33.3%	22.2%	44.4%	33.3%
Minimum Split (s)	9.5	24.1	24.5	9.5	24.1	24.5
Yellow Time (s)	3.5	5	4.3	3.5	5	4.3
All-Red Time (s)	1	1.1	2.2	1	1.1	2.2
Minimum Initial (s)	5	10	6	5	10	6
Vehicle Extension (s)	3	6	1.5	3	6	1.5
Minimum Gap (s)	3	3	3	3	3	3
Time Before Reduce (s)	0	0	0	0	0	0
Time To Reduce (s)	0	0	0	0	0	0
Walk Time (s)						
Flash Dont Walk (s)						
Dual Entry	No	Yes	Yes	No	Yes	Yes
Inhibit Max	Yes	Yes	Yes	Yes	Yes	Yes
Start Time (s)	0	12	60	0	20	60
End Time (s)	12	60	0	20	60	0
Yield/Force Off (s)	7.5	53.9	83.5	15.5	53.9	83.5
Yield/Force Off 170(s)	7.5	53.9	83.5	15.5	53.9	83.5
Local Start Time (s)	78	0	48	78	8	48
Local Yield (s)	85.5	41.9	71.5	3.5	41.9	71.5
Local Yield 170(s)	85.5	41.9	71.5	3.5	41.9	71.5

Intersection Summary

Cycle Length	90
Control Type	Actuated-Uncoordinated
Natural Cycle	70























Splits and Phases: 2: US 191 & SR 80



HCM 6th Signalized Intersection Summary







2: US 191 & SR 80

Horizon Year PM

												
Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Volume (veh/h)	332	1050	174	16	478	126	78	57	7	44	127	157
Future Volume (veh/h)	332	1050	174	16	478	126	78	57	7	44	127	157
Initial Q (Qb), veh	0	0	0	0	0	0	0	0	0	0	0	0
Ped-Bike Adj(A_pbT)	1.00		1.00	1.00		1.00	1.00		1.00	1.00		1.00
Parking Bus, Adj	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Work Zone On Approach	No			No			No			No		
Adj Sat Flow, veh/h/ln	1485	1633	1870	1870	1663	1737	1870	1870	1870	1559	1870	1530
Adj Flow Rate, veh/h	391	1167	205	20	562	148	92	71	9	55	149	185
Peak Hour Factor	0.85	0.90	0.85	0.80	0.85	0.85	0.85	0.80	0.80	0.80	0.85	0.85
Percent Heavy Veh, %	28	18	2	2	16	11	2	2	2	23	2	25
Cap, veh/h	455	1496	764	210	992	462	204	464	59	366	216	269
Arrive On Green	0.19	0.48	0.48	0.02	0.31	0.31	0.29	0.29	0.29	0.29	0.29	0.29
Sat Flow, veh/h	1414	3103	1585	1781	3159	1472	1046	1627	206	1099	759	942
Grp Volume(v), veh/h	391	1167	205	20	562	148	92	0	80	55	0	334
Grp Sat Flow(s),veh/h/ln	1414	1552	1585	1781	1580	1472	1046	0	1833	1099	0	1701
Q Serve(g_s), s	14.6	25.4	6.3	0.6	12.1	6.2	7.0	0.0	2.7	3.2	0.0	14.2
Cycle Q Clear(g_c), s	14.6	25.4	6.3	0.6	12.1	6.2	21.2	0.0	2.7	5.9	0.0	14.2
Prop In Lane	1.00		1.00	1.00		1.00	1.00		0.11	1.00		0.55
Lane Grp Cap(c), veh/h	455	1496	764	210	992	462	204	0	523	366	0	485
V/C Ratio(X)	0.86	0.78	0.27	0.10	0.57	0.32	0.45	0.00	0.15	0.15	0.00	0.69
Avail Cap(c_a), veh/h	455	1599	817	335	1317	614	208	0	530	370	0	491
HCM Platoon Ratio	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Upstream Filter(I)	1.00	1.00	1.00	1.00	1.00	1.00	1.00	0.00	1.00	1.00	0.00	1.00
Uniform Delay (d), s/veh	15.4	17.5	12.5	19.0	23.3	21.3	35.3	0.0	21.7	23.9	0.0	25.9
Incr Delay (d2), s/veh	15.1	3.6	0.7	0.2	1.8	1.4	0.6	0.0	0.0	0.1	0.0	3.3
Initial Q Delay(d3),s/veh	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
%ile BackOfQ(95%),veh/ln	9.3	12.6	3.5	0.4	7.5	3.7	3.2	0.0	2.0	1.4	0.0	9.6
Unsig. Movement Delay, s/veh												
LnGrp Delay(d),s/veh	30.6	21.1	13.2	19.2	25.1	22.7	35.8	0.0	21.8	24.0	0.0	29.1
LnGrp LOS	C	C	B	B	C	C	D	A	C	C	A	C
Approach Vol, veh/h	1763			730			172			389		
Approach Delay, s/veh	22.3			24.5			29.3			28.4		
Approach LOS	C			C			C			C		
Timer - Assigned Phs	1	2		4	5	6		8				
Phs Duration (G+Y+Rc), s	6.3	45.3		29.7	20.0	31.6		29.7				
Change Period (Y+Rc), s	4.5	* 6.1		* 6.5	4.5	* 6.1		* 6.5				
Max Green Setting (Gmax), s	7.5	* 42		* 24	15.5	* 34		* 24				
Max Q Clear Time (g_c+I1), s	2.6	27.4		16.2	16.6	14.1		23.2				
Green Ext Time (p_c), s	0.0	11.8		0.6	0.0	8.5		0.0				
Intersection Summary												
HCM 6th Ctrl Delay	24.0											
HCM 6th LOS	C											
Notes												

***IPOE East Intersection
(2028/2050 Build)***







Intersection	
Intersection Delay, s/veh	8.9
Intersection LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	52	5	5	5	5	30	5	5	5	58	50	69
Future Vol, veh/h	52	5	5	5	5	30	5	5	5	58	50	69
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.85	0.85	0.80
Heavy Vehicles, %	71	2	2	2	2	20	2	2	2	20	2	58
Mvmt Flow	65	6	6	6	6	38	6	6	6	68	59	86
Number of Lanes	1	1	0	0	1	0	0	1	0	0	1	1

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	2	2	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	1	2	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	2	1	2
HCM Control Delay	10	8.2	8.2	8.7
HCM LOS	A	A	A	A

Lane	NBLn1	EBLn1	EBLn2	WBLn1	SBLn1	SBLn2
Vol Left, %	33%	100%	0%	12%	54%	0%
Vol Thru, %	33%	0%	50%	12%	46%	0%
Vol Right, %	33%	0%	50%	75%	0%	100%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	15	52	10	40	108	69
LT Vol	5	52	0	5	58	0
Through Vol	5	0	5	5	50	0
RT Vol	5	0	5	30	0	69
Lane Flow Rate	19	65	12	50	127	86
Geometry Grp	4b	5	5	4b	5	5
Degree of Util (X)	0.026	0.123	0.017	0.067	0.194	0.101
Departure Headway (Hd)	5.027	6.838	4.806	4.803	5.506	4.228
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	713	526	746	747	654	850
Service Time	3.051	4.562	2.529	2.826	3.222	1.943
HCM Lane V/C Ratio	0.027	0.124	0.016	0.067	0.194	0.101
HCM Control Delay	8.2	10.5	7.6	8.2	9.5	7.4
HCM Lane LOS	A	B	A	A	A	A
HCM 95th-tile Q	0.1	0.4	0.1	0.2	0.7	0.3

Intersection	
Intersection Delay, s/veh	9.1
Intersection LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	79	5	5	5	5	74	5	50	5	23	50	48
Future Vol, veh/h	79	5	5	5	5	74	5	50	5	23	50	48
Peak Hour Factor	0.85	0.80	0.80	0.85	0.85	0.85	0.80	0.80	0.80	0.80	0.80	0.80
Heavy Vehicles, %	53	2	2	2	2	20	2	2	2	20	2	76
Mvmt Flow	93	6	6	6	6	87	6	63	6	29	63	60
Number of Lanes	1	1	0	0	1	0	0	1	0	0	1	1

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	1	2	2	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	2	1	2	1
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	2	1	2
HCM Control Delay	10.3	8.5	9	8.6
HCM LOS	B	A	A	A






Lane	NBLn1	EBLn1	EBLn2	WBLn1	SBLn1	SBLn2
Vol Left, %	8%	100%	0%	6%	32%	0%
Vol Thru, %	83%	0%	50%	6%	68%	0%
Vol Right, %	8%	0%	50%	88%	0%	100%
Sign Control	Stop	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	60	79	10	84	73	48
LT Vol	5	79	0	5	23	0
Through Vol	50	0	5	5	50	0
RT Vol	5	0	5	74	0	48
Lane Flow Rate	75	93	12	99	91	60
Geometry Grp	4b	5	5	4b	5	5
Degree of Util (X)	0.11	0.17	0.017	0.131	0.143	0.075
Departure Headway (Hd)	5.269	6.582	4.855	4.765	5.651	4.482
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes	Yes
Cap	680	546	736	751	635	799
Service Time	3.308	4.32	2.593	2.803	3.384	2.214
HCM Lane V/C Ratio	0.11	0.17	0.016	0.132	0.143	0.075
HCM Control Delay	9	10.7	7.7	8.5	9.3	7.6
HCM Lane LOS	A	B	A	A	A	A
HCM 95th-tile Q	0.4	0.6	0.1	0.4	0.5	0.2

Intersection				
Intersection Delay, s/veh	7.3			
Intersection LOS	A			
Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	148	142	36	453
Demand Flow Rate, veh/h	212	166	36	571
Vehicles Circulating, veh/h	328	212	459	36
Vehicles Exiting, veh/h	279	283	81	342
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	7.7	5.2	4.6	8.1
Approach LOS	A	A	A	A
Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976	4.976
Entry Flow, veh/h	212	166	36	571
Cap Entry Lane, veh/h	988	1112	864	1330
Entry HV Adj Factor	0.697	0.854	0.993	0.793
Flow Entry, veh/h	148	142	36	453
Cap Entry, veh/h	688	949	858	1055
V/C Ratio	0.215	0.149	0.042	0.429
Control Delay, s/veh	7.7	5.2	4.6	8.1
LOS	A	A	A	A
95th %tile Queue, veh	1	1	0	2

Intersection				
Intersection Delay, s/veh	7.6			
Intersection LOS	A			
Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	255	312	86	256
Demand Flow Rate, veh/h	340	370	87	335
Vehicles Circulating, veh/h	181	391	437	36
Vehicles Exiting, veh/h	190	133	84	725
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	7.4	9.6	5.1	6.0
Approach LOS	A	A	A	A
Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976	4.976
Entry Flow, veh/h	340	370	87	335
Cap Entry Lane, veh/h	1147	926	884	1330
Entry HV Adj Factor	0.749	0.843	0.986	0.764
Flow Entry, veh/h	255	312	86	256
Cap Entry, veh/h	860	780	871	1016
V/C Ratio	0.296	0.400	0.098	0.252
Control Delay, s/veh	7.4	9.6	5.1	6.0
LOS	A	A	A	A
95th %tile Queue, veh	1	2	0	1

***IPOE West Intersection
(2028/2050 Build)***






Intersection	
Intersection Delay, s/veh	8.6
Intersection LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	5	15	5	33	29	7	5	5	33	6	5	5
Future Vol, veh/h	5	15	5	33	29	7	5	5	33	6	5	5
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Heavy Vehicles, %	2	20	100	100	20	20	100	100	100	13	100	2
Mvmt Flow	6	19	6	41	36	9	6	6	41	8	6	6
Number of Lanes	0	1	0	1	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	2	1
HCM Control Delay	7.4	9.1	9	7.5
HCM LOS	A	A	A	A

Lane	NBLn1	EBLn1	WBLn1	WBLn2	SBLn1
Vol Left, %	12%	20%	100%	0%	38%
Vol Thru, %	12%	60%	0%	81%	31%
Vol Right, %	77%	20%	0%	19%	31%
Sign Control	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	43	25	33	36	16
LT Vol	5	5	33	0	6
Through Vol	5	15	0	29	5
RT Vol	33	5	0	7	5
Lane Flow Rate	54	31	41	45	20
Geometry Grp	2	4a	5	5	2
Degree of Util (X)	0.082	0.037	0.078	0.061	0.024
Departure Headway (Hd)	5.514	4.275	6.849	4.85	4.408
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes
Cap	654	842	520	730	816
Service Time	3.516	2.279	4.635	2.635	2.412
HCM Lane V/C Ratio	0.083	0.037	0.079	0.062	0.025
HCM Control Delay	9	7.4	10.2	8	7.5
HCM Lane LOS	A	A	B	A	A
HCM 95th-tile Q	0.3	0.1	0.3	0.2	0.1

Intersection	
Intersection Delay, s/veh	8.6
Intersection LOS	A

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Traffic Vol, veh/h	5	37	5	33	12	6	5	5	33	9	5	5
Future Vol, veh/h	5	37	5	33	12	6	5	5	33	9	5	5
Peak Hour Factor	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80	0.80
Heavy Vehicles, %	2	20	100	100	20	10	100	100	100	20	100	2
Mvmt Flow	6	46	6	41	15	8	6	6	41	11	6	6
Number of Lanes	0	1	0	1	1	0	0	1	0	0	1	0

Approach	EB	WB	NB	SB
Opposing Approach	WB	EB	SB	NB
Opposing Lanes	2	1	1	1
Conflicting Approach Left	SB	NB	EB	WB
Conflicting Lanes Left	1	1	1	2
Conflicting Approach Right	NB	SB	WB	EB
Conflicting Lanes Right	1	1	2	1
HCM Control Delay	7.6	9.4	9	7.7
HCM LOS	A	A	A	A

Lane	NBLn1	EBLn1	WBLn1	WBLn2	SBLn1
Vol Left, %	12%	11%	100%	0%	47%
Vol Thru, %	12%	79%	0%	67%	26%
Vol Right, %	77%	11%	0%	33%	26%
Sign Control	Stop	Stop	Stop	Stop	Stop
Traffic Vol by Lane	43	47	33	18	19
LT Vol	5	5	33	0	9
Through Vol	5	37	0	12	5
RT Vol	33	5	0	6	5
Lane Flow Rate	54	59	41	22	24
Geometry Grp	2	4a	5	5	2
Degree of Util (X)	0.083	0.07	0.08	0.03	0.03
Departure Headway (Hd)	5.526	4.298	6.97	4.773	4.584
Convergence, Y/N	Yes	Yes	Yes	Yes	Yes
Cap	651	837	517	739	784
Service Time	3.533	2.307	4.67	2.571	2.593
HCM Lane V/C Ratio	0.083	0.07	0.079	0.03	0.031
HCM Control Delay	9	7.6	10.3	7.7	7.7
HCM Lane LOS	A	A	B	A	A
HCM 95th-tile Q	0.3	0.2	0.3	0.1	0.1

Intersection				
Intersection Delay, s/veh	5.7			
Intersection LOS	A			
Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	76	177	68	36
Demand Flow Rate, veh/h	98	249	136	50
Vehicles Circulating, veh/h	131	55	93	240
Vehicles Exiting, veh/h	159	174	136	64
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	4.6	5.7	7.0	5.1
Approach LOS	A	A	A	A
Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976	4.976
Entry Flow, veh/h	98	249	136	50
Cap Entry Lane, veh/h	1207	1305	1255	1080
Entry HV Adj Factor	0.777	0.711	0.500	0.720
Flow Entry, veh/h	76	177	68	36
Cap Entry, veh/h	938	927	627	778
V/C Ratio	0.081	0.191	0.108	0.046
Control Delay, s/veh	4.6	5.7	7.0	5.1
LOS	A	A	A	A
95th %tile Queue, veh	0	1	0	0

Intersection				
Intersection Delay, s/veh	5.8			
Intersection LOS	A			
Approach	EB	WB	NB	SB
Entry Lanes	1	1	1	1
Conflicting Circle Lanes	1	1	1	1
Adj Approach Flow, veh/h	156	100	68	56
Demand Flow Rate, veh/h	194	157	136	74
Vehicles Circulating, veh/h	155	55	213	163
Vehicles Exiting, veh/h	82	294	136	49
Ped Vol Crossing Leg, #/h	0	0	0	0
Ped Cap Adj	1.000	1.000	1.000	1.000
Approach Delay, s/veh	5.4	5.5	8.0	4.7
Approach LOS	A	A	A	A
Lane	Left	Left	Left	Left
Designated Moves	LTR	LTR	LTR	LTR
Assumed Moves	LTR	LTR	LTR	LTR
RT Channelized				
Lane Util	1.000	1.000	1.000	1.000
Follow-Up Headway, s	2.609	2.609	2.609	2.609
Critical Headway, s	4.976	4.976	4.976	4.976
Entry Flow, veh/h	194	157	136	74
Cap Entry Lane, veh/h	1178	1305	1110	1169
Entry HV Adj Factor	0.805	0.636	0.500	0.757
Flow Entry, veh/h	156	100	68	56
Cap Entry, veh/h	948	830	555	884
V/C Ratio	0.165	0.120	0.122	0.063
Control Delay, s/veh	5.4	5.5	8.0	4.7
LOS	A	A	A	A
95th %tile Queue, veh	1	0	0	0

Appendix C: Agency Comments and Responses

FHWA Comments on Initial Modeling Files (Received 8/30/2024)

- The AERMOD input file includes erroneous factors in the SRCPARAM keyword resulting in source emissions that are ~100-200 times too low. The emissions were calculated correctly using MOVES output and road dust factors and used to generate an HROFDY EMISFACT table. However, additional factors were also provided in the SRCPARAM keyword that were likely due to the AERMOD View software further dividing by the source area to calculate g/s/m² (this step was already completed in the “emission rates and fugitive dust” spreadsheet.) This explains why the reported project contributions are incredibly low (H8H of 0.09). We re-ran the scenario with correct factors and are now seeing a H6H concentration of ~33 ug/m³.
 - Response: Model files were corrected, and results were revised within the report.
- The LINE sources do not include initsigZ values defining each source’s initial plume (recommended per EPA guidance).
 - Response: initsig values were added to the LINE sources.
- It appears some of the highest receptors may be too close to sources and at inappropriate locations (< 1 m away).
 - Response: Receptor locations were checked and adjusted as needed.
- The design values appear to have been incorrectly calculated from the background data. The results indicate the background component is the average of each year’s max PM₁₀ concentration. However, the design value should be calculated as the fourth high value from three years of monitoring data following the example in Appendix K.5 of the EPA PM Hot-Spot Guidance. The monitoring data from the EPA website (<https://www.epa.gov/outdoor-air-quality-data>) has been attach for the Paul Spur and Douglas for the years 2021 – 2023. The 4th highest concentration for Paul Spur is 93 ug/m³ and 4th highest concentration for Douglas is 107 ug/m³.
 - Response: The background values were adjusted to reflect this procedure. The concentration for Douglas was used as the background value.
- We believe it is unnecessary for this project to use terrain/AERMAP. Using “FLAT” should be sufficient for this project given the lack of elevations differences near the focus intersection.
 - Response: Model was revised to use “FLAT” instead of terrain/AERMAP.
- How were the meteorological files processed with AERMET? How was the surface roughness determined? Was AERSURFACE run to process the met data?
 - Response: The meteorological files were provided by ADEQ. AERMET (version 23132) and AERMINUTE (version 15272) were used to process five years (2015-2019) of surface meteorological data obtained from Bisbee-Douglas International Airport along with concurrent upper air radiosonde data obtained from Tucson. In Arizona, there are two radiosonde stations, Tucson and Flagstaff. The Tucson radiosonde

station is located in a similar climatic region and is most representative of upper air conditions at the project site. Based on the EPA's guidance for AERMINUTE, a minimum wind speed threshold of 0.5 m/s was applied to the hourly averaged wind speeds provided by AERMINUTE. To address issues with model overprediction due to underprediction of the surface friction velocity (u^*) during light wind/stable conditions, EPA has integrated the ADJ_U* option into the AERMET. Based on the EPA's evaluations, using the ADJ_U* option is appropriate when standard NWS data are used. Therefore, the ADJ_U* option was used as a regulatory option in the data processing.

The EPA's AERSURFACE tool (version 20060) was used to calculate surface characteristic parameters (albedo, Bowen ratio and surface roughness) required by AERMET. National Land Cover Data 2016 (NLCD 2016) obtained from the U.S. Geological Survey was input to AERSURFACE. In addition to the NLCD 2016 data, the following inputs were used:

Method for determining surface roughness length – ZORAD;
Study radius for surface roughness (km) – 1 kilometer;
Number of sectors – 12;
Temporal resolution – Monthly;
Continuous snow cover most of the winter? – No;
Surface moisture: Average;
Arid Region? – No;
Month/Season assignments – Default.

- Can ADOT explain why there is only a single peak traffic period between 4-7pm and all other hours assume the same traffic?
 - Response: The Final Traffic Report only contained AM and PM peak hour traffic volume projections, with PM being the peak hour for the day. To be conservative, the AM traffic volumes were used for both the midday and overnight periods.
- We would like to see additional discussion justifying the rationale for modeling a single intersection and not the remainder of James Ranch to the IPOE. Specifically, we are interested in why the new port of entry south on James Ranch Road might not need additional dispersion modeling. Though the port itself is covered under general conformity, are the emissions from idling trucks significant enough to necessitate modeling the southern portion of James Ranch Road that connects to the port? Section 8 of the PM Hot-Spot Guidance discussion discusses when nearby sources should be considered. Since the IPOE is not yet built, it will potentially contribute to the background concentration for the project.
 - Response: Additional justification is provided in the PM₁₀ Hot Spot Air Quality Memorandum - City of Douglas Commercial Land Port of Entry (LPOE), which is included as Appendix E of this report.

EPA Comments on Initial Modeling Files (Received 9/5/2024)

- EPA concurs with and strongly emphasizes FHWA's comments, provided to ADOT on Friday, August 30th via e-mail.
 - Response: See responses to FHWA comments above.
- The receptor grid spacing labeled in the figure titled "AERMOD Receptor Grid Map" on page 29 of the IAC document does not appear to be consistent with the spacing shown in the AERMOD files (e.g., some distances < 5 m despite labels). Please ensure that labels are accurate and consistent with AERMOD files and that receptor spacing relative to sources is consistent with guidance documents, as also described by FHWA.
 - Response: Receptor locations were reviewed and corrected as needed to ensure appropriate spacing.

Appendix D: PM₁₀ Modeling Results by Receptor

Discrete Receptor ID	X	Y	Concentration	Elevation (Hill Heights (ZHILL)	
FENCEGRD	627837.1	3470279	3.65853	1239.09	1239.09
FENCEGRD	627861.5	3470276	4.1079	1238.89	1238.89
FENCEGRD	627885.9	3470274	4.25763	1238.65	1238.65
FENCEGRD	627910.2	3470271	4.32769	1238.47	1238.47
FENCEGRD	627934.6	3470268	4.37221	1238.37	1238.37
FENCEGRD	627959	3470266	4.42676	1238.2	1238.2
FENCEGRD	627983.3	3470263	4.47358	1238	1238
FENCEGRD	628007.7	3470260	4.5109	1237.88	1237.88
FENCEGRD	628032	3470257	4.55633	1237.74	1237.74
FENCEGRD	628056.4	3470255	4.58577	1237.54	1237.54
FENCEGRD	628080.8	3470252	4.65372	1237.39	1237.39
FENCEGRD	628105.1	3470249	4.7212	1237.32	1237.32
FENCEGRD	628129.5	3470247	4.79716	1237.07	1237.07
FENCEGRD	628153.9	3470244	4.86968	1236.87	1236.87
FENCEGRD	628178.2	3470241	4.95279	1236.75	1236.75
FENCEGRD	628202.6	3470239	5.04188	1236.55	1236.55
FENCEGRD	628227	3470236	5.13303	1236.32	1236.32
FENCEGRD	628251.3	3470233	5.22565	1236.16	1236.16
FENCEGRD	628275.7	3470230	5.3161	1236.01	1236.01
FENCEGRD	628300.1	3470228	5.44199	1235.76	1235.76
FENCEGRD	628324.4	3470225	5.58465	1235.55	1235.55
FENCEGRD	628348.8	3470222	5.76078	1235.41	1235.41
FENCEGRD	628373.2	3470220	5.91762	1235.2	1235.2
FENCEGRD	628397.5	3470217	6.15765	1235.03	1235.03
FENCEGRD	628421.9	3470214	6.47473	1234.84	1234.84
FENCEGRD	628446.3	3470212	6.73771	1234.62	1234.62
FENCEGRD	628470.6	3470209	7.23846	1234.4	1234.4
FENCEGRD	628495	3470206	7.64567	1234.24	1234.24
FENCEGRD	628519.4	3470203	8.34608	1234.09	1234.09
FENCEGRD	628543.7	3470201	9.15533	1233.85	1233.85
FENCEGRD	628568.1	3470198	10.43609	1233.67	1233.67
FENCEGRD	628592.4	3470195	12.01271	1233.53	1233.53
FENCEGRD	628616.8	3470193	14.58254	1233.33	1233.33
FENCEGRD	627839.9	3470304	2.64876	1233.18	1233.18
FENCEGRD	627864.2	3470301	2.82307	1238.2	1238.2
FENCEGRD	627888.6	3470298	2.91274	1237.69	1237.69
FENCEGRD	627913	3470296	3.0163	1237.41	1237.41
FENCEGRD	627937.3	3470293	3.12209	1237.29	1237.29
FENCEGRD	627961.7	3470290	3.20359	1237.15	1237.15
FENCEGRD	627986.1	3470288	3.28146	1237.01	1237.01
FENCEGRD	628010.4	3470285	3.34343	1236.82	1236.82
FENCEGRD	628034.8	3470282	3.41701	1236.63	1236.63
FENCEGRD	628059.2	3470280	3.48585	1236.46	1236.46
FENCEGRD	628083.5	3470277	3.55411	1236.26	1236.26
FENCEGRD	628107.9	3470274	3.62465	1236.19	1236.19
FENCEGRD	628132.3	3470271	3.70734	1236.55	1236.55
FENCEGRD	628156.6	3470269	3.78118	1236.21	1236.21
FENCEGRD	628181	3470266	3.86348	1235.85	1235.85
FENCEGRD	628205.4	3470263	3.96667	1235.7	1235.7
FENCEGRD	628229.7	3470261	4.07077	1235.51	1235.51
FENCEGRD	628254.1	3470258	4.16909	1235.38	1235.38
FENCEGRD	628278.5	3470255	4.27716	1235.2	1235.2
FENCEGRD	628302.8	3470253	4.4072	1234.98	1234.98
FENCEGRD	628327.2	3470250	4.55061	1234.81	1234.81
FENCEGRD	628351.5	3470247	4.70396	1234.66	1234.66
FENCEGRD	628375.9	3470244	4.88774	1234.49	1234.49
FENCEGRD	628400.3	3470242	5.08245	1234.37	1234.37
FENCEGRD	628424.6	3470239	5.36128	1234.22	1234.22
FENCEGRD	628449	3470236	5.6104	1233.94	1233.94
FENCEGRD	628473.4	3470234	5.97711	1233.66	1233.66
FENCEGRD	628497.7	3470231	6.57862	1233.48	1233.48
FENCEGRD	628522.1	3470228	7.08473	1233.49	1233.49
FENCEGRD	627822.4	3470323	2.23736	1233.57	1233.57
FENCEGRD	627792.1	3470299	2.20002	1233.2	1233.2
FENCEGRD	627842.6	3470329	2.32238	1232.76	1232.76
FENCEGRD	627867	3470326	2.4418	1232.55	1232.55
FENCEGRD	627891.4	3470323	2.51408	1232.38	1232.38
FENCEGRD	627915.7	3470321	2.56772	1232.47	1232.47
FENCEGRD	627940.1	3470318	2.64339	1238.12	1238.12
FENCEGRD	627964.5	3470315	2.70962	1238.63	1238.63
FENCEGRD	627988.8	3470313	2.78999	1237.9	1237.9
FENCEGRD	628013.2	3470310	2.8776	1237.63	1237.63
FENCEGRD	628037.6	3470307	2.94728	1237.41	1237.41
FENCEGRD	628061.9	3470304	3.02211	1237.3	1237.3
FENCEGRD	628086.3	3470302	3.09756	1237.15	1237.15
FENCEGRD	628110.7	3470299	3.17124	1236.95	1236.95
FENCEGRD	628135	3470296	3.25144	1236.76	1236.76
FENCEGRD	628159.4	3470294	3.33452	1236.57	1236.57
FENCEGRD	628183.7	3470291	3.41885	1236.41	1236.41
FENCEGRD	628208.1	3470288	3.49648	1236.26	1236.26
FENCEGRD	628232.5	3470286	3.57936	1236.13	1236.13
FENCEGRD	628256.8	3470283	3.66358	1236.23	1236.23
FENCEGRD	628281.2	3470280	3.77244	1235.89	1235.89

Paul Spur/Douglas PM10 Monitoring Data (2020-2023)				
Year	PM10 Annual 24-hr Mean Concentration		PM10 Max 24-hr Concentration	
	Paul Spur	Douglas	Paul Spur	Douglas
2020	22.40	28.70	154.00	129.00
2021	21.30	31.90	161.00	107.00
2022	18.80	26.20	91.00	130.00
2023	19.00	27.70	99.00	155.00

Summary of Model Results and Compare to NAAQS (unit in ug/m3)	
	24-hr 6th Highest
Project - Max	31.06
Background - 4th Highest Value of 3 Years	107.00
Total (Project + Background)	138.06
Total (Project + Background)	138.06
NAAQS Threshold	150
Exceed Threshold?	No

FENCEGRD	628305.6	3470277	3.88593	1235.72	1235.72
FENCEGRD	628329.9	3470275	4.00603	1235.58	1235.58
FENCEGRD	628354.3	3470272	4.17836	1235.49	1235.49
FENCEGRD	628378.7	3470269	4.40155	1235.34	1235.34
FENCEGRD	628403	3470267	4.63491	1235.16	1235.16
FENCEGRD	628427.4	3470264	4.90777	1234.98	1234.98
FENCEGRD	628451.8	3470261	5.19134	1234.74	1234.74
FENCEGRD	628476.1	3470259	5.51016	1234.57	1234.57
FENCEGRD	628500.5	3470256	5.97367	1234.44	1234.44
FENCEGRD	628524.9	3470253	6.45168	1234.27	1234.27
FENCEGRD	627825.8	3470348	2.04308	1234.15	1234.15
FENCEGRD	627806.2	3470342	1.98333	1233.99	1233.99
FENCEGRD	627776.7	3470319	1.93296	1233.75	1233.75
FENCEGRD	627766.9	3470301	1.98918	1233.58	1233.58
FENCEGRD	627845.4	3470354	2.10023	1233.42	1233.42
FENCEGRD	627869.8	3470351	2.21735	1233.11	1233.11
FENCEGRD	627894.1	3470348	2.28096	1232.9	1232.9
FENCEGRD	627918.5	3470345	2.33219	1232.79	1232.79
FENCEGRD	627942.8	3470343	2.37718	1232.6	1232.6
FENCEGRD	627967.2	3470340	2.43211	1232.47	1232.47
FENCEGRD	627991.6	3470337	2.49517	1238.14	1238.14
FENCEGRD	628015.9	3470335	2.56589	1238.32	1238.32
FENCEGRD	628040.3	3470332	2.6417	1238.56	1238.56
FENCEGRD	628064.7	3470329	2.71866	1238.92	1238.92
FENCEGRD	628089	3470327	2.79391	1237.94	1237.94
FENCEGRD	628113.4	3470324	2.87322	1237.62	1237.62
FENCEGRD	628137.8	3470321	2.95425	1237.4	1237.4
FENCEGRD	628162.1	3470318	3.03765	1237.28	1237.28
FENCEGRD	628186.5	3470316	3.10222	1237.09	1237.09
FENCEGRD	628210.9	3470313	3.16963	1236.93	1236.93
FENCEGRD	628235.2	3470310	3.24749	1236.76	1236.76
FENCEGRD	628259.6	3470308	3.33317	1236.58	1236.58
FENCEGRD	628284	3470305	3.46467	1236.42	1236.42
FENCEGRD	628308.3	3470302	3.62615	1236.25	1236.25
FENCEGRD	628332.7	3470300	3.8006	1236.12	1236.12
FENCEGRD	628357.1	3470297	3.94851	1235.97	1235.97
FENCEGRD	628381.4	3470294	4.08351	1235.77	1235.77
FENCEGRD	628405.8	3470291	4.29384	1235.67	1235.67
FENCEGRD	628430.2	3470289	4.50766	1235.57	1235.57
FENCEGRD	628454.5	3470286	4.74604	1235.46	1235.46
FENCEGRD	628478.9	3470283	5.10399	1235.32	1235.32
FENCEGRD	628503.2	3470281	5.39594	1235.15	1235.15
FENCEGRD	628527.6	3470278	5.84946	1234.99	1234.99
FENCEGRD	627828.8	3470373	1.91621	1234.81	1234.81
FENCEGRD	627809.5	3470367	1.89512	1234.59	1234.59
FENCEGRD	627790.3	3470362	1.78764	1234.42	1234.42
FENCEGRD	627761.3	3470338	1.746	1234.26	1234.26
FENCEGRD	627751.6	3470321	1.80244	1234.09	1234.09
FENCEGRD	627741.9	3470303	1.82338	1233.94	1233.94
FENCEGRD	627848.1	3470378	1.91622	1233.8	1233.8
FENCEGRD	627872.5	3470376	2.00663	1233.6	1233.6
FENCEGRD	627896.9	3470373	2.09618	1233.4	1233.4
FENCEGRD	627921.2	3470370	2.17632	1233.2	1233.2
FENCEGRD	627945.6	3470368	2.22009	1233.03	1233.03
FENCEGRD	627970	3470365	2.26497	1232.8	1232.8
FENCEGRD	627994.3	3470362	2.31526	1232.65	1232.65
FENCEGRD	628018.7	3470360	2.37271	1232.53	1232.53
FENCEGRD	628043.1	3470357	2.43706	1238.1	1238.1
FENCEGRD	628067.4	3470354	2.50537	1238.34	1238.34
FENCEGRD	628091.8	3470351	2.57909	1238.46	1238.46
FENCEGRD	628116.2	3470349	2.65446	1238.65	1238.65
FENCEGRD	628140.5	3470346	2.7286	1238.78	1238.78
FENCEGRD	628164.9	3470343	2.80373	1239.18	1239.18
FENCEGRD	628189.3	3470341	2.86351	1237.9	1237.9
FENCEGRD	628213.6	3470338	2.93189	1237.64	1237.64
FENCEGRD	628238	3470335	3.05443	1237.46	1237.46
FENCEGRD	628262.3	3470333	3.14753	1237.28	1237.28
FENCEGRD	628286.7	3470330	3.25271	1237.08	1237.08
FENCEGRD	628311.1	3470327	3.36245	1236.89	1236.89
FENCEGRD	628335.4	3470324	3.47663	1236.7	1236.7
FENCEGRD	628359.8	3470322	3.60697	1236.51	1236.51
FENCEGRD	628384.2	3470319	3.75149	1236.37	1236.37
FENCEGRD	628408.5	3470316	3.91163	1236.22	1236.22
FENCEGRD	628432.9	3470314	4.14276	1236.09	1236.09
FENCEGRD	628457.3	3470311	4.35371	1235.87	1235.87
FENCEGRD	628481.6	3470308	4.55931	1235.71	1235.71
FENCEGRD	628506	3470306	4.86161	1235.62	1235.62
FENCEGRD	628530.4	3470303	5.22098	1235.5	1235.5
FENCEGRD	628639	3470226	11.98682	1235.36	1235.36
FENCEGRD	628614.1	3470228	10.50944	1235.22	1235.22
FENCEGRD	628589.2	3470230	9.32435	1235.06	1235.06
FENCEGRD	628564.3	3470232	8.28845	1234.88	1234.88
FENCEGRD	628539.4	3470234	7.54283	1234.74	1234.74
FENCEGRD	628639.9	3470245	10.4225	1234.58	1234.58
FENCEGRD	628640.8	3470265	9.23071	1234.4	1234.4
FENCEGRD	628641.7	3470285	8.28417	1234.25	1234.25

FENCEGRD	628642.6	3470304	7.46517	1234.06	1234.06
FENCEGRD	628614.9	3470246	9.03896	1233.9	1233.9
FENCEGRD	628615.8	3470266	8.13388	1233.75	1233.75
FENCEGRD	628616.7	3470286	7.53671	1233.62	1233.62
FENCEGRD	628617.6	3470305	6.66208	1233.41	1233.41
FENCEGRD	628590	3470247	8.22677	1233.23	1233.23
FENCEGRD	628590.9	3470267	7.16617	1233.04	1233.04
FENCEGRD	628591.8	3470287	6.5533	1232.81	1232.81
FENCEGRD	628592.7	3470307	5.90292	1232.61	1232.61
FENCEGRD	628565	3470248	7.58688	1232.47	1232.47
FENCEGRD	628565.9	3470268	6.82553	1233.26	1233.26
FENCEGRD	628566.8	3470288	5.96316	1232.51	1232.51
FENCEGRD	628567.7	3470308	5.33637	1232.4	1232.4
FENCEGRD	628540	3470250	6.94776	1232.55	1232.55
FENCEGRD	628540.9	3470269	6.25341	1232.73	1232.73
FENCEGRD	628541.8	3470289	5.75738	1232.7	1232.7
FENCEGRD	628542.7	3470309	5.21462	1232.85	1232.85
FENCEGRD	628647.8	3470309	7.39425	1232.85	1232.85
FENCEGRD	628656.3	3470309	7.34237	1232.41	1232.41
FENCEGRD	628641.6	3470331	6.50524	1232.46	1232.46
FENCEGRD	628634.4	3470329	6.45192	1232.43	1232.43
FENCEGRD	628624.1	3470319	6.43253	1232.42	1232.42
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FENCEGRD	628618.2	3470348	5.63316	1232.55	1232.55
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FENCEGRD	628658.3	3470359	5.83164	1232.81	1232.81
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FENCEGRD	628661.1	3470280	8.28597	1232.5	1232.5
FENCEGRD	628661.1	3470255	9.48244	1232.52	1232.52
FENCEGRD	628661.1	3470231	10.96377	1232.56	1232.56
FENCEGRD	628661.1	3470207	12.97387	1232.59	1232.59
FENCEGRD	628686.1	3470304	6.85136	1232.63	1232.63
FENCEGRD	628686.1	3470280	7.53453	1232.66	1232.66
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FENCEGRD	628686.1	3470231	9.50722	1232.77	1232.77
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FENCEGRD	628711.1	3470304	5.96029	1232.83	1232.83
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FENCEGRD	628711.1	3470255	7.71041	1232.85	1232.85

FENCEGRD	628711.1	3470231	9.35046	1232.87	1232.87
FENCEGRD	628711.1	3470207	11.63928	1232.88	1232.88
FENCEGRD	628711.1	3470183	15.18336	1232.9	1232.9
FENCEGRD	628728.7	3470322	5.28875	1232.29	1232.29
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FENCEGRD	628736.1	3470231	8.57887	1232.57	1232.57
FENCEGRD	628736.1	3470207	9.80929	1232.59	1232.59
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FENCEGRD	628678.1	3470401	5.11757	1232.81	1232.81
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FENCEGRD	628761.1	3470231	7.29403	1232.96	1232.96
FENCEGRD	628761.1	3470207	8.24898	1232.97	1232.97
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FENCEGRD	629418.1	3470207	2.05498	1229.44	1229.44
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FENCEGRD	629409.7	3470088	3.75346	1229.14	1229.14
FENCEGRD	629407.7	3470075	3.84551	1228.98	1228.98
FENCEGRD	629433.5	3470110	2.98414	1228.77	1228.77
FENCEGRD	629420.3	3470127	2.76035	1228.62	1228.62
FENCEGRD	629436.5	3470098	2.92913	1228.44	1228.44
FENCEGRD	629434.4	3470084	2.76553	1229.76	1229.76
FENCEGRD	629432.4	3470071	2.58878	1229.62	1229.62
FENCEGRD	629458.5	3470105	2.48359	1229.47	1229.47
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FENCEGRD	628689.1	3469695	13.56592	1231.46	1231.46
FENCEGRD	628689.1	3469671	13.59149	1231.85	1231.85
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FENCEGRD	628714.1	3469767	9.4744	1231.26	1231.26
FENCEGRD	628714.1	3469743	9.47632	1231.6	1231.6
FENCEGRD	628714.1	3469719	9.45861	1231.44	1231.44
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FENCEGRD	628739.1	3469791	7.3267	1232.11	1232.11
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FENCEGRD	628664.3	3469576	23.33272	1231.71	1231.71
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FENCEGRD	628667.2	3468714	23.32943	1231.62	1231.62
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FENCEGRD	628717.6	3468614	9.56135	1233.14	1233.14

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FENCEGRD	628718.7	3468315	9.25524	1232.53	1232.53
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FENCEGRD	628719.5	3468116	9.09937	1232.26	1232.26
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FENCEGRD	628719.7	3468066	9.17289	1232.26	1232.26
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FENCEGRD	628719.9	3468016	8.95683	1232.3	1232.3
FENCEGRD	628719.9	3467991	8.98009	1232.37	1232.37
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FENCEGRD	628739.8	3469337	7.71789	1232.63	1232.63
FENCEGRD	628739.9	3469312	7.74579	1232.65	1232.65
FENCEGRD	628740	3469287	7.7524	1232.53	1232.53
FENCEGRD	628740.1	3469262	7.76247	1232.81	1232.81
FENCEGRD	628740.2	3469238	7.77092	1233.12	1233.12
FENCEGRD	628740.3	3469213	7.75147	1233.19	1233.19
FENCEGRD	628740.4	3469188	7.77137	1233.23	1233.23
FENCEGRD	628740.5	3469163	7.76963	1233.24	1233.24
FENCEGRD	628740.6	3469138	7.7725	1233.26	1233.26
FENCEGRD	628740.7	3469113	7.77247	1233.24	1233.24
FENCEGRD	628740.8	3469088	7.76334	1233.25	1233.25
FENCEGRD	628740.9	3469063	7.79381	1233.28	1233.28
FENCEGRD	628741	3469038	7.79494	1233.28	1233.28
FENCEGRD	628741.1	3469013	7.7647	1233.3	1233.3
FENCEGRD	628741.2	3468988	7.78872	1233.26	1233.26
FENCEGRD	628741.3	3468963	7.78602	1233.22	1233.22
FENCEGRD	628741.4	3468939	7.7547	1233.27	1233.27
FENCEGRD	628741.5	3468914	7.76211	1233.21	1233.21
FENCEGRD	628741.5	3468889	7.77233	1233.12	1233.12
FENCEGRD	628741.6	3468864	7.74271	1233.11	1233.11
FENCEGRD	628741.7	3468839	7.76408	1233.07	1233.07
FENCEGRD	628741.8	3468814	7.75335	1232.94	1232.94
FENCEGRD	628741.9	3468789	7.71872	1232.89	1232.89
FENCEGRD	628742	3468764	7.70033	1232.84	1232.84
FENCEGRD	628742.1	3468739	7.68476	1232.79	1232.79
FENCEGRD	628742.2	3468714	7.65364	1232.78	1232.78
FENCEGRD	628742.3	3468689	7.58547	1232.68	1232.68
FENCEGRD	628742.4	3468664	7.55241	1232.66	1232.66
FENCEGRD	628742.5	3468639	7.51364	1232.61	1232.61
FENCEGRD	628742.6	3468615	7.47293	1232.55	1232.55
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FENCEGRD	628743.6	3468340	7.23111	1232.64	1232.64
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FENCEGRD	628744.6	3468091	7.09645	1233.41	1233.41
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FENCEGRD	628744.9	3467992	7.28469	1233.38	1233.38
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FENCEGRD	628765.3	3469213	6.63914	1233.25	1233.25
FENCEGRD	628765.4	3469188	6.60045	1233.18	1233.18
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FENCEGRD	628769.2	3468191	5.93776	1233.65	1233.65
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FENCEGRD	628519.6	3467937	13.23344	1232.68	1232.68
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FENCEGRD	628634.2	3468959	21.99839	1235.47	1235.47
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FENCEGRD	628634.1	3469008	22.0575	1235.71	1235.71
FENCEGRD	628634	3469033	22.09865	1235.93	1235.93
FENCEGRD	628633.9	3469058	22.18469	1236.1	1236.1
FENCEGRD	628633.8	3469083	21.86589	1232.76	1232.76
FENCEGRD	628633.7	3469108	21.87884	1232.91	1232.91
FENCEGRD	628633.6	3469133	21.89145	1233.07	1233.07
FENCEGRD	628633.5	3469158	21.90518	1233.23	1233.23
FENCEGRD	628633.4	3469183	21.61627	1233.39	1233.39
FENCEGRD	628633.4	3469208	21.62102	1233.6	1233.6
FENCEGRD	628633.3	3469233	21.69413	1233.76	1233.76
FENCEGRD	628633.2	3469257	21.78965	1233.99	1233.99
FENCEGRD	628633.1	3469282	21.6931	1234.18	1234.18
FENCEGRD	628633	3469307	21.74022	1234.36	1234.36
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FENCEGRD	628632.6	3469432	22.1527	1235.17	1235.17
FENCEGRD	628632.5	3469457	22.16356	1235.28	1235.28
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FENCEGRD	628632.3	3469507	22.17006	1235.51	1235.51
FENCEGRD	628632.2	3469531	22.17272	1235.69	1235.69
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FENCEGRD	628632	3469581	22.1741	1236.1	1236.1
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FENCEGRD	628631.9	3469631	21.58329	1236.98	1236.98
FENCEGRD	628631.8	3469656	21.56973	1237.13	1237.13
FENCEGRD	628631.7	3469681	21.49798	1237.19	1237.19
FENCEGRD	628612.7	3467987	13.29545	1237.39	1237.39
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FENCEGRD	628612.1	3468136	13.54554	1238.43	1238.43
FENCEGRD	628612.1	3468161	13.7427	1236.61	1236.61
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FENCEGRD	628611.9	3468211	13.77184	1236.83	1236.83
FENCEGRD	628611.8	3468236	13.79141	1236.92	1236.92
FENCEGRD	628611.7	3468261	13.84939	1236.9	1236.9
FENCEGRD	628611.6	3468286	13.92509	1237.15	1237.15
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FENCEGRD	628610.9	3468485	14.48723	1236.53	1236.53
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FENCEGRD	628610.4	3468635	14.24211	1237.65	1237.65
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FENCEGRD	628609.6	3468859	14.44052	1237.32	1237.32
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FENCEGRD	628609.3	3468934	14.4547	1237.81	1237.81
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FENCEGRD	628609.1	3469008	14.52429	1236.43	1236.43
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FENCEGRD	628608.9	3469058	14.55399	1236.82	1236.82
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FENCEGRD	628607.9	3469332	14.74855	1237.92	1237.92
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FENCEGRD	628607.1	3469556	14.76981	1238.73	1238.73
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FENCEGRD	628606.9	3469606	14.55636	1238.79	1238.79
FENCEGRD	628606.9	3469631	14.54192	1237.8	1237.8
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FENCEGRD	628587.1	3468136	10.16843	1238.42	1238.42
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FENCEGRD	628586.2	3468410	10.64472	1237.88	1237.88
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FENCEGRD	628585.7	3468535	10.67496	1237.07	1237.07
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FENCEGRD	628584.1	3469008	11.34083	1233.53	1233.53
FENCEGRD	628584	3469033	11.34962	1233.33	1233.33
FENCEGRD	628583.9	3469058	11.37693	1233.18	1233.18
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FENCEGRD	628583.6	3469133	11.35194	1237.41	1237.41
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FENCEGRD	628583.4	3469183	11.38997	1237.15	1237.15
FENCEGRD	628583.4	3469207	11.38994	1237.01	1237.01
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FENCEGRD	628583.1	3469282	11.44073	1236.46	1236.46
FENCEGRD	628583	3469307	11.43448	1236.26	1236.26
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FENCEGRD	628582.6	3469407	11.48359	1235.85	1235.85
FENCEGRD	628582.6	3469432	11.48193	1235.7	1235.7
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FENCEGRD	628562.4	3468061	8.27026	1233.57	1233.57
FENCEGRD	628562.3	3468086	8.23822	1233.2	1233.2
FENCEGRD	628562.2	3468111	8.23056	1232.76	1232.76
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FENCEGRD	628562.1	3468161	8.31467	1232.38	1232.38
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FENCEGRD	628560.3	3468659	8.90679	1235.34	1235.34
FENCEGRD	628560.2	3468684	8.95636	1235.16	1235.16
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FENCEGRD	628557.6	3469432	9.54564	1236.12	1236.12
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FENCEGRD	628557.4	3469481	9.54148	1235.77	1235.77
FENCEGRD	628557.3	3469506	9.52822	1235.67	1235.67
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FENCEGRD	628557	3469581	9.55887	1235.32	1235.32
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FENCEGRD	628536.7	3468261	7.29533	1232.53	1232.53
FENCEGRD	628536.6	3468286	7.32704	1238.1	1238.1
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FENCEGRD	628536.4	3468360	7.41642	1238.65	1238.65
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FENCEGRD	628536.2	3468410	7.48713	1239.18	1239.18
FENCEGRD	628536.1	3468435	7.52392	1237.9	1237.9
FENCEGRD	628536	3468460	7.51017	1237.64	1237.64
FENCEGRD	628535.9	3468485	7.50122	1237.46	1237.46
FENCEGRD	628535.8	3468510	7.486	1237.28	1237.28
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FENCEGRD	628535.6	3468585	7.43139	1236.7	1236.7
FENCEGRD	628535.5	3468609	7.40997	1236.51	1236.51
FENCEGRD	628535.4	3468634	7.4065	1236.37	1236.37
FENCEGRD	628535.3	3468659	7.47005	1236.22	1236.22
FENCEGRD	628535.2	3468684	7.51093	1236.09	1236.09
FENCEGRD	628535.1	3468709	7.57582	1235.87	1235.87
FENCEGRD	628535	3468734	7.61002	1235.71	1235.71
FENCEGRD	628534.9	3468759	7.65785	1235.62	1235.62
FENCEGRD	628534.9	3468784	7.69644	1235.5	1235.5
FENCEGRD	628534.8	3468809	7.74011	1235.36	1235.36
FENCEGRD	628534.7	3468834	7.77778	1235.22	1235.22
FENCEGRD	628534.6	3468859	7.8066	1235.06	1235.06
FENCEGRD	628534.5	3468883	7.84959	1234.88	1234.88
FENCEGRD	628534.4	3468908	7.88627	1234.74	1234.74
FENCEGRD	628534.3	3468933	7.89957	1234.58	1234.58
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FENCEGRD	628534.1	3468983	7.94041	1234.25	1234.25
FENCEGRD	628534.1	3469008	7.93955	1234.06	1234.06
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FENCEGRD	628533.9	3469058	7.95351	1233.75	1233.75
FENCEGRD	628533.8	3469083	7.96452	1233.62	1233.62
FENCEGRD	628533.7	3469108	8.02843	1233.41	1233.41
FENCEGRD	628533.6	3469133	8.03627	1233.23	1233.23
FENCEGRD	628533.5	3469157	8.03338	1233.04	1233.04
FENCEGRD	628533.4	3469182	8.00618	1232.81	1232.81
FENCEGRD	628533.4	3469207	8.02143	1232.61	1232.61
FENCEGRD	628533.3	3469232	8.02753	1232.47	1232.47
FENCEGRD	628533.2	3469257	8.10088	1233.26	1233.26
FENCEGRD	628533.1	3469282	8.10946	1232.51	1232.51
FENCEGRD	628533	3469307	8.04671	1232.4	1232.4
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FENCEGRD	628532.3	3469506	8.09354	1232.43	1232.43
FENCEGRD	628532.2	3469531	8.10006	1232.42	1232.42
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FENCEGRD	628532	3469581	8.1016	1232.48	1232.48
FENCEGRD	628531.9	3469606	8.07945	1232.55	1232.55
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FENCEGRD	628531.7	3469681	8.01806	1233.71	1233.71

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FENCEGRD	628631.5	3469750	21.83142	1232.69	1232.69
FENCEGRD	628631.4	3469773	21.96466	1232.69	1232.69
FENCEGRD	628631.4	3469796	21.9936	1232.7	1232.7
FENCEGRD	628631.3	3469819	21.92485	1232.76	1232.76
FENCEGRD	628631.2	3469842	21.83431	1232.81	1232.81
FENCEGRD	628631.2	3469865	21.78071	1232.91	1232.91
FENCEGRD	628631.1	3469888	22.1514	1232.92	1232.92
FENCEGRD	628631.1	3469911	22.18906	1233.18	1233.18
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FENCEGRD	628606.4	3469773	14.93022	1232.35	1232.35
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FENCEGRD	628581.5	3469750	11.47401	1232.3	1232.3
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FENCEGRD	628581.4	3469796	11.33229	1232.41	1232.41
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FENCEGRD	628581.2	3469865	11.21398	1232.49	1232.49
FENCEGRD	628581.1	3469888	11.16873	1232.52	1232.52
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FENCEGRD	628556.4	3469773	9.30536	1232.64	1232.64
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FENCEGRD	628556	3470049	9.15993	1232.72	1232.72
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FENCEGRD	628605.9	3470093	13.86932	1233.03	1233.03
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FENCEGRD	628585.6	3470157	12.36423	1232.05	1232.05
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FENCEGRD	627923.5	3470212	2.63539	1229.73	1229.73
FENCEGRD	627900.3	3470214	2.58164	1229.6	1229.6
FENCEGRD	627877.1	3470217	2.49966	1229.44	1229.44
FENCEGRD	627853.9	3470220	2.40828	1229.29	1229.29
FENCEGRD	627830.7	3470223	2.29123	1229.14	1229.14
FENCEGRD	628013.5	3470176	2.55452	1228.98	1228.98
FENCEGRD	627990.3	3470179	2.49584	1228.77	1228.77
FENCEGRD	627967	3470181	2.43453	1228.62	1228.62
FENCEGRD	627943.8	3470184	2.36841	1228.44	1228.44
FENCEGRD	627920.6	3470187	2.29402	1229.76	1229.76
FENCEGRD	627897.4	3470190	2.21646	1229.62	1229.62
FENCEGRD	627874.2	3470192	2.14543	1229.47	1229.47
FENCEGRD	627851	3470195	2.09359	1229.29	1229.29
FENCEGRD	627827.8	3470198	2.02142	1229.14	1229.14
FENCEGRD	628010.6	3470151	2.37324	1228.98	1228.98
FENCEGRD	627987.4	3470154	2.30638	1228.8	1228.8
FENCEGRD	627964.2	3470157	2.23944	1228.61	1228.61
FENCEGRD	627941	3470159	2.16838	1228.44	1228.44
FENCEGRD	627917.7	3470162	2.09982	1228.92	1228.92
FENCEGRD	627894.5	3470165	2.04996	1228.82	1228.82
FENCEGRD	627871.3	3470167	1.98757	1228.74	1228.74
FENCEGRD	627848.1	3470170	1.9426	1228.58	1228.58
FENCEGRD	627824.9	3470173	1.90023	1228.4	1228.4
FENCEGRD	628007.7	3470126	2.27064	1228.35	1228.35
FENCEGRD	627984.5	3470129	2.20691	1228.28	1228.28
FENCEGRD	627961.3	3470132	2.14861	1228.04	1228.04
FENCEGRD	627938.1	3470135	2.09265	1227.91	1227.91

FENCEGRD	627914.9	3470137	2.04244	1228.26	1228.26
FENCEGRD	627891.7	3470140	1.99038	1228.13	1228.13
FENCEGRD	627868.5	3470143	1.94238	1228.03	1228.03
FENCEGRD	627845.2	3470145	1.89727	1227.93	1227.93
FENCEGRD	627822	3470148	1.85262	1227.8	1227.8
FENCEGRD	627829.2	3470253	3.21358	1227.67	1227.67
FENCEGRD	627831.6	3470275	3.63056	1227.53	1227.53
FENCEGRD	627807.5	3470245	2.45782	1227.4	1227.4
FENCEGRD	627820.7	3470228	2.28723	1227.26	1227.26
FENCEGRD	627804.3	3470256	2.56083	1228.32	1228.32
FENCEGRD	627806.8	3470277	2.60215	1228.14	1228.14
FENCEGRD	627785.3	3470238	2.19837	1228.03	1228.03
FENCEGRD	627809.5	3470208	2.02674	1227.88	1227.88
FENCEGRD	627779.5	3470258	2.22713	1227.74	1227.74
FENCEGRD	627781.9	3470280	2.21996	1227.6	1227.6
FENCEGRD	627760.3	3470242	2.03812	1227.48	1227.48
FENCEGRD	627765.9	3470222	1.98701	1227.32	1227.32
FENCEGRD	627789.4	3470193	1.88684	1227.19	1227.19
FENCEGRD	627807.1	3470183	1.88924	1228.29	1228.29
FENCEGRD	627754.7	3470261	1.99971	1228.14	1228.14
FENCEGRD	627757.1	3470283	1.98682	1228.01	1228.01
FENCEGRD	627735.4	3470245	1.88534	1227.83	1227.83
FENCEGRD	627740.9	3470225	1.88787	1227.69	1227.69
FENCEGRD	627746.5	3470206	1.84284	1227.56	1227.56
FENCEGRD	627769.5	3470177	1.80154	1227.41	1227.41
FENCEGRD	627787	3470167	1.81543	1227.26	1227.26
FENCEGRD	627804.5	3470158	1.83193	1227.18	1227.18
FENCEGRD	627729.8	3470264	1.85103	1228.28	1228.28
FENCEGRD	627732.2	3470286	1.82873	1228.15	1228.15
	627834.2	3470252	3.45036	1228	1228
	627836.6	3470274	4.00853	1227.79	1227.79
	628640.6	3470185	22.81933	1227.61	1227.61
	628644	3470225	12.55493	1227.5	1227.5
	628647.6	3470304	7.64992	1227.33	1227.33
	628656.1	3470304	7.55178	1227.23	1227.23
	628656.1	3470183	18.00311	1227.16	1227.16
	628810.8	3470168	10.49388	1228.1	1228.1
	628973.1	3470150	9.43124	1227.85	1227.85
	629027.2	3470144	9.46964	1227.49	1227.49
	629079.2	3470138	9.47702	1227.2	1227.2
	629192.2	3470126	9.03473	1227.89	1227.89
	629272.3	3470117	8.57841	1227.68	1227.68
	629406.8	3470103	5.05895	1227.12	1227.12
	629402.7	3470075	4.53475	1227.13	1227.13
	629304.3	3470086	6.62738	1227.76	1227.76
	629197.4	3470098	7.37866	1227.61	1227.61
	629079.4	3470111	7.77938	1226.88	1226.88
	628907.1	3470131	8.66963	1226.89	1226.89
	628897.4	3470132	8.73077	1227.01	1227.01
	628806.3	3470142	9.84008	1227.12	1227.12
	628663.5	3470158	20.18295	1227.7	1227.7
	628661.8	3470158	20.37157	1227.58	1227.58
	628662.2	3470156	20.1681	1226.84	1226.84
	628662.4	3470153	20.55099	1226.76	1226.76
	628661.5	3470091	21.02501	1226.76	1226.76
	628658	3470071	26.62595	1226.85	1226.85
	628658.2	3470038	27.20212	1226.98	1226.98
	628659	3469863	28.00954	1227.07	1227.07
	628659.1	3469671	29.32208	1227.52	1227.52
	628659.8	3469362	31.06344	1227.39	1227.39
	628664	3467941	24.3078	1227.62	1227.62
	628470.9	3467943	13.00173	1227.81	1227.81
	628470.9	3467961	15.23979	1227.91	1227.91
	628645.5	3467960	23.36569	1228	1228
	628636.7	3469681	25.29889	1228.19	1228.19
	628636	3469934	25.43478	1227.08	1227.08
	628636	3470049	25.28956	1227.26	1227.26
	628635.9	3470116	24.48981	1227.47	1227.47
	628636	3470135	24.40868	1227.56	1227.56
	628633.6	3470156	22.11274	1227.6	1227.6
	628606.5	3470161	15.01742	1227.52	1227.52
	628565.5	3470163	10.5675	1227	1227
	628550.5	3470170	9.73791	1227.4	1227.4
	628529.8	3470172	8.72548	1227.54	1227.54
	628491.7	3470177	7.66548	1227.6	1227.6
	628290.5	3470200	5.14165	1227.75	1227.75
	628099	3470222	4.50109	1227.87	1227.87
	628043	3470228	4.43678	1227.21	1227.21

**Appendix E: PM₁₀ Hot Spot Air Quality Memorandum - City of
Douglas Commercial Land Port of Entry (LPOE)**

MEMORANDUM

To: Beverly T. Chenausky, Arizona Department of Transportation

From: Sophia La Herran, Kimley-Horn and Associates, Inc.
Ace Malisos, Kimley-Horn and Associates, Inc.

Date: October 10, 2024

Subject: PM₁₀ Hot Spot Air Quality Memorandum -City of Douglas Commercial Land Port of Entry (LPOE)

This PM₁₀ Hot Spot Air Quality Memorandum supports the City of Douglas Land Port of Entry Connector Road project, which connects the proposed Commercial Land Port of Entry (LPOE) west of the City of Douglas to State Route (SR) 80. The memorandum analyzes the potential particulate matter (PM₁₀) impacts associated with the idling operations at the LPOE and evaluates whether the LPOE would contribute to the study area exceeding the National Ambient Air Quality Standards (NAAQS).

Background

The proposed Douglas Commercial Land Port of Entry (LPOE) is located in the Arizona Department of Transportation (ADOT) Southeast District in Cochise County west of Douglas, Arizona, along United States (U.S.)-Mexico border and Arizona State Route 80 (SR 80) and is anticipated to open in 2028.

Future commercial volumes generated by the proposed commercial LPOE were estimated based on the existing traffic count data collected at the RHC LPOE from the Stantec Study previously described in *City of Douglas International Port of Entry Connector Road Final Traffic Report* (Kimley-Horn, April 2024). The existing peak hour processed volume at the LPOE is 24 trucks, with a daily processed volume of 98 trucks.¹ To account for additional traffic that arrived within the hour but was not processed, a demand factor of 1.3 was applied to each hour. This results in a peak hour truck demand of 31 trucks, with a daily demand of 128 trucks at the LPOE. To obtain truck volumes for the opening year and horizon year of the LPOE and Connector Road, the Final Traffic Report assumed a truck growth rate of 1.1% per year at the LPOE, which results in a peak hour demand volume of 42 trucks.²

As discussed in the *City of Douglas International Port of Entry Connector Road Final Traffic Report* (Kimley-Horn, April 2024), peak hour LPOE traffic is 42 trucks per hour based on estimated demand. The U.S. Border Patrol identified that the proposed vehicles entering and exiting the LPOE would be required to idle in three potential locations; (1) the Primary Inspection located at the U.S.-Mexico border, (2) the Exit Inspection located northeast of the Commercial Vehicle Secondary Inspection building, and (3) Outbound Inspection located west of the Commercial Vehicle Secondary Inspection building. Refer to *Exhibit 1* for more details.

¹ The existing processed/demand volumes are in Appendix 1 of the *City of Douglas International Port of Entry Connector Road Final Traffic Report* (Kimley-Horn, April 2024).

² The demand factor and 1.1% growth rate are included in Section 3.4.2 of the *City of Douglas International Port of Entry Connector Road Final Traffic Report* (Kimley-Horn, April 2024), and raw volume calculations are in Appendix 4.

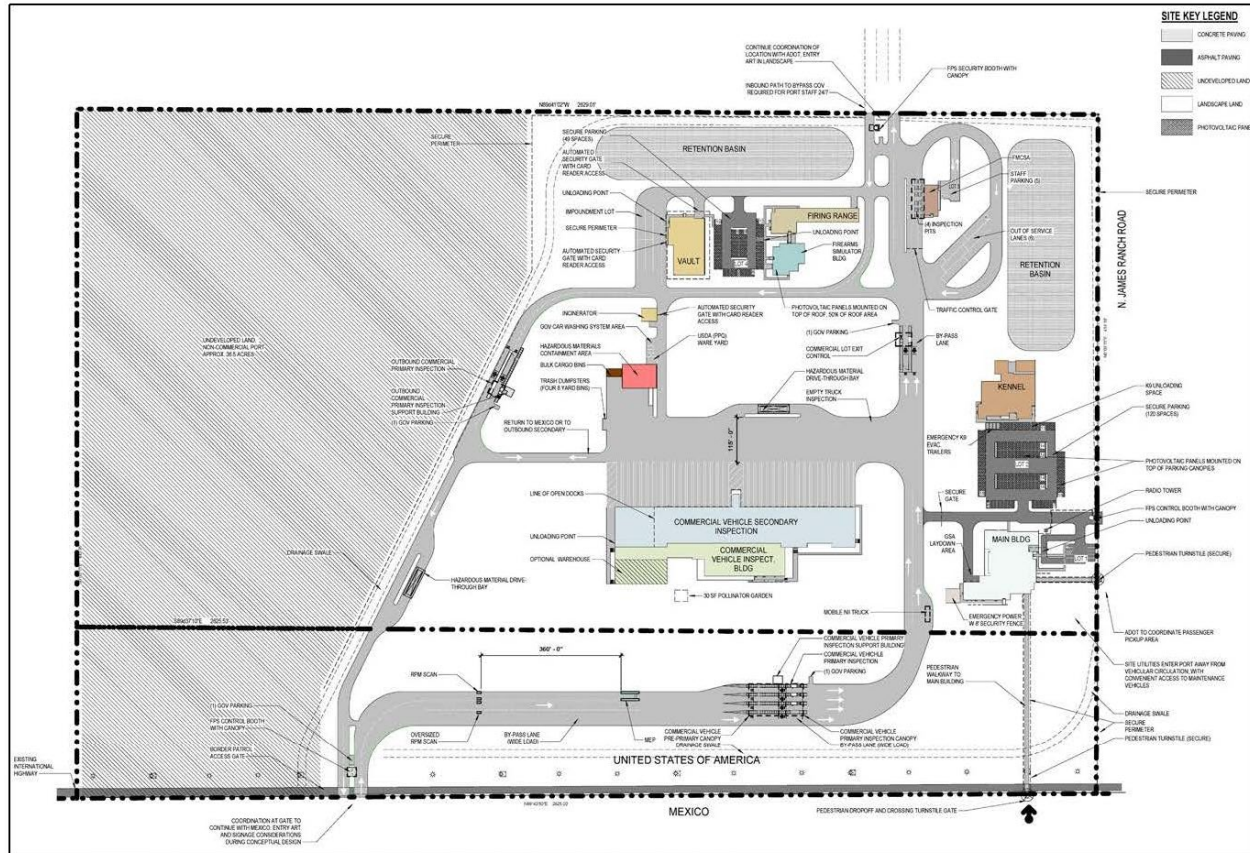


Exhibit 1: Conceptual Site Layout of the Proposed Commercial LPOE

Determination of PM₁₀ Hot Spot Impact

EPA's AERMOD (version 23132) air dispersion model was used to estimate the idling concentrations of PM₁₀ at the LPOE. The model uses traffic data, emission factor data, and meteorological data to estimate ground-level concentrations of PM₁₀ at a series of receptors. The model setup included a series of area sources representing the three proposed idling locations at the LPOE. Area specific inputs included source location, source length and width, emission rate, release height, and initial vertical dimension.

Modeling Analysis for PM₁₀

Input Data

1. **Meteorological Data** – The AERMOD dispersion model requires meteorological data to predict pollutant concentrations at receptors within the project area. Five years of meteorological data files were provided by Arizona Department of Environmental Quality (ADEQ) based on observed surface data and upper air data from Bisbee-Douglas Airport for the 5-year period from 2015 through 2019. This meteorological data was determined to be representative of the project area conditions because of its proximity to the project site (7 miles), similarity in land use and terrain, and the data meets the completeness requirements of Section 5.3.2 of EPA's *Meteorological Monitoring Guidance for Regulatory Modeling*

*Applications.*³ Information from ADEQ that describes the processing steps and summarizes completeness determination is included in Appendix A.

MOVES Source Data – On-road vehicle emissions were estimated using EPA’s MOVES3.1 software. A project level MOVES run was completed for both year 2028 and 2050 to determine an average idle emissions rate for PM₁₀ in the study area. This MOVES run involved the following specifications and methodology:

- a) Scale
 - a. Model: Onroad
 - b. Domain/Scale: Project Scale
 - c. Calculation Type: Inventory
- b) Time Spans
 - a. Years: 2028 and 2050
 - b. Months: July
 - c. Days: Weekdays
 - d. Hours: PM peak hour (16:00-16:59)
- c) Geographic Bounds:
 - a. Arizona - Cochise County
- d) Onroad Vehicles
 - a. Fuel Types: All available fuel types
 - b. Source Types: All available source types
- e) Road Type
 - a. Rural Unrestricted Access
- f) Pollutants and Processes
 - a. Pollutants: PM₁₀, and all additional pre-requisites
 - b. Processes: Running Exhaust, Crankcase Running Exhaust, Brakewear, and Tirewear
- g) Output Units
 - a. Mass: Grams
 - b. Energy: Joules
 - c. Distance: Miles
- h) Input Database:
 - a. I/M Programs: No I/M program
 - b. Age Distribution: 2028 and 2050 age distribution files from the project level PM hot spot analysis were used in this analysis.
 - c. Fuel: 2028 and 2050 default fuel information from MOVES and the project level PM hot spot analysis were used in this analysis.
 - d. Meteorology Data: 2028 and 2050 meteorology data files from the project level PM hot spot analysis were used in this analysis.
 - e. Links: A single link was identified to represent an idle link within the port. The average speed was set as 0 mph, and the link volume was set as 1 vehicle. Link length and link grade do not impact this analysis and were set as 0.

³ U.S. EPA, *Meteorological Monitoring Guidance for Regulatory Modeling Applications*, February 2002. https://www.epa.gov/sites/default/files/2020-10/documents/mmgma_0.pdf, accessed June 2024.

- f. **Link Source Types:** To be consistent with the source type for vehicles at the LPOE from the Regional Conformity Analysis, only source types 61 and 62 were selected for this link. The distribution between source types 61 and 62 is also consistent with the Regional Conformity Analysis.

After the MOVES run completed, the results were post processed using the PM₁₀_Grams_Per_Hour script within MOVES to obtain an overall emissions rate in grams/veh-hour for each year. This resulted in a rate of 2.72 grams/veh-hour for 2028 and 0.22 grams/veh-hour for 2050. The rate for 2028 was determined to be more conservative and was selected for use in the analysis.

AERMOD Source Data – The proposed LPOE would have three idling locations for trucks entering and exiting the facility; (1) the Primary Inspection located at the U.S.-Mexico border, (2) the Exit Inspection located northeast of the Commercial Vehicle Secondary Inspection building, and (3) Outbound Inspection located west of the Commercial Vehicle Secondary Inspection building. The idling locations were digitized in ArcGIS using the scaled site plan (*Exhibit 1*) and uploaded into AERMOD as a shapefile. Each of the three idling locations were outlined based on the shapefiles and modeled as an area source in AERMOD.

It should be noted that the AERMOD emissions rates for each idling area was calculated using the emissions rates proved by the MOVES run and the number of trucks per hour at each idling location. Additionally, the emissions rates assumed the following idling averages provided by U.S. Border Patrol:

1. **Area 1 - Primary Inspection Booth:** 5-20 mins for queuing and x-ray – average idling time of 16 minutes.
2. **Area 2 – Exit Inspection Booth:** 2-5 mins for document review– average idling time of 3.5 minutes.
3. **Area 3 - Outbound Inspection Booth:** 2-5 mins for document review– average idling time of 3.5 minutes.

Consistent with EPA Hot Spot Guidance Appendix J.3.1, the area sources were modeled using the following inputs:

- a. Release Height: 3.4 meters
- b. Emissions Rates⁴:
 - i. **Area 1 - Primary Inspection Booth:** 0.0847 grams/second
 - ii. **Area 2 – Exit Inspection Booth:** 0.0015 grams/second
 - iii. **Area 3 - Outbound Inspection Booth:** 0.0015 grams/second
- c. Initial Vertical Dimension of the Plume: 6.8 meters

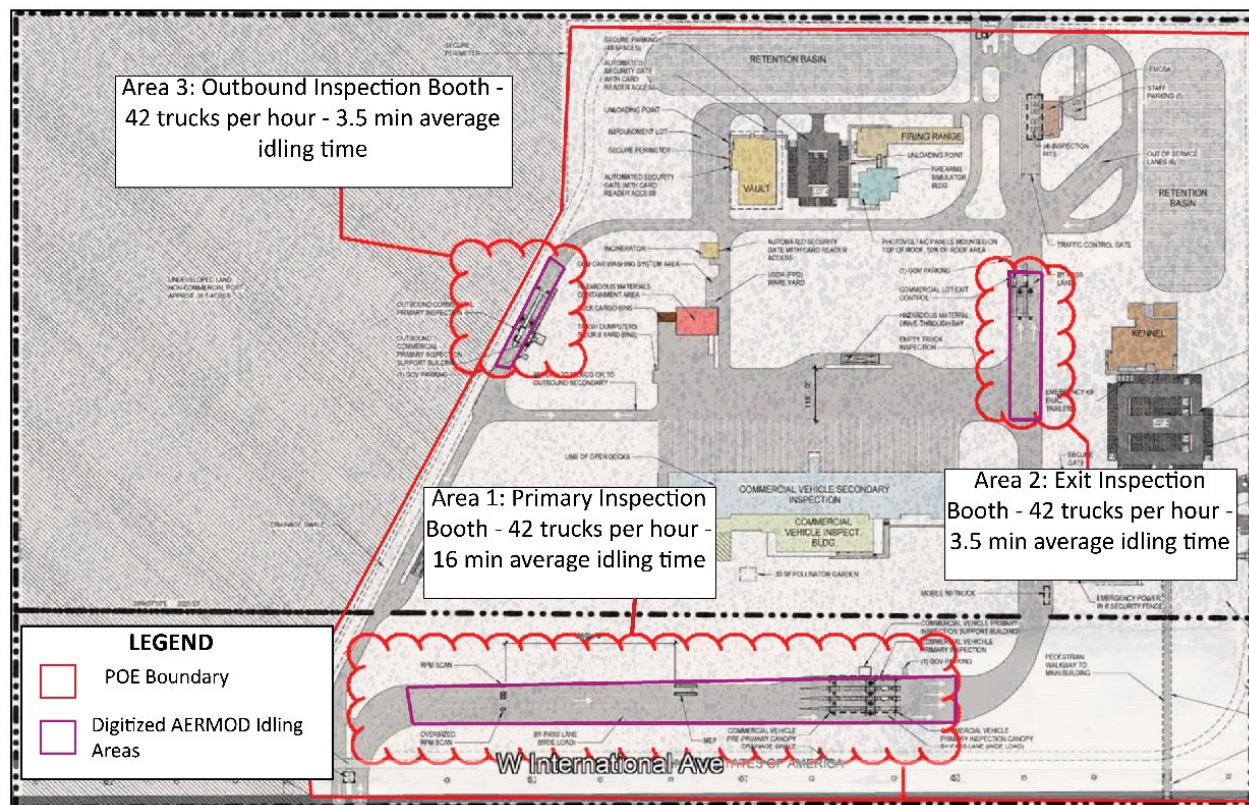
The Traffic Report contains idling volumes for the AM and PM peak hours but does not have idling volumes for midday or overnight time periods. Therefore, to be conservative, the peak hour idling volumes (42 truck trips per hour) were used for every hour. This hourly demand volume was applied to both trips entering and leaving the U.S. This results in 336 trucks per day per direction using the LPOE, which is over 2.5 times the demand at the existing LPOE.

⁴ Refer to Appendix A for detailed calculations of emission rates.

Exhibit 2 details the idling areas modeled in AERMOD, the number of trucks in each idling area, and the average idling estimates.

2. **Rural Classification** - To determine whether urban or rural model options are appropriate for the project, the population density procedure was used in accordance with Section 7.2.1.1(b)(ii) of EPA's Guideline on Air Quality Models Appendix W. It was determined that the rural classification is most appropriate for the project area.
3. **Receptor Locations** – Receptors were placed to estimate the highest concentrations of PM₁₀ in the study area to determine any possible violations of the NAAQS. Receptors were placed starting five meters from the proposed POE boundary line, extending up to 200 meters away with a spacing of 25 meters. Receptors were placed at a height of 1.8 meters. Locations where the public does not have access cannot be determined at this time because the proposed roadway is located in a rural, undeveloped area. As a result, receptors were placed at all possible locations.
4. **Terrain Elevations** – Topography was found to be generally flat in the site vicinity. The non-default regulatory “FLAT” terrain modeling option was utilized per EPA guidance.
5. **Background Concentrations** – ADEQ maintains two active air quality monitoring stations in the Paul Spur/Douglas PM₁₀ nonattainment area:
 - a. AQS Site ID 04-003-0011 – Paul Spur Chemical Lime Plant
 - b. AQS Site ID 04-003-1005 – Douglas Red Cross

The fourth high concentration from three years of monitoring data from the Douglas Red Cross monitor from 2021 to 2023 is 107 µg/m³. This selected monitor was discussed and approved during the interagency consultation process due to its close proximity, similar land use characteristics, higher average wind speeds, and wind directions being upwind from the LPOE.



Model Results

The modeled concentrations, including background, were compared to the PM₁₀ NAAQS. The receptor with the 6th-highest maximum concentration was located within the LPOE. *Exhibit 3* shows the receptor concentrations at the intersection with the maximum value denoted by a star.

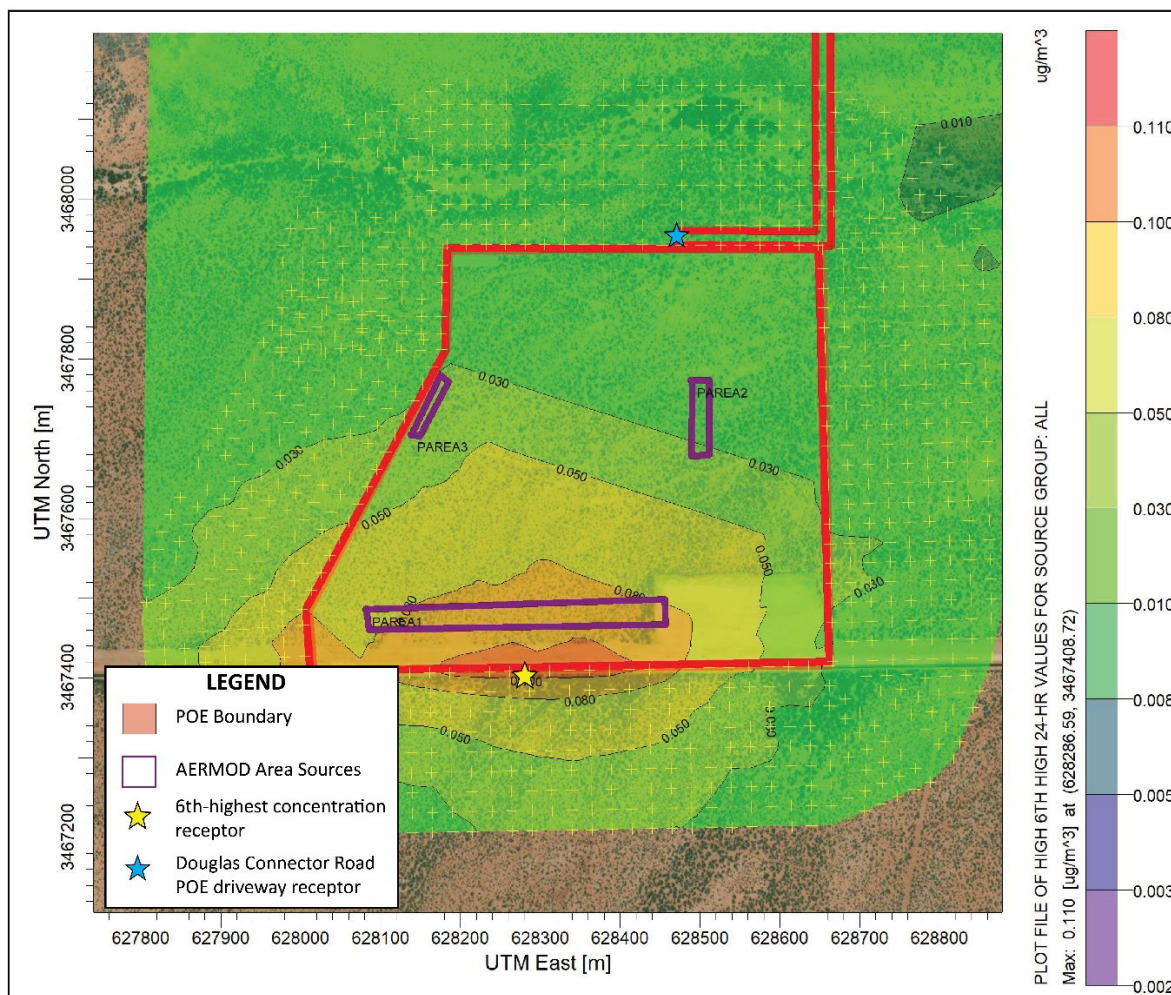


Exhibit 3: AERMOD PM₁₀ Model Results

Table 3 presents the values used to determine the maximum predicted 24-hour PM₁₀ concentrations for the receptor located at the proposed Douglas Connector Road LPOE driveway and the receptor with the 6th-highest maximum concentration. The total concentrations for the project do not exceed the PM₁₀ NAAQS when rounded to the nearest 10 $\mu\text{g}/\text{m}^3$. Therefore, the project meets conformity requirements. Mitigation or control measures to reduce emissions in the project area do not need to be considered by the project sponsors. Modeling files are available by request.

Table 3. Predicted LPOE PM₁₀ Concentration

Location	6 th Highest PM ₁₀ Value	Background PM ₁₀ Value ¹	Total Concentration
6 th -highest maximum concentration receptor	0.11	107	107.11
Douglas Connector Road POE driveway receptor	0.02	107	107.02

Notes:

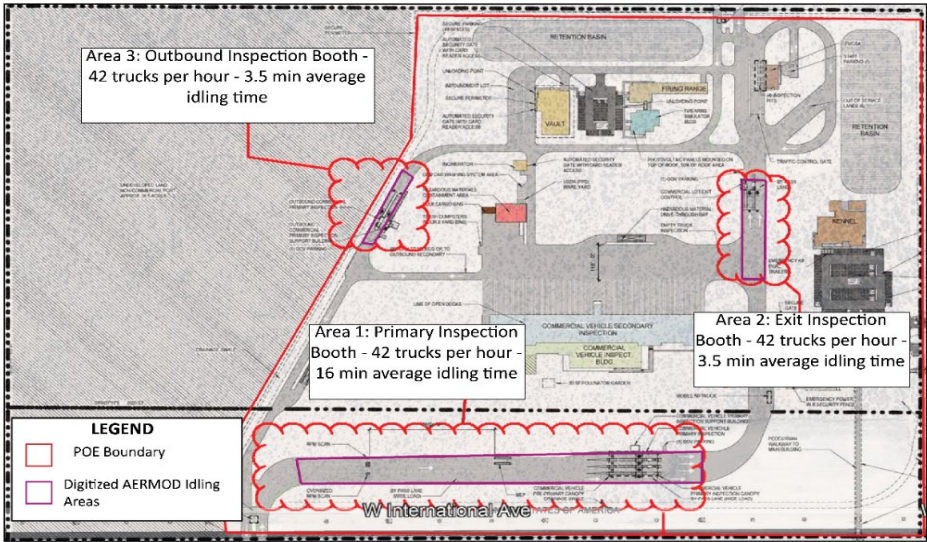
1. Background values taken from the fourth high concentration from three years of monitoring data from the Douglas Red Cross monitor.
2. PM₁₀ concentrations at the receptors decrease with increasing distance from the source, as PM₁₀ disperses and dilutes with distance.

Appendix A

Modeling Data

movesRunl d	yearId	monthId	hourId	pollutant	gramsPe		Vehicles per hour	Vehicles per Day	Duration	Duration	Duration	PAREA1 g/s	PAREA2 g/s	PAREA3 g/s
					rHour	rSec			(Hour/Vehicl e) PAREA1	(Hour/Vehicl e) PAREA2	(Hour/Vehicl e) PAREA3			
1	2050	7	17	Total PM10	0.2204	6E-05	42	420	0.266666667	0.058333333	0.058333333	0.006855377	0.001499614	0.001499614
1	2028	7	17	Total PM10	2.7209	0.0008	42	420	0.266666667	0.058333333	0.058333333	0.084651027	0.001499614	0.001499614

(Hour/Vehi
cle)
PAREA1
assumes 16
(Hour/Vehi
cle)
PAREA2
assumes
(Hour/Vehi
cle)
PAREA3
assumes



Discrete Receiver X	Y	Concentration	Elevation (ft)	Hill Height (ft)	ZHILL
FENCEGRD	628653.4	3467937	0.01599	1239.09	1239.09
FENCEGRD	628654	3467913	0.01668	1238.89	1238.89
FENCEGRD	628654.6	3467888	0.01566	1238.65	1238.65
FENCEGRD	628655.3	3467864	0.01531	1238.47	1238.47
FENCEGRD	628655.9	3467839	0.01556	1238.37	1238.37
FENCEGRD	628656.5	3467814	0.01709	1238.2	1238.2
FENCEGRD	628657.1	3467790	0.01885	1238	1238
FENCEGRD	628657.7	3467765	0.02046	1237.88	1237.88
FENCEGRD	628658.3	3467741	0.02078	1237.74	1237.74
FENCEGRD	628658.9	3467716	0.02262	1237.54	1237.54
FENCEGRD	628659.6	3467691	0.02378	1237.39	1237.39
FENCEGRD	628660.2	3467667	0.02415	1237.32	1237.32
FENCEGRD	628660.8	3467642	0.02473	1237.07	1237.07
FENCEGRD	628661.4	3467617	0.02707	1236.87	1236.87
FENCEGRD	628662	3467593	0.02701	1236.75	1236.75
FENCEGRD	628662.6	3467568	0.03431	1236.55	1236.55
FENCEGRD	628663.2	3467544	0.03686	1236.32	1236.32
FENCEGRD	628663.8	3467519	0.03619	1236.16	1236.16
FENCEGRD	628664.5	3467494	0.03177	1236.01	1236.01
FENCEGRD	628665.1	3467470	0.02513	1235.76	1235.76
FENCEGRD	628665.7	3467445	0.03031	1235.55	1235.55
FENCEGRD	628666.3	3467421	0.02824	1235.41	1235.41
FENCEGRD	628678.4	3467938	0.01444	1235.2	1235.2
FENCEGRD	628679	3467913	0.01344	1235.03	1235.03
FENCEGRD	628679.6	3467889	0.0142	1234.84	1234.84
FENCEGRD	628680.2	3467864	0.01428	1234.62	1234.62
FENCEGRD	628680.9	3467840	0.01572	1234.4	1234.4
FENCEGRD	628681.5	3467815	0.01736	1234.24	1234.24
FENCEGRD	628682.1	3467790	0.01886	1234.09	1234.09
FENCEGRD	628682.7	3467766	0.01765	1233.85	1233.85
FENCEGRD	628683.3	3467741	0.02086	1233.67	1233.67
FENCEGRD	628683.9	3467717	0.0213	1233.53	1233.53
FENCEGRD	628684.5	3467692	0.02174	1233.33	1233.33
FENCEGRD	628685.2	3467667	0.02279	1233.18	1233.18
FENCEGRD	628685.8	3467643	0.02384	1238.2	1238.2
FENCEGRD	628686.4	3467618	0.02482	1237.69	1237.69
FENCEGRD	628687	3467593	0.02414	1237.41	1237.41
FENCEGRD	628687.6	3467569	0.03334	1237.29	1237.29
FENCEGRD	628688.2	3467544	0.03228	1237.15	1237.15
FENCEGRD	628688.8	3467520	0.03306	1237.01	1237.01
FENCEGRD	628689.5	3467495	0.02816	1236.82	1236.82
FENCEGRD	628690.1	3467470	0.02278	1236.63	1236.63
FENCEGRD	628690.7	3467446	0.02581	1236.46	1236.46
FENCEGRD	628691.3	3467421	0.02441	1236.26	1236.26
FENCEGRD	628695.1	3467958	0.01368	1236.19	1236.19
FENCEGRD	628667.7	3467984	0.01436	1236.55	1236.55
FENCEGRD	628703.4	3467939	0.01148	1236.21	1236.21
FENCEGRD	628704	3467914	0.0129	1235.85	1235.85
FENCEGRD	628704.6	3467889	0.0129	1235.7	1235.7
FENCEGRD	628705.2	3467865	0.0145	1235.51	1235.51
FENCEGRD	628705.9	3467840	0.01604	1235.38	1235.38
FENCEGRD	628706.5	3467816	0.01701	1235.2	1235.2
FENCEGRD	628707.1	3467791	0.01553	1234.98	1234.98
FENCEGRD	628707.7	3467766	0.01856	1234.81	1234.81
FENCEGRD	628708.3	3467742	0.01947	1234.66	1234.66
FENCEGRD	628708.9	3467717	0.01984	1234.49	1234.49
FENCEGRD	628709.5	3467693	0.0206	1234.37	1234.37
FENCEGRD	628710.1	3467668	0.02079	1234.22	1234.22
FENCEGRD	628710.8	3467643	0.02252	1233.94	1233.94
FENCEGRD	628711.4	3467619	0.02296	1233.66	1233.66
FENCEGRD	628712	3467594	0.02481	1233.48	1233.48
FENCEGRD	628712.6	3467569	0.03208	1233.49	1233.49
FENCEGRD	628713.2	3467545	0.0283	1233.57	1233.57
FENCEGRD	628713.8	3467520	0.03037	1233.2	1233.2
FENCEGRD	628714.4	3467496	0.0252	1232.76	1232.76
FENCEGRD	628715.1	3467471	0.02073	1232.55	1232.55
FENCEGRD	628715.7	3467446	0.02211	1232.38	1232.38
FENCEGRD	628716.3	3467422	0.02241	1232.47	1232.47
FENCEGRD	628720.4	3467958	0.01067	1238.12	1238.12
FENCEGRD	628712.4	3467976	0.01193	1238.63	1238.63
FENCEGRD	628685.8	3468002	0.01359	1237.9	1237.9
FENCEGRD	628667.2	3468010	0.01426	1237.63	1237.63
FENCEGRD	628728.4	3467939	0.01141	1237.41	1237.41

Paul Spur/Douglas PM10 Monitoring Data (2020-2023)

Year	PM10 Annual 24-hr Mean Concentration		PM10 Max 24-hr Concentration	
	Paul Spur	Douglas	Paul Spur	Douglas
2020	22.40	28.70	154.00	129.00
2021	21.30	31.90	161.00	107.00
2022	18.80	26.20	91.00	130.00
2023	19.00	27.70	99.00	155.00

Summary of Model Results and Compare to NAAQS (unit in	
	24-hr 6th Highest
Douglas Connector Road Receptor	0.01841
POE Emissions - Max	0.11
Background - 4th Highest Value of 3 Years	107.00
Total (POE + Background)	107.11
Total (POE + Background)	107.11
NAAQS Threshold	150
Exceed Threshold?	No

FENCEGRD	628729	3467915	0.01193	1237.3	1237.3
FENCEGRD	628729.6	3467890	0.01342	1237.15	1237.15
FENCEGRD	628730.2	3467865	0.01486	1236.95	1236.95
FENCEGRD	628730.8	3467841	0.01531	1236.76	1236.76
FENCEGRD	628731.5	3467816	0.01394	1236.57	1236.57
FENCEGRD	628732.1	3467792	0.01624	1236.41	1236.41
FENCEGRD	628732.7	3467767	0.01821	1236.26	1236.26
FENCEGRD	628733.3	3467742	0.01869	1236.13	1236.13
FENCEGRD	628733.9	3467718	0.01815	1236.23	1236.23
FENCEGRD	628734.5	3467693	0.01906	1235.89	1235.89
FENCEGRD	628735.1	3467669	0.02038	1235.72	1235.72
FENCEGRD	628735.8	3467644	0.02026	1235.58	1235.58
FENCEGRD	628736.4	3467619	0.02064	1235.49	1235.49
FENCEGRD	628737	3467595	0.02413	1235.34	1235.34
FENCEGRD	628737.6	3467570	0.02938	1235.16	1235.16
FENCEGRD	628738.2	3467545	0.02487	1234.98	1234.98
FENCEGRD	628738.8	3467521	0.0272	1234.74	1234.74
FENCEGRD	628739.4	3467496	0.02272	1234.57	1234.57
FENCEGRD	628740.1	3467472	0.01895	1234.44	1234.44
FENCEGRD	628740.7	3467447	0.01909	1234.27	1234.27
FENCEGRD	628741.3	3467422	0.02092	1234.15	1234.15
FENCEGRD	628745.5	3467958	0.01051	1233.99	1233.99
FENCEGRD	628737.6	3467976	0.01006	1233.75	1233.75
FENCEGRD	628729.7	3467994	0.01095	1233.58	1233.58
FENCEGRD	628703.6	3468020	0.01288	1233.42	1233.42
FENCEGRD	628685.3	3468027	0.0136	1233.11	1233.11
FENCEGRD	628667	3468035	0.01402	1232.9	1232.9
FENCEGRD	628753.4	3467940	0.01106	1232.79	1232.79
FENCEGRD	628754	3467915	0.01244	1232.6	1232.6
FENCEGRD	628754.6	3467891	0.01379	1232.47	1232.47
FENCEGRD	628755.2	3467866	0.01387	1238.14	1238.14
FENCEGRD	628755.8	3467841	0.01293	1238.32	1238.32
FENCEGRD	628756.5	3467817	0.01404	1238.56	1238.56
FENCEGRD	628757.1	3467792	0.01708	1238.92	1238.92
FENCEGRD	628757.7	3467768	0.01707	1237.94	1237.94
FENCEGRD	628758.3	3467743	0.01691	1237.62	1237.62
FENCEGRD	628758.9	3467718	0.01642	1237.4	1237.4
FENCEGRD	628759.5	3467694	0.01799	1237.28	1237.28
FENCEGRD	628760.1	3467669	0.01918	1237.09	1237.09
FENCEGRD	628760.7	3467645	0.01909	1236.93	1236.93
FENCEGRD	628761.4	3467620	0.01836	1236.76	1236.76
FENCEGRD	628762	3467595	0.02391	1236.58	1236.58
FENCEGRD	628762.6	3467571	0.02661	1236.42	1236.42
FENCEGRD	628763.2	3467546	0.02258	1236.25	1236.25
FENCEGRD	628763.8	3467521	0.02433	1236.12	1236.12
FENCEGRD	628764.4	3467497	0.02062	1235.97	1235.97
FENCEGRD	628765	3467472	0.0174	1235.77	1235.77
FENCEGRD	628765.7	3467448	0.01659	1235.67	1235.67
FENCEGRD	628766.3	3467423	0.01936	1235.57	1235.57
FENCEGRD	628768.6	3467963	0.0103	1235.46	1235.46
FENCEGRD	628758.8	3467985	0.00999	1235.32	1235.32
FENCEGRD	628749.1	3468008	0.00996	1235.15	1235.15
FENCEGRD	628716.7	3468040	0.01243	1234.99	1234.99
FENCEGRD	628694	3468049	0.01323	1234.81	1234.81
FENCEGRD	628671.4	3468058	0.01364	1234.59	1234.59
FENCEGRD	628778.4	3467941	0.01156	1234.42	1234.42
FENCEGRD	628779	3467916	0.01282	1234.26	1234.26
FENCEGRD	628779.6	3467891	0.01264	1234.09	1234.09
FENCEGRD	628780.2	3467867	0.01205	1233.94	1233.94
FENCEGRD	628780.8	3467842	0.01269	1233.8	1233.8
FENCEGRD	628781.4	3467817	0.01512	1233.6	1233.6
FENCEGRD	628782.1	3467793	0.01588	1233.4	1233.4
FENCEGRD	628782.7	3467768	0.01568	1233.2	1233.2
FENCEGRD	628783.3	3467744	0.01594	1233.03	1233.03
FENCEGRD	628783.9	3467719	0.01589	1232.8	1232.8
FENCEGRD	628784.5	3467694	0.01768	1232.65	1232.65
FENCEGRD	628785.1	3467670	0.01714	1232.53	1232.53
FENCEGRD	628785.7	3467645	0.0182	1238.1	1238.1
FENCEGRD	628786.4	3467621	0.01761	1238.34	1238.34
FENCEGRD	628787	3467596	0.02349	1238.46	1238.46
FENCEGRD	628787.6	3467571	0.02406	1238.65	1238.65
FENCEGRD	628788.2	3467547	0.02109	1238.78	1238.78
FENCEGRD	628788.8	3467522	0.02189	1239.18	1239.18
FENCEGRD	628789.4	3467497	0.01882	1237.9	1237.9
FENCEGRD	628790	3467473	0.01602	1237.64	1237.64
FENCEGRD	628790.7	3467448	0.01457	1237.46	1237.46

FENCEGRD	628791.3	3467424	0.01815	1237.28	1237.28
FENCEGRD	628794.1	3467963	0.01076	1237.08	1237.08
FENCEGRD	628784.7	3467984	0.00957	1236.89	1236.89
FENCEGRD	628775.4	3468005	0.00929	1236.7	1236.7
FENCEGRD	628766.1	3468027	0.00931	1236.51	1236.51
FENCEGRD	628735.2	3468057	0.01165	1236.37	1236.37
FENCEGRD	628713.6	3468066	0.01239	1236.22	1236.22
FENCEGRD	628692	3468075	0.01293	1236.09	1236.09
FENCEGRD	628670.4	3468083	0.01313	1235.87	1235.87
FENCEGRD	628803.4	3467941	0.01195	1235.71	1235.71
FENCEGRD	628804	3467917	0.01158	1235.62	1235.62
FENCEGRD	628804.6	3467892	0.01128	1235.5	1235.5
FENCEGRD	628805.2	3467867	0.01151	1235.36	1235.36
FENCEGRD	628805.8	3467843	0.013	1235.22	1235.22
FENCEGRD	628806.4	3467818	0.01507	1235.06	1235.06
FENCEGRD	628807	3467793	0.01504	1234.88	1234.88
FENCEGRD	628807.7	3467769	0.01422	1234.74	1234.74
FENCEGRD	628808.3	3467744	0.01386	1234.58	1234.58
FENCEGRD	628808.9	3467720	0.01576	1234.4	1234.4
FENCEGRD	628809.5	3467695	0.01663	1234.25	1234.25
FENCEGRD	628810.1	3467670	0.01575	1234.06	1234.06
FENCEGRD	628810.7	3467646	0.01649	1233.9	1233.9
FENCEGRD	628811.3	3467621	0.01767	1233.75	1233.75
FENCEGRD	628812	3467597	0.02292	1233.62	1233.62
FENCEGRD	628812.6	3467572	0.02175	1233.41	1233.41
FENCEGRD	628813.2	3467547	0.01972	1233.23	1233.23
FENCEGRD	628813.8	3467523	0.01979	1233.04	1233.04
FENCEGRD	628814.4	3467498	0.01726	1232.81	1232.81
FENCEGRD	628815	3467474	0.01481	1232.61	1232.61
FENCEGRD	628815.6	3467449	0.01357	1232.47	1232.47
FENCEGRD	628816.3	3467424	0.01708	1233.26	1233.26
FENCEGRD	628819.3	3467963	0.0112	1232.51	1232.51
FENCEGRD	628810.3	3467983	0.01009	1232.4	1232.4
FENCEGRD	628801.3	3468004	0.00896	1232.55	1232.55
FENCEGRD	628792.3	3468025	0.00863	1232.73	1232.73
FENCEGRD	628783.3	3468045	0.0087	1232.7	1232.7
FENCEGRD	628753.4	3468075	0.01073	1232.85	1232.85
FENCEGRD	628732.5	3468083	0.01163	1232.85	1232.85
FENCEGRD	628711.6	3468092	0.01222	1232.41	1232.41
FENCEGRD	628690.7	3468100	0.01256	1232.46	1232.46
FENCEGRD	628669.8	3468109	0.01262	1232.43	1232.43
FENCEGRD	628828.4	3467942	0.01065	1232.42	1232.42
FENCEGRD	628829	3467917	0.01059	1232.4	1232.4
FENCEGRD	628829.6	3467893	0.01045	1232.48	1232.48
FENCEGRD	628830.2	3467868	0.01186	1232.55	1232.55
FENCEGRD	628830.8	3467843	0.01414	1232.52	1232.52
FENCEGRD	628831.4	3467819	0.01411	1232.53	1232.53
FENCEGRD	628832	3467794	0.01358	1233.71	1233.71
FENCEGRD	628832.7	3467770	0.01326	1232.55	1232.55
FENCEGRD	628833.3	3467745	0.01392	1232.64	1232.64
FENCEGRD	628833.9	3467720	0.01554	1232.69	1232.69
FENCEGRD	628834.5	3467696	0.01466	1232.69	1232.69
FENCEGRD	628835.1	3467671	0.01517	1232.7	1232.7
FENCEGRD	628835.7	3467646	0.01483	1232.76	1232.76
FENCEGRD	628836.3	3467622	0.01788	1232.81	1232.81
FENCEGRD	628837	3467597	0.02224	1232.91	1232.91
FENCEGRD	628837.6	3467573	0.01966	1232.92	1232.92
FENCEGRD	628838.2	3467548	0.01846	1233.18	1233.18
FENCEGRD	628838.8	3467523	0.01798	1233.36	1233.36
FENCEGRD	628839.4	3467499	0.0159	1232.99	1232.99
FENCEGRD	628840	3467474	0.01373	1233.12	1233.12
FENCEGRD	628840.6	3467450	0.01273	1233.15	1233.15
FENCEGRD	628841.2	3467425	0.01518	1232.35	1232.35
FENCEGRD	628844.6	3467963	0.01035	1232.29	1232.29
FENCEGRD	628835.8	3467983	0.01056	1232.38	1232.38
FENCEGRD	628827	3468003	0.00951	1232.42	1232.42
FENCEGRD	628818.2	3468023	0.00844	1232.44	1232.44
FENCEGRD	628809.4	3468043	0.00803	1232.45	1232.45
FENCEGRD	628800.6	3468064	0.00812	1232.48	1232.48
FENCEGRD	628771.4	3468092	0.00998	1232.48	1232.48
FENCEGRD	628751	3468101	0.01128	1232.5	1232.5
FENCEGRD	628730.6	3468109	0.01152	1232.32	1232.32
FENCEGRD	628710.2	3468117	0.01196	1232.3	1232.3
FENCEGRD	628689.8	3468126	0.01216	1232.36	1232.36
FENCEGRD	628669.4	3468134	0.0121	1232.41	1232.41
FENCEGRD	628853.4	3467942	0.00998	1232.44	1232.44

FENCEGRD	628854	3467918	0.00951	1232.47	1232.47
FENCEGRD	628854.6	3467893	0.01083	1232.49	1232.49
FENCEGRD	628855.2	3467869	0.01225	1232.52	1232.52
FENCEGRD	628855.8	3467844	0.01329	1232.55	1232.55
FENCEGRD	628856.4	3467819	0.01285	1232.59	1232.59
FENCEGRD	628857	3467795	0.01274	1232.6	1232.6
FENCEGRD	628857.6	3467770	0.01223	1232.61	1232.61
FENCEGRD	628858.3	3467746	0.01394	1232.62	1232.62
FENCEGRD	628858.9	3467721	0.01465	1232.64	1232.64
FENCEGRD	628859.5	3467696	0.01396	1232.66	1232.66
FENCEGRD	628860.1	3467672	0.01469	1232.68	1232.68
FENCEGRD	628860.7	3467647	0.01335	1232.3	1232.3
FENCEGRD	628861.3	3467622	0.01781	1232.29	1232.29
FENCEGRD	628861.9	3467598	0.0206	1232.36	1232.36
FENCEGRD	628862.6	3467573	0.01778	1232.44	1232.44
FENCEGRD	628863.2	3467549	0.01731	1232.47	1232.47
FENCEGRD	628863.8	3467524	0.01641	1232.5	1232.5
FENCEGRD	628864.4	3467499	0.01471	1232.52	1232.52
FENCEGRD	628865	3467475	0.01276	1232.56	1232.56
FENCEGRD	628865.6	3467450	0.01196	1232.59	1232.59
FENCEGRD	628866.2	3467426	0.01354	1232.63	1232.63
FENCEGRD	628661.4	3467415	0.02859	1232.66	1232.66
FENCEGRD	628636.4	3467415	0.0327	1232.7	1232.7
FENCEGRD	628611.4	3467415	0.03707	1232.77	1232.77
FENCEGRD	628586.4	3467414	0.04161	1232.78	1232.78
FENCEGRD	628561.4	3467414	0.05304	1232.8	1232.8
FENCEGRD	628536.5	3467413	0.05556	1232.81	1232.81
FENCEGRD	628511.5	3467413	0.06596	1232.83	1232.83
FENCEGRD	628486.5	3467412	0.07451	1232.84	1232.84
FENCEGRD	628461.5	3467412	0.08848	1232.85	1232.85
FENCEGRD	628436.5	3467411	0.0975	1232.87	1232.87
FENCEGRD	628411.5	3467411	0.10279	1232.88	1232.88
FENCEGRD	628386.5	3467411	0.10756	1232.9	1232.9
FENCEGRD	628361.6	3467410	0.10845	1232.29	1232.29
FENCEGRD	628336.6	3467410	0.10732	1232.23	1232.23
FENCEGRD	628311.6	3467409	0.10582	1232.35	1232.35
FENCEGRD	628286.6	3467409	0.10956	1232.43	1232.43
FENCEGRD	628261.6	3467408	0.10848	1232.47	1232.47
FENCEGRD	628236.6	3467408	0.10714	1232.51	1232.51
FENCEGRD	628211.6	3467407	0.10609	1232.54	1232.54
FENCEGRD	628186.6	3467407	0.10404	1232.57	1232.57
FENCEGRD	628161.7	3467406	0.0975	1232.59	1232.59
FENCEGRD	628136.7	3467406	0.09223	1232.62	1232.62
FENCEGRD	628111.7	3467406	0.08645	1232.65	1232.65
FENCEGRD	628086.7	3467405	0.08286	1232.67	1232.67
FENCEGRD	628061.7	3467405	0.08159	1232.69	1232.69
FENCEGRD	628036.7	3467404	0.07863	1232.72	1232.72
FENCEGRD	628011.7	3467404	0.08132	1232.76	1232.76
FENCEGRD	628661.8	3467390	0.02972	1232.81	1232.81
FENCEGRD	628636.9	3467390	0.03216	1232.88	1232.88
FENCEGRD	628611.9	3467390	0.0363	1232.91	1232.91
FENCEGRD	628586.9	3467389	0.03955	1232.94	1232.94
FENCEGRD	628561.9	3467389	0.03905	1232.96	1232.96
FENCEGRD	628536.9	3467388	0.04521	1232.97	1232.97
FENCEGRD	628511.9	3467388	0.05363	1232.99	1232.99
FENCEGRD	628486.9	3467387	0.06141	1233.01	1233.01
FENCEGRD	628461.9	3467387	0.07127	1233.03	1233.03
FENCEGRD	628437	3467386	0.07689	1233.05	1233.05
FENCEGRD	628412	3467386	0.08135	1233.06	1233.06
FENCEGRD	628387	3467386	0.08355	1233.07	1233.07
FENCEGRD	628362	3467385	0.08603	1233.09	1233.09
FENCEGRD	628337	3467385	0.08783	1233.11	1233.11
FENCEGRD	628312	3467384	0.08715	1233.13	1233.13
FENCEGRD	628287	3467384	0.08588	1232.29	1232.29
FENCEGRD	628262	3467383	0.08453	1232.25	1232.25
FENCEGRD	628237.1	3467383	0.08312	1232.23	1232.23
FENCEGRD	628212.1	3467382	0.08165	1232.27	1232.27
FENCEGRD	628187.1	3467382	0.07978	1232.26	1232.26
FENCEGRD	628162.1	3467381	0.07502	1232.28	1232.28
FENCEGRD	628137.1	3467381	0.07203	1232.43	1232.43
FENCEGRD	628112.1	3467381	0.06873	1233.14	1233.14
FENCEGRD	628087.1	3467380	0.0643	1232.05	1232.05
FENCEGRD	628062.2	3467380	0.06243	1232.14	1232.14
FENCEGRD	628037.2	3467379	0.06536	1232.13	1232.13
FENCEGRD	628012.2	3467379	0.06464	1232.04	1232.04
FENCEGRD	628681.7	3467374	0.02664	1232.06	1232.06

FENCEGRD	628708.7	3467402	0.02407	1232.85	1232.85
FENCEGRD	628662.3	3467365	0.02724	1231.99	1231.99
FENCEGRD	628637.3	3467365	0.0303	1232.17	1232.17
FENCEGRD	628612.3	3467365	0.02956	1231.91	1231.91
FENCEGRD	628587.3	3467364	0.03084	1231.98	1231.98
FENCEGRD	628562.3	3467364	0.03669	1231.84	1231.84
FENCEGRD	628537.4	3467363	0.04352	1231.79	1231.79
FENCEGRD	628512.4	3467363	0.04752	1231.88	1231.88
FENCEGRD	628487.4	3467362	0.05136	1232.5	1232.5
FENCEGRD	628462.4	3467362	0.05946	1231.76	1231.76
FENCEGRD	628437.4	3467361	0.06321	1231.85	1231.85
FENCEGRD	628412.4	3467361	0.067	1231.93	1231.93
FENCEGRD	628387.4	3467361	0.06721	1232.12	1232.12
FENCEGRD	628362.4	3467360	0.06913	1231.83	1231.83
FENCEGRD	628337.5	3467360	0.07039	1231.56	1231.56
FENCEGRD	628312.5	3467359	0.0713	1231.63	1231.63
FENCEGRD	628287.5	3467359	0.07134	1231.66	1231.66
FENCEGRD	628262.5	3467358	0.07047	1231.72	1231.72
FENCEGRD	628237.5	3467358	0.06889	1232.14	1232.14
FENCEGRD	628212.5	3467357	0.06664	1231.58	1231.58
FENCEGRD	628187.5	3467357	0.06129	1231.61	1231.61
FENCEGRD	628162.5	3467357	0.05935	1231.7	1231.7
FENCEGRD	628137.6	3467356	0.05654	1231.84	1231.84
FENCEGRD	628112.6	3467356	0.05459	1231.96	1231.96
FENCEGRD	628087.6	3467355	0.05104	1232.12	1232.12
FENCEGRD	628062.6	3467355	0.04949	1231.74	1231.74
FENCEGRD	628037.6	3467354	0.04974	1231.67	1231.67
FENCEGRD	628012.6	3467354	0.0512	1231.47	1231.47
FENCEGRD	628681.5	3467349	0.02458	1231.48	1231.48
FENCEGRD	628700.3	3467357	0.02436	1231.51	1231.51
FENCEGRD	628726.5	3467384	0.02361	1231.73	1231.73
FENCEGRD	628733.9	3467403	0.02187	1233.08	1233.08
FENCEGRD	628662.7	3467340	0.02319	1232.87	1232.87
FENCEGRD	628637.7	3467340	0.02211	1232.68	1232.68
FENCEGRD	628612.8	3467340	0.02487	1232.48	1232.48
FENCEGRD	628587.8	3467339	0.03098	1232.35	1232.35
FENCEGRD	628562.8	3467339	0.03731	1232.2	1232.2
FENCEGRD	628537.8	3467338	0.03869	1231.92	1231.92
FENCEGRD	628512.8	3467338	0.04071	1231.72	1231.72
FENCEGRD	628487.8	3467337	0.04761	1232.41	1232.41
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FENCEGRD	628412.9	3467336	0.05737	1231.78	1231.78
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FENCEGRD	628312.9	3467334	0.05931	1231.04	1231.04
FENCEGRD	628287.9	3467334	0.05973	1232.21	1232.21
FENCEGRD	628262.9	3467333	0.05958	1231.68	1231.68
FENCEGRD	628238	3467333	0.05334	1231.57	1231.57
FENCEGRD	628213	3467332	0.05198	1231.38	1231.38
FENCEGRD	628188	3467332	0.04952	1231.23	1231.23
FENCEGRD	628163	3467332	0.04656	1231.02	1231.02
FENCEGRD	628138	3467331	0.04653	1232.19	1232.19
FENCEGRD	628113	3467331	0.04682	1231.66	1231.66
FENCEGRD	628088	3467330	0.0434	1231.54	1231.54
FENCEGRD	628063	3467330	0.04451	1231.35	1231.35
FENCEGRD	628038.1	3467329	0.04284	1231.2	1231.2
FENCEGRD	628013.1	3467329	0.04223	1230.97	1230.97
FENCEGRD	628681.7	3467324	0.0193	1232.19	1232.19
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FENCEGRD	628744.4	3467367	0.02094	1231.29	1231.29
FENCEGRD	628751.7	3467385	0.02135	1231.16	1231.16
FENCEGRD	628759	3467404	0.01945	1230.95	1230.95
FENCEGRD	628663.2	3467315	0.01951	1231.61	1231.61
FENCEGRD	628638.2	3467315	0.02214	1231.45	1231.45
FENCEGRD	628613.2	3467315	0.02691	1231.2	1231.2
FENCEGRD	628588.2	3467314	0.03267	1231.05	1231.05
FENCEGRD	628563.2	3467314	0.03298	1230.97	1230.97
FENCEGRD	628538.2	3467313	0.03473	1230.76	1230.76
FENCEGRD	628513.3	3467313	0.03682	1230.55	1230.55
FENCEGRD	628488.3	3467312	0.0406	1230.88	1230.88
FENCEGRD	628463.3	3467312	0.04632	1230.71	1230.71
FENCEGRD	628438.3	3467311	0.04887	1230.53	1230.53
FENCEGRD	628413.3	3467311	0.05009	1230.36	1230.36

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FENCEGRD	628338.3	3467310	0.05209	1229.88	1229.88
FENCEGRD	628313.4	3467309	0.05136	1230.86	1230.86
FENCEGRD	628288.4	3467309	0.05106	1230.69	1230.69
FENCEGRD	628263.4	3467308	0.04979	1230.51	1230.51
FENCEGRD	628238.4	3467308	0.04872	1230.34	1230.34
FENCEGRD	628213.4	3467307	0.04586	1230.18	1230.18
FENCEGRD	628188.4	3467307	0.04314	1230.02	1230.02
FENCEGRD	628163.4	3467307	0.04102	1229.9	1229.9
FENCEGRD	628138.5	3467306	0.03784	1230.85	1230.85
FENCEGRD	628113.5	3467306	0.03595	1230.68	1230.68
FENCEGRD	628088.5	3467305	0.03812	1230.51	1230.51
FENCEGRD	628063.5	3467305	0.03887	1230.35	1230.35
FENCEGRD	628038.5	3467304	0.03889	1230.19	1230.19
FENCEGRD	628013.5	3467304	0.0384	1230.03	1230.03
FENCEGRD	628686.5	3467300	0.01731	1229.91	1229.91
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FENCEGRD	628732.3	3467320	0.01994	1230.67	1230.67
FENCEGRD	628764.2	3467354	0.01931	1230.51	1230.51
FENCEGRD	628773.2	3467377	0.02018	1230.35	1230.35
FENCEGRD	628782.2	3467400	0.01804	1230.19	1230.19
FENCEGRD	628663.6	3467290	0.02028	1230.05	1230.05
FENCEGRD	628638.6	3467290	0.02424	1229.92	1229.92
FENCEGRD	628613.7	3467290	0.02707	1230.43	1230.43
FENCEGRD	628588.7	3467289	0.02909	1230.34	1230.34
FENCEGRD	628563.7	3467289	0.03015	1230.07	1230.07
FENCEGRD	628538.7	3467288	0.03017	1229.92	1229.92
FENCEGRD	628513.7	3467288	0.03404	1229.81	1229.81
FENCEGRD	628488.7	3467287	0.03666	1229.61	1229.61
FENCEGRD	628463.7	3467287	0.04155	1229.4	1229.4
FENCEGRD	628438.7	3467286	0.04269	1229.28	1229.28
FENCEGRD	628413.8	3467286	0.04446	1229.19	1229.19
FENCEGRD	628388.8	3467286	0.04584	1229.73	1229.73
FENCEGRD	628363.8	3467285	0.04569	1229.58	1229.58
FENCEGRD	628338.8	3467285	0.04823	1229.45	1229.45
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FENCEGRD	628288.8	3467284	0.04469	1229.15	1229.15
FENCEGRD	628263.8	3467283	0.04482	1228.97	1228.97
FENCEGRD	628238.8	3467283	0.04278	1228.81	1228.81
FENCEGRD	628213.9	3467282	0.04128	1228.65	1228.65
FENCEGRD	628188.9	3467282	0.03697	1228.49	1228.49
FENCEGRD	628163.9	3467282	0.0329	1229.73	1229.73
FENCEGRD	628138.9	3467281	0.03341	1229.6	1229.6
FENCEGRD	628113.9	3467281	0.03141	1229.43	1229.43
FENCEGRD	628088.9	3467280	0.03067	1229.3	1229.3
FENCEGRD	628063.9	3467280	0.03176	1229.15	1229.15
FENCEGRD	628039	3467279	0.03229	1228.99	1228.99
FENCEGRD	628014	3467279	0.03468	1228.8	1228.8
FENCEGRD	628685.9	3467275	0.0188	1228.64	1228.64
FENCEGRD	628707.7	3467285	0.01613	1228.47	1228.47
FENCEGRD	628729.6	3467294	0.01497	1229.73	1229.73
FENCEGRD	628751.4	3467304	0.01699	1229.6	1229.6
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FENCEGRD	628790.4	3467358	0.0185	1229.29	1229.29
FENCEGRD	628799	3467380	0.01812	1229.14	1229.14
FENCEGRD	628807.7	3467402	0.01621	1228.98	1228.98
FENCEGRD	628664.1	3467265	0.02216	1228.77	1228.77
FENCEGRD	628639.1	3467265	0.02414	1228.62	1228.62
FENCEGRD	628614.1	3467265	0.02601	1228.44	1228.44
FENCEGRD	628589.1	3467264	0.02693	1229.76	1229.76
FENCEGRD	628564.1	3467264	0.02736	1229.62	1229.62
FENCEGRD	628539.1	3467263	0.02796	1229.47	1229.47
FENCEGRD	628514.2	3467263	0.03121	1229.29	1229.29
FENCEGRD	628489.2	3467262	0.03404	1229.14	1229.14
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FENCEGRD	628439.2	3467261	0.03761	1228.8	1228.8
FENCEGRD	628414.2	3467261	0.03998	1228.61	1228.61
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FENCEGRD	628364.2	3467260	0.04146	1228.92	1228.92
FENCEGRD	628339.2	3467260	0.04191	1228.82	1228.82
FENCEGRD	628314.3	3467259	0.04037	1228.74	1228.74
FENCEGRD	628289.3	3467259	0.04003	1228.58	1228.58
FENCEGRD	628264.3	3467258	0.03975	1228.4	1228.4
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FENCEGRD	628214.3	3467257	0.03497	1228.28	1228.28

FENCEGRD	628189.3	3467257	0.03309	1228.04	1228.04
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FENCEGRD	628139.3	3467256	0.02822	1228.26	1228.26
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FENCEGRD	628064.4	3467255	0.02696	1227.93	1227.93
FENCEGRD	628039.4	3467254	0.02739	1227.8	1227.8
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FENCEGRD	628770.2	3467287	0.01459	1228.14	1228.14
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FENCEGRD	628816.3	3467360	0.01812	1227.74	1227.74
FENCEGRD	628824.6	3467382	0.01659	1227.6	1227.6
FENCEGRD	628832.9	3467403	0.01458	1227.48	1227.48
FENCEGRD	628664.5	3467240	0.02182	1227.32	1227.32
FENCEGRD	628639.5	3467240	0.02351	1227.19	1227.19
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FENCEGRD	628514.6	3467238	0.02881	1227.69	1227.69
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FENCEGRD	628439.6	3467236	0.0343	1227.26	1227.26
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FENCEGRD	628314.7	3467234	0.03704	1227.79	1227.79
FENCEGRD	628289.7	3467234	0.03656	1227.61	1227.61
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FENCEGRD	628239.7	3467233	0.0345	1227.33	1227.33
FENCEGRD	628214.8	3467232	0.03155	1227.23	1227.23
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FENCEGRD	628139.8	3467231	0.02672	1227.85	1227.85
FENCEGRD	628114.8	3467231	0.02364	1227.49	1227.49
FENCEGRD	628089.8	3467230	0.0246	1227.2	1227.2
FENCEGRD	628064.8	3467230	0.0244	1227.89	1227.89
FENCEGRD	628039.8	3467229	0.0242	1227.68	1227.68
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FENCEGRD	628590	3467214	0.02226	1227.52	1227.52
FENCEGRD	628565	3467214	0.02264	1227.39	1227.39
FENCEGRD	628540	3467213	0.02448	1227.62	1227.62
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FENCEGRD	628290.2	3467209	0.0331	1227.52	1227.52
FENCEGRD	628265.2	3467208	0.03257	1227	1227
FENCEGRD	628240.2	3467208	0.03087	1227.4	1227.4
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FENCEGRD	628005.4	3467428	0.0949	1227.7	1227.7
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FENCEGRD	628001.5	3467486	0.07586	1227.37	1227.37
FENCEGRD	627986.5	3467397	0.07544	1227.27	1227.27
FENCEGRD	628001.8	3467383	0.06792	1227.11	1227.11
FENCEGRD	627981.7	3467407	0.08376	1227	1227
FENCEGRD	627980.4	3467426	0.08248	1227	1227
FENCEGRD	627979.1	3467445	0.08728	1226.73	1226.73
FENCEGRD	627977.8	3467465	0.07793	1227.5	1227.5
FENCEGRD	627976.6	3467484	0.0665	1227.64	1227.64
FENCEGRD	627962.7	3467393	0.07268	1227.79	1227.79
FENCEGRD	627968.5	3467381	0.06278	1227.92	1227.92
FENCEGRD	627987.2	3467363	0.05697	1228.06	1228.06
FENCEGRD	627999.9	3467359	0.05457	1228.33	1228.33
FENCEGRD	627956.8	3467405	0.07587	1228.4	1228.4
FENCEGRD	627955.5	3467424	0.07066	1228.49	1228.49
FENCEGRD	627954.2	3467444	0.07629	1228.79	1228.79
FENCEGRD	627952.9	3467463	0.06583	1228.87	1228.87
FENCEGRD	627951.6	3467482	0.05873	1227.86	1227.86
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FENCEGRD	627971.4	3467345	0.04889	1228.62	1228.62
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FENCEGRD	627999.2	3467334	0.04228	1228.1	1228.1
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FENCEGRD	627930.5	3467423	0.06642	1228.42	1228.42
FENCEGRD	627929.2	3467442	0.06709	1228.33	1228.33
FENCEGRD	627928	3467461	0.05684	1228.09	1228.09
FENCEGRD	627926.7	3467481	0.05234	1228.21	1228.21
FENCEGRD	627913.6	3467388	0.06024	1228.33	1228.33
FENCEGRD	627920.4	3467374	0.05874	1228.42	1228.42
FENCEGRD	627927.1	3467360	0.05274	1228.52	1228.52
FENCEGRD	627933.9	3467346	0.04759	1228.17	1228.17
FENCEGRD	627955.2	3467326	0.0418	1228.26	1228.26
FENCEGRD	627969.8	3467320	0.03858	1228.36	1228.36
FENCEGRD	627984.4	3467315	0.03919	1228.5	1228.5
FENCEGRD	627998.9	3467309	0.03862	1228.64	1228.64
FENCEGRD	627906.9	3467402	0.05838	1228.94	1228.94
FENCEGRD	627905.6	3467421	0.05848	1229.09	1229.09
FENCEGRD	627904.3	3467440	0.05955	1229.26	1229.26
FENCEGRD	627903	3467460	0.04992	1229.43	1229.43
FENCEGRD	627901.7	3467479	0.04703	1229.56	1229.56
FENCEGRD	627890.3	3467383	0.05492	1228.73	1228.73
FENCEGRD	627898.6	3467365	0.05396	1228.81	1228.81
FENCEGRD	627907	3467348	0.04803	1228.95	1228.95
FENCEGRD	627915.3	3467331	0.0436	1229.07	1229.07
FENCEGRD	627941.7	3467306	0.03529	1229.18	1229.18
FENCEGRD	627959.8	3467299	0.03624	1228.54	1228.54
FENCEGRD	627977.9	3467293	0.03579	1228.65	1228.65
FENCEGRD	627995.9	3467286	0.03456	1228.83	1228.83
FENCEGRD	627881.9	3467400	0.05038	1228.96	1228.96
FENCEGRD	627880.6	3467419	0.05181	1229.07	1229.07
FENCEGRD	627879.4	3467439	0.05202	1228.65	1228.65
FENCEGRD	627878.1	3467458	0.04444	1228.83	1228.83
FENCEGRD	627876.8	3467478	0.04259	1228.94	1228.94
FENCEGRD	627865.3	3467381	0.04983	1229.13	1229.13
FENCEGRD	627873.6	3467364	0.05143	1229.23	1229.23
FENCEGRD	627881.9	3467347	0.04774	1228.74	1228.74
FENCEGRD	627890.2	3467329	0.04193	1228.85	1228.85
FENCEGRD	627898.5	3467312	0.03941	1229.01	1229.01
FENCEGRD	627924.7	3467288	0.03235	1229.21	1229.21
FENCEGRD	627942.7	3467281	0.03396	1229.4	1229.4
FENCEGRD	627960.6	3467274	0.03248	1229.75	1229.75
FENCEGRD	627978.5	3467267	0.03189	1229.94	1229.94
FENCEGRD	627996.5	3467261	0.03036	1230.04	1230.04

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FENCEGRD	627855.7	3467418	0.04671	1230.37	1230.37
FENCEGRD	627854.4	3467437	0.04587	1230.5	1230.5
FENCEGRD	627853.1	3467457	0.03999	1230.63	1230.63
FENCEGRD	627851.8	3467476	0.03882	1229.3	1229.3
FENCEGRD	627840.3	3467380	0.04479	1229.47	1229.47
FENCEGRD	627848.6	3467362	0.04818	1229.58	1229.58
FENCEGRD	627856.8	3467345	0.04444	1229.74	1229.74
FENCEGRD	627865.1	3467328	0.04158	1229.88	1229.88
FENCEGRD	627873.3	3467311	0.03868	1230.04	1230.04
FENCEGRD	627881.6	3467293	0.03462	1230.22	1230.22
FENCEGRD	627907.7	3467269	0.03059	1229.26	1229.26
FENCEGRD	627925.6	3467263	0.03121	1229.39	1229.39
FENCEGRD	627943.4	3467256	0.02826	1229.57	1229.57
FENCEGRD	627961.3	3467249	0.02958	1229.7	1229.7
FENCEGRD	627979.1	3467242	0.02767	1229.9	1229.9
FENCEGRD	627997	3467236	0.02668	1230.13	1230.13
FENCEGRD	627832	3467397	0.04139	1230.32	1230.32
FENCEGRD	627830.8	3467416	0.04234	1229.36	1229.36
FENCEGRD	627829.5	3467436	0.04078	1229.58	1229.58
FENCEGRD	627828.2	3467455	0.03633	1229.73	1229.73
FENCEGRD	627826.9	3467474	0.0356	1229.82	1229.82
FENCEGRD	627815.3	3467378	0.04	1229.97	1229.97
FENCEGRD	627823.6	3467361	0.04459	1230.18	1230.18
FENCEGRD	627831.8	3467344	0.04423	1230.37	1230.37
FENCEGRD	627840	3467327	0.04059	1229.52	1229.52
FENCEGRD	627848.2	3467309	0.03583	1229.64	1229.64
FENCEGRD	627856.5	3467292	0.03489	1229.76	1229.76
FENCEGRD	627864.7	3467275	0.03048	1229.89	1229.89
FENCEGRD	627890.7	3467251	0.02903	1230.04	1230.04
FENCEGRD	627908.5	3467244	0.02739	1230.25	1230.25
FENCEGRD	627926.3	3467238	0.02649	1230.43	1230.43
FENCEGRD	627944.1	3467231	0.02709	1230.85	1230.85
FENCEGRD	627961.9	3467224	0.02574	1231.02	1231.02
FENCEGRD	627979.7	3467217	0.02412	1231.16	1231.16
FENCEGRD	627997.5	3467211	0.02309	1231.36	1231.36
FENCEGRD	627807.1	3467395	0.03947	1231.58	1231.58
FENCEGRD	627805.8	3467415	0.03851	1231.73	1231.73
FENCEGRD	627804.5	3467434	0.03656	1231.96	1231.96
FENCEGRD	627803.2	3467453	0.03333	1232.17	1232.17
FENCEGRD	627801.9	3467473	0.03282	1232.34	1232.34
FENCEGRD	628013.7	3467510	0.06748	1232.67	1232.67
FENCEGRD	628025.3	3467532	0.06561	1230.49	1230.49
FENCEGRD	628036.9	3467553	0.06209	1230.65	1230.65
FENCEGRD	628048.5	3467575	0.05532	1230.8	1230.8
FENCEGRD	628060.1	3467596	0.04952	1231.02	1231.02
FENCEGRD	628071.7	3467618	0.04404	1231.21	1231.21
FENCEGRD	628083.3	3467640	0.04092	1231.42	1231.42
FENCEGRD	628094.9	3467661	0.03708	1231.7	1231.7
FENCEGRD	628106.5	3467683	0.03471	1231.89	1231.89
FENCEGRD	628118.1	3467704	0.03391	1232.02	1232.02
FENCEGRD	628129.7	3467726	0.03077	1230.53	1230.53
FENCEGRD	628141.3	3467747	0.02968	1230.79	1230.79
FENCEGRD	628152.9	3467769	0.03002	1230.97	1230.97
FENCEGRD	628164.5	3467790	0.02961	1231.16	1231.16
FENCEGRD	628176.1	3467812	0.02618	1231.48	1231.48
FENCEGRD	627980.1	3467500	0.06698	1231.74	1231.74
FENCEGRD	627991.7	3467522	0.0574	1231.94	1231.94
FENCEGRD	628003.3	3467544	0.05563	1232.16	1232.16
FENCEGRD	628014.9	3467565	0.05225	1232.27	1232.27
FENCEGRD	628026.5	3467587	0.04846	1230.58	1230.58
FENCEGRD	628038.1	3467608	0.04398	1230.76	1230.76
FENCEGRD	628049.7	3467630	0.04005	1230.98	1230.98
FENCEGRD	628061.3	3467651	0.03764	1231.17	1231.17
FENCEGRD	628072.9	3467673	0.0345	1231.47	1231.47
FENCEGRD	628084.5	3467694	0.03123	1231.77	1231.77
FENCEGRD	628096.1	3467716	0.02947	1231.95	1231.95
FENCEGRD	628107.7	3467738	0.02832	1232.08	1232.08
FENCEGRD	628119.3	3467759	0.02751	1232.31	1232.31
FENCEGRD	628130.9	3467781	0.0265	1230.6	1230.6
FENCEGRD	628142.5	3467802	0.02557	1230.81	1230.81
FENCEGRD	628154.1	3467824	0.02549	1231.01	1231.01
FENCEGRD	627954.8	3467497	0.05665	1231.25	1231.25
FENCEGRD	627958	3467512	0.04738	1231.44	1231.44
FENCEGRD	627969.6	3467534	0.05016	1231.67	1231.67
FENCEGRD	627981.2	3467555	0.04846	1231.87	1231.87

FENCEGRD	627992.9	3467577	0.04508	1232.03	1232.03
FENCEGRD	628004.5	3467598	0.04177	1232.23	1232.23
FENCEGRD	628016.1	3467620	0.0395	1232.79	1232.79
FENCEGRD	628027.7	3467642	0.03732	1232.48	1232.48
FENCEGRD	628039.3	3467663	0.03479	1232.46	1232.46
FENCEGRD	628050.9	3467685	0.03269	1232.19	1232.19
FENCEGRD	628062.5	3467706	0.0296	1232.22	1232.22
FENCEGRD	628074.1	3467728	0.02799	1231.86	1231.86
FENCEGRD	628085.7	3467749	0.02628	1231.91	1231.91
FENCEGRD	628097.3	3467771	0.02457	1231.63	1231.63
FENCEGRD	628108.9	3467793	0.02484	1231.62	1231.62
FENCEGRD	628120.5	3467814	0.02383	1231.38	1231.38
FENCEGRD	628132.1	3467836	0.02214	1232.09	1232.09
FENCEGRD	627931.3	3467502	0.04808	1232.41	1232.41
FENCEGRD	627936	3467524	0.04164	1232.23	1232.23
FENCEGRD	627947.6	3467546	0.04391	1232.3	1232.3
FENCEGRD	627959.2	3467567	0.04305	1232.23	1232.23
FENCEGRD	627970.8	3467589	0.03978	1231.88	1231.88
FENCEGRD	627982.4	3467610	0.03709	1232.25	1232.25
FENCEGRD	627994	3467632	0.03578	1232.05	1232.05
FENCEGRD	628005.6	3467653	0.03419	1232.13	1232.13
FENCEGRD	628017.2	3467675	0.03155	1232.06	1232.06
FENCEGRD	628028.8	3467697	0.03018	1231.66	1231.66
FENCEGRD	628040.4	3467718	0.02835	1232.12	1232.12
FENCEGRD	628052	3467740	0.02658	1231.85	1231.85
FENCEGRD	628063.6	3467761	0.02476	1231.97	1231.97
FENCEGRD	628075.2	3467783	0.02325	1231.9	1231.9
FENCEGRD	628086.8	3467804	0.02165	1231.46	1231.46
FENCEGRD	628098.4	3467826	0.02112	1231.85	1231.85
FENCEGRD	628110	3467848	0.02142	1231.68	1231.68
FENCEGRD	627909.9	3467517	0.03755	1231.82	1231.82
FENCEGRD	627905.8	3467498	0.0433	1231.71	1231.71
FENCEGRD	627914	3467536	0.03843	1231.26	1231.26
FENCEGRD	627925.6	3467557	0.03959	1231.6	1231.6
FENCEGRD	627937.2	3467579	0.03882	1231.44	1231.44
FENCEGRD	627948.8	3467601	0.03544	1231.58	1231.58
FENCEGRD	627960.4	3467622	0.03421	1231.5	1231.5
FENCEGRD	627972	3467644	0.03279	1232.19	1232.19
FENCEGRD	627983.6	3467665	0.03135	1232.21	1232.21
FENCEGRD	627995.2	3467687	0.03007	1232.11	1232.11
FENCEGRD	628006.8	3467708	0.02819	1232.08	1232.08
FENCEGRD	628018.4	3467730	0.02707	1232.07	1232.07
FENCEGRD	628030	3467752	0.0257	1232.04	1232.04
FENCEGRD	628041.6	3467773	0.02409	1232.04	1232.04
FENCEGRD	628053.2	3467795	0.02214	1232.07	1232.07
FENCEGRD	628064.8	3467816	0.02044	1232.01	1232.01
FENCEGRD	628076.4	3467838	0.02008	1231.93	1231.93
FENCEGRD	628088	3467859	0.01975	1231.91	1231.91
FENCEGRD	627886.9	3467524	0.03183	1231.92	1231.92
FENCEGRD	627881.8	3467501	0.0388	1231.9	1231.9
FENCEGRD	627892	3467548	0.03545	1231.88	1231.88
FENCEGRD	627903.6	3467569	0.03558	1231.87	1231.87
FENCEGRD	627915.2	3467591	0.0354	1231.89	1231.89
FENCEGRD	627926.8	3467612	0.03154	1231.83	1231.83
FENCEGRD	627938.4	3467634	0.03166	1231.75	1231.75
FENCEGRD	627950	3467656	0.02962	1231.73	1231.73
FENCEGRD	627961.6	3467677	0.02839	1231.71	1231.71
FENCEGRD	627973.2	3467699	0.02802	1231.71	1231.71
FENCEGRD	627984.8	3467720	0.02671	1231.7	1231.7
FENCEGRD	627996.4	3467742	0.02601	1231.71	1231.71
FENCEGRD	628008	3467763	0.02432	1231.73	1231.73
FENCEGRD	628019.6	3467785	0.02332	1231.67	1231.67
FENCEGRD	628031.2	3467807	0.02173	1231.64	1231.64
FENCEGRD	628042.8	3467828	0.01963	1231.62	1231.62
FENCEGRD	628054.4	3467850	0.01905	1231.55	1231.55
FENCEGRD	628066	3467871	0.01886	1231.55	1231.55
FENCEGRD	627865.4	3467539	0.02983	1231.55	1231.55
FENCEGRD	627860.9	3467518	0.03217	1231.56	1231.56
FENCEGRD	627856.4	3467497	0.03471	1231.6	1231.6
FENCEGRD	627870	3467560	0.0296	1231.5	1231.5
FENCEGRD	627881.6	3467581	0.03215	1231.51	1231.51
FENCEGRD	627893.2	3467603	0.03171	1231.46	1231.46
FENCEGRD	627904.8	3467624	0.02865	1231.4	1231.4
FENCEGRD	627916.4	3467646	0.02907	1231.37	1231.37
FENCEGRD	627928	3467667	0.02782	1231.39	1231.39
FENCEGRD	627939.6	3467689	0.02619	1231.4	1231.4

FENCEGRD	627951.2	3467711	0.02612	1231.43	1231.43
FENCEGRD	627962.8	3467732	0.0252	1232.08	1232.08
FENCEGRD	627974.4	3467754	0.02384	1232.13	1232.13
FENCEGRD	627986	3467775	0.02288	1232.21	1232.21
FENCEGRD	627997.6	3467797	0.02204	1232.21	1232.21
FENCEGRD	628009.2	3467818	0.02131	1232.22	1232.22
FENCEGRD	628020.8	3467840	0.0194	1232.22	1232.22
FENCEGRD	628032.4	3467862	0.01792	1232.18	1232.18
FENCEGRD	628044	3467883	0.01791	1232.29	1232.29
FENCEGRD	627843.7	3467552	0.02911	1232.36	1232.36
FENCEGRD	627839.5	3467533	0.02575	1232.43	1232.43
FENCEGRD	627835.3	3467513	0.02948	1232.55	1232.55
FENCEGRD	627831.1	3467494	0.0327	1232.55	1232.55
FENCEGRD	627848	3467571	0.02825	1232.48	1232.48
FENCEGRD	627859.6	3467593	0.02919	1232.48	1232.48
FENCEGRD	627871.2	3467615	0.02815	1232.64	1232.64
FENCEGRD	627882.8	3467636	0.02596	1232.7	1232.7
FENCEGRD	627894.4	3467658	0.02578	1232.77	1232.77
FENCEGRD	627906	3467679	0.0257	1232.7	1232.7
FENCEGRD	627917.6	3467701	0.02384	1232.7	1232.7
FENCEGRD	627929.2	3467722	0.02422	1232.73	1232.73
FENCEGRD	627940.8	3467744	0.02379	1231.96	1231.96
FENCEGRD	627952.4	3467766	0.02272	1232.04	1232.04
FENCEGRD	627964	3467787	0.02127	1232.02	1232.02
FENCEGRD	627975.6	3467809	0.02065	1232.01	1232.01
FENCEGRD	627987.2	3467830	0.02071	1232.04	1232.04
FENCEGRD	627998.8	3467852	0.01919	1232.04	1232.04
FENCEGRD	628010.4	3467873	0.01693	1231.98	1231.98
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FENCEGRD	627816.3	3467539	0.02408	1232.17	1232.17
FENCEGRD	627811.5	3467517	0.02626	1232.19	1232.19
FENCEGRD	627806.7	3467495	0.03003	1232.21	1232.21
FENCEGRD	627825.9	3467583	0.02693	1232.27	1232.27
FENCEGRD	627837.5	3467605	0.0266	1232.25	1232.25
FENCEGRD	627849.1	3467626	0.02509	1232.36	1232.36
FENCEGRD	627860.7	3467648	0.02363	1232.51	1232.51
FENCEGRD	627872.3	3467670	0.02302	1232.53	1232.53
FENCEGRD	627883.9	3467691	0.0241	1232.53	1232.53
FENCEGRD	627895.6	3467713	0.02261	1232.58	1232.58
FENCEGRD	627907.2	3467734	0.02188	1232.53	1232.53
FENCEGRD	627918.8	3467756	0.02244	1231.82	1231.82
FENCEGRD	627930.4	3467777	0.02124	1231.82	1231.82
FENCEGRD	627942	3467799	0.02021	1231.79	1231.79
FENCEGRD	627953.6	3467821	0.01893	1231.84	1231.84
FENCEGRD	627965.2	3467842	0.01953	1231.87	1231.87
FENCEGRD	627976.8	3467864	0.01898	1231.86	1231.86
FENCEGRD	627988.4	3467885	0.01711	1231.83	1231.83
FENCEGRD	628000	3467907	0.01567	1231.85	1231.85
FENCEGRD	628175.9	3467831	0.02465	1231.91	1231.91
FENCEGRD	628176.4	3467853	0.02329	1231.94	1231.94
FENCEGRD	628176.8	3467874	0.02212	1231.94	1231.94
FENCEGRD	628177.2	3467896	0.02083	1232	1232
FENCEGRD	628177.6	3467917	0.01963	1232.08	1232.08
FENCEGRD	628178.1	3467939	0.01849	1232.06	1232.06
FENCEGRD	628150.5	3467810	0.02611	1232.1	1232.1
FENCEGRD	628150.9	3467832	0.0244	1232.21	1232.21
FENCEGRD	628151.4	3467853	0.02137	1232.28	1232.28
FENCEGRD	628151.8	3467875	0.02037	1232.29	1232.29
FENCEGRD	628152.2	3467896	0.01947	1232.37	1232.37
FENCEGRD	628152.7	3467918	0.01866	1232.4	1232.4
FENCEGRD	628153.1	3467939	0.01793	1231.64	1231.64
FENCEGRD	628125.5	3467811	0.02408	1231.63	1231.63
FENCEGRD	628125.9	3467832	0.02223	1231.63	1231.63
FENCEGRD	628126.4	3467854	0.02063	1231.64	1231.64
FENCEGRD	628126.8	3467875	0.01969	1231.64	1231.64
FENCEGRD	628127.2	3467897	0.01878	1231.62	1231.62
FENCEGRD	628127.7	3467918	0.01792	1231.62	1231.62
FENCEGRD	628128.1	3467940	0.01709	1231.66	1231.66
FENCEGRD	628100.5	3467811	0.02197	1231.71	1231.71
FENCEGRD	628100.9	3467833	0.02106	1231.69	1231.69
FENCEGRD	628101.4	3467854	0.02024	1231.73	1231.73
FENCEGRD	628101.8	3467876	0.0195	1231.81	1231.81
FENCEGRD	628102.2	3467897	0.01876	1231.92	1231.92
FENCEGRD	628102.7	3467919	0.0171	1231.9	1231.9
FENCEGRD	628103.1	3467940	0.0165	1231.89	1231.89

FENCEGRD	628075.5	3467812	0.02096	1231.95	1231.95
FENCEGRD	628076	3467833	0.02021	1232.02	1232.02
FENCEGRD	628076.4	3467855	0.01959	1232.08	1232.08
FENCEGRD	628076.8	3467876	0.019	1232.14	1232.14
FENCEGRD	628077.2	3467898	0.01841	1232.21	1232.21
FENCEGRD	628077.7	3467919	0.01755	1231.43	1231.43
FENCEGRD	628078.1	3467941	0.01622	1231.44	1231.44
FENCEGRD	628050.5	3467812	0.02069	1231.42	1231.42
FENCEGRD	628051	3467834	0.01934	1231.44	1231.44
FENCEGRD	628051.4	3467855	0.01881	1231.44	1231.44
FENCEGRD	628051.8	3467877	0.01831	1231.47	1231.47
FENCEGRD	628052.2	3467898	0.01782	1231.46	1231.46
FENCEGRD	628052.7	3467920	0.01735	1231.48	1231.48
FENCEGRD	628053.1	3467941	0.01688	1231.51	1231.51
FENCEGRD	628025.5	3467813	0.02138	1231.52	1231.52
FENCEGRD	628026	3467834	0.01968	1231.52	1231.52
FENCEGRD	628026.4	3467856	0.01788	1231.56	1231.56
FENCEGRD	628026.8	3467877	0.01738	1231.62	1231.62
FENCEGRD	628027.2	3467899	0.017	1231.7	1231.7
FENCEGRD	628027.7	3467920	0.01665	1231.71	1231.71
FENCEGRD	628028.1	3467942	0.01628	1231.78	1231.78
FENCEGRD	628000.5	3467813	0.02167	1231.82	1231.82
FENCEGRD	628001	3467835	0.02035	1231.85	1231.85
FENCEGRD	628001.4	3467856	0.01879	1231.94	1231.94
FENCEGRD	628001.8	3467878	0.01706	1231.98	1231.98
FENCEGRD	628002.3	3467899	0.01587	1232.75	1232.75
FENCEGRD	628002.7	3467921	0.01544	1232.76	1232.76
FENCEGRD	628003.1	3467942	0.01521	1232.79	1232.79
FENCEGRD	627975.5	3467814	0.02055	1232.81	1232.81
FENCEGRD	627976	3467835	0.02014	1232.82	1232.82
FENCEGRD	627976.4	3467857	0.01944	1232.85	1232.85
FENCEGRD	627976.8	3467878	0.01801	1232.91	1232.91
FENCEGRD	627977.3	3467900	0.01635	1232.96	1232.96
FENCEGRD	627977.7	3467921	0.01489	1232.55	1232.55
FENCEGRD	627978.1	3467943	0.01424	1232.58	1232.58
FENCEGRD	628183.1	3467944	0.0182	1232.62	1232.62
FENCEGRD	628207.6	3467944	0.0193	1232.66	1232.66
FENCEGRD	628232.1	3467943	0.01926	1232.68	1232.68
FENCEGRD	628256.6	3467943	0.01956	1232.73	1232.73
FENCEGRD	628281.1	3467943	0.02024	1232.79	1232.79
FENCEGRD	628305.5	3467943	0.0214	1232.8	1232.8
FENCEGRD	628330	3467943	0.02213	1232.42	1232.42
FENCEGRD	628354.5	3467943	0.0216	1232.44	1232.44
FENCEGRD	628379	3467943	0.02203	1232.47	1232.47
FENCEGRD	628403.5	3467943	0.02233	1232.49	1232.49
FENCEGRD	628428	3467943	0.02247	1232.53	1232.53
FENCEGRD	628452.5	3467943	0.02233	1232.6	1232.6
FENCEGRD	628477	3467943	0.01841	1232.65	1232.65
FENCEGRD	628501.5	3467943	0.01992	1232.67	1232.67
FENCEGRD	628526	3467943	0.01846	1232.26	1232.26
FENCEGRD	628550.5	3467943	0.01737	1232.31	1232.31
FENCEGRD	628575	3467943	0.01665	1232.32	1232.32
FENCEGRD	628599.4	3467942	0.01666	1232.38	1232.38
FENCEGRD	628623.9	3467942	0.01623	1232.42	1232.42
FENCEGRD	628648.4	3467942	0.01529	1232.49	1232.49
FENCEGRD	628183.2	3467969	0.01708	1232.54	1232.54
FENCEGRD	628207.6	3467969	0.01704	1232.55	1232.55
FENCEGRD	628232.1	3467968	0.01735	1232.06	1232.06
FENCEGRD	628256.6	3467968	0.01744	1232.16	1232.16
FENCEGRD	628281.1	3467968	0.0182	1232.19	1232.19
FENCEGRD	628305.6	3467968	0.01898	1232.23	1232.23
FENCEGRD	628330.1	3467968	0.02085	1232.3	1232.3
FENCEGRD	628354.6	3467968	0.02065	1232.38	1232.38
FENCEGRD	628379.1	3467968	0.02113	1232.38	1232.38
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FENCEGRD	628477.1	3467968	0.01784	1233.1	1233.1
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FENCEGRD	628526	3467968	0.01817	1232.93	1232.93
FENCEGRD	628550.5	3467968	0.01614	1232.99	1232.99
FENCEGRD	628575	3467968	0.01584	1232.97	1232.97
FENCEGRD	628599.5	3467967	0.016	1233.01	1233.01
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FENCEGRD	628648.5	3467967	0.01518	1233	1233
FENCEGRD	628163.9	3467986	0.01643	1232.87	1232.87

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FENCEGRD	628207.7	3467994	0.01629	1232.88	1232.88
FENCEGRD	628232.2	3467993	0.01656	1232.92	1232.92
FENCEGRD	628256.7	3467993	0.01662	1232.62	1232.62
FENCEGRD	628281.2	3467993	0.01675	1232.61	1232.61
FENCEGRD	628305.7	3467993	0.01794	1232.76	1232.76
FENCEGRD	628330.2	3467993	0.01964	1232.84	1232.84
FENCEGRD	628354.7	3467993	0.01975	1232.77	1232.77
FENCEGRD	628379.2	3467993	0.02027	1232.67	1232.67
FENCEGRD	628403.7	3467993	0.02063	1232.71	1232.71
FENCEGRD	628428.1	3467993	0.02082	1232.81	1232.81
FENCEGRD	628452.6	3467993	0.02077	1232.98	1232.98
FENCEGRD	628477.1	3467993	0.01743	1232.47	1232.47
FENCEGRD	628501.6	3467993	0.01606	1232.4	1232.4
FENCEGRD	628526.1	3467993	0.01735	1232.12	1232.12
FENCEGRD	628550.6	3467993	0.01562	1231.93	1231.93
FENCEGRD	628575.1	3467993	0.01557	1232.37	1232.37
FENCEGRD	628599.6	3467992	0.01531	1232.54	1232.54
FENCEGRD	628624.1	3467992	0.01531	1232.55	1232.55
FENCEGRD	628648.6	3467992	0.01493	1232.44	1232.44
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FENCEGRD	628119.1	3467977	0.01561	1232.69	1232.69
FENCEGRD	628111.1	3467959	0.01607	1233.18	1233.18
FENCEGRD	628183.3	3468019	0.01515	1233.14	1233.14
FENCEGRD	628207.8	3468019	0.0156	1233.15	1233.15
FENCEGRD	628232.3	3468018	0.01583	1233.13	1233.13
FENCEGRD	628256.8	3468018	0.01584	1233.12	1233.12
FENCEGRD	628281.3	3468018	0.01545	1233.16	1233.16
FENCEGRD	628305.8	3468018	0.01694	1233.13	1233.13
FENCEGRD	628330.2	3468018	0.01807	1233.17	1233.17
FENCEGRD	628354.7	3468018	0.01862	1233.18	1233.18
FENCEGRD	628379.2	3468018	0.01946	1233.14	1233.14
FENCEGRD	628403.7	3468018	0.01986	1233.05	1233.05
FENCEGRD	628428.2	3468018	0.02007	1233.07	1233.07
FENCEGRD	628452.7	3468018	0.02006	1233.07	1233.07
FENCEGRD	628477.2	3468018	0.01704	1233	1233
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FENCEGRD	628526.2	3468018	0.01526	1232.97	1232.97
FENCEGRD	628550.7	3468018	0.01556	1232.92	1232.92
FENCEGRD	628575.2	3468018	0.01458	1232.82	1232.82
FENCEGRD	628599.7	3468017	0.0146	1232.8	1232.8
FENCEGRD	628624.1	3468017	0.01475	1232.69	1232.69
FENCEGRD	628648.6	3468017	0.01457	1232.6	1232.6
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FENCEGRD	628128.1	3468021	0.01437	1232.47	1232.47
FENCEGRD	628101.8	3467995	0.01504	1232.46	1232.46
FENCEGRD	628093.9	3467977	0.01508	1232.4	1232.4
FENCEGRD	628086	3467959	0.01471	1232.33	1232.33
FENCEGRD	628183.4	3468044	0.01433	1232.29	1232.29
FENCEGRD	628207.9	3468044	0.01496	1232.27	1232.27
FENCEGRD	628232.3	3468043	0.01515	1232.26	1232.26
FENCEGRD	628256.8	3468043	0.01513	1232.27	1232.27
FENCEGRD	628281.3	3468043	0.01444	1232.26	1232.26
FENCEGRD	628305.8	3468043	0.01589	1232.29	1232.29
FENCEGRD	628330.3	3468043	0.01717	1232.3	1232.3
FENCEGRD	628354.8	3468043	0.01781	1232.37	1232.37
FENCEGRD	628379.3	3468043	0.01833	1232.45	1232.45
FENCEGRD	628403.8	3468043	0.01912	1232.55	1232.55
FENCEGRD	628428.3	3468043	0.01937	1232.63	1232.63
FENCEGRD	628452.8	3468043	0.01941	1232.65	1232.65
FENCEGRD	628477.3	3468043	0.01668	1232.53	1232.53
FENCEGRD	628501.8	3468043	0.01301	1232.81	1232.81
FENCEGRD	628526.2	3468043	0.01332	1233.12	1233.12
FENCEGRD	628550.7	3468043	0.01521	1233.19	1233.19
FENCEGRD	628575.2	3468043	0.01368	1233.23	1233.23
FENCEGRD	628599.7	3468042	0.01387	1233.24	1233.24
FENCEGRD	628624.2	3468042	0.01414	1233.26	1233.26
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FENCEGRD	628165.2	3468061	0.01333	1233.25	1233.25
FENCEGRD	628146.9	3468054	0.01344	1233.28	1233.28
FENCEGRD	628128.7	3468046	0.01369	1233.28	1233.28
FENCEGRD	628110.4	3468039	0.014	1233.3	1233.3
FENCEGRD	628084.4	3468013	0.01318	1233.26	1233.26

FENCEGRD	628076.6	3467995	0.01349	1233.22	1233.22
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FENCEGRD	628060.9	3467959	0.01581	1233.21	1233.21
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FENCEGRD	628207.9	3468069	0.01436	1233.11	1233.11
FENCEGRD	628232.4	3468068	0.01452	1233.07	1233.07
FENCEGRD	628256.9	3468068	0.01446	1232.94	1232.94
FENCEGRD	628281.4	3468068	0.01348	1232.89	1232.89
FENCEGRD	628305.9	3468068	0.01476	1232.84	1232.84
FENCEGRD	628330.4	3468068	0.01628	1232.79	1232.79
FENCEGRD	628354.9	3468068	0.01695	1232.78	1232.78
FENCEGRD	628379.4	3468068	0.01658	1232.68	1232.68
FENCEGRD	628403.9	3468068	0.01842	1232.66	1232.66
FENCEGRD	628428.4	3468068	0.01871	1232.61	1232.61
FENCEGRD	628452.8	3468068	0.01878	1232.55	1232.55
FENCEGRD	628477.3	3468068	0.01634	1232.46	1232.46
FENCEGRD	628501.8	3468068	0.01286	1232.39	1232.39
FENCEGRD	628526.3	3468068	0.0124	1232.38	1232.38
FENCEGRD	628550.8	3468068	0.01337	1232.38	1232.38
FENCEGRD	628575.3	3468068	0.01329	1232.38	1232.38
FENCEGRD	628599.8	3468067	0.01329	1232.36	1232.36
FENCEGRD	628624.3	3468067	0.0135	1232.39	1232.39
FENCEGRD	628648.8	3468067	0.01364	1232.38	1232.38
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FENCEGRD	628140	3468076	0.01273	1232.53	1232.53
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FENCEGRD	628096.5	3468058	0.01358	1232.73	1232.73
FENCEGRD	628065.4	3468028	0.01251	1232.8	1232.8
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FENCEGRD	628208	3468094	0.0138	1233.2	1233.2
FENCEGRD	628232.5	3468093	0.01392	1233.35	1233.35
FENCEGRD	628257	3468093	0.01351	1233.46	1233.46
FENCEGRD	628281.5	3468093	0.01258	1233.41	1233.41
FENCEGRD	628306	3468093	0.01368	1233.37	1233.37
FENCEGRD	628330.5	3468093	0.01526	1233.37	1233.37
FENCEGRD	628354.9	3468093	0.01629	1233.36	1233.36
FENCEGRD	628379.4	3468093	0.01514	1233.38	1233.38
FENCEGRD	628403.9	3468093	0.01705	1233.39	1233.39
FENCEGRD	628428.4	3468093	0.01807	1233.49	1233.49
FENCEGRD	628452.9	3468093	0.01819	1233.6	1233.6
FENCEGRD	628477.4	3468093	0.01602	1233.46	1233.46
FENCEGRD	628501.9	3468093	0.01272	1233.51	1233.51
FENCEGRD	628526.4	3468093	0.01122	1233.42	1233.42
FENCEGRD	628550.9	3468093	0.01168	1233.35	1233.35
FENCEGRD	628575.4	3468093	0.01335	1233.25	1233.25
FENCEGRD	628599.9	3468092	0.01254	1233.18	1233.18
FENCEGRD	628624.4	3468092	0.01284	1233.12	1233.12
FENCEGRD	628648.8	3468092	0.01302	1233.04	1233.04
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FENCEGRD	628030.2	3468005	0.01452	1232.6	1232.6
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FENCEGRD	628012.1	3467963	0.01537	1232.51	1232.51
FENCEGRD	628183.6	3468119	0.01223	1232.5	1232.5
FENCEGRD	628208.1	3468119	0.01327	1232.48	1232.48
FENCEGRD	628232.6	3468118	0.01336	1232.47	1232.47
FENCEGRD	628257	3468118	0.0122	1232.48	1232.48
FENCEGRD	628281.5	3468118	0.01177	1232.53	1232.53
FENCEGRD	628306	3468118	0.01267	1232.55	1232.55
FENCEGRD	628330.5	3468118	0.01428	1232.61	1232.61
FENCEGRD	628355	3468118	0.01563	1232.71	1232.71
FENCEGRD	628379.5	3468118	0.01456	1232.82	1232.82
FENCEGRD	628404	3468118	0.01553	1232.97	1232.97
FENCEGRD	628428.5	3468118	0.01747	1232.88	1232.88
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FENCEGRD	628477.5	3468118	0.01572	1233.25	1233.25
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FENCEGRD	628575.4	3468118	0.01178	1233.3	1233.3
FENCEGRD	628599.9	3468117	0.01183	1233.49	1233.49
FENCEGRD	628624.4	3468117	0.01215	1233.55	1233.55
FENCEGRD	628648.9	3468117	0.01242	1233.55	1233.55
FENCEGRD	628163.1	3468135	0.0109	1233.55	1233.55
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FENCEGRD	628122	3468119	0.01167	1233.47	1233.47
FENCEGRD	628101.4	3468110	0.01204	1233.51	1233.51
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FENCEGRD	628060.3	3468094	0.01113	1233.59	1233.59
FENCEGRD	628031	3468065	0.01166	1233.69	1233.69
FENCEGRD	628022.2	3468044	0.01283	1233.65	1233.65
FENCEGRD	628013.3	3468024	0.01412	1233.65	1233.65
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FENCEGRD	628208.1	3468144	0.01277	1233.27	1233.27
FENCEGRD	628232.6	3468143	0.01284	1233.19	1233.19
FENCEGRD	628257.1	3468143	0.01114	1233.13	1233.13
FENCEGRD	628281.6	3468143	0.01137	1233.07	1233.07
FENCEGRD	628306.1	3468143	0.01175	1233.05	1233.05
FENCEGRD	628330.6	3468143	0.01335	1233	1233
FENCEGRD	628355.1	3468143	0.01476	1232.95	1232.95
FENCEGRD	628379.6	3468143	0.01402	1232.89	1232.89
FENCEGRD	628404.1	3468143	0.0141	1232.83	1232.83
FENCEGRD	628428.6	3468143	0.01607	1232.76	1232.76
FENCEGRD	628453.1	3468143	0.01709	1232.72	1232.72
FENCEGRD	628477.5	3468143	0.01543	1232.68	1232.68
FENCEGRD	628502	3468143	0.01245	1232.65	1232.65
FENCEGRD	628526.5	3468143	0.01055	1232.64	1232.64
FENCEGRD	628551	3468143	0.01019	1232.6	1232.6
FENCEGRD	628575.5	3468143	0.01062	1232.61	1232.61
FENCEGRD	628600	3468142	0.01149	1232.68	1232.68
FENCEGRD	628624.5	3468142	0.01157	1232.71	1232.71
FENCEGRD	628649	3468142	0.01184	1232.73	1232.73
	627834.2	3470252	0.00152	1232.84	1232.84
	627836.6	3470274	0.0015	1232.95	1232.95
	628640.6	3470185	0.00174	1233.11	1233.11
	628644	3470225	0.00173	1233.05	1233.05
	628647.6	3470304	0.0017	1232.99	1232.99
	628656.1	3470304	0.00169	1233.38	1233.38
	628656.1	3470183	0.00168	1233.36	1233.36
	628810.8	3470168	0.00173	1233.23	1233.23
	628973.1	3470150	0.00193	1233.01	1233.01
	629027.2	3470144	0.00212	1232.88	1232.88
	629079.2	3470138	0.00226	1232.86	1232.86
	629192.2	3470126	0.0022	1233.43	1233.43
	629272.3	3470117	0.00191	1233.62	1233.62
	629406.8	3470103	0.00158	1233.66	1233.66
	629402.7	3470075	0.00164	1233.69	1233.69
	629304.3	3470086	0.00187	1233.69	1233.69
	629197.4	3470098	0.0022	1233.68	1233.68
	629079.4	3470111	0.00231	1233.58	1233.58
	628907.1	3470131	0.00204	1233.63	1233.63
	628897.4	3470132	0.00202	1233.61	1233.61
	628806.3	3470142	0.00175	1233.59	1233.59
	628663.5	3470158	0.00164	1233.8	1233.8
	628661.8	3470158	0.00165	1233.79	1233.79
	628662.2	3470156	0.00165	1233.75	1233.75
	628662.4	3470153	0.00164	1233.7	1233.7
	628661.5	3470091	0.00164	1233.62	1233.62
	628658	3470071	0.00165	1233.55	1233.55
	628658.2	3470038	0.00169	1233.49	1233.49
	628659	3469863	0.00228	1233.43	1233.43
	628659.1	3469671	0.00254	1233.34	1233.34
	628659.8	3469362	0.00275	1233.27	1233.27
	628664	3467941	0.01583	1233.24	1233.24
	628470.9	3467943	0.01946	1233.23	1233.23
	628470.9	3467961	0.01908	1233.15	1233.15
	628645.5	3467960	0.01534	1233.1	1233.1
	628636.7	3469681	0.00259	1233.04	1233.04
	628636	3469934	0.0018	1232.97	1232.97
	628636	3470049	0.00178	1232.93	1232.93
	628635.9	3470116	0.00177	1232.86	1232.86

628636	3470135	0.00177	1232.82	1232.82
628633.6	3470156	0.00178	1232.81	1232.81
628606.5	3470161	0.00187	1232.76	1232.76
628565.5	3470163	0.00197	1232.76	1232.76
628550.5	3470170	0.00199	1232.77	1232.77
628529.8	3470172	0.00208	1232.84	1232.84
628491.7	3470177	0.00239	1232.87	1232.87
628290.5	3470200	0.00228	1232.91	1232.91
628099	3470222	0.00205	1232.98	1232.98
628043	3470228	0.00211	1233.11	1233.11
628183.1	3467939	0.01845	1233.26	1233.26
628648.4	3467937	0.01561	1233.23	1233.23
628661.3	3467420	0.02879	1233.16	1233.16
628011.6	3467409	0.08769	1232.62	1232.62
628006.5	3467486	0.08014	1232.72	1232.72
628180.5	3467810	0.02682	1232.54	1232.54

**Appendix F: PM₁₀ MOVES and AERMOD Modeling Files
(Available by Request)**