



Appendix M

Recommended Alternative Traffic Results

FM 76 (North Loop Drive) Feasibility Study

February, 2024

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1. Introduction

The Farm to Market (FM) 76 Corridor Feasibility Study is focused on improving mobility and safety along FM 76 (North Loop Drive) between Horizon Boulevard (FM 1281) and Alameda Avenue in Fabens. The study corridor is approximately 12.5 miles long. The FM 76 (North Loop Drive) Feasibility Study limits are shown in Figure 1. The traffic projections methodology presented in a previous submittal, the Methodology Report, is applied to obtain the traffic growth rate for the FM 76 (North Loop Drive) corridor. The same methodology, data sources and criteria were used within this report as the **Growth Rate Determination** report (Appendix E).

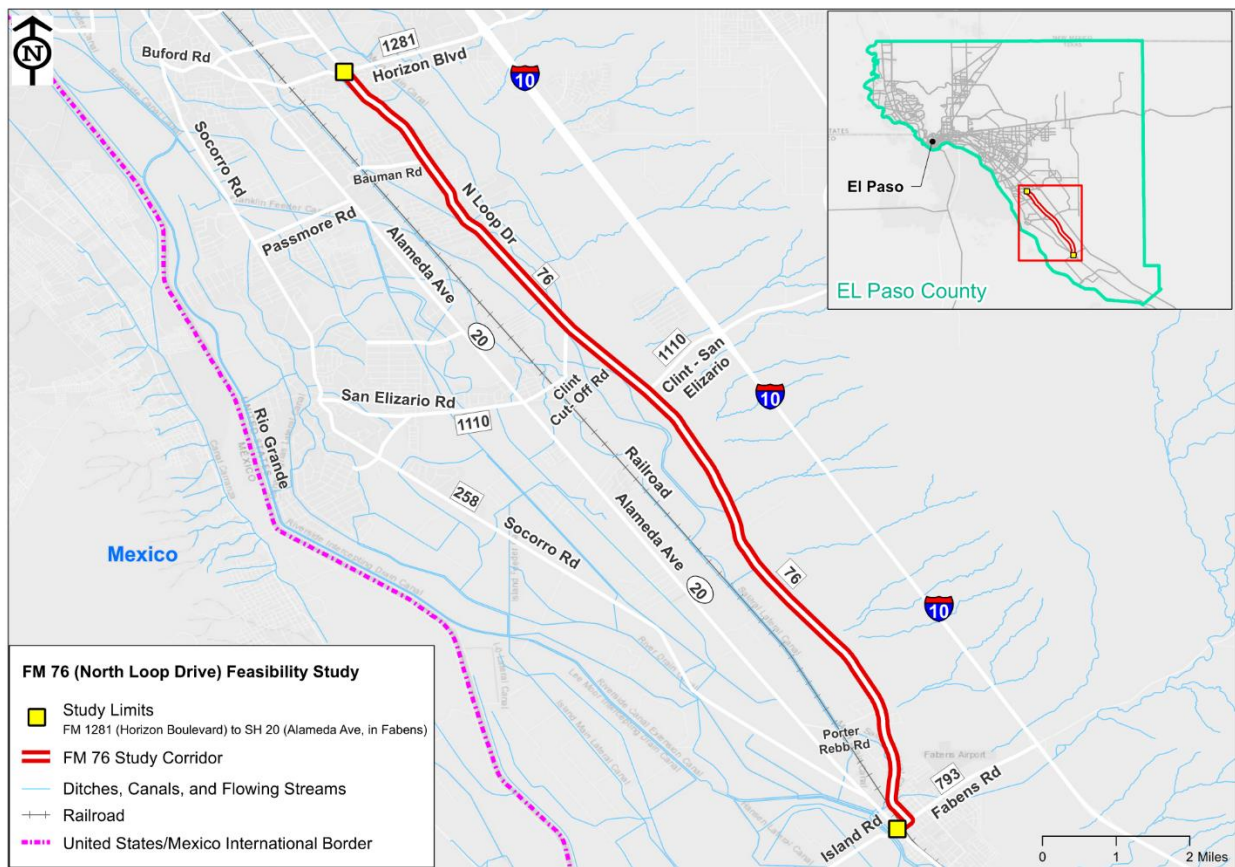


Figure 1: FM 76 Study Corridor Limits

2. Sources of Traffic Forecasts, Counts, and Data used in Determining the Growth Rate

2.1 Future Developments Affecting Corridor Traffic Forecasts

The most significant project affecting the corridor traffic in the future is the Eastwind Development. The Eastwind Development contains approximately 734.16 acres and is bounded by Interstate 10 / Gateway Boulevard (Blvd.) to the east, FM 76 to the west, Clint-San Elizario to the south and open desert and brushland to the north. This development is described in further detail in the Growth Rate Determination report (Appendix E).

2.2 Sources of Traffic Counts

To develop the existing year (2019) traffic and classification counts, traffic data from the Texas Department of Transportation (TxDOT) count data and the SteetLight origin-destination (O-D) data. The process for creating the existing 2019 volumes was described within the **Growth Rate Determination** report (Appendix E).

2.3 Sources of Traffic Forecasts

The future year baseline traffic forecast for No-Build scenario was obtained by applying a growth rate to the existing year traffic. The growth rate was determined by reviewing the following sources:

1. Historic TxDOT count data
2. The El Paso Metropolitan Planning Organization (MPO) Destino 2045 Travel Demand Model (TDM)
3. Regression Analysis using the Transportation Planning and Program (TP&P) work sheet

The process used by the team to evaluate each of the three sources listed above is reviewed within the **Growth Rate Determination** report (Appendix E) and in the **Existing Conditions Memo** (Appendix A).

3. Proposed Alternative Data Review

3.1 Transportation Facilities

The FM 76 corridor is a two-lane undivided roadway classified as a minor arterial from FM 1281 to FM 1110 intersection and major collector from FM 1110 until the end of project corridor at Fabens and is part of the TxDOT roadway system. TxDOT owns the transportation right-of-way (ROW) for the length of the corridor. Interstate 10 runs parallel and to the east of the FM 76 corridor with two general purpose lanes in each direction totaling four lanes and frontage roads. Alameda Ave (SH 20) is a two-lane undivided arterial road running parallel and to the west of the FM 76 corridor. FM 1110 and FM 1281 are two-lane roads that connect FM 76 to Interstate 10 and Alameda Ave. FM 76, Alameda Ave, and Interstate 10 provide routes from the city of El Paso to the southeastern El Paso County. There were

32 intersections within this corridor which were selected for analysis. The corridor's existing and projected volumes may be found in the **Growth Rate Determination** report (**Appendix E**) within Figure 3 and Figure 6. Details about the configuration, speed limits, and multimodal transportation are all discussed within the **Existing Conditions Memo (Appendix A)**.

3.2 Traffic Data Acquisition and Synthesis

Traffic data from 2019 was used rather than more recent data which may have been impacted by COVID-19 shutdowns throughout 2020. This means that 2019 was chosen as the existing year for the study, additional traditional data collection was not undertaken for this study and instead data fusion techniques were utilized to take advantage of TxDOT's traffic data resources, including historical traffic counts, probe-vehicle data, and location-based traffic data. The **Existing Conditions Memo (Appendix A)** describes how each data element was synthesized.

4. Operational Analysis

Capacity analyses were prepared to illustrate the existing traffic conditions in the FM 76 corridor. The existing traffic conditions represent a typical workday when schools are in session. The capacity analysis was performed for the FM 76 corridor segments and for selected intersections shown in **Section 4.2, Table 2**. This analysis examined the delay and the Level of Service (LOS).

Level of service (LOS) is a qualitative measure of traffic operations, ranging from LOS A through LOS F. LOS A-C represents traffic ranging from free-flow conditions to stable flow conditions causing minor traffic flow disruptions. LOS D represents unstable traffic flow conditions with significantly reduced travel speeds. LOS E represents noticeable traffic congestion with travel demand approaching or at roadway capacity and LOS F represents severe traffic congestion with travel demand exceeding roadway capacity causing stop-and-go traffic flow conditions.

The 2010 Highway Capacity Manual (HCM) provides measures of effectiveness used to determine level of service for signalized intersections, which are shown in **Table 1**. Level of service is determined using the average delay (in seconds per vehicle) for the intersections.

Table 1: Intersection LOS Criteria

LOS	Average Control Delay (second/vehicle)	Description
A	≤ 10	Very low vehicle delays, free traffic flow, signal progression extremely favorable, most vehicles arrive during given signal phase.
B	> 10 to ≤ 20	Good traffic flow, good signal progression, more vehicles stop and experience higher delays than for LOS A.
C	> 20 to ≤ 35	Stable traffic flow, fair signal progression, significant number of vehicles stop at signals.
D	>35 to ≤ 55	Noticeable traffic congestion longer delays and unfavorable signal progression, many vehicles stop at signals.
E	>55 to ≤ 80	Unstable traffic flow, poor signal progression, significant congestion, traffic near Roadway capacity, frequent traffic signal cycle failures.
F	> 80	Unacceptable delay, extremely unstable flow, heavy congestion, traffic exceeds Roadway capacity, stop-and-go conditions.

5. Future Year 2045 Proposed Alternative Traffic Conditions

5.1 Proposed Alternative and Screening Process

The recommended alternative, Alternative 3, was selected through a screening process. The screening process reviewed three different alternatives, and screened each alternative using quantitative metrics to find out which alternative best suited the needs of the corridor. Alternative 3 was chosen due to it having scored higher than Alternative 1 in safety, access management, and active transportation, and scored higher than Alternative 2 in access management and emergency management. Alternative 3 scored the highest overall and provided the most improvements to the corridor, and thus moved forward as the recommended alternative.

5.2 Input Parameters

The input parameters describe the configuration used within both Synchro v.11 and Highway Capacity Software (HCS) to obtain the information displayed in **Table 3**. **Table 2**, immediately below, displays the input parameter assumptions that were used in the corridor. Signal-controlled and two-way stop-controlled (TWSC) intersections in the corridor were analyzed utilizing single period peak-hour methodology compliant with the HCM.

Table 2: Synchro and HCS Input Parameter Assumptions

HCS Input Parameters	Model Coded Values	
	Signalized Intersection	TWSC
Duration	1 hour (peak hour)	1 hour (peak hour)
No. of Periods	N/A	N/A
Peak Hour Factor (PHF)	1	1
Volume/ Demand	Arrivals by 0.25 hours (12 periods for the entire peak period)	Arrivals by peak hour
Lane Width	12 ft	12 ft
Storage Length	Measured	Measured
Heavy Vehicles	1 hour (peak hour)	1 hour (peak hour)
Saturation Flow Rate	Default	Default
Grade	N/A	N/A
Arrival Type	3	3
Initial Queue	0	N/A
Detector	As per TSI Sheets	N/A
RTOR	0	N/A
Phasing and Timing	As per TSI Sheets	N/A
Lanes	Geometric Field Check Forms	Geometric Field Check Forms
Access Points	N/A	N/A
Optimization	Full Optimization conducted for 2040	N/A
Minimum Cycle	60 s	N/A
Maximum Cycle	120 s	N/A
Objective Function	Overall Delay	N/A
Optimized Parameters	Splits, Phasing Sequence	N/A
Interchanges and Alternative Intersections	N/A	N/A
Segments	N/A	N/A
Critical Headway	Default	As per HCM 2016, Chapter 20, Equation 20-30 and Exhibit 20-12
Follow-up Headway	Default	As per HCM 2016, Chapter 20, Equation 20-31 and Exhibit 20-13
Platoon factors and parameters	Default	N/A

HCS Input Parameters	Model Coded Values	
	Signalized Intersection	TWSC
Any Adjustments	Default	Default

5.3 Future Year (2045) Build Traffic Forecasts for Level of Service Analysis

The study team completed 2045 No-Build traffic projections on the FM 76 corridor along with Highway Capacity and Synchro Analyses. The current configuration of FM 76 has had an average linear growth of 2.9% between 1999 and 2019 and is expected to grow 2.6% between 2019 and 2039, and then 2% between 2039 and 2045, the growth rate is further discussed in the **Growth Rate Determination** report (**Appendix E**).

The traffic analysis software such as Synchro v.11 and Highway Capacity Software (HCS) was utilized to analyze the existing condition MOEs for signal-controlled and stop-controlled intersections respectively. The traffic analysis software Synchro v.11 and HCS were utilized to analyze the future 2045 No-Build and 2045 Proposed Alternative conditions and measure the forecasted operations at the intersections along the FM 76 corridor. A visual representation of the 2045 No-Build results may be seen below in **Figure 2** and **Figure 3**, showing both stop controlled intersections and signalized intersections along the corridor.

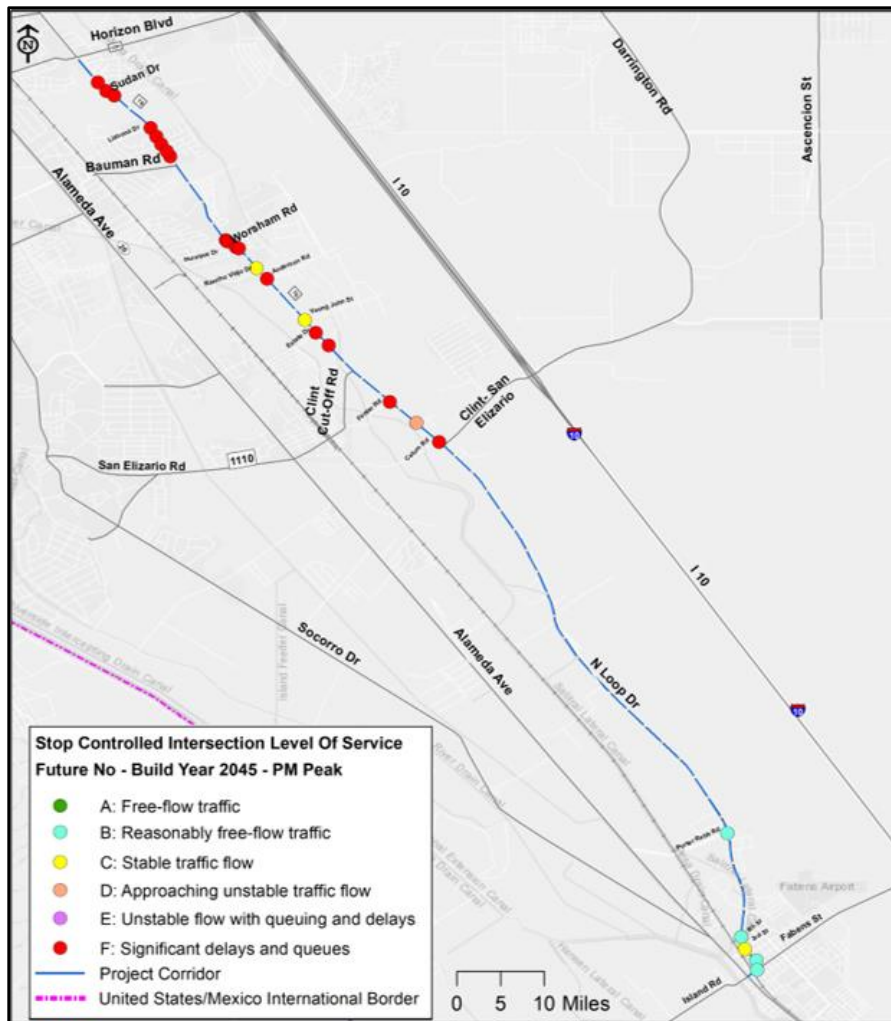


Figure 2: Future Traffic Demand During Afternoon (PM) Peak Hour – No-Build Scenario – Stop Controlled Intersection

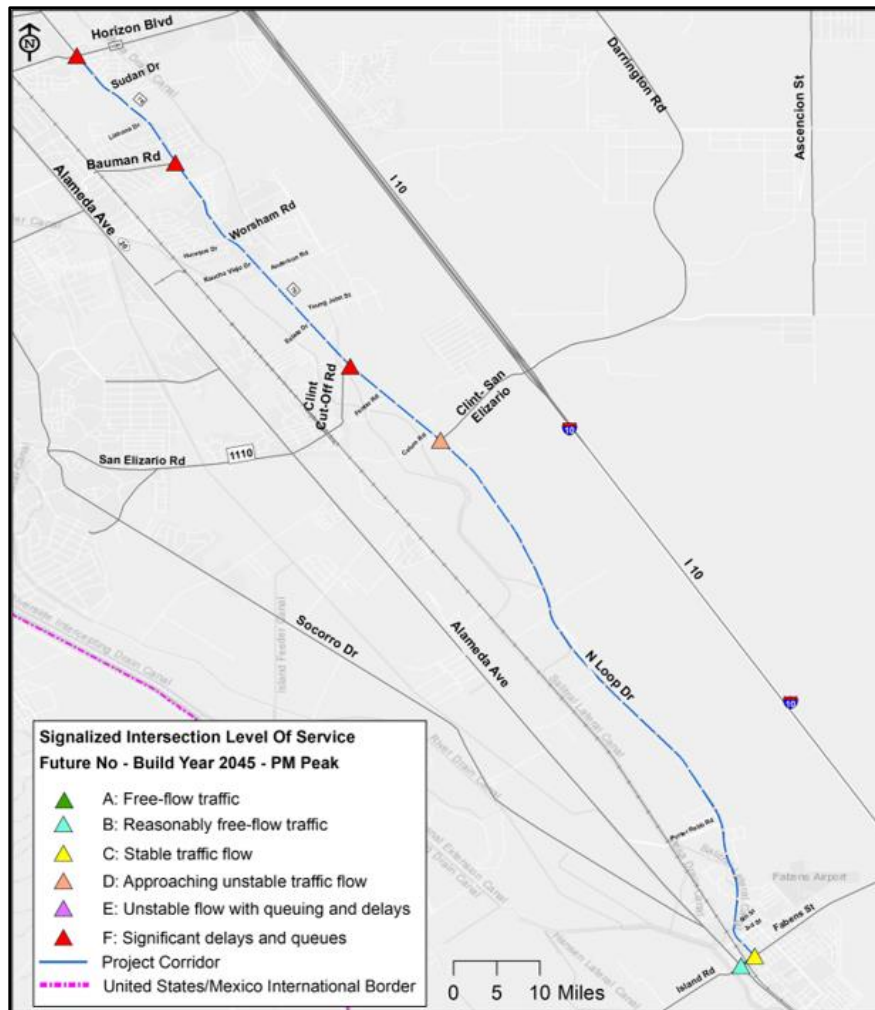


Figure 3: Future Traffic Demand During Afternoon (PM) Peak Hour – No-Build Scenario – Signalized Intersection

Due to the rapid growth, FM 76 is expected to have operating conditions with excessive control delays and queues in both peak periods at several signalized and unsignalized intersections if there are no changes to its current configuration. At signalized intersections, the available storage lane length will not be adequate for turning movements. As a result, traffic would spill back onto through lanes and thus affect through traffic movement. The recurring congestion in the existing conditions could lead to a greater risk of vehicle crashes. The excessive queues would also affect access to the existing and future commercial establishments near the signalized intersections.

As shown in **Figure 2**, in the 2045 No-Build scenario there were numerous issues due to traffic growth, specifically that any intersection, whether signalized or stop controlled, east of Clint-San Elizario would be rated as LOS E or F with the exception of two C ratings. Throughout the corridor in the 2045 No-Build model 20 out of 32 intersections were rated as F, though there were no E ratings for intersections.

Figure 3 shows the 2045 No-Build intersection analysis indicates that the following signalized intersections in the study limits are forecasted to operate at LOS E or F with excessive delays.

- FM 76 and Horizon Blvd (FM 1281)
- FM 76 and Bauman Rd
- FM 76 and Clint Cut-Off Rd

The No-Build scenario did however have one intersection with LOS C at FM 76 and Camp Street, and LOS B at FM 76 and Alameda Ave.

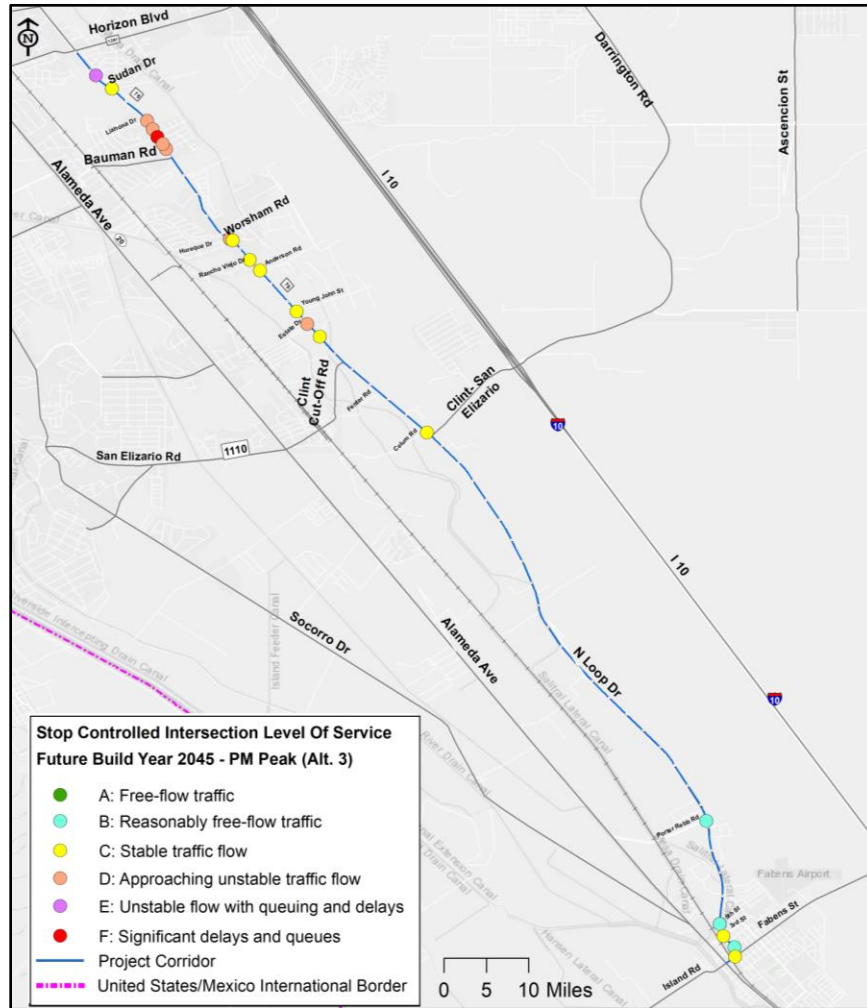


Figure 4: Future Traffic Demand During Afternoon (PM) Peak Hour – Proposed Alternative Scenario – Stop Controlled Intersection

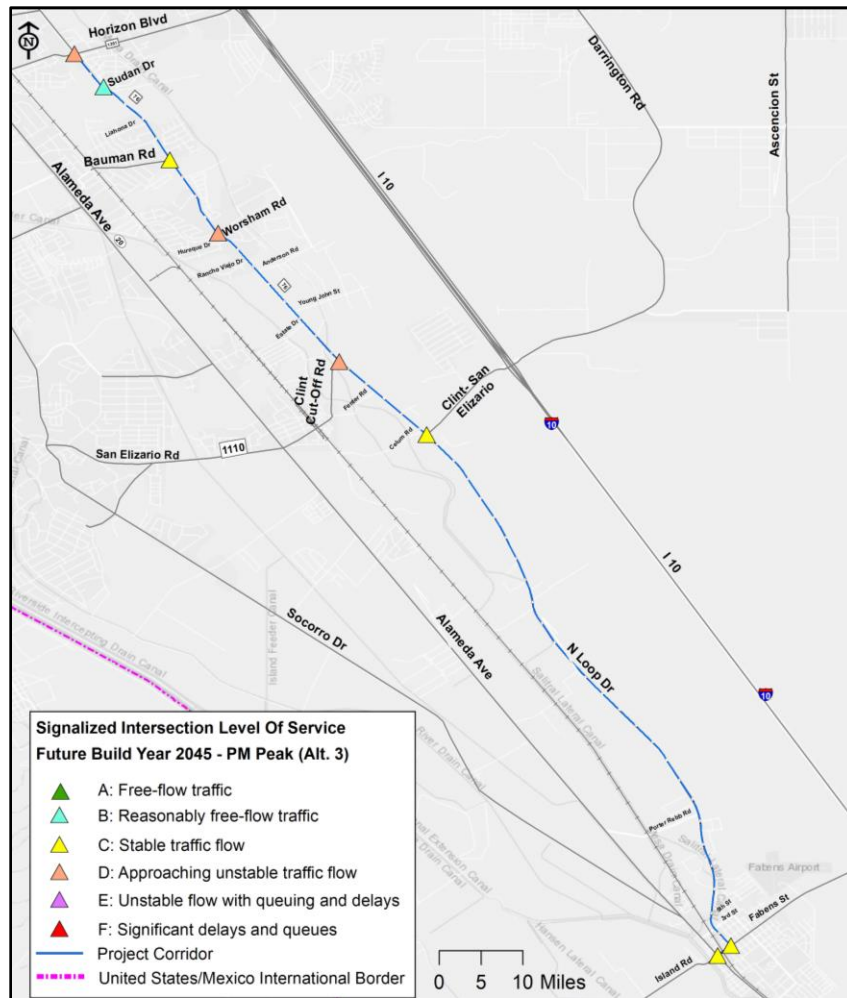


Figure 5: Future Traffic Demand During Afternoon (PM) Peak Hour – Proposed Alternative Scenario – Signalized Intersection

Within **Figure 4** the 2045 Proposed Alternative Scenario for the recommended alternative which addresses the traffic growth issues previously forecast in **Figure 2** and **Figure 3**. Specifically, only 2 intersections now rate at E or F, with only 1 F rating at a stop-controlled intersection, FM 76 and Barnhart Drive.

Within the 2045 Proposed Alternative intersection analysis with mitigation, all of the signalized intersections within the study limits are forecasted to improve by at least one grade when compared to the 2045 No-Build scenario. Additionally, throughout the corridor every intersection east of Clint-San Elizario the LOS scores are forecasted to improve by at least one grade and in most cases more. The recommended alternative adds two new traffic signals to the FM 76 corridor, at the intersection of FM 76/Sudan Drive; and at FM 76/Worsham Road/Wellettka Road, increasing the total number of traffic signals along the FM 76 corridor in the study limits from 6 to 8. The Proposed Alternative scenario also shows an improved level of service at the signalized intersections, with an 86% reduction in the queues and delays observed in the No-Build Scenario. A summary of the intersection capacity

analysis for the signalized and unsignalized intersections within both the 2045 No-Build scenario and the Proposed Alternative scenario are shown in **Table 3**.

Table 3: 2045 Build Operational Analysis Summary LOS

No.	Intersection	2045 No-Build			2045 Alternative		
		Intersection Control	PM Peak Hr		Intersection Control	PM Peak Hr	
			Delay (s)	LOS		Delay (s)	LOS
1	FM 76 at Horizon Blvd (CMP Layout)	Signal	126.7	F	Signal	54.5	D
2	FM 76 at Milo Dr ¹	Stop	626.5	F	RIRO	37.1	E
3	FM 76 at Sudan Dr ¹	Stop	626.5	F	Signal	19.2	B
4	FM 76 at Clems Rd ¹	Stop	142.2	F	RIRO	19.0	C
5	FM 76 at Liahona Dr ¹	Stop	296.9	F	RIRO	34.5	D
6	FM 76 at Sunhaven Dr ¹	Stop	232.2	F	RIRO	33.7	D
7	FM 76 at Barnhart Dr ¹	Stop	453.5	F	RIRO	55.2	F
8	FM 76 at McAdoo Dr ¹	Stop	229.6	F	RIRO	25.9	D
9	FM 76 at Jewel Dr ¹	Stop	382.3	F	RIRO	33.0	D
10	FM 76 at Bauman Rd	Signal	583.0	F	Signal	23.8	C
11	FM 76 at Worsham Rd ¹	Stop	575.5	F	Signal	40.5	D
12	FM 76 at Wellettka Dr ¹	Stop	414.8	F	Signal		
13	FM 76 at Hureque Dr ¹	Stop	521.9	F	RIRO	30.6	D
14	FM 76 at Richardson Rd ¹	Stop	273.4	F	RIRO	19.0	C
15	FM 76 at Rancho Viejo Dr ¹	Stop	24.4	C	RIRO	19.0	C
16	FM 76 at Anderson Rd ¹	Stop	458.2	F	RIRO	21.8	C
17	FM 76 at Young John St ¹	Stop	21.4	C	RIRO	19.8	C
18	FM 76 at Estate Dr ¹	Stop	1,077.3	F	RIRO	30.9	D
19	FM 76 at Pickard Rd ¹	Stop	235.2	F	RIRO	19.0	C
20	FM 76 at Clint Cut-off Rd (with Mitigation)	Signal	638.9	F	Signal	41.9	D
21	FM 76 at EastWind Development (New Road) ¹	Stop	-	-	Stop	11.9	B
22	FM 76 at Fenter Rd ¹	Stop	125.4	F	Stop	14.8	B
23	Roberts Ranch Rd ²	Stop	25.0	D	Stop	13.2	B
24	FM 76 at Celum Rd ¹	Stop	94.6	F	Stop	16.8	C
25	FM 76 at Clint-San Elizario (proposed configuration)	Signal	47.2	D	Signal	31.3	C
26	FM 76 at Porter Rebb Rd ²	Stop	11.7	B	Stop	11.7	B
27	FM 76 at 5 th St ²	Stop	13.3	B	Stop	13.2	B
28	FM 76 at 3 rd St ²	Stop	15.4	C	Stop	15.3	C
29	FM 76 at 1 st St ²	Stop	14.6	B	Stop	14.6	B

No.	Intersection	2045 No-Build			2045 Alternative Proposed		
		Intersection Control	PM Peak Hr		Intersection Control	PM Peak Hr	
			Delay (s)	LOS		Delay (s)	LOS
30	Fabens Rd at Camp St	Signal	27.0	C	Signal	22.8	C
31	Fabens Rd at Bryan St ²	Stop	27.3	C	Stop	27.3	C
32	Fabens Rd at Alameda Ave	Signal	22.7	B	Signal	22.7	C

Note:

RIRO: Right In Right Out intersection

For unsignalized intersections stop on the intersecting routes and not stop on FM 76

For Signalized Intersections results are based on HCM 2000 methodology and mitigations where required

¹Delay estimates using Synchro model based on HCM 2000 Methodology

²Delay estimates using HCS model as per HCM 7th Methodology

6. Quality Control

Quality control checks on the results from all the analyses were conducted on both the future year (2045) No-Build line diagrams and the future year (2045) Build line diagrams. This ensured that the resulting line diagrams provide a reliable representation of the existing traffic conditions as well as a reasonable future traffic forecast along the study corridor.

7. Appendix Description

There results for the HCS and Synchro models, shown in **Table 3**, were generated using the results for the 2045 build and no build models outputs present within **Appendix M.1**.



APPENDIX M.1

No Build and Build 2045 Synchro and HCS Outputs