

**Addendum
Implementation Plan**

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List of Abbreviations

AASHTO	American Association of State Highway and Transportation Officials
Ave.	Avenue
Blvd.	Boulevard
BNSF	Burlington Northern Santa Fe (Railway)
Cat. Ex.	Categorical Exclusion
CDOT	Colorado Department of Transportation
EB	eastbound
FHWA	Federal Highway Administration
FIR	Field Inspection Review
FOR	Final Office Review
ft.	feet/foot
I-25	Interstate 25
LOS	Level of Service
MHT	Method of Handling Traffic
mon	month(s)
MS4	Municipal Separate Storm Sewer System
NB	northbound
NE	northeast
NEPA	National Environmental Policy Act
NW	northwest
PACOG	Pueblo Area Council of Governments
PAT	Policy Advisory Team
PBE	Pueblo Blvd. Extension
PEL	Planning and Environmental Linkages
Rd.	Road
ROW	right-of-way
SB	southbound
SE	southeast
seq.	sequence
SH	State Highway (numbered highway route)
St.	Street
SW	southwest
US	United States (also numbered highway route)
WB	westbound
WPC	West Pueblo Connector
y	year(s)

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Implementation Plan Addendum

1. Executive Summary

The study team developed this Implementation Plan by sorting the elements of the Preferred Alternative based on the traffic need. **Section 4** describes in detail how this plan was developed. Intermediate year traffic volumes were estimated using the 2035 forecasts developed for the US 50 Planning and Environmental Linkages (PEL) study, the time elapsed, and how much of the Preferred Alternative was forecasted to be built. **Section 5** explains how the traffic forecasts were made and **Section 6** provides tables of the turning movement forecasts.

Table IP-1 summarizes the sequence of transportation improvements for the US 50 Corridor. **Figure IP-1** illustrates the timing of improvements, with those needing to be completed soonest shown in shades of green. Those improvements that could be completed latest (around the study horizon year of 2035) are depicted in shades of orange. Transportation improvements that are needed in the intermediate term are shown in shades of blue. Flexible, low construction cost improvements at the west end of the corridor are shown in purple. **Section 11** discusses the sequence of improvements in more detail. **Section 8** provides information about traffic needs at individual intersections.

The first phase of US 50 improvements involves widening the highway to six lanes from west of Pueblo Blvd. to Wills Blvd., including the construction of new westbound lanes at the Pueblo Blvd. intersection just north of the existing eastbound lanes. The first phase also converts the Pueblo Blvd. intersection to a jughandle operation. Westbound US 50 traffic turning south onto Pueblo Blvd. would exit along the existing westbound lanes and turn left as they do today. Northbound Pueblo Blvd. traffic turning left onto westbound US 50 would drive past the first intersection, where eastbound and westbound through traffic cross, and continue to the intersection with the existing westbound lanes.

Table IP-1. Summary of Transportation Improvement Priorities

Year of Critical LOS Failure without Improvement ¹	Estimated Design Duration	Estimated Construction Duration	Transportation Improvement Description ²	Estimated Construction Cost (Current \$)
2013	2 y 3 mon ³	1 y 6 mon	<u>West of Pueblo Blvd. to Wills Blvd.</u> <ul style="list-style-type: none"> • Widen EB US 50 to 3 lanes • Widen WB US 50 east of BNSF crossing to 3 lanes • Build 3 WB lanes at Pueblo Blvd. just north of EB lanes • Convert existing WB lanes to jughandle 	\$16.2 million
2013	1 y 6 mon	1 y	<u>West of Purcell Blvd. to west of Pueblo Blvd.</u> <ul style="list-style-type: none"> • Widen US 50 to 3 lanes each direction 	\$9.8 million
2017	2 y 3 mon ⁴	3 mon	<u>At Pueblo Blvd.</u> <ul style="list-style-type: none"> • Construct 3rd NB lane at mainline US 50 intersection • Construct a dedicated through lane at jughandle intersection 	\$600,000

Year of Critical LOS Failure without Improvement ¹	Estimated Design Duration	Estimated Construction Duration	Transportation Improvement Description ²	Estimated Construction Cost (Current \$)
2021	1 y 6 mon ⁴	6 mon	<u>At Purcell Blvd.</u> <ul style="list-style-type: none"> Construct jughandle in NW & NE quadrants Construct 3rd SB lane at mainline US 50 intersection 	\$3.4 million
2023	2 y 3 mon ⁴	3 mon	<u>At Pueblo Blvd.</u> <ul style="list-style-type: none"> Construct 4th NB & 3rd SB lane at mainline US 50 intersection Continue new NB lane as 2nd through lane past jughandle intersection 	\$1.0 million
2023	1 y 6 mon ⁴	6 mon	<u>At Purcell Blvd.</u> <ul style="list-style-type: none"> Construct jughandle in SW & SE quadrants 	\$3.7 million
2025	1 y 6 mon	1 y 3 mon	<u>West of Main McCulloch Blvd. to West of Purcell Blvd.</u> <ul style="list-style-type: none"> Widen US 50 to 3 lanes in each direction <u>At Main McCulloch Blvd.</u> <ul style="list-style-type: none"> Construct noise wall in SW quadrant Construct jughandle in NE quadrant Convert 2nd NB & SB left turn lanes to SB through lane 	\$18.0 million
2027	6 y ^{3,5}	4 y ⁵	Construct Pueblo Blvd. Extension to Platteville Blvd.	N/C ⁵
2027	2 y 3 mon ⁴	1 y 9 mon	<u>At Pueblo Blvd.</u> <ul style="list-style-type: none"> Construct diverging diamond interchange 	\$27.0 million
2029	1 y 6 mon ⁴	6 mon	<u>At Main McCulloch Blvd.</u> <ul style="list-style-type: none"> Construct jughandle in SW & SE quadrants 	\$3.1 million
2029	1 y 6 mon ⁴	6 mon	<u>At Purcell Blvd.</u> <ul style="list-style-type: none"> Construct grade separation to complete diamond interchange 	\$11.3 million
2029 to 2035 ⁶	6 y ^{3,5}	3 y ⁵	Construct West Pueblo Connector	N/C ⁵
2029 to 2033	1 y 6 mon	TBD	<u>At Baltimore Ave.</u> <ul style="list-style-type: none"> To be determined from four options 	TBD
2033	1 y 6 mon ⁴	6 mon	<u>At Main McCulloch Blvd.</u> <ul style="list-style-type: none"> Construct ramp in NW quadrant & grade separation to complete diamond interchange 	\$16.2 million
			<u>Total Cost of US 50 Improvements</u> <ul style="list-style-type: none"> Excluding ROW Excluding improvements at Baltimore Ave. to be determined Including Municipal Separate Storm Sewer System (MS4) requirements Including pedestrian and bicycle facilities 	\$125 million

Notes: Corridor-wide MS4 requirements would need to be built before any improvement project could begin. These requirements are estimated to cost \$2 to 3 million and require additional ROW near Swallows Rd. and Turkey Creek.

¹ Improvements could be completed sooner as funding becomes available.

² Complimentary accommodation of pedestrian and bicycle facilities would occur as corresponding improvements are made to US 50. Additional ROW would be required for pedestrian and bicycle facilities. These facilities are estimated to cost a total of \$12 to 14 million.

³ Duration is uncertain because of the time required to coordinate with railroads.

⁴ Many design activities are completed during the first phase of improvements at each location.

⁵ No exact estimates were made for the design and construction duration or the construction cost of the two off-US 50 improvements because other studies beyond the scope of this PEL Study would be required.

⁶ The timing of the West Pueblo Connector depends on the improvements made at US 50 and Baltimore Ave.

Abbreviations:	EB = eastbound	LOS = levels of service	mon = month(s)	NB = northbound	N/C = not calculated
	NE = northeast	NW = northwest	ROW = right-of-way	SB = southbound	SE = southeast
	SW = southwest	TBD = to be determined	WB = westbound	y = year(s)	

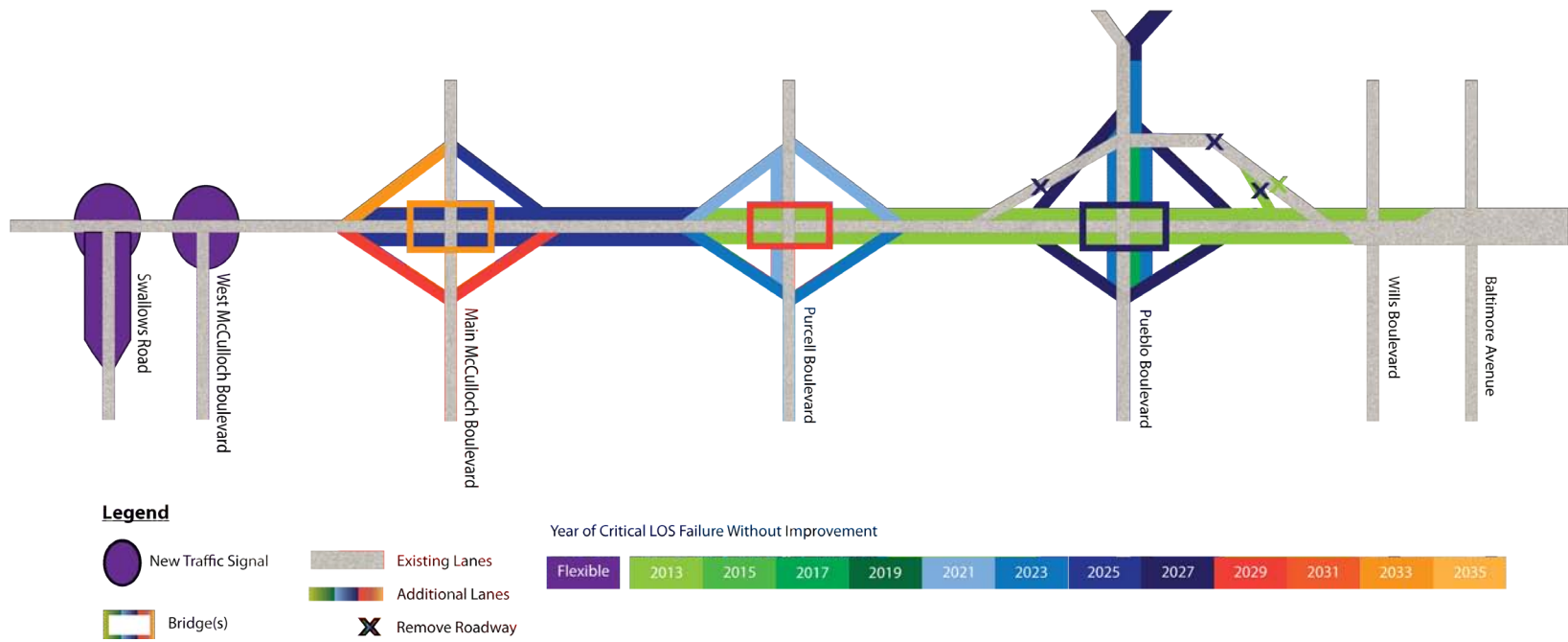
The timing for the two local improvement projects, the Pueblo Blvd. Extension and the West Pueblo Connector, was driven by traffic conditions at the US 50 intersection with Baltimore Ave. The Pueblo Blvd. Extension to Platteville Blvd. needs to be completed by 2027. The length of the West Pueblo Connector needs to be completed between 2029 and 2035, depending on what additional improvements are made to the Baltimore Ave. intersection. (Individual segments of the West Pueblo Connector could be built sooner and would provide the benefit of an alternate route during US 50 construction.)

2. What's in the Implementation Plan?

This Implementation Plan describes the steps to build the Preferred Alternative for the US 50 Corridor and the timing of each step based on traffic needs. It also describes the decision process used to develop the plan and includes the traffic forecasts that establish the needs over time. It also discusses the levels of service (LOS) corresponding to those traffic patterns, which indicates when individual improvement projects are needed at various locations. The plan describes specific improvements and how long those improvements will meet the growing traffic needs. The plan also presents a Corridor-wide sequence of improvements that reflect the priorities based on traffic operation needs. The plan also discusses safety and multimodal improvements. Finally, the plan describes factors that may cause it to change and the process for making changes to the plan.

3. Why does the US 50 Corridor need an Implementation Plan?

The US 50 Corridor needs an Implementation Plan because the Preferred Alternative is expected to cost more than \$120 million, and it is unlikely the Colorado Department of Transportation (CDOT) will have the funds available to build the Preferred Alternative all at once. CDOT will more likely have a stream of smaller amounts of funds to build the Preferred Alternative in phases over time. In the future, other corridors, such as the I-25 New Pueblo Freeway, may also compete for available funding. By dividing the Preferred Alternative into segmented improvement projects, CDOT will be able to use these smaller fund amounts. Phasing construction of the Preferred Alternative also lets CDOT be responsive to traffic needs, which may grow differently than forecasted for this study.



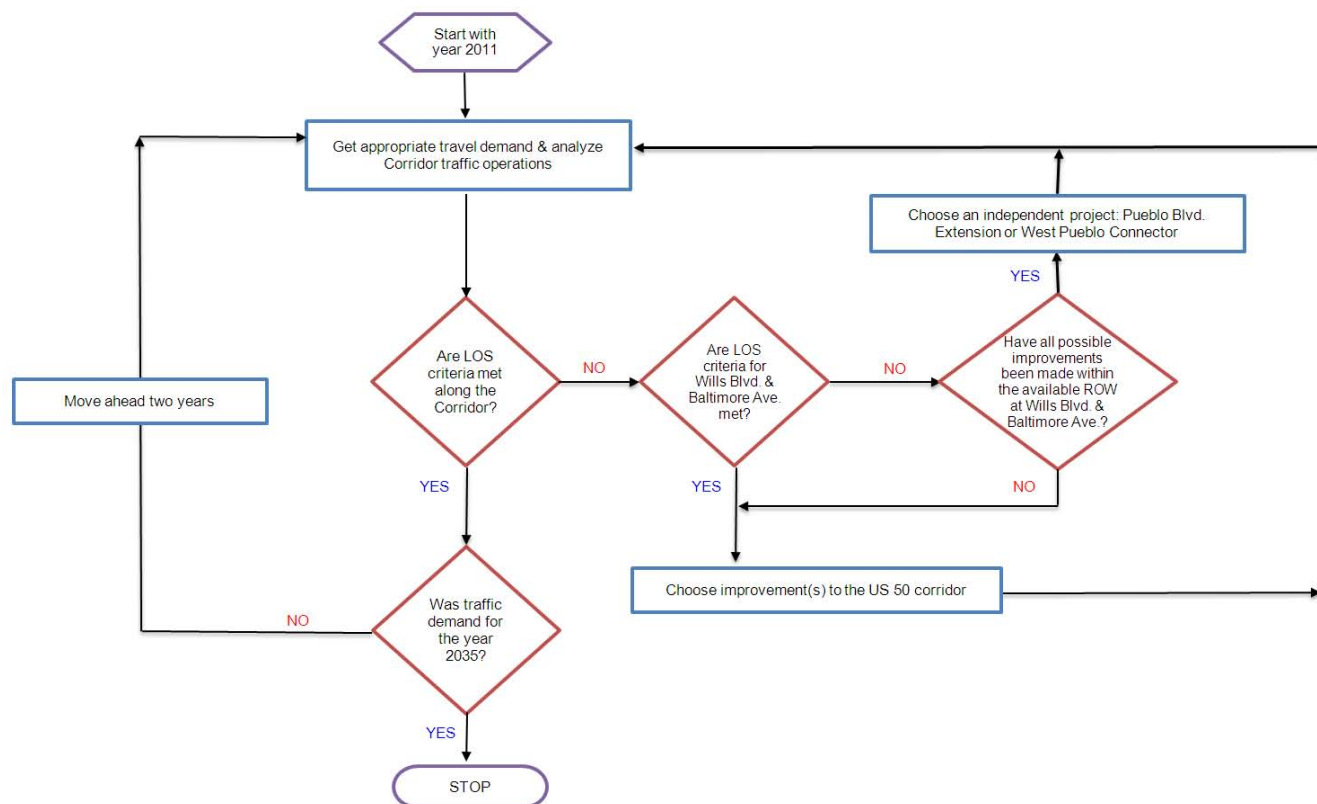
Notes: Improvements could be completed sooner than shown if funding becomes available.
 The timing of the West Pueblo Connector (not shown) depends on the improvements made at US 50 and Baltimore Ave.

Figure IP-1. Schematic Map Showing Timing of Improvement Needs

4. How was the Implementation Plan developed?

The study team developed the Implementation Plan by looking at traffic operations beginning in 2011 and moving to 2035 two years at a time. If operations at a certain location did not meet the Purpose and Need criteria during a certain year, the team proposed and examined possible improvement projects. Where possible, the team created improvement projects to build parts of the Preferred Alternative in phases. However, “throw-away” improvements were made in a few locations. Note that failure to meet the traffic operations criteria somewhere does not necessarily mean that improvements must be made at that location. Because the Preferred Alternative recognizes the benefit that the Pueblo Blvd. Extension and West Pueblo Connector have on US 50 traffic, the study team also considered these independent improvement projects.

Figure IP-2 shows a detailed flowchart of the process used to develop the Implementation Plan. It begins at the top center left with the purple hexagon showing that the process starts with year 2011 conditions. Traffic volumes for 2011 are computed (as described in **Section 5**) and the morning peak hour LOS and evening peak hour LOS are calculated for intersections and mainline segments as part of a Corridor-wide traffic operations analysis, as shown in the blue box. The process proceeds down the column to check if the calculated LOS values are consistent with the study Purpose and Need. If so, the process loops back up along the left side of **Figure IP-2** to then examine traffic operations in 2013. If some locations do not meet the Purpose and Need criteria for LOS, then the process moves to the right half of **Figure IP-2**.



Notes: LOS = level(s) of service ROW = right of way

Figure IP-2. Process to Prioritize Implementation Plan Components

For the US 50 PEL Study, the process worked as follows. First, the study team examined whether the LOS deficiencies occurred at Wills Blvd. or Baltimore Ave., or elsewhere farther west in the Corridor. Poor traffic operations west of the Burlington Northern Santa Fe (BNSF) railroad crossing were generally addressed by making improvements at that location, as shown by the blue box at the lower center portion of **Figure IP-2**. However, because of the close business development near the Wills Blvd. and Baltimore Ave. intersections, congestion relief there required more careful consideration. First, the study team tried to make limited improvements on site that would require no additional right-of-way (ROW), as shown by the “NO” branch below the rightmost red diamond of **Figure IP-2**. Once all the possible improvements had been made at Wills Blvd. and Baltimore Ave., the study team identified the need for the local improvement projects that support the Preferred Alternative, the Pueblo Blvd. Extension, and the West Pueblo Connector. Because of potential ROW, environmental, and community concerns associated with the West Pueblo Connector south of 18th St., the study team assumed that the Pueblo Blvd. Extension would be completed before the West Pueblo Connector.

Once potential improvements were identified to address all the LOS deficiencies, the process looped back along the upper right side of **Figure IP-2** to examine the LOS in the Corridor with those improvements in place. Improvements were modified if they were not able to bring traffic operations within the Purpose and Need criteria. Once all the LOS issues were addressed, the process moved to the next two years in the future, as shown along the left side of **Figure IP-2**.

After multiple loops corresponding to the left or right sides of **Figure IP-2**, the process eventually reached the year 2035, when the Preferred Alternative would be complete.

5. How were traffic forecasts developed to assess the traffic needs?

The study team needed traffic volumes for every two years between 2011 and 2035 to develop the Implementation Plan. Turning movement counts taken in September 2009 were available, as were 2035 forecasts developed earlier in this PEL study. The team used a different procedure to estimate current turning movements than they did for the forecasts for 2013 to 2033.

The study team used counts collected continually at CDOT’s automated traffic recorder west of Swallows Rd. to factor the 2009 turning movement counts to 2011. Three sets of factors were used:

- One for eastbound traffic
- One for westbound traffic
- One based on the two-way total

If a turning movement began or ended eastbound, its volume was brought to 2011 using the eastbound factor. The same process was used for westbound movements. The northbound and southbound through movements were brought to 2011 using the two-way factor. **Table IP-2** summarizes the factors used for each movement.

Table IP-2. Factors Used to Convert 2009 Turning Movements to 2011

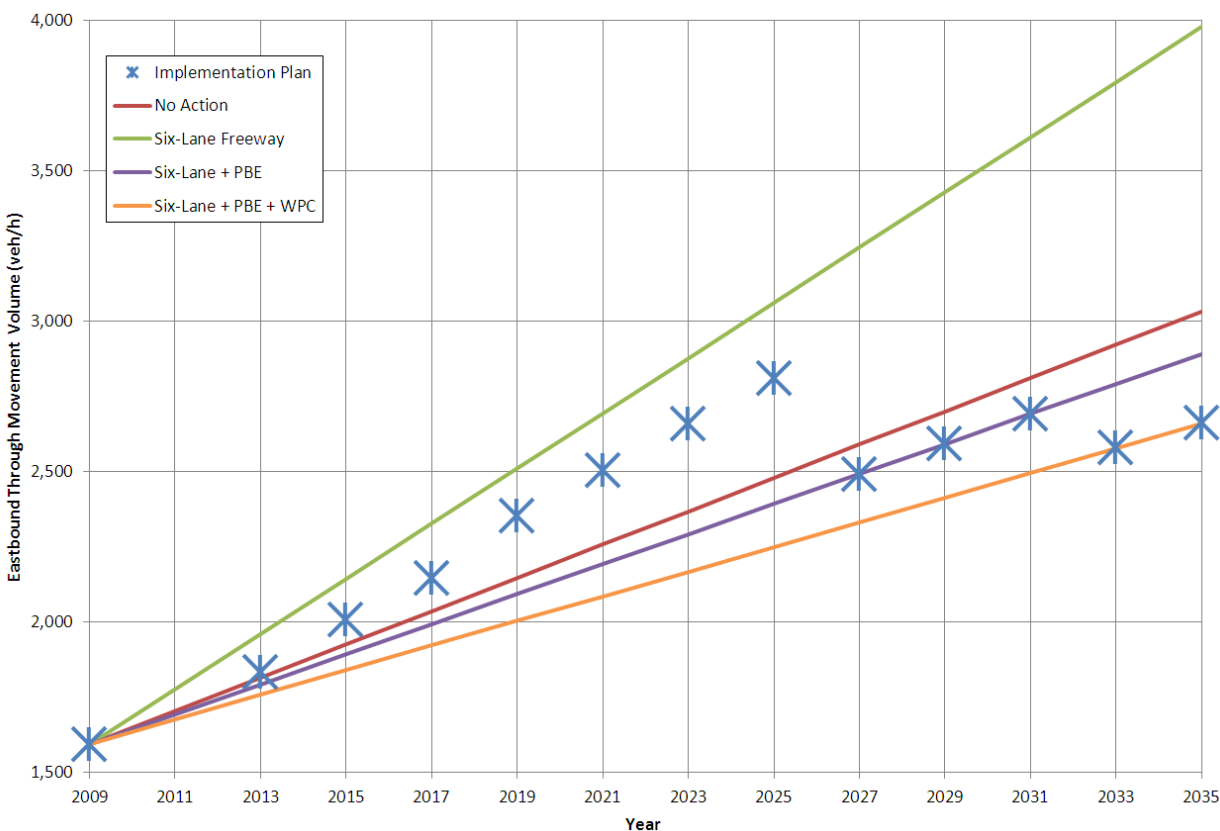
Turning Movement	Direction of Factor Used	Turning Movement	Direction of Factor Used
Eastbound Left	Eastbound	Northbound Left	Westbound
Eastbound Through	Eastbound	Northbound Through	Two-Way
Eastbound Right	Eastbound	Northbound Right	Eastbound
Westbound Left	Westbound	Southbound Left	Eastbound
Westbound Through	Westbound	Southbound Through	Two-Way
Westbound Right	Westbound	Southbound Right	Westbound

The process to make the 2013 to 2033 forecasts can be thought of as drawing paths on a graph of volume over time, such as the one shown in **Figure IP-3** for the morning peak hour eastbound through movement at Pueblo Blvd. The study team used linear interpolation—equivalent to drawing a straight line—to draw four paths between the 2009 counts and the 2035 forecasts for four demand scenarios:

1. No Action (shown as the red line in **Figure IP-3**)
2. Six-Lane Freeway (Action Plan 5, the green line)
3. Six-Lane Expressway with Pueblo Blvd. Extension (Action Plan 6, the purple line)
4. Six-Lane Expressway with Pueblo Blvd. Extension and West Pueblo Connector (Action Plan 7, the orange line)

Also, because new lanes will be added to US 50 in segments, volumes were further interpolated between the No Action and Six-Lane Freeway paths based on how many of the roughly 14 lane-miles (7 miles in each direction) added by the Preferred Alternative were expected to be built by that year. The study team used forecasts from the No Action path to determine a preliminary estimate of when the added lanes would be needed.

In **Figure IP-3**, blue stars represent the final set of forecasts. In 2013, the star is near the No Action path because little of the additional lanes have been built by then. The stars representing the forecasts fall between the red No Action path and the green Six-Lane Freeway path until 2025, with the forecasts being closer to the Six-Lane Freeway path in later years. **Figure IP-3** shows the Pueblo Blvd. Extension being completed in 2027, at which point the forecasts track the purple path. Finally, **Figure IP-3** shows the West Pueblo Connector being built by 2033, when the forecasts jump to the orange path.



Source: JFSA, 2011

Notes: PBE = Pueblo Blvd. Extension WPC = West Pueblo Connector

Figure IP-3. Method to Forecast Intermediate Year Turning Movements

6. *What are the turning movement forecasts?*

The turning movement forecasts are presented below in a series of tables, grouped by intersection, from west to east. At each intersection, one table presents the turning movements for the morning peak hour and the second for the evening peak hour. The years of each forecast are given along the first column of each table. Movements are shown in the remaining columns, grouped by the approach shown in the top header row.

The body of the table has three sections relating to the network associated with the demand scenarios. Each section is headed by a full row across describing the demand scenario:

- Phased improvements to US 50, relating to adding a third lane in either direction
- Six-Lane Expressway with Pueblo Blvd. Extension
- Six-Lane Expressway with Pueblo Blvd. Extension and West Pueblo Connector

Some years are shown in two sections to document the demand that shows the need for completion of the two local improvement projects. Because CDOT will be tracking conditions on US 50 to determine the precise timing of needed improvements, the tables allow for comparison against

future traffic counts. Years in multiple sections also provide some flexibility in completing the local improvement projects earlier or later than the year established in this Implementation Plan.

Swallows Rd.

Table IP-3 shows the forecasted turning movements during the morning peak hour at US 50 and Swallows Rd. Note that while eastbound through traffic is currently the heaviest movement, it soon becomes second to westbound through traffic as more Pueblo area residents take jobs in Cañon City and Florence. After completion of the West Pueblo Connector, westbound left turning traffic drops considerably, as travel patterns shift to use the Joe Martinez Blvd. Extension and other arterials in Pueblo West, while some traffic remaining on US 50 makes the left turn at intersections to the east of Swallows Rd. A similar, but less pronounced drop occurs in northbound right turning traffic.

Table IP-3. Forecasted Morning Peak Hour Turning Movements at US 50 and Swallows Rd.

Year	Eastbound		Westbound		Northbound	
	Through	Right	Left	Through	Left	Right
Demand with Phased Improvements to US 50						
2009	340	8	15	330	40	35
2011	420	10	15	380	45	40
2013	370	8	15	380	50	55
2015	390	8	20	400	55	70
2017	400	10	20	420	55	85
2019	420	10	25	450	60	100
2021	440	10	25	470	65	120
2023	460	10	30	490	70	130
2025	470	10	30	510	75	140
2027	490	10	35	530	75	160
Demand with Pueblo Blvd. Extension						
2027	490	10	55	540	75	180
2029	510	10	60	560	75	190
2031	520	10	65	590	80	210
2033	540	10	70	610	85	230
2035	560	10	75	630	85	240
Demand with Pueblo Blvd. Extension and West Pueblo Connector						
2033	540	10	8	610	85	190
2035	560	10	8	630	85	200

Sources: CDOT, 2009, 2010, 2011; JFSA, 2011

Table IP-4 shows the forecasted turning movements at US 50 and Swallows Rd. during the evening rush hour. Westbound through traffic is consistently the heaviest movement, followed closely by eastbound through traffic. Initially, westbound left turning traffic grows quickly as some drivers switch to making the left at Swallows Rd. rather than at more congested intersections to the east. However, after completion of the West Pueblo Connector, the westbound left and northbound right volumes drop as a result of the same shifting traffic patterns that occurred during the morning peak.

Table IP-4. Forecasted Evening Peak Hour Turning Movements at US 50 and Swallows Rd.

Year	Eastbound		Westbound		Northbound	
	Through	Right	Left	Through	Left	Right
Demand with Phased Improvements to US 50						
2009	370	20	20	410	35	35
2011	400	20	20	450	35	40
2013	420	25	60	460	40	40
2015	440	30	80	490	40	45
2017	470	30	100	520	45	50
2019	490	35	130	540	50	60
2021	510	40	160	570	50	65
2023	530	40	180	600	55	70
2025	560	45	200	620	55	75
2027	580	50	230	650	60	85
Demand with Pueblo Blvd. Extension						
2027	600	35	370	650	55	90
2029	620	35	410	680	60	95
2031	650	35	450	710	65	100
2033	670	40	490	740	65	110
2035	700	40	530	760	70	120
Demand with Pueblo Blvd. Extension and West Pueblo Connector						
2033	650	60	330	740	65	45
2035	670	65	350	760	70	45

Sources: CDOT, 2009, 2010, 2011; JFSA, 2011

West McCulloch Blvd.

Table IP-5 shows that the northbound right turn from West McCulloch Blvd. to eastbound US 50 is the heaviest movement during the morning rush hour and is expected to remain so for the foreseeable future. As many or more people are traveling through westbound on US 50 as traveling through eastbound on US 50 until 2017, when eastbound travel becomes more dominant. This change in travel patterns likely corresponds with increased development in the southwest section of Pueblo West near Swallows Rd.

Table IP-5 shows that turning movements at US 50 and West McCulloch Blvd. during the morning peak hour are relatively unaffected by the completion of the Pueblo Blvd. Extension. However, completion of the West Pueblo Connector results in fewer eastbound through, westbound through, and northbound right movements. Not only does the West Pueblo Connector create an alternative route to US 50 between Purcell Blvd. and Pueblo Blvd. but it also encourages Pueblo West residents who live south of US 50 to use arterial streets within the metro district to reach the West Pueblo Connector.

**Table IP-5. Forecasted Morning Peak Hour Turning Movements
at US 50 and West McCulloch Blvd.**

Year	Eastbound		Westbound		Northbound	
	Through	Right	Left	Through	Left	Right
Demand with Phased Improvements to US 50						
2009	300	95	15	330	50	440
2011	370	120	15	370	55	550
2013	360	100	35	380	50	510
2015	400	100	45	410	45	550
2017	440	110	60	430	45	590
2019	480	110	70	470	45	630
2021	520	110	80	490	45	660
2023	550	110	95	520	45	700
2025	590	120	110	550	45	740
2027	630	120	120	580	45	770
Demand with Pueblo Blvd. Extension						
2027	660	110	180	610	45	780
2029	700	120	190	650	45	820
2031	740	120	210	680	40	860
2033	780	120	230	710	40	890
2035	820	120	250	740	40	930
Demand with Pueblo Blvd. Extension and West Pueblo Connector						
2033	720	130	160	620	40	850
2035	760	130	170	650	40	880

Sources: CDOT, 2009, 2010, 2011; JFSA, 2011

Table IP-6 shows that westbound left turning vehicles are currently the heaviest movement at US 50 and West McCulloch Blvd. during the evening rush hour, but westbound through traffic will soon outnumber the westbound left movement. **Table IP-6** shows a noticeable jump in westbound traffic following completion of the Pueblo Blvd. Extension. However, these forecasts are more of a result of the demand scenario that includes six lanes on US 50 east of Main McCulloch Blvd. Similarly, forecasts show that completion of the West Pueblo Connector is expected to draw traffic off US 50 during the morning rush hour.

**Table IP-6. Forecasted Evening Peak Hour Turning Movements
at US 50 and West McCulloch Blvd.**

Year	Eastbound		Westbound		Northbound	
	Through	Right	Left	Through	Left	Right
Demand with Phased Improvements to US 50						
2009	320	40	430	400	10	160
2011	350	45	470	450	10	170
2013	370	40	500	510	10	200
2015	400	40	550	570	10	220
2017	420	40	590	620	10	230
2019	450	35	640	690	10	250
2021	480	35	680	740	10	270

Year	Eastbound		Westbound		Northbound	
	Through	Right	Left	Through	Left	Right
2023	500	35	720	800	10	290
2025	530	35	770	860	10	310
2027	550	30	810	910	10	330
Demand with Pueblo Blvd. Extension						
2027	580	20	920	1,100	10	370
2029	610	15	980	1,160	10	390
2031	640	15	1,040	1,240	10	420
2033	670	10	1,100	1,320	10	440
2035	700	10	1,140	1,400	10	460
Demand with Pueblo Blvd. Extension and West Pueblo Connector						
2033	580	20	930	1,120	10	410
2035	600	20	970	1,180	10	430

Sources: CDOT, 2009, 2010, 2011; JFSA, 2011

Main McCulloch Blvd.

Table IP-7 shows that the heaviest movement at US 50 and Main McCulloch Blvd. during the morning rush hour is the northbound right turn to eastbound US 50. This movement is expected to be surpassed by eastbound through traffic by 2025, as more parcels in the western areas of Pueblo West are developed. The increased northbound through traffic occurring with completion of the Pueblo Blvd. Extension is likely destined to Platteville Blvd., which was assumed to be improved in conjunction with the Pueblo Blvd. Extension. A smaller reverse pattern is also noticeable: With the Pueblo Blvd. Extension, westbound left traffic decreases, while southbound through traffic increases, as more people use Platteville Blvd. as an alternate route to US 50. With the West Pueblo Connector completed and serving as a third alternate route, some of the Platteville Blvd. traffic returns to US 50, which is shown by decreasing southbound through traffic and increased westbound left traffic.

Table IP-8 shows that during the evening rush hour, westbound left-turning vehicles outnumber westbound through vehicles at the Main McCulloch Blvd. intersection until 2013, again consistent with continuing development farther west. With the Pueblo Blvd. Extension and improvements to US 50 assumed at the same time, about 260 vehicles change from making their left turn at Main McCulloch Blvd. to West McCulloch Blvd. or Swallows Rd., even though the improved part of US 50 is east of Main McCulloch Blvd. As expected, completing the West Pueblo Connector reduces eastbound and westbound through traffic here. At the same time, westbound left traffic increases—many of these vehicles used to turn left at Purcell Blvd. Also note that northbound and southbound through volumes drop after the West Pueblo Connector is built as some drivers switch to Pueblo Blvd. and the Joe Martinez Blvd. Extension.

Purcell Blvd.

Table IP-9 shows that eastbound through traffic dominates the morning rush hour at the US 50 and Purcell Blvd. intersection and will continue to do so for the foreseeable future. As expected, the West Pueblo Connector results in a decline of westbound left and northbound right traffic, as people switch to the new alternate route. The West Pueblo Connector has a more modest effect on

US 50 through traffic. If completed in 2033, the Joe Martinez Blvd. Extension would result in just under a 6 percent reduction to eastbound through traffic.

The evening peak hour turning movements shown in **Table IP-10** mirror those of the morning rush hour in **Table IP-9**: Westbound through traffic is and will continue to be the heaviest movement. Completion of each local improvement project results in lower westbound left volumes as traffic continues farther west before entering the metro district or—in the case of the West Pueblo Connector—diverts to a southern alternate route. Interestingly, the West Pueblo Connector has little impact on US 50 through traffic at Purcell Blvd. Reductions by drivers switching to the Joe Martinez Blvd. Extension are offset by other people driving longer distances on US 50.

Pueblo Blvd.

Table IP-11 shows that, as expected, eastbound through traffic is the heaviest movement at US 50 and Pueblo Blvd. (SH 45) during the morning peak hour. The eastbound right turn to southbound Pueblo Blvd. is currently the second heaviest movement and remains so until 2019, when westbound through traffic volumes move into second place. The ranking changes with the completion of the Pueblo Blvd. Extension in 2027, when northbound through traffic becomes the second heaviest movement. At this point, westbound through traffic volumes drop as cars from I-25 switch to using Platteville Blvd. and the Pueblo Blvd. Extension (making the southbound right turn) instead of driving through the commercial section of US 50. Volumes of most movements in the intersection drop once the West Pueblo Connector is built, as some traffic moves south to that alternate route.

Table IP-7. Forecasted Morning Peak Hour Turning Movements at US 50 and Main McCulloch Blvd.

Year	Eastbound			Westbound			Northbound			Southbound		
	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
Demand with Phased Improvements to US 50												
2009	120	700	45	230	270	45	75	330	840	45	190	80
2011	150	860	55	260	310	50	90	390	1,040	55	230	90
2013	170	810	45	270	290	55	75	470	910	55	280	120
2015	180	880	45	300	310	65	70	520	960	110	310	140
2017	200	940	40	330	320	70	70	590	1,000	130	350	160
2019	220	1,020	40	370	350	90	65	630	1,060	200	370	180
2021	240	1,080	40	390	360	100	65	690	1,100	230	400	200
2023	250	1,140	40	420	380	110	60	750	1,140	260	440	220
2025	270	1,200	35	450	390	120	60	810	1,180	290	470	240
2027	290	1,280	35	480	410	130	55	860	1,240	340	510	260
Demand with Pueblo Blvd. Extension												
2027	150	1,440	35	380	550	70	55	1,120	1,180	220	650	180
2029	160	1,520	35	390	590	70	55	1,200	1,200	240	700	190
2031	160	1,600	35	410	620	75	50	1,280	1,240	260	750	210
2033	160	1,680	35	430	650	80	50	1,380	1,280	270	810	220
2035	170	1,760	30	440	680	80	45	1,460	1,320	290	860	230
Demand with Pueblo Blvd. Extension and West Pueblo Connector												
2033	330	1,440	30	580	460	95	50	940	1,300	470	580	290
2035	340	1,500	25	610	481	100	50	990	1,340	500	610	310

Sources: CDOT, 2009, 2010, 2011; JFSA, 2011



Table IP-8. Forecasted Evening Peak Hour Turning Movements at US 50 and Main McCulloch Blvd.

Year	Eastbound			Westbound			Northbound			Southbound		
	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
Demand with Phased Improvements to US 50												
2009	75	350	85	650	560	140	45	300	360	70	480	120
2011	80	370	90	720	620	150	50	320	390	75	520	140
2013	140	400	85	700	700	150	50	360	390	110	630	160
2015	170	430	80	760	790	180	50	380	420	170	640	170
2017	200	460	80	790	860	190	50	410	440	200	700	190
2019	220	500	75	870	960	220	50	420	480	270	670	190
2021	250	530	75	910	1,040	240	50	450	500	310	710	210
2023	280	560	70	960	1,120	260	55	480	520	350	750	220
2025	310	590	70	1,000	1,200	270	55	500	550	390	790	240
2027	340	620	65	1,060	1,300	300	55	520	570	440	810	250
Demand with Pueblo Blvd. Extension												
2027	200	720	110	800	1,560	230	35	590	600	160	810	250
2029	210	760	110	820	1,680	240	35	620	630	170	850	270
2031	220	800	120	830	1,780	240	35	660	650	180	890	280
2033	240	850	120	850	1,900	250	35	690	680	190	930	300
2035	250	890	120	870	2,000	260	35	720	710	200	960	310
Demand with Pueblo Blvd. Extension and West Pueblo Connector												
2033	420	710	45	1,200	1,580	250	55	590	670	520	600	260
2035	440	740	40	1,260	1,660	260	55	610	711	560	610	270

Sources: CDOT, 2009, 2010, 2011; JFSA, 2011

Table IP-9. Forecasted Morning Peak Hour Turning Movements at US 50 and Purcell Blvd.

Year	Eastbound			Westbound			Northbound			Southbound		
	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
Demand with Phased Improvements to US 50												
2009	150	1,500	30	270	450	300	45	370	840	290	160	50
2011	180	1,860	40	310	510	350	50	440	1,040	350	190	55
2013	220	1,660	30	290	500	430	45	420	910	360	190	60
2015	250	1,780	30	290	550	500	45	450	940	390	210	65
2017	280	1,880	30	300	580	560	45	470	970	420	230	75
2019	320	2,040	30	290	650	620	50	510	990	450	250	80
2021	350	2,140	30	300	690	680	50	530	1,020	480	260	85
2023	390	2,260	30	300	730	740	50	560	1,040	510	280	95
2025	420	2,360	30	310	760	810	50	590	1,080	550	300	100
2027	450	2,480	35	310	810	870	50	620	1,100	580	310	110
Demand with Pueblo Blvd. Extension												
2027	450	2,540	30	260	790	850	40	720	1,040	480	380	100
2029	480	2,640	30	260	830	910	40	760	1,080	500	410	110
2031	520	2,760	30	260	870	970	40	800	1,100	520	430	120
2033	550	2,880	35	260	900	1,020	40	840	1,120	540	450	120
2035	580	2,980	35	250	940	1,080	40	880	1,140	560	480	130
Demand with Pueblo Blvd. Extension and West Pueblo Connector												
2033	550	2,720	35	85	870	1,060	50	840	860	580	460	130
2035	580	2,820	40	70	900	1,120	50	880	860	610	480	140

Sources: CDOT, 2009, 2010, 2011; JFSA, 2011



Table IP-10. Forecasted Evening Peak Hour Turning Movements at US 50 and Purcell Blvd.

Year	Eastbound			Westbound			Northbound			Southbound		
	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
Demand with Phased Improvements to US 50												
2009	95	630	25	760	1,300	130	30	150	430	360	360	95
2011	100	680	30	850	1,440	150	30	160	450	390	400	100
2013	110	730	30	830	1,440	230	25	170	450	530	400	120
2015	110	830	40	840	1,580	270	25	180	460	580	420	150
2017	120	890	45	860	1,660	320	25	200	470	660	440	170
2019	130	1,020	65	860	1,820	370	30	210	480	690	460	210
2021	140	1,100	70	870	1,940	410	30	230	490	750	480	230
2023	140	1,160	80	890	2,050	460	30	240	500	820	500	260
2025	150	1,240	85	910	2,150	510	30	250	510	880	510	280
2027	160	1,340	95	920	2,250	550	30	270	510	940	530	310
Demand with Pueblo Blvd. Extension												
2027	160	1,240	35	780	2,300	520	30	300	440	950	660	230
2029	160	1,320	35	780	2,400	560	35	320	440	1,020	690	240
2031	170	1,380	35	780	2,550	610	35	340	440	1,080	720	260
2033	180	1,440	40	780	2,650	650	35	350	440	1,140	750	270
2035	180	1,520	40	780	2,750	690	35	370	440	1,220	790	280
Demand with Pueblo Blvd. Extension and West Pueblo Connector												
2033	180	1,520	150	460	2,600	700	35	350	260	1,120	710	380
2035	190	1,600	160	430	2,700	750	35	370	240	1,180	740	400

Sources: CDOT, 2009, 2010, 2011; JFSA, 2011



Table IP-11. Forecasted Morning Peak Hour Turning Movements at US 50 and Pueblo Blvd.

Year	Dir	Eastbound			Westbound			Northbound			Southbound		
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
Demand with Phased Improvements to US 50													
2009	EB	1	1,600	910	-	-	-	-	450	400	65	450	-
	WB	-	-	-	370	630	10	430	15	-	-	150	5
2011	EB	1	1,960	1,120	-	-	-	-	530	490	80	530	-
	WB	-	-	-	420	720	15	490	20	-	-	170	6
2013	EB	5	1,840	980	-	-	-	-	590	430	80	520	-
	WB	-	-	-	410	750	35	510	110	-	-	210	10
2015	EB	8	2,000	990	-	-	-	-	660	450	85	560	-
	WB	-	-	-	430	840	45	520	170	-	-	240	15
2017	EB	10	2,150	1,020	-	-	-	-	720	460	90	590	-
	WB	-	-	-	450	910	55	550	220	-	-	270	20
2019	EB	15	2,350	1,020	-	-	-	-	780	450	85	630	-
	WB	-	-	-	470	1,020	55	550	280	-	-	290	20
2021	EB	15	2,500	1,040	-	-	-	-	840	500	90	670	-
	WB	-	-	-	490	1,100	65	570	340	-	-	320	25
2023	EB	20	2,650	1,060	-	-	-	-	910	520	95	710	-
	WB	-	-	-	510	1,180	75	600	390	-	-	350	30
2025	EB	20	2,800	1,080	-	-	-	-	970	540	100	750	-
	WB	-	-	-	530	1,260	85	620	440	-	-	380	30
2027	EB	25	3,000	1,100	-	-	-	-	1,040	560	100	780	-
	WB	-	-	-	550	1,340	90	640	500	-	-	400	35
Demand with Pueblo Blvd. Extension													
2027	Both	250	2,500	1,080	460	1,180	65	510	1,740	400	35	940	550
2029	Both	280	2,600	1,100	470	1,240	70	510	1,920	410	30	1,040	610
2031	Both	310	2,700	1,120	480	1,300	75	520	2,100	410	30	1,140	670
2033	Both	340	2,800	1,140	490	1,360	85	530	2,300	410	25	1,240	730
2035	Both	360	2,900	1,160	500	1,400	90	540	2,500	410	20	1,320	790
Demand with Pueblo Blvd. Extension and West Pueblo Connector													
2033	Both	330	2,600	940	440	1,280	85	370	2,250	430	25	1,160	740
2035	Both	360	2,650	940	450	1,340	90	370	2,450	430	25	1,240	810

Sources: CDOT, 2009, 2010, 2011; JFSA, 2011

Note: - Indicates turning movements that are not possible with the existing split intersection configuration.

Abbreviations: EB = eastbound WB = westbound

Table IP-12 shows the evening rush hour traffic volumes at US 50 and Pueblo Blvd., where westbound through traffic is currently the heaviest movement, followed by eastbound through traffic. This pattern continues until the Pueblo Blvd. Extension is built, when Pueblo Blvd. through volumes rise dramatically (more than double for southbound through traffic). At the same time, US 50 through volumes decline, so the ranking with the Pueblo Blvd. Extension in place becomes southbound through traffic, then westbound through traffic, then northbound through traffic, with eastbound through traffic in fourth place. As with the morning rush hour, the West Pueblo Connector generally reduces traffic volumes here.

It is interesting to note that while volumes to and from Wildhorse Rd. to the north of US 50 are small today (at most about 150 vehicles per hour), these volumes would increase in response to development in the northern part of Pueblo West to as much as 800 vehicles per hour in 2027, before completion of the Pueblo Blvd. Extension.

Another interesting pattern is that traffic on US 50 is relatively balanced between the two peaks—about the same number of cars going east in the morning return west in the evening, and similarly for the less dominant through movement. While Pueblo Blvd. traffic is more northbound in the morning and southbound in the evening, both directions have higher volumes during the evening peak hour. Increased traffic on Pueblo Blvd. during the evening rush hour may result from greater congestion on I-25.

Wills Blvd.

Table IP-13 for the morning peak hour and **Table IP-14** for the evening peak hour show that the US 50 through movements are the dominant travel at the Wills Blvd. intersection, with side street movements never more than 200 vehicles per hour. The eastbound left and right turns are two heavy morning movements, likely representing Pueblo West residents headed to the commercial area along US 50. A third important morning movement is the southbound right turn from residents of the neighborhood north of US 50. The reverse patterns can be seen in the evening when the eastbound left, northbound left, and southbound right are the most important turning movements.

The most noticeable impact of the Pueblo Blvd. Extension and West Pueblo Connector is to reduce through volumes on US 50. The Pueblo Blvd. Extension also has a more subtle impact by reducing the eastbound left and southbound right turning volumes. This effect likely results from the new alternate route for the neighborhood north of US 50 that is provided by the Eagleridge Blvd. Extension and the Pueblo Blvd. Extension.



US 50 West PEL Study: Swallows Rd. to Baltimore Ave.

Table IP-12. Forecasted Evening Peak Hour Turning Movements at US 50 and Pueblo Blvd.

Year	Dir	Eastbound			Westbound			Northbound			Southbound		
		Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
Demand with Phased Improvements to US 50													
2009	EB	3	850	670	-	-	-	-	830	370	45	590	-
	WB	-	-	-	550	1,640	80	760	70	-	-	85	2
2011	EB	3	900	710	-	-	-	-	900	390	50	640	-
	WB	-	-	-	610	1,820	90	850	75	-	-	90	2
2013	EB	6	990	800	-	-	-	-	960	400	95	660	-
	WB	-	-	-	550	1,880	120	830	180	-	-	240	5
2015	EB	8	1,100	830	-	-	-	-	1,020	410	110	710	-
	WB	-	-	-	560	2,050	120	830	240	-	-	320	8
2017	EB	10	1,180	890	-	-	-	-	1,080	420	130	760	-
	WB	-	-	-	570	2,200	130	860	300	-	-	400	8
2019	EB	10	1,320	900	-	-	-	-	1,120	430	130	820	-
	WB	-	-	-	580	2,400	130	840	380	-	-	480	10
2021	EB	15	1,400	950	-	-	-	-	1,180	440	150	870	-
	WB	-	-	-	590	2,550	140	860	440	-	-	550	10
2023	EB	15	1,500	1,000	-	-	-	-	1,220	450	170	920	-
	WB	-	-	-	590	2,700	150	870	500	-	-	630	15
2025	EB	15	1,600	1,040	-	-	-	-	1,280	460	180	960	-
	WB	-	-	-	600	2,850	160	890	570	-	-	710	15
2027	EB	15	1,700	1,080	-	-	-	-	1,340	470	200	1,020	-
	WB	-	-	-	610	3,000	170	900	630	-	-	790	15
Demand with Pueblo Blvd. Extension													
2027	Both	300	1,080	960	450	2,550	100	790	2,100	360	120	2,800	250
2029	Both	330	1,120	990	440	2,650	100	790	2,350	360	130	3,100	280
2031	Both	360	1,140	1,020	430	2,750	100	800	2,550	350	140	3,400	300
2033	Both	400	1,160	1,060	420	2,850	110	800	2,800	350	150	3,700	330
2035	Both	430	1,200	1,080	410	2,950	110	800	3,000	350	160	4,000	360
Demand with Pueblo Blvd. Extension and West Pueblo Connector													
2033	Both	390	1,540	870	430	2,650	120	630	2,800	330	120	3,650	360
2035	Both	420	1,600	890	420	2,750	120	620	3,000	320	130	3,950	390

Sources: CDOT, 2009, 2010, 2011; JFSA, 2011

Note: - Indicates turning movements that are not possible with the existing split intersection configuration.

Abbreviations: EB = eastbound WB = westbound

Table IP-13. Forecasted Morning Peak Hour Turning Movements at US 50 and Wills Blvd.

Year	Eastbound			Westbound			Northbound			Southbound		
	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
Demand with Phased Improvements to US 50												
2009	55	1,540	45	15	660	15	8	8	8	35	10	40
2011	65	1,900	55	20	760	15	10	8	10	45	10	45
2013	70	1,740	50	15	800	15	10	10	8	40	10	55
2015	85	1,860	60	20	890	15	15	10	8	40	8	65
2017	95	1,960	60	20	960	15	15	10	10	40	8	75
2019	110	2,100	70	20	1,060	20	15	10	10	40	8	85
2021	120	2,250	75	20	1,140	20	20	10	10	40	6	90
2023	130	2,350	80	20	1,220	20	20	10	10	40	5	100
2025	140	2,450	85	20	1,300	20	20	15	10	45	5	110
2027	150	2,600	90	20	1,380	20	25	15	10	45	4	120
Demand with Pueblo Blvd. Extension												
2027	110	2,050	70	20	1,160	20	30	15	15	45	15	85
2029	110	2,150	75	25	1,220	25	30	15	20	45	15	90
2031	120	2,200	80	25	1,280	25	35	15	20	45	20	95
2033	120	2,250	80	25	1,340	25	35	20	20	45	20	100
2035	130	2,300	85	25	1,380	25	40	20	20	45	20	110
Demand with Pueblo Blvd. Extension and West Pueblo Connector												
2033	140	2,100	75	25	1,240	25	35	25	10	45	15	100
2035	150	2,150	80	25	1,280	25	40	30	15	45	15	110

Sources: CDOT, 2009, 2010, 2011; JFSA, 2011



Table IP-14. Forecasted Evening Peak Hour Turning Movements at US 50 and Wills Blvd.

Year	Eastbound			Westbound			Northbound			Southbound		
	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
Demand with Phased Improvements to US 50												
2009	60	1,180	15	25	1,920	40	55	2	25	25	8	85
2011	65	1,260	15	25	2,150	45	60	2	25	30	8	95
2013	80	1,360	15	25	2,150	45	55	2	25	25	8	100
2015	90	1,480	20	30	2,300	45	60	2	30	30	8	110
2017	100	1,580	20	30	2,450	45	60	1	30	30	8	120
2019	110	1,720	20	35	2,650	50	65	1	30	30	10	130
2021	120	1,820	25	35	2,750	50	70	1	30	30	10	140
2023	130	1,920	25	35	2,900	50	70	1	30	30	10	150
2025	140	2,050	25	40	3,050	55	75	1	35	30	10	160
2027	150	2,150	30	40	3,200	55	75	1	35	35	10	170
Demand with Pueblo Blvd. Extension												
2027	110	1,660	35	40	2,600	55	60	3	40	35	15	130
2029	120	1,720	35	40	2,700	55	60	3	45	35	15	130
2031	120	1,780	35	45	2,750	60	60	3	45	40	15	140
2033	130	1,820	40	45	2,850	60	60	3	45	40	15	140
2035	130	1,880	40	45	2,900	60	60	3	50	40	15	150
Demand with Pueblo Blvd. Extension and West Pueblo Connector												
2033	130	1,800	40	45	2,700	60	60	6	40	35	20	150
2035	130	1,840	40	45	2,750	60	60	6	40	35	20	160

Sources: CDOT, 2009, 2010, 2011; JFSA, 2011

Baltimore Ave.

Table IP-15 shows that at the Baltimore Ave. intersection, as at the Wills Blvd. intersection, eastbound through traffic is the heaviest movement during the morning rush hour, followed by westbound through traffic. However, volumes to and from Baltimore Ave. are higher than those to and from Wills Blvd. Two currently heavy turning movements are the eastbound right and the westbound left, both to southbound Baltimore Ave. These vehicles may be going to Centennial High School. The northbound right movement is expected to grow in the future, possibly with more activity in the neighborhood south of US 50.

As expected, the Pueblo Blvd. Extension and West Pueblo Connector result in declines to the through traffic volumes on US 50. Interestingly, the Pueblo Blvd. Extension results in growth to the westbound left, westbound right, northbound right, and southbound left turning movements. An explanation for this growth may be that with longer distance through traffic diverting to the Pueblo Blvd. Extension and Platteville Blvd., residents on either side of US 50 here who had been using parallel roads such as Fortino Blvd. or 29th St. may switch to using US 50 now that it is less congested.

Table IP-16 shows the expected pattern of a heavy westbound through movement at Baltimore Ave. during the evening rush hour, with eastbound through traffic being the other dominant movement. The northbound left and right turns are the heaviest movements to and from Baltimore Ave., and they mirror the traffic destined to Centennial High School in the morning. Movements expected to grow in the future are the westbound left—the reverse direction of the northbound right movement expected to grow during the morning rush hour—and the southbound left.

As was seen with the morning rush hour, completion of the Pueblo Blvd. Extension results in more turning travel between Baltimore Ave. and locations to the east. Both the Pueblo Blvd. Extension and West Pueblo Connector reduce evening peak hour through volumes on US 50.

7. How do we know when we need the Pueblo Blvd. Extension and the West Pueblo Connector?

The LOS at US 50 and Baltimore Ave. drives the need for the Pueblo Blvd. Extension and West Pueblo Connector. (These two local improvements are described briefly in **Chapter 1, Section 1.7**, of the PEL Study. The Pueblo Blvd. Extension is described in more detail in the *Preferred Alternative, Eden Interchange/Pueblo Boulevard Feasibility Study* prepared for CDOT in 1999 by Kimley-Horn and Associates.) The Preferred Alternative acknowledges the benefits of the Pueblo Blvd. Extension and West Pueblo Connector in allowing continued use of signalized intersections at Wills Blvd. and Baltimore Ave., and, therefore, avoiding the need for more expansive intersection options involving grade separation where ROW is limited. The Baltimore Ave. intersection has higher turning volumes than Wills Blvd., as can be seen by comparing **Table IP-15** against **Table IP-13** and **Table IP-16** against **Table IP-14**. Therefore, LOS at Baltimore Ave. would fail the Purpose and Need criteria before it does so at Wills Blvd., indicating the benefit that would occur from congestion relief from the local improvement projects.

Table IP-15. Forecasted Morning Peak Hour Turning Movements at US 50 and Baltimore Ave.

Year	Eastbound			Westbound			Northbound			Southbound		
	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
Demand with Phased Improvements to US 50												
2009	40	1,740	210	180	860	60	80	55	140	50	110	15
2011	50	2,150	260	210	970	70	90	65	170	60	130	15
2013	35	1,940	220	200	1,000	80	75	70	180	45	140	15
2015	35	2,100	230	200	1,080	90	110	75	190	45	150	15
2017	35	2,200	230	210	1,160	100	110	80	210	45	160	15
2019	35	2,400	240	210	1,260	110	130	85	210	40	170	15
2021	30	2,500	240	210	1,340	120	140	90	230	40	180	15
2023	30	2,650	250	220	1,420	130	150	100	240	35	200	15
2025	30	2,750	250	220	1,500	140	160	100	260	35	210	15
2027	30	2,900	260	220	1,600	150	170	110	270	35	220	10
Demand with Pueblo Blvd. Extension												
2027	30	2,300	280	270	1,360	170	150	90	320	65	180	10
2029	30	2,350	280	280	1,420	180	160	95	340	65	180	10
2031	25	2,450	290	290	1,460	190	170	100	360	70	190	10
2033	25	2,500	300	300	1,520	200	180	100	380	70	200	10
2035	25	2,550	300	310	1,580	210	190	110	400	70	200	10
Demand with Pueblo Blvd. Extension and West Pueblo Connector												
2029	30	2,250	260	270	1,340	180	150	100	350	70	180	10
2031	25	2,300	270	270	1,380	190	150	110	370	70	190	10
2033	25	2,350	270	280	1,440	200	160	110	390	75	200	10
2035	25	2,400	280	290	1,480	210	160	110	410	75	200	10

Sources: CDOT, 2009, 2010, 2011; JFSA, 2011

Table IP-16. Forecasted Evening Peak Hour Turning Movements at US 50 and Baltimore Ave.

Year	Eastbound			Westbound			Northbound			Southbound		
	Left	Through	Right	Left	Through	Right	Left	Through	Right	Left	Through	Right
Demand with Phased Improvements to US 50												
2009	50	1,220	75	150	2,050	80	110	45	130	90	50	35
2011	55	1,300	80	170	2,300	90	130	50	140	100	50	35
2013	55	1,420	90	180	2,300	85	120	55	150	120	60	35
2015	55	1,540	110	180	2,450	85	130	60	160	140	70	35
2017	55	1,640	120	200	2,600	85	130	65	170	150	75	35
2019	55	1,760	130	200	2,750	85	140	70	180	170	85	40
2021	55	1,860	150	200	2,900	85	150	75	190	180	90	40
2023	60	1,980	160	210	3,050	85	150	80	200	200	100	40
2025	60	2,100	170	220	3,200	90	160	85	210	210	110	40
2027	60	2,200	190	230	3,350	90	170	90	210	220	110	45
Demand with Pueblo Blvd. Extension												
2027	55	1,720	150	300	2,700	120	200	90	220	250	100	45
2029	55	1,780	160	320	2,750	120	210	95	240	270	110	45
2031	55	1,820	170	340	2,800	130	220	100	250	290	110	45
2033	60	1,880	180	350	2,900	130	220	110	260	310	120	45
2035	60	1,940	190	370	3,000	140	230	110	270	320	120	45
Demand with Pueblo Blvd. Extension and West Pueblo Connector												
2029	55	1,740	180	300	2,650	130	170	70	240	270	110	45
2031	60	1,780	190	310	2,700	130	180	70	250	280	120	45
2033	60	1,840	200	330	2,750	140	190	75	260	300	120	45
2035	60	1,880	210	340	2,800	140	190	75	270	320	130	45

Sources: CDOT, 2009, 2010, 2011; JFSA, 2011

8. What is the traffic need at the US 50 intersections and what short-term improvements can be made to address those needs?

This section presents current and future LOS estimates for the intersections along the US 50 Corridor. The intersections are discussed in order moving east through the Corridor, from Swallows Rd. to Baltimore Ave. Within each section for a particular intersection, the tables indicate when the local improvement projects, the Pueblo Blvd. Extension and the West Pueblo Connector, are in place. Because the timing of these projects are related to the LOS at Baltimore Ave., interested readers may want to skip ahead to that section.

Each section presents a series of LOS tables for the intersection being discussed. The first table always addresses the existing configuration of the intersection. The table goes into the future only until the LOS criteria from the study Purpose and Need are no longer met. The text will discuss why traffic operations no longer meet the Purpose and Need criteria and present a possible remedy. Another LOS table starts from the last year of the previous table and goes to 2035 or until that proposed intersection configuration no longer satisfies the Purpose and Need. The process continues until the Preferred Alternative is built at that location.

The Purpose and Need criteria for signalized intersections, based on American Association of State Highway and Transportation Officials (AASHTO) guidance and CDOT practice, are:

- LOS for the intersection as a whole should be D or better.
- LOS for any turning movement from US 50 should be E or better.
- LOS for any crossing street approach should be E or better.

Criteria for unsignalized intersections are similar, although there is no overall intersection LOS defined for an unsignalized intersection. LOS for unsignalized intersections is defined for individual turning movements and is shown with lower-case letters.

Swallows Rd.

The intersection of US 50 and Swallows Rd. is currently an unsignalized three-leg or T intersection. Swallows Rd. has two lanes, so the northbound left and right turn movements share the same lane. **Table IP-17** shows the LOS of the current Swallows Rd. intersection for the next few years. The year being considered is given in the leftmost column. Then three columns address the morning peak hour, followed by three columns addressing the evening peak hour. The first two of the three columns are LOS measures for certain turning movements—westbound left and the shared northbound left and right. Because the eastbound right turn is relatively free flowing, its LOS is not shown in **Table IP-17**. The third of the three columns for each peak hour is the average intersection delay in seconds for all movements, including the US 50 through movements.

Table IP-17 shows that during either rush hour, the westbound left turn experiences relatively good LOS, since it must yield only to eastbound through traffic. LOS for the shared northbound approach is currently at “b” and “c,” but worsens to “e” and “f” by 2027. Northbound left-turning traffic must yield to eastbound and westbound through traffic, as well as to westbound left-turning vehicles. Northbound right-turning vehicles must yield to eastbound through traffic but must also wait behind any northbound left-turning vehicles at the intersection. The northbound approach LOS shows more delay during the evening rush hour, when there are more westbound through and left-turning vehicles.

Table IP-17. Traffic Operations of Existing Configuration at Swallows Rd.

Year	Morning Peak Hour LOS		Average Morning Peak Hour Intersection Delay (s)	Evening Peak Hour LOS		Average Evening Peak Hour Intersection Delay (s)
	Westbound Left	Northbound Left & Right		Westbound Left	Northbound Left & Right	
2011	a	c	1.7	a	b	1.2
2013	a	b	1.9	a	b	1.5
2015	a	c	2.2	a	c	1.9
2017	a	c	2.5	a	c	2.2
2019	a	c	3.0	a	c	2.7
2021	a	c	3.4	a	d	3.2
2023	a	c	4.0	a	d	3.8
2025	a	d	4.7	a	e	4.8
Pueblo Blvd. Extension Built by 2027						
2027	a	e	7.0	b	f	25.3

Source: JFSA, 2011

Notes: LOS at unsignalized intersections is defined only for individual movements and is designated with a lowercase letter. Average intersection delay is calculated including through vehicles on US 50, which experience no delay. **Bold red** text indicates operations inconsistent with the study Purpose and Need.

The *Manual on Uniform Traffic Control Devices* (2009) describes eight situations called *warrants* that indicate when traffic signals are justified. Some relate to safety considerations or pedestrian volumes. One, Warrant 3, considers traffic during the peak hour and so it is quite relevant to the LOS discussion here. Warrant 3 may be met in a couple of ways. One way is based on peak hour turning movements, with criteria that consider whether the intersection has three or four legs and the speed of the major road. Another way is based on the total hours of delay for all vehicles entering the intersection. CDOT typically expects multiple warrants to be met before installing traffic signals.

The US 50 and Swallows Rd. intersection in its current configuration would meet the volume criterion of Warrant 3 in 2019. Both the morning and evening peak hour volumes would meet this criterion. The intersection would meet the delay criterion of Warrant 3 during the evening peak hour of 2027, when the LOS of the Swallows Rd. approach would be “f.” However, because installing signals at Swallows Rd. could potentially cause a safety concern with through traffic on US 50 not being used to stopping, the study team proposed another improvement first.

The Phase 1 improvement at US 50 and Swallows Rd. is to widen Swallows Rd. so that the northbound approach has two lanes, one for left turns and one for right turns. A similar improvement was made at US 50 and West McCulloch Blvd. in 2010. This configuration would reduce delays and improve LOS for northbound right-turning vehicles as they would no longer have to wait for northbound left-turning vehicles, which require gaps in both eastbound and westbound US 50 traffic. The right turn from Swallows Rd. could be made free-flowing by providing a sufficiently long acceleration lane on eastbound US 50.

Table IP-18 shows LOS for this Phase 1 configuration. Note that with separate left turn and right turn lanes on Swallows Rd., there are now separate columns for these movements in the table. Note that the northbound left turn reaches LOS “e” during the evening peak hour of 2023, compared to the Swallows Rd. approach of the existing configuration not reaching LOS “e” until the evening peak hour of 2025. This result occurs because the existing configuration essentially averages the

delay and LOS of the northbound left and northbound right movements. The average intersection delay provides a more useful comparison here. During a 2023 evening rush hour, the existing configuration is expected to result in an average of 3.8 seconds of delay (including the through vehicles on US 50, which have no delay), while the Phase 1 configuration would result in an average of 2.8 seconds of delay.

Table IP-18. Unsignalized Traffic Operations with Widened Swallows Rd. Approach

Year	Morning Peak Hour LOS			Average Morning Peak Hour Intersection Delay (s)	Evening Peak Hour LOS			Average Evening Peak Hour Intersection Delay (s)
	West-bound Left	North-bound Left	North-bound Right		West-bound Left	North-bound Left	North-bound Right	
2013	a	c	b	1.7	a	c	a	1.5
2015	a	c	b	2.0	a	c	a	1.8
2017	a	c	b	2.2	a	c	b	2.1
2019	a	c	b	2.3	a	d	b	2.2
2021	a	c	b	2.4	a	d	b	2.5
2023	a	c	b	2.6	a	e	b	2.8
2025	a	d	b	3.2	a	f	b	4.0
Pueblo Blvd. Extension Built by 2027								
2027	a	e	b	3.9	b	f	b	13.6
2029	a	e	b	4.4	b	f	b	21.5
2031	a	e	b	5.0	b	f	b	33.3
2033	a	f	b	5.7	b	f	b	>80
West Pueblo Connector Built by 2033 or 2035								
2033	a	d	b	3.8	b	f	b	14.9
2035	a	e	b	4.1	b	f	b	21.5

Source: JFSA, 2011

Notes: LOS at unsignalized intersections is defined only for individual movements and is designated with a lowercase letter.

Average intersection delay is calculated including through vehicles on US 50, which experience no delay.

Bold red text indicates operations inconsistent with the study Purpose and Need.

During the evening peak hour, the northbound left movement is expected to operate at LOS “f” in 2025, and to continue to do so after the Pueblo Blvd. Extension and West Pueblo Connector are built. The intersection would continue to meet the delay criterion of Warrant 3 during the 2027 evening rush hour.

The northbound left movement is also the most delayed movement during the morning rush hour. In 2027, after the Pueblo Blvd. Extension is completed, the LOS for this movement would be “e” during the morning peak hour. This movement’s LOS would fall to “f” in 2033 if the West Pueblo Connector is not completed by then. Completing the West Pueblo Connector would reduce the delay to northbound left-turning vehicles in the morning because of the reduction in westbound left-turning vehicles.

The Phase 2 improvement at US 50 and Swallows Rd. is to install traffic signals. One option that would minimize delay is called a “Florida T,” as shown in **Figure IP-4**. With a Florida T, a low barrier separates the westbound left turn from the westbound through traffic. An acceleration lane is provided for northbound left-turning vehicles to merge with westbound through traffic. Traditional signals are provided on the eastbound and northbound approaches, as well as for the westbound left

movement. However, because of the barrier and acceleration lane, westbound through traffic would not have to stop. Instead a signal head with a single green arrow would be shown over each lane of westbound US 50 to help drivers anticipate the signal when they make the return eastbound trip.

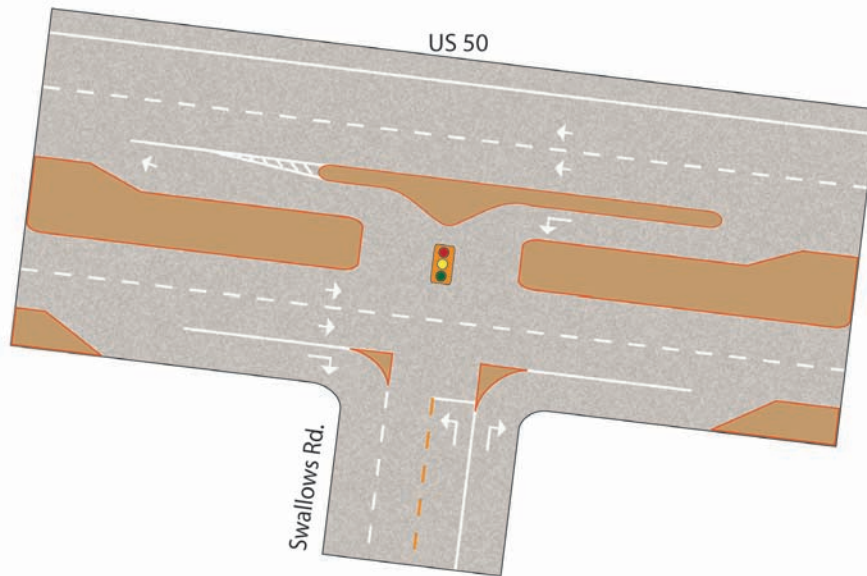


Figure IP-4. Florida T Option for US 50 and Swallows Rd.

Table IP-19 summarizes the anticipated traffic operations of a traditional signalized intersection at US 50 and Swallows Rd. The table contains three columns for each peak hour, corresponding to the three Purpose and Need criteria for the LOS of (1) the intersection as a whole, (2) individual turning and through movements from US 50, and (3) the crossing road approach(es). **Table IP-19** shows that a signalized intersection at US 50 and Swallows Rd. would operate at LOS A during the morning rush hour, and at LOS A or B during the evening rush hour. As mentioned previously, because a Florida T would eliminate the delay to westbound through traffic, the LOS of the Florida T option would be better than what is shown in **Table IP-19**.

Table IP-19. Signalized Traffic Operations with Widened Swallows Rd. Approach

Year	Morning Peak Hour			Evening Peak Hour		
	Intersection LOS	Any US 50 Movement at LOS F?	Is Swallows Rd. Approach at LOS F?	Intersection LOS	Any US 50 Movement at LOS F?	Is Swallows Rd. Approach at LOS F?
Pueblo Blvd. Extension Built by 2027						
2027	A	No	No	A	No	No
2029	A	No	No	B	No	No
2031	A	No	No	B	No	No
2033	A	No	No	B	No	No
West Pueblo Connector Built by 2033 or 2035						
2033	A	No	No	A	No	No
2035	A	No	No	B	No	No

Source: JFSA, 2011

Notes: LOS is calculated assuming all movements are signalized. LOS would be further improved using a "Florida T" configuration, in which westbound US 50 through traffic would not stop.

Bold red text (not shown in this table) would indicate operations inconsistent with the study Purpose and Need.

West McCulloch Blvd.

The intersection of US 50 and West McCulloch Blvd. currently has three legs, and West McCulloch Blvd. has four lanes, so separate northbound left turn and right turn lanes are provided.

Table IP-20 shows the LOS of the existing configuration here. The northbound left turn currently operates at LOS “P” during the evening rush hour, though as **Table IP-6** shows, this affects a small number of cars.

Table IP-20. Traffic Operations of Existing US 50 and West McCulloch Blvd. Intersection

Year	Morning Peak Hour LOS			Average Morning Peak Hour Intersection Delay (s)	Evening Peak Hour LOS			Average Evening Peak Hour Intersection Delay (s)
	West-bound Left	North-bound Left	North-bound Right		West-bound Left	North-bound Left	North-bound Right	
2011	a	c	c	9.7	b	f	b	5.2
2013	a	c	c	8.4	b	f	b	5.9
2015	a	c	d	10.5	b	f	b	6.1
2017	a	c	e	13.9	b	f	b	6.9
2019	a	d	f	20.6	b	f	b	9.0
2021	a	d	f	30.3	c	f	b	10.8
2023	a	d	f	42.4	c	f	b	14.4
2025	a	e	f	56.5	c	f	b	52.4

Source: JFSA, 2011

Notes: LOS at unsignalized intersections is defined only for individual movements and is designated with a lower-case letter. Average intersection delay is calculated including through vehicles on US 50, which experience no delay. **Bold red** text indicates operations inconsistent with the study Purpose and Need.

Although the northbound right movement is free-flowing here (that is, an acceleration lane is provided), free-flow right turns have a finite capacity related to the ability to merge after making the turn. Because the eastbound through and northbound right movements are both heavy during the morning rush hour, the northbound right movement is expected to reach LOS “e” by 2017 and LOS “P” by 2019. The northbound left movement would reach LOS “e” during the morning peak hour by 2025.

The US 50 and West McCulloch Blvd. intersection currently meets the volume criterion of signal Warrant 3 if northbound right volumes are included. The intersection meets the delay criterion of the warrant during the morning peak hour of 2017. During the evening peak hour, the intersection is expected to meet the delay criterion in 2023 if the northbound right movement is included and in 2025 otherwise.

The sole improvement project here is to convert US 50 and West McCulloch Blvd. to a signalized intersection, which completes the Preferred Alternative here. As with the Swallows Rd. intersection, building a Florida T is also an option here. **Table IP-21** shows that the signalized intersection would continue to meet the Purpose and Need criteria through 2035. The LOS would be A during the morning peak hour and would range from A to C during the evening peak hour. The evening peak hour LOS would be C starting in 2029 until the West Pueblo Connector is built.

Table IP-21. Traffic Operations of Signalized US 50 and West McCulloch Blvd. Intersection

Year	Morning Peak Hour			Evening Peak Hour		
	Intersection LOS	Any US 50 Movement at LOS F?	Is West McCulloch Blvd. Approach at LOS F?	Intersection LOS	Any US 50 Movement at LOS F?	Is West McCulloch Blvd. Approach at LOS F?
2013	A	No	No	A	No	No
2015	A	No	No	A	No	No
2017	A	No	No	A	No	No
2019	A	No	No	A	No	No
2021	A	No	No	B	No	No
2023	A	No	No	B	No	No
2025	A	No	No	B	No	No
Pueblo Blvd. Extension Built by 2027						
2027	A	No	No	B	No	No
2029	A	No	No	C	No	No
2031	A	No	No	C	No	No
2033	A	No	No	C	No	No
West Pueblo Connector Built by 2033 or 2035						
2033	A	No	No	B	No	No
2035	A	No	No	B	No	No

Source: JFSA, 2011

Notes: LOS is calculated assuming all movements are signalized. LOS would be further improved using a "Florida T" configuration, in which westbound US 50 through traffic would not stop.

Bold red text (not shown in this table) would indicate operations inconsistent with the study Purpose and Need.

Main McCulloch Blvd.

The signalized intersection at US 50 and Main McCulloch Blvd. currently operates at LOS C during both peak hours, as shown in **Table IP-22**. The LOS is expected to fall to D in 2021 for the morning rush hour and in 2023 for the evening rush hour. In 2025, the morning peak hour LOS is expected to fall to E, no longer meeting the Purpose and Need criteria. At this point, the eastbound through movement and the westbound left turn are expected to operate at LOS F. Because these two movements conflict (that is, they cannot both be shown a green signal at the same time), the only way to improve their LOS would be to give them more green time by either taking it from the Main McCulloch Blvd. approaches or by using a longer cycle (the series of green signals to serve all the movements at the intersection). Either option worsens the LOS for other movements.

Table IP-22. Traffic Operations of Existing US 50 and Main McCulloch Blvd. Intersection

Year	Morning Peak Hour			Evening Peak Hour		
	Intersection LOS	Any US 50 Movement at LOS F?	Any Main McCulloch Blvd. Approach at LOS F?	Intersection LOS	Any US 50 Movement at LOS F?	Any Main McCulloch Blvd. Approach at LOS F?
2011	C	No	No	C	No	No
2013	C	No	No	C	No	No
2015	C	No	No	C	No	No
2017	C	No	No	C	No	No
2019	C	No	No	C	No	No
2021	D	No	No	C	No	No
2023	D	No	No	D	No	No
2025	E	Yes	No	D	No	No

Source: JFSA, 2011

Note: **Bold red** text indicates operations inconsistent with the study Purpose and Need.

Phase 1: Six-Lane US 50 and Single-Quadrant Jughandle

The Phase 1 improvement at US 50 and Main McCulloch Blvd. addresses the need for more eastbound through and westbound left capacity by widening US 50 to six lanes and providing a jughandle in the northeast quadrant. This phase also reallocates the left turn bays on Main McCulloch Blvd. into a single left turn lane for either direction, and a third southbound through lane, shown in **Figure IP-5**. The figure shows the new lane construction and new lane stripes with yellow lines. The jughandle would ultimately become the exit ramp for the diamond interchange specified here by the Preferred Alternative. Westbound left- and right-turning traffic would use the jughandle to reach Main McCulloch Blvd. Westbound left-turning traffic would continue through the main intersection of US 50 with Main McCulloch Blvd. with the southbound through traffic.

Table IP-23 summarizes traffic operations of the Phase 1 intersection with a jughandle here. In 2025, the LOS of the north (jughandle) intersection is B during either peak hour. The main intersection has an LOS of C during the morning rush hour and D during the evening rush hour. Building the Pueblo Blvd. Extension results in some LOS improvement. However, by 2029, this configuration no longer meets the Purpose and Need because the westbound left turn movement experiences LOS F as it goes through the main intersection with the southbound through traffic.

Table IP-23. Traffic Operations of Phase 1 Main McCulloch Blvd. Intersection

Year	Inter-section	Morning Peak Hour			Evening Peak Hour		
		Inter-section LOS	Any US 50 Movement at LOS F?	Any Main McCulloch Blvd. Approach at LOS F?	Inter-section LOS	Any US 50 Movement at LOS F?	Any Main McCulloch Blvd. Approach at LOS F?
2025	North	B	No	No	B	No	No
	Main	C	No	No	D	No	No
Pueblo Blvd. Extension Built by 2027							
2027	North	A	No	No	B	No	No
	Main	C	No	No	C	No	No
2029	North	A	No	No	B	No	No
	Main	C	No	No	D	Yes	No

Source: JFSA, 2011

Note: **Red** text indicates operations inconsistent with the study Purpose and Need.

Optional Phase 2: Three-Quadrant Jughandle

Optional Phase 2 at US 50 and Main McCulloch Blvd. builds jughandles in the southwest and southeast quadrants, as shown in **Figure IP-6**. The eastbound left and right turns use the jughandle in the southwest quadrant, while the northbound right and southbound left turns use the jughandle in the southeast quadrant. As with the northeast quadrant jughandle of Phase 1, these jughandles ultimately become ramps for the diamond interchange here.

Table IP-24 summarizes traffic operations for the Phase 2 configuration here. Individual intersections function at LOS A through C until the West Pueblo Connector is built, when the main intersection is expected to operate at LOS E during the evening peak hour. The southbound approach is expected to operate at LOS F; therefore, westbound left-turning vehicles also experience LOS F.

The ability of the Phase 2 configuration to meet the Purpose and Need depends on whether the criteria are interpreted to apply to the three intersections here individually or as a complex. If the criteria should apply to the complex as a whole—as some members of the study team advocated—this phase will not meet the Purpose and Need as long. While the westbound left movement experiences LOS E or better at each of the three intersections, if the delays at the three intersections are summed, it may be sufficient for this movement to reach LOS F as early as 2029. The study team did not conduct the traffic simulations to confirm the delay estimates for the complex as a whole. This issue merely determines whether the final phase configuration—the diamond interchange illustrated in **Figure IP-7**—is needed by 2029 or 2033.

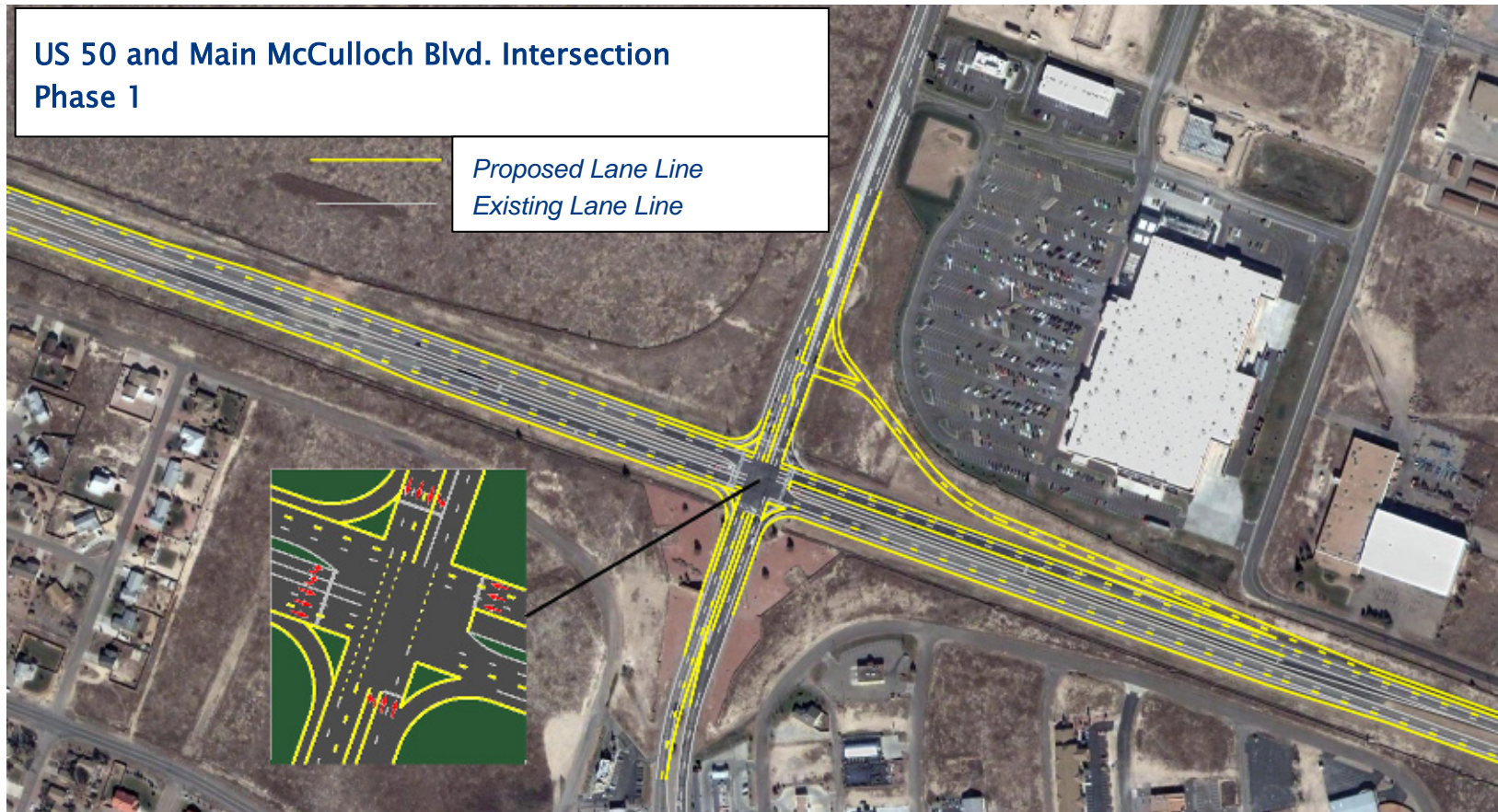


Figure IP-5. Phase 1 Improvements at US 50 and Main McCulloch Blvd.

Table IP-24. Traffic Operations of Phase 2 Main McCulloch Blvd. Intersection

Year	Inter-section	Morning Peak Hour			Evening Peak Hour		
		Inter-section LOS	Any US 50 Movement at LOS F?	Any Main McCulloch Blvd. Approach at LOS F?	Inter-section LOS	Any US 50 Movement at LOS F?	Any Main McCulloch Blvd. Approach at LOS F?
2029	North	A	No	No	B	No	No
	Main	C	No	No	C	No	No
	South	B	No	No	A	No	No
2031	North	A	No	No	B	No	No
	Main	C	No	No	C	No	No
	South	B	No	No	B	No	No
2033	North	B	No	No	B	No	No
	Main	C	No	No	C	No	No
	South	B	No	No	B	No	No
West Pueblo Connector Built by 2033 or 2035							
2033	North	B	No	No	C	No	No
	Main	C	No	No	E	Yes	Yes
	South	B	No	No	B	No	No

Source: JFSA, 2011

Note: **Bold red** text indicates operations inconsistent with the study Purpose and Need.

Level 3 evaluation assumed that the diamond interchange configuration would have Main McCulloch Blvd. on a bridge crossing over US 50. However, the Technical Advisory Team (TAT) decided during the development of this Implementation Plan that US 50 should cross over Main McCulloch Blvd. because this configuration will have fewer impacts for the following reasons:

- This configuration allows all existing business accesses to Main McCulloch Blvd. to remain open.
- This configuration will not require relocating a trail parallel to Main McCulloch Blvd. that is being built with Enhancement funds.
- Construction phasing would be less complex, with US 50 through traffic using the future ramps as detours. Through traffic on Main McCulloch Blvd. would not need to use detours.
- Although elevating US 50 would result in greater noise levels, the commercial uses abutting the interchange would shield residences in the area from this noise.

The entities implementing this plan have already begun making decisions on development, business access, pedestrian and bicycle trails, and other infrastructure improvements by relying on this decision for US 50 to cross over Main McCulloch Blvd.

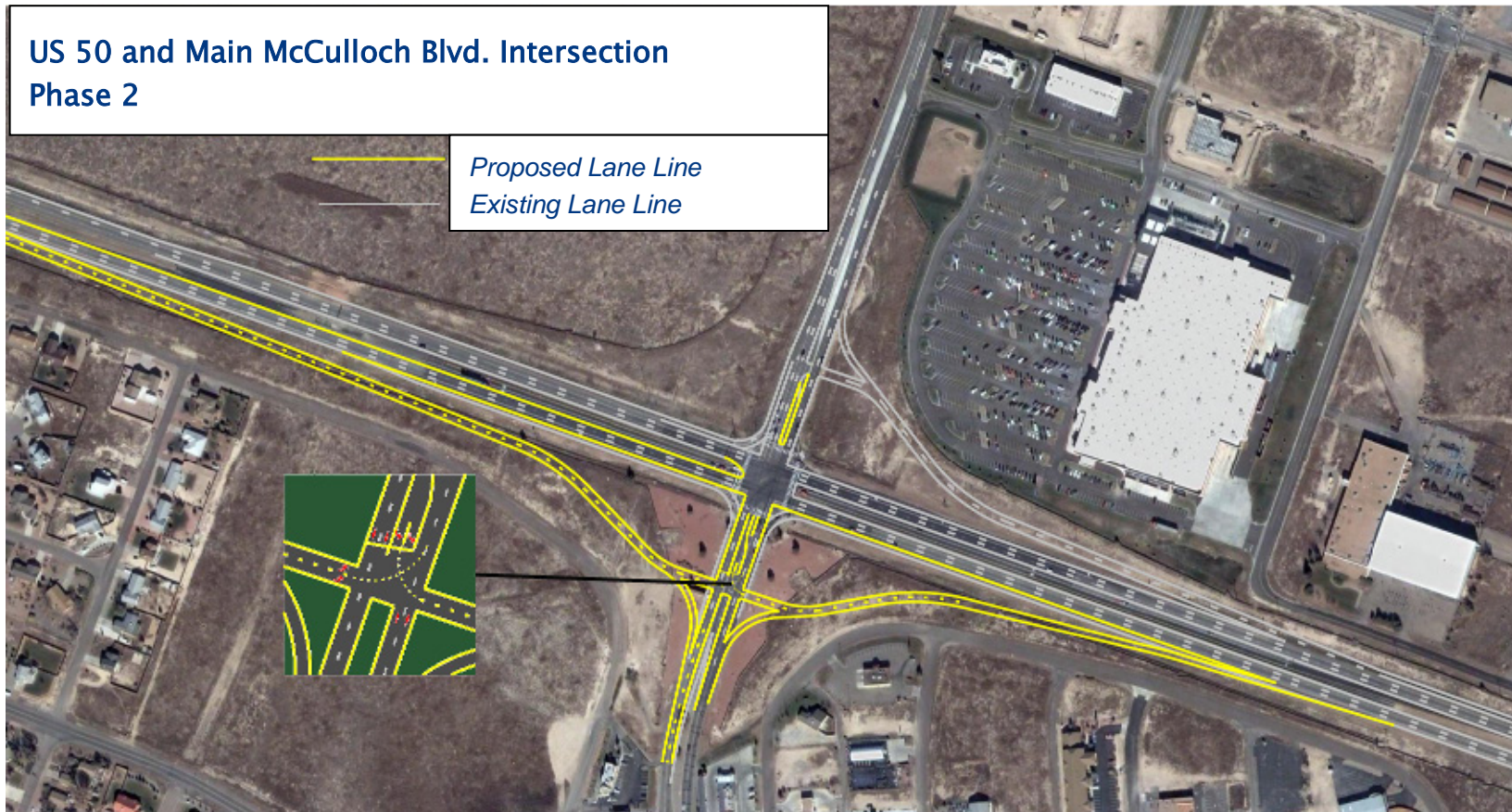


Figure IP-6. Phase 2 Improvements at US 50 and Main McCulloch Blvd.

**US 50 and Main McCulloch Blvd. Intersection
Diamond Interchange**

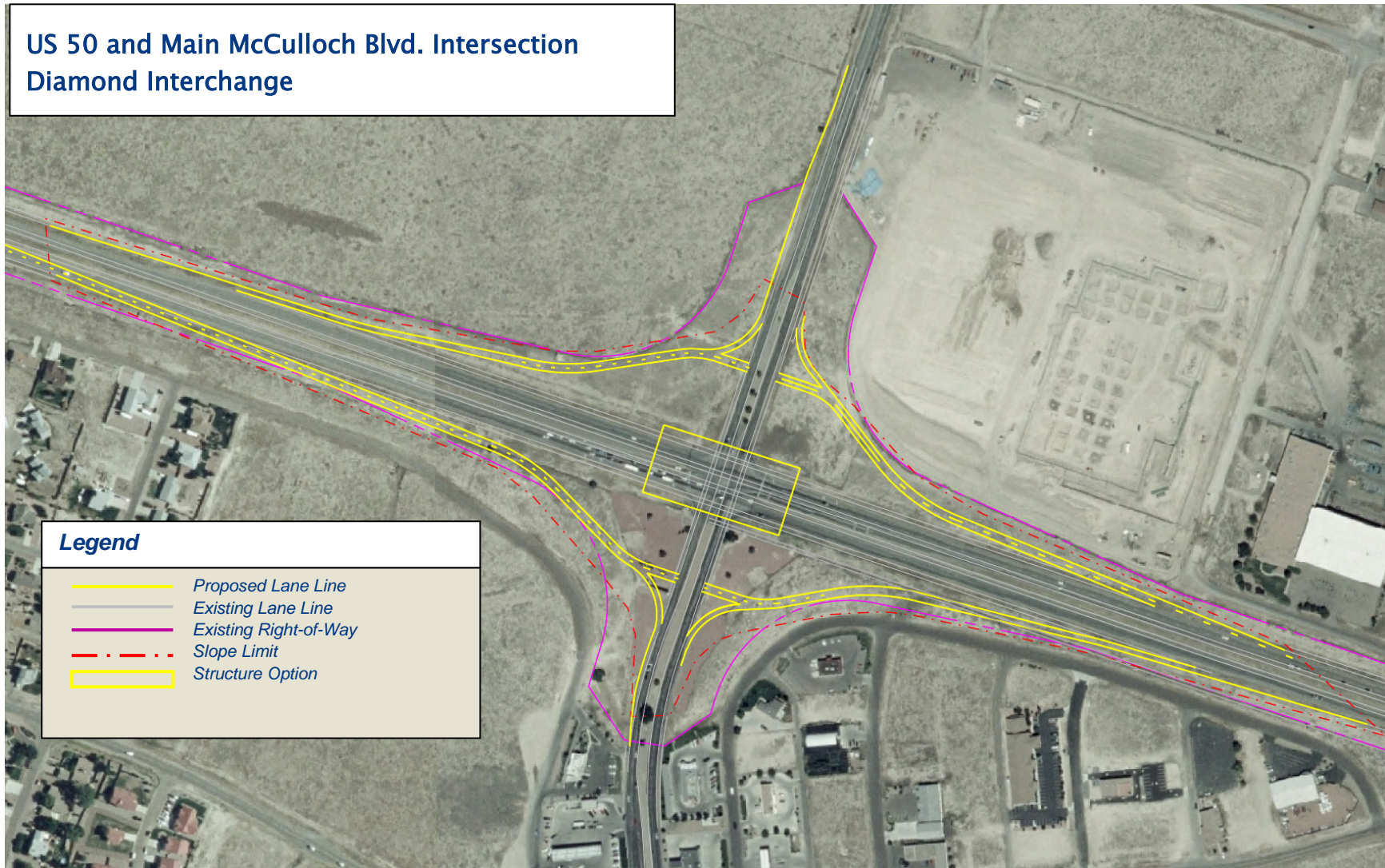


Figure IP-7. Final Phase at US 50 and Main McCulloch Blvd.

Purcell Blvd.

Table IP-25 shows that the signalized intersection at US 50 and Purcell Blvd. currently operates at LOS E during the morning rush hour. The eastbound left turn, eastbound through movement, and westbound left turn operate at LOS F. Also, the southbound approach operates at LOS F during the morning rush hour.

Table IP-25. Traffic Operations of Existing US 50 and Purcell Blvd. Intersection

Year	Morning Peak Hour			Evening Peak Hour		
	Intersection LOS	Any US 50 Movement at LOS F?	Any Purcell Blvd. Approach at LOS F?	Intersection LOS	Any US 50 Movement at LOS F?	Any Purcell Blvd. Approach at LOS F?
2011	E	Yes	Yes	D	No	No

Source: JFSA, 2011

Note: **Bold red text indicates operations inconsistent with the study Purpose and Need.**

Phase 1: Widen US 50

The Phase 1 improvements at US 50 and Purcell Blvd. widen US 50 to six lanes, as shown in **Figure IP-8**. By improving the eastbound through movement capacity, green time from the eastbound through movement can be given to the other over-capacity movements during the morning peak hour to bring the intersection into compliance with the Purpose and Need criteria, as shown in **Table IP-26**. With six lanes on US 50, this intersection is expected to operate at LOS C during either peak hour in 2013, and at LOS D during either peak hour from 2013 to 2019. In 2021, the morning peak hour LOS is expected to fall to E. At the same time, the westbound left movement and the southbound approach are anticipated to operate at LOS F.

Table IP-26. Traffic Operations of Phase 1 Purcell Blvd. Intersection

Year	Morning Peak Hour			Evening Peak Hour		
	Intersection LOS	Any US 50 Movement at LOS F?	Any Purcell Blvd. Approach at LOS F?	Intersection LOS	Any US 50 Movement at LOS F?	Any Purcell Blvd. Approach at LOS F?
2013	C	No	No	C	No	No
2015	D	No	No	D	No	No
2017	D	No	No	D	No	No
2019	D	No	No	D	No	No
2021	E	Yes	Yes	D	No	No

Source: JFSA, 2011

Note: **Bold red text indicates operations inconsistent with the study Purpose and Need.**

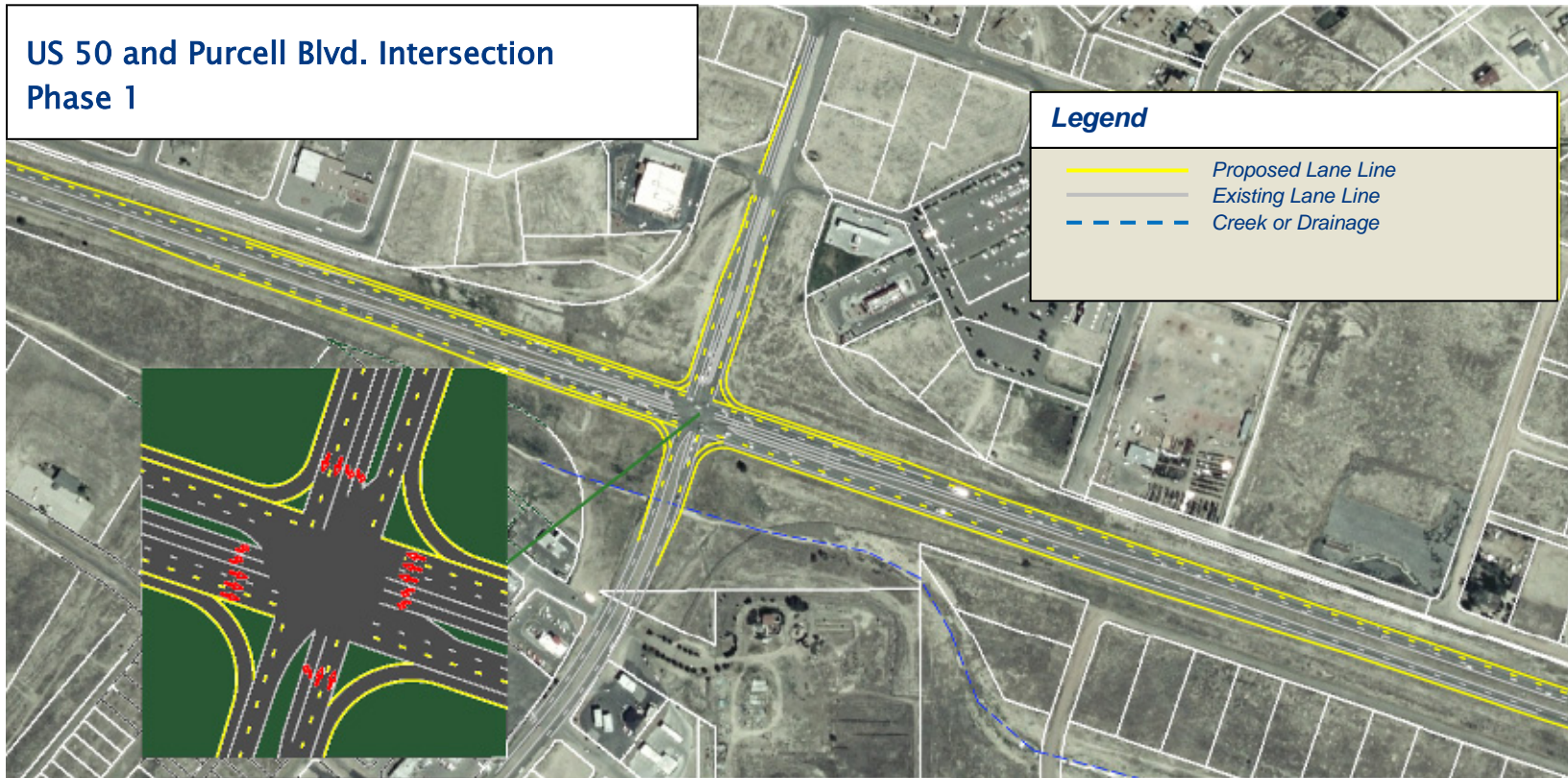


Figure IP-8. Phase 1 Improvements at US 50 and Purcell Blvd.

Phase 2: Two-Quadrant Jughandle

The Phase 2 improvements for US 50 and Purcell Blvd. are to build jughandles in the northwest and northeast quadrants, as shown in **Figure IP-9**. Left and right turns from westbound US 50 will use the jughandle in the northeast quadrant. Northbound left-turning traffic and southbound right-turning traffic will use the jughandle in the northwest quadrant. Phase 2 also includes building a third southbound through lane on Purcell Blvd., which would be dropped at or before Spaulding Ave.

Table IP-27 summarizes the traffic operations of the Phase 2 improvements here. In 2021, the north (jughandle) intersection would operate at LOS B during either peak hour, and the main intersection would operate at LOS D. However, during the evening peak hour of 2023, the LOS of each intersection falls by a letter grade. At the main intersection, the westbound through movement and the southbound approach are anticipated to operate at LOS F.

Table IP-27. Traffic Operations of Phase 2 Purcell Blvd. Intersection

Year	Inter-section	Morning Peak Hour			Evening Peak Hour		
		Inter-section LOS	Any US 50 Movement at LOS F?	Any Purcell Blvd. Approach at LOS F?	Inter-section LOS	Any US 50 Movement at LOS F?	Any Purcell Blvd. Approach at LOS F?
2021	North	B	No	No	B	No	No
	Main	D	No	No	D	No	No
2023	North	B	No	No	C	No	No
	Main	D	No	No	E	Yes	Yes

Source: JFSA, 2011

Note: **Bold red** text indicates operations inconsistent with the study Purpose and Need.

Phase 3: Four-Quadrant Jughandle or At-Grade Diamond

The Phase 3 improvements here are to build jughandles in the remaining quadrants, to the southwest and southeast of the main intersection. These improvements are highlighted by the yellow lines in **Figure IP-10**. Because this configuration has all four of the future diamond interchange ramps built and only lacks grade separation for the main intersection of US 50 and Purcell Blvd., it could also be called an at-grade diamond.

Traffic operations of the four-quadrant jughandle or at-grade diamond here are summarized in **Table IP-28**. The north intersection operates at LOS B during both peak hours for the four years between 2023 and 2029 shown in the table. Likewise, the south intersection consistently operates at LOS B during the morning rush hour and LOS A during the evening rush hour. The main intersection is expected to operate at LOS C during both peak hours in 2023 and 2025. It would continue to operate at LOS C during the evening peak hours of 2027 and 2029. However, during the morning peak hour, the LOS of the main intersection changes to D in 2027 and to E in 2029. During the 2029 morning rush hour, the eastbound left and through movements would operate at LOS F, as would the northbound approach.

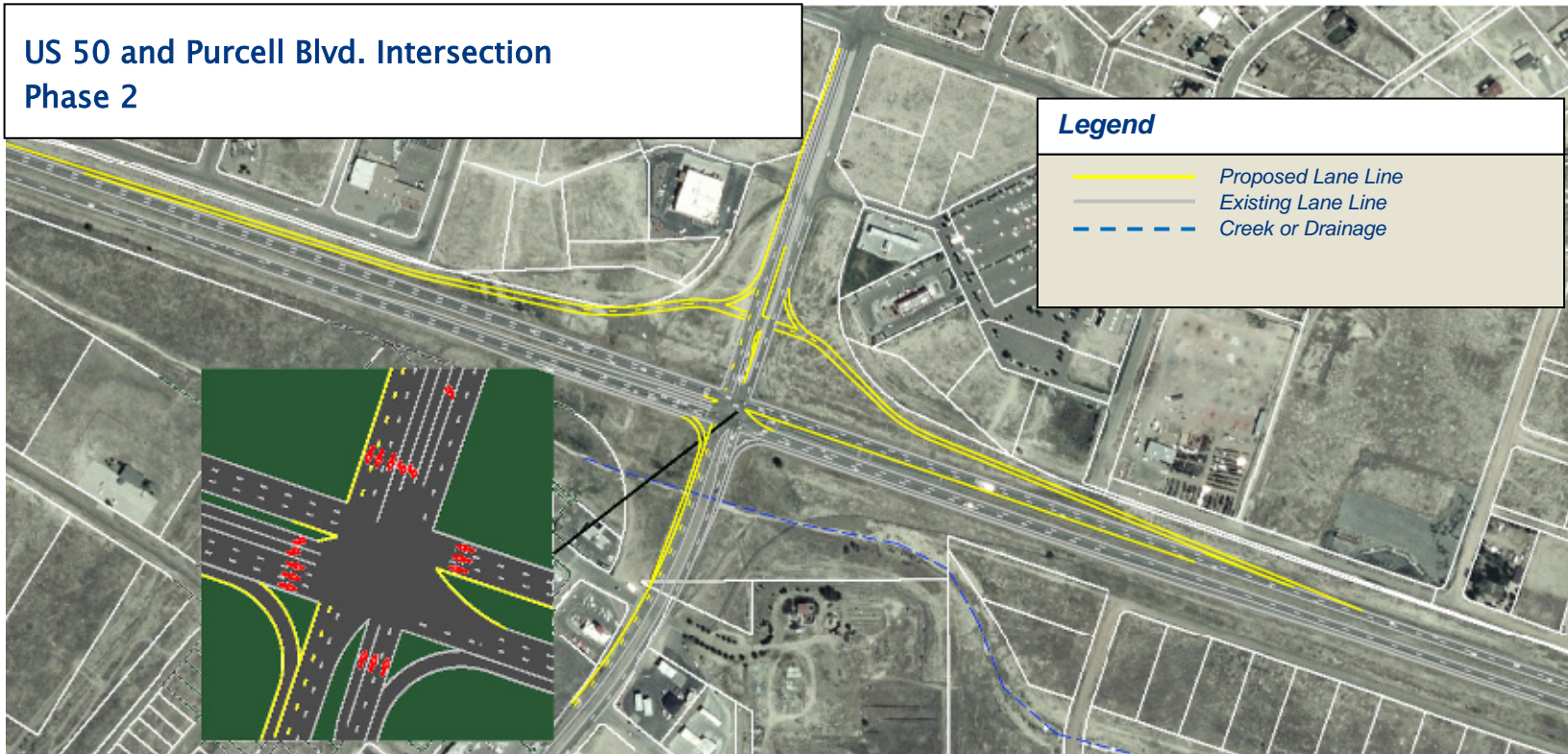


Figure IP-9. Phase 2 Improvements at US 50 and Purcell Blvd.

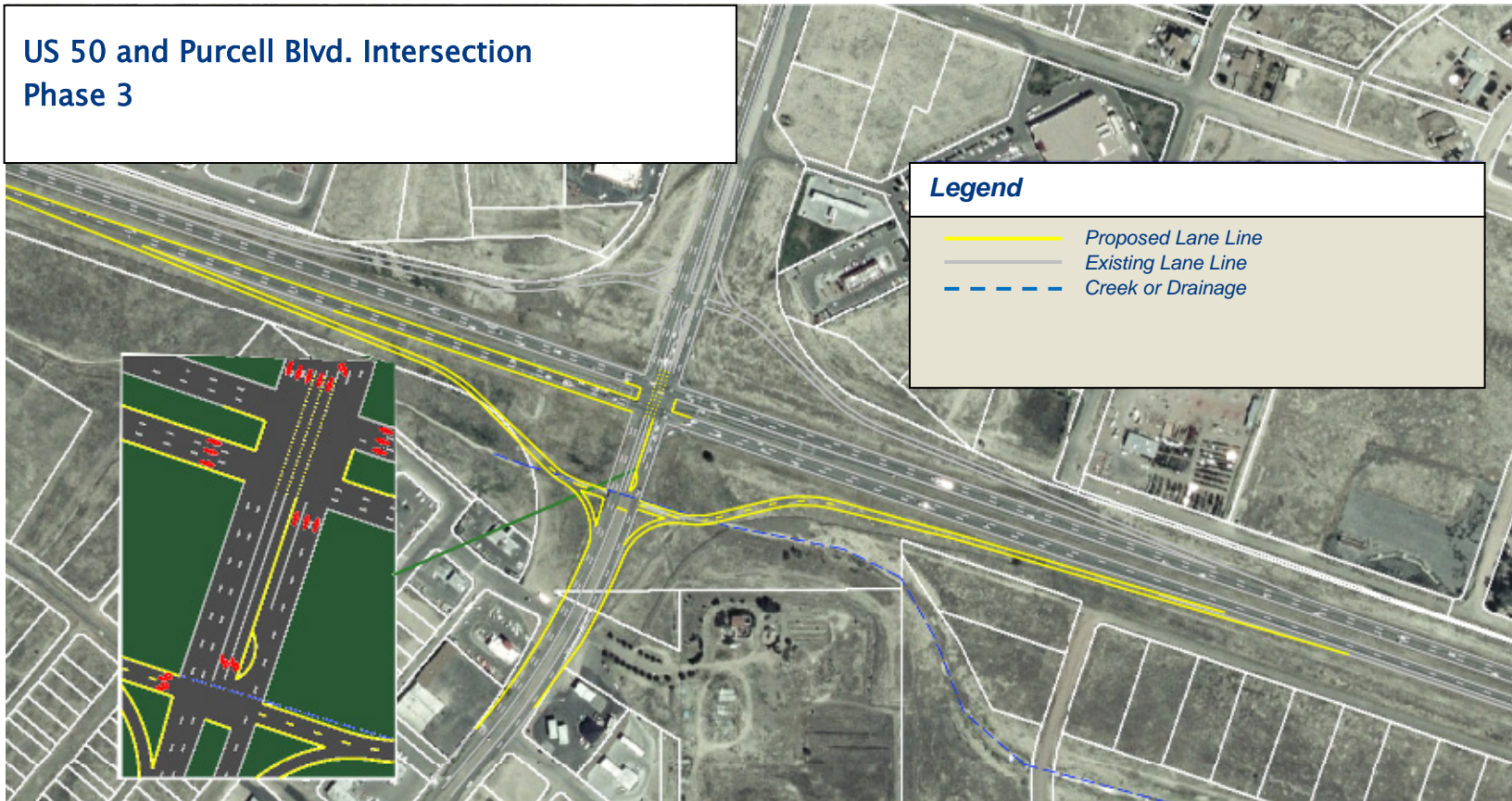


Figure IP-10. Phase 3 Improvements at US 50 and Purcell Blvd.

Table IP-28. Traffic Operations of Phase 3 Purcell Blvd. Intersection

Year	Inter-section	Morning Peak Hour			Evening Peak Hour		
		Inter-section LOS	Any US 50 Movement at LOS F?	Any Purcell Blvd. Approach at LOS F?	Inter-section LOS	Any US 50 Movement at LOS F?	Any Purcell Blvd. Approach at LOS F?
2023	North	B	No	No	B	No	No
	Main	C	No	No	C	No	No
	South	B	No	No	A	No	No
2025	North	B	No	No	B	No	No
	Main	C	No	No	C	No	No
	South	B	No	No	A	No	No
Pueblo Blvd. Extension Built by 2027							
2027	North	B	No	No	B	No	No
	Main	D	No	No	C	No	No
	South	B	No	No	A	No	No
2029	North	B	No	No	B	No	No
	Main	E	Yes	Yes	C	No	No
	South	B	No	No	A	No	No

Source: JFSA, 2011

Note: **Bold red** text indicates operations inconsistent with the study Purpose and Need.

The fourth and final phase here is to complete the diamond interchange by grade separating the main intersection, as shown in **Figure IP-11**. Similar to decision making process for the Main McCulloch Blvd. interchange, the TAT decided that a bridge will be built for US 50 to cross over Purcell Blvd. for similar reasons (maintaining business accesses, simplifying construction phasing, and having businesses shield residences in the area from noise increases). Eastbound and westbound traffic could use the ramps as detours during construction.

Pueblo Blvd.

The two directions of US 50 currently meet Pueblo Blvd. (SH 45) at two intersections about 600 feet apart. The current US 50 alignment was originally intended to become the ramps of a diamond interchange once a bridge for US 50 through traffic is built over Pueblo Blvd. However, more recent traffic forecasts for this study suggest that with the Pueblo Blvd. Extension, Pueblo Blvd. might carry more traffic than US 50 in the future. (See the turning movement forecasts in **Table IP-11** and **Table IP-12**. The forecasts for Action Plan 4 in **Appendix B** may also be of interest.) Therefore, it might be more appropriate to have ramps exiting and entering Pueblo Blvd., with signals on US 50, as is illustrated for the Preferred Alternative. Final determination of the interchange configuration (whether the signalized cross-over intersections will be on US 50 or Pueblo Blvd.) will be made during the design and NEPA clearance phase. In making this decision, the analysis will compare the following aspects of the various configurations:

- Phase costs
- Total cost of all phases
- Cost of throw-away improvements
- Variability or uncertainty of volumes inherent in travel demand forecasting
- LOS and delay during construction
- LOS and delay after completion
- Accident reduction

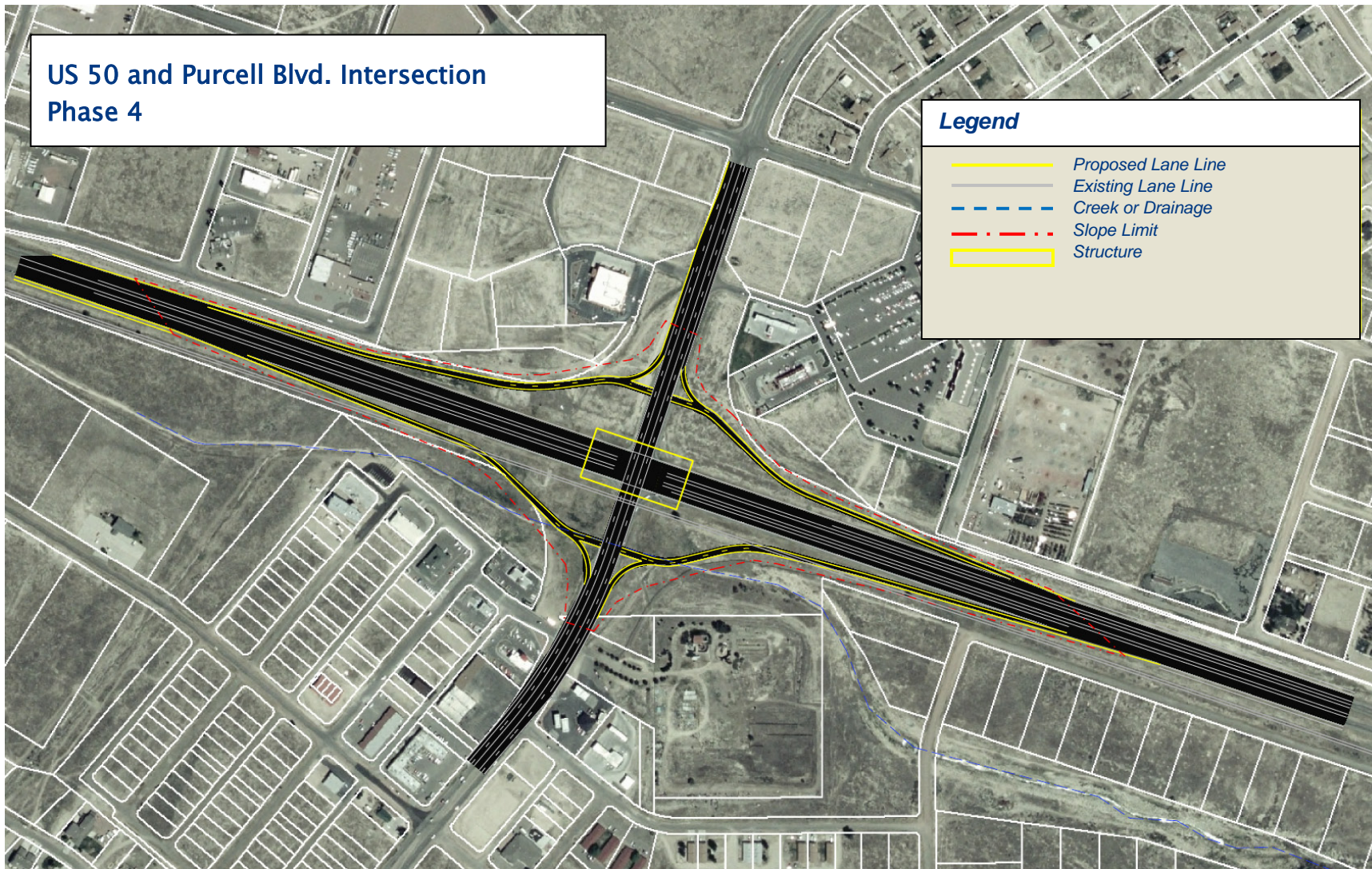


Figure IP-11. Final Phase at US 50 and Purcell Blvd.

Table IP-29 shows that while the south (eastbound US 50) intersection with Pueblo Blvd. currently operates at LOS C during both peak hours, the north (westbound US 50) intersection operates at LOS E during the evening rush hour. Westbound through traffic currently operates at LOS F.

Table IP-29. Traffic Operations of Existing US 50 and Pueblo Blvd. Intersection

Year	Inter-section	Morning Peak Hour			Evening Peak Hour		
		Inter-section LOS	Any US 50 Movement at LOS F?	Any Pueblo Blvd. Approach at LOS F?	Inter-section LOS	Any US 50 Movement at LOS F?	Any Pueblo Blvd. Approach at LOS F?
2011	EB	C	No	No	C	No	No
	WB	B	No	No	E	Yes	No

Source: JFSA, 2011

Note: **Bold red** text indicates operations inconsistent with the study Purpose and Need.

Phase 1: Two-Quadrant Jughandle

The Phase 1 improvement for US 50 and Pueblo Blvd. is to convert the existing two intersections to a two-quadrant jughandle by building three new westbound lanes north of the existing eastbound lanes, which will be widened to three lanes, as shown in **Figure IP-12**. Widening to six lanes will require extending the existing box culvert at Williams Creek and building two new bridges over Wild Horse Creek. Because the existing westbound bridge over Wild Horse Creek has a cracked abutment, it will be removed at this phase. Westbound US 50 traffic wanting to turn left to Pueblo Blvd. or right to Wildhorse Rd. will use a new ramp alignment between Williams Creek and Wildhorse Creek to reach the existing westbound lanes that now form the jughandle. The left of the two current through lanes will become a second dedicated left turn lane, to match the two southbound Pueblo Blvd. lanes.

Northbound Pueblo Blvd. traffic wanting to turn left to westbound US 50 will be directed by overhead signs to go through the main (south) intersection and turn left at the north intersection, much as they would today. Other signs will indicate that left turns from northbound Pueblo Blvd. are prohibited at the main intersection. Up arrow signals could be used to reinforce the turn prohibition.

The eastbound left turn to northbound Wildhorse Rd., which is currently protected for the duration of the eastbound through signal phase, would likely receive permissive phasing once westbound traffic also uses this intersection. At present, there does not appear to be sufficient demand to justify a protected, green arrow left turn phase for this movement.

Table IP-30 summarizes the traffic operations of this first phase at US 50 and Pueblo Blvd. Both intersections are forecast to operate at LOS B during the morning rush hour in 2013, changing to LOS C by the morning rush hour of 2017. During the 2013 evening rush hour, the main intersection is expected to operate at LOS D while the north (jughandle) intersection operates at LOS C. By the 2017 evening peak hour, however, LOS at the main intersection would fall to E, with westbound through traffic experiencing LOS F conditions.

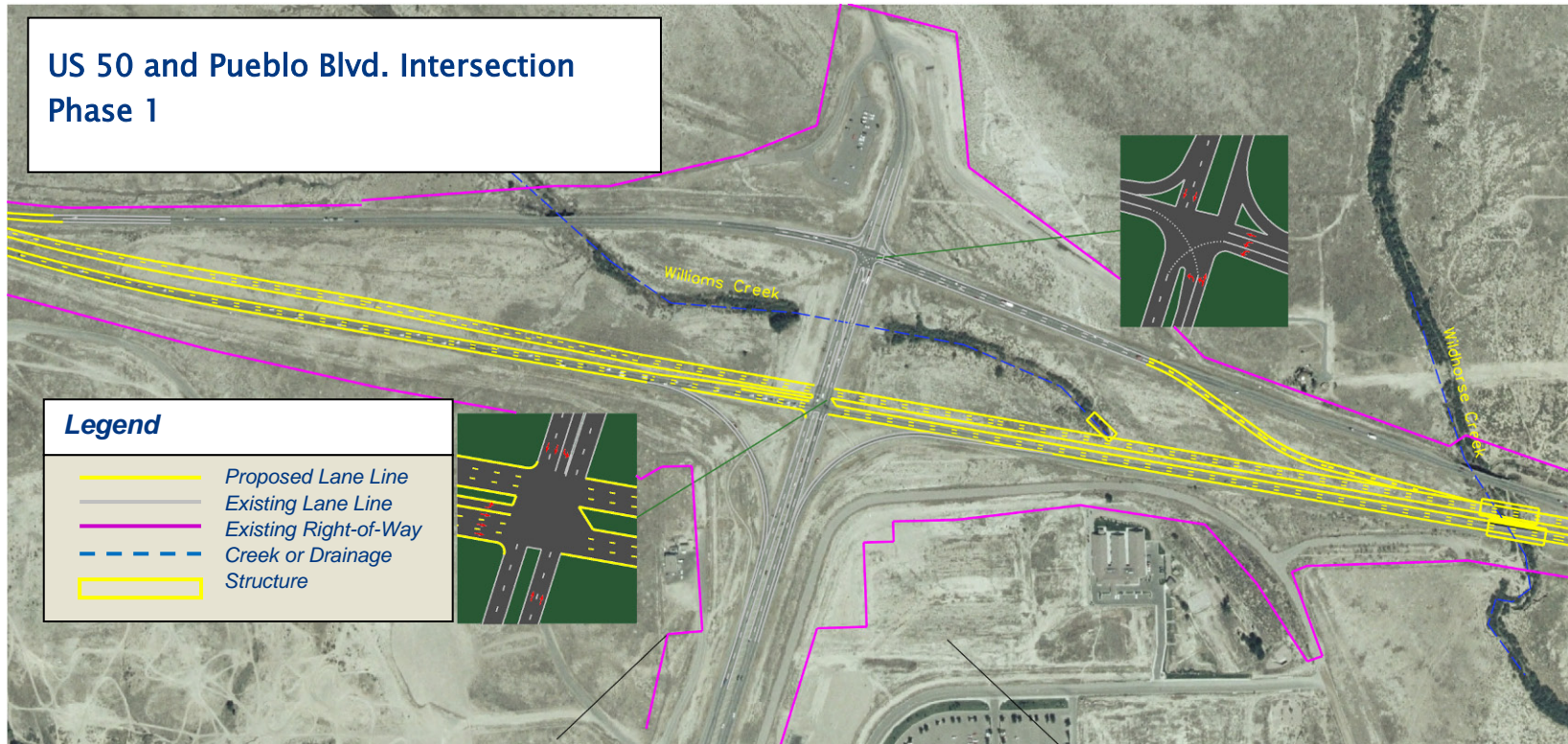


Figure IP-12. Phase 1 Improvements at US 50 and Pueblo Blvd.

Table IP-30. Traffic Operations of Phase 1 Pueblo Blvd. Intersection

Year	Inter-section	Morning Peak Hour			Evening Peak Hour		
		Inter-section LOS	Any US 50 Movement at LOS F?	Any Pueblo Blvd. Approach at LOS F?	Inter-section LOS	Any US 50 Movement at LOS F?	Any Pueblo Blvd. Approach at LOS F?
2013	North	B	No	No	C	No	No
	Main	B	No	No	D	No	No
2015	North	B	No	No	C	No	No
	Main	C	No	No	D	No	No
2017	North	C	No	No	C	No	No
	Main	C	No	No	E	Yes	No

Source: JFSA, 2011

Note: **Bold red** text indicates operations inconsistent with the study Purpose and Need.

Phase 2: Additional Northbound Pueblo Blvd. Lane

The Phase 2 improvement here is to add a third northbound through lane to Pueblo Blvd. at the main intersection. North of the intersection, the third lane would become a dedicated through lane to Wildhorse Rd., while the current shared left turn and through lane would become a dedicated left turn lane. **Figure IP-13** shows each of these improvements. The additional northbound lane allows green signal time to be given to the eastbound and westbound US 50 movements.

Table IP-31 summarizes the traffic operations at US 50 and Pueblo Blvd. during this phase. During the morning rush hour, the main intersection is expected to operate at LOS C and the north intersection at LOS B from 2017 to 2023. During the evening rush hour, the main intersection would operate at LOS D and the north intersection would operate at LOS C until 2023, when each drops a letter grade. During the 2023 evening rush hour, the westbound and northbound approaches both experience LOS F conditions. (Recall that at the main intersection, the through movement of these two directions is the only movement allowed.)

Table IP-31. Traffic Operations of Phase 2 Pueblo Blvd. Intersection

Year	Inter-section	Morning Peak Hour			Evening Peak Hour		
		Inter-section LOS	Any US 50 Movement at LOS F?	Any Pueblo Blvd. Approach at LOS F?	Inter-section LOS	Any US 50 Movement at LOS F?	Any Pueblo Blvd. Approach at LOS F?
2017	North	B	No	No	C	No	No
	Main	C	No	No	D	No	No
2019	North	B	No	No	C	No	No
	Main	C	No	No	D	No	No
2021	North	B	No	No	C	No	No
	Main	C	No	No	D	No	No
2023	North	B	No	No	D	No	No
	Main	C	No	No	E	Yes	Yes

Source: JFSA, 2011

Note: **Bold red** text indicates operations inconsistent with the study Purpose and Need.

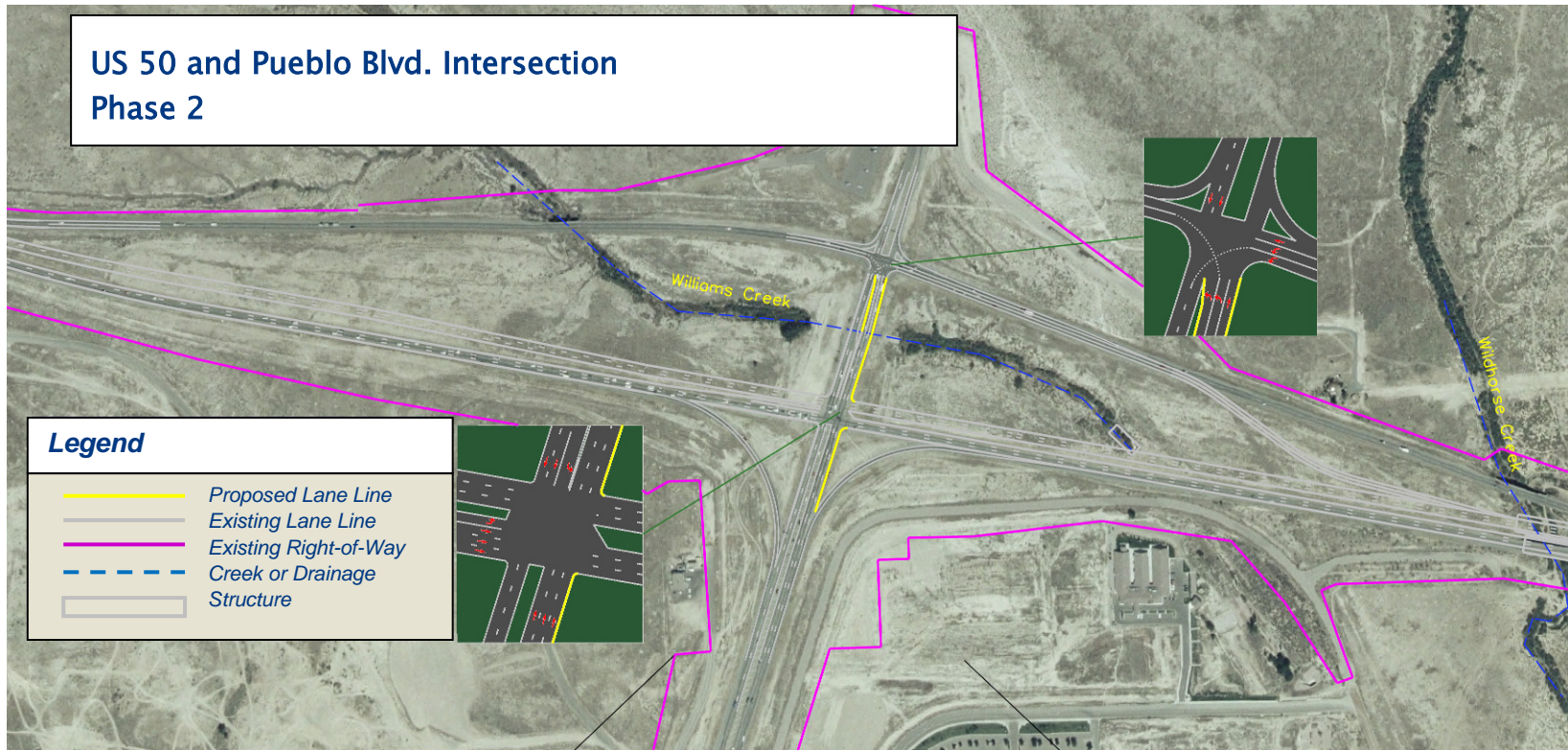


Figure IP-13. Phase 2 Improvements at US 50 and Pueblo Blvd.

Phase 3: Additional Northbound and Southbound Pueblo Blvd. Lanes

The Phase 3 improvement to the Pueblo Blvd. intersection adds a fourth northbound and third southbound through lane at the main intersection with US 50, as shown in **Figure IP-14**. The four northbound lanes become two left turn lanes and two through lanes at the north (jughandle) intersection. Wildhorse Rd. must also be widened to two lanes northbound for a sufficient distance for traffic to merge. (Also refer to **Table IP-12**, which shows that by 2023, around 500 vehicles make the northbound through movement to Wildhorse Rd. during the evening peak hour.) The third southbound lane could be merged before or dropped at the Spaulding Ave. intersection.

Table IP-32 shows the traffic operations at the two Pueblo Blvd. intersections after the Phase 3 improvements. In 2023, the main intersection is anticipated to operate at LOS C during either peak hour, while the north (jughandle) intersection would operate at LOS B during the morning rush hour and LOS C during the evening rush hour. In 2025, the north (jughandle) intersection would operate at LOS C during either peak hour. That same year, the main intersection would experience LOS C conditions during the morning peak hour and LOS D conditions in the evening.

Table IP-32. Traffic Operations of Phase 3 Pueblo Blvd. Intersection

Year	Inter-section	Morning Peak Hour			Evening Peak Hour		
		Inter-section LOS	Any US 50 Movement at LOS F?	Any Pueblo Blvd. Approach at LOS F?	Inter-section LOS	Any US 50 Movement at LOS F?	Any Pueblo Blvd. Approach at LOS F?
2023	North	B	No	No	C	No	No
	Main	C	No	No	C	No	No
2025	North	C	No	No	C	No	No
	Main	C	No	No	D	No	No

Source: JFSA, 2011

Note: **Red text** (not present in this table) would indicate operations inconsistent with the study Purpose and Need.

As will be seen, the need for the Pueblo Blvd. Extension in 2027 is established by traffic operations at Baltimore Ave. Once Pueblo Blvd. is extended to the north in 2027, a minimum of a diamond interchange is required, although it may be advantageous to build the final diverging diamond interchange configuration at this time. The diverging diamond interchange for Pueblo Blvd. and US 50 is shown in **Figure IP-15**.

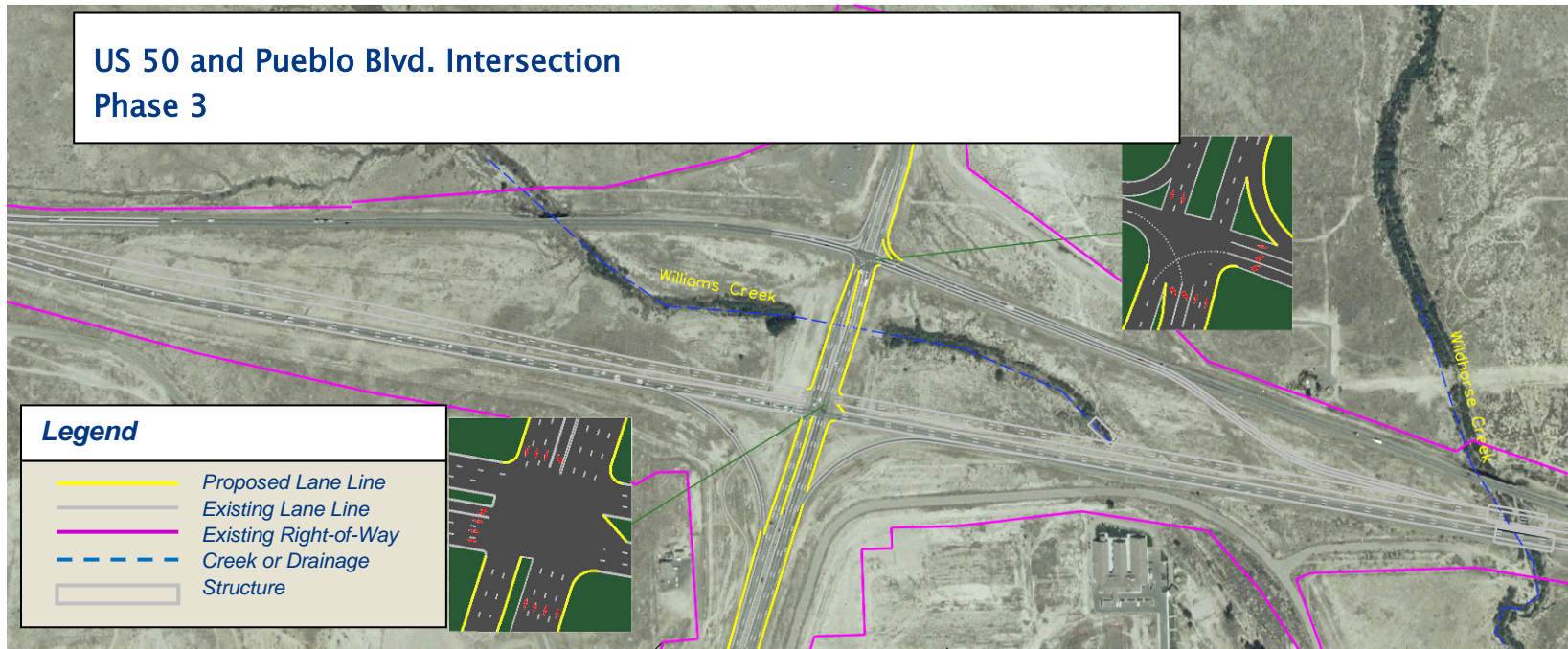
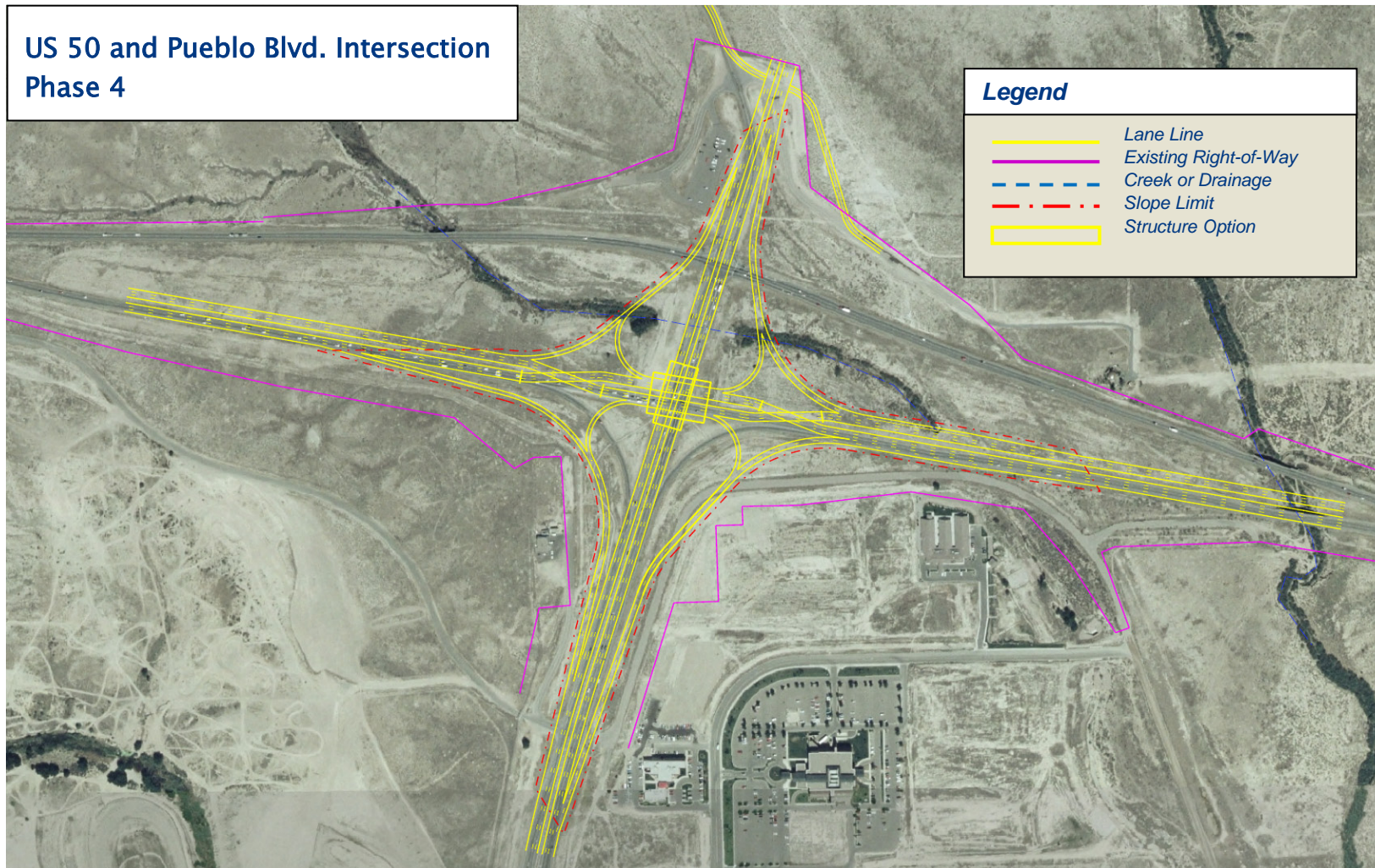


Figure IP-14. Phase 3 Improvements at US 50 and Pueblo Blvd.



Note: The question of whether US 50 will pass over or under Pueblo Blvd. will be decided as part of future design and NEPA clearance processes.

Figure IP-15. Final Phase of Improvements at US 50 and Pueblo Blvd.

Wills Blvd.

US 50 at Wills Blvd. currently has three eastbound through lanes and two westbound through lanes. Both directions of US 50 have dedicated left turn and right turn lanes. Construction scheduled for later this year will create a third westbound through lane on US 50. Both of the Wills Blvd. approaches have three lanes, one for each of the left turn, through, and right turn movements.

Table IP-33 shows that the US 50 and Wills Blvd. intersection currently operates at LOS A during either peak hour and is expected to continue to do so through 2019. In fact, the intersection is forecast to operate at LOS A during the morning rush hour through the study horizon of 2035. However, during the evening peak hour, the LOS would fall to B in 2021 and C in 2025.

Table IP-33. Traffic Operations at US 50 and Wills Blvd. Intersection

Year	Morning Peak Hour			Evening Peak Hour		
	Intersection LOS	Any US 50 Movement at LOS F?	Any Wills Blvd. Approach at LOS F?	Intersection LOS	Any US 50 Movement at LOS F?	Any Wills Blvd. Approach at LOS F?
2011	A	No	No	A	No	No
2013	A	No	No	A	No	No
2015	A	No	No	A	No	No
2017	A	No	No	A	No	No
2019	A	No	No	A	No	No
2021	A	No	No	B	No	No
2023	A	No	No	B	No	No
2025	A	No	No	C	No	No
Pueblo Blvd. Extension Built by 2027						
2027	A	No	No	A	No	No
2029	A*	No	No	A*	No	No
2031	A*	No	No	A*	No	No
2033	A*	No	No	B*	No	No
West Pueblo Connector Built by 2033 or 2035						
2033	A*	No	No	B*	No	No
2035	A*	No	No	B*	No	No

Source: JFSA, 2011

Notes: * LOS is calculated assuming left arrow signal heads are provided on Wills Blvd., allowing for protected and permitted left turn phasing. These signal heads improve the LOS of the northbound and southbound left turn movements—which would otherwise be F—while resulting in little change to the Wills Blvd. approach LOS.

Bold red text (not present in this table) would indicate operations inconsistent with the study Purpose and Need.

After the Pueblo Blvd. Extension is built in 2027, the evening peak hour LOS returns to A through 2031. Around 2029, one improvement may be justified, though not required by the study Purpose and Need. With Wills Blvd. only having circular green traffic signals, left-turning traffic would have to wait longer as traffic volumes build over time. Left arrow signals with protected and permissive phasing would allow the delay to be more equitably split between Wills Blvd. left-turning traffic and through traffic.

In 2033, the evening peak hour LOS is expected to be B before the West Pueblo Connector is built. **Table IP-33** shows that the impact of the West Pueblo Connector on traffic operations here isn't large enough to result in an LOS letter grade change. The evening peak hour LOS would be B in 2033 and 2035 with the West Pueblo Connector.

Baltimore Ave.

As discussed in **Section 7**, the need for the Pueblo Blvd. Extension and West Pueblo Connector is driven by the LOS at US 50 and Baltimore Ave. The existing intersection here has a left turn lane, three through lanes, and a right turn lane on either direction of US 50. The northbound Baltimore Ave. approach has two left turn lanes, a through lane, and a free-flow right turn lane to eastbound US 50. The southbound Baltimore Ave. approach has two left turn lanes and a shared through and right turn lane. CDOT is investigating the possibility of purchasing additional ROW for one more southbound lane.

Table IP-34 shows the traffic operations of the existing US 50 and Baltimore Ave. intersection. The intersection currently operates at LOS C during the morning rush hour and LOS B during the evening rush hour. The intersection is expected to continue operating at LOS C in the morning through 2017. The evening peak hour LOS is expected to be C from 2013 through 2019, and then D through 2027. LOS D conditions are expected during the morning peak hour of 2019 through 2025. In 2027, the morning rush hour LOS drops to E and no longer meets the Purpose and Need criteria. Also, the southbound approach operates at LOS F during the 2027 morning peak hour. These deficiencies establish that the Pueblo Blvd. Extension to Platteville Blvd. is needed by 2027.

Once the Pueblo Blvd. Extension is completed, the 2027 LOS for each peak hour raises a letter grade, to D in the morning and C in the evening. In 2029, LOS D conditions are expected during both peak hours. However, during the 2029 morning rush, the southbound approach operates at LOS F, indicating the need for additional improvements.

Table IP-34. Traffic Operations at US 50 and Baltimore Ave. Intersection

Year	Morning Peak Hour			Evening Peak Hour		
	Intersection LOS	Any US 50 Movement at LOS F?	Any Wills Blvd. Approach at LOS F?	Intersection LOS	Any US 50 Movement at LOS F?	Any Wills Blvd. Approach at LOS F?
2011	C	No	No	B	No	No
2013	C	No	No	C	No	No
2015	C	No	No	C	No	No
2017	C	No	No	C	No	No
2019	D	No	No	C	No	No
2021	D	No	No	D	No	No

Year	Morning Peak Hour			Evening Peak Hour		
	Intersection LOS	Any US 50 Movement at LOS F?	Any Wills Blvd. Approach at LOS F?	Intersection LOS	Any US 50 Movement at LOS F?	Any Wills Blvd. Approach at LOS F?
2023	D	No	No	D	No	No
2025	D	No	No	D	No	No
2027	E	No	Yes	D	No	No
Pueblo Blvd. Extension Needed by 2027						
2027	D	No	No	C	No	No
2029	D	No	Yes	D	No	No

Source: JFSA, 2011

Notes: **Bold red** text indicates operations inconsistent with the study Purpose and Need.

The study team considered four options affecting operations at US 50 and Baltimore Ave. in an attempt to balance the potential impacts at the intersection itself against those associated with the West Pueblo Connector. Three options make improvements at the intersection first, while one, Option 2, assumes the West Pueblo Connector is built before making improvements at US 50 and Baltimore Ave. The four options considered are:

1. Additional through lanes on Baltimore Ave.
2. Early completion of the West Pueblo Connector
3. Reallocation of the existing southbound approach lanes
4. Addition of a single southbound lane

The effect each option has on the intersection LOS is described in the following sections. The study team chose not to recommend any particular option because of uncertainty of future development in the area and to allow the most flexibility in implementation.

Option 1: Additional Baltimore Ave. Through Lanes

Option 1 brings each Baltimore Ave. approach to five lanes: two left turn lanes, two through lanes, and a right turn lane, as shown in **Figure IP-16**. This option requires the most ROW. In the northeast corner of the intersection, ROW is constrained by the parking and landscaping requirements of Pueblo zoning codes. Acquiring additional ROW in this corner would likely require purchasing the whole parcel outright. Alternatively, ROW may be available in the northwest corner, which is currently a Toyota dealership. There has been some speculation about whether the Toyota dealer plans to move in the future but not of enough certainty to make assumptions for this Implementation Plan.

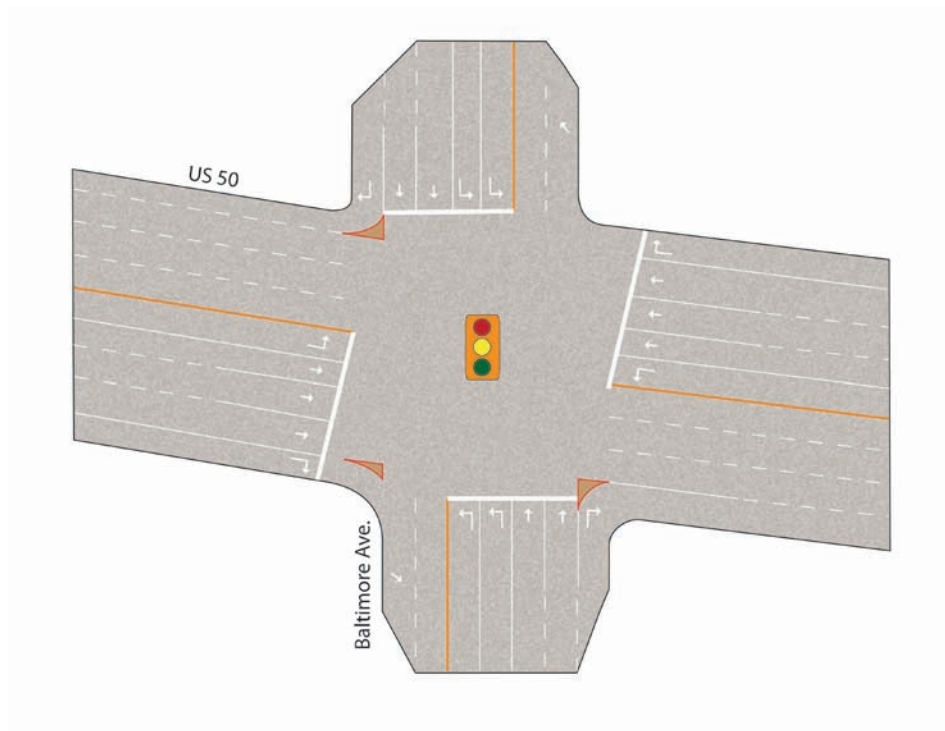


Figure IP-16. US 50 and Baltimore Ave. Intersection Improvements for Option 1

Table IP-35 shows that with the Option 1 improvements, the Baltimore Ave. intersection operates at LOS C during the morning peak hour in 2029 and LOS D during the evening peak hour. In 2031 and 2033, the LOS of either peak hour is D. However, during the 2033 morning rush hour, the westbound left movement and the southbound approach both experience LOS F conditions. Completing the West Pueblo Connector by 2033 ensures that the intersection will meet the Purpose and Need criteria through 2035.

Table IP-35. Traffic Operations for Baltimore Ave. Intersection Option 1

Year	Morning Peak Hour			Evening Peak Hour		
	Intersection LOS	Any US 50 Movement at LOS F?	Any Baltimore Ave. Approach at LOS F?	Intersection LOS	Any US 50 Movement at LOS F?	Any Baltimore Ave. Approach at LOS F?
2029	C	No	No	D	No	No
2031	D	No	No	D	No	No
2033	D	Yes	Yes	D	No	No
West Pueblo Connector Needed by 2033						
2033	D	No	No	D	No	No
2035	D	No	No	D	No	No

Source: JFSA, 2011

Notes: **Bold red** text indicates operations inconsistent with the study Purpose and Need.

Option 2: Early Completion of the West Pueblo Connector

Option 2 was motivated by a desire to see if further improvements at US 50 and Baltimore Ave. would be unnecessary after the Pueblo Blvd. Extension and West Pueblo Connector were completed. Therefore, it assumed completion of the West Pueblo Connector in 2029. **Table IP-36** shows traffic operations of the existing US 50 and Baltimore Ave. intersection with both local improvement projects in place.

**Table IP-36. Traffic Operations for Baltimore Ave. Intersection
Option 2 with West Pueblo Connector**

Year	Morning Peak Hour			Evening Peak Hour		
	Intersection LOS	Any US 50 Movement at LOS F?	Any Baltimore Ave. Approach at LOS F?	Intersection LOS	Any US 50 Movement at LOS F?	Any Baltimore Ave. Approach at LOS F?
2029	D	No	No	C	No	No
2031	D	No	No	C	No	No
2033	D	No	No	D	No	Yes*
2035	E	No	Yes	D	No	Yes*

Source: JFSA, 2011

Notes: * Excludes an unusually high (more than half of the total approach volume) northbound right movement—which is provided a free-flowing turn channel—from calculation of the northbound approach LOS.
Bold red text indicates operations inconsistent with the study Purpose and Need.

During the morning peak hour, the intersection is expected to operate at LOS D from 2029 through 2033, and at LOS E in 2035. Both approaches of Baltimore Ave. operate at LOS F during the 2035 morning rush hour. This congestion is driven by the relatively high volumes of the northbound left turn and southbound through movement.

The evening peak hour LOS is expected to be C in 2029 and 2031, and D in 2033 and 2035. However, in 2033 and 2035, both the northbound left and through movements operate at LOS F during the evening peak hour. The LOS for the northbound approach is D because the northbound left and through delay is averaged with a large number of right-turning vehicles that experience minimal delay through the free-flow turn. The study team thought that the right-turning traffic—which accounts for more than half of the northbound approach volume—obscured serious operational deficiencies for other traffic. Therefore, the team concluded that improvements would be required by 2033 at Baltimore Ave. even with the West Pueblo Connector.

The intersection improvement selected for this option was to add a lane to the southbound approach so that two lanes could be used through the intersection, as shown on **Figure IP-17**. **Table IP-37** shows that these improvements would result in LOS D operation during either peak hour in 2033 or 2035.

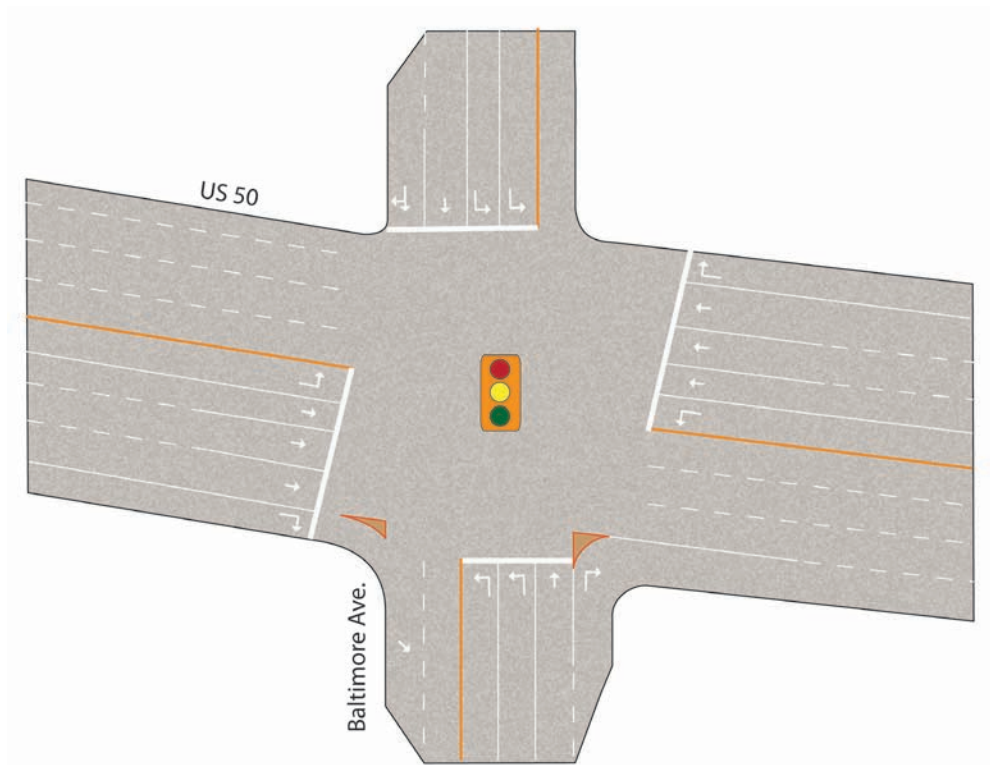


Figure IP-17. US 50 and Baltimore Ave. Intersection Improvements for Option 2

Table IP-37. Traffic Operations for Baltimore Ave. Intersection
Option 2 with Intersection Improvements

Year	Intersection LOS	Morning Peak Hour		Evening Peak Hour		
		Any US 50 Movement at LOS F?	Any Baltimore Ave. Approach at LOS F?	Intersection LOS	Any US 50 Movement at LOS F?	Any Baltimore Ave. Approach at LOS F?
2033	D	No	No	D	No	No
2035	D	No	No	D	No	No

Source: JFSA, 2011

Notes: **Bold red text** (not present in this table) would indicate operations inconsistent with the study Purpose and Need.

Option 3: Reallocated Southbound Approach Lanes

Option 3 assumes no additional ROW is available at US 50 and Baltimore Ave. It converts the middle of the existing three southbound lanes from an exclusive left turn lane to a shared left and through lane. This conversion also requires that the southbound receiving lane for the free-flow eastbound right turn now receive traffic from the second southbound through lane. Therefore the eastbound free-flow right turn would be eliminated. The Option 3 configuration is shown in **Figure IP-18**.

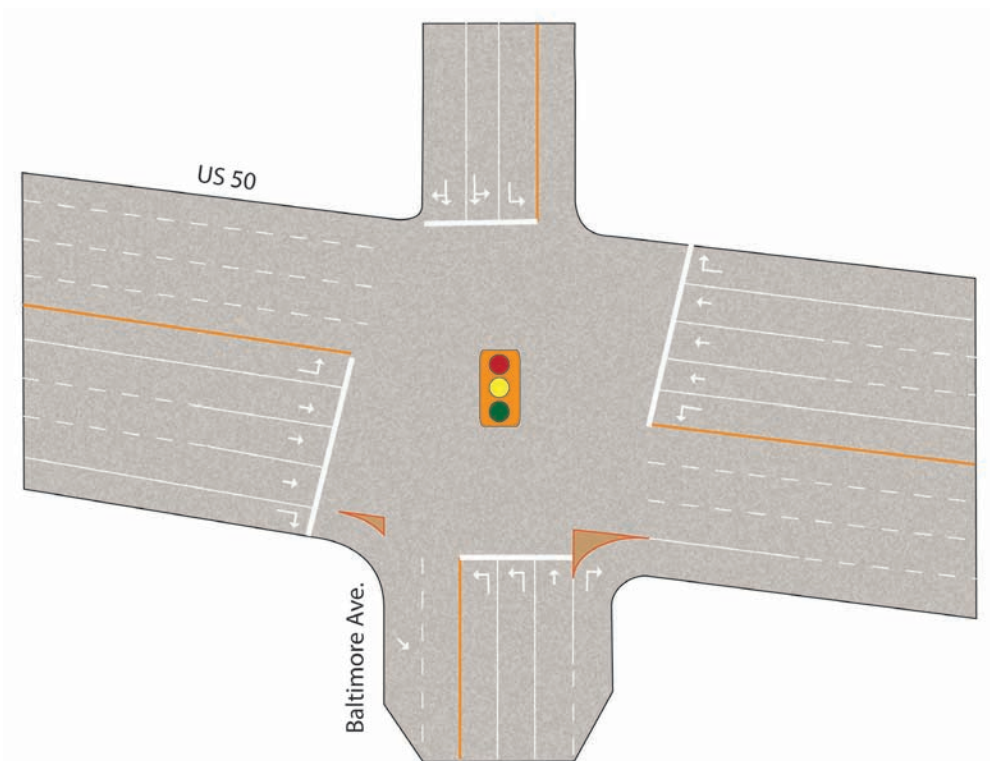


Figure IP-18. US 50 and Baltimore Ave. Intersection Improvements for Option 3

Because of the combined southbound left and through turn lane, the northbound and southbound approaches here would need to use split signal phasing, where all northbound movements get green signals at one time, then all southbound movements get green signals at a different time.

Table IP-38 shows that after constructing Option 3 in 2029, the LOS during either peak hour would be D that year and in 2031. However, the evening peak hour LOS is expected to fall to E in 2033, when the West Pueblo Connector would be needed. Once the West Pueblo Connector is built, LOS D is expected during either peak hour.

Table IP-38. Traffic Operations for Baltimore Ave. Intersection Option 3

Year	Intersection LOS	Morning Peak Hour		Evening Peak Hour		
		Any US 50 Movement at LOS F?	Any Baltimore Ave. Approach at LOS F?	Intersection LOS	Any US 50 Movement at LOS F?	Any Baltimore Ave. Approach at LOS F?
2029	D	No	No	D	No	No
2031	D	No	No	D	No	No
2033	D	No	No	E	No	No
West Pueblo Connector Needed by 2033						
2033	D	No	No	D	No	No
2035	D	No	No	D	No	No

Source: JFSA, 2011

Notes: **Bold red text** indicates operations inconsistent with the study Purpose and Need.

Option 4: Additional Southbound Approach Lane

Option 4 assumes that CDOT completes its plan to acquire ROW for an additional southbound lane. The four southbound lanes would be allocated as two exclusive left turn lanes, an exclusive through lane, and a shared through and right turn lane, as shown in **Figure IP-19**. This is the same configuration as Option 2, with the difference being the timing of improvements. For Option 2, the West Pueblo Connector is built before improvements are made at US 50 and Baltimore Ave. For Option 4, improvements are made at US 50 and Baltimore Ave. first.

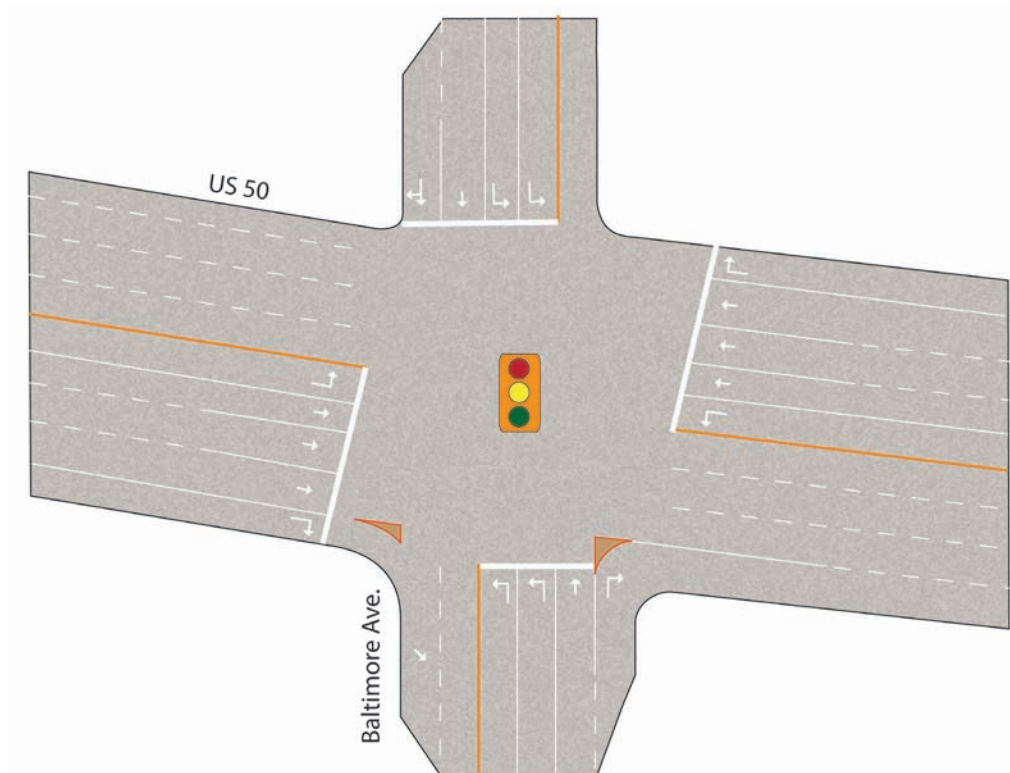


Figure IP-19. US 50 and Baltimore Ave. Intersection Improvements for Option 4

Table IP-39 summarizes the traffic operations for Option 4. In 2029, the intersection is forecasted to operate at LOS C during the morning rush hour and LOS D during the evening rush hour. In 2031 and 2033, LOS D conditions are anticipated during either peak hour. However, in 2035 the intersection would no longer operate within the Purpose and Need criteria. During the morning peak hour, the northbound left and through movements would operate at LOS F. During the 2035 evening peak hour, the intersection is expected to operate at LOS E. Therefore, with Option 4, the West Pueblo Connector would be needed by 2035.

Table IP-39. Traffic Operations for Baltimore Ave. Intersection Option 4

Year	Morning Peak Hour			Evening Peak Hour		
	Intersection LOS	Any US 50 Movement at LOS F?	Any Baltimore Ave. Approach at LOS F?	Intersection LOS	Any US 50 Movement at LOS F?	Any Baltimore Ave. Approach at LOS F?
2029	C	No	No	D	No	No
2031	D	No	No	D	No	No
2033	D	No	No	D	No	No
2035	D	No	Yes*	E	No	No
West Pueblo Connector Needed by 2035						
2035	D	No	No	D	No	No

Source: JFSA, 2011

Notes: * Excludes an unusually high (more than half of the total approach volume) northbound right movement—which is provided a free-flowing turn channel—from calculation of the northbound approach LOS.

Bold red text indicates operations inconsistent with the study Purpose and Need.

9. How was the timing of mainline improvements determined?

The timing of mainline improvements was determined by considering both traffic operations between intersections and when intersections at both ends of a segment need more through lanes. Generally, improvements need to be made to eastern intersections before western intersections; therefore, the western intersection of a segment is the one determining when widening may be needed. **Table IP-40** shows when the Purpose and Need criteria would no longer be met for three segments identified for six-lanes by the Preferred Alternative. The segment between Wills Blvd. and Baltimore Ave. already has three lanes eastbound and is scheduled to get three lanes westbound as a result of a construction project planned for later this year. Therefore, this easternmost segment is not shown in **Table IP-40**.

The third column of **Table IP-40** shows when eastbound mainline US 50 LOS becomes E during the morning rush hour. The fourth column shows the similar year based on westbound travel in the evening. Note that mainline considerations show a need for three lanes in either direction no sooner than 2029. In contrast, the fifth column of **Table IP-40** shows that improvements are needed soon at Purcell Blvd. and Pueblo Blvd., as discussed in **Section 8**. The timing for widening US 50 between Main McCulloch Blvd. and Purcell Blvd. is also driven by the need for three through lanes in either direction at the Main McCulloch Blvd. intersection in 2025.

Table IP-40. Timing of Mainline Improvements

US 50 Mainline Segment		Earliest Need for 3 Lanes Based on		Year 3 Through Lanes Needed at West Intersection	Year Selected for Widening
West Intersection	East Intersection	Morning Peak Hour Eastbound	Evening Peak Hour Westbound		
Main McCulloch Blvd.	Purcell Blvd.	After 2035	After 2035	2025	2025
Purcell Blvd.	Pueblo Blvd.	2029	2033	2013	2013
Pueblo Blvd.	Wills Blvd.	After 2035	2031	2013	2013

Source: JFSA, 2011

10. How were individual improvements prioritized?

The improvement projects or phases were prioritized solely by traffic need. Because the traffic operations analysis established the year each phase would be needed based on the traffic forecasts, the priorities were determined by sorting the improvement projects by the year they are needed. Because the traffic operations and signal warrant analysis did not establish clear dates for the improvements to the Swallows Rd. and West McCulloch Blvd. improvements, these projects are excluded from the main prioritization and tabulated separately. The relatively low cost of the improvements at these two intersections give them great flexibility regarding when they are built.

11. What is the Corridor-wide list of improvement priorities?

Table IP-41 shows the prioritized list of transportation improvement projects to address corridor congestion, safety, and other issues. **Table IP-42** shows three more flexible, lower cost projects.

Of the 14 projects shown in **Table IP-41**, 12 make improvements in the US 50 Corridor itself and the remaining two are off-corridor local improvement projects; that is, the Pueblo Blvd. Extension (sequence 8) and the West Pueblo Connector (sequence 14). The sequence number in the left column indicates the order in which the projects are expected to be built based on their timing to maintain traffic operations within the Purpose and Need criteria (the second column) and the relative levels of need for improvements at different locations within the same year. Estimates of the time required to design and construct the improvements are listed in the third and fourth columns, respectively. The time when design needs to begin so that an improvement is completed before it is needed is calculated based on the information in the second, third, and fourth columns. **Section 17** describes some of the assumptions that were used to calculate the design and construction duration.

The fifth column is the location of the improvements (for example, at an intersection or along a stretch of the highway). The sixth column briefly describes the improvements associated with each project. Multimodal improvements would also be made in conjunction with highway improvements in the same area. The seventh column indicates that ROW is needed for the two local improvement projects, for multimodal improvements, and possibly at the Baltimore Ave. intersection, depending on the improvement option selected. The final column provides the construction cost estimate, not including any ROW costs. Design costs, which are typically 10 percent of construction costs, are also not included in the construction cost estimates.

Before any improvements in **Table IP-41** are built, MS4 requirements must be built for the whole US 50 Corridor. These improvements would likely involve detention ponds near Turkey Creek, Williams Creek, and Wild Horse Creek. Sufficient ROW should be available for these ponds near Pueblo Blvd., although additional ROW may be required near Swallows Rd. for the Turkey Creek pond(s).

Table IP-41 shows that the top priority is to widen US 50 to six lanes east of Pueblo Blvd. and to convert the Pueblo Blvd. intersection into a jughandle. The next highest priority is to widen US 50 to six lanes between Purcell Blvd. and Pueblo Blvd. The first improvement at Main McCulloch Blvd. involves widening and a jughandle, at sequence 7. Improvements at Baltimore Ave. are prioritized as sequence 11.

Note that these sequences are based on the traffic operation needs established from the turning movement forecasts discussed in **Section 6**. Traffic counts should be made to confirm operation needs before beginning any construction project. CDOT's regular count program will also identify changing traffic patterns that may indicate a need to revisit the priorities.



Table IP-41. Corridor-wide Sequence of Transportation Improvement Priorities

Seq.	Year of Critical LOS Failure without Improvements ¹	Estimated Design Duration	Estimated Construction Duration	Location	Transportation Improvement Description ²	Is ROW needed? ²	Construction Cost Estimate (Current \$)
1	2013	2 y 3 mon ³	1 y 6 mon	Diverge point west of Pueblo Blvd. to Wills Blvd.	<ul style="list-style-type: none"> Widen EB US 50 to three lanes² Widen WB US 50 east of the BNSF crossing to three lanes Construct three WB lanes to north of EB lanes in vicinity of Pueblo Blvd. Convert existing WB lanes to jughandles 	No ²	\$16.2 million
2	2013	1 y 6 mon	1 y	West of Purcell Blvd. to diverge point west of Pueblo Blvd.	<ul style="list-style-type: none"> Construct third EB and WB lanes on US 50² 	No ²	\$9.8 million
3	2017	2 y 3 mon ⁴	3 mon	At Pueblo Blvd.	<ul style="list-style-type: none"> Construct third NB lane at intersection with mainline US 50 Construct a dedicated through lane at intersection with a jughandle 	No	\$600,000
4	2021	1 y 6 mon ⁴	6 mon	At Purcell Blvd.	<ul style="list-style-type: none"> Construct a jughandle in NW and NE quadrants (future diamond ramps) Construct third SB through lane at mainline US 50 intersection 	No	\$3.4 million
5	2023	2 y 3 mon ⁴	3 mon	At Pueblo Blvd.	<ul style="list-style-type: none"> Construct fourth NB lane and third SB lane at intersection with mainline US 50 Continue new NB lane as a second through lane past the north (jughandle) intersection 	No	\$1.0 million
6	2023	1 y 6 mon ⁴	6 mon	At Purcell Blvd.	<ul style="list-style-type: none"> Construct a jughandle in SW and SE quadrants to create an "at-grade" diamond" 	No	\$3.7 million
7	2025	1 y 6 mon	1 y 3 mon	West of Main McCulloch Blvd. to west of Purcell Blvd.	<ul style="list-style-type: none"> Widen US 50 to three lanes each direction² Construct noise wall SW of Main McCulloch Blvd. intersection Construct a jughandle (future diamond ramp) in NE quadrant of intersection Convert second NB and SB left to SB through lane 	No ²	\$18.0 million



US 50 West PEL Study: Swallows Rd. to Baltimore Ave.

Seq.	Year of Critical LOS Failure without Improvements ¹	Estimated Design Duration	Estimated Construction Duration	Location	Transportation Improvement Description ²	Is ROW needed? ²	Construction Cost Estimate (Current \$)
8	2027	6 y ^{3,5}	4 y ⁵	Off US 50	• Construct Pueblo Blvd. Extension to Platteville Blvd.	Yes	N/C ⁵
9	2027	2 y 3 mon ⁴	1 y 9 mon	At Pueblo Blvd.	• Construct diverging diamond interchange	No	\$27.0 million
10	2029	1 y 6 mon ⁴	6 mon	At Main McCulloch Blvd.	• Construct a jughandle in SW and SE quadrants (optionally complete diamond interchange)	No	\$3.1 million (for jughandle)
11	2029	1 y 6 mon ⁴	6 mon	At Purcell Blvd.	• Construct grade separation to complete the diamond interchange	No	\$11.3 million
12	2029 to 2035 ⁶	6 y ^{3,5}	3 y ⁵	Off US 50	• Construct West Pueblo Connector	Yes	N/C ⁵
13	2029	1 y 6 mon	TBD	At Baltimore Ave.	• To be determined from four options	TBD	TBD
14	2033	1 y 6 mon ⁴	6 mon	At Main McCulloch Blvd.	• Construct diamond interchange (if not completed by 2029)	No	\$16.2 million

Notes: Corridor-wide MS4 requirements would need to be built before any improvement project could begin. These requirements are estimated to cost \$2 to 3 million and require additional ROW near Swallows Rd. and Turkey Creek.

This list does not include an independent utility project to construct a third westbound lane in the vicinity of Wills Blvd., already scheduled for Fall 2012.

¹ Improvements (or portions of thereof) could be completed sooner as funding becomes available. There may be additional benefits to constructing the two off-US 50 improvements, the Pueblo Blvd. Extension and the West Pueblo Connector, sooner because they would provide alternate routes during construction on US 50.

² Complimentary accommodation of pedestrian and bicycle facilities would occur as corresponding improvements are made to US 50. Additional ROW would be required for pedestrian and bicycle facilities. These facilities are estimated to cost a total of \$12 to \$14 million.

³ Duration is uncertain because of the time required to coordinate with railroads.

⁴ Many design activities are completed during the first phase of improvements at each location.

⁵ No exact estimates were made for the design and construction duration or the construction cost for the two off-US 50 improvements because other studies beyond the scope of this PEL Study would be required.

⁶ The timing of the West Pueblo Connector depends on the improvements made at US 50 and Baltimore Ave.

Abbreviations: EB = eastbound LOS = Levels of Service mon = month(s) NB = northbound N/C = not calculated NE = northeast NW = northwest
 ROW = right-of-way SB = southbound SE = southeast Seq. = sequence SW = southwest TBD = to be determined WB = westbound y = year(s)

The three flexible improvement projects in **Table IP-42** involve installing traffic signals at the two currently unsignalized intersections in the Corridor and creating separate left and right turn lanes at Swallows Rd. Compared to many of the improvement projects prioritized in **Table IP-41**, these projects have relatively low costs and might be built with federal safety funds.

Table IP-42. Flexible, Low-Capital Improvements

Location	Improvement Description	Is ROW needed?	Construction Cost Estimate (Current \$)
At West McCulloch Blvd.	<ul style="list-style-type: none"> Install traffic signals (optionally add pavement barriers to form "Florida T") 	No	\$1 million or less (signals only)
At Swallows Rd.	<ul style="list-style-type: none"> Construct separate NB left and right turn lanes 	No	\$300,000
At Swallows Rd.	<ul style="list-style-type: none"> Install traffic signals (optionally add pavement barriers to form "Florida T") 	No	\$1 million or less (signals only)

Abbreviations: NB = northbound

ROW = right-of-way

12. Do US 50 improvements have to be built in this order or can the Implementation Plan change?

This Implementation Plan was developed based on the traffic operations needs resulting from certain traffic volume forecasts. If traffic volumes do not grow as forecast—they may grow more rapidly in one area and less rapidly at another location—then the Implementation Plan can and should be changed to respond to the evolving traffic needs. This Implementation Plan contains the detailed tables of traffic turning movement forecasts in **Section 6** so that they can easily be compared against traffic counts taken in the future.

Also, if funding becomes available, some phases may be built earlier than they are absolutely needed. Two phases in the same area might also be combined to gain efficiencies from only having to mobilize the construction workers and equipment once. Such a combination would also prevent the perception that a particular area is continually under construction. Safety issues or other considerations may also change the priority for a particular project.

13. How would the Implementation Plan be changed?

Before changing the Implementation Plan, CDOT would consult with its local governmental partners through existing coordination channels, such as the Pueblo Area Council of Governments' (PACOG's) Transportation Technical Committee and the bimonthly city and county coordination meetings that served as the Policy Advisory Team (PAT) for this PEL study. CDOT would present information on how traffic patterns have grown differently than expected and suggest some possible responses resulting in changes to the Implementation Plan. Local partners would have the opportunity to suggest other potential responses.

14. What safety improvements may be made with each project?

What safety improvements may be made with each project depends on the nature of that project. For example, a project to widen US 50 to six lanes might also install median barrier and flatten the side slopes of the grassy area beyond the roadway shoulders. Six-lane widening also provides an opportunity to bring shoulders up to current standards. Rumble strips might be cut into the shoulders if cars running off the road become a concern.

Another example of an associated safety improvement is that installing signals at Swallows Rd. or West McCulloch Blvd. provides an opportunity to add intersection lighting as well. Advance warning of stopped traffic—like the “be prepared to stop when flashing” signs at Pueblo Blvd.—may also be included with traffic signal projects.

Some types of safety improvements, such as intersection lighting, are a matter of good practice. Other improvements may be in response to specific safety needs. For example, guard rail may need to be placed around a particular obstacle close to the road. CDOT’s safety assessment procedures should be followed to identify cost-effective improvements.

15. What multimodal improvements may be made with each project?

The multimodal improvements identified by the Preferred Alternative include a multiple use pedestrian and bicycle path and the potential for park-and-ride lots. The multiple use path would be south of US 50 starting at Main McCulloch Blvd. and connecting to the existing sidewalk east of Wills Blvd. It would be built in conjunction with the six-lane widening projects (sequences 1, 2, and 7 of **Table IP-41**). While final park-and-ride lots are yet to be identified, they would most likely be associated with intersection improvements. When signals are installed at jughandle intersections, Swallows Rd., and West McCulloch Blvd., they would also have pedestrian signal heads with symbolic walk and don’t walk indicators. Crosswalk striping would be a cost-effective component of any intersection improvement.

16. Why are local improvement projects not included in the Implementation Plan?

While this Implementation Plan identifies times when the local improvement projects (the Pueblo Blvd. Extension and the West Pueblo Connector) are needed, they are not formally part of this plan, because they are not part of the state highway system and therefore are beyond CDOT’s jurisdiction. CDOT wants to provide its local governmental partners with the maximum flexibility to construct all or part of these local improvement projects according to their own timeline.

17. What happens next?

The first step to improving US 50 would be to conduct traffic counts because the traffic operations analyses (based on current forecasts from historical traffic counts) revealed that transportation improvements are needed right away. CDOT routinely measures traffic volumes in the Corridor. More recent traffic counts will allow the LOS analysis to be updated and may result in adjustments to the timing of improvement needs.

CDOT plans two related efforts to begin implementation of the US 50 improvements: One effort involves Corridor-wide planning activities; and the other is project specific and focuses on the first improvement project in the vicinity of Pueblo Blvd.

Corridor-wide planning

Corridor-wide planning activities include developing MS4 and Corridor design vision, as well as collecting data for future National Environmental Policy Act (NEPA) and design studies.

Current CDOT policy creates MS4 plans for an entire corridor or drainage basin, rather than on a project-specific basis. Therefore, these activities would occur before beginning any road construction project. Water quality ponds may be built as a stand-alone project before any construction begins, or combined with the first improvement project to US 50.

The Corridor design vision process would develop general design guidelines for the Corridor. CDOT would engage Corridor stakeholders to develop the Corridor design vision. The document would address general features such as architectural treatments, landscaping, and aesthetics. For example, the stakeholders may establish a color scheme to be used on US 50 bridges. The process might also establish whether any special structural details are used for street lights or overhead signs. The landscaping element might specify what types of plants would be used. Design guidelines might be chosen to complement the existing features in the Corridor, such as the rail tie fence in Pueblo West or the Pueblo West welcome sign at Main McCulloch Blvd. **Figure IP-20** illustrates how such design guidelines were used at the I-25 interchange with Eagleridge Blvd. in Pueblo.

Historical field surveys, soil sampling, and topographical surveys are some of the Corridor-wide data collection activities that will support future improvement projects. Historical field surveys involve examining structures and other objects to determine if they might be eligible for protection under federal law. Geotechnical engineers will examine soil samples in the lab to determine its structural, drainage, and other properties. The information they obtain will be used to determine the most appropriate pavement design for US 50. Pavement designers determine what thicknesses and materials to use for the various layers of pavement and base course (underlying pavement support). Various utilities in the Corridor will be located and marked so they can be included in the topographical survey. Locations of structures, trees, driveways, streams, and other features are also included in the topographical survey. That information allows roadway designers to establish horizontal and vertical alignments for future US 50, crossing streets, and interchange ramps.



Figure IP-20. Example of Design Guidelines Applied at I-25 and Eagleridge Blvd. Interchange

Project design

Figure IP-21 shows several categories of design tasks, including how long each task takes and the sequence in which tasks are completed. Before design can begin, various data needs to be collected, as discussed earlier. Data collection typically takes about three months. Preliminary design would first establish a general horizontal and vertical alignment. Traffic studies would confirm the need for lanes and establish details such as turn bay lengths. By drawing cross sections along the horizontal alignment, roadway designers establish the width of the highway and its embankment. When a footprint is established, typically after about three months of design, NEPA clearance can begin.

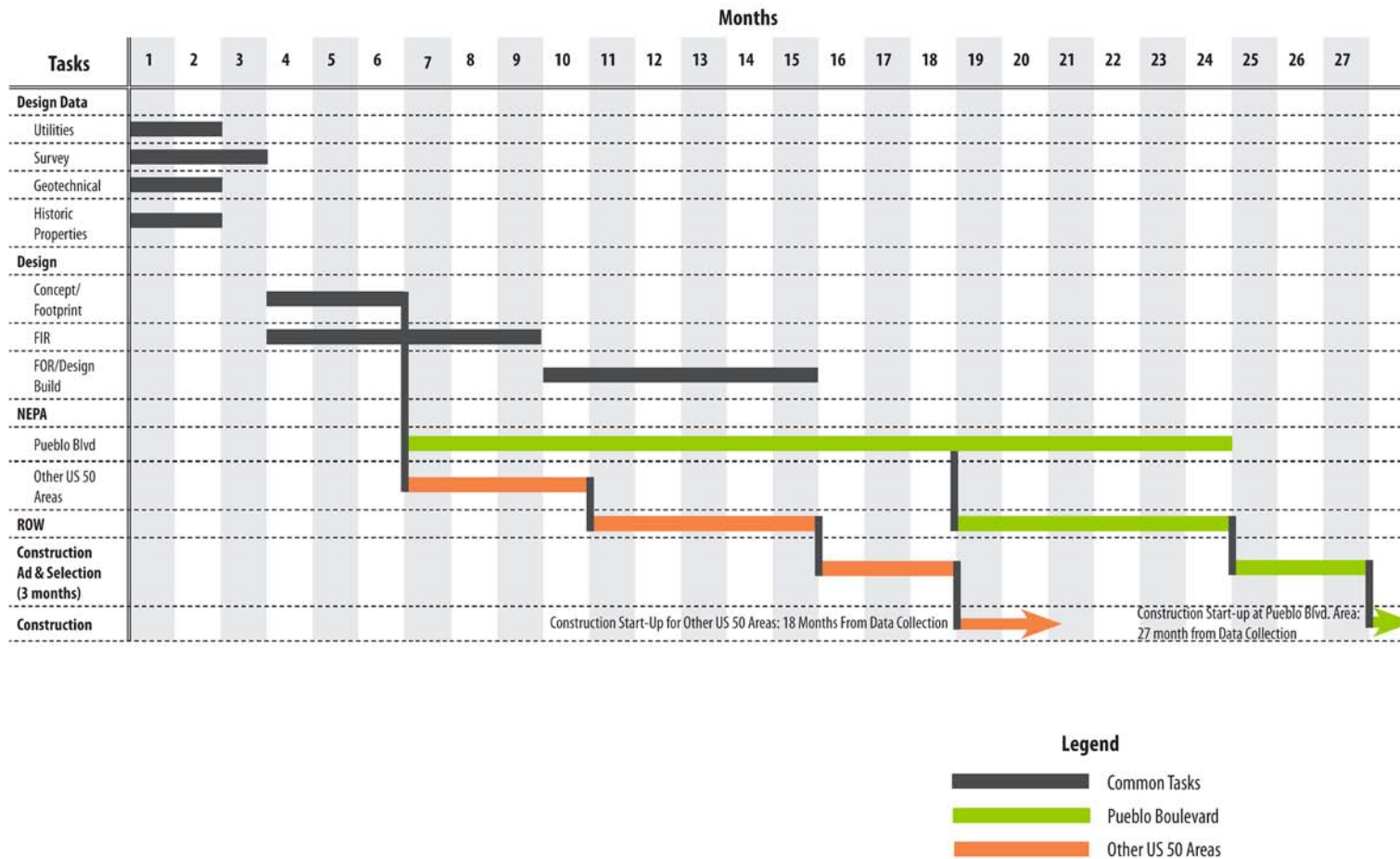
NEPA clearances for US 50 transportation improvements will most likely require a Categorical Exclusion (Cat. Ex.). This effort may include a documented Cat. Ex. at Pueblo Blvd., or possibly an Environmental Assessment, if warranted. The NEPA process will examine the environmental and community concerns identified in this PEL study in more detail. In areas where there are few or no environmental concerns, a simple Cat. Ex. may take about four months to complete. A documented Cat. Ex. for the Pueblo Blvd. intersection may require about 18 months to complete. Once funding for a construction project is obtained, CDOT and the Federal Highway Administration (FHWA) will make a decision on what type of NEPA document to prepare.

The Cat. Ex. document follows a government form (CDOT Form # 128) that has two main parts. The upper part is for environmental clearance actions, indicating that environmental concerns are understood and addressed. The lower part records the permits that CDOT must obtain before construction begins. For example, if a project will disturb an acre or more of wetlands, CDOT must obtain a Section 404 permit from the U.S. Army Corps of Engineers. Other agencies issue other types of permits. If federal funds are used to purchase ROW—which is a common practice for transportation projects—then this activity may begin after the environmental clearance (top) part of the form is completed and approved. **Figure IP-21** shows that this activity is expected to occur about four months after NEPA study begins for a typical project, and about 12 months after the study for the Pueblo Blvd. intersection begins.

Design can continue while NEPA clearance is ongoing. During preliminary engineering cost estimates can be completed in more detail so that funding can be obtained. Designs will also address construction phasing and traffic detours. Although only one phase of improvements will initially be built at each location, the design will consider the final intersection configuration and the other improvement phases to develop the best design for the overall timeframe. About six months after design starts, it reaches a stage called Field Inspection Review (FIR).

After the FIR stage, design plans can be used to request design-build proposals, or the design effort can continue for about another six months to develop sets of plans that can be sent out to bid to general contractors. Under this latter option, the plans for general contractors are called Final Office Review (FOR). Under a design-build arrangement, CDOT enters into a single contract for both design and construction services. Because the designers and general contractors are part of the same team, some design tasks can occur at the same time as other construction activities, which can shorten the total design and construction duration.

CDOT is planning to create design plans for all the segments of US 50 improvements so that new construction could begin as soon as funding is obtained.



Notes: Times shown above are approximate and represent the time duration required for a typical design task. Times for specific improvement projects may be longer or shorter depending on project complexity.

Figure IP-21. Estimated Duration of Preconstruction Tasks

Once plans are developed, NEPA documents are completed and accepted, and ROW is purchased, CDOT can advertise a project for general contractors to bid on. It may take CDOT about a month to prepare the documents for the advertisement based on the FOR plans. It may take another two months for contractors to respond to the advertisement, for CDOT to evaluate the contractors' bids, and for CDOT to negotiate a contract with the successful bidder.

Figure IP-21 shows that the elapsed time required between beginning data collection and beginning construction is about 18 months for a less involved project at most US 50 locations and about 27 months for the more complicated Pueblo Blvd. intersection. These timeframes are reflected in the Corridor-wide list of improvement priorities found in **Table IP-41**.

When a project is ready to begin construction, CDOT will involve Corridor stakeholders in making several decisions on how best to proceed. For example, night construction is one technique that reduces the duration of construction, but it can have noise and light impacts.

CDOT has an established Lane Closure Policy that will determine how many lanes in each direction need to remain open during peak and off-peak hours to accommodate existing traffic.

At intersections, accommodating all turning movement directions may result in additional construction phases and longer construction duration. CDOT and stakeholders will weigh the access impacts of detours against the benefits of shorter construction.

CDOT will also develop a traffic management plan for the construction project, which will include plans called Methods of Handling Traffic (MHTs) for each construction phase. The MHTs include such details as which signs will be placed in various locations and how driving lanes will be marked.

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