

## VALUE ANALYSIS ALTERNATIVE 3.2

**Construct a classic L-1 type interchange ¼ mile east of Upper Carson with frontage connection to Camino Heights (consider park and ride/rest area)**

**Assumptions and Calculations:** Assume 20% more earthwork for frontage road connector. Assume a 20% increase in Pavement Structural Section for construction of frontage road, ramps, overcrossing and connection from interchange to Carson Road. Will need additional cross culverts at the new frontage road, ramps; assume a 5% increase. More retaining wall will need approximately 25% more treatments. Retaining wall: assume 5,280 feet long for ramps and frontage road x 6 feet high = 31,680 SF or approximately 32,000 SF of new wall; assume \$120/SF. Assume the overcrossing structure would be approximately 15% more than the undercrossing. Assume \$2,000,000 for right-of-way for the frontage road and access to Carson Road and the interchange footprint.

### Initial Cost Estimates

CONSTRUCTION ELEMENT		BASELINE CONCEPT			ALTERNATIVE CONCEPT		
Description	Unit	Qty	Cost/Unit	Total	Qty	Cost/Unit	Total
<b>ROADWAY ITEMS</b>							
Earthwork (increase by 20%)		1	\$ 740,000	\$ 740,000	1	\$ 888,000	\$ 888,000
Pavement (increase by 20%)		1	\$ 4,860,000	\$ 4,860,000	1	\$ 5,832,000	\$ 5,832,000
Drainage (increase by 5%)		1	\$ 1,056,000	\$ 1,056,000	1	\$ 1,108,800	\$ 1,108,800
Architectural Treatment (+25%)		1	\$ 1,008,000	\$ 1,008,000	1	\$ 1,260,000	\$ 1,260,000
<b>ROADWAY SUBTOTAL</b>				\$ 7,664,000			\$ 9,088,800
<b>ROADWAY MARK-UP</b>	40.0%			\$ 3,065,600			\$ 3,635,520
<b>ROADWAY TOTAL</b>				\$ 10,729,600			\$ 12,724,320
<b>STRUCTURE ITEMS</b>							
Additional Retaining Wall				\$ -	32,000	\$ 120	\$ 3,840,000
Additional UC cost (+15%)		1	\$ 3,885,000	\$ 3,885,000	1	\$ 4,467,750	\$ 4,467,750
<b>STRUCTURE SUBTOTAL</b>				\$ 3,885,000			\$ 8,307,750
<b>STRUCTURE MARK-UP</b>				\$ -			\$ -
<b>STRUCTURE TOTAL</b>				\$ 3,885,000			\$ 8,307,750
<b>RIGHT-OF-WAY ITEMS</b>							
Additional Right-of-Way Acquisition				\$ -	1	\$ 2,000,000	\$ 2,000,000
<b>RIGHT-OF-WAY TOTAL</b>				\$ -			\$ 2,000,000
<b>TOTAL</b>				\$14,614,600			\$23,032,070
<b>TOTAL (Rounded)</b>				\$14,610,000			\$23,030,000
						<b>SAVINGS</b>	<b>(\$8,420,000)</b>

## VALUE ANALYSIS ALTERNATIVE 4.1

### Construct right-in/right-out hook ramps between Camino Heights and Sierra Blanca

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<b>Initial Cost Savings:</b>	\$165,000
<b>Change in Schedule:</b>	-2 months
<b>Performance Change:</b>	-3 %
<b>Value Change:</b>	-1 %

**Description of Baseline Concept:** The baseline concept proposes to widen US 50 for the installation of concrete median barrier from Still Meadows Road (PM 22.0) to the existing concrete median barrier located at Upper Carson Road (PM 24.01). A partial median access opening (westbound, left turn only) at Still Meadows Road would be maintained. Vista Tierra Drive would be extended in a northeasterly direction through a proposed undercrossing (PM 23.48) at US 50 with a connection to Carson Road on the north side of US 50 to include Class II bike lanes and sidewalk. Carson Road will be realigned and improved to accommodate traffic at this location.

**Description of Alternative Concept:** The alternative will construct the median barrier and close access to US 50 from Camino Heights Drive and Pondorado road and install a four-legged intersection at the Vista Tierra Drive/Camino Hills Drive intersection. On-/off-ramps would be constructed from US 50 to the Vista Tierra Drive/Camino Hills Drive four-legged intersection. Sierra Blanca Drive would be closed off by installing a cul-de-sac. The park and ride lot would be modified.

#### **Advantages:**

- Reduces right-of-way needed
- Reduces construction cost

#### **Disadvantages:**

- Introduces hook ramps which could create a potential for wrong-way movements

**Discussion:** The main benefit of this concept is that it provides simpler construction because of the elimination of the roundabout. There will also be cost savings because the roundabout is eliminated. Local opposition may be reduced because of fewer right-of-way impacts; however, it would likely remain due to increased traffic in local neighborhood consistent with traffic expected in the baseline concept.

**Technical Review Comments:** There is a concern about the potential for wrong-way movement; however, a design could accommodate this issue.

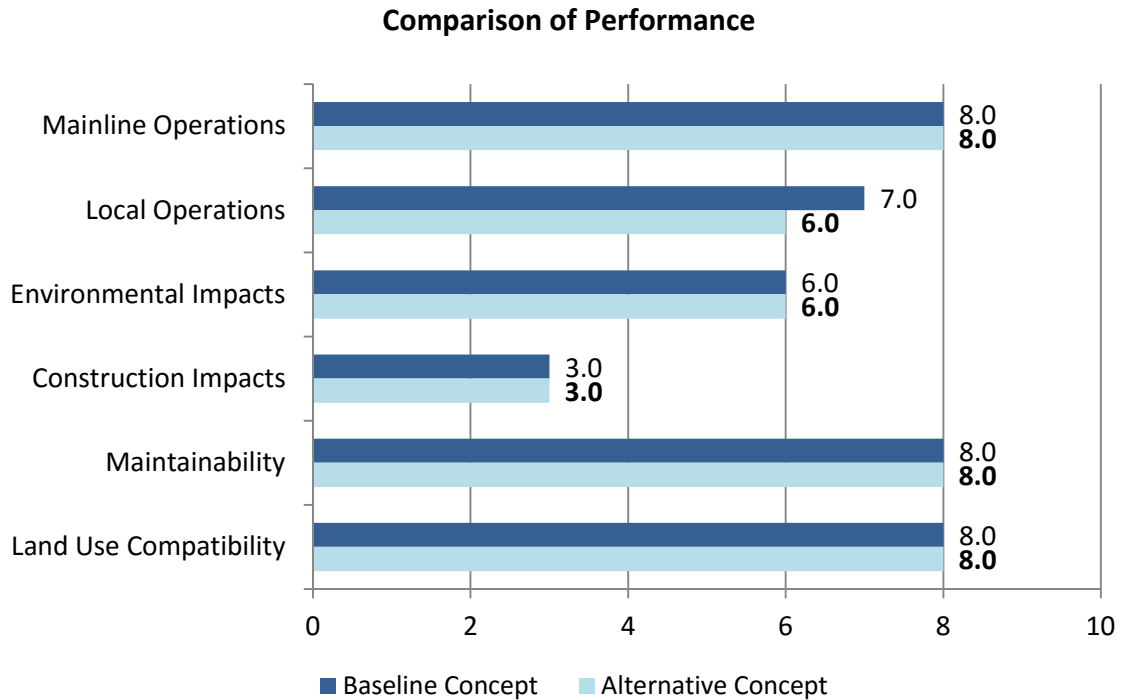
**Project Management Considerations:** Requires redesign.

**Discussion of Schedule Impacts:** Shorter construction time and design time because of the elimination of the roundabout, but it is not on the critical path. Less right-of-way work. Results in a reduction of 2 months.

**Discussion of Risk Impacts:** Potential safety risk related to wrong-way movement.

## VALUE ANALYSIS ALTERNATIVE 4.1

### Construct right-in/right-out hook ramps between Camino Heights and Sierra Blanca



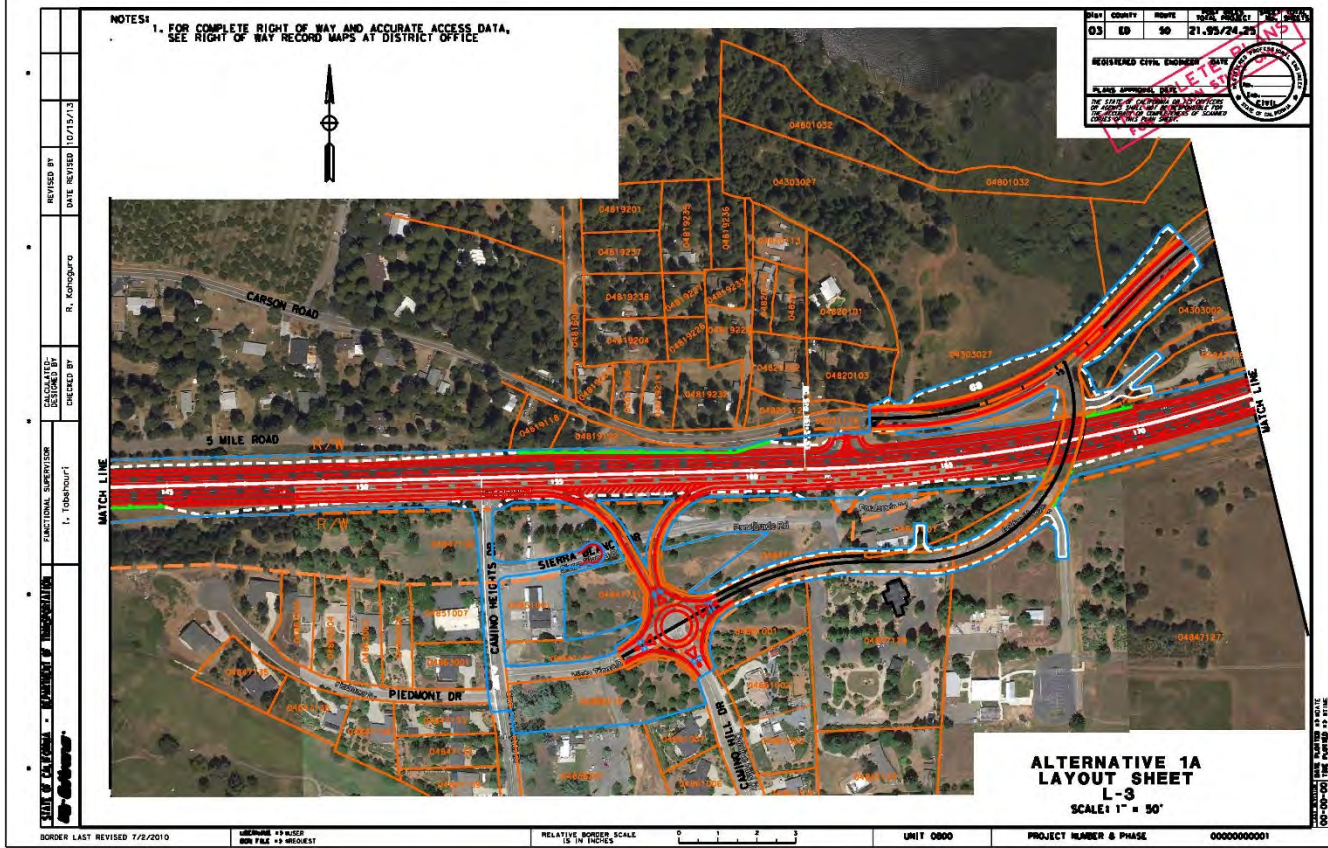
### Performance Assessment

Performance Attribute	Rationale for Change in Performance
Mainline Operations	No change.
Maintainability	No change.
Local Operations	Elimination of the roundabout with a corresponding collision reduction.
Environmental Impacts	No change. Slight increase in greenhouse gas expected, but not enough to change this attribute.
Land Use Compatibility	Less impact to parcels in the vicinity of the proposed roundabout, but not enough to change this attribute.
Construction Impacts	No change.

# VALUE ANALYSIS ALTERNATIVE 4.1

## Construct right-in/right-out hook ramps between Camino Heights and Sierra Blanca

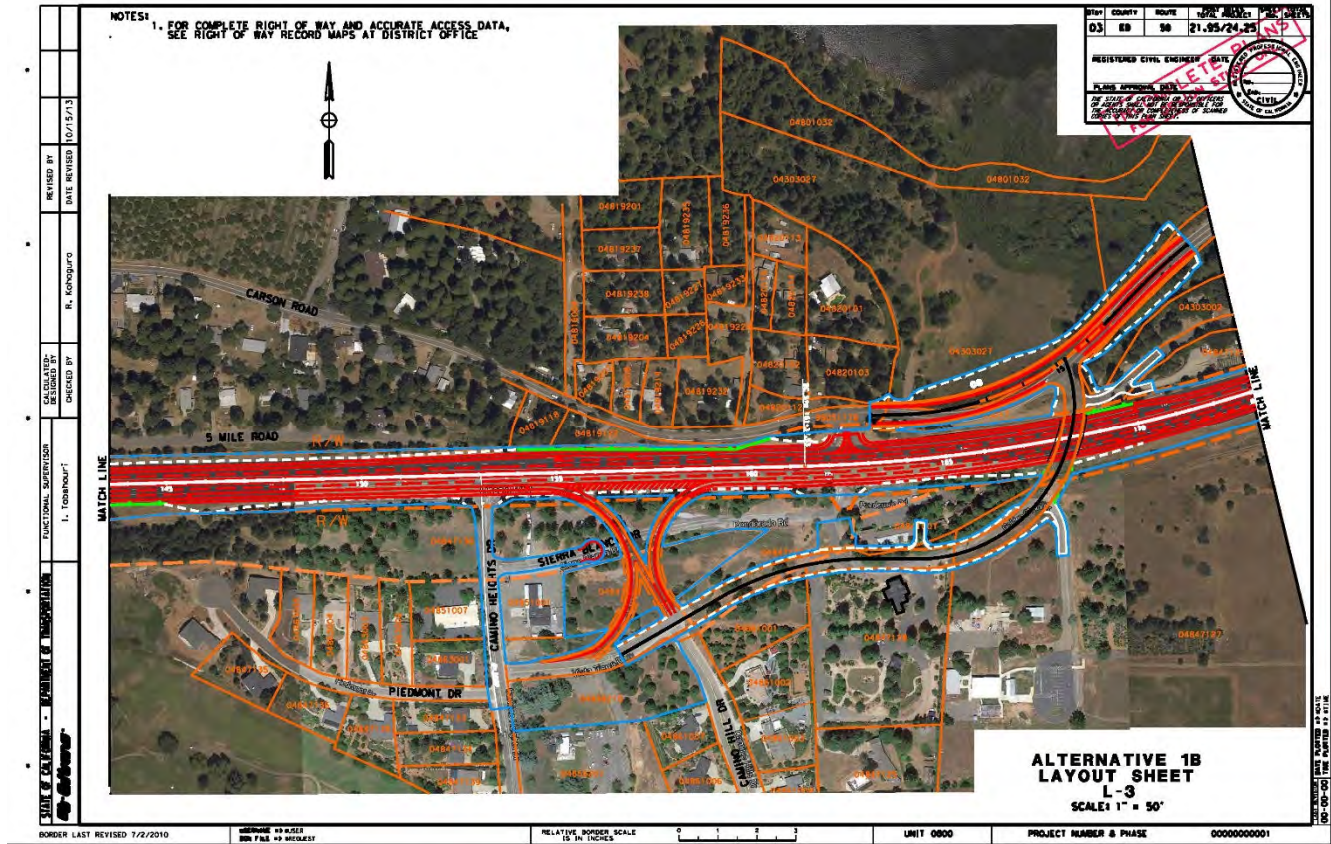
### Baseline Concept Sketch



# VALUE ANALYSIS ALTERNATIVE 4.1

## Construct right-in/right-out hook ramps between Camino Heights and Sierra Blanca

### VA Alternative Concept Sketch



**Assumptions and Calculations:** The baseline concept costs \$33,488,000 vs. the alternative concept cost of \$33,323,000 results in a savings of \$165,000.

## VALUE ANALYSIS ALTERNATIVE 4.2

### Construct right-in/right-out ramps at Sierra Blanca keeping Camino Heights Drive open

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<b>Initial Cost Savings:</b>	\$995,000
<b>Change in Schedule:</b>	-2 months
<b>Performance Change:</b>	-2 %
<b>Value Change:</b>	+1 %

**Description of Baseline Concept:** The baseline concept proposes to widen US 50 for the installation of concrete median barrier from Still Meadows Road (PM 22.0) to the existing concrete median barrier located at Upper Carson Road (PM 24.01). A partial median access opening (westbound, left turn only) at Still Meadows Road would be maintained. Vista Tierra Drive would be extended in a northeasterly direction through a proposed undercrossing (PM 23.48) at US 50 with a connection to Carson Road on the north side of US 50 to include Class II bike lanes and sidewalk. Carson Road will be realigned and improved to accommodate traffic at this location.

**Description of Alternative Concept:** The alternative will construct the median barrier and maintain access from Camino Heights Drive and Pondorado Road. The three-way intersection at the Vista Tierra Drive/Camino Hills Drive intersection will be maintained. A 1,400-foot eastbound auxiliary lane on US 50 that would exit at Pondorado Road will be installed that connects to Vista Tierra Drive at an all-way stop controlled three-way intersection. The Pondorado Road exit into a right-in and right-out access point to US 50 will be modified.

#### **Advantages:**

- Reduces right-of-way needed
- Reduces construction cost

#### **Disadvantages:**

- Potential for weaving incidents on US 50 because two access points remain that do not meet driver expectations
- Reduces mainline operations because of less vehicle storage

**Discussion:** The main benefit of this concept is that it provides simpler construction because of the elimination of the roundabout. There will also be cost savings because of the elimination of the roundabout. Local opposition may be reduced because of less right-of-way impacts; however, it would likely remain due to increased traffic in local neighborhood consistent with traffic expected in the baseline concept. Right-of-way costs would be reduced because of fewer parcels needed.

**Technical Review Comments:** Limited vehicle storage at the Sierra Blanca stop sign to Golden Chain may require a design exception.

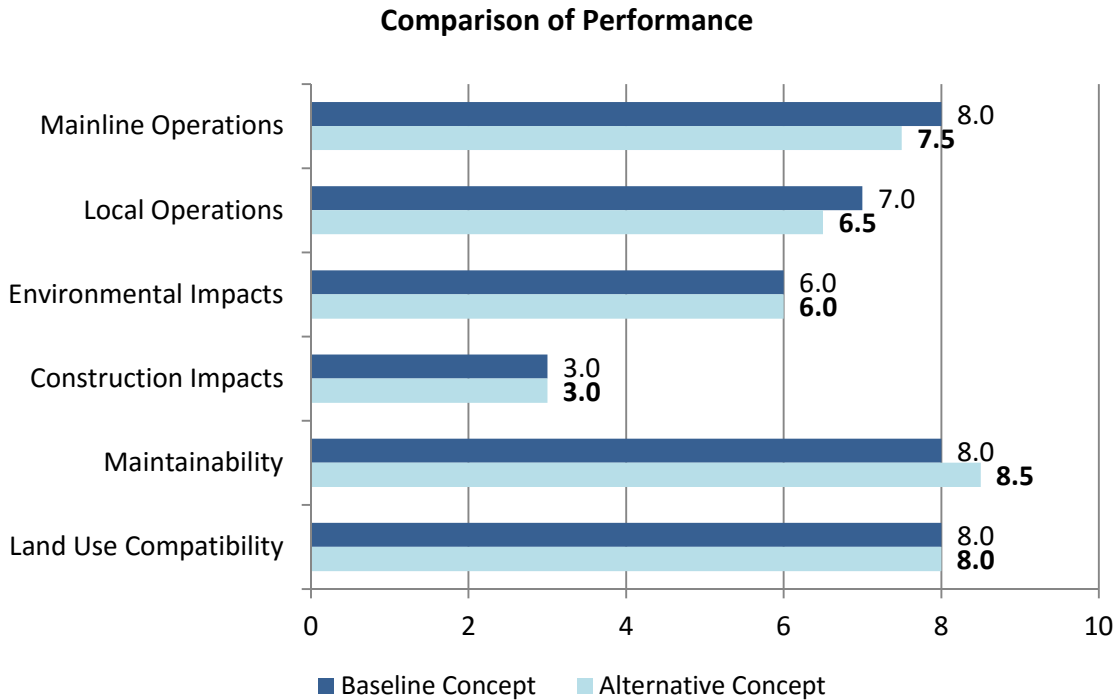
**Project Management Considerations:** Redesign needed.

**Discussion of Schedule Impacts:** The reduction of right-of-way acquisition time could save 2 months.

**Discussion of Risk Impacts:** Weave and short ramps may cause incidents.

## VALUE ANALYSIS ALTERNATIVE 4.2

### Construct right-in/right-out ramps at Sierra Blanca keeping Camino Heights Drive open



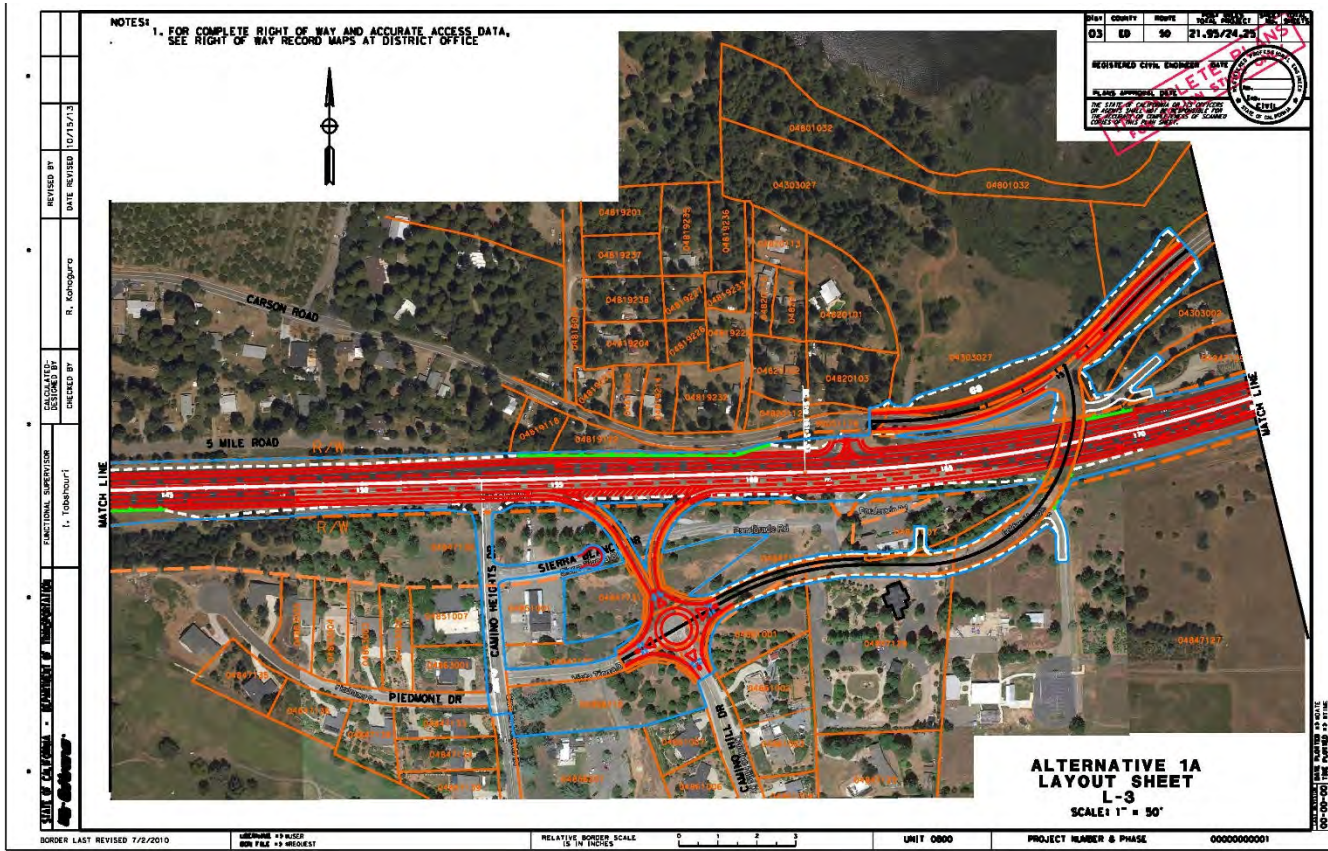
#### Performance Assessment

Performance Attribute	Rationale for Change in Performance
Mainline Operations	Reduced vehicle storage may impact mainline operations.
Maintainability	No roundabout or hook ramps to maintain.
Local Operations	Elimination of the roundabout complicates local traffic operations.
Environmental Impacts	No change. Slight increase in greenhouse gas expected, but not enough to change this attribute.
Land Use Compatibility	No change.
Construction Impacts	No change.

# VALUE ANALYSIS ALTERNATIVE 4.2

## Construct right-in/right-out ramps at Sierra Blanca keeping Camino Heights Drive open

### Baseline Concept Sketch

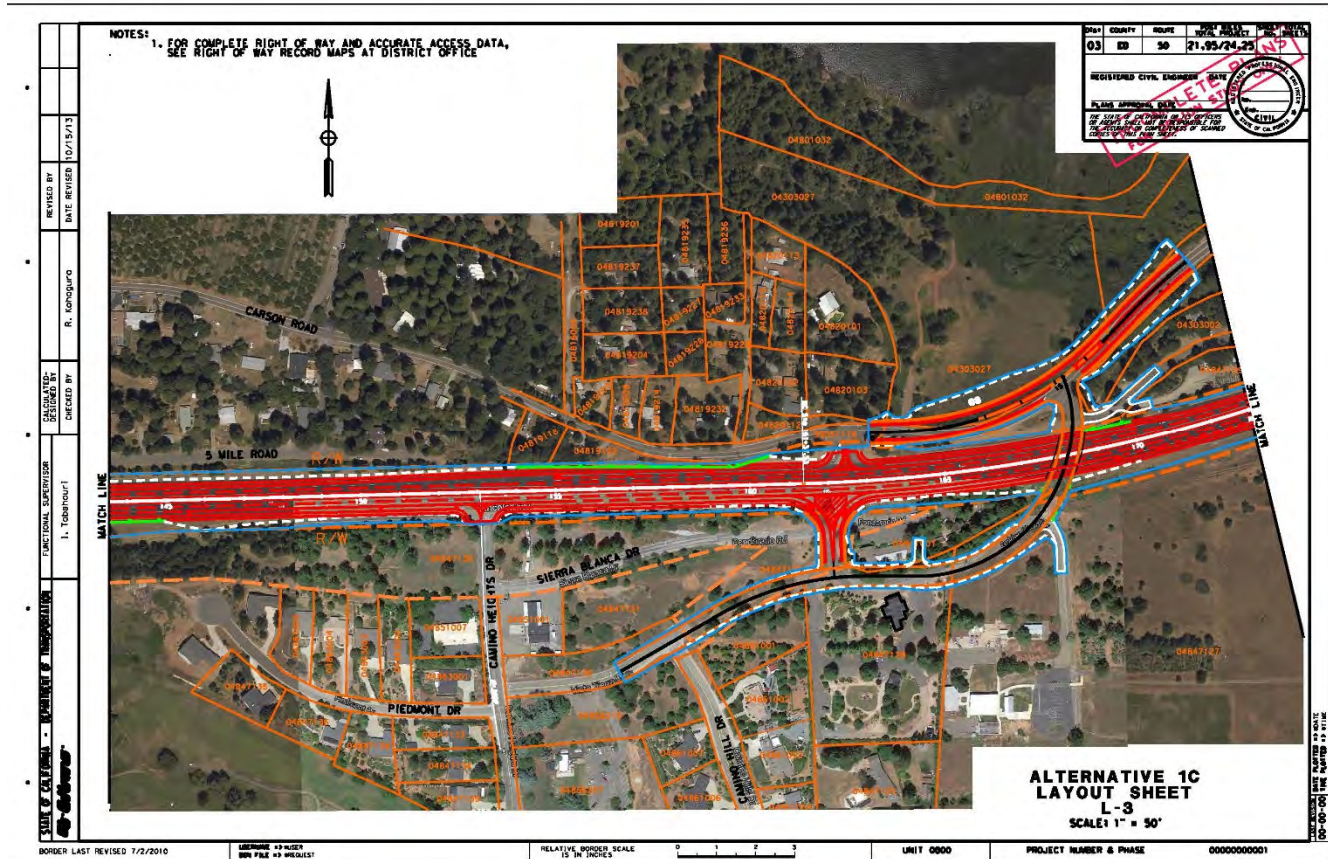




# VALUE ANALYSIS ALTERNATIVE 4.2

## Construct right-in/right-out ramps at Sierra Blanca keeping Camino Heights Drive open

### VA Alternative Concept Sketch



**Assumptions and Calculations:** The baseline concept cost is \$33,488,000 vs. the alternative concept cost of \$32,493,000 results in a savings of \$995,000.

## VALUE ANALYSIS ALTERNATIVE 4.3

### Maintain Camino Heights Drive as the main off-ramp to the undercrossing and close Sierra Blanca

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<b>Initial Cost Savings:</b>	\$1,095,000
<b>Change in Schedule:</b>	-2 months
<b>Performance Change:</b>	No change
<b>Value Change:</b>	+4 %

**Description of Baseline Concept:** The baseline concept proposes to widen US 50 for the installation of concrete median barrier from Still Meadows Road (PM 22.0) to the existing concrete median barrier located at Upper Carson Road (PM 24.01). A partial median access opening (westbound, left turn only) at Still Meadows Road would be maintained. Vista Tierra Drive would be extended in a northeasterly direction through a proposed undercrossing (PM 23.48) at US 50 with a connection to Carson Road on the north side of US 50 to include Class II bike lanes and sidewalk. Carson Road will be realigned and improved to accommodate traffic at this location.

**Description of Alternative Concept:** The alternative will construct the median barrier and maintain access to US 50 from Camino Heights Drive and close access to US 50 from Ponderado Road. A three-way intersection at the Vista Tierra Drive/Camino Hills Drive intersection will be maintained.

#### Advantages:

- Reduces right-of-way needed
- Reduces construction cost

#### Disadvantages:

- Eliminating the roundabout complicates local circulation and increases the chance of collisions
- A squared-up intersection slows traffic when compared to the baseline concept; would not operation as well during heavy traffic volume periods

**Discussion:** The main benefit of this alternative is cost and schedule savings. There will be fewer construction impacts to local residents because of less noise and construction activities and fewer delays for motorists.

An option for this alternative would be to construct an undercrossing at Upper Carson Road with a T connection to Carson Road (Idea BO-23).

**Technical Review Comments:** None noted.

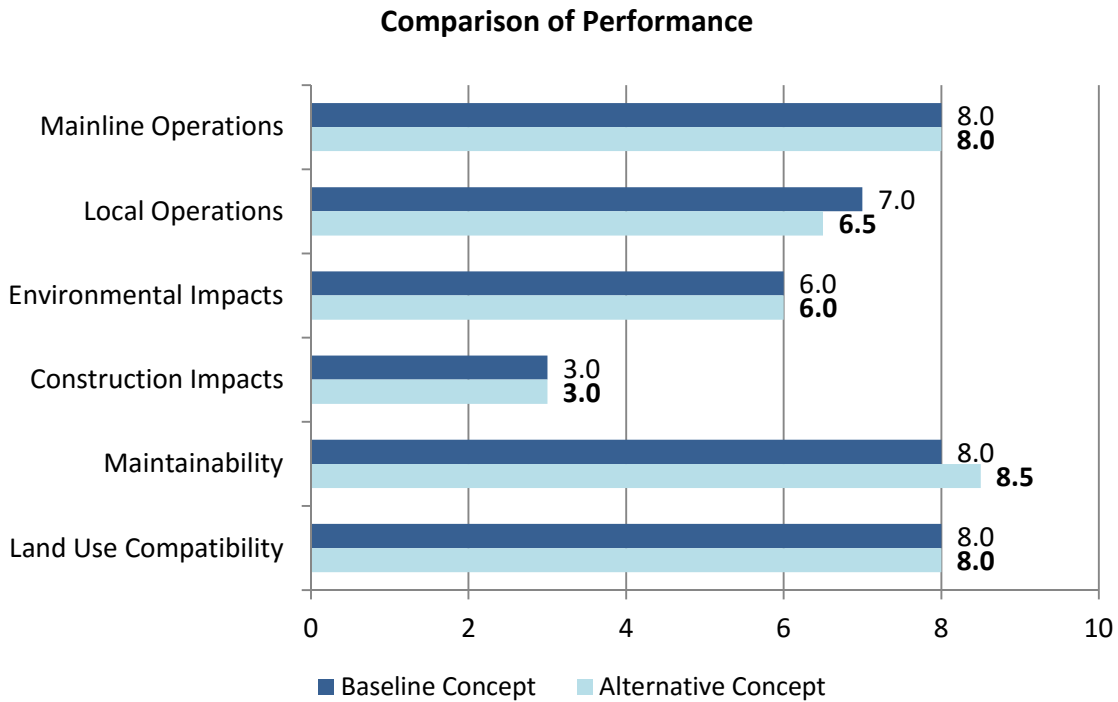
**Project Management Considerations:** Need redesign.

**Discussion of Schedule Impacts:** The reduction of right-of-way acquisition time could save 2 months.

**Discussion of Risk Impacts:** No change.

## VALUE ANALYSIS ALTERNATIVE 4.3

Maintain Camino Heights Drive as the main off-ramp to the undercrossing and close Sierra Blanca



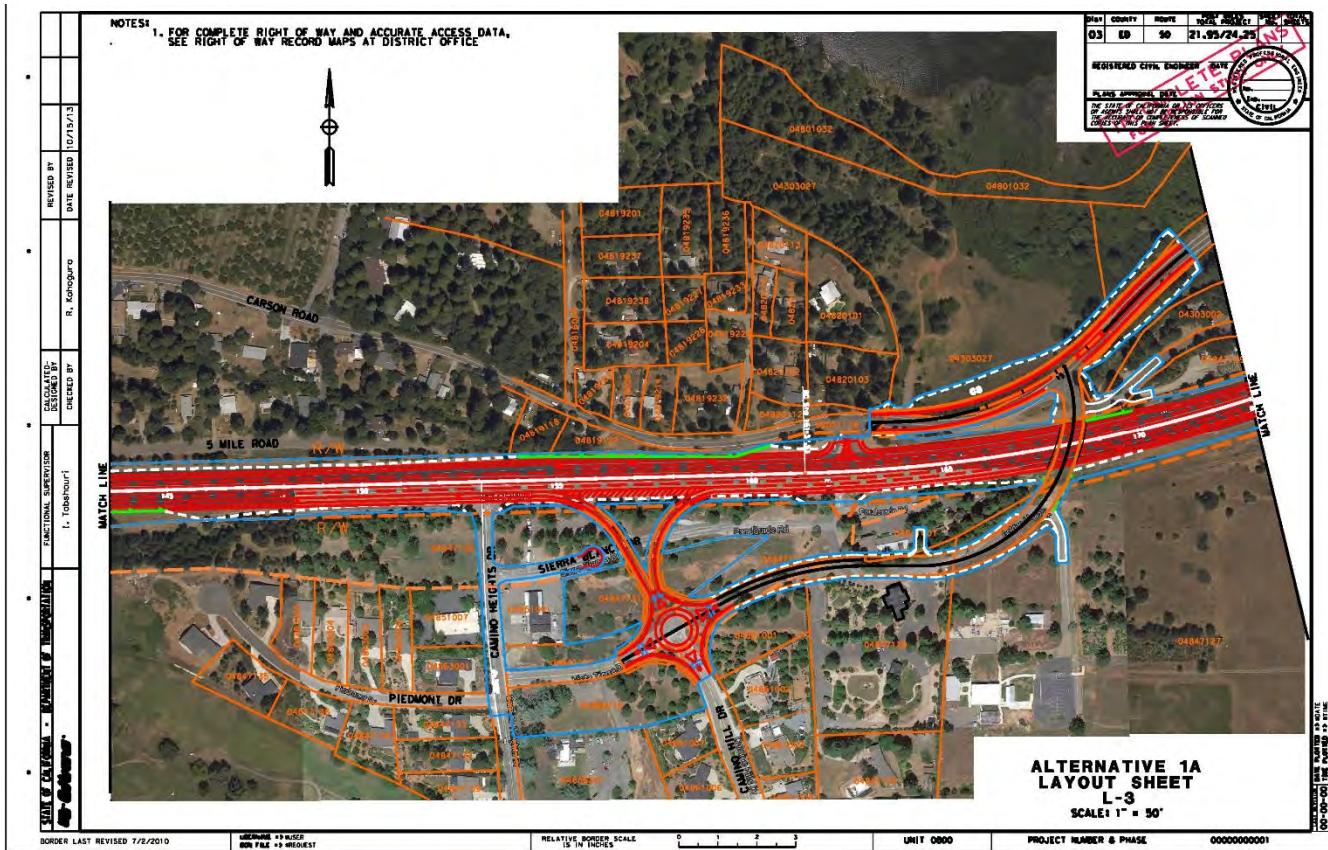
### Performance Assessment

Performance Attribute	Rationale for Change in Performance
Mainline Operations	No change.
Maintainability	No roundabout or hook ramps to maintain.
Local Operations	Elimination of the roundabout complicates local traffic operations.
Environmental Impacts	No change. Slight increase in greenhouse gas expected, but not enough to change this attribute.
Land Use Compatibility	No change.
Construction Impacts	No change.

# VALUE ANALYSIS ALTERNATIVE 4.3

Maintain Camino Heights Drive as the main off-ramp to the undercrossing and close Sierra Blanca

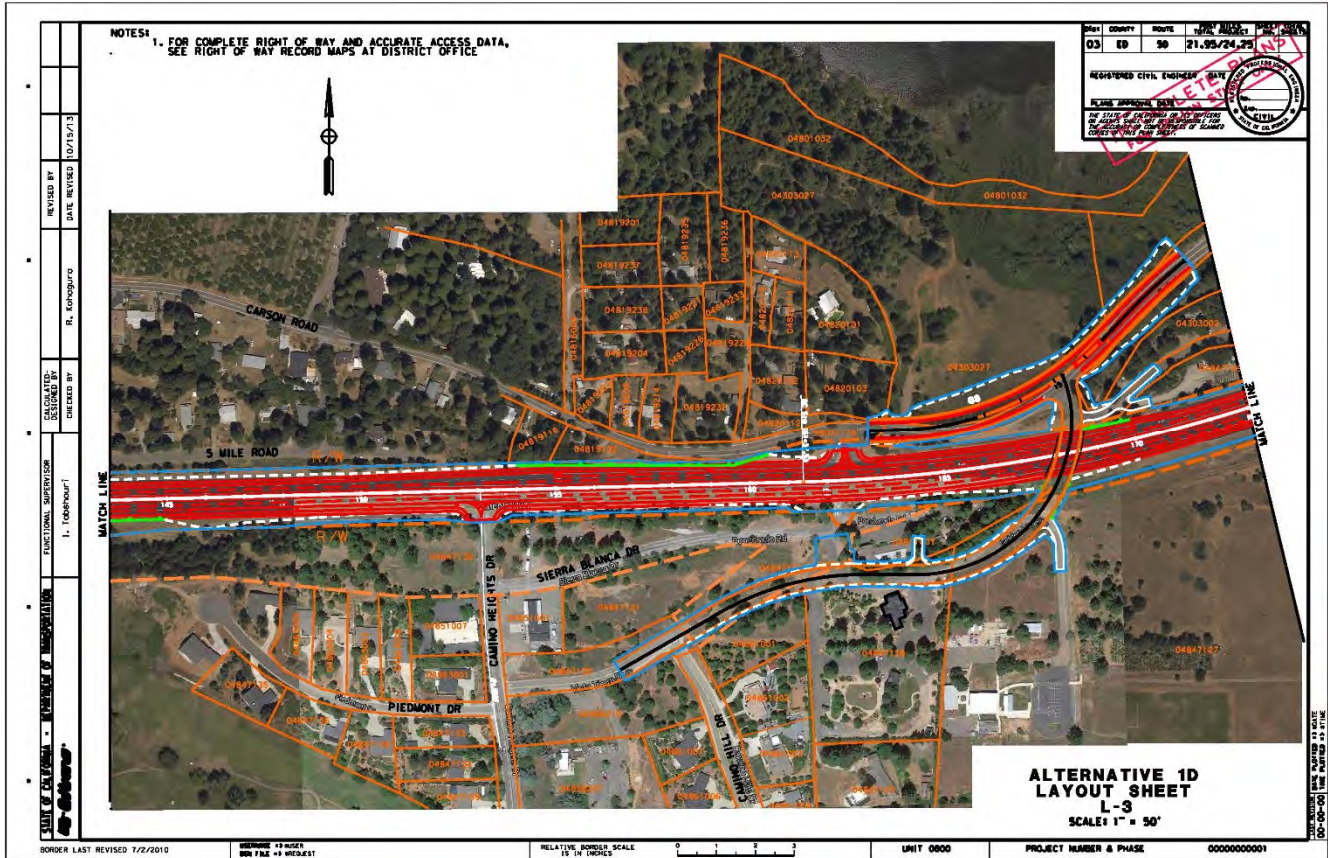
## Baseline Concept Sketch



# VALUE ANALYSIS ALTERNATIVE 4.3

Maintain Camino Heights Drive as the main off-ramp to the undercrossing and close Sierra Blanca

## VA Alternative Concept Sketch



**Assumptions and Calculations:** The baseline concept costs \$33,488,000 vs. the alternative concept cost of \$32,393,000 results in a savings of \$1,095,000.

## VALUE ANALYSIS ALTERNATIVE 4.4

### Construct eastbound loop off-ramp as connection to new Pondorado Road undercrossing with a four-leg intersection for local traffic on south side

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<b>Initial Cost Savings:</b>	\$200,000
<b>Change in Schedule:</b>	-3 months
<b>Performance Change:</b>	-3 %
<b>Value Change:</b>	No change

**Description of Baseline Concept:** The baseline concept proposes to widen US 50 for the installation of concrete median barrier from Still Meadows Road (PM 22.0) to the existing concrete median barrier located at Upper Carson Road (PM 24.01). A partial median access opening (westbound, left turn only) at Still Meadows Road would be maintained. Vista Tierra Drive would be extended in a northeasterly direction through a proposed undercrossing (PM 23.48) at US 50 with a connection to Carson Road on the north side of US 50 to include Class II bike lanes and sidewalk. Carson Road will be realigned and improved to accommodate traffic at this location.

**Description of Alternative Concept:** The alternative will construct a new eastbound loop off-ramp connecting to a four-leg intersection with north leg connection to the proposed Pondorado Road undercrossing. Local Camino Heights traffic would be connected to the four-leg intersection via extension of either Vista Tierra Drive as Option 1 or Sierra Blanca Drive as Option 2. Sierra Blanca Drive access to US 50 would be closed no matter which option is exercised.

NOTE: Option 2 may be more favorable to local residents because traffic would be further away from the nearby neighborhoods.

This alternative would incorporate all the proposed features common to all alternatives as listed above. Below are the features that may differ from the previous alternatives (Alternatives 4.1, 4.2, and 4.3):

- Will maintain access to US 50 from Camino Heights Drive
- Option 1 would provide a three-way intersection at the Vista Tierra Drive/Camino Hills Drive intersection
- Will provide a 1,400-foot eastbound auxiliary lane on US 50 that would exit at a new loop off-ramp for the Pondorado Road undercrossing that would connect via either Vista Tierra Drive or Sierra Blanca Drive at a four-leg intersection

See Alt. 4.40 sketch below.

#### **Advantages:**

- Reduces impacts to local residents because the roundabout at Camino Hills is eliminated and traffic is routed instead into an eastern placed loop off ramp
- Slightly reduces construction cost
- Reduces potential right-of-way conflicts by avoiding a local business parcel acquisition

#### **Disadvantages:**

- More right-of-way needed

## VALUE ANALYSIS ALTERNATIVE 4.4

### Construct eastbound loop off-ramp as connection to new Pondorado Road undercrossing with a four-leg intersection for local traffic on south side

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- Potential for weaving incidents on US 50 because two access points remain and it will not meet driver expectations

**Discussion:** The main benefit of this concept is to replace the proposed roundabout and the two hook ramps from the residential neighborhood by constructing an eastbound loop off-ramp starting at Camino Heights Drive and extend all the way to the new proposed Pondorado Road undercrossing. The alternative would close the existing Sierra Blanca Drive connection to US 50. There could be a weave issue with eastbound traffic entering US 50 at Camino Heights with exiting traffic to the new eastbound off-ramp.

#### Other Considerations and Options

In exploring the possibility of a roundabout on the eastbound side of the undercrossing, a roundabout was placed that was sized similar to the roundabouts at the I-80/SR 89 connection at Truckee. Since the roundabout has to be flat and because of its closeness to the undercrossing, it would create a 30-foot cut on the south down from the school buildings, so a 2:1 slope would need to be created that would catch right behind the buildings. Another entrance would have to be built on their western boundary. See Alt. 4.50 sketch below.

An eastbound on-ramp was added to the loop off-ramp in case there are issues with Camino Heights and it needs to be closed and route everyone through the loop. See Alt. 4.60 sketch below.

**Technical Review Comments:** Concern about using a loop off-ramp. A slip type ramp would be more desirable. Environmental Study Limits would be larger.

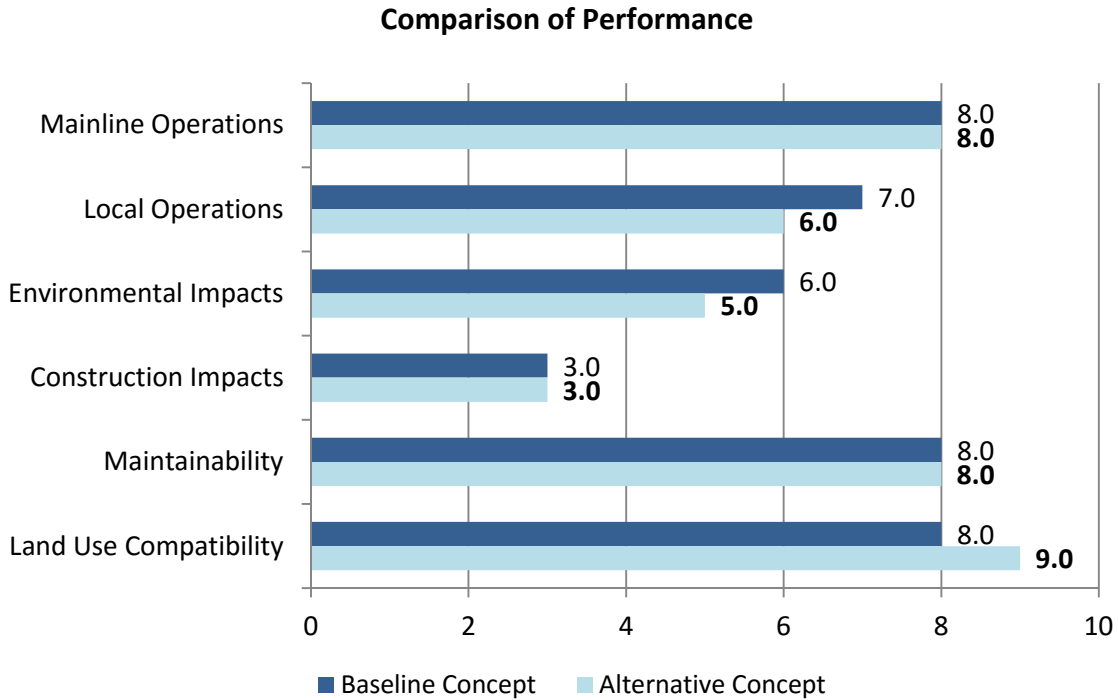
**Project Management Considerations:** Redesign needed.

**Discussion of Schedule Impacts:** The reduction of right-of-way acquisition time could save approximately 3 months.

**Discussion of Risk Impacts:** Weave and short ramps may cause incidents.

## VALUE ANALYSIS ALTERNATIVE 4.4

Construct eastbound loop off-ramp as connection to new Pondorado Road undercrossing with a four-leg intersection for local traffic on south side



### Performance Assessment

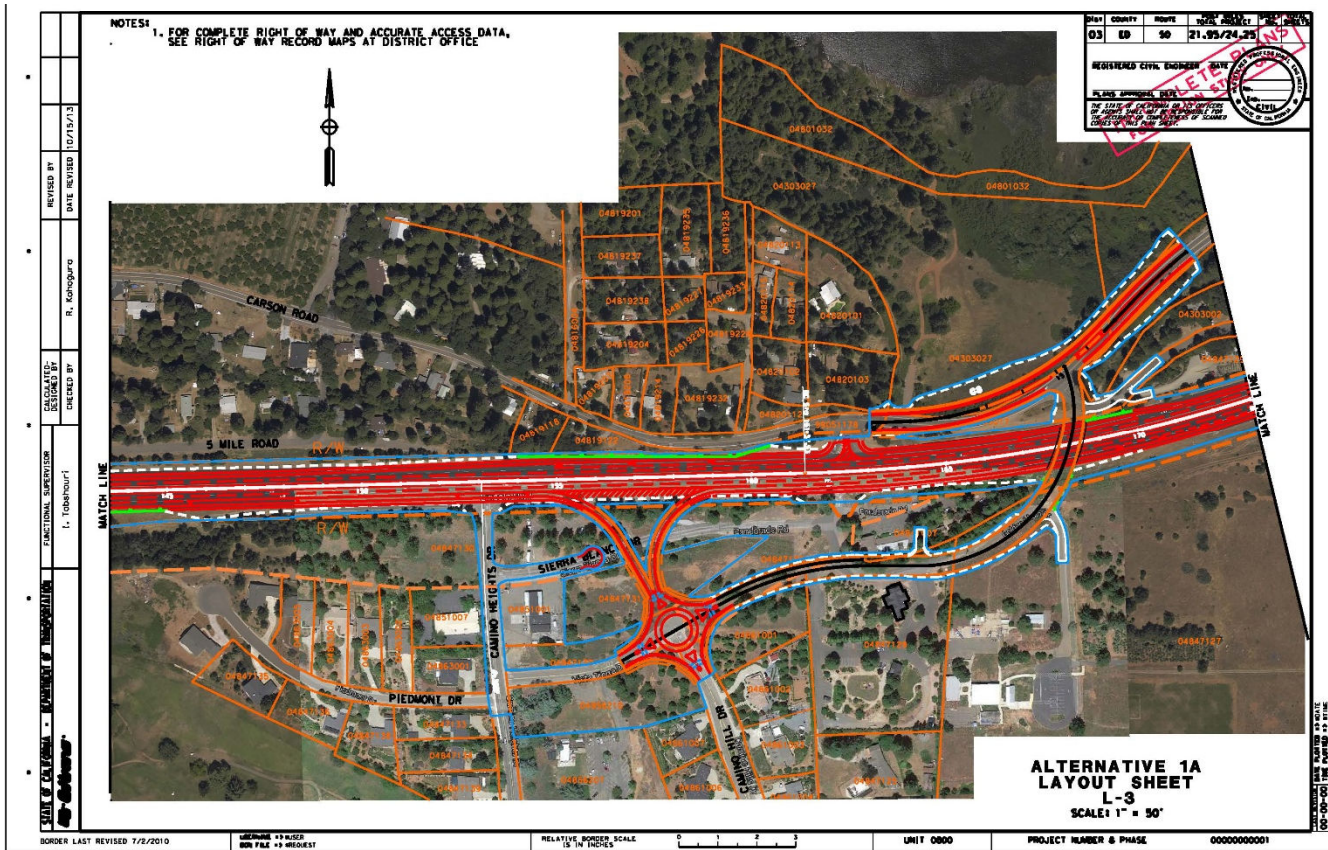
Performance Attribute	Rationale for Change in Performance
Mainline Operations	No change.
Maintainability	No change.
Local Operations	Longer out-of-direction travel for motorists going from north of US 50 to eastbound US 50.
Environmental Impacts	Affects the area owned by the El Dorado county school district near the new loop off ramp that would have not been disturbed as much as in the base case.
Land Use Compatibility	Reduces impacts to residential areas.
Construction Impacts	No change.



# VALUE ANALYSIS ALTERNATIVE 4.4

Construct eastbound loop off-ramp as connection to new Pondorado Road undercrossing with a four-leg intersection for local traffic on south side

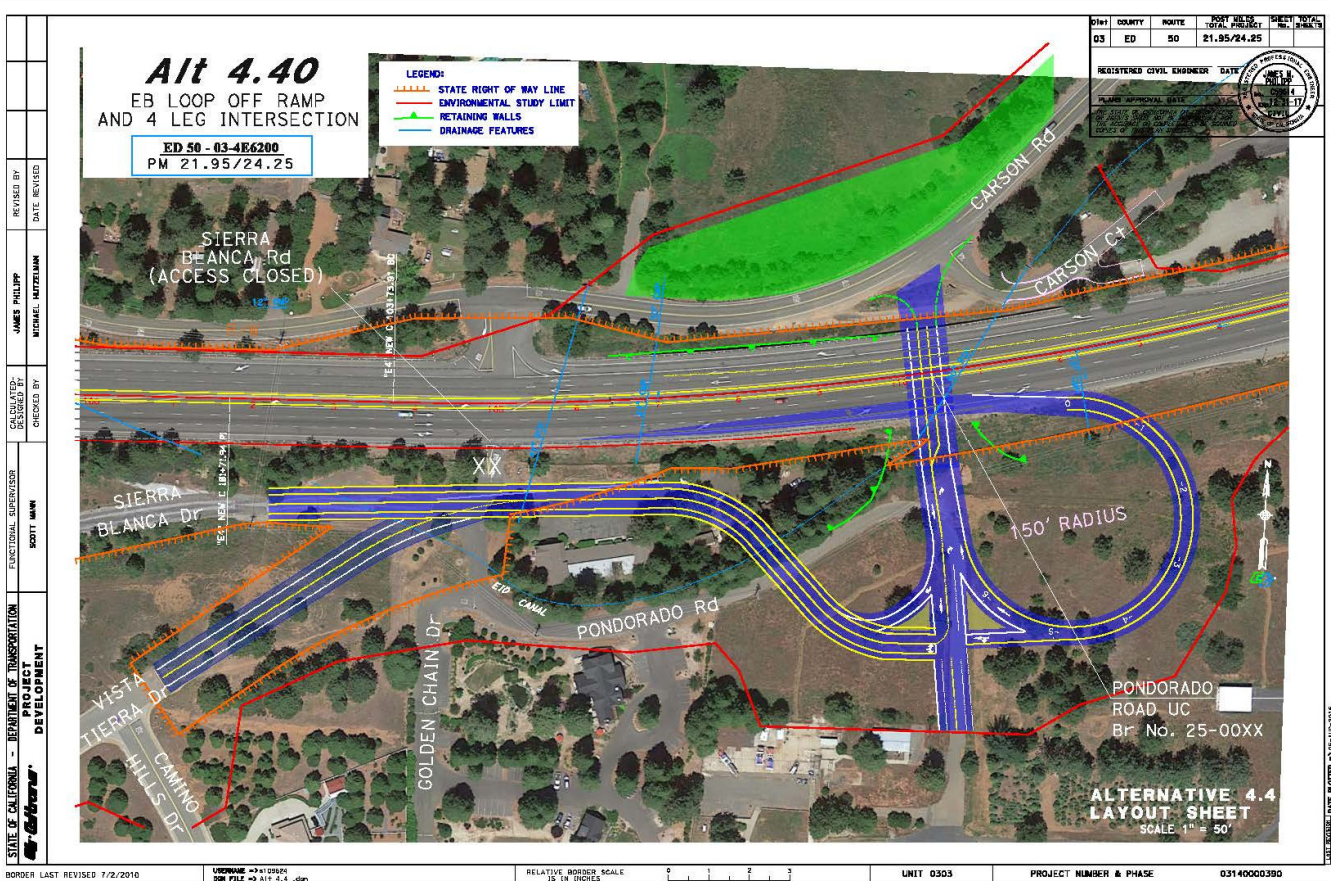
## Baseline Concept Sketch



# VALUE ANALYSIS ALTERNATIVE 4.4

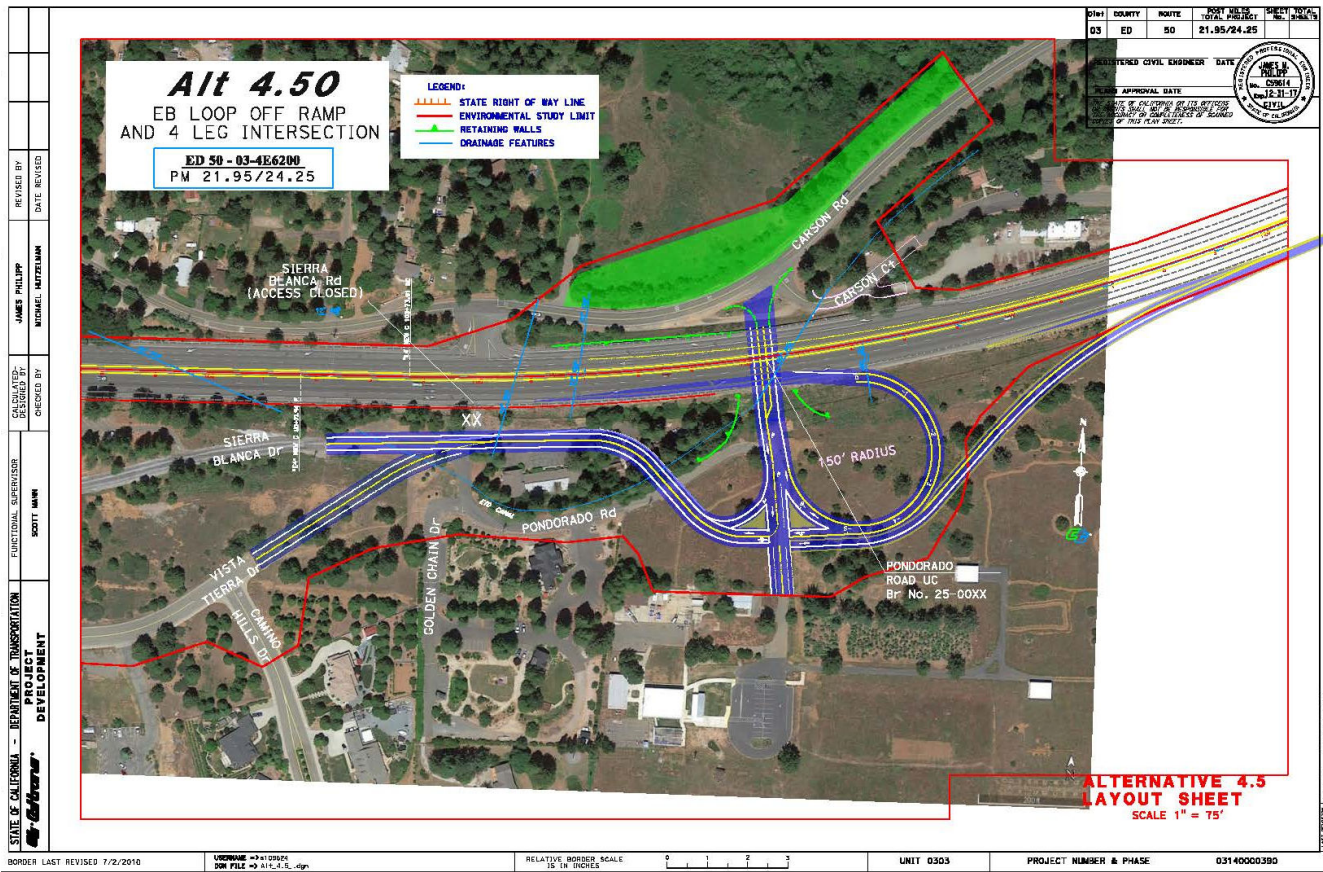
Construct eastbound loop off-ramp as connection to new Pondorado Road undercrossing with a four-leg intersection for local traffic on south side

VA Alternative Concept Sketch



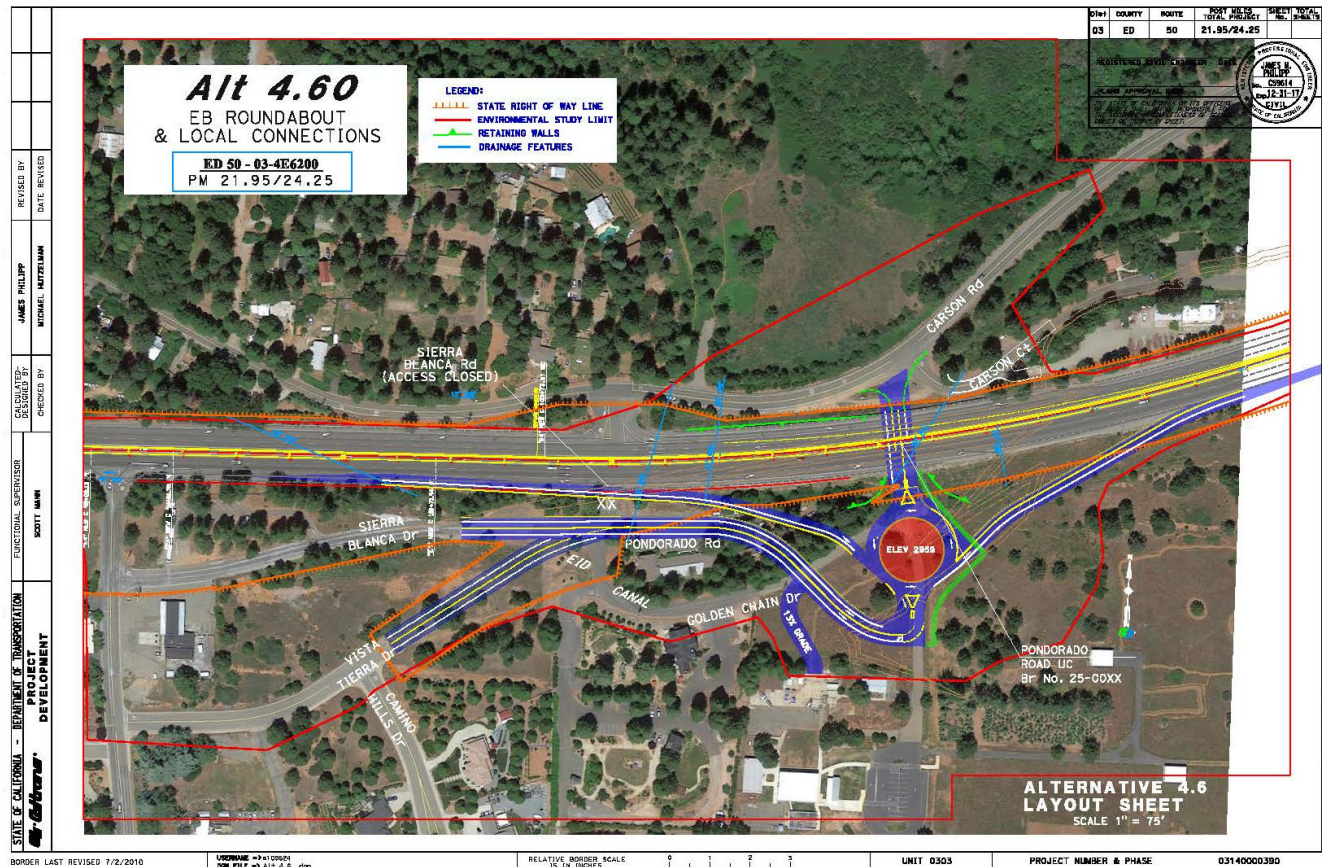
# VALUE ANALYSIS ALTERNATIVE 4.4

Construct eastbound loop off-ramp as connection to new Pondorado Road undercrossing with a four-leg intersection for local traffic on south side



# VALUE ANALYSIS ALTERNATIVE 4.4

Construct eastbound loop off-ramp as connection to new Ponderado Road undercrossing with a four-leg intersection for local traffic on south side



## Initial Cost Estimates

CONSTRUCTION ELEMENT		BASELINE CONCEPT			ALTERNATIVE CONCEPT		
Description	Unit	Qty	Cost/Unit	Total	Qty	Cost/Unit	Total
<b>ROADWAY ITEMS</b>							
Earthwork (increase by 5%)		1	\$ 740,000	\$ 740,000	1	\$ 777,000	\$ 777,000
Pavement (increase by 5%)		1	\$ 4,860,000	\$ 4,860,000	1	\$ 5,103,000	\$ 5,103,000
<b>ROADWAY SUBTOTAL</b>				\$ 5,600,000			\$ 5,880,000
<b>ROADWAY MARK-UP</b>	40.0%			\$ 2,240,000			\$ 2,352,000
<b>ROADWAY TOTAL</b>				\$ 7,840,000			\$ 8,232,000
<b>STRUCTURE ITEMS</b>							
Additional undercrossing cost (-15%)		1	\$ 3,885,000	\$ 3,885,000	1	\$ 3,302,250	\$ 3,302,250
<b>STRUCTURE SUBTOTAL</b>				\$ 3,885,000			\$ 3,302,250
<b>STRUCTURE MARK-UP</b>				\$ -			\$ -
<b>STRUCTURE TOTAL</b>				\$ 3,885,000			\$ 3,302,250
<b>TOTAL</b>				\$11,725,000			\$11,534,250
<b>TOTAL (Rounded)</b>				\$11,730,000			\$11,530,000
					<b>SAVINGS</b>		<b>\$200,000</b>

# PROJECT INFORMATION

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# PROJECT INFORMATION

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## BACKGROUND

US 50 within the project limits is a four-lane expressway with a striped median that separates opposing traffic lanes. The surrounding portion of US 50 in this area is a multi-lane facility. Median barrier exists at each end of the limits of this project. US 50 also contains 12-foot-wide lanes with shoulders that vary from 1 foot to 8 feet. The profile of US 50 from Smith Flat follows a steep topography with grades that vary from 3.9% to 6.0%. The horizontal radii in this location vary from 1,000 feet to 4,140 feet. There are 13 at-grade intersections and 5 driveways from Smith Flat to Cedar Grove.

A Project Study Report- Project Development Support Project Initiation Document (PSR-PDS) was approved for this project in December 2009. The lead agency that sponsored the PSR-PDS was the El Dorado County Transportation Commission (EDCTC). The 2009 PSR-PDS indicated that the Project Approval and Environmental Document Phase (PA&ED) was proposed to be funded by the 2010 State Transportation Improvement Program. The project is also a part of the US 50 Camino Corridor Safety and Operational Improvements Project, which is in the El Dorado County Regional Transportation Plan 2005-2025 and the Metropolitan Transportation Improvement Program (MTIP).

The purpose of the project is to improve the safety on US 50 in the Camino Corridor by modifying the facility. This will be done by installing a concrete median barrier that will restrict left-turn movements within the project limits. Widening the outside shoulders to standard width and installing several acceleration/deceleration lanes will help to reduce collisions within the project limits. A secondary purpose is to maintain local and regional access to and from the north and south sides of US 50 while providing safe east-west access on and off US 50.

The project is needed because collision rates along this segment of US 50 in El Dorado County are higher than the state-wide average. Uncontrolled left-turn movements at intersections and driveways, as well as cross-centerline collisions, contribute to an increase in potential conflicts. There is a need to reduce the collision rate along the Camino Corridor of US 50.

## PROJECT DESCRIPTION

The project proposes to install a concrete median barrier that will restrict left-turn movements within the project limits. Widening the outside shoulders to standard width and installing several acceleration/deceleration lanes will help to reduce collisions. The baseline concept used for the VA study was Project Study Report Alternative 1A. This alternative provides a median barrier, shoulders constructed to standard, and a roundabout south of US 50 in the Camino Hills area. The baseline concept proposes to leave a gap in the median barrier at the Still Meadows area in the west end of the project; however, subsequent to the Project Study Report of December 2015, District 3 management directed that this gap be closed as part of the project.

## PROJECT DESIGN EXCEPTIONS

At the time of the VA study, there were no project design exceptions.

## INFORMATION PROVIDED TO THE VA TEAM

The following project documents were provided to the VA team for their use during the study:

- Project Study Report: Request for Programming and Amendment into the 2016 SHOPP; On US Highway 50 between Still Meadows Road and Upper Carson Road; December 1, 2015

*Note: The information presented in this section of the report may have been excerpted either in part or in full from the documents/information provided to the VA team listed above.*

## PROJECT DRAWINGS

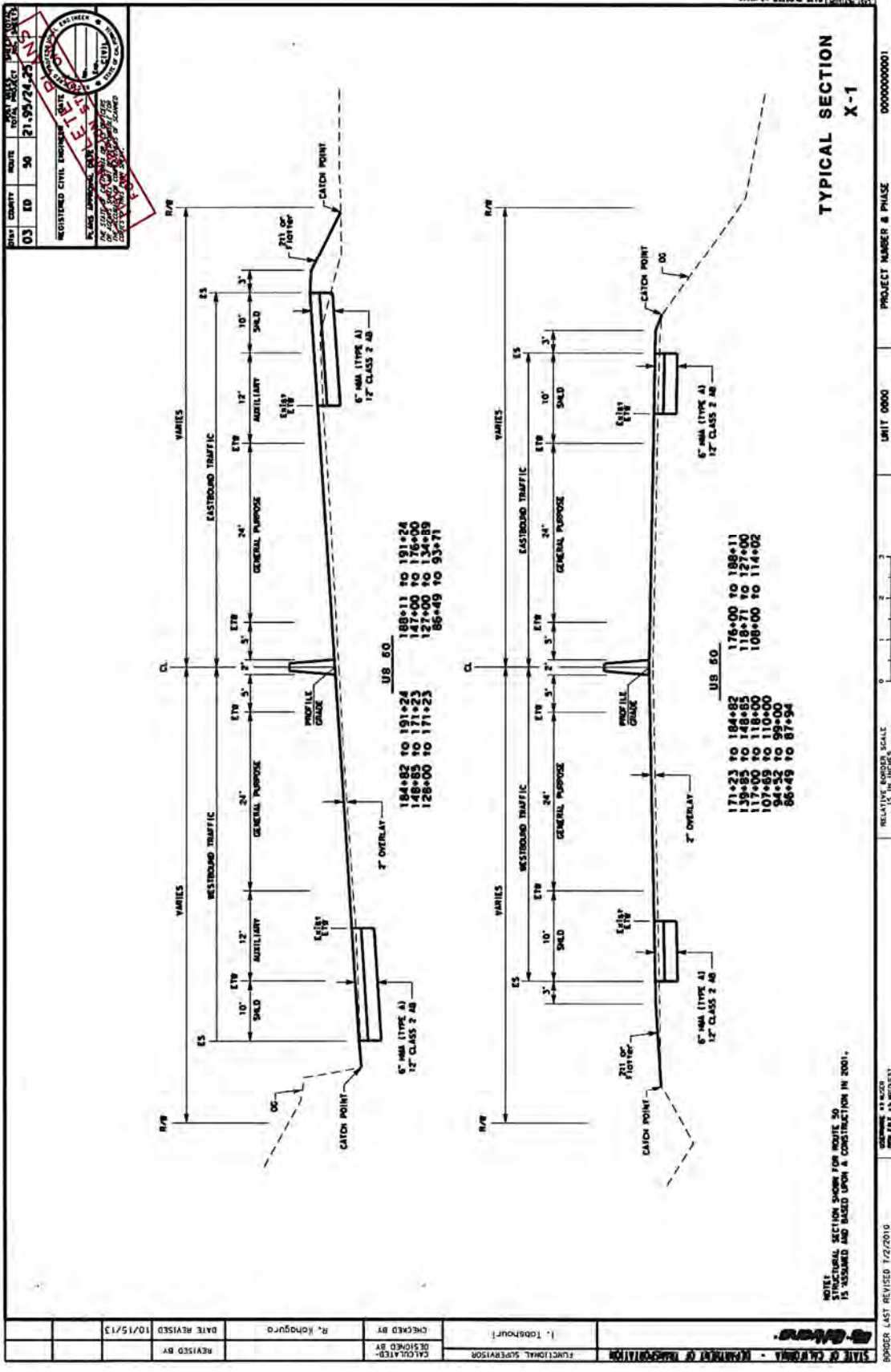
Selected sheets from the project drawings are included on the following pages.

## PROJECT COST ESTIMATE

The project cost estimate that was used as the baseline for the VA study is included at the end of this section.

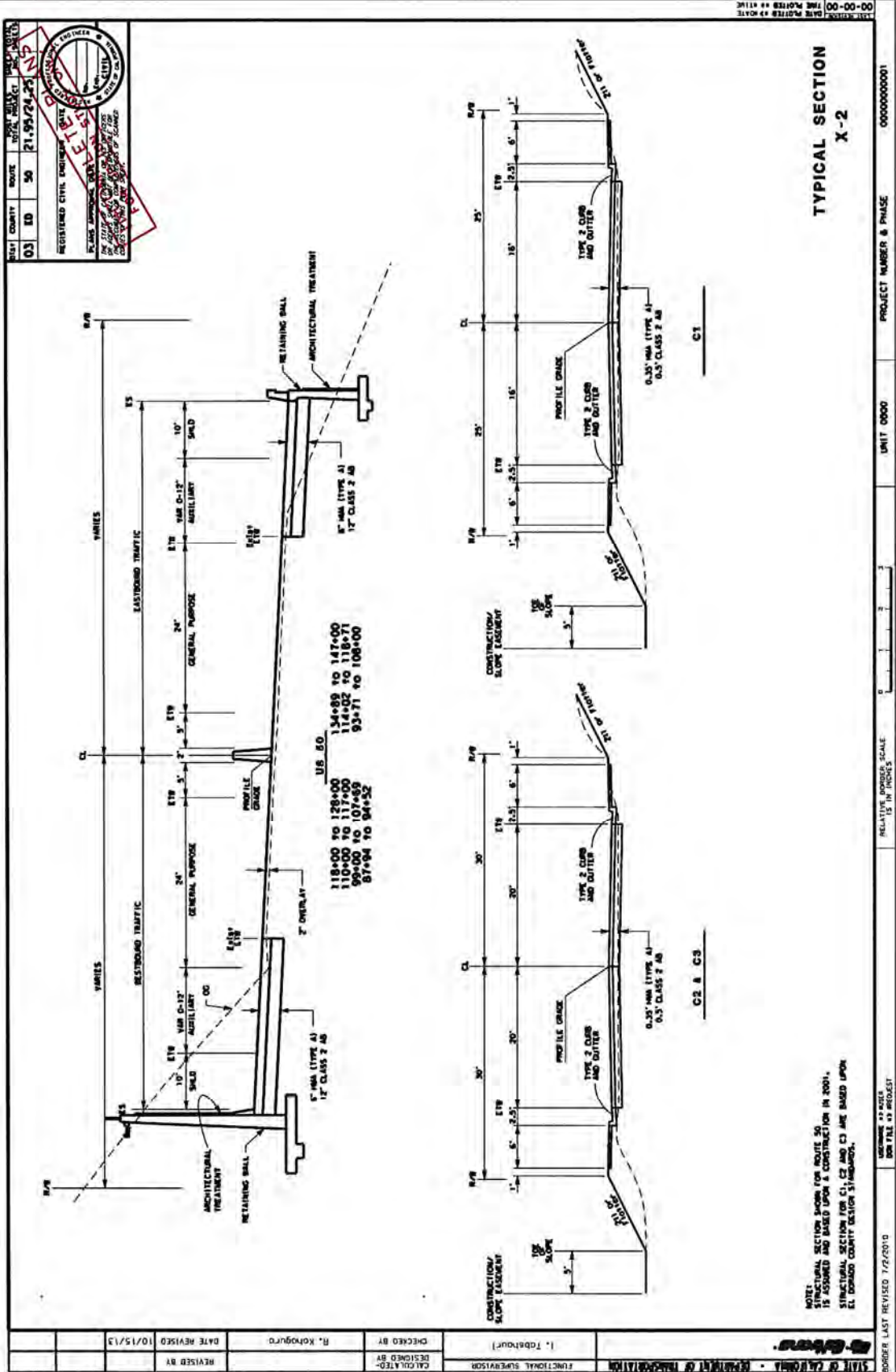


**Vicinity Map**



Typical Cross Section 1





TYPICAL SECTION X-2

NOTE: 1. TYPICAL SECTION SHOWN FOR ROUTE 50 IS ASSUMED AND BASED UPON A CONSTRUCTION IN 2007. 2. TYPICAL SECTION FOR C1, C2 AND C3 ARE BASED UPON 61. BOARDMAN COUNTY DESIGN 1511600000.

Typical Cross Section 2

**Preliminary Cost Estimate**  
Alternative 1A

**PROJECT DESCRIPTION:** On ED 50, from Still Meadows Road to just east of Upper Carson Road. The project proposes to install median barriers, Overlay and widen the existing pavement on ED 50. Construct Vista Terra Drive Undercrossing, frontage road and realignment of Carson road.

**SUMMARY OF PROJECT COST ESTIMATE**

TOTAL ROADWAY ITEMS	\$ 20,100,000
TOTAL STRUCTURE ITEMS	\$ 11,000,000
SUBTOTAL CONSTRUCTION COSTS	<b>\$ 31,100,000</b>
TOTAL RIGHT OF WAY ITEMS	\$2,388,000
TOTAL PROJECT CAPITAL OUTLAY COSTS	<b>\$ 33,488,000</b>

Reviewed by District  
Program Manager

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

Approved by  
Project Manager

\_\_\_\_\_  
Signature

\_\_\_\_\_  
Date

**I. ROADWAY ITEMS**

*Quantity      Unit      Unit Price      Item Cost      Section Cost*

**Section 1: Earthwork**

Roadway Excavation	\$ 29,000	CY	\$ 20	\$ 580,000
Clearing & Grubbing	\$ 1	LS	\$ 150,000	\$ 150,000
Develop Water Supply	\$ 1	LS	\$ 10,000	\$ 10,000

*Subtotal Earthwork* **\$ 740,000**

**Section 2: Pavement**

Hot Mix Asphalt (Type A)	31,600	TON	\$ 90	\$ 2,844,000
Aggregate Base (Class 2)	20,500	CY	\$ 60	\$ 1,230,000
Tack Coat	240	Ton	\$ 800	\$ 192,000
Type E Curb	5,000	LF	\$ 8	\$ 40,000
Type 2 Curb & Gutter	5,300	LF	\$ 15	\$ 79,500
Pavers (Roundabout)	6,700	LF	\$ 15	\$ 100,500
Curb (Roundabout)	600	LF	\$ 8	\$ 4,800
Minor Concrete (Sidewalk)	34,800	LF	\$ 10	\$ 348,000
Remove Dike	10,400	LF	\$ 2	\$ 20,800

*Subtotal Pavement Structural Sections* **\$ 4,859,600**

**Section 3: Drainage**

Relocation EID Facilities	1	LS	\$ 250,000	\$ 250,000
Project Drainage (Culverts, DI, etc..)	1	LS	\$ 350,000	\$ 350,000
Preparation of SWPPP	1	LS	\$ 10,000	\$ 10,000
Water Pollution Control (3.25%)	1	LS	\$ 446,000	\$ 446,000
				\$ -

*Subtotal Drainage* **\$ 1,056,000**

**Section 4: Specialty Items**

Concrete Barrier (Type 60 Series)	10,320	LF	\$ 60	\$ 619,200
Metal Beam Guardrail (Steel Post)	25,000	LF	\$ 35	\$ 875,000
Remove MBGR	1,420	LF	\$ 15	\$ 21,300
Treatment BMP	1	LS	\$ 240,000	\$ 240,000
Construction Site BMP	1	LS	\$ 340,000	\$ 340,000
Lead Compliance Plan	1	LS	\$ 2,000	\$ 2,000
Temporary Fence & Gate	13,000	LF	\$ 10	\$ 130,000
Temporary Fence (ESA)	7,000	LF	\$ 5	\$ 35,000
Erosion Control	1	LS	\$ 366,000	\$ 366,000
Highway Architectural Cost (Gore)	1	LS	\$ 125,000	\$ 125,000
Highway Architectural Cost Ret. Wall	56,000	SF	\$ 18	\$ 1,008,000
Resident Engineer Office Space	1	LS	\$ 240,000	\$ 240,000

*Subtotal Specialty Items* **\$ 4,001,500**

*Quantity      Unit      Unit Price      Item Cost      Section Cost*

**Section 5: Traffic Items**

4" Recessed Thermoplastic Traffic Stripe (Broken 12-3	28,000	LF	\$ 2	\$ 56,000
4" Recessed Thermoplastic White Traffic Stripe	35,000	LF	\$ 2	\$ 70,000
4" Recessed Thermoplastic Yellow Traffic Stripe	25,000	LF	\$ 2	\$ 50,000
12" Recessed Thermoplastic Pavement Marking	10,000	SQFT	\$ 8	\$ 80,000
Delineator	200	EA	\$ 60	\$ 12,000
Object Markers	10	EA	\$ 60	\$ 600
Mile Post Markers	10	EA	\$ 80	\$ 800
Sign - One post	15	EA	\$ 275	\$ 4,125
Sign - Double Post	16	EA	\$ 540	\$ 8,640
Traffic Management Plan	300	WD	\$ 2,500	\$ 750,000
Public Information Office (PIO)	1	LS	\$ 1,500,000	\$ 1,500,000
COZEEP	300	WD	\$ 1,000	\$ 300,000
Lighting	1	LS	\$ 560,000	\$ 560,000
Temporary Railing (Type K)	13,000	LF	\$ 10	\$ 130,000

*Subtotal Traffic Items* **\$ 3,522,165**

**SUBTOTAL SECTIONS 1 THROUGH 5** **\$ 14,179,265**

**Section 6: Minor**

*Section Cost*

**\$ 14,179,265** X **0.05** = **\$ 708,963**  
(Subtotal Sections 1-5)

*Total Minor Items* **\$ 708,963**

**Section 7: Roadway Mobilization**

**\$ 14,888,228** X **0.05** = **\$ 744,411**  
(Subtotal Sections 1-6)

*Total Roadway Mobilization* **\$ 744,411**

**Section 8: Roadway Additions**

Supplemental Work  
**\$ 14,888,228** X **0.05** X **\$ 744,411**  
(Subtotal Sections 1-6)

Contingencies  
**\$ 14,888,228** X **0.250** X **\$ 3,722,057**  
(Subtotal Sections 1-6)

*Total Roadway Additions* **\$ 4,466,468**

**TOTAL ROADWAY ITEMS** **\$ 20,099,109**

(Subtotal Sections 1-8)

Estimate Prepared By: Ryan Kohagura  
(Print Name)

Date: 11/10/2014  
Phone: 530-741-5746

Estimate Checked By: Ryan Kohagura  
(Print Name)

Date: 11/10/2014  
Phone: 530-741-5746

**II. Structures Items**

*Section Cost*

Pondorado Road UC \$ 3,885,000  
Retaining Walls \$ 6,684,000

(The estimated cost includes 10% Time-related overhead, 10% mobilization and 25% contingency)

*Total Cost for Structure* \$ 10,569,000

*Subtotal Structures Items* \$ 10,569,000

**III. Railroad Related Costs**

	<i>Quantity</i>	<i>Unit</i>	<i>Unit Price</i>	<i>Item Cost</i>	<i>Section Cost</i>
			\$ -	\$ -	-
			\$ -	\$ -	-
			\$ -	\$ -	-
			\$ -	\$ -	-

*Subtotal Railroad Costs* \$ -

**TOTAL STRUCTURES AND RAILROAD ITEMS** \$ 10,569,000

Estimate Prepared By: \_\_\_\_\_  
(Print Name)

Date: \_\_\_\_\_  
Phone: \_\_\_\_\_

**IV. Right of Way Cost Estimate:**

	<i>Current Value</i>	<i>Escalation Rate</i>	<i>Escalated Value</i>
A) Total Acquisition Cost	\$1,555,225	5.00%	\$1,764,156
B) Appraisal Fee Estimate	\$35,000	N/A	\$35,000
C) Mitigation acquisition & credits	\$0	5.00%	\$0
D) Project Development Permit Fees	\$6,000	5.00%	\$6,806
E) Utility Relocation (State share)	\$218,000	5.00%	\$278,867
F) Relocation Assistance (RAP)	\$200,000	5.00%	\$226,868
G) Clearance/Demolition	\$50,000	5.00%	\$56,717
H) Title and Escrow Fees	\$16,400	14.63%	\$18,603
J) Construction Contract Work	\$15,000	N/A	

**Total Estimate Right of Way Co** **\$2,080,625**      **Rounded** **\$2,388,000**

Current Date of Right of Way Certification      July 15, 2017  
(Date to which values are escalated)

Construction Contract Work:

Brief Description of Work:

Right of Way Branch Cost Estimate for Work\* \$ -

\* This dollar amount is to be included in the Roadway and/or Structures items of work, as appropriate. Do not include in Right of Way items.

Estimate Prepared By: \_\_\_\_\_  
(Print Name)

Date: \_\_\_\_\_  
Phone: \_\_\_\_\_

# PROJECT ANALYSIS

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# PROJECT ANALYSIS

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## SUMMARY OF ANALYSIS

The following analysis tools were used to study the project:

- Key Project Factors
- Cost Model
- Function Analysis
- Value Metrics

## KEY PROJECT FACTORS

The first day of the VA study included meetings with the project stakeholders and a site visit. The following summarizes key project issues and site visit observations identified during these sessions.

### Project Issues

The following are some of the issues and concerns associated with the project.

- Public acceptance issues related to project awareness, active HOA concerns, concerns about the accident history timeframe (date of the data), and concerns related to additional traffic in neighborhoods related to construction of the extension of Tiera Vista Road.
- Conflicting movements and cross median areas do not meet driver expectations.
- The project design does not include accommodations for Apple Hill traffic during the fall agritourism events. However, the project will look for opportunities to accommodate this seasonal traffic.
- Traffic management during construction.
- Emergency vehicle access.
- Impacts such as noise and inconvenience from construction activities to residential areas.
- US 50 east of Placerville is designated as a scenic highway.

### Site Visit Observations

A site visit was conducted in order to visually assess the project site conditions. The following observations were made by the VA team.

- There are considerable grades within the project limits.



- Many utilities run through the project limits: water lines, water valves, power lines.
- Access across the highway can cause incidents.
- A chain-up area is located within the project limits.
- There is poor sight distance at potential crossover tunnel area.
- Emergency vehicle access concerns are noted, as well as impact on response times.
- Median barriers are Type 50 on the west end and Type 60 on the east end.
- There is an intersection warning system located at Still Meadows Road.
- The irrigation canal at Lower Carson Road and Carson Court could be historical.
- Culvert under US 50 at Lower Carson Road area.
- There is minimal street lighting in the project limits; only safety lighting at the intersections.
- Existing trees at Camino Heights; southbound at the park and ride and planted at the Sierra Banquet location.
- The park and ride area showed old pavement that may have been part of an old roadway.

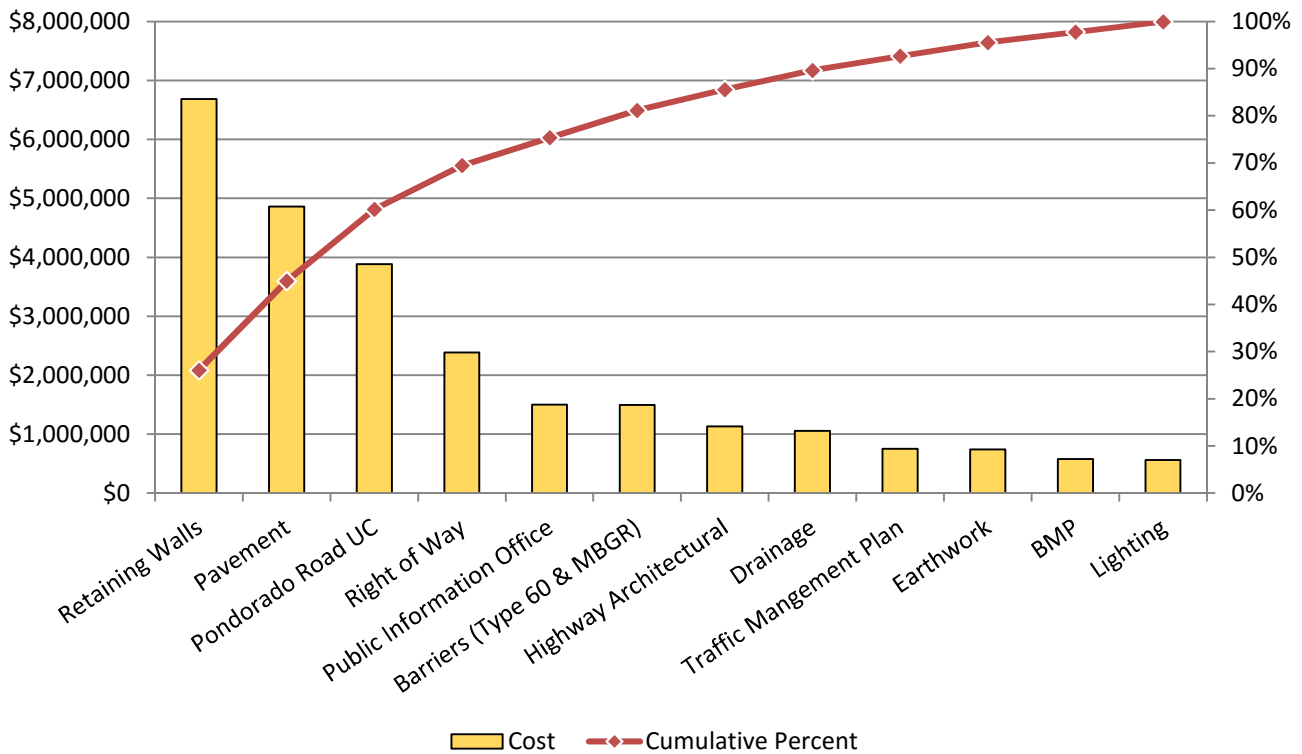
## **COST MODEL**

The VA team leader prepared a cost model from the cost estimate presented in the *Project Information* section of this report. The model is organized to identify major construction elements or trade categories, the original estimated costs, and the percent of total project cost for the significant cost items.

The cost model clearly showed the cost drivers for the project and was used to guide the VA team during the VA study. The following conclusions were noted by the VA team regarding the project costs:

- The largest cost item is retaining walls at \$6.5 million. The second largest project element is pavement structural section at \$4.9 million followed by the proposed roundabout at \$3.9 million and right-of-way at \$2.3 million. These four items are approximately 80% of the total project cost (includes project markups of 40%).

## Cost Model



## FUNCTION ANALYSIS

Function analysis was performed and a Function Analysis System Technique (FAST) Diagram was produced, which revealed the key functional relationships for the project. This analysis provided a greater understanding of the total project and how the project’s performance, cost, time, and risk characteristics are related to the various functions identified.

The FAST diagram arranges the functions in logical order so that when read from left to right, the functions answer the question, “How?” If the diagram is read from right to left, the functions answer the question, “Why?” Functions connected with a vertical line are those that happen at the same time as, or are caused by, the function at the top of the column (a “When?” relationship).

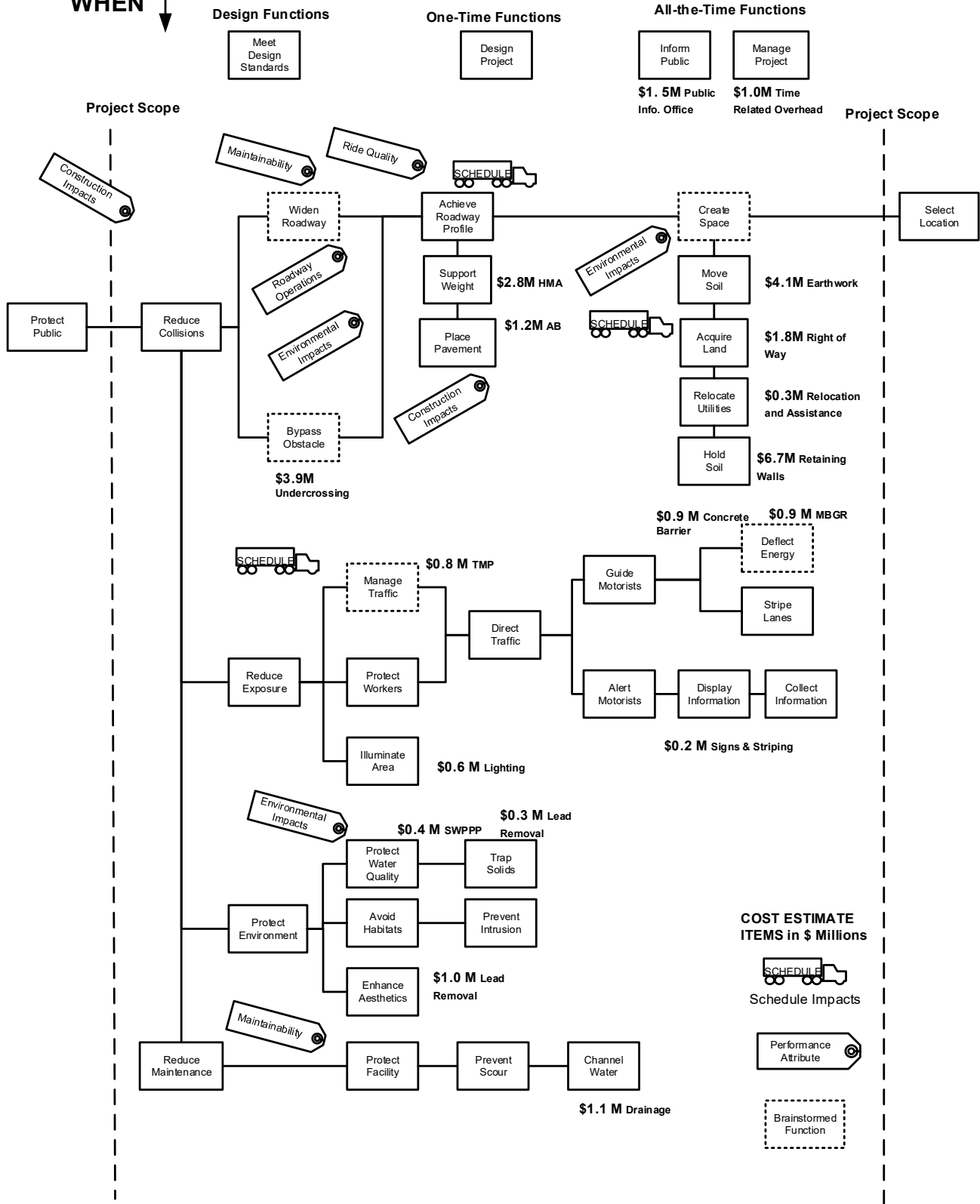
### Random Function Determination

Project Element	Function
Need	Maintain Mobility
Purpose	Widen Roadway
	Bypass Obstacle
	Deflect Energy
	Manage Traffic
	Create Space

# FAST Diagram

HOW →  
WHEN ↕

← WHY



## VALUE METRICS

Value Methodology (VM) has traditionally been perceived as an effective means for reducing project costs. This paradigm only addresses one part of the value equation, oftentimes at the expense of the role that VM can play with regard to improving project performance. Project costs are fairly easy to quantify and compare; performance is not.

Project performance must be properly defined and agreed to by the stakeholders at the beginning of the VA study. The performance requirements and attributes developed are then used throughout the study to identify, evaluate, and document alternatives. This process, Value Metrics, emphasizes the interrelationship between the elements of performance, cost, and time and can be quantified and compared in terms of how they contribute to overall value. The basic equation for value is:

$$Value = \frac{Performance}{Cost + Time}$$

Value Metrics provides a standardized means of identifying, defining, evaluating, and measuring performance. Once this has been achieved and costs for all Value Analysis alternatives have been developed, measuring value is very straightforward.

The following pages describe the steps in the Value Metrics process.

### Define Performance Requirements

Performance requirements represent essential, non-discretionary aspects of project performance. Any concept that fails to meet the project's performance requirements, regardless of whether it was developed during the project's design process or during the course of the VA study, cannot be considered as a viable solution. Concepts that do not meet a performance requirement cannot be considered further unless such shortcomings are addressed through the VA study process in the form of VA alternatives. It should be noted that in some cases, a performance requirement may also represent the minimum acceptable level of a performance attribute. The following performance requirements were selected for this project.

Performance Requirement	Definition
Highway Design Standards	Any deviation from the Caltrans Highway Design Manual must be approvable by the District's Design Reviewer.
Structural Design Standards	Any structure on the project must comply with current seismic design standards and meet the Load Resistance Design Factor.
Environmental Review Process	Any concept or design modification considered must comply with state and federal environmental law and be compatible with the environmental review process.
Critical Project Milestones	Several critical schedule milestones must be met in order to meet legislative and/or funding requirements. These include PA&ED, April 2017; PS&E, July 2018; RTL, October 2018; Start Construction, Spring 2019; Construction Complete, December 2021.

## Define Performance Attributes and Scales

Performance attributes represent those aspects of a project’s scope that may possess a range of potential values. For example, an attribute called “Environmental Impacts” may have a range of acceptable values for a project ranging from 1 acre to 20 acres of wetlands mitigation. It is clear that a concept that offered 15 acres of mitigation would perform at a higher level than one that offered 5 acres, but both would meet the project’s need and purpose, and their values (i.e., the relationship between performance and cost) could be rationally compared. The following performance attributes were selected for this project.

### Mainline Operations

An assessment of traffic operations and safety on the mainline facility(s), including off-ramps and collector-distributor roads. Operational considerations include level of service relative to the 20-year traffic projections, as well as geometric considerations such as design speed, sight distance, lane widths, and shoulder widths.

Rating	Label	Description
0.0	Unacceptable	Very poor level of traffic operations.
2.0	Poor	Poor level of traffic operations.
4.0	Fair	Fair level of traffic operations.
6.0	Good	Good level of traffic operations.
8.0	Very Good	High level of traffic operations.
10.0	Excellent	Highest level of traffic operations.

### Maintainability

An assessment of the long-term maintainability of the transportation facility(s). Maintenance considerations include the overall durability, longevity, and maintainability of pavements, structures, and systems; ease of maintenance; accessibility and safety considerations for maintenance personnel.

Rating	Label	Description
0.0	Unacceptable	The anticipated level of maintenance for the project will be extreme and unacceptably high.
2.0	Poor	The project is expected to require maintenance that far exceeds the norm for a facility of its kind.
4.0	Fair	The highway facility is expected to require greater than normal maintenance due to existing site conditions or materials selection.
6.0	Good	The project provides a satisfactory level of maintainability and is typical of a highway facility of this kind statewide.

Rating	Label	Description
8.0	Very Good	The project provides a high level of maintainability. The facility utilizes many low maintenance features and is better than average in terms of expected maintenance.
10.0	Excellent	The project provides the highest possible level of maintainability and far exceeds expectations when compared to comparable facilities statewide. Examples are the use of long-life pavement, low maintenance water quality facilities, low maintenance structures, etc.

### Local Operations

An assessment of traffic operations and safety on the local roadway infrastructure, including on-ramps and frontage roads. Operational considerations include level of service relative to the 20-year traffic projections; geometric considerations such as design speed, sight distance, and lane widths; bicycle and pedestrian operations and access.

Rating	Label	Description
0.0	Unacceptable	Very poor level of traffic operations. Severely impacts existing local access.
2.0	Poor	Poor level of traffic operations. Significantly impacts existing local access.
4.0	Fair	Fair level of traffic operations. Somewhat impacts existing local access.
6.0	Good	Good level of traffic operations. Maintains existing local access.
8.0	Very Good	High level of traffic operations. Maintains or improves existing local access.
10.0	Excellent	Highest level of traffic operations. Significantly maintains or improves upon existing local access.

### Environmental Impacts

An assessment of the permanent impacts to the environment, including ecological (i.e., flora, fauna, air quality, water quality, visual, noise); socioeconomic impacts (i.e., environmental justice); impacts to cultural, recreational, and historic resources. Also considered under this attribute are drainage and hydraulic issues.

Rating	Label	Description
0.0	Unacceptable	The environmental impacts are severe and the project does not comply with state and/or federal environmental laws.
2.0	Poor	The project introduces environmental impacts that are both significant in number and impact that require extensive mitigation.

Rating	Label	Description
4.0	Fair	The project introduces many new environmental impacts that will require extensive mitigation.
6.0	Good	The project introduces some new environmental impacts that can be addressed through standard and accepted mitigation approaches.
8.0	Very Good	The project introduces no new environmental impacts.
10.0	Excellent	The project improves upon the existing environmental conditions while introducing no new environmental impacts.

### Land Use Compatibility

How land uses and values are benefited by construction of this project

Rating	Label	Description
0.0	Unacceptable	Extensive number of parcels are affected.
2.0	Poor	Very many parcels are affected.
4.0	Fair	Many parcels are affected.
6.0	Good	Some parcels are affected.
8.0	Very Good	Very few parcels are affected.
10.0	Excellent	No unviable parcels; none are impacted.

### Construction Impacts

An assessment of the temporary impacts to the public during construction related to traffic disruptions, detours, and delays; impacts to businesses and residents relative to access, visual, noise, vibration, dust, and construction traffic; environmental impacts related to water quality, air quality, soil erosion, and local flora and fauna.

Rating	Label	Description
0.0	Unacceptable	Temporary traffic, impacts to residents, access to businesses and environmental impacts will be severe and create impacts that are unacceptable to the public.
2.0	Poor	Temporary traffic, impacts to residents, access to businesses and environmental impacts will be extensive, lengthy, and very disruptive. Temporary environmental impacts will require extraordinary mitigation measures and create major inconveniences to the public.

Rating	Label	Description
4.0	Fair	Temporary traffic, impacts to residents, access to businesses and environmental impacts will be significant and be much greater than what would normally be anticipated for similar projects. Temporary environmental impacts will be more significant in nature and require greater mitigation measures and/or inconveniences to the public.
6.0	Good	There will be some nighttime lane closures and/or temporary ramp closures. There will be some minor to moderate temporary environmental impacts. Impacts will be fairly "typical" for this type of project and can be handled through normal processes and procedures.
8.0	Very Good	Temporary traffic, impacts to residents, access to businesses and environmental impacts will be minor temporary traffic and/or environmental impacts expected during construction. Impacts will be less than typical.
10.0	Excellent	Temporary traffic, impacts to residents, access to businesses and environmental impacts will very minor.

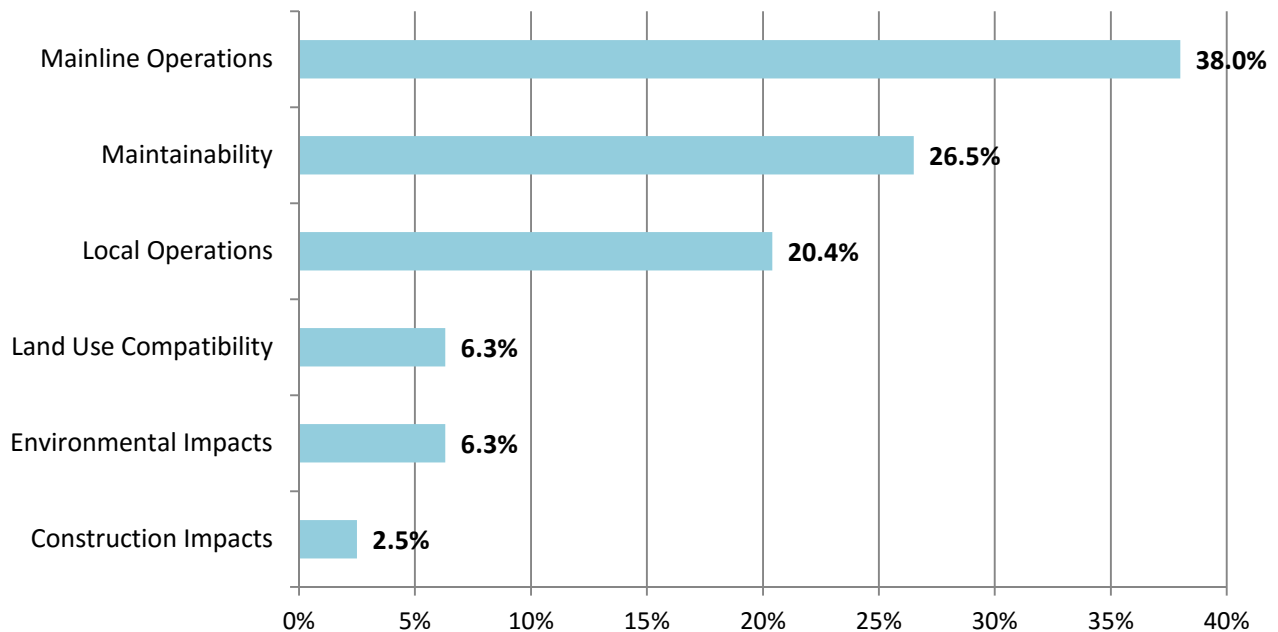
### Prioritize Performance Attributes

The performance attributes of a project are seldom of equal importance. Therefore, a systematic approach must be utilized in order to determine their relative importance in meeting the project's need and purpose.

Once the performance attributes were defined and their scales developed, the Project Team and stakeholders prioritized them based on their relative importance to the project. The Analytic Hierarchy Process (AHP) was utilized in the prioritization process. The performance attributes were systematically compared in pairs, asking the question: "An improvement to which attribute will provide the greatest benefit relative to the project's need and purpose?" Participants were then asked to indicate their priorities and the relative intensities of their preferences. The chart below provides the results of this analysis and includes the complete breakdown of the priorities, expressed as a percentage of the whole.



## Performance Attribute Prioritization



### Measure Performance of Baseline Concept

The project team and stakeholders evaluated the performance of the Baseline Concept relative to the scales previously identified. The information below reflects the performance ratings and associated rationale for each attribute.

#### ***Mainline Operations***

Rating: **8.0**

**Rationale:** The installation of a median barrier will prevent crossover collisions.

#### ***Maintainability***

Rating: **8.0**

**Rationale:** The project will be designed and constructed with best practices that will minimize the frequency, duration, and severity of maintenance events.

#### ***Local Operations***

Rating: **7.0**

**Rationale:** The project will result in longer out-of-direction travel.

#### ***Environmental Impacts***

Rating: **6.0**

**Rationale:** There will be some environmental impacts because of the disturbance related to additional land needed to construct the project.

### **Land Use Compatibility**

Rating: **8.0**

**Rationale:** Access across US 50 will provide improved access to land parcels.

### **Construction Impacts**

Rating: **3.0**

**Rationale:** There will be considerable construction-related impacts to local residents and delays while the project is being constructed.

## **Measure Performance of VA Alternatives**

The VA team prepared performance assessments of each of the VA alternatives during the Development Phase of the VA study. For each VA alternative, the VA team rated its performance using the previously defined scale for each performance attribute. The rationale for any change in performance as compared to the Baseline Concept was recorded. Please refer to the individual performance assessments for each VA alternative as presented in the *Value Analysis Alternatives* section of this report.

## **Define VA Strategies**

The VA team identified one or more VA strategies for consideration. VA strategies reflect different combinations of complimentary VA alternatives. The VA strategies are summarized in the table below.

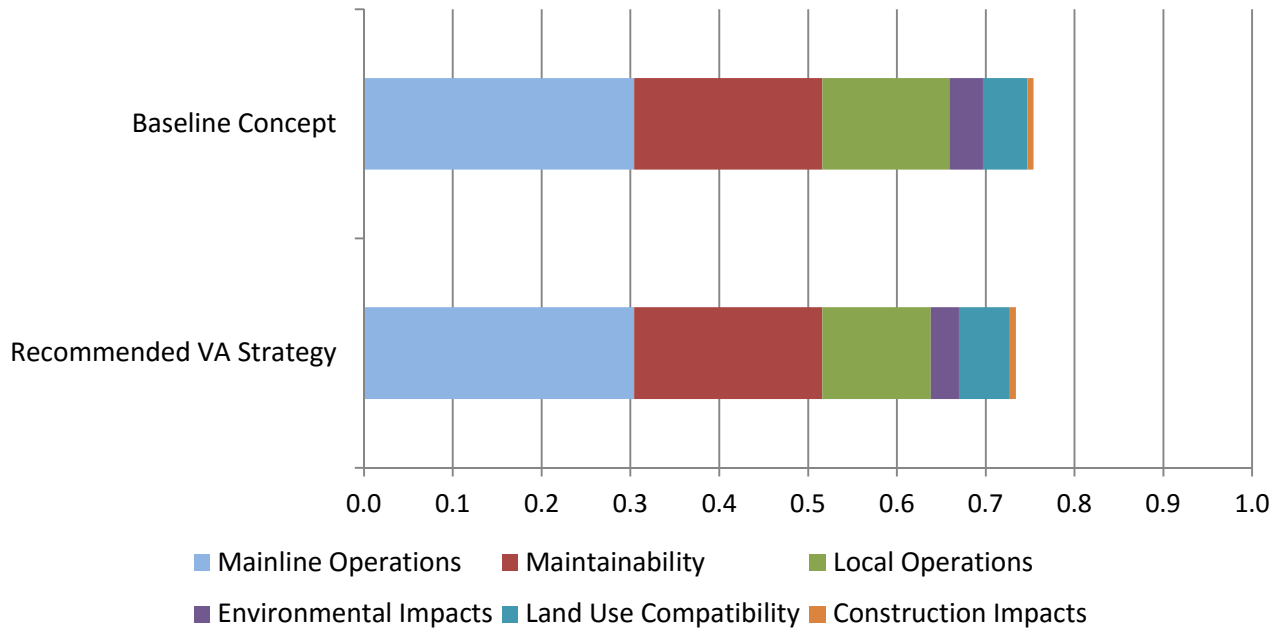
### **Summary of VA Strategies**

<b>Strategy Description</b>	<b>Initial Cost Savings</b>	<b>Change in Schedule</b>	<b>Change in Performance</b>	<b>Value Change</b>
Recommended VA Strategy <i>VA Alternative 4.4</i>	\$200,000	-3 months	-3 %	No change

## **Compare Performance – Baseline Concept and VA Strategies**

The VA team considered the combined effect of all VA alternatives for each VA strategy. The total performance scores reflect the performance rating for each attribute multiplied by its overall priority (weight) expressed using a ratio scale. A total performance score of “1” would indicate the highest level of desired performance (i.e., “ideal” performance). The chart below compares the total performance scores for the Baseline Concept and the VA strategies.

### Comparison of Performance



### Rating Rationale for VA Strategies

The rating rationale for the performance of the Baseline Concept was presented previously in this section. The rating rationale for the VA strategies that were developed by the VA team is provided below.

#### VA Strategy 1 – Recommended VA Strategy

##### **Mainline Operations**

Rating: **8.0**

**Rationale:** No change.

##### **Maintainability**

Rating: **8.0**

**Rationale:** No change.

##### **Local Operations**

Rating: **6.0**

**Rationale:** Longer out-of-direction travel for motorists going from north of US 50 to eastbound US 50.

### **Environmental Impacts**

Rating: **5.0**

**Rationale:** Affects the area owned by the El Dorado county school district near the new loop off ramp that would have not been disturbed as much as in the base case.

### **Land Use Compatibility**

Rating: **9.0**

**Rationale:** Reduces impacts to residential areas.

### **Construction Impacts**

Rating: **3.0**

**Rationale:** No change.

## **Compare Value**

The cost and time (i.e., schedule) elements were compared and normalized for the Baseline Concept and the VA strategies using the following tables. These tables illustrate how cost and time (schedule) scores were derived. In this comparison, a lower score is desirable as the project will benefit from lower costs and a shorter schedule.

<b>Strategies</b>	<b>Cost</b>	<b>Score</b>
Baseline Concept	\$33,488,000	0.501
Recommended VA Strategy	\$33,288,000	0.499
<b>TOTAL</b>	<b>\$66,776,000</b>	<b>1.000</b>

<b>Strategies</b>	<b>Time</b>	<b>Score</b>
Baseline Concept	64 months	0.512
Recommended VA Strategy	61 months	0.488
<b>TOTAL</b>	<b>125 months</b>	<b>1.000</b>

Project Management indicated the following preferences in considering trade-offs between cost and time:

<b>Relative Importance</b>	
COST	40.00 %
TIME	60.00 %

Once relative scores for performance, cost and time have been derived, the next step is to synthesize a value index for the Baseline Concept and each of the VA strategies. This is achieved by applying the following algorithm for value:

- V = Value
- f = Function
- P = Performance
- C = Cost
- t = Time
- α = Risk

$$V_f(P, C, t)_{total} = \frac{\sum_{n=1}^{\infty} P_n \cdot \alpha}{\sum_{n=1}^{\infty} [(C_n \cdot \alpha) + (t_n \cdot \alpha)]}$$

A Value Matrix was prepared which facilitated the comparison of competing strategies by organizing and summarizing this data into a tabular format. The performance scores for each strategy were divided by the total cost/time scores for each strategy to derive a value index. The value indices for the VA strategies are then compared against the value index of the Baseline Concept and the difference is expressed as a percent (±%) deviation.

**Value Matrix**  
**Baseline Concept and VA Strategies**

Strategies	Performance Score	Change in Performance	Cost/Time Score	Net Change	Value Index	Change in Value
Baseline Concept	0.755	---	0.508	---	1.486	---
Recommended VA Strategy	0.734	-3 %	0.492	-3 %	1.492	No change

# IDEA EVALUATION

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# IDEA EVALUATION

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The ideas generated by the VA team were carefully evaluated, and project-specific attributes were applied to each idea to assure an objective evaluation.

## PERFORMANCE ATTRIBUTES

The following are key performance attributes identified for this project and used to assist the VA team in evaluating the ideas:

- Mainline Operations
- Maintainability
- Local Operations
- Environmental Impacts
- Land Use Compatibility
- Construction Impacts

The VA team enlisted the assistance of the stakeholders and project team (when available) to develop these attributes so that the evaluation would reflect their specific requirements.

## EVALUATION PROCESS

The VA team generated and evaluated ideas on how to perform the various project functions using other approaches. The idea list was grouped by function or major project element. Each idea was evaluated with respect to the functional requirements of the project. Performance, cost, time, and risk may also have been considered during this evaluation.

Once each idea was fully evaluated, it was given a total rating number. This is based on a scale of 1 to 7, as indicated by the rating index described in the *Value Analysis Process* section of this report. Ideas rated 4 to 7 were developed further and those that were found to have the greatest potential for value improvement are documented in the *Value Analysis Alternatives* section of this report. The rationale for why ideas that were rated highly but were not developed as alternatives is documented later in this section.

## IDEA SUMMARY

All of the ideas that were generated during the Speculation Phase using brainstorming techniques were recorded on the following pages. Ideas received an idea code based on the function statement under which it was brainstormed. The following table indicates the functions related to each idea code.

Idea Code	Related Function	Idea Code	Related Function
BO	Bypass Obstacle	MT	Manage Traffic
CS	Create Space	WR	Widen Roadway
DE	Deflect Energy		

A detailed idea evaluation summary is also included. This summary includes additional information related to how each idea improves or degrades the elements of performance, cost, time (schedule), and risk. Only those elements where the idea differs from the baseline concept are included in this summary.

## IDEA SUMMARY LIST

Idea Code and Description	Rating
BO-1: Construct the undercrossing with precast girders in lieu of cast-in-place at Lower Carson Road and Upper Carson Road and align the structure perpendicular to US 50	DS
BO-2: Construct an overcrossing at Snows Road	DIS
BO-3: Construct a full interchange at Smith Flat	DIS
BO-4: Construct a double roundabout undercrossing at Upper Carson Road (W-6)	DIS
BO-5: Construct a ¾-mile Still Meadows to Camino Heights connector (W-1)	2
BO-6: Construct a ¼-mile Paul Bunyan to Camino Heights Drive (W-2)	DIS
BO-7: Construct a ¼-mile Paul Bunyan to Pina Avenue connector (W-3)	3
BO-8: Construct a ¼-mile Paul Bunyan to Piedmont Road connector (W-4)	DIS
BO-9: Construct a ½-mile Paul Bunyan to Sierra Blanca connector with a connector to the undercrossing (W-5)	DS
BO-10: Construct a ½-mile Paul Bunyan to Sierra Blanca connector with two roundabouts at the undercrossing (W-6)	6
BO-11: Construct right-in/right-out hook ramps between Camino Heights and Sierra Blanca (which will be closed) (1B)	4
BO-12: Construct right-in/right-out ramps at Sierra Blanca keeping Camino Heights Drive open (1C)	4
BO-13: Camino Heights Drive is main off-ramp to the undercrossing and close Sierra Blanca (1D)	5
BO-14: Construct an eastbound off-ramp only flyover with direct connection with two structures to westbound Carson Road at the Upper Carson Road area (E-1A)	1
BO-15: Construct an eastbound-only off-ramp to Carson Road with one structure at the Upper Carson Road area (E-1B)	1
BO-16: Construct an eastbound off-ramp flyover with direct connection to Carson Road at Upper Carson Road, ¼ mile east of the existing Upper Carson Road intersection (E-2)	DIS
BO-17: Construct diverging diamond flyover from Upper Carson Road to Vista Del Mondo with roundabout on south side (E-3)	2
BO-18: Construct diverging diamond flyover from Upper Carson Road to eastbound US 50 with a parallel frontage road to Golden Chain Drive (E-4)	2



Idea Code and Description	Rating
BO-19: Construct diverging diamond flyover from Upper Carson Road to eastbound US 50 frontage road with park and ride area (E-5)	DS
BO-20: Construct a classic L-1 type interchange ¼ mile east of Upper Carson Road with frontage connection to Camino Heights (consider park and ride/rest area) (E-6)	5
BO-21: Construct a classic L-1 type interchange 1.25 miles east of Upper Carson Road with a rest area and frontage connection to Camino Heights (E-7)	1
BO-22: Construct an undercrossing at Upper Carson Road with a roundabout connection to Carson Road with a roundabout on the north side of US 50	4
BO-23: Construct an undercrossing at Upper Carson Road with a T connection to Carson Road (modified E-2)	DIS
BO-24: Eliminate from the project the mitigation for the loss of the left turns and the north-south movements across US 50	7
BO-25: Construct two mainline roundabouts on US 50 at Still Meadows and the Upper Carson Road area	DIS
BO-26: Construct a mainline roundabout with eastbound bypass lane at Upper Carson Road	3
BO-27: Eliminate park and ride	DS
BO-28: Relocate the park and ride	DS
BO-29: Add a mainline roundabout at intersection of US 50 and Still Meadows	DIS
BO-30: Construct a tight diamond interchange east of Upper Carson Road from Camino Heights to Carson Road with a frontage road (E-6)	1
BO-31: Construct two roundabouts: a mainline and local one at Upper Carson Road	3
BO-32: Construct a single roundabout combining Carson Road and Upper Carson Road	2
BO-33: Construct a bypass around the existing project limits	1
BO-34: Construct eastbound on-/off-ramps to connect with two roundabouts at the undercrossing (W-6 mod)	6
BO-35: Construct eastbound on-/off-ramps to connect with two roundabouts at the undercrossing and construct a right-in ramp only for local Camino Heights traffic (W-6 mod)	5
CS-1: Construct 2:1 fill slopes at west end and eliminate retaining walls	DS
CS-2: Use soldier pile walls in lieu of soil nail walls	DS
CS-3: Consider including CHP or emergency turnarounds in the median	DS
CS-4: Purchase the house near the vacant Sierra Business Center	DS
CS-5: Reduce the length of retaining walls and construct slopes in its place	DS
CS-6: Construct retaining wall out of precast panel (RediRock)	DS

Idea Code and Description	Rating
CS-7: Construct MSE walls in lieu of soil nail walls	DS
DE-1: Close the median barrier gap at Upper Carson Road (Upper Carson Road Option - 1)	DS
DE-2: Leave the existing median barrier open in the Upper Carson Road area (Upper Carson Road - Option 2)	DIS
DE-3: At Still Meadows Road construct a partial barrier that allows eastbound right-in/right-out and westbound left-in	DIS
DE-4: At Still Meadows Road construct a full barrier that allows only an eastbound right-in/right-out and closing the westbound movements	ABD
DE-5: Increase the roadway curve radius just west of Still Meadows Road to improve westbound US 50 stopping sight distance	DS
DE-6: Construct a full westbound acceleration lane at Still Meadows Road	DIS
DE-7: Construct a mainline roundabout at Still Meadows Road	DIS
DE-8: Construct a mainline roundabout at Upper Carson Road	DIS
MT-1: Make the old logging mill a parking center for events	DS
MT-2: Construct a linear rest area in the eastbound direction of US 50 near Camino Heights	DS
WR-1: At the west end of the project, shift the roadway center line to the south to straighten the curve (widen to the south)	DS

*DEV: Develop as a VA Alternative*

*DS: Design Suggestion*

*ABD: Already Being Done in the Baseline Concept*

*DIS: Dismissed*

## DETAILED IDEA EVALUATION SUMMARY

**BO-1: Construct the undercrossing with precast girders in lieu of cast-in-place at Lower Carson Road and Upper Carson Road and align the structure perpendicular to US 50**

Overall Rating:  
**DS**

*General comments:* Shallower excavation. Less vertical clearance needed under structure because of elimination of falsework. Less grading at the Upper Carson Road intersection area.

**BO-2: Construct an overcrossing at Snows Road**

Overall Rating:  
**DIS**

*General comments:* Duplicate to BO-21.

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**BO-3: Construct a full interchange at Smith Flat**Overall Rating:  
**DIS**

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*General comments:* Duplicate to W-6.

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**BO-4: Construct a double roundabout undercrossing at Upper Carson Road (W-6)**Overall Rating:  
**DIS**

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*General comments:* Duplicate idea.

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**BO-5: Construct a ¾-mile Still Meadows to Camino Heights connector (W-1)**Overall Rating:  
**2**

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<i>Attributes</i>	<i>Rating</i>	<i>Comments</i>
Local Operations	Improved	Provides Camino Heights residents a parallel route for local traffic to traverse in lieu of going on US 50
Environmental Impacts	Degraded	Retaining walls and drainage would impact environmental impacts
Maintainability	Degraded	New road, drainage, and retaining wall structures would have to be maintained
Land Use Compatibility	Improved	Better access and circulation for the local residents

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*General comments:* A retaining wall of approximately 4,000 feet would be very expensive, approximately (estimate) \$1,440,000 (4,000 feet x 4 feet high x \$90/SF) + nearby roadway construction. The greatest benefit would be during Apple Hill tourist events. Would introduce queueing on the mainline. Alignment would be near the existing bike lane. Would be an expensive road that would benefit the local area.

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**BO-6: Construct a ¼-mile Paul Bunyan to Camino Heights Drive (W-2)**Overall Rating:  
**DIS**

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*General comments:* Severe 20% grade which exceeds the County standard of 15%. Therefore, this idea is dismissed.

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**BO-7: Construct a ¼-mile Paul Bunyan to Pina Avenue connector (W-3)**Overall Rating:  
**3**

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<i>Attributes</i>	<i>Rating</i>	<i>Comments</i>
Local Operations	Improved	Slight improvement
Environmental Impacts	Degraded	Environmental impacts from road construction and drainage

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**BO-7: Construct a ¼-mile Paul Bunyan to Pina Avenue connector (W-3)**Overall Rating:  
**3**

Construction Impacts	Degraded	Impacts access to nearby businesses
Maintainability	Degraded	New roadway to maintain
Land Use Compatibility	Improved	Opens access to additional parcels

*General comments:* Expensive facility for a few residents. Note that this idea is near an existing golf course.

**BO-8: Construct a ¼-mile Paul Bunyan to Piedmont Road connector (W-4)**Overall Rating:  
**DIS**

<i>Attributes</i>	<i>Rating</i>	<i>Comments</i>
Mainline Operations	Degraded	Higher potential for wrong-way move
Local Operations	Degraded	Complicates movements; does not meet driver expectations
Environmental Impacts	Degraded	New roadways would enlarge the footprint and more work on environmental document
Construction Impacts	Degraded	Increased delays for motorists, access to businesses would be greater
Maintainability	Degraded	More roadway to maintain

*General comments:* Potential for wrong-way movements because motorists could use the natural path to go south from the tunnel and make a wrong-way move. Because of the potential for wrong-way movements, this idea is dismissed.

**BO-9: Construct a ½-mile Paul Bunyan to Sierra Blanca connector with a connector to the undercrossing (W-5)**Overall Rating:  
**DS**

<i>Attributes</i>	<i>Rating</i>	<i>Comments</i>
Mainline Operations	Degraded	Higher potential for wrong-way move
Local Operations	Degraded	Complicates movements; does not meet driver expectations; better local street connections (Paul Bunyan) when compared to W-4
Environmental Impacts	Degraded	New roadways would enlarge the footprint and more work on environmental document
Construction Impacts	Degraded	Increased delays for motorists, access to businesses would be greater
Maintainability	Degraded	More roadway to maintain

**BO-9: Construct a ½-mile Paul Bunyan to Sierra Blanca connector with a connector to the undercrossing (W-5)** Overall Rating: **DS**

*General comments:* Potential for wrong-way movements because motorists could use the natural path to go south from the tunnel and make a wrong-way move. Local alignment of Paul Bunyan to Camino Heights is better than W-4. Because of the potential for wrong-way movements, this idea is dismissed. This idea has potential if design improvements are made to eliminate wrong-way movements and tightly-spaced intersections. TR: Closely-spaced intersections. Hard for trucks. This is a design suggestion for the baseline.

**BO-10: Construct a ½-mile Paul Bunyan to Sierra Blanca connector with two roundabouts at the undercrossing (W-6)** Overall Rating: **6**

<i>Attributes</i>	<i>Rating</i>	<i>Comments</i>
Mainline Operations	Improved	Slight improvement because on-ramp access would be improved
Local Operations	Improved	Roundabouts will keep traffic moving; better local circulation for residents
Environmental Impacts	Degraded	Slight increase because of roundabout footprint; may be a wetlands impact
Construction Impacts	Degraded	More delays for motorists during construction
Maintainability	Degraded	More roadway to maintain
Land Use Compatibility	Improved	Access with local connection provided, takes high traffic from residential area

*General comments:* Longer ramps improves deceleration; it takes traffic out of residential areas.

**BO-11: Construct right-in/right-out hook ramps between Camino Heights and Sierra Blanca (which will be closed) (1B)** Overall Rating: **4**

<i>Attributes</i>	<i>Rating</i>	<i>Comments</i>
Local Operations	Degraded	Closes Camino Heights and Sierra Vista; traffic in the neighbor
Construction Impacts	Improved	Easier to maintain traffic during construction
Maintainability	Improved	Easier because simpler roads than a roundabout, fewer markings vs. stop signs

*General comments:* TR: Potential for wrong-way movement when a motorist is going from Vista Tierra Drive to eastbound US 50.

**BO-12: Construct right-in/right-out ramps at Sierra Blanca keeping Camino Heights Drive open (1C)**

Overall Rating:  
**4**

<i>Attributes</i>	<i>Rating</i>	<i>Comments</i>
Mainline Operations	Degraded	Weaving between the right-in/right-out intersections would be complicated, causing slower traffic on US 50
Local Operations	Degraded	More traffic in the residential neighborhoods; four-way stop will degrade local operations
Environmental Impacts	Improved	Less footprint; increased delays cause more greenhouse gas emissions
Construction Impacts	Improved	Constructing a smaller facility, less paving, fewer delays
Maintainability	Improved	Smaller facility than baseline concept

*General comments:* Having two right-in/right-out hook ramps close to each other is not desirable. TR: Weaving on when compared to 1D vs. 1C. The amount of traffic that uses the weave is quite low. Poor spacing.

**BO-13: Camino Heights Drive is main off-ramp to the undercrossing and close Sierra Blanca (1D)**

Overall Rating:  
**5**

<i>Attributes</i>	<i>Rating</i>	<i>Comments</i>
Mainline Operations	Improved	Weaving is improved
Environmental Impacts	Improved	Less footprint and right-of-way take
Construction Impacts	Improved	Less to build results in fewer delays, less noise, and less disruption to business access
Maintainability	Improved	Smaller facility

*General comments:* No potential for a wrong-way movement. Weave risk is reduced. TR: Do a mandatory design exception if the acceleration and deceleration lanes were not to standard.

**BO-14: Construct an eastbound off-ramp only flyover with direct connection with two structures to westbound Carson Road at the Upper Carson Road area (E-1A)**

Overall Rating:  
**1**

<i>Attributes</i>	<i>Rating</i>	<i>Comments</i>
Local Operations	Degraded	Removal of left turn will reduce conflicts, but is offset because there is no on-ramp
Environmental Impacts	Degraded	Degrades visual impacts, more footprint
Construction Impacts	Degraded	Limits access to nearby businesses, considerable import of material

**BO-14: Construct an eastbound off-ramp only flyover with direct connection with two structures to westbound Carson Road at the Upper Carson Road area (E-1A)** Overall Rating: **1**

Maintainability	Degraded	Large structure and retaining walls require more maintenance
Land Use Compatibility	Degraded	More difficult to get to businesses

*General comments:* The views will be seriously degraded and would not be an acceptable, viable option.

**BO-15: Construct an eastbound-only off-ramp to Carson Road with one structure at the Upper Carson Road area (E-1B)** Overall Rating: **1**

*General comments:* The views will be seriously degraded and would not be an acceptable viable option. Geometrically not feasible because of very steep profiles and limited space that prevents an acceptable connection area. The views will be seriously degraded and would not be an acceptable, viable option.

**BO-16: Construct an eastbound off-ramp flyover with direct connection to Carson Road at Upper Carson Road, ¼ mile east of the existing Upper Carson Road intersection (E-2)** Overall Rating: **DIS**

<i>Attributes</i>	<i>Rating</i>	<i>Comments</i>
Local Operations	Degraded	Only one direction, emergency vehicle impacts, does not provide a path for traffic north of US 50 to go south
Environmental Impacts	Degraded	
Construction Impacts	Degraded	
Maintainability	Degraded	
Land Use Compatibility	Degraded	

*General comments:* During events there would be some stacking of vehicles. Emergency vehicles would be negatively impacted and response time would increase because the vehicles would have to move out of the way. No way to get from the north side of the highway to eastbound US 50. Takes away local funds. For these reasons this idea is dismissed.

**BO-17: Construct diverging diamond flyover from Upper Carson Road to Vista Del Mondo with roundabout on south side (E-3)** Overall Rating: **2**

<i>Attributes</i>	<i>Rating</i>	<i>Comments</i>
Local Operations	Degraded	Considerable out-of-direction travel

**BO-17: Construct diverging diamond flyover from Upper Carson Road to Vista Del Mondo with roundabout on south side (E-3)** Overall Rating: **2**

Construction Impacts	Degraded	Noise impacts residents, may be blasting, construction on a steep hill would be needed
Maintainability	Degraded	Major increase in the retaining wall maintenance, one mile of new road

*General comments:* Opposition to constructing a new road would be expected.

**BO-18: Construct diverging diamond flyover from Upper Carson Road to eastbound US 50 with a parallel frontage road to Golden Chain Drive (E-4)** Overall Rating: **2**

<i>Attributes</i>	<i>Rating</i>	<i>Comments</i>
Local Operations	Degraded	Provides access across US 50, but there will be considerable out-of-direction travel
Environmental Impacts	Degraded	Much bigger footprint when compared to the baseline concept
Maintainability	Degraded	More road and retaining walls to maintain
Land Use Compatibility	Improved	Greater ability to develop the nearby land

*General comments:* None.

**BO-19: Construct diverging diamond flyover from Upper Carson Road to eastbound US 50 frontage road with park and ride area (E-5)** Overall Rating: **DS**

*General comments:* Evaluate whether warrants would require the need for park and ride area.

**BO-20: Construct a classic L-1 type interchange ¼ mile east of Upper Carson Road with frontage connection to Camino Heights (consider park and ride/rest area) (E-6)** Overall Rating: **5**

<i>Attributes</i>	<i>Rating</i>	<i>Comments</i>
Local Operations	Degraded	Provides access across US 50, but there will be considerable out-of-direction travel
Maintainability	Degraded	More road and retaining walls to maintain
Land Use Compatibility	Improved	Greater ability to develop the nearby land

*General comments:* Interferes with chain-up area; suggest moving it to the west. TR: Concern about meeting Complete Streets and ADA. Would cost approximately \$25 million for new frontage road and interchange construction. The additional cost would significantly delay the project and put funding at risk.



**BO-21: Construct a classic L-1 type interchange 1.25 miles east of Upper Carson Road with a rest area and frontage connection to Camino Heights (E-7)** Overall Rating: **1**

<i>Attributes</i>	<i>Rating</i>	<i>Comments</i>
Local Operations	Degraded	Provides access across US 50, but there will be considerable out-of-direction travel; improves bike/pedestrian to the elementary school from Camino Heights
Environmental Impacts	Degraded	Much bigger footprint when compared to the baseline concept
Maintainability	Degraded	More road and retaining walls to maintain
Land Use Compatibility	Improved	Greater ability to develop the nearby land

*General comments:* TR: Need design exception for under 2-mile (rural) interchange spacing. Out of project limits. Good sight distances noted. Outside the environmental footprint. Would cost approximately \$25million for new frontage road and interchange construction. The additional cost would significantly delay the project and put funding at risk.

**BO-22: Construct an undercrossing at Upper Carson Road with a roundabout connection to Carson Road with a roundabout on the north side of US 50** Overall Rating: **4**

<i>Attributes</i>	<i>Rating</i>	<i>Comments</i>
Local Operations	Degraded	More out-of-direction travel
Environmental Impacts	Degraded	More footprint
Maintainability	Degraded	Two vs. one roundabout will need to be maintained

*General comments:* Possibility for a second Safety grant, but would increase the project cost. TR: Operation of roundabouts in snow.

**BO-23: Construct an undercrossing at Upper Carson Road with a T connection to Carson Road (modified E-2)** Overall Rating: **DIS**

<i>Attributes</i>	<i>Rating</i>	<i>Comments</i>
Local Operations	Degraded	More out-of-direction travel
Environmental Impacts	Degraded	Longer frontage road footprint

*General comments:* TR: Intersection spacing concern. Possible stopping sight distance. Combined with BO-22.

**BO-24: Eliminate from the project the mitigation for the loss of the left turns and the north-south movements across US 50** Overall Rating: **7**

*General comments:* This concept proposes to only install an entire project length median barrier and right-in/right-out ramps, with no ability to cross US 50 except for emergency vehicle. Due to the fact that this is a safety project, a No-Build Alternative is not an option. This concept is the minimum default build option.

**BO-25: Construct two mainline roundabouts on US 50 at Still Meadows and the Upper Carson Road area** Overall Rating: **DIS**

<i>Attributes</i>	<i>Rating</i>	<i>Comments</i>
Mainline Operations	Degraded	Slows down trucks and climbing the grades
Local Operations	Degraded	Considerable out-of-direction travel
Environmental Impacts	Degraded	Slight reduction in air quality
Land Use Compatibility	Improved	Better access to parcels, maintains LT at Still Meadows, no impact to parcels off the project area

*General comments:* Consider an eastbound truck acceleration/deceleration lane TR: Grade near the roundabout is a concern. Climbs out of the two roundabouts. A roundabout at Still Meadows would be challenging to design and construct because of the steep vertical grade in the vicinity. It is about 5% when going east and west. An eastbound truck climbing lane would be needed with additional cost.

**BO-26: Construct a mainline roundabout with eastbound bypass lane at Upper Carson Road** Overall Rating: **3**

<i>Attributes</i>	<i>Rating</i>	<i>Comments</i>
Local Operations	Degraded	More local out-of-direction travel for residents
Maintainability	Improved	Less to maintain a roundabout than a tunnel
Land Use Compatibility	Degraded	Limits access to parcels

*General comments:* No crossover capability. There is a climb for trucks when they exit the roundabout. May need to construct an acceleration lane. Because of the loss of connectivity south to residents and emergency vehicle access, this idea is discouraged.

**BO-27: Eliminate park and ride** Overall Rating: **DS**

*General comments:* None.

**BO-28: Relocate the park and ride**Overall Rating:  
**DS***General comments:* None.**BO-29: Add a mainline roundabout at intersection of US 50 and Still Meadows**Overall Rating:  
**DIS***General comments:* Geometrically challenging because of a vertical profile grade.**BO-30: Construct a tight diamond interchange east of Upper Carson Road from Camino Heights to Carson Road with a frontage road (E-6)**Overall Rating:  
**1**

<i>Attributes</i>	<i>Rating</i>	<i>Comments</i>
Local Operations	Improved	Full access across US 50
Environmental Impacts	Degraded	More footprint

*General comments:* The geometry would result in very steep and touch down would impact considerable properties. This idea was considered in previous reports and was rejected because of major right-of-way impacts. Would cost approximately \$20 million for new frontage road and interchange construction. The additional cost would significantly delay the project and put funding at risk.

**BO-31: Construct two roundabouts: a mainline and local one at Upper Carson Road**Overall Rating:  
**3**

<i>Attributes</i>	<i>Rating</i>	<i>Comments</i>
Local Operations	Degraded	No connectivity across US 50 and increased out-of-direction travel for residents and emergency vehicle access
Maintainability	Improved	Less structure to maintain
Land Use Compatibility	Degraded	Limits access to parcels

*General comments:* No crossover capability. There is a climb for trucks when they exit the roundabout. May need to construct an acceleration lane. Because of the loss of connectivity south to residents and emergency vehicle access, this idea is discouraged.

**BO-32: Construct a single roundabout combining Carson Road and Upper Carson Road**

Overall Rating:  
**2**

<i>Attributes</i>	<i>Rating</i>	<i>Comments</i>
Local Operations	Degraded	No connectivity across US 50 and increased out-of-direction travel for residents and emergency vehicle access
Maintainability	Degraded	Less structure to maintain
Land Use Compatibility	Degraded	Limits access to parcels

*General comments:* No crossover capability. There is a climb for trucks when they exit the roundabout. May need to construct an acceleration lane. Because of the loss of connectivity south to residents and emergency vehicle access, this idea is discouraged.

**BO-33: Construct a bypass around the existing project limits**

Overall Rating:  
**1**

<i>Attributes</i>	<i>Rating</i>	<i>Comments</i>
Mainline Operations	Improved	Fewer conflicts
Local Operations	Improved	Fewer conflicts
Environmental Impacts	Degraded	Much larger footprint, economic impacts
Construction Impacts	Degraded	Built off mainline, some impacts to local residents
Maintainability	Degraded	More road to maintain

*General comments:* The median barrier would not be constructed.

**BO-34: Construct eastbound on-/off-ramps to connect with two roundabouts at the undercrossing (W-6 mod)**

Overall Rating:  
**6**

<i>Attributes</i>	<i>Rating</i>	<i>Comments</i>
Environmental Impacts	Improved	Smaller footprint; less socioeconomic
Construction Impacts	Improved	Less construction
Land Use Compatibility	Improved	Decreased impacts to parcels

*General comments:* None.

**BO-35: Construct eastbound on-/off-ramps to connect with two roundabouts at the undercrossing and construct a right-in ramp only for local Camino Heights traffic (W-6 mod)**

Overall Rating:  
**5**

<i>Attributes</i>	<i>Rating</i>	<i>Comments</i>
Local Operations	Improved	Direct access off to Camino Heights
Maintainability	Degraded	More facility: roundabout
Land Use Compatibility	Improved	Better access to parcels

*General comments:* Some type of grade separation needed.

**CS-1: Construct 2:1 fill slopes at west end and eliminate retaining walls**

Overall Rating:  
**DS**

<i>Attributes</i>	<i>Rating</i>	<i>Comments</i>
Environmental Impacts	Degraded	Slightly larger footprint
Maintainability	Degraded	Less complex maintenance for a slope vs. retaining wall

*General comments:* TR: Geotechnical issues would have to be accommodated.

**CS-2: Use soldier pile walls in lieu of soil nail walls**

Overall Rating:  
**DS**

<i>Attributes</i>	<i>Rating</i>	<i>Comments</i>
Environmental Impacts	Improved	Slightly less footprint

*General comments:* Need to check geotechnical aspects. Potentially widen to the south.

**CS-3: Consider including CHP or emergency turnarounds in the median**

Overall Rating:  
**DS**

*General comments:* None.

**CS-4: Purchase the house near the vacant Sierra Business Center**

Overall Rating:  
**DS**

*General comments:* None.

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**CS-5: Reduce the length of retaining wall and construct slopes in its place**

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Overall Rating:  
**DS***General comments:* None.

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**CS-6: Construct retaining wall out of precast panel (RediRock)**

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Overall Rating:  
**DS***General comments:* None.

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**CS-7: Construct MSE walls in lieu of soil nail walls**

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Overall Rating:  
**DS***General comments:* Assumes a shift of the US 50 centerline to the south by approximately 20 feet.

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**DE-1: Close the median barrier gap at Upper Carson Road (Upper Carson Road Option 1)**

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Overall Rating:  
**DS**

<i>Attributes</i>	<i>Rating</i>	<i>Comments</i>
Mainline Operations	Improved	Reduces left turn conflicts.
Local Operations	Degraded	Eliminates left turn access across US 50 at Upper Cross Road
Environmental Impacts	Degraded	Slight degradation due to more greenhouse gas because of more out-of-direction travel

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*General comments:* Management has directed that Upper Carson Road Option 1 be implemented. The VA team recommends that this idea be implemented.

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**DE-2: Leave the existing median barrier open in the Upper Carson Road area (Upper Carson Road - Option 2)**

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Overall Rating:  
**DIS***General comments:* Extending the median barrier on the west side of the Upper Carson Road intersection would introduce a sight distance issue for vehicles turning left out of Upper Carson Road in the eastbound direction. Therefore, this idea is dismissed.

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**DE-3: At Still Meadows Road construct a partial barrier that allows eastbound right-in/ right-out and westbound left-in**

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Overall Rating:  
**DIS***General comments:* Management has recommended this idea be dismissed because of potential high incident area. The VA team concurs.

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**DE-4: At Still Meadows Road construct a full barrier that allows only an eastbound right-in/right-out and closing the westbound movements**

Overall Rating:  
**ABD**

<i>Attributes</i>	<i>Rating</i>	<i>Comments</i>
Mainline Operations	Improved	Less chance of incidents
Local Operations	Degraded	Eliminates a westbound left turn and U turn movements
Maintainability	Improved	Slight reduction in maintenance because the guardrail would not have to be repaired
Land Use Compatibility	Degraded	Limits access to parcels

*General comments:* Management prefers this concept.

**DE-5: Increase the roadway curve radius just west of Still Meadows Road to improve westbound US 50 stopping sight distance**

Overall Rating:  
**DS**

<i>Attributes</i>	<i>Rating</i>	<i>Comments</i>
Mainline Operations	Improved	Increased sight distance reduces incidents
Environmental Impacts	Degraded	More footprint

*General comments:* Improves westbound sight distance to objects ahead.

**DE-6: Construct a full westbound acceleration lane at Still Meadows Road**

Overall Rating:  
**DIS**

*General comments:* The project will construct a median barrier at Still Meadows Road; therefore, this idea would not be implementable.

**DE-7: Construct a mainline roundabout at Still Meadows Road**

Overall Rating:  
**DIS**

*General comments:* Duplicate idea.

**DE-8: Construct a mainline roundabout at Upper Carson Road**

Overall Rating:  
**DIS**

*General comments:* Duplicate idea.

**MT-1: Make the old logging mill a parking center for events**

Overall Rating:  
**DS**

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*General comments:* None.

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**MT-2: Construct a linear rest area in the eastbound direction of US 50 near Camino Heights**

Overall Rating:  
**DS**

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*General comments:* None.

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**WR-1: At the west end of the project, shift the roadway center line to the south to straighten the curve (widen to the south)**

Overall Rating:  
**DS**

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*General comments:* Duplicate idea.

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# VALUE ANALYSIS PROCESS

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# VALUE ANALYSIS PROCESS

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The Caltrans VA process involves 16 activities needed to accomplish a VA study, organized in three parts: Pre-study, VA Study, and Report. Integral to Caltrans' VA process is the Value Metrics process. Value Metrics offers the cornerstone of the Caltrans VA process by providing a systematic and structured means of considering the relationship of a project's performance and cost as they relate to value.

Value Analysis has traditionally been perceived as an effective means for reducing project costs. This paradigm only addresses one part of the value equation, oftentimes at the expense of the role that VA can play with regard to improving project performance. Project costs are fairly easy to quantify and compare; performance is not.

Project performance must be properly defined and concurred by the stakeholders at the beginning of the VA study. The performance attributes and requirements developed are then used throughout the study to identify, evaluate, and document alternatives. This process, Value Metrics, emphasizes the interrelationship between cost and performance and can be quantified and compared in terms of how they contribute to overall value.

Value Metrics provides a standardized means of identifying, defining, evaluating, and measuring performance. Once this has been achieved, and costs for all VA alternatives have been developed, measuring value is straightforward.

Value Metrics can improve VA studies by:

- Building consensus among project stakeholders (especially those holding conflicting views)
- Developing a better understanding of a project's goals and objectives as they relate to purpose and need
- Developing a baseline understanding of how the project is meeting performance goals and objectives
- Identifying areas where project performance can be improved through the VA process
- Developing a better understanding of an alternative concept's effect on project performance
- Developing a deeper understanding of the relationship between performance and cost in determining value
- Using value as the basis for selecting the best project or design concept

The following provides an overview of the Caltrans approach to VA. The Caltrans VA Study Activity Chart at the end of this narrative identifies the steps in each activity, which are detailed as follows.

## PRE-STUDY

Meaningful and measurable results are directly related to the pre-study work performed. Depending on the type of study, all or part of the following information needs to be determined during the pre-study phase:

- Clear definition of the current situation and study objectives
- Identification of study team members
- Identification of project stakeholders
- Definition of how stakeholders are impacted by the project
- Identification of key issues and concerns
- Identification of project's performance requirements and attributes
- Status of project cost estimate
- Project data gathered to be distributed to VA team

In preparation for the VA study, the team leader confers with owners and stakeholders to outline the VA process, initiate data gathering, refine project scope and objectives, structure the scope and team members and technical specialists, and finalize study plans. Specific deliverables are provided.

Following the initial planning meeting, the team leader reviews the data collected for the project and develops a cost model. The team leader also consults with the technical specialists to prepare them for the VA study.

## VA STUDY

The VA Job Plan guides the VA team in their search to enhance value in the project or process. Caltrans follows a seven-phase VA Job Plan:

1. Information Phase
2. Function Phase
3. Speculation Phase
4. Evaluation Phase
5. Development Phase
6. Presentation Phase
7. Implementation Phase

### Information Phase

At the beginning of the VA study, the design team presents a more detailed review of the design and the various systems. This includes an overview of the project and its various requirements, which further enhances the VA team's knowledge and understanding of the project. The project team also responds to questions posed by the VA team.

The project’s performance requirements and attributes are discussed, and the performance of the baseline concept is evaluated.

### Function Phase

Key to the VA process is the function analysis techniques used during the Function Phase. Analyzing the functional requirements of a project is essential to assuring an owner that the project has been designed to meet the stated criteria and its need and purpose. The analysis of these functions in terms cost, performance, time, and risk is a primary element in a VA study, and is used to develop alternatives. This procedure is beneficial to the VA team, as it forces the participants to think in terms of functions and their relative value in meeting the project’s need and purpose. This facilitates a deeper understanding of the project.

### Speculation Phase

The Speculation Phase involves identifying and listing creative ideas. During this phase, the VA team participates in a brainstorming session to identify as many means as possible to provide the necessary project functions. Judgment of the ideas is not permitted in order to generate a broad range of ideas.

The idea list includes all of the ideas suggested during the study. These ideas should be reviewed further by the project team, since they may contain ideas that are worthy of further evaluation and may be used as the design develops. These ideas could also help stimulate additional ideas by others.

### Evaluation Phase

The purpose of the Evaluation Phase is to systematically assess the potential impacts of ideas generated during the Speculation Phase relative to their potential for value improvement. Each idea is evaluated in terms of its potential impact to performance, cost, time, and risk. Once each idea is fully evaluated, it is given a total rating number. This is based on a scale of 1 to 7, as indicated by the following rating index:

7 = Major Value Improvement 6 = Moderate Value Improvement 5 = Minor Value Improvement 4 = Possible Value Improvement	These ratings represent the subjective opinion of the VA team regarding the potential benefits of the concepts in order to prioritize them for development.
3 = Minor Value Degradation	Concept results in a minor cost or performance improvement at the expense of the other.
2 = Moderate Value Degradation	Concept reduces cost but creates an unacceptable degradation to performance.
1 = Major Value Degradation	Concept is not technically feasible or does not meet project need and purpose.

Ideas rated 4 to 7 are developed further and those found to have the greatest potential for value improvement are documented in the *VA Alternatives* section of this report. The rationale for why

ideas were rated highly but not developed as alternatives is documented in the *Idea Evaluation* section of the report.

## **Development Phase**

During the Development Phase, the highly rated ideas are expanded and developed into VA alternatives. The development process considers the impact to performance, cost, time, and risk of the alternative concepts relative to the baseline concept. This analysis is prepared as appropriate for each alternative, and the information may include a performance assessment, initial cost and life-cycle cost comparisons, schedule analysis, and an assessment of risk. Each alternative describes the baseline concept and proposed changes and includes a technical discussion. Sketches and calculations are also prepared for each alternative as appropriate.

## **Presentation Phase**

The VA study concludes with a preliminary presentation of the VA team's assessment of the project and VA alternatives. The presentation provides an opportunity for the owner, project team, and stakeholders to preview the alternatives and develop an understanding of the rationale behind them.

## **Implementation Phase**

After the stakeholders have had an opportunity to review the alternatives identified by the VA team, the team leader conducts an implementation meeting to discuss the alternatives and resolve appropriate action for each VA alternative. If necessary, any other VA report edits requested by the representatives are also made by the VA team leader and a final report is issued.

This implementation meeting helps to ensure that savings or process improvements are not lost due to lack of communication, and that those VA alternatives that are accepted are properly integrated into the project design.

## **VA REPORT**

### **Preliminary Report**

Following the completion of the VA study, the team leader compiles the information developed during the VA study into the *Preliminary Value Analysis Study Report*. This report, documenting viable alternatives, is provided to the customer within the timeframe requested (usually within two weeks). The preliminary report also contains a *VA Study Summary Report – Preliminary Findings*, designed to highlight critical elements of the VA study, including detailed documentation of VA alternatives, in a concise manner for the use of parties without the opportunity to review the report in its entirety. More details can be found in the complete preliminary report, which consists of the following documentation: Executive Summary, VA Alternatives, Project Information, Project Analysis, Idea Evaluation, and VA Process.

## **Written Report – VA Implementation Action Memo**

If the disposition of all VA alternatives cannot be determined at the Implementation Meeting, then a *VA Implementation Action Memo* is submitted. This memo states which alternatives are accepted, which are rejected and the rationale for rejection, and which VA alternatives are conditionally accepted with further study required. For these alternatives, the memo states what action must be completed so that a decision can be made as to the disposition of this VA alternative, when that action is expected to be completed, and who is responsible to complete this action. If all VA alternatives are either accepted or rejected then this memo is not required.

## **Written Report – Final Report**

Once all VA alternatives have been either accepted or rejected, the team leader updates the *Preliminary Value Analysis Study Report* to show the final results of the study in a *Final Value Analysis Study Report*. In addition, a Value Analysis Study Summary Report (VASSR) is sent to Caltrans HQ to permit easy documentation into the Caltrans Annual Report to FHWA.

The following Caltrans VA Study Activity Chart describes each activity.

## CALTRANS VA JOB PLAN & STUDY ACTIVITY CHART

<b>PREPARATION</b>	<b>INITIATE STUDY</b> 1 <ul style="list-style-type: none"> <li>➤ Identify study project</li> <li>➤ Identify study roles and responsibilities</li> <li>➤ Define study goals</li> <li>➤ Select team leader</li> <li>➤ Prepare draft Study Charter</li> </ul>	<b>ORGANIZE STUDY</b> 2 <ul style="list-style-type: none"> <li>➤ Conduct Pre-Study Meeting</li> <li>➤ Select team members</li> <li>➤ Identify stakeholders, decision-makers, and technical reviewers</li> <li>➤ Identify data collection</li> <li>➤ Select study dates</li> <li>➤ Determine study logistics</li> <li>➤ Update VA Study Charter</li> <li>➤ Identify and define performance requirements</li> </ul>	<b>PREPARE DATA</b> 3 <ul style="list-style-type: none"> <li>➤ Collect and distribute data</li> <li>➤ Develop construction cost models</li> <li>➤ Develop highway user benefit / life cycle cost (LCC) model (if required)</li> </ul>		
	<b>VA STUDY WORKSHOP</b>	<b>INFORM TEAM</b> 4 <ul style="list-style-type: none"> <li>➤ Review study activities and confirm reviews</li> <li>➤ Present design concept</li> <li>➤ Present stakeholders' interests</li> <li>➤ Review project issues and objectives</li> <li>➤ Discuss Design Exceptions</li> <li>➤ Rate performance of baseline concept</li> <li>➤ Visit project site</li> </ul>	<b>ANALYZE FUNCTIONS</b> 5 <ul style="list-style-type: none"> <li>➤ Analyze project data</li> <li>➤ Expand project functions</li> <li>➤ Prepare FAST diagram</li> <li>➤ Determine functional cost drivers and performance</li> <li>➤ Assess Risk (if needed)</li> </ul>	<b>CREATE IDEAS</b> 6 <ul style="list-style-type: none"> <li>➤ Focus on functions</li> <li>➤ List all ideas</li> <li>➤ Apply creativity and innovation techniques (group and individual)</li> </ul>	<b>EVALUATE IDEAS</b> 7 <ul style="list-style-type: none"> <li>➤ Apply key performance attributes to rate idea</li> <li>➤ List advantages and disadvantages</li> <li>➤ Consider cost impacts</li> <li>➤ Rank all ideas</li> <li>➤ Assign alternatives for development</li> </ul>
		<b>DEVELOP ALTERNATIVES</b> 8 <ul style="list-style-type: none"> <li>➤ Develop alternative concepts</li> <li>➤ Prepare sketches and calculations</li> <li>➤ Measure performance</li> <li>➤ Estimate costs, LCC benefits/costs</li> </ul>	<b>CRITIQUE ALTERNATIVES</b> 9 <ul style="list-style-type: none"> <li>➤ VA Alternatives Technical Review</li> <li>➤ VA Alternatives Team Consensus Review</li> <li>➤ Identify mutually exclusive groups of alternatives</li> <li>➤ Identify VA strategies</li> <li>➤ Validate performance</li> </ul>	<b>PRESENT ALTERNATIVES*</b> 10 <ul style="list-style-type: none"> <li>➤ Present findings</li> <li>➤ Document feedback</li> <li>➤ Confirm pending reviews</li> </ul> <p><i>*Interim presentation of study findings</i></p>	
<b>DETERMINE DISPOSITION</b>	<b>DOCUMENT VA STUDY</b> 11 <ul style="list-style-type: none"> <li>➤ Document process and study findings</li> <li>➤ Develop and Distribute VA Study Summary Report - Preliminary Findings and VA Study Preliminary Report</li> <li>➤ Distribute electronic report to HQ VA Branch</li> </ul>	<b>ASSESS ALTERNATIVES**</b> 12 <ul style="list-style-type: none"> <li>➤ Review Study Summary Report</li> <li>➤ Assess alternatives for project acceptance</li> <li>➤ Prepare draft implementation dispositions</li> </ul> <p><i>**Activities performed by PDT, Technical Reviewers, and Stakeholders</i></p>	<b>RESOLVE ALTERNATIVES</b> 13 <ul style="list-style-type: none"> <li>➤ Review implementation dispositions</li> <li>➤ Conduct Implementation Meeting</li> <li>➤ Resolve implementation actions with decision-makers and stakeholders</li> <li>➤ Document VA Alternative Disposition</li> <li>➤ Develop Implementation Action Memo (If Conditionally Accepted (CA) Alternatives remain)</li> </ul>	<b>FINALIZE ALTERNATIVES</b> 14 <ul style="list-style-type: none"> <li>➤ VA Team Leader follow up with PM on CA Alternatives</li> <li>➤ Resolve Conditionally Accepted Alternatives</li> <li>➤ Develop Implementation Plan with PM</li> <li>➤ Design Manager Sign off on VA Implementation Plan Authorization</li> <li>➤ Final presentation of study results (if needed)</li> </ul>	
	<b>REPORTING RESULTS</b>	<b>PUBLISH RESULTS</b> 15 <ul style="list-style-type: none"> <li>➤ Document process and study results</li> <li>➤ Incorporate all comments and implementation plan</li> <li>➤ Distribute Final VA Study Report in PDF format</li> <li>➤ Submit VA Study Summary Report (VASSR) and two-page summary to HQ VA for FHWA Auditing</li> <li>➤ Include Implementation Plan Authorization in Final VA Report</li> </ul>			

**Monday, June 20, El Dorado County Offices, Room TBD**

**VA Study Kick-Off Meeting (Project Stakeholders, Designer & VA study team)**

- 9:00 Introductions and Purpose of the VA Study *(1. VA Study Information Phase)*
- 9:30 Brief Overview of the VA Process
- 9:45 Overview of the Project by the Project Development Team
- 10:45 Key project Issues, Concerns and Risks
- 11:00 Stakeholder Concerns Discussion
- 11:30 Value Discussion: Performance, Cost, and Schedule
- End of VA Study Kick-Off Meeting**
- 12:00 Lunch (coordinated with the site visit)
- 1:00 Site Visit and Lessons Learned Discussion
- 3:30 Adjourn

**Tuesday, June 21, District 3 Offices, Marysville, Room TBD**

- 8:00 Review of Day 1 activities
- 8:15 Project Cost Drivers Discussion and Pareto Analysis
- 8:30 Function Analysis and FAST Diagram *(2. Function Phase)*
- 10:30 Speculation for New Improvement Ideas *(3. Speculation Phase)*
- 11:30 Lunch
- 12:30 Speculation for Improvement Ideas (continued)
- 2:30 Overview of Evaluation of Ideas Process *(4. Evaluation Phase)*
- 2:15 Evaluation of Ideas
- 4:00 Adjourn

**Wednesday, June 22; District 3 Offices, Marysville, Room TBD**

- 8:00 Evaluation of Ideas (Continued)
- 11:30 Lunch
- 12:30 Development of VA Alternatives *(5. Development Phase)*
- 4:00 Adjourn

**Monday, June 27; District 3 Offices, Marysville, Room TBD**

- 8:00 Development of VA Alternatives (continued)
- 11:30 Lunch
- 12:30 Development of VA Alternatives (continued)
- 1:30 **VA Study Technical Review of Proposed VA Alternatives**
- 3:00 Development of VA Alternatives (continued)
- 4:00 Adjourn

**Tuesday, June 28; District 3 Offices, Marysville, Room TBD**

- 8:00 Development of VA Alternatives (continued)
- 11:30 Lunch
- 12:30 VA Strategy Identification
- 4:00 Adjourn

**Friday, June 29: District 3 Offices, Marysville, Room TBD**

- 8:00 Management Presentation Development *(6. Presentation Phase)*
- 10:30 Management Presentation**
- 12:00 pm Adjourn



## VA STUDY MEETING ATTENDEES

6/20	6/21	6/22	6/27	6/28	6/29	Name	Position/Role	Organization	Telephone	E-mail
X	X	X	X	X	X	Fred Kolano	VA Study Team Leader	Value Management Strategies	970 216-1739	fred@vms-inc.com
X	X	X	X		X	Kevin Espinoza	VA Coordinator	Caltrans North Region	530 741-5499	kevin_espinoza@dot.ca.gov
X	X	X	X	X	X	Eric Royer	Traffic Operations	Caltrans District 3	510 741-5113	eric_royer@dot.ca.gov
X	X	X	X	X	X	Darryl Chambers	Traffic Safety	Caltrans District 3	530 741-5721	darryl_chambers@dot.ca.gov
X	X	X	X	X	X	Robin Chen	Roadway Design	Caltrans District 3	530 741-5164	robin_chen@dot.ca.gov
X						Karen Basra	Right of Way	Caltrans District 3	530 741-4565	karen_basra@dot.ca.gov
X						Georgette Neal	Environmental	Caltrans District 3	916 234-0623	georgette_neal@dot.ca.gov
X	X	X	X	X	X	Steve Waikel	Structures	Caltrans HQ	530 218-4808	steve_waikel@dot.ca.gov
X						Darrell Uppendahl	Maintenance	Caltrans District 3	510 577-7878	darrell_uppendahl@dot.ca.gov
X	X	X	X	X	X	Matt Smeltzer	County Representative	El Dorado County	520 621-5912	matt_smeltzer@edcgov.us
X	X	X	X	X	X	Woody Deloria	Traffic Planner	El Dorado County Transportation Commission	530 333-5147	wdeloria@edctc.org
X		X				Jarrett Woodraff	Construction	Caltrans District 3	916 416-7598	Jarrett_woodraff@dot.ca.gov
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X					X	Clark Peri	Project Manager	Caltrans District 3	619 825-8168	clakr_peri@dot.ca.gov
X	X	X	X	X	X	Jim Philipp	Roadway Design	Caltrans District 3	530 741-5386	jim_philipp@dot.ca.gov
			X			Tim Sobelman	Project Development Coordinator	Caltrans HQ Design	916 825-6674	tim_sobelman@dot.ca.gov
					X	Cindy Anderson	Environmental Division Chief	Caltrans District 3	530 741-4277	cindy_anderson@dot.ca.gov
					X	Andrew Brandt	Maintenance & Operations	Caltrans District 3	530 741-4318	andrew_brandt@dot.ca.gov
					X	Tom Brannon	SFP	Caltrans District 3	916 826-6052	tom_brannon@dot.ca.gov
					X	Thomas Wood	Property Development	Caltrans District 3	530 682-6515	thomas_wood@dot.ca.gov