Value Analysis Study Report

D-1 US 101 Dr. Fine Bridge Replacement

EA No. 436400

01-DN-101-PM 35.8/36.5

Contract No. 53A0133

Task Order No. 650

December 2009

Prepared by

Value Management Strategies, Inc.

"Value Leadership"

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Date: December 22, 2009

To: Kevin Church, Project Manager

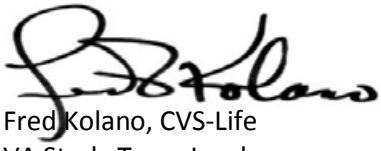
Subject: Final Value Analysis Study Report (Task Order 650)
D-1 US 101 Dr. Fine Bridge Replacement

Value Management Strategies, Inc. is pleased to transmit this Final Value Analysis Study Report for the referenced project. A PDF version of the report is being sent to you and Naghi Ghafari. Naghi will also be receiving two paper copies.

If you have any questions or comments concerning this Final Report, please contact me at (970) 216-1739 or email fred@vms-inc.com.

Sincerely,

VALUE MANAGEMENT STRATEGIES, INC.



Fred Kolano, CVS-Life
VA Study Team Leader

Copy: Naghi Ghafari, District VA Coordinator
Richel Espinoza-Noss, HQ VA Branch

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FINAL RESULTS

VA Study Summary Report – Final Results

D-1 US 101 Dr. Fine Bridge Replacement

1-DN-101
EA 436400
(PM 35.8/36.5)

A Value Analysis (VA) study, sponsored by Caltrans District 1 and facilitated by Value Management Strategies, Inc., was conducted for the Dr. Fine Bridge Replacement project on US 101 near Crescent City, California. The six -day VA study was conducted in July 2009. This *VA Study Summary Report – Final Results* provides an overview of the project, key findings, and the accepted and rejected alternatives developed by the VA team. ***Detailed documentation and exhibits of the study's analysis are provided in the Final VA Study Report.***

PROJECT DESCRIPTION

Project Study Report Alternative 1A – Alignment to the West of the Existing Bridge – was used as the original design concept for the VA study. This alternative proposes to replace the existing structure with a concrete cast-in-place prestressed box girder bridge that will be 1,050 feet long and 66 feet wide. The bridge will provide three 12-foot lanes, two 10-foot shoulders, one 5-foot bicycle/pedestrian lane, a 2-foot separation for this, and 3 feet for railings. The bridge will have five piers and three foundations within the Smith River. The construction is expected to require three seasons for completion and delivery by December 2016.

The project will also provide improvements to intersections at Lake Earl Drive (south of the bridge) and US 101/SR 197 (just north of the bridge).

The cost estimate used for the original design concept is $51,114,000, consisting of $14,775,000 for roadway items, $34,969,000 for the bridge structure, and $1,370,000 for right-of-way.

PROJECT PURPOSE AND NEED

The purpose and need of the project is to replace the deteriorating Dr. Fine Bridge because it is physically deficient and functionally obsolete (narrow width). In addition, other issues include exposure of bridge piers to water scour, existing bridge steel and straps requiring frequent maintenance, no shoulder available to accommodate bicyclists or pedestrians (existing is 1 foot in width), and the approach slabs are not rated for California weight restriction standards.

VA STUDY TIMING

The VA study was being conducted early in the Project Approval & Environmental Documentation (PA&ED) Phase, which is to be completed in February 2012. The project is scheduled for Ready to List (RTL) in July 2013.

VA STUDY OBJECTIVES

The objective of the VA study was to identify value improving alternatives to the original design concept, Project Study Report Alternative 1A.

KEY PROJECT ISSUES

The items listed below are the key drivers, constraints, or issues being addressed by the project and considered during this VA study to identify possible improvements.

1. Impacts to the Smith River water quality and biologic resources (fish).
2. Traffic management during construction.
3. Impacts to cultural resources and aesthetics aspects of the project area.
4. Accommodating large turning radius trucks accessing US 101 near the north and south end of the bridge.

Performance Attributes
Mainline Operations
Local Operations
Maintainability
Environmental Impacts - Temporary
Environmental Impacts
Construction Impacts
Project Schedule

VA STUDY RESULTS

This project will be enhanced by the implementation of three VA alternatives that will save cost and improve performance. Two alternatives will save cost and one will add cost to the project. Reduction of the south end bridge length will save cost and reduce environmental impacts because of less movement of soil for construction. Using isolation bearings in the bridge design will also save cost because the Caltrans HQ Advance Planning cost for a bridge with isolation bearings is less than was projected for the original design concept. The construction of a variable depth bridge structure will cost more; however, the

Accepted VA Alternatives	
1.0	Reduce the South End Bridge Length by 150 Feet and Use Fill with Large Culverts in lieu of a Bridge
2.2	Construct a Variable Depth Bridge Structure (HQ Structures Advance Planning Study – Alternative 4)
5.0	Use Isolation Bearings in the Bridge Superstructure to Reduce the Size of the Pier Foundations

structure will be more visually appealing and would require one less pier and thus have less environmental impact to the Smith River. The total net savings from implementing the three accepted VA alternatives will be approximately $2.6 million and performance will be improved by 4%. These two factors, when combined using the value equation (Value = Performance / Cost), will result in a value improvement of 10%.

The accepted alternatives are discussed below, along with the alternative number and title, and cost savings (or increases) and performance that were validated by the Project Development Team (PDT) after the VA study. The rejected alternatives, and their respective reasons for rejection, can be found following the descriptions of accepted alternatives.

Alternative Number and Title		Initial Cost Savings (or increase)	Performance Change
1.0	Reduce the South End Bridge Length by 150 Feet and Use Fill with Large Culverts in lieu of a Bridge	$3,756,000	+5%

This alternative proposes to construct a filled in roadway in lieu of a bridge section with two or more large culverts to accommodate traffic on South Bank Road and too allow flood water pass through.

2.1	Construct a Variable Depth Bridge Structure (HQ Structures Advance Planning Study – Alternative 4)	($2,767,000)	+6%

This concept proposes to construct a four span CIP PS Box girder bridge of variable depth (Structures Advance Planning Study – Alternative 4). NOTE: Although this alternative was originally thought to be mutually exclusive with 2.1, 2.3, and 2.4, the project decision makers elected to also accept this VA alternative.

5.0	Use Isolation Bearings in the Bridge Superstructure to Reduce the Size of the Pier Foundations	$1,627,000	+3%

This alternative proposes to use isolation bearings in the bridge to isolate superstructure from the substructure. This will reduce the foundation size and improve seismic performance.

Net Effect of Accepted VA Alternatives

Accepted Alternatives	Initial Cost Savings	Present Value Subsequent Cost	Present Value Highway User Cost	Performance Change	Value Change
1.0, 2.1, 5.0	$2,616,000	$0	$0	+4%	+10%

REJECTED VA ALTERNATIVES – Reason for Rejection

2.2 Use Steel Girders in the Bridge to Eliminate Falsework

This VA alternative is rejected in favor of VA Alternative 2.1. Also, the additional maintenance that would be required would not be acceptable to District Maintenance because this type of material is not suitable for a marine environment.

2.3 Use Precast Girders (Bulb-T) to Eliminate Falsework

This VA alternative is rejected in favor of VA Alternative 2.1.

3.1 Construct an Access Road from Northbound US 101 to South Bank Road and Keep the Existing Access Open Under the Bridge

This VA alternative is rejected because the potential performance improvements do not justify the additional cost. There would also be issues with encountering potential hazardous materials, agricultural land, and the need to acquire additional right-of-way.

3.2 Construct an Access Road from Northbound US 101 to South Bank Road and Close the Existing Access Under the Bridge

This VA alternative is rejected because the potential performance improvements do not justify the additional cost. There would also be issues with encountering potential hazardous materials, agricultural land, and the need to acquire additional right-of-way.

4.0 Construct a Two-Lane, 50 foot wide bridge in lieu of a 66 foot bridge by eliminating one 12-foot land and reducing each shoulder by 2 feet

Traffic Safety holds the position that it is essential for the need and purpose of the project to include the acceleration lane for southbound traffic from SR 197. It should be noted that the Project Study Report planned for an acceleration lane to the south on US 101 and describes it as one of the physical deficiencies that needs to be addressed to facilitate the safe merging of traffic from SR 197 to southbound US 101. For these reasons, this VA alternative is rejected.

VA TEAM

The VA team included:

Fred Kolano	Value Management Strategies, Inc.	VA Team Leader
Tatiana Ahlstrand	Caltrans District 1	Planning
Linda Evans	Caltrans District 1	Environmental
Leonard Fiji	Caltrans District 1	Structures Construction
Manode Kodsuntie	Caltrans HQ	Structures Design
Gordon Leppig	California Department of Fish and Game	Environmental Scientist
Doug Wakefield	Del Norte County Local Transportation Commission	Resident

Key project contacts included:

Kevin Church	Caltrans	Project Manager
Dennis McBride	Caltrans	Branch Chief, Design
Naghi Ghafari	Caltrans	DVAC

VA ALTERNATIVES

The results of this study are presented as individual alternatives to the original concept. The VA alternative documents in this section are presented as written by the team during the VA study. While they have been edited from the Preliminary VA Report to correct errors or better clarify the alternatives, they represent the VA team's findings during the VA study.

The Implementation Action forms located behind the Summary of VA Alternatives reflects the accepted VA alternative cost and performance values. The individual VA alternatives are not edited to reflect cost and performance changes of the implementation dispositions. Added backup information to support the validation of cost or performance changes may follow an implementation form to document the changes.

VA ALTERNATIVES

Each alternative consists of a summary of the original concept, a description of the suggested change, a listing of its advantages and disadvantages, a cost comparison, change in performance*, and a brief narrative comparing the original design with the alternative. Sketches, calculations, and performance attribute ratings are also presented. The cost comparisons reflect a comparable level of detail as in the original estimate. A life cycle benefit-cost analysis for major alternatives is included where appropriate.

** Please refer to the Project Analysis section of this report for an explanation of how the performance attributes are calculated.*

OTHER CONSIDERATIONS

The VA team generated several design suggestions for consideration by the PDT. These items represent ideas that are relatively general in nature, and are listed below.

- Design
  - Reduce design speed from 70 to 55 mph
  - Include fenders in the bridge columns
- Construction
  - Use tower crane in middle of river
  - Use bubble curtains to suppress pile driving vibrations
  - Use high strength concrete to be able to increase span lengths
  - Use center relief drilling to minimize pile driving period
  - Vibrate sheet piles first, then drive
  - Screw in pile where possible to minimize pile driving
- Environmental
  - Add bat-friendly nesting features under the bridge

- ◊ Install nets for fish exclusion
- ◊ Conduct a habitat assessment
- ◊ Construct a boat ramp or fishing parking area

- Traffic Management
  - ◊ Detour traffic to SR 197 to SR 199 to US 101 for one year
  - ◊ Implement weekend closures
  - ◊ Implement a robust public awareness campaign
- Cost Estimate Items
  - ◊ Add cost for disposal of water extracted from coffer dams
  - ◊ Add cost for environmental mitigation

Several ideas initially analyzed, but not advanced:

- Construct an acceleration and merge lane northbound from Lake Earl Drive
- Geometry does not allow
- Use the existing bridge as a pedestrian/cyclist lane and eliminate demolishing
  - ◊ Maintenance of existing bridge; bridge collapses into new bridge
- Lengthen the deceleration lane from northbound US 101 to eastbound SR 197 by approximately 300 feet
  - ◊ Geometry does not allow; per consultation with Design
- Construct MSE retaining walls in the northwest quadrant of the project
  - ◊ Too close to stream; footing erosion concerns
- Construct bridge using segmental construction technique to eliminate falsework
  - ◊ Too expensive
- Use existing bridge for construction of new bridge in lieu of a trestle, and detour traffic through SR 197 and SR 199 to US 101 near Elk Valley Crossroads
  - ◊ Existing bridge is not strong or wide enough
- Build bridge 32 feet on west side, tear down existing bridge; build 34 feet on the east side
  - ◊ Much higher cost; challenging traffic management

Long range planning suggestions:

- Signalize the SR 197 Intersection (maybe with traffic activated sensors)
  - ◊ Traffic warrants cannot be obtained; District Traffic opposition
- Construct a roundabout at SR 197
  - ◊ Too close to stream; footing erosion concerns
- Relocate the SR 197 Intersection to Fred D. Haight Road (approximately 1,500 feet north)
  - ◊ Too expensive; approximately $6,000,000 more; considerable earthwork; considerable drainage
- Separate Grade at SR 197
  - ◊ Too expensive; environmental disturbance; challenging geometry because of closeness to the bridge

VA SUMMARY TABLES

Summary of VA Alternatives

Alt. No.	Alternative Title	Potential Initial Savings	Potential Performance Change	Validated Initial Cost Savings	Validated Performance Change
1.0	Reduce the South End Bridge Length by 300 Feet and Use Fill with Large Culverts in lieu of a Bridge	$7,512,000	+5%	$3,756,000	+5%
2.1	Construct a Variable Depth Bridge Structure (HQ Structures Advance Planning Study – Alternative 4)	($2,767,000)	+6%	($2,767,000)	+6%
2.2	Use Steel Girders in the Bridge to Eliminate Falsework	($678,000)	+8%	Rejected	Rejected
2.3	Use Precast Girders (Bulb-T) to Eliminate Falsework	($1,694,000)	+8%	Rejected	Rejected
3.1	Construct an Access Road from Northbound US 101 to South Bank Road and Keep the Existing Access Open Under the Bridge	($453,000)	+4%	Rejected	Rejected
3.2	Construct an Access Road from Northbound US 101 to South Bank Road and Close the Existing Access Under the Bridge	($553,000)	-5%	Rejected	Rejected

Alt. No.	Alternative Title	Potential Initial Savings	Potential Performance Change	Validated Initial Cost Savings	Validated Performance Change
4.0	Construct a Two-Lane, 50-Foot-Wide Bridge in lieu of 66 Feet Wide by Eliminating One 12-Foot Lane and Reducing Each Shoulder by 2 Feet	$9,033,000	-4%	Rejected	Rejected
5.0	Use Isolation Bearings in the Bridge Superstructure to Reduce the Size of the Pier Foundations	$1,627,000	+3%	$1,627,000	+3%

Net Effect of Accepted VA Alternatives

Accepted Alternatives	Initial Cost Savings	Present Value Subsequent Cost	Present Value Highway User Cost	Performance Change	Value Change
1.0, 2.1, 5.0	$2,616,000	$0	$0	+4%	+10%

SUMMARY OF PERFORMANCE IMPROVEMENTS

The following information is required by the Caltrans HQ VA Program to enable reporting of performance to the FHWA. Only the six standard Caltrans performance attributes, shown in the table below, are to be documented. Caltrans does not require reporting of the performance of any other attributes utilized in this study.

Summary of Proposed VA Alternative Performance Improvements

Alternative No.	*Mainline Operations*	*Local Operations*	*Maintainability*	*Environmental Impacts*	*Construction Impacts*	*Project Schedule*
1.0			Improved			Improved
2.1			Improved	Improved		Improved
2.2				Improved	Improved	Improved
2.3			Improved		Improved	Improved
3.1	Improved	Improved			Improved	
3.2					Improved	
4.0					Improved	
5.0	Improved					

Summary of Accepted VA Alternative Performance Improvements

Alternative No.	*Mainline Operations*	*Local Operations*	*Maintainability*	*Environmental Impacts*	*Construction Impacts*	*Project Schedule*
1.0			Improved			Improved
2.1			Improved	Improved		Improved
5.0	Improved					

VA ALTERNATIVE IMPLEMENTATION ACTION

D-1 US 101 Dr. Fine Bridge Replacement

TITLE: Reduce the South End Bridge Length by 300 Feet and Use Fill with Large Culverts in lieu of a Bridge

NUMBER 1.0

RESPONSES | **Prepared by:** Fred Kolano | **Date:** 9/25/09

Acceptance of alternatives denotes intent to implement, based on current information, in the given project development phase (PID, PA&ED or PS&E). It is recognized that future conditions may change this disposition. The validation of disposition and the cost and performance changes for the alternative are required by Caltrans to ensure that the project decision makers agree with the study results. These validated results become the basis for the VA Program reportables.

Technical Feasibility / Validated Performance

This VA alternative is technically feasible as proposed. The performance is as proposed in the VA alternative.

DISPOSITION

☑ **Accept**
☐ **Conditionally Accept**
☐ **Reject**

Validated Performance

+5%

Implementable Portions

This VA alternative can be implemented in full.

If Alternative is Rejected

Was rejection due to VA study taking place too late in the project development process to implement the change?

Yes ☐ No ☐

Validated Cost Savings

The cost savings proposed in the VA alternative ($7,512,000) was reduced by 50% because the concept originally proposed was twice as long as was practical.

Validated Savings

$3,756,000

Project Development Support Cost Savings

N/A

Project Development Delivery Impacts

	No Change	Reduced by	Increased by
PID	☑	Mo.	Mo.
PA&ED	☑	Mo.	Mo.
PS&E	☑	Mo.	Mo.
Const.	☑	Mo.	Mo.

Other Comments

This concept will provide considerable cost savings for the project.

VA ALTERNATIVE IMPLEMENTATION ACTION

D-1 US 101 Dr. Fine Bridge Replacement

TITLE: Construct a Variable Depth Bridge Structure (HQ Structures Advance Planning Study – Alternative 4)		**NUMBER** 2.1
RESPONSES	**Prepared by:** Fred Kolano	**Date:** 9/25/09

Acceptance of alternatives denotes intent to implement, based on current information, in the given project development phase (PID, PA&ED or PS&E). It is recognized that future conditions may change this disposition. The validation of disposition and the cost and performance changes for the alternative are required by Caltrans to ensure that the project decision makers agree with the study results. These validated results become the basis for the VA Program reportables.

Technical Feasibility / Validated Performance

This VA alternative is technically feasible as proposed and the proposed performance improvement is acceptable.

NOTE: Although this alternative was originally thought to be mutually exclusive with 2.1, 2.3, and 2.4, the project decision makers elected to also accept this VA alternative.

DISPOSITION

- ☑ **Accept**
- ☐ **Conditionally Accept**
- ☐ **Reject**

Validated Performance

+6%

Implementable Portions

This VA alternative can be implemented in full.

If Alternative is Rejected

Was rejection due to VA study taking place too late in the project development process to implement the change?

Yes ☐ No ☐

Validated Cost Savings

The cost additions are as proposed in the VA alternative.

Validated Savings

($2,767,000)

Project Development Support Cost Savings

N/A

Project Development Delivery Impacts

	No Change	Reduced by	Increased by
PID	☑	Mo.	Mo.
PA&ED	☑	Mo.	Mo.
PS&E	☑	Mo.	Mo.
Const.	☑	Mo.	Mo.

Other Comments

VA ALTERNATIVE IMPLEMENTATION ACTION

D-1 US 101 Dr. Fine Bridge Replacement

TITLE: Use Steel Girders in the Bridge to Eliminate Falsework

NUMBER 2.2

RESPONSES | **Prepared by:** Fred Kolano | **Date:** 9/25/09

Acceptance of alternatives denotes intent to implement, based on current information, in the given project development phase (PID, PA&ED or PS&E). It is recognized that future conditions may change this disposition. The validation of disposition and the cost and performance changes for the alternative are required by Caltrans to ensure that the project decision makers agree with the study results. These validated results become the basis for the VA Program reportables.

Technical Feasibility / Validated Performance

This VA alternative is rejected in favor of VA Alternative 2.1. Also, the additional maintenance that would be required would not be acceptable to District Maintenance because this type of material is not suitable for a marine environment.

DISPOSITION

- ☐ **Accept**
- ☐ **Conditionally Accept**
- ☑ **Reject**

Validated Performance

Implementable Portions

If Alternative is Rejected

Was rejection due to VA study taking place too late in the project development process to implement the change?

Yes ☐ No ☑

Validated Cost Savings

Validated Savings

Project Development Support Cost Savings

Project Development Delivery Impacts

	No Change	Reduced by	Increased by
PID	☐	Mo.	Mo.
PA&ED	☐	Mo.	Mo.
PS&E	☐	Mo.	Mo.
Const.	☐	Mo.	Mo.

Other Comments

VA ALTERNATIVE IMPLEMENTATION ACTION

D-1 US 101 Dr. Fine Bridge Replacement

TITLE: Use Precast Girders (Bulb-T) to Eliminate Falsework

NUMBER 2.3

RESPONSES | **Prepared by:** Fred Kolano | **Date:** 9/25/09

Acceptance of alternatives denotes intent to implement, based on current information, in the given project development phase (PID, PA&ED or PS&E). It is recognized that future conditions may change this disposition. The validation of disposition and the cost and performance changes for the alternative are required by Caltrans to ensure that the project decision makers agree with the study results. These validated results become the basis for the VA Program reportables.

Technical Feasibility / Validated Performance

This VA alternative is rejected in favor of VA Alternative 2.1.

DISPOSITION

- ☐ **Accept**
- ☐ **Conditionally Accept**
- ☑ **Reject**

Validated Performance

Implementable Portions

If Alternative is Rejected

Was rejection due to VA study taking place too late in the project development process to implement the change?

Yes ☐ No ☑

Validated Cost Savings

Validated Savings

Project Development Support Cost Savings

Project Development Delivery Impacts

	No Change	Reduced by	Increased by
PID	☐	Mo.	Mo.
PA&ED	☐	Mo.	Mo.
PS&E	☐	Mo.	Mo.
Const.	☐	Mo.	Mo.

Other Comments

VA ALTERNATIVE IMPLEMENTATION ACTION

D-1 US 101 Dr. Fine Bridge Replacement

TITLE:	Construct an Access Road from Northbound US 101 to South Bank Road and Keep the Existing Access Open Under the Bridge	**NUMBER** 3.1
RESPONSES	**Prepared by:** Fred Kolano	**Date:** 9/25/09

Acceptance of alternatives denotes intent to implement, based on current information, in the given project development phase (PID, PA&ED or PS&E). It is recognized that future conditions may change this disposition. The validation of disposition and the cost and performance changes for the alternative are required by Caltrans to ensure that the project decision makers agree with the study results. These validated results become the basis for the VA Program reportables.

Technical Feasibility / Validated Performance

This VA alternative is rejected because the potential performance improvements do not justify the additional cost. There would also be issues with encountering potential hazardous materials, agricultural land, and the need to acquire additional right-of-way.

DISPOSITION

- ☐ **Accept**
- ☐ **Conditionally Accept**
- ☑ **Reject**

Validated Performance

Implementable Portions

If Alternative is Rejected

Was rejection due to VA study taking place too late in the project development process to implement the change?

Yes ☐ No ☑

Validated Cost Savings

Validated Savings

Project Development Support Cost Savings

Project Development Delivery Impacts

	No Change	Reduced by	Increased by
PID	☐	Mo.	Mo.
PA&ED	☐	Mo.	Mo.
PS&E	☐	Mo.	Mo.
Const.	☐	Mo.	Mo.

Other Comments

VA ALTERNATIVE IMPLEMENTATION ACTION

D-1 US 101 Dr. Fine Bridge Replacement

TITLE: Construct an Access Road from Northbound US 101 to South Bank Road and Close the Existing Access Under the Bridge

NUMBER 3.2

RESPONSES | **Prepared by:** Fred Kolano | **Date:** 9/25/09

Acceptance of alternatives denotes intent to implement, based on current information, in the given project development phase (PID, PA&ED or PS&E). It is recognized that future conditions may change this disposition. The validation of disposition and the cost and performance changes for the alternative are required by Caltrans to ensure that the project decision makers agree with the study results. These validated results become the basis for the VA Program reportables.

Technical Feasibility / Validated Performance

This VA alternative is rejected because the potential performance improvements do not justify the additional cost. There would also be issues with encountering potential hazardous materials, agricultural land, and the need to acquire additional right-of-way.

DISPOSITION

- ☐ **Accept**
- ☐ **Conditionally Accept**
- ☑ **Reject**

Validated Performance

Implementable Portions

If Alternative is Rejected

Was rejection due to VA study taking place too late in the project development process to implement the change?

Yes ☐ No ☑

Validated Cost Savings

Validated Savings

Project Development Support Cost Savings

Project Development Delivery Impacts

	No Change	Reduced by	Increased by
PID	☐	Mo.	Mo.
PA&ED	☐	Mo.	Mo.
PS&E	☐	Mo.	Mo.
Const.	☐	Mo.	Mo.

Other Comments

VA ALTERNATIVE IMPLEMENTATION ACTION

D-1 US 101 Dr. Fine Bridge Replacement

TITLE: Construct a Two-Lane, 50-Foot-Wide Bridge in lieu of 66 Feet Wide by Eliminating One 12-Foot Lane and Reducing Each Shoulder by 2 Feet

NUMBER 4.0

RESPONSES | **Prepared by:** Fred Kolano | **Date:** 12/1/09

Acceptance of alternatives denotes intent to implement, based on current information, in the given project development phase (PID, PA&ED or PS&E). It is recognized that future conditions may change this disposition. The validation of disposition and the cost and performance changes for the alternative are required by Caltrans to ensure that the project decision makers agree with the study results. These validated results become the basis for the VA Program reportables.

Technical Feasibility / Validated Performance

Traffic Safety holds the position that it is essential for the need and purpose of the project to include the acceleration lane for southbound traffic from SR 197. It should be noted that the Project Study Report planned for an acceleration lane to the south on US 101 and describes it as one of the physical deficiencies that need to be addressed to facilitate the safe merging of traffic from SR 197 to southbound US 101. Therefore, this VA alternative is rejected.

DISPOSITION

- ☐ **Accept**
- ☐ **Conditionally Accept**
- ☑ **Reject**

Validated Performance

Implementable Portions

If Alternative is Rejected

Was rejection due to VA study taking place too late in the project development process to implement the change?

Yes ☐ No ☑

Validated Cost Savings

Validated Savings

Project Development Support Cost Savings

Project Development Delivery Impacts

	No Change	Reduced by	Increased by
PID	☐	Mo.	Mo.
PA&ED	☐	Mo.	Mo.
PS&E	☐	Mo.	Mo.
Const.	☐	Mo.	Mo.

Other Comments

VA ALTERNATIVE IMPLEMENTATION ACTION

D-1 US 101 Dr. Fine Bridge Replacement

TITLE: Use Isolation Bearings in the Bridge Superstructure to Reduce the Size of the Pier Foundations		**NUMBER** 5.0
RESPONSES	**Prepared by:** Fred Kolano	**Date:** 9/25/09

Acceptance of alternatives denotes intent to implement, based on current information, in the given project development phase (PID, PA&ED or PS&E). It is recognized that future conditions may change this disposition. The validation of disposition and the cost and performance changes for the alternative are required by Caltrans to ensure that the project decision makers agree with the study results. These validated results become the basis for the VA Program reportables.

Technical Feasibility / Validated Performance

This VA alternative is technically feasible as proposed. The performance is as propose in the VA alternative.

DISPOSITION

☑ **Accept**
☐ **Conditionally Accept**
☐ **Reject**

Validated Performance

+3%

Implementable Portions

This VA alternative can be implemented in full.

If Alternative is Rejected

Was rejection due to VA study taking place too late in the project development process to implement the change?

Yes ☐ No ☐

Validated Cost Savings

The savings are as proposed in the VA alternative.

Validated Savings

$1,627,000

Project Development Support Cost Savings

N/A

Project Development Delivery Impacts

	No Change	Reduced by	Increased by
PID	☑	Mo.	Mo.
PA&ED	☑	Mo.	Mo.
PS&E	☑	Mo.	Mo.
Const.	☑	Mo.	Mo.

Other Comments

VALUE ANALYSIS ALTERNATIVE *D-1 US 101 Dr. Fine Bridge Replacement*			
FUNCTION:	Replace Bridge	**IDEA NO.** RB-10	**NUMBER** 1.0
TITLE:	Reduce the South End Bridge Length by 300 Feet and Use Fill with Large Culverts in lieu of a Bridge		**PAGE NO.** 1 of 5

ORIGINAL CONCEPT:

The original concept proposes a bridge over 300 feet of land within the flood zone on the south side of the river.

ALTERNATIVE CONCEPT:

Construct a filled-in roadway with two or more large culverts to accommodate traffic on South Bank Road and to allow water to pass during flood events.

ADVANTAGES:

- Reduces the structure cost on land (potential of $9 million)
- Fewer piles to be driven

DISADVANTAGES:

- Would need a larger footprint to accommodate side slopes
- May not provide enough hydrologic space
- Additional fill and culverts

COST SUMMARY	Initial Cost	Present Value Subsequent Cost	Present Value Highway User Cost	Net Present Value
Original Concept	$ 34,968,000	$ 0	$ 0	$ 34,968,000
Alternative Concept	$ 27,456,000	$ 0	$ 0	$ 27,456,000
Savings	$ 7,512,000	$ 0	$ 0	$ 7,512,000

DISCUSSION / JUSTIFICATION:

Saves construction cost by shortening the length of the span. Should shorten the bridge construction time. Less pile driving will result in fewer impacts to biological resources in the river and less disruption to the project footprint. Since there would be soil on the berm, habitat could be created in lieu of a concrete structure. Using soil is more desirable than using concrete because concrete requires considerable amounts of greenhouse gas producing materials to generate concrete.

TECHNICAL REVIEWER COMMENTS:

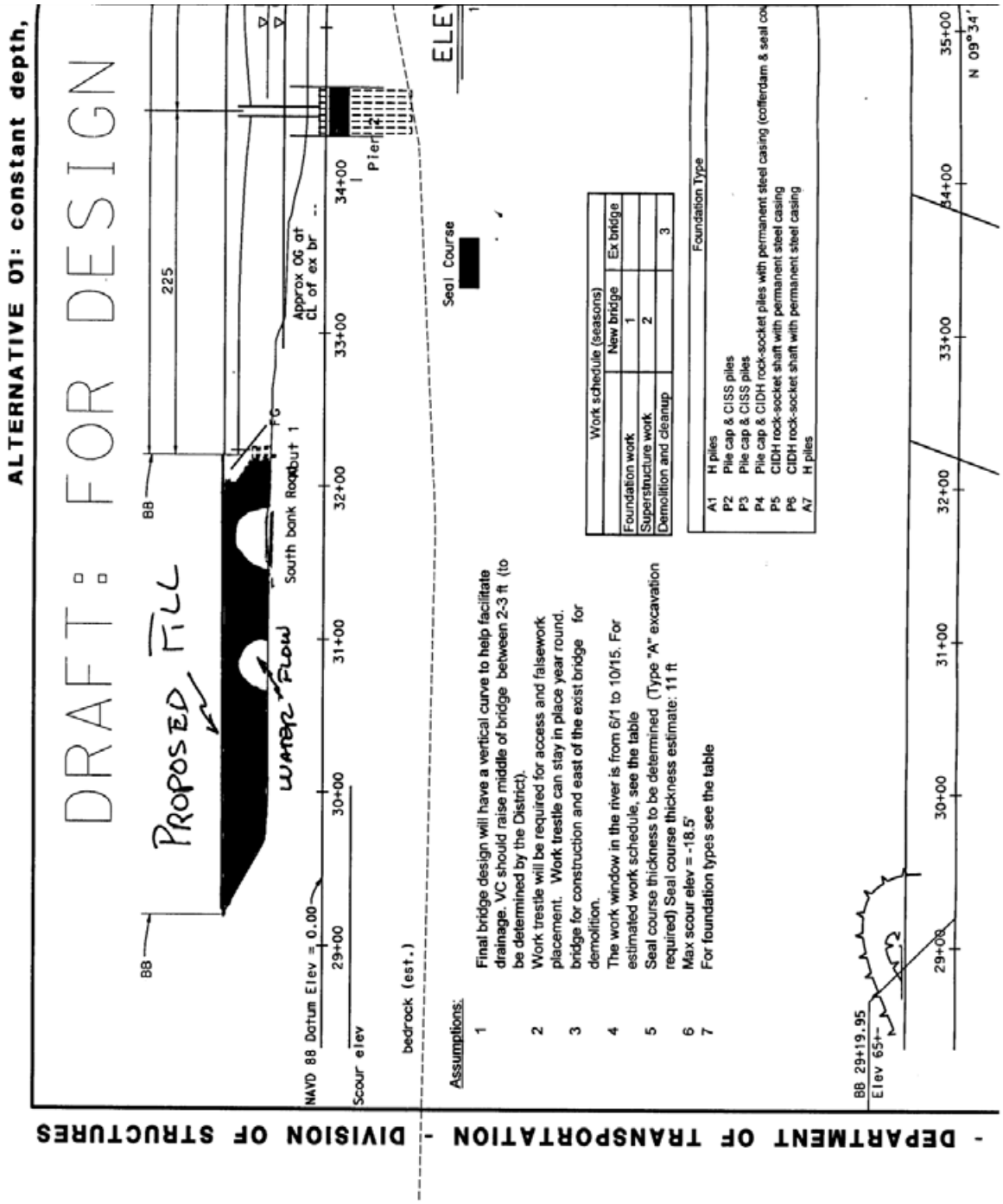
Concern about whether there would be enough freeboard to accommodate 100-year flood events.

Local traffic management during construction.

PROJECT MANAGEMENT CONSIDERATIONS:

Bridge redesign would be needed. Hydrology analysis would have to be performed. Because the footprint would be greater, this would have to be incorporated in the Environmental Document.

SKETCHES *D-1 US 101 Dr. Fine Bridge Replacement*			
TITLE:	Reduce the South End Bridge Length by 300 Feet and Use Fill with Large Culverts in lieu of a Bridge	**NUMBER** 1.0	**PAGE NO.** 3 of 5



PERFORMANCE ATTRIBUTES *D-1 US 101 Dr. Fine Bridge Replacement*			
TITLE: Reduce the South End Bridge Length by 300 Feet and Use Fill with Large Culverts in lieu of a Bridge		**NUMBER** 1.0	**PAGE NO.** 4 of 5
ATTRIBUTES and RATING RATIONALE for ALTERNATIVE	**Performance**	**Original**	**Alternative**
Mainline Operations No change.	Rating	8	8
	Weight	36	36
	Contribution	288	288
Local Operations No change.	Rating	6	6
	Weight	14	14
	Contribution	84	84
Maintainability Less bridge length to maintain. This is offset somewhat by slope maintenance. Still a bit better than the original design concept.	Rating	9	9.5
	Weight	18	18
	Contribution	162	171
Environmental Impacts – Temporary Reduced pile driving. Reduced effect on air quality (concrete manufacturing produces greenhouse gas emission). Reduced take of salmonids.	Rating	2	4
	Weight	11	11
	Contribution	22	44
Environmental Impacts Would impact some vegetation, but not enough to change this performance attribute.	Rating	5	5
	Weight	13	13
	Contribution	65	65
Construction Impacts No change.	Rating	6	6
	Weight	3	3
	Contribution	18	18
Project Schedule Placing imported borrow is quicker than building a bridge.	Rating	5	6
	Weight	5	5
	Contribution	25	30
	Rating		
	Weight		
	Contribution		
Total Performance:		**664**	**700**
Net Change in Performance:			**+5%**

COST SAVINGS					
300	Length				
66	width				
19,800	SF				
$ 489	cost/SF				
$ 9,682,200	Total Cost				
COST ADDITIONS					
Imported Borrow					
300	Length				
3900	Cross Section (70 x 30 + 60 x 30)				
1,170,000	SF				
33,130	m^3				
$ 15					
$ 496,950	Additional Imported Borrow				
Additional Culverts					
2	ea				
$ 500,000					
$ 1,000,000	Culvert Cost				
$ 1,496,950	Sub Total Additions				
1.45	Project Markup for Roadway Items				
$ 2,170,578	Total Cost Additions				
$ 7,511,623	**Net Savings**				

VALUE ANALYSIS ALTERNATIVE *D-1 US 101 Dr. Fine Bridge Replacement*			
FUNCTION:	Replace Bridge	**IDEA NO.** RB-37	**NUMBER** 2.1
TITLE:	Construct a Variable Depth Bridge Structure (HQ Structures Advance Planning Study – Alternative 4)		**PAGE NO.** 1 of 5

ORIGINAL CONCEPT:

The original concept proposes to construct a six-span cast-in-place prestressed box girder bridge.

ALTERNATIVE CONCEPT:

This alternative proposes to construct a four-span cast-in-place prestressed box girder bridge of variable depth (Structures Advance Planning Study – Alternative 4).

One less pier in the river than the original design concept.

ADVANTAGES:

- One less column in the river
- Nice arch makes it more aesthetically pleasing

DISADVANTAGES:

- Deeper section at the piers
- Could impact water pass through during a flood event
- Additional construction cost

COST SUMMARY	Initial Cost	Present Value Subsequent Cost	Present Value Highway User Cost	Net Present Value
Original Concept	$ 34,968,000	$ 0	$ 0	$ 34,968,000
Alternative Concept	$ 37,735,000	$ 0	$ 0	$ 37,735,000
Savings	$ (2,767,000)	$ 0	$ 0	$ (2,767,000)

DISCUSSION / JUSTIFICATION:

Eliminates one pier in the river and related reduction in environmental disturbance.

More aesthetically pleasing than the original design concept.

Adds cost to the project.

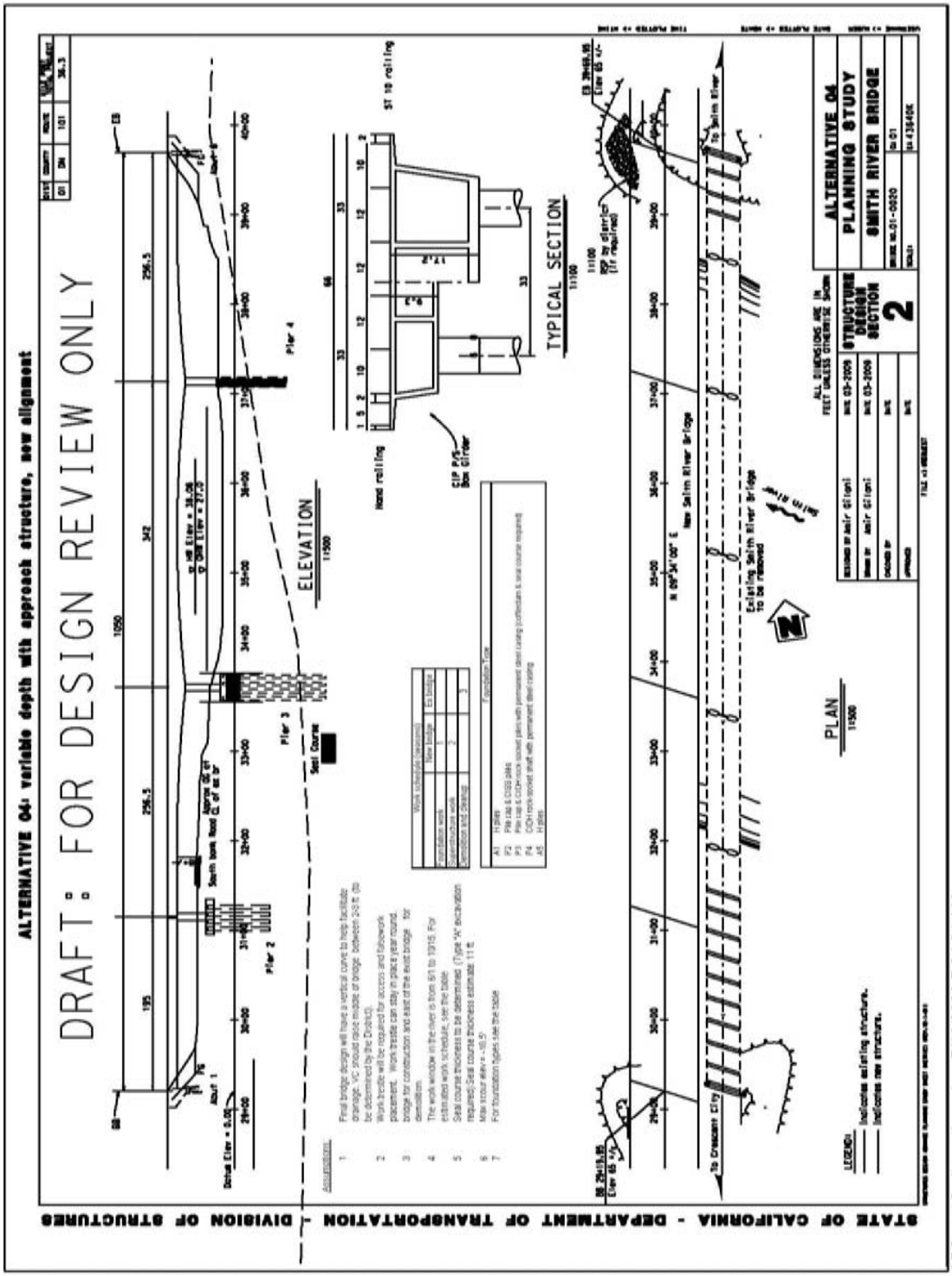
TECHNICAL REVIEWER COMMENTS:

Concern about clearance (15.5 feet) at South Bank Road. Note: Would cost more.

PROJECT MANAGEMENT CONSIDERATIONS:

This concept would have to be incorporated into the final bridge design.

Would need to perform a hydrology study to determine if this design would accommodate a 100-year flood event.


DRAFT: FOR DESIGN REVIEW ONLY
ALTERNATIVE 04: variable depth with approach structure, new alignment
STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION - DIVISION OF STRUCTURES
ELEVATION
TYPICAL SECTION
PLAN
ALTERNATIVE 04
PLANNING STUDY
SMITH RIVER BRIDGE
STRUCTURE DESIGN SECTION
2
Pier 1
Pier 2
Pier 3
Pier 4
Abut 1
Abut 2
New Smith River Bridge
Existing Smith River Bridge
To Crescent City
To Smith River
APS part 2 alternatives.dgn 7/16/2009 7:34:04 AM

PERFORMANCE ATTRIBUTES *D-1 US 101 Dr. Fine Bridge Replacement*				
TITLE:	Construct a Variable Depth Bridge Structure (HQ Structures Advance Planning Study – Alternative 4)	**NUMBER** 2.1	**PAGE NO.** 4 of 5	
ATTRIBUTES and RATING RATIONALE for ALTERNATIVE		**Performance**	**Original**	**Alternative**
Mainline Operations No change.		Rating	8	8
		Weight	36	36
		Contribution	288	288
Local Operations No change.		Rating	6	6
		Weight	14	14
		Contribution	84	84
Maintainability One less pier in the river and less scouring.		Rating	9	9.5
		Weight	18	18
		Contribution	162	171
Environmental Impacts – Temporary Fewer disturbances from pile driving in the river and less disturbance from elimination of the pier foundation.		Rating	2	4
		Weight	11	11
		Contribution	22	44
Environmental Impacts One less pier in the river with fewer disturbances.		Rating	5	5.5
		Weight	13	13
		Contribution	65	71.5
Construction Impacts No change.		Rating	6	6
		Weight	3	3
		Contribution	18	18
Project Schedule One less pier to construct will decrease the construction time period.		Rating	5	6
		Weight	5	5
		Contribution	25	30
		Rating		
		Weight		
		Contribution		
Total Performance:			**664**	**706.5**
Net Change in Performance:				**+6%**

ORIGINAL PROPOSED BRIDGE COST	
Assume bridge cost = $489 per square foot	
1050	length
66	w
69,300	SF
$ 489	Cost per SF
$33,887,700	Cost or Original Concept Cast-in-Place Prestressed Box Girder Bridge
$ 1,080,000	Demolition of existing bridge
$34,967,700	Original Concept Bridge Cost
PROPOSED BRIDGE COST WITH ALTERNATIVE 4	
$36,655,000	Cost of HQ Advance Planning Alternative 4
$ 1,080,000	Demolition of existing bridge
$37,735,000	Sub Total Proposed Cost
$ (2,767,300)	**Additional cost for this VA alternative**

Note: Environmental mitigation costs may change. However, unable to quantify at the time of the VA study.

VALUE ANALYSIS ALTERNATIVE *D-1 US 101 Dr. Fine Bridge Replacement*			
FUNCTION:	Replace Bridge	**IDEA NO.** RB-17	**NUMBER** 2.2
TITLE:	Use Steel Girders in the Bridge to Eliminate Falsework		**PAGE NO.** 1 of 4

ORIGINAL CONCEPT:

The original concept proposes to construct a cast-in-place prestressed box girder bridge.

ALTERNATIVE CONCEPT:

This alternative proposes to use steel girders to support the bridge deck.

ADVANTAGES:

- Eliminates falsework
- Reduces construction time
- Longer spans could eliminate two piers
- Column foundations are smaller
- Steel works better in seismic area

DISADVANTAGES:

- Slightly higher cost for steel
- More maintenance (however, weathering steel does not need painting)
- Would need larger cranes

COST SUMMARY	Initial Cost	Present Value Subsequent Cost	Present Value Highway User Cost	Net Present Value
Original Concept	$ 34,968,000	$ 0	$ 0	$ 34,968,000
Alternative Concept	$ 35,646,000	$ 0	$ 0	$ 35,646,000
Savings	$ (678,000)	$ 0	$ 0	$ (678,000)

VALUE ANALYSIS ALTERNATIVE *D-1 US 101 Dr. Fine Bridge Replacement*		
TITLE: Use Steel Girders in the Bridge to Eliminate Falsework	**NUMBER** 2.2	**PAGE NO.** 2 of 4

DISCUSSION / JUSTIFICATION:

Save construction time; possibly one of three seasons. Less impact to the river during construction mainly because of the reduction of one or more piers. Reduces the pile driving and lessens the impacts to biological resources.

Possibility of using existing bridge for construction.

Most likely aesthetics would be comparable to the existing bridge. Motorists would not see most of the understructure. Would be compatible with the steel bridges found north in Oregon.

TECHNICAL REVIEWER COMMENTS:

Possibility of three trestles.

Maintenance would have concerns of a steel bridge in marine environment.

PROJECT MANAGEMENT CONSIDERATIONS:

Requires bridge redesign.

Would have to incorporate this into the Environmental Document.

Hauling of the steel girders may be challenging. (Note: Easier to haul than precast concrete girders.)

PERFORMANCE ATTRIBUTES *D-1 US 101 Dr. Fine Bridge Replacement*			
TITLE: Use Steel Girders in the Bridge to Eliminate Falsework	**NUMBER** 2.2		**PAGE NO.** 3 of 4
ATTRIBUTES and RATING RATIONALE for ALTERNATIVE	**Performance**	**Original**	**Alternative**
Mainline Operations No change.	Rating	8	8
	Weight	36	36
	Contribution	288	288
Local Operations No change.	Rating	6	6
	Weight	14	14
	Contribution	84	84
Maintainability Steel bridges require more maintenance than concrete.	Rating	9	8
	Weight	18	18
	Contribution	162	144
Environmental Impacts – Temporary Elimination of falsework will reduce pile driving. Reduced impacts from fewer piers. Quicker construction would have fewer impacts to river. Maybe two seasons in lieu of three seasons. Less traffic diversion.	Rating	2	6
	Weight	11	11
	Contribution	22	66
Environmental Impacts Fewer piers in the river.	Rating	5	6
	Weight	13	13
	Contribution	65	78
Construction Impacts Less construction time.	Rating	6	7
	Weight	3	3
	Contribution	18	21
Project Schedule Could shorten the construction time of the bridge; thus improving this performance attribute. (Note: Shorter construction time than precast girders because of reduction in the number of piers.)	Rating	5	7
	Weight	5	5
	Contribution	25	35
	Rating		
	Weight		
	Contribution		
Total Performance:		**664**	**716**
Net Change in Performance:			**+8%**

ORIGINAL PROPOSED BRIDGE COST						
Assume bridge SF cost = $489						
Assume bridge cost = $489 per square foot						
	1050	length				
	66	w				
	69,300	SF				
$	489	Cost per SF				
$	33,887,700	Cost or Original Concept Cast-in-Place Prestressed Box Grider Bridge				
$	1,080,000	Demolition of existing bridge				
$	34,967,700	Original Concept Bridge Cost				
PROPOSED STEEL GIRDER BRIDGE						
Assume a steel grider bridge would be 2% more.						
Base Caltrans Comparative Bridge cost data						
This assumption would include one less pier and foundation						
than the concrete cast-in-place bridge.						
$	489	Original Bridge SF unit cost				
	1.02	2% increase				
$	499					
$	69,300	Bridge SF				
$	34,565,454	Proposed Bridge Cost				
$	1,080,000	Demolition of existing bridge				
$	35,645,454	Total Proposed Cost				
$	(677,754)	Total Additional Cost				

Note: Environmental costs may be changed.

VALUE ANALYSIS ALTERNATIVE *D-1 US 101 Dr. Fine Bridge Replacement*			
FUNCTION:	Replace Bridge	**IDEA NO.** RB-17	**NUMBER** 2.3
TITLE:	Use Precast Girders (Bulb-T) to Eliminate Falsework		**PAGE NO.** 1 of 4

ORIGINAL CONCEPT:

The original concept proposes to construct a cast-in-place prestressed box girder bridge.

ALTERNATIVE CONCEPT:

This alternative proposes to use precast girders to support the bridge deck.

ADVANTAGES:

- Eliminates falsework
- Reduces construction time

DISADVANTAGES:

- Slightly higher cost for precast
- May require one more pier for bridge support

COST SUMMARY	Initial Cost	Present Value Subsequent Cost	Present Value Highway User Cost	Net Present Value
Original Concept	$ 34,968,000	$ 0	$ 0	$ 34,968,000
Alternative Concept	$ 36,662,000	$ 0	$ 0	$ 36,662,000
Savings	$ (1,694,000)	$ 0	$ 0	$ (1,694,000)

VALUE ANALYSIS ALTERNATIVE *D-1 US 101 Dr. Fine Bridge Replacement*		
TITLE: Use Precast Girders (Bulb-T) to Eliminate Falsework	**NUMBER** 2.3	**PAGE NO.** 2 of 4

DISCUSSION / JUSTIFICATION:

Saves construction time; possibly one of three seasons. Less impact to the river during construction. Reduces the pile driving. Fewer impacts to biological resources.

TECHNICAL REVIEWER COMMENTS:

Concern about transporting the girders to the site because of the length of the girders and the tight curves on the roads that would be traversed.

Does not completely eliminate falsework because temporary support of girders is needed before prestress.

PROJECT MANAGEMENT CONSIDERATIONS:

Requires bridge redesign.

Would have to be incorporated in the Environmental Document.

Hauling of the precast girders may be challenging.

PERFORMANCE ATTRIBUTES *D-1 US 101 Dr. Fine Bridge Replacement*			
TITLE: Use Precast Girders (Bulb-T) to Eliminate Falsework	**NUMBER** 2.3		**PAGE NO.** 3 of 4
ATTRIBUTES and RATING RATIONALE for ALTERNATIVE	**Performance**	**Original**	**Alternative**
Mainline Operations No change.	Rating	8	8
	Weight	36	36
	Contribution	288	288
Local Operations No change.	Rating	6	6
	Weight	14	14
	Contribution	84	84
Maintainability There may be one more pier; however, the maintenance of this would not be enough to change this performance attribute. Easier to replace a deck on precast girders. Better girder quality because manufactured in a controlled environment.	Rating	9	9.5
	Weight	18	18
	Contribution	162	171
Environmental Impacts – Temporary Elimination of falsework will reduce pile driving. More impacts for the possibility of the additional pier. Quicker construction would have fewer impacts to river. May be two seasons in lieu of three seasons.	Rating	2	5
	Weight	11	11
	Contribution	22	55
Environmental Impacts Possibility of an additional pier in the river. However, since this is unknown this performance attribute is not changed.	Rating	5	5
	Weight	13	13
	Contribution	65	65
Construction Impacts Less construction time.	Rating	6	7
	Weight	3	3
	Contribution	18	21
Project Schedule Could shorten the construction time of the bridge; thus improving this performance attribute.	Rating	5	6
	Weight	5	5
	Contribution	25	30
	Rating		
	Weight		
	Contribution		
Total Performance:		**664**	**714**
Net Change in Performance:			**+8%**

Assume bridge SF cost = $489

	1050	length
	66	w
	69,300	SF
$	489	
$	33,887,700	
$	1,080,000	bridge removal
$	34,967,700	Original Concept Bridge Cost

Assume a precast girder bridge would be 5% more.
Base Caltrans Comparative Bridge cost data
This assumption is probably conservative.

$	33,887,700
	1.05
$	35,582,085
$	1,080,000
$	36,662,085
$	(1,694,385)

Note: Environmental costs may be changed.

VALUE ANALYSIS ALTERNATIVE *D-1 US 101 Dr. Fine Bridge Replacement*			
FUNCTION:	Add Lane	**IDEA NO.** AL-1	**NUMBER** 3.1
TITLE:	Construct an Access Road from Northbound US 101 to South Bank Road and Keep the Existing Access Open Under the Bridge		**PAGE NO.** 1 of 5

ORIGINAL CONCEPT:

The original concept does not have a direct access from northbound US 101 to South Bank Road. The access to South Bank road (granite business and residents) is via under the proposed bridge on the south bank of the river.

ALTERNATIVE CONCEPT:

This alternative proposes to construct an access road (approximately 1,500 feet long) from approximately 400 feet south of the south end of the bridge (across from Lake Earl Drive), east to South Bank Road. The existing South Bank Road access under the bridge would be maintained.

ADVANTAGES:

- Eliminates height restriction under bridge (a high truck load would use the proposed intersection)
- Eliminates disruptions to traffic on South Bank Road
- Could use fill in area in lieu of bridge
- During flood events the existing road under the bridge would not be in use
- Local operations would be improved; allows northbound and southbound right-turn movements
- Easier construction; traffic can be detoured

DISADVANTAGES:

- Additional cost for new lane construction
- Would require more right-of-way
- Need cooperative agreement with Del Norte County
- Four-way intersection in lieu of "T" intersection may impact incidents

COST SUMMARY	Initial Cost	Present Value Subsequent Cost	Present Value Highway User Cost	Net Present Value
Original Concept	$ 0	$ 0	$ 0	$ 0
Alternative Concept	$ 453,000	$ 0	$ 0	$ 453,000
Savings	$ (453,000)	$ 0	$ 0	$ (453,000)

DISCUSSION / JUSTIFICATION:

See advantages and disadvantages.

NOTE: Discussion conducted with granite company individuals during the VA study indicated they would be in favor of the concept. They liked to be able to do a right turn to go north, and if northbound into the plant, would not have to loop and go under the bridge. However, concerned about alignment. Did not want the road to go into their plant operations.

TECHNICAL REVIEWER COMMENTS:

Would need more right-of-way; minor impacts to agricultural land.

PROJECT MANAGEMENT CONSIDERATIONS:

Would have to obtain a cooperative agreement with Del Norte County.

Would have to design the road.

Would have to acquire the necessary right-of-way.

SKETCHES *D-1 US 101 Dr. Fine Bridge Replacement*			
TITLE:	Construct an Access Road from Northbound US 101 to South Bank Road and Keep the Existing Access Open Under the Bridge	**NUMBER** 3.1	**PAGE NO.** 3 of 5

PERFORMANCE ATTRIBUTES *D-1 US 101 Dr. Fine Bridge Replacement*			
TITLE: Construct an Access Road from Northbound US 101 to South Bank Road and Keep the Existing Access Open Under the Bridge		**NUMBER** 3.1	**PAGE NO.** 4 of 5
ATTRIBUTES and RATING RATIONALE for ALTERNATIVE	**Performance**	**Original**	**Alternative**
Mainline Operations A four-way intersection would help truck operations (turns and acceleration).	Rating	8	8.5
	Weight	36	36
	Contribution	288	306
Local Operations Local operations would be improved; allows northbound and southbound right-turn movements.	Rating	6	7
	Weight	14	14
	Contribution	84	98
Maintainability More road to maintain. County would maintain this road. Therefore, minimal change to this performance attribute.	Rating	9	9
	Weight	18	18
	Contribution	162	162
Environmental Impacts – Temporary Possible transportation of dust and sediments from the roadway construction to the river, thus impacting fish. However, this impact, when considering the whole project, is not enough to change this performance attribute.	Rating	2	2
	Weight	11	11
	Contribution	22	22
Environmental Impacts Some small agricultural land takes. Will cause some disturbance to the existing area.	Rating	5	4.5
	Weight	13	13
	Contribution	65	58.5
Construction Impacts Could improve traffic management during construction in the area of South Bank Road.	Rating	6	7
	Weight	3	3
	Contribution	18	21
Project Schedule Additional construction time; the negotiation for right-of-way may take additional time; may require more Environmental Document development time.	Rating	5	4
	Weight	5	5
	Contribution	25	20
	Rating		
	Weight		
	Contribution		
Total Performance:		**664**	**687.5**
Net Change in Performance:			**+4%**

COST ADDITIONS				
Additional 1,500 feet of roadway				
Imported Borrow				
1200	long		15	Cost m^3
32	wide		35.3	conversion
1	deep		0.424929	cost ft^3
38,400	SF			
0.4249292	cost per ft^3			
$ 16,317	Cost for AB			
Aggreate Base				
1,500	long		$ 55	Cost m^3
32	wide		35.3	conversion
1	deep		$ 1.558	cost ft^3
48,000	ft^3 AB			
1.55	cost per ft^3			
$ 74,400	Cost for AB			
Class 3 Subbase				
1,500	long			
32	wide			
1	deep			
48,000	ft^3 sb			
$ 1	Cost for subbase			
$ 48,000	Cost for subbase			
Asphalt Concrete (AC)				
1,500	long			
32	wide			
0.4	feet deep			
19,200	cf			
150	assume #/cf of AC			
2,880,000				
2200	#/ton			
1,309	tonne			
$ 80	Cost per tonne			
$ 104,727				
$ 243,445	Sub Total Additional Costs			
1.45	Project Markup for Roadway Items			
$ 352,995	Total Cost Additions			
Right-of-Way				
$ 100,000	Assumption			
$ 452,995	Total Additional Cost			

VALUE ANALYSIS ALTERNATIVE *D-1 US 101 Dr. Fine Bridge Replacement*			
FUNCTION:	Add Lane	**IDEA NO.** AL-1	**NUMBER** 3.2
TITLE:	Construct an Access Road from Northbound US 101 to South Bank Road and Close the Existing Access Under the Bridge		**PAGE NO.** 1 of 5

ORIGINAL CONCEPT:

The original concept does not have a direct access from northbound US 101 to South Bank Road. The access to South Bank road (granite business and residents) is via under the proposed bridge on the south bank of the river.

ALTERNATIVE CONCEPT:

This alternative proposes to construct an access road (approximately 1,500 feet long) from approximately 400 feet south of the south end of the bridge (across from Lake Earl Drive), east to South Bank Road. The existing South Bank Road access under the bridge would be closed.

ADVANTAGES:

- Eliminates height restriction under bridge
- Eliminates disruptions to traffic on South Bank Road
- The area under the bridge could become a pier location
- Could use fill in the area under the bridge and shorten the bridge
- Easier construction; traffic can be detoured
- This concept could be used in combination with other bridge options
- Recreational access to river could be developed

DISADVANTAGES:

- Additional cost for new lane construction
- Would require more right-of-way
- Need cooperative agreement with Del Norte County
- Four-way intersection in lieu of "T" intersection could increase incidents
- Additional costs needed to restore the part of the road that would not be used anymore
- Could negatively impact motorists traveling from this project to Crescent City because of left-turn movement and crossing the roadway

COST SUMMARY	Initial Cost	Present Value Subsequent Cost	Present Value Highway User Cost	Net Present Value
Original Concept	$ 0	$ 0	$ 0	$ 0
Alternative Concept	$ 553,000	$ 0	$ 0	$ 553,000
Savings	$ (553,000)	$ 0	$ 0	$ (553,000)

DISCUSSION / JUSTIFICATION:

See advantages and disadvantages.

TECHNICAL REVIEWER COMMENTS:

Would need more right-of-way; minor impacts to agricultural land.

PROJECT MANAGEMENT CONSIDERATIONS:

Would have to obtain a cooperative agreement with Del Norte County.

Would have to design the road.

Would have to acquire the necessary right-of-way.

SKETCHES *D-1 US 101 Dr. Fine Bridge Replacement*			
TITLE:	Construct an Access Road from Northbound US 101 to South Bank Road and Close the Existing Access Under the Bridge	**NUMBER** 3.2	**PAGE NO.** 3 of 5

PERFORMANCE ATTRIBUTES *D-1 US 101 Dr. Fine Bridge Replacement*				
TITLE:	Construct an Access Road from Northbound US 101 to South Bank Road and Close the Existing Access Under the Bridge	**NUMBER** 3.2	**PAGE NO.** 4 of 5	
ATTRIBUTES and RATING RATIONALE for ALTERNATIVE		**Performance**	**Original**	**Alternative**
Mainline Operations More vehicles crossing the roadway would disrupt traffic on the mainline.		Rating	8	7.5
		Weight	36	36
		Contribution	288	270
Local Operations Forces all movement from South Bank Road on to the highway. Residents could no longer go under the bridge to get to Redwood School.		Rating	6	5.5
		Weight	14	14
		Contribution	84	77
Maintainability More road to maintain. County would maintain this road. Therefore, minimal change to this performance attribute.		Rating	9	9
		Weight	18	18
		Contribution	162	162
Environmental Impacts – Temporary Possible transportation of dust and sediments from the roadway construction to the river, thus impacting fish. However, this impact, when considering the whole project, is not enough to change this performance attribute.		Rating	2	2
		Weight	11	11
		Contribution	22	22
Environmental Impacts Some small agricultural land takes. Will cause some disturbance to the existing area.		Rating	5	4.5
		Weight	13	13
		Contribution	65	58.5
Construction Impacts Could improve traffic management during construction in the area of South Bank Road.		Rating	6	7
		Weight	3	3
		Contribution	18	21
Project Schedule Additional construction time; the negotiation for right-of-way may take additional time; may require more Environmental Document development time.		Rating	5	4
		Weight	5	5
		Contribution	25	20
		Rating		
		Weight		
		Contribution		
Total Performance:			**664**	**630.5**
Net Change in Performance:				**-5%**

COST ADDITIONS								
Additional 1,500 feet of roadway								
Imported Borrow								
1200	long		15	Cost m^3				
32	wide		35.3	conversion				
1	deep		0.424929	cost ft^3				
38,400	SF							
0.424929178	cost per ft^3							
$ 16,317	**Cost for Imported Borrow**							
Aggreate Base								
1,500	long		$ 55	3				
32	wide		35.3	conversion				
1	deep		$ 1.558	3				
48,000	ft^3 AB							
1.55	cost per ft^3							
$ 74,400	**Cost for AB**							
Class 3 Subbase								
1,500	long							
32	wide							
1	deep							
48,000	ft^3 subbase							
$ 1	Cost for subbase							
$ 48,000	**Cost for subbase**							
Asphalt Concrete								
1,500	long							
32	wide							
0.4	feet deep							
19,200	cf							
150	assume #/cf of AC							
2,880,000								
2200	#/ton							
1,309	tonne							
$ 80	Cost per tonne							
$ 104,727	**Cost of AC**							
$ 243,445	Sub Total Additional Costs							
1.45	Project Markup for Roadway Items							
$ 352,995	Total Cost Additions							
Right-of-Way								
$ 100,000	Assumption for needed right-of-way							
Other Costs								
$ 50,000	Assumed cost to demolish and restore 300 feet of abandoned road under bridge							
$ 50,000	Assumed cost to provide access to river							
$ 100,000	Total Other Costs							
$ 552,995	**Total Cost Additions**							

VALUE ANALYSIS ALTERNATIVE *D-1 US 101 Dr. Fine Bridge Replacement*			
FUNCTION:	Replace Bridge	**IDEA NO.** RB-8	**NUMBER** 4.0
TITLE:	Construct a Two-Lane, 50-Foot-Wide Bridge in lieu of 66 Feet Wide by Eliminating One 12-Foot Lane and Reducing Each Shoulder by 2 Feet		**PAGE NO.** 1 of 5

ORIGINAL CONCEPT:

The original concept proposes to construct a 66-foot-wide cast-in-place prestressed concrete box girder bridge. Three 12-foot lanes, two 10-foot shoulders, one 5-foot pedestrian lane, two 2-foot rails, and one 1-foot hand railing.

ALTERNATIVE CONCEPT:

This alternative proposes to eliminate one 12-foot lane and reduce the shoulder from 10 to 8 feet; a total reduction of 16 feet. ITS would be used to alert southbound motorists (north of the project area) of the likelihood of encountering large, slow moving vehicles entering and on the highway. Other intersections could be considered.

ADVANTAGES:

- Saves construction costs (bridge, imported borrow, structural section)
- More likely to obtain funding for this idea
- Less environmental disturbance
- Would be compatible with a couplet bridge if needed for future expansion to four-lane Route Concept Report goal

DISADVANTAGES:

- Without a third lane there could be more incidents and future liability may be impacted; Note: Current safety data and traffic analysis do not support the need for a middle lane
- Reduction of the shoulder width could create reduced protection for cyclists/vehicles
- Compared to the original design concept (Project Study Report Alternative 1A), truck traffic operations would be degraded

COST SUMMARY	Initial Cost	Present Value Subsequent Cost	Present Value Highway User Cost	Net Present Value
Original Concept	$ 34,968,000	$ 0	$ 0	$ 34,968,000
Alternative Concept	$ 25,935,000	$ 0	$ 0	$ 25,935,000
Savings	$ 9,033,000	$ 0	$ 0	$ 9,033,000

DISCUSSION / JUSTIFICATION:

If a wider roadway is required in the future, the bridge would have to be widened. This alternative will save construction costs.

This bridge could be used for one-half of a four-lane configuration if needed in the future.

Note: A potential strategy could be to use savings from this alternative to relocate the SR 197 Intersection to the north to Fred D. Haight Drive (1,500 feet).

TECHNICAL REVIEWER COMMENTS:

With no signal, more potential for incidents at the SR 197 Intersection; however, does not affect traffic operations on the bridge.

Traffic Safety would oppose this concept because truck acceleration is an integral part of the project. Does not meet signal warrants.

PROJECT MANAGEMENT CONSIDERATIONS:

Redesign would be needed.

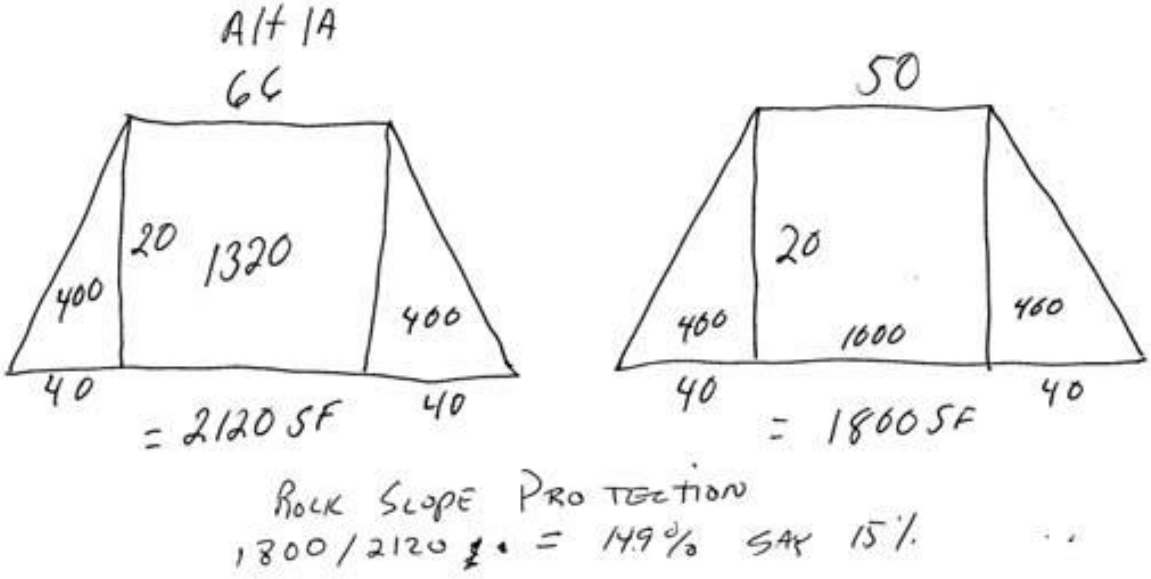
This concept would have to be incorporated in the Environmental Document.

Traffic Operations and Traffic Safety would have to analyze and propose reasons why this concept would not be viable.

PERFORMANCE ATTRIBUTES *D-1 US 101 Dr. Fine Bridge Replacement*			
TITLE: Construct a Two-Lane, 50-Foot-Wide Bridge in lieu of 66 Feet Wide by Eliminating One 12-Foot Lane and Reducing Each Shoulder by 2 Feet		**NUMBER** 4.0	**PAGE NO.** 3 of 5
ATTRIBUTES and RATING RATIONALE for ALTERNATIVE	**Performance**	**Original**	**Alternative**
Mainline Operations Less refuge for vehicles. Reduction of the shoulder width could create reduced protection for cyclists/vehicles.	Rating	8	7
	Weight	36	36
	Contribution	288	252
Local Operations Lack of a middle acceleration lane would slow down traffic operations at SR 197.	Rating	6	5.5
	Weight	14	14
	Contribution	84	77
Maintainability Less bridge and roadway to maintain. It was noted that maintenance worker exposure may be impacted; however, this was considered to be manageable with adequate traffic control.	Rating	9	9
	Weight	18	18
	Contribution	162	162
Environmental Impacts – Temporary Smaller pier foundations would result in less pile driving and less impact to fish resources.	Rating	2	3
	Weight	11	11
	Contribution	22	33
Environmental Impacts Less impact to creeks on the north side; however, not enough to change this performance attribute.	Rating	5	5
	Weight	13	13
	Contribution	65	65
Construction Impacts Quicker bridge construction would result in fewer delays to motorists. Smaller piers, less width.	Rating	6	7
	Weight	3	3
	Contribution	18	21
Project Schedule Quicker construction, but not enough to change this performance attribute.	Rating	5	5
	Weight	5	5
	Contribution	25	25
	Rating		
	Weight		
	Contribution		
Total Performance:		**664**	**635**
Net Change in Performance:			**-4%**

BRIDGE SAVINGS		
Assume bridge SF cost = $489		
1050	length	
66	w	
69,300	SF	
$ 489		
$33,887,700		
$ 1,080,000	bridge removal	
$34,967,700	Original Concept Bridge Cost	
1050	length	
50	w	
52,500	SF	
$ 489		
$25,672,500		
$ 1,080,000	bridge removal	
$26,752,500	Original Concept Bridge Cost	
$ 8,215,200	**Bridge Savings**	
ROADWAY ITEMS SAVINGS		
Imported Borrow		
$ 840,000	Origianal Cost	
0.33	Assumed savings	
$ 277,200	Proposed Cost	
Open Grade Asphalt Concrete + Dense Grade AC + Aggregate Base		
$ 474,000	Original cost	
0.33	Assumed savings	
$ 156,420	Proposed Cost	
Rock Slope Protection (1-Ton Method A + 1/2-Ton Method B)		
$ 870,000	Original Concept Cost	
0.15	Assumed savings	
$ 130,500	Proposed Cost	
$ 564,120	Sub Total Roadway Items Savings	
1.45	Project Markups (45%)	
$ 817,974	Total Roadway Items Savings	
$ 9,033,174	**Total Savings**	
NOTE 1: Assume right-of-way costs would not change.		
NOTE 2: Changes in environmental mitigation costs could not be quantified.		

Basis for earthwork calculation:



ROCK SLOPE PROTECTION
1800/2120 ft. = 149% SAY 15%

VALUE ANALYSIS ALTERNATIVE *D-1 US 101 Dr. Fine Bridge Replacement*			
FUNCTION:	Replace Bridge	**IDEA NO.** RB-15	**NUMBER** 5.0
TITLE:	Use Isolation Bearings in the Bridge Superstructure to Reduce the Size of the Pier Foundations		**PAGE NO.** 1 of 5

ORIGINAL CONCEPT:

The original concept proposes no isolation bearings in the bridge superstructure.

ALTERNATIVE CONCEPT:

This alternative proposes to use isolation bearings in the bridge to isolate superstructure from the substructure. This will reduce the foundation size and improve seismic performance.

Span lengths would be the same as proposed in the original design concept.

This is Alternative 10, which was developed by Caltrans HQ Structure Design as part of their Advance Planning Study.

ADVANTAGES:

- Reduces the column foundation size
- Improves seismic performance
- Would minimize repair time in the event of a seismic event

DISADVANTAGES:

- May require more bridge bearing maintenance

COST SUMMARY	Initial Cost	Present Value Subsequent Cost	Present Value Highway User Cost	Net Present Value
Original Concept	$ 34,968,000	$ 0	$ 0	$ 34,968,000
Alternative Concept	$ 33,341,000	$ 0	$ 0	$ 33,341,000
Savings	$ 1,627,000	$ 0	$ 0	$ 1,627,000

DISCUSSION / JUSTIFICATION:

Provides an earthquake-resistant bridge and improves performance during a seismic event.

Provides a way to quickly put the bridge back into service after a major seismic event; thereby improving traffic flows.

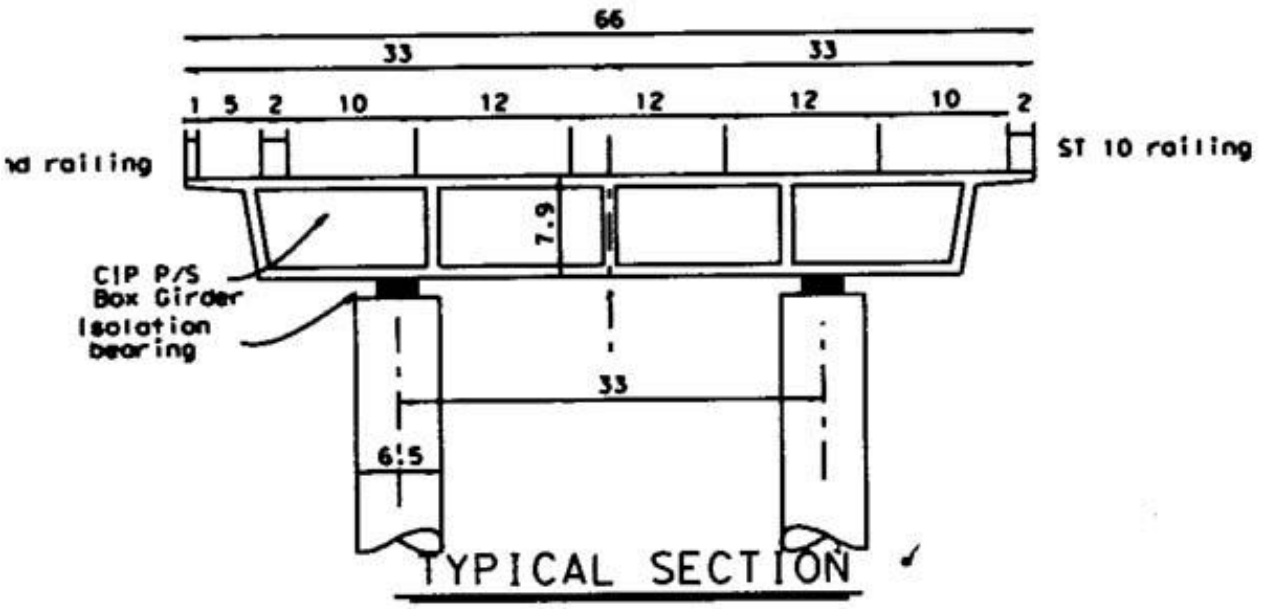
Saves construction costs.

TECHNICAL REVIEWER COMMENTS:

Depending on the magnitude of the earthquake, the bridge would sustain less damage than if isolation bearings were not used.

PROJECT MANAGEMENT CONSIDERATIONS:

This concept would have to be incorporated in the final bridge design.


66
33
33
1 5 2 10 12 12 12 10 2
ST 10 railing
7.9
CIP P/S
Box Girder
Isolation
bearing
33
6.5
TYPICAL SECTION

PERFORMANCE ATTRIBUTES *D-1 US 101 Dr. Fine Bridge Replacement*			
TITLE: Use Isolation Bearings in the Bridge Superstructure to Reduce the Size of the Pier Foundations		**NUMBER** 5.0	**PAGE NO.** 4 of 5
ATTRIBUTES and RATING RATIONALE for ALTERNATIVE	**Performance**	**Original**	**Alternative**
Mainline Operations Improved because traffic can be restored quicker than the original design concept bridge in the event of a seismic event.	Rating	8	8.5
	Weight	36	36
	Contribution	288	306
Local Operations No change.	Rating	6	6
	Weight	14	14
	Contribution	84	84
Maintainability More routine maintenance is offset by quicker repair of a seismic event. Therefore, no change in this performance attribute.	Rating	9	9
	Weight	18	18
	Contribution	162	162
Environmental Impacts – Temporary No change	Rating	2	2
	Weight	11	11
	Contribution	22	22
Environmental Impacts No change.	Rating	5	5
	Weight	13	13
	Contribution	65	65
Construction Impacts No change.	Rating	6	6
	Weight	3	3
	Contribution	18	18
Project Schedule No change. Slightly more time to build, but will not affect this performance attribute.	Rating	5	5
	Weight	5	5
	Contribution	25	25
	Rating		
	Weight		
	Contribution		
Total Performance:		**664**	**682**
Net Change in Performance:			**+3%**

ORIGINAL BRIDGE COST					
Assume bridge SF cost = $489					
1050	length				
66	width ft				
69,300	SF				
$ 489	Unit cost				
$33,887,700	Sub Total Bridge Cost				
$ 1,080,000	bridge removal				
$34,967,700	Original Concept Bridge Cost				
PROPOSED BRIDGE COST USING ALTERNATIVE 10					
$32,261,000	Cost of HQ Advance Bridge Planning Alternative 10				
$ 1,080,000	bridge removal				
$33,341,000	Total Cost of Alternative 10				
$ 1,626,700	**Net Savings**				

PROJECT INFORMATION

PROJECT INFORMATION

BACKGROUND

The project proposes to replace the Dr. Fine Bridge on US 101 over the Smith River. The bridge is located approximately 10 miles north of Crescent City, California. Caltrans District 1 Maintenance Engineering Office has recommended its replacement due to its deteriorating condition. US 101 is known as the Redwood Highway and is considered the "lifeline" of the North Coast. It connects communities within Mendocino, Humboldt, and Del Norte Counties. It is functionally classified as a rural principal arterial and is part of the California Freeway and Expressway System. This part of US 101 is in the Pacific Coast Bike Route.

PROJECT DESCRIPTION

The purpose of the project is to replace the deteriorating Dr. Fine Bridge because it is physically deficient and functionally obsolete (narrow width). In addition, other issues include exposure of bridge piers to water scour, existing bridge steel and straps requiring frequent maintenance, no shoulder available to accommodate bicyclists or pedestrians (existing is 1 foot in width), and the approach slabs are not rated for California weight restriction standards.

Project Study Report Alternative 1A – Alignment to the West of the Existing Bridge – was used as the original design concept for the VA study. This alternative proposes to replace the existing structure with a concrete cast-in-place prestressed box girder bridge that will be 1,050 feet long and 66 feet wide. The bridge will provide three 12-foot lanes, two 10-foot shoulders, one 5-foot bicycle/pedestrian lane, a 2-foot separation for this, and 3 feet for railings. The bridge will have five piers and three foundations within the Smith River. The construction is expected to require three seasons for completion and delivery by December 2016.

The project will also provide improvements to intersections at Lake Earl Drive (south of the bridge) and US 101/SR 197 (just north of the bridge).

The cost estimate used for the original design concept is $51,114,000, consisting of $14,775,000 for roadway items, $34,969,000 for the bridge structure, and $1,370,000 for right-of-way.

PROJECT DESIGN EXCEPTIONS

Listed below is 1 advisory design exception at the time of the VA study. There were no mandatory design exceptions.

Mandatory Design Exceptions

- None.

Advisory Design Exceptions

- Highway Design Manual; 304.1 Side Slope Standards; 2:1 side slopes in lieu of 4:1.

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, In Del Norte County about 8.9 miles North of Crescent City from the Overflow Bridge (#1-46) to Fred D. Haight Drive; October 26, 2005
- Cost Estimate, June 2009
- Project Milestone Document from Work Breakdown Structure, July 2, 2009

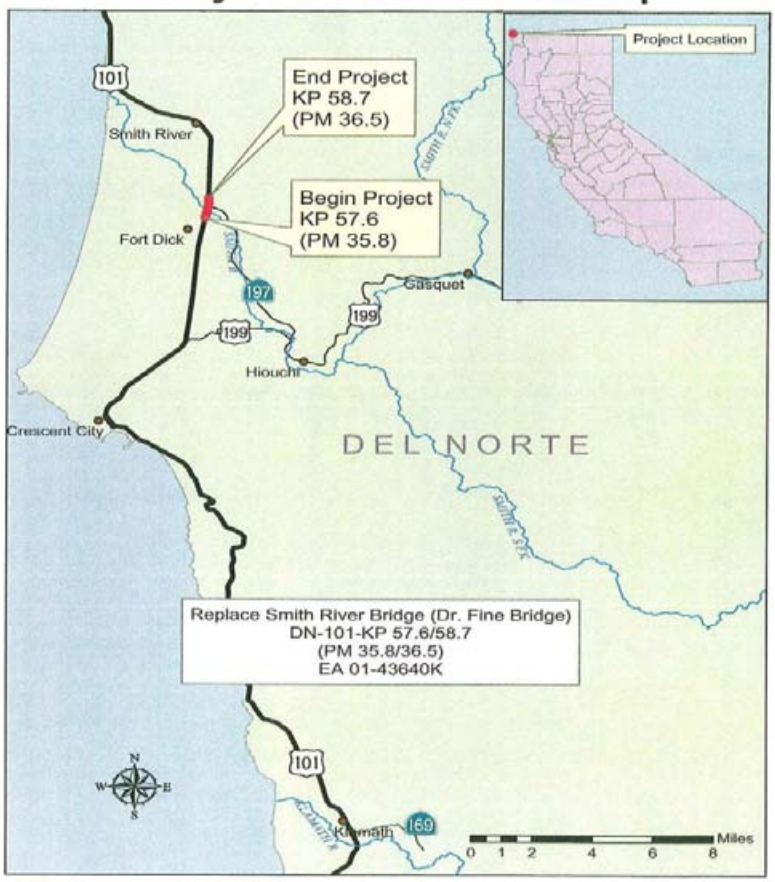
PROJECT DRAWINGS

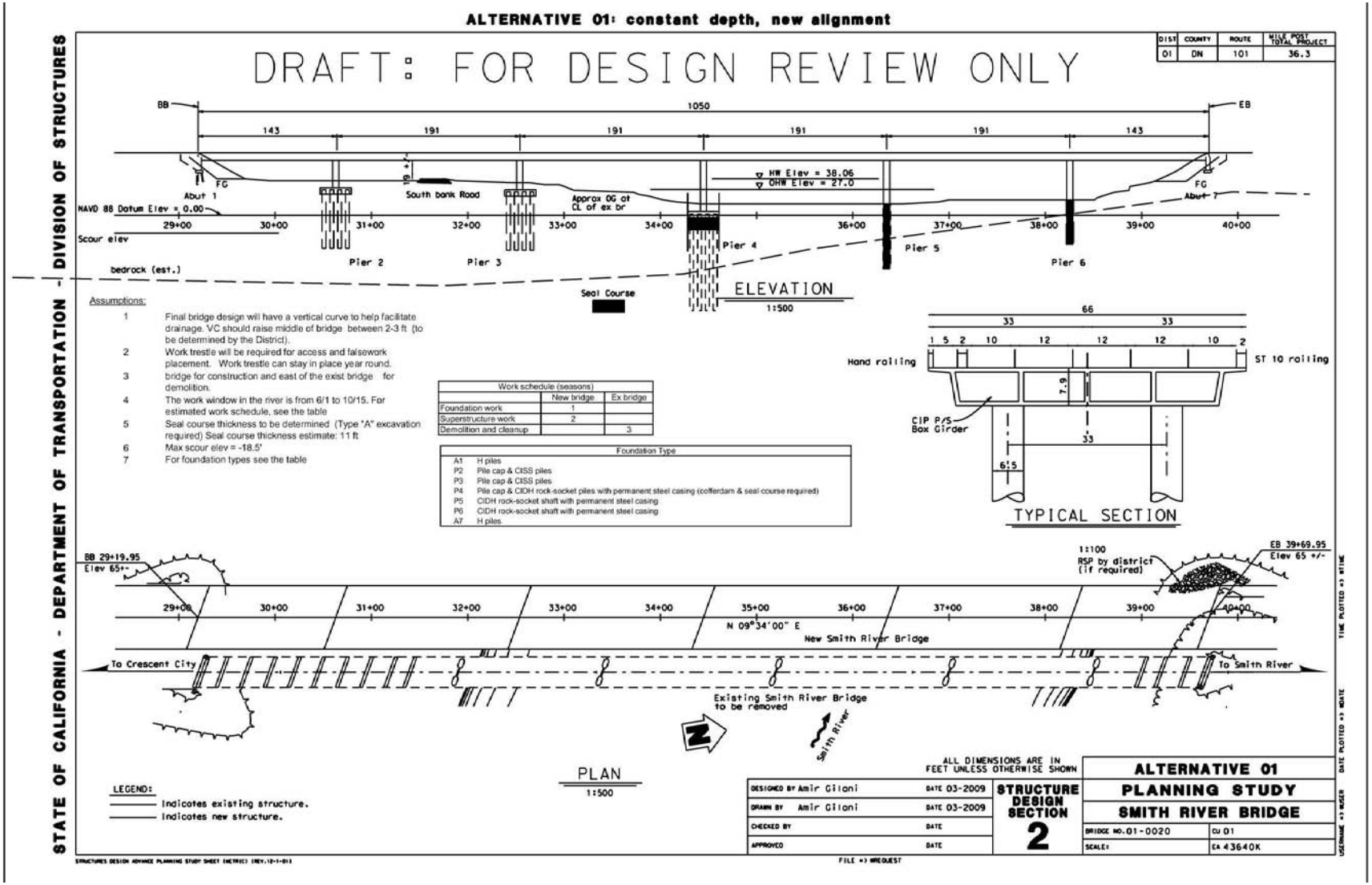
The Dr. Fine Bridge Replacement Project Area Map and drawings for Project Study Report Alternative 1A are included on the following pages.

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.

Project Location Map




ALTERNATIVE 01: constant depth, new alignment
DRAFT: FOR DESIGN REVIEW ONLY
STATE OF CALIFORNIA - DEPARTMENT OF TRANSPORTATION - DIVISION OF STRUCTURES
DIST 01 | COUNTY DN | ROUTE 101 | MILE POST/TOTAL PROJECT 36.3
BB
EB
1050
143
191
191
191
191
143
HW Elev = 38.06
OHW Elev = 27.0
FG
Abut 1
Abut 7
NAVD 88 Datum Elev = 0.00
Scour elev
bedrock (est.)
South bank Road
Approx OG at CL of ex br
29+00
30+00
31+00
32+00
33+00
34+00
36+00
37+00
38+00
39+00
40+00
Pier 2
Pier 3
Pier 4
Pier 5
Pier 6
Seal Course
ELEVATION
1:500
Assumptions:
1 Final bridge design will have a vertical curve to help facilitate drainage. VC should raise middle of bridge between 2-3 ft (to be determined by the District).
2 Work trestle will be required for access and falsework placement. Work trestle can stay in place year round.
3 bridge for construction and east of the exist bridge for demolition.
4 The work window in the river is from 6/1 to 10/15. For estimated work schedule, see the table
5 Seal course thickness to be determined (Type "A" excavation required) Seal course thickness estimate: 11 ft
6 Max scour elev = -18.5'
7 For foundation types see the table
Work schedule (seasons)
New bridge | Ex bridge
Foundation work 1
Superstructure work 2
Demolition and cleanup 3
Foundation Type
A1 H piles
P2 Pile cap & CISS piles
P3 Pile cap & CISS piles
P4 Pile cap & CIDH rock-socket piles with permanent steel casing (cofferdam & seal course required)
P5 CIDH rock-socket shaft with permanent steel casing
P6 CIDH rock-socket shaft with permanent steel casing
A7 H piles
66
33
33
1 5 2 10 12 12 12 10 2
Hand railing
ST 10 railing
7.9
CIP P/S Box Girder
33
6:5
TYPICAL SECTION
BB 29+19.95
Elev 65+-
EB 39+69.95
Elev 65 +/-
1:100
RSP by district (if required)
N 09°34'00" E
New Smith River Bridge
To Crescent City
To Smith River
Existing Smith River Bridge to be removed
Smith River
PLAN
1:500
LEGEND:
Indicates existing structure.
Indicates new structure.
ALL DIMENSIONS ARE IN FEET UNLESS OTHERWISE SHOWN
DESIGNED BY Amir Gilani DATE 03-2009
DRAWN BY Amir Gilani DATE 03-2009
CHECKED BY DATE
APPROVED DATE
STRUCTURE DESIGN SECTION 2
ALTERNATIVE 01
PLANNING STUDY
SMITH RIVER BRIDGE
BRIDGE NO. 01-0020 CU 01
SCALE: EA 43640K
STRUCTURES DESIGN ADVANCE PLANNING STUDY SHEET (METRIC) (REV. 12-1-01)
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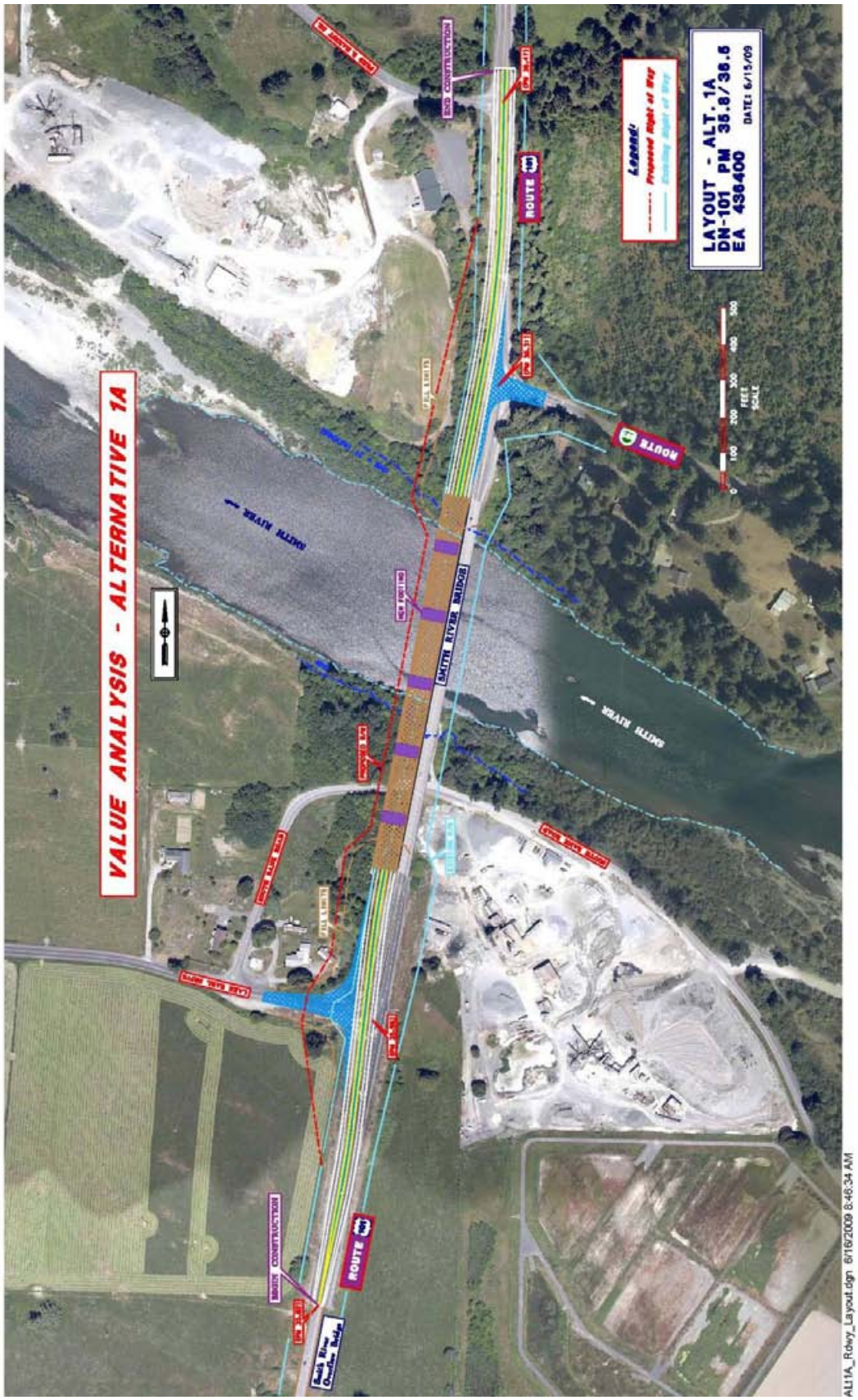
DATE PLOTTED => %DATE
TIME PLOTTED => %TIME
USERNAME => %USER


VALUE ANALYSIS - ALTERNATIVE 1A
LAYOUT - ALT. 1A
DN-101 PM 38.8/38.6
EA 436400
DATE: 6/15/09
Legend:
Proposed Right of Way
Existing Right of Way
SCALE
FEET
0
100
200
300
400
500
SMITH RIVER BRIDGE
SMITH RIVER
SMITH RIVER
ROUTE 101
ROUTE 101
ROUTE 101
Smith River Overflow Bridge
ALT1A_Rdwy_Layout.dgn 6/16/2009 8:48:34 AM

Project Study Report Cost Estimate

01-DN-101

KP 57.6/58.7 (PM 35.8/36.5)

EA 01-43640K

Program Code 201.110(HA21)

PROJECT DESCRIPTION:

Limits: In Del Norte County about 14.3 km North of Crescent City from the Overflow Bridge (#1-46) to Fred D. Haight Drive.

Proposed Improvement (Scope): Replace Bridge, remove existing bridge

Alternative 1
REPLACE BRIDGE
WESTERN ALIGNMENT

SUMMARY OF PROJECT COST ESTIMATE

		Escalated Current Estimate (6/2009)	
TOTAL ROADWAY ITEMS	$12,527,103	$14,775,000	
TOTAL STRUCTURE ITEMS	$27,458,000	~~$32,405,600~~	34,969,000
SUBTOTAL CONSTRUCTION COSTS	$39,986,000	$47,180,000	49,744,000
TOTAL RIGHT OF WAY ITEMS	$462,000	$1,370,000	1,370,000
TOTAL PROJECT CAPITAL OUTLAY COSTS	$40,448,000	$48,550,000	
CALL	$40,500,000	$48,550,000	51,114,000 MS

Reviewed by District Program Manager _____ Date _____

Approved by Project Manager _____ Date _____

I. ROADWAY ITEMS

Section 1 Earthwork	Quantity	Unit	Unit Price	Item Cost
Imported Borrow	56,000	M3	$15	$840,000
Obliterate Surfacing	4,000	M2	$4	$16,000
Clearing & Grubbing	1	LS	$200,000	$200,000
Abutments Rock Slope Protection				
Rock Slope Protection (1 Ton, Method B)	5,000	M3	$120	$600,000
Rock Slope Protection (1/4 Ton, Method B)	2,700	M3	$100	$270,000
RSP Backing No. 2 (Method B)	1,400	M3	$115	$161,000
RSP Fabric Type B	2,700	M2	$5	$13,500
			Subtotal Earthwork	**$2,100,500**

Section 2 Pavement Structural Section	Quantity	Unit	Unit Price	Item Cost
OGAC	800	TONNE	$125	$100,000
DG Asphalt Concrete (Type A)	3,500	TONNE	$80	$280,000
AC Dike (Type E)	1,100	M	$5	$5,500
AC Dike (Type F)	360	M	$10	$3,600
AB (Class-2)	1,700	M3	$55	$93,500
Pavement Reinforcing Fabric	500	M2	$10	$5,000
Cold Plane AC	10,000	M2	$6	$60,000
			Subtotal Pavement Structural Section	**$547,600**

Section 3 Drainage	Quantity	Unit	Unit Price	Item Cost
Remove Downdrain	45	M	$55	$2,475
300mm Entrance Taper	7	EA	$800	$5,600
300mm CSP Downdrain	60	M	$150	$9,000
300mm Anchor Assembly	7	EA	$175	$1,225
Extend 450mm CSP Culvert	6	M	$250	$1,500
Extend 450mm RCP Culvert	10	M	$750	$7,500
Rock Energy Dissipator at Culvert Outlets				
Rock Energy Dissipator (RSP Fabric) 7 Locations	60.0	M2	$35	$2,100
RSP Backing No. 2 (Method B)	11.0	M3	$300	$3,300
			Subtotal Drainage	**$32,700**

Section 4 Specialty Items	Quantity	Unit	Unit Price	Item Cost
Intersection Lighting	2	LS	$30,000	$60,000
Erosion Control and Highway Planting (As Per LAAS)	15,000	M2	$2	$30,000
Time Related Overhead (TRO)	525	WDA	$1,500	$787,500
Mitigation Planting	30,000	M2	$50	$1,500,000
3-year Plant Establishment	30,000	M2	$25	$750,000
Prepare SWPPP/Water Pollution Control	1	LS	(2% Items & structure)	$600,000
Construct Metal Beam Guardrail	250	M	$100	$25,000
Fiber Weed Control Mat	270	M2	$30	$8,100
MBGR Terminal System(Type SRT)	4	EA	$3,000	$12,000
			Subtotal Specialty Items	**$3,772,600**

Section 5 Traffic Items	Quantity	Unit	Unit Price	Item Cost
Thermplastic Striping (100mm)	5,500	M	$2	$11,000
Thermoplastic Striping (200mm) Channelizing Line	600	M	$3	$1,800
Thermoplastic Pavement Marking	80	M2	$55	$4,400
Pavement Marker (Retroflective)	450	EA	$6.00	$2,700
Delineators	20	EA	$32	$640
Portable Message Sign (CMS)	5	EA	$20,000	$100,000
Relocate Roadside Sign-Two Post	8	EA	$400	$3,200
Reset Roadside Signs, PM & Culvert Markers	17	EA	$200	$3,400
Remove Roadside Sign	2	EA	$150	$300
Construction Area Signs	1	LS	$10,000	$10,000
			Subtotal Traffic Items	**$137,440**

Traffic Additions (Added in "TOTAL SECTIONS 1 thru 5)				
Traffic Control System	1	LS	(5% Item Subtotal)	$1,702,500
Maintain Traffic	1	LS	(2% Item Subtotal)	$131,900
			SUBTOTAL	**$8,590,840**
			TOTAL SECTIONS 1 thru 5	**$8,425,240**

Section 6 Minor Items		
	$8,425,240 x (5%) = (Subtotal Sections 1 thru 5)	$421,262
	TOTAL MINOR ITEMS	$421,262

Section 7 Roadway Mobilization		
	$8,846,502 x (10%) = (Subtotal Sections 1 thru 6)	$884,650
	TOTAL ROADWAY MOBILIZATION	$884,650

Section 8 Roadway Additions	Quantity	Unit	Unit Price	Item Cost
	Supplemental Work			
	$	8,846,502 x (5%) = (Subtotal Sections 1 thru 6)		$442,325
	Contingencies			
	$	8,846,502 x (25%) =		$2,211,626
	$ Per Hour	Hours Per Day	Work Days	
COZEEP @ $100 per Hour Working 14 Hour Days	$100	14	10	$14,000
Construction Office		RE Office ($3000/month for 3 years)		$108,000
		Partnering		$20,000
		(Subtotal Sections 1 thru 6)		$8,846,502
		TOTAL ROADWAY ADDITIONS		$3,660,661
		TOTAL ROADWAY ITEMS		$12,527,103

II. STRUCTURES ITEMS

Bridge Name	Smith River Bridge #01-20	
Bridge Removal	$	1,080,000.00
Structure Type	CIP P/S Box Girder	
Width (out to out) - (m)	320	
Span Lengths - (m)	16.6	
Total Area - (m2)	5,312	
Footing Type (pile/spread)	Pile footing	
Cost Per m2	$ 3,836.14	
(incl. 10% mobilization and 20% contingency)		
	$	4,000,000.00
Aethetic Treatment of Soffits	$	2,000,000.00
Total Cost for Structure	$	20,377,575.68

SUBTOTAL STRUCTURES ITEMS $27,458,000
(Sum of Total Cost for Structures)

~~34,969,000~~

Railroad Related Costs:	NA

SUBTOTAL RAILROAD ITEMS $0

TOTAL STRUCTURES ITEMS $27,458,000

III. RIGHT OF WAY ITEMS

A. Acquisition, including excess lands,	$162,880
B. Mitigation acquisition & credits	$0
C. Project Development Permit Fees	$19,161
D. Utility Relocation (State share)	$240,765
E. Relocation Assistance (RAP)	$29,938
F. Clearance/Demolition	$5,988
G. Title and Escrow Fees	$3,593

TOTAL RIGHT OF WAY ITEMS $462,000

Anticipated Date of Right of Way Certification October 1, 2011
(Date to which Values are Escalated) July 2, 2010

F. Construction Contract Work
Brief Description of Work: Replace Bridge realign roadway near bridge

Estimate Prepared By: Kristine Pepper **Phone #** 707.445.5207

Estimate Checked By: Sheri Rodriguez **Phone #** 707.445.5208

PROJECT ANALYSIS

PROJECT ANALYSIS

SUMMARY OF ANALYSIS

The following analysis tools were used to study the project:

Key Project Factors

- Project Issues
- Site Visit/VA Team Observations
- Project Drivers

Cost Model

Function Analysis

- FAST Diagram

Value Metrics

- Performance Requirements
- Performance Attribute Definitions
- Performance Attribute Matrix
- Performance Attribute Rating Scales

Value Matrix

- Rationale for Performance Ratings
  - Original Concept
  - VA Strategy 1
  - VA Strategy 2
  - VA Strategy 3
- Value Matrix
  - Original Concept
  - VA Strategy 1
  - VA Strategy 2
  - VA Strategy 3
- Rationale for Performance Ratings – Accepted
- Performance Rating Matrix – Accepted

KEY PROJECT FACTORS

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

Project Issues

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

- Traffic management during construction.
- Impacts on threatened and endangered species.
- Impacts on nearby wetlands.
- Impacts on nearby agricultural land.
- Impacts on cultural resources.
- Hazardous materials (items on Cortese List).
- Accommodating large turning radius Surface Transportation Assistance Act (STAA) trucks.

Site Visit/VA Team Observations

The following issues and concerns were listed by the VA team following the site visit:

- Old steel girders and concrete deck and columns, 1050 feet long; approximately year 70 of 75-year life.
- Subject to scouring.
- Many redwoods on the north side of the existing bridge.
- Two lanes, 1-foot shoulder on each side.
- Intersections at north and south ends.
- Work in the channel will be complicated, expensive, and result in the take of listed species.
- Two streams on the north side, each side of the roadway. The one on the west will be relocated or mitigated.
- One stream drainage under South Bank Road.
- Powerlines will have to be relocated during construction.
- Phone company, and probably the cable company, desire cable in box of bridge. No natural gas.
- The bridge is in a rural area; aesthetics issues may not be visible to many motorists.

- Considerable traffic noted within the project limits. Traffic management will be challenging.
- A pedestrian walkway is needed on the new bridge.
- There are notification signals for cyclists on both ends of the bridge.
- The SR 197 and US 101 Intersection is hidden with close geometry. Many trucks were noted; one had to wait approximately five minutes to negotiate the westbound SR 197 to southbound US 101 movement.
- Much of the truck traffic is in the summer months; decreases in the winter months.
- Good bat habitat in the area of the project limits.
- The channel is shallow on the north side (2 to 3 feet) and deeper on the south portion of the channel (>7 feet).
- High water mark was within 10 feet of the bottom of the bridge deck.
- The only detour (SR 197 to SR 199 to US 101) is about one-half hour extra travel time. Long trucks cannot legally use this detour.

Project Drivers

The VA team identified the following list of project aspects that are determining the size, shape, extent, and nature of respective and specific project features throughout the project. The VA team used this list as a precursor to function analysis to identify the controlling factors that led the design team and project stakeholders to the various project specifics indicated in the project documents. The main items listed below are the drivers, constraints, or issues being addressed by the project and the sub-items are the features influenced by these aspects.

- Caltrans
  - ◊ Obtain required agency approvals and permits
  - ◊ Minimizing traffic disruptions during construction
  - ◊ Minimizing impacts of construction activities in the Smith River
- Regulatory Agencies
  - ◊ Minimal or no impacts to threatened and endangered species
  - ◊ Minimal or no impacts to cultural resources
  - ◊ Minimal or no impacts to several streams located within the project limits
- Route Concept Report Goals
  - ◊ Number of lanes within the project limits

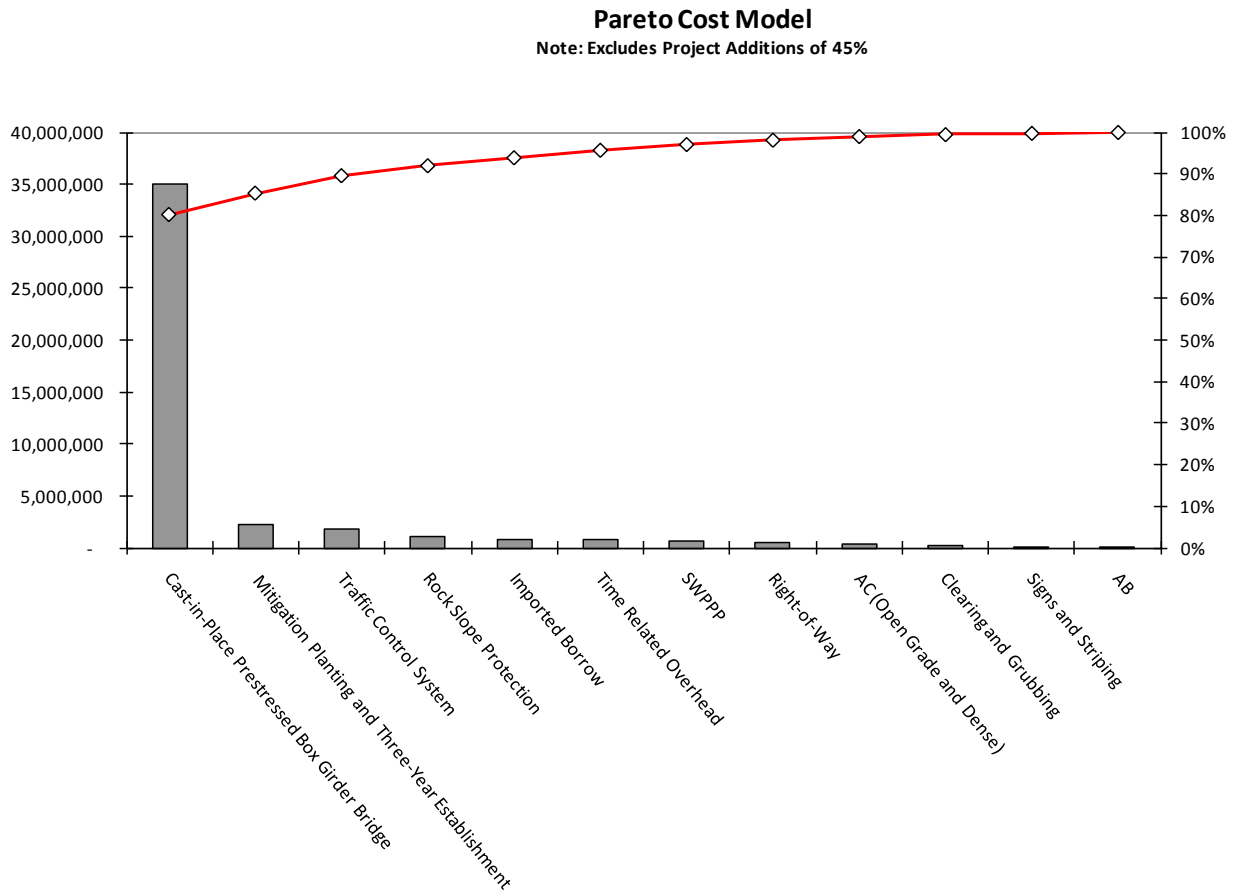
COST MODEL

The VA team leader prepared a cost model from the cost estimate of Project Study Report Alternative 1A. The model is organized to identify major construction elements or trade categories, the originally 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 the concrete cast-in-place prestressed box girder bridge with a cost of approximately $34,969,000 or 80% of the project's cost. [Excludes markups for minor items (5%), roadway mobilization (10%), supplemental work (5%), and contingencies (25%).]
- Planting and related three-year establishment costs are approximately $2,250,000 or 5% of the project cost.
- Traffic control costs account for approximately $1,834,500 and 4% of the project's cost.



PARETO COST MODEL BASELINE CONCEPT ***D-1 US 101 Dr.Fine Bridge Replacement***			
Cost Item	**Cost**	**% of Total**	**Cumulative %**
Cast-in-Place Prestressed Box Girder Bridge	34,969,000	80%	80%
Mitigation Planting and Three-Year Establishment	2,250,000	5%	85%
Traffic Control System	1,834,500	4%	90%
Rock Slope Protection	1,044,500	2%	92%
Imported Borrow	840,000	2%	94%
Time Related Overhead	788,000	2%	96%
SWPPP	600,000	1%	97%
Right-of-Way	462,000	1%	98%
AC (Open Grade and Dense)	380,000	1%	99%
Clearing and Grubbing	200,000	0%	99%
Signs and Striping	137,000	0%	100%
AB	94,000	0%	100%
TOTAL	**$ 43,599,000**	**100%**	**100%**

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 issues, project cost, and function requirements are related.

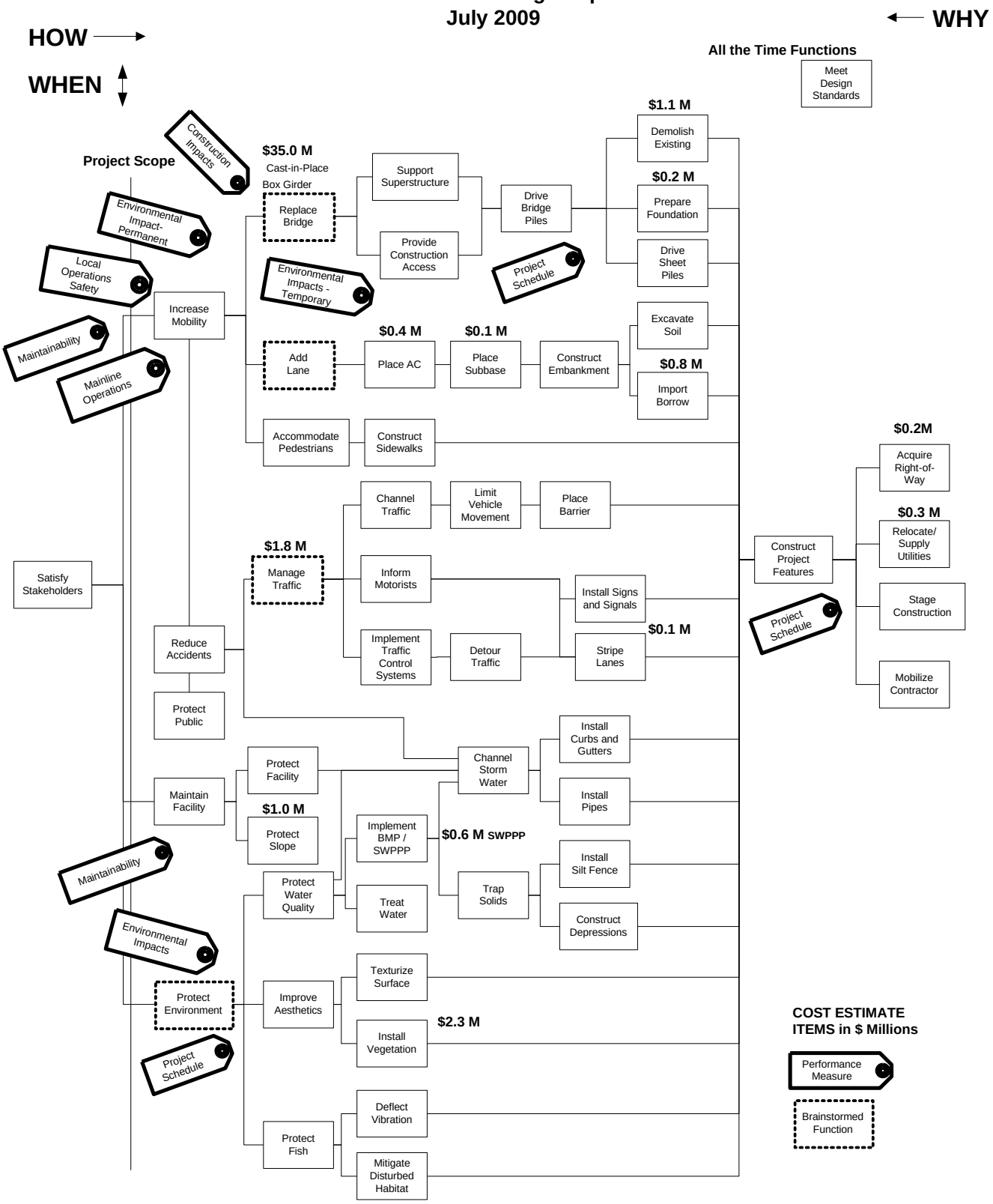
The FAST diagram arranges the functions in logical order so that when read from left to right, the functions answer the question "How?" If the diagram is read from right to left, the functions answer the question "Why?" Functions connected with a vertical line are those that happen at the same time as,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

The FAST Diagram for this project shows *Meet Stakeholder Needs* as the basic function and *Improve Mobility* as the Higher Order Function. Key secondary functions include *Replace Bridge, Add Lanes, Protect Environment,* and *Manage Traffic*. This provided the VA team with an understanding of the project design rationale and which functions offer the best opportunity for cost or performance improvement.

FUNCTION ANALYSIS SYSTEM TECHNIQUE

D-1 US 101 Dr. Fine Bridge Replacement

July 2009



VALUE METRICS

The Value Metrics process is an integral part of the Caltrans Value Analysis Process. This process provides the cornerstone of the VA process by providing a systematic and structured means of considering the relationship of a design or VA concept's performance and cost as they relate to value.

The following pages describe the Value Metrics process and summarize the results for this VA Study:

- Performance Requirement Definitions
- Performance Attribute Definitions
- Performance Attribute Matrix
- Performance Attribute Scales
- Rationale for Change in Performance
- Value Matrix

Performance Requirements

Performance requirements represent essential, non-discretionary aspects of project performance. Any concept either developed during the project's design process or during the course of the VA Study that fails to meet the project's basic objectives, therefore, cannot be considered as a valid solution. For example, a concept that did not meet a performance requirement for a key project milestone could not be considered further as an acceptable design solution. Concepts that do not meet a performance requirement *cannot* be considered further in the Value Metrics process unless such shortcomings are addressed through the VA process in the form of VA alternatives. It should be noted that in some cases, performance requirements may also represent the minimum acceptable level of a performance attribute. (Performance attributes are discussed in depth in the following section.) The following performance requirements were selected for this project:

Performance Requirement	Definition
Design Standards	Any deviation from the Caltrans Highway Design Manual must be approvable by the District's Design Reviewer.
Structure Design	Any structure on the project must comply with current seismic design standards and meet the Load Resistance Design Factor (LRDF).
Project Milestones	Several critical schedule milestones must be met in order to meet funding requirements. These include the following revised Key Milestone dates: PA&ED, February 2012; PS&E, April 2013; RTL, July 2013; Construction Start, December 2013; Construction End, December 2016.
Environmental	Any concept or design modification considered must comply with state and federal environmental law and be compatible with the environmental review process.

Performance Attribute Definitions

Performance attributes represent those aspects of a project's scope and schedule that may possess a range of potential values. For example, the Mainline Operations performance attribute may have a range of acceptable values for a project between Level of Service (LOS) A and LOS D. It is clear that a concept that offered an LOS A would perform at a higher level than one performing at LOS D, 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:

Performance Attribute	Definition
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.
Local Operations	An assessment of traffic operations and access 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.
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.
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.
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.
Project Schedule	An assessment of the total project delivery as measured from the time of the VA study to completion of construction.

In addition to the "standard" six performance attributes, the following additional attribute was used. The use of this attribute was based on the discretion of the project's PDT and/or stakeholders.

Performance Attribute	Definition
Environmental Impacts – Temporary	An assessment of impacts to fish from water turbidity generated from construction activities in the river.

Performance Attribute Matrix

The performance attributes of a project are seldom of equal importance. Therefore, a systematic assessment must be utilized in order to determine their relative weights in meeting the project's need and purpose. The Performance Attribute Matrix is used to determine the relative importance of each of the performance attributes for the project.

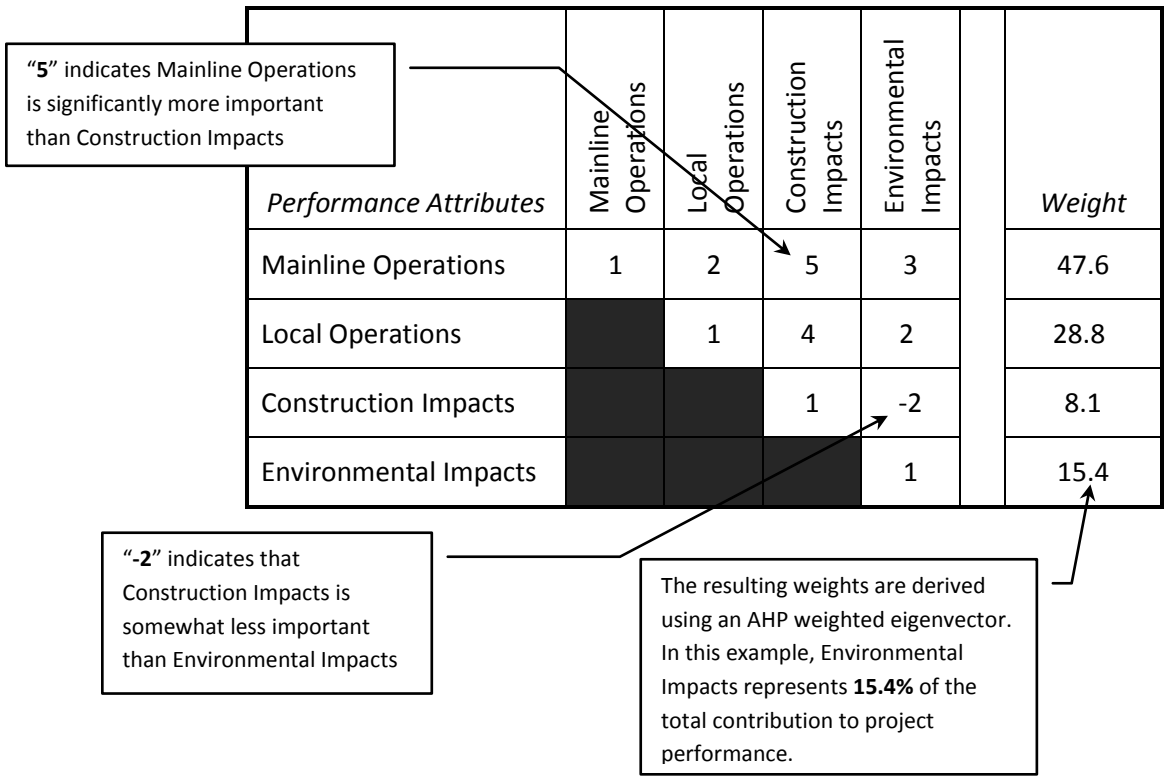
The performance attributes are compared in pairs, asking the question: "An improvement to which attribute will provide the greatest benefit relative to the project's need and purpose?" The methodology employed to perform these pairwise comparisons draws upon the Analytic Hierarchy Process. In this method, a pair of attributes is compared using the Fundamental Scale as defined below:

Intensity of Importance	Definition	Explanation
1	Equal importance	The two attributes contribute equally to the project's need and purpose.
3	Moderate importance	Experience and judgment slightly favor one attribute over another.
5	Strong importance	Experience and judgment strongly favor one attribute over another.
7	Very strong importance	Experience and judgment very strongly favor one attribute over another.
9	Extreme importance	The evidence favoring one activity over another is of the highest possible importance.
2, 4, 6, 8	For compromises between the preceding values	Sometimes there is a need to compromise between the preceding values, in which case these intermediate values can be used.

Intensity of Importance	Definition	Explanation
Negative Numbers	A positive number indicates that the attribute in the *row* is more important, while a negative number indicates that the attribute in the *column* is more important	The positive/negative numbering convention is used to make the matrix easier to read. In actuality, the negative numbers are computed as reciprocal numbers with respect to the mathematics used in computing the relative weights.

The PDT and other stakeholders evaluated the relative importance of the performance attributes that would be used to evaluate the baseline concept and VA alternatives. The Performance Attribute Matrix reflects the general consensus of these discussions.

The diagram below provides guidance on how to properly interpret pairwise comparisons appearing on the Performance Attribute Matrix:



(For additional information concerning the mathematics involved in calculating the relative weights of the performance attributes, it is recommended that the reader visit Wikipedia.org and search "Analytic Hierarchy Process.") The sum of the relative weights for the performance attributes equals 100. Therefore, an attribute with a weight of 40 would indicate that it is twice as important as an attribute with a weight of 20. The Performance Attribute Matrix for the VA study is shown on the following page.

PERFORMANCE ATTRIBUTE MATRIX

D-1 US 101 Dr. Fine Bridge Replacement

Performance Attributes	Mainline Operations	Local Operations	Maintainability	Construction Impacts	Environmental Impacts - Temporary	Environmental Impacts	Project Schedule
Mainline Operations	1	6	4	7	3	3	4
Local Operations		1	1	5	2	2	3
Maintainability			1	5	3	3	3
Construction Impacts				1	-6	-7	-2
Environmental Impacts - Temporary					1	1	3
Environmental Impacts						1	5
Project Schedule							1

Performance Attribute Rating Scales

The following scales were used to evaluate the performance of the baseline and alternative concepts for each of the performance attributes. A standard 0-to-10 scale is utilized for all attributes; however, it is important to note that the values and definitions of the scales vary significantly for each. Please refer to the Performance Attribute Rating Scales that follow.

Mainline Operations		
Verbal Rating	**Definition**	**Number Rating**
Excellent	Highest level of traffic operations on US 101 after the project is complete.	**10**
Very Good	High level of traffic operations.	**8**
Good	Good level of traffic operations.	**6**
Fair	Fair level of traffic operations.	**4**
Poor	Poor level of traffic operations.	**2**
Unacceptable	Very poor level of traffic operations.	**0**

Local Operations		
Verbal Rating	**Definition**	**Number Rating**
Excellent	Highest level of traffic operations of local roads. Significantly maintains or improves upon existing local access.	**10**
Very Good	High level of traffic operations. Maintains or improves existing local access. Meets all mandatory design standards.	**8**
Good	Good level of traffic operations. Maintains existing local access.	**6**
Fair	Fair level of traffic operations. Somewhat impacts existing local access.	**4**
Poor	Poor level of traffic operations. Significantly impacts existing local access.	**2**
Unacceptable	Very poor level of traffic operations. Severely impacts existing local access.	**0**

Maintainability		
Verbal Rating	**Definition**	**Number Rating**
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.	**10**
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.	**8**
Good	The project provides a satisfactory level of maintainability and is typical of a highway facility of this kind statewide.	**6**
Fair	The highway facility is expected to require greater than normal maintenance due to existing site conditions or materials selection.	**4**
Poor	The project is expected to require maintenance that far exceeds the norm for a facility of its kind.	**2**
Unacceptable	The anticipated level of maintenance for the project will be extreme and unacceptably high.	**0**

Environmental Impacts		
Verbal Rating	**Definition**	**Number Rating**
Excellent	The project improves upon the existing environmental conditions when the project is complete. Focus is on impacts to threatened and endangered species, water quality, cultural resources, and aesthetics.	**10**
Very Good	The project introduces no impacts to threatened and endangered species, water quality, cultural resources, and aesthetics.	**8**
Good	The project introduces some new environmental impacts to threatened and endangered species, water quality, cultural resources, and aesthetics that can be addressed through standard and accepted mitigation approaches.	**6**
Fair	The project introduces many new environmental impacts to threatened and endangered species, water quality, cultural resources, and aesthetics that will require extensive mitigation.	**4**
Poor	The project introduces environmental impacts to threatened and endangered species, water quality, cultural resources, and aesthetics that are both significant in number and impact that require extensive mitigation.	**2**
Unacceptable	The environmental impacts are severe and the project does not comply with state and/or federal environmental laws.	**0**

Construction Impacts		
Verbal Rating	**Definition**	**Number Rating**
Excellent	There will be no temporary traffic delays or noise/dust impacts during construction.	**10**
Very Good	There will be some minor temporary traffic delays or noise/dust impacts expected during construction. Impacts will be less than typical.	**8**
Good	There will be some minor to moderate temporary traffic delays or noise/dust impacts. Impacts will be fairly "typical" for this type of project and can be handled through normal processes and procedures.	**6**
Fair	Temporary traffic delays or noise/dust impacts will be more significant in nature and require greater mitigation measures and/or inconveniences to the public.	**4**
Poor	Temporary traffic delays or noise/duct impacts will be extensive, lengthy, and very disruptive. Temporary environmental impacts will require extraordinary mitigation measures and create major inconveniences to the public.	**2**
Unacceptable	Temporary traffic and/or environmental impacts will be severe and create impacts that are unacceptable to the public.	**0**

Project Schedule		
Verbal Rating	**Definition**	**Number Rating**
Excellent	The project will be completed significantly earlier than scheduled; twelve months earlier than December 2016.	**10**
Very Good	The project will be completed somewhat earlier than scheduled; six months earlier than December 2016.	**8**
Good	The project will meet the current schedule milestones with delivery on December 2016.	**6**
Fair	The project will be completed somewhat later than scheduled; six months later than December 2016.	**4**
Poor	The project will be completed significantly later than scheduled; twelve months earlier than December 2016.	**2**
Unacceptable	The project cannot be delivered in a manner that will meet current funding and/or legislative mandates.	**0**

Environmental Impacts – Temporary		
Verbal Rating	**Definition**	**Number Rating**
Excellent	The project improves upon the existing environmental conditions while constructing the project. Focus is on impacts to fish (water quality, turbidity, pile driving vibration).	**10**
Very Good	The project introduces no improvement to impacts to fish generated by project construction activities.	**8**
Good	The project introduces some new environmental impacts to fish that can be addressed through standard and accepted mitigation approaches.	**6**
Fair	The project introduces many new environmental impacts to fish that will require extensive mitigation.	**4**
Poor	The project introduces environmental impacts to fish that are both significant in number and impact that require extensive mitigation.	**2**
Unacceptable	The environmental impacts to fish are severe and the project does not comply with state and/or federal environmental laws.	**0**

VALUE MATRIX

The Value Matrix facilitates the comparison of competing strategies by organizing and summarizing the data developed for performance and cost into a matrix format. The performance scores for each strategy are calculated by multiplying the performance rating by the performance weight for each performance attribute, the product of which is expressed as a number from 1 to 1,000. These performance scores are then divided by the total cost 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.

The Value Matrix is essential for understanding the relationship of cost, performance, and value of the Baseline Concept and VA Strategies. The comparison of performance and cost in this manner exposes the trade-offs between these two key factors and provides useful information to decision-makers in acting upon the information developed during the VA Study.

The following discusses how the design alternatives meet the performance attributes of the project, and the matrix at the end of this section shows the rating given for each VA strategy. The total performance score is shown at the bottom of the matrix. Each alternative developed as part of the VA Study was rated to compare against the appropriate Design Alternative and the percent change in performance is relative to that alternative; however, the total score can be used as a comparison of all alternatives – those developed by both the Design Team and VA team.

Rating Rationale: Original Concept

Performance Attribute	Rating	Rationale for Rating
Mainline Operations	**8**	The project will provide a two-lane facility that will meet expected traffic volumes.
Local Operations	**6**	The project will provide a two-lane facility that will allow adequate access and turning movements within the project limits.
Maintainability	**9**	The completed facility will minimize the frequency, duration, and severity of future maintenance activities.
Environmental Impacts – Temporary	**2**	There will considerable disruption to river water quality and turbidity when coffer dams are constructed and piles are driven.
Environmental Impacts	**5**	There will be some impacts to cultural resources and aesthetics when the project is complete.
Construction Impacts	**6**	There will be some delays to motorists during construction and some noise and dust impacts to residents from construction related activities
Project Schedule	**5**	The project is expected to be delivered in December 2016.

Rating Rationale: VA Strategy 1

VA Recommended Strategy – Best Value (Alternatives 1.0, 2.1, 3.1)

Performance Attribute	Rating	Rationale for Rating
Mainline Operations	**8**	No change from the original design concept, Project Study Report Alternative 1A.
Local Operations	**8**	Allows improved operations; more options to exit the freeway and access the freeway; ability to get on/off highway at Lake Earl Drive. However, not enough to change this performance attribute.
Maintainability	**9**	No change from the original design concept, Project Study Report Alternative 1A.
Environmental Impacts – Temporary	**4**	Less pile driving will reduce impacts to fish.
Environmental Impacts	**4.5**	Possibility that the proposed culverts in the south end of the bridge could not accommodate a 100-year flood event.
Construction Impacts	**6.5**	Fewer traffic delays to motorists results in a slight improvement in this performance attribute.
Project Schedule	**5**	No change from the original design concept, Project Study Report Alternative 1A.

Rating Rationale: VA Strategy 2
Most Likely (Alternatives 2.1, 3.1)

Performance Attribute	Rating	Rationale for Rating
Mainline Operations	**8**	No change from the original design concept, Project Study Report Alternative 1A.
Local Operations	**8**	Allows improved operations; more options to exit the freeway and access the freeway; ability to get on/off highway at Lake Earl Drive. However, not enough to change this performance attribute.
Maintainability	**9**	No change from the original design concept, Project Study Report Alternative 1A.
Environmental Impacts – Temporary	**2**	No change from the original design concept, Project Study Report Alternative 1A.
Environmental Impacts	**5**	No change from the original design concept, Project Study Report Alternative 1A.
Construction Impacts	**6.5**	Fewer traffic delays to motorists results in a slight improvement in this performance attribute.
Project Schedule	**5**	No change from the original design concept, Project Study Report Alternative 1A.

Rating Rationale: VA Strategy 3
Most Appealing (Alternatives 1.0, 2.2, 3.1)

Performance Attribute	Rating	Rationale for Rating
Mainline Operations	**8**	No change from the original design concept, Project Study Report Alternative 1A.
Local Operations	**8**	Allows improved operations; more options to exit the freeway and access the freeway; ability to get on/off highway at Lake Earl Drive. However, not enough to change this performance attribute.
Maintainability	**9**	No change from the original design concept, Project Study Report Alternative 1A.
Environmental Impacts – Temporary	**5**	Fewer piers to construct and less bridge to construct will improve this performance attribute.
Environmental Impacts	**6**	A variable depth bridge is more visually appealing than a constant depth bridge and fewer permanent piers in the river improves this performance attribute.
Construction Impacts	**6.5**	Fewer traffic delays to motorists results in a slight improvement in this performance attribute.
Project Schedule	**5**	No change from the original design concept, Project Study Report Alternative 1A.

VALUE MATRIX

D-1 US 101 Dr. Fine Bridge Replacement

Proposed Alternatives (Preliminary)

Attribute	Attribute Weight	Concept	Performance Rating 1	2	3	4	5	6	7	8	9	10	Total Performance
Mainline Operations	36	Original Concept								8			288
		VA Strategy 1								8			288
		VA Strategy 2								8			288
		VA Strategy 3								8			288
Local Operations	14	Original Concept						6					84
		VA Strategy 1								8			112
		VA Strategy 2								8			112
		VA Strategy 3								8			112
Maintainability	18	Original Concept									9		162
		VA Strategy 1									9		162
		VA Strategy 2									9		162
		VA Strategy 3									9		162
Environmental Impacts - Temporary	11	Original Concept		2									22
		VA Strategy 1				4							44
		VA Strategy 2		2									22
		VA Strategy 3					5						55
Environmental Impacts	13	Original Concept					5						65
		VA Strategy 1				4.5							59
		VA Strategy 2					5						65
		VA Strategy 3						6					78
Construction Impacts	3	Original Concept						6					18
		VA Strategy 1							6.5				20
		VA Strategy 2							6.5				20
		VA Strategy 3							6.5				20
Project Schedule	5	Original Concept					5						25
		VA Strategy 1					5						25
		VA Strategy 2					5						25
		VA Strategy 3					5						25

OVERALL PERFORMANCE	Total Performance	% Performance Improvement	Total Cost	Value Index (Performance/ Cost)	% Value Improvement
Original Concept	664		51.1	13.0	
VA Strategy 1	709	7%	42.4	16.7	29%
VA Strategy 2	694	4%	49.9	13.9	7%
VA Strategy 3	740	11%	46.6	15.9	22%

Rating Rationale: Accepted Alternatives

Alternatives 1.0, 2.1, 5.0

Performance Attribute	Rating	Rationale for Rating
Mainline Operations	**8**	No change from the original design concept.
Local Operations	**6**	No change from the original design concept.
Maintainability	**9**	No change from the original design concept.
Environmental Impacts – Temporary	**4**	Less pile driving related to reducing the southern end of the bridge will reduce impacts to fish.
Environmental Impacts	**6**	One less pier would be needed with the implementation of the variable depth bridge structure, therefore less long-term disturbance to the river and riverbed.
Construction Impacts	**6**	No change as a result of implementing the three VA alternatives
Project Schedule	**6**	Slight improvement because of construction of one less pier using the variable depth concept.

Value Matrix

Accepted Alternatives (Final)

Attribute	Attribute Weight	Concept	Performance Rating 1	2	3	4	5	6	7	8	9	10	Total Performance
Mainline Operations	36	Original Concept								8			288
		Accepted Alts								8			288
Local Operations	14	Original Concept						6					84
		Accepted Alts						6					84
Maintainability	18	Original Concept									9		162
		Accepted Alts									9		162
Environmental Impacts - Temporary	11	Original Concept		2									22
		Accepted Alts				4							44
Environmental Impacts	13	Original Concept					5						65
		Accepted Alts						6					78
Construction Impacts	3	Original Concept						6					18
		Accepted Alts						6					18
Project Schedule	5	Original Concept					5						25
		Accepted Alts						6					18

OVERALL PERFORMANCE	Total Performance	% Performance Improvement	Total Cost	Value Index (Performance/ Cost)	% Value Improvement
Original Concept	664		51.1	13.0	
Accepted Alternatives	692	4%	48.5	14.3	10%

IDEA EVALUATION

IDEA EVALUATION

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

PERFORMANCE ATTRIBUTES

The VA team used the paired comparison method to prioritize the key performance attributes for this project:

- Mainline Operations
- Local Operations
- Maintainability
- Environmental Impacts – Temporary
- Environmental Impacts
- Construction Impacts
- Project Schedule

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

EVALUATION PROCESS

The VA team, as a group, generated and evaluated ideas on how to perform the various functions. The idea list was grouped by function or major project element.

The team compared each of the ideas with the original concept for each of the performance attributes to determine whether it was better than, equal to, or worse than the original concept. The team reached a consensus on the ranking of the idea. High-ranked ideas would be developed further; low-ranked ones would be dropped from further consideration.

IDEA EVALUATION FORMS

All of the ideas that were generated during the creative phase using brainstorming techniques were recorded on the following Idea Evaluation forms. These ideas were discussed and the advantages and disadvantages of each were listed.

CREATIVITY & EVALUATION

D-1 US 101 Dr.Fine Bridge Replacement

Function	Idea No.	Idea	Performance Attributes: Mainline Operations	Local Operations	Maintainability	Environmental Impacts - Temporary	Environmental Impacts	Construction Impacts	Project Schedule	Legend: + = Improved; 0 = No Change; – = Degraded	Legend: 7 = Major Value Improvement; 6 = Moderate Value Improvement; 5 = Minor Value Improvement; 4 = Possible Value Improvement; 3 = Design Consideration (No cost data developed); 2 = Moderate Value Degradation; 1 = Major Value Degradation	Cost	Rating
										Advantages	**Disadvantages**		
AL	1	Construct an entrance to Granite Company Site from northbound US 101 in lieu of access from under the bridge	–	+	0	0	0	0	0	Eliminates height restriction under bridge; eliminates disruptions to traffic on South Bank Road; the area under the bridge could become a pier location; could fill in area in lieu of bridge; during flood events the road under the bridge would not be in use	Additional cost for new lane construction; would require more right-of-way; need cooperative agreement with Del Norte County; four-way intersection in lieu of "T" intersection could increase incidents	–	**4**
AL	2	Construct an acceleration lane northbound from Lake Earl Drive	+	+	0	0	0	0	0	Allows the truck traffic out of Lake Earl Drive to northbound US 101 an acceleration distance; provides a refuge as vehicles are attempting to merge into the northbound traffic	Small additional cost for structural section; could shorten the acceleration lane from SR 197 to southbound US 101; some small agricultural land take	0	**5**
AL	3	Construct a deceleration lane from northbound US 101 to eastbound SR 197	+	0	0	0	0	0	0	Improves ability for vehicles to slow down and turn onto northbound SR 197	Small additional cost for structural section	0	**4**
AL	4	Construct a roundabout at SR 197 and Lake Earl Drive areas	–	+	–	0	0	0	–	Slower traffic speeds reduce severity; reduces waiting to get through the intersections; could eliminate potential need for a signal; could improve aesthetics in the middle of the roundabout; same alignment; do not have to reconstruct the southern portion of the project; bridge width is less and saves cost	Additional cost for structural section; additional right-of-way; reduces mainline flows; depending on locationm could take redwood trees; a roundabout in a rural area would not meet driver expectations; requires traffic management; previously considered by District Traffic Operations and not advanced; does not fit present route concept	+	**2**

CREATIVITY & EVALUATION

D-1 US 101 Dr.Fine Bridge Replacement

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AL	5	Combine Fred D. Haight Drive and SR 197 into one roundabout	–	+	–			0	–	Slower traffic speeds reduces severity; reduces waiting to get through the intersections; could eliminate potential need for a signal; could improve aesthetics in the middle of the roundabout	Additional cost for structural section; additional right-of-way; reduces mainline flows; depending on location, could take redwood trees; a roundabout in a rural area would not meet driver expectations; requires traffic management; previously considered by District Traffic Operations and not advanced	+	**2**
AL	6	Grind up the old bridge and use it as imported borrow									Cannot grind the old bridge and reuse in this project; could reuse on another project		**3**
AL	7	Use the existing bridge as a pedestrian/cyclist lane and eliminate demolishing	0	0	–	+	–	0	+	Reduces the width of the new bridge by 6 feet; smaller bridge foundations because of less load	Failure of an old bridge upstream from the new bridge would damage the new bridge in a flood event; considerable future maintenance cost; old and new bridge next to each other may not be aesthetically pleasing; more constriction of water flow in the channel because of more columns	–	**5**
AL	8	Construct a new interchange at SR 197 and US 101	+	+	–	–	–	–	–	Improves mainline and local operations	Considerable cost and much larger footprint are reasons for rejecting this idea; also, traffic counts do not justify an interchange	+	**2**
AL	9	Construct MSE retaining walls in the northwest quadrant of the project	0	0	–	+	+	0	0	Reduces imported borrow and right-of-way costs; reduces impact to intermittent stream next to the roadway; less potential of erosion with a wall	Additional cost of a retaining wall; maintenance of MSE wall is more difficult than a 2:1 slope; could be visually unpleasing	+	**4**
AL	10	Construct retaining walls in the southwest quadrant of the project									Probably not practical for this location because there is no environmental advantage (no stream to protect)		**2**

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AL	11	Signalize SR 197/US 101 Intersection during construction and after the project is constructed	–	+	–	0	0	0	0	Improves turning movements at the intersection	More equipment to maintain; additional cost for signal equipment; would be in conflict with the freeway/expressway route concept; probably not enough accidents to warrant implementing this idea	0	**2**
AL	12	Move SR 197/US 101 Intersection 800 feet to the north	+	+	0	0	–	0	–	Improves mainline flows because of combining the two intersections, more room for acceleration lanes; improves off-ramp flow; improves local traffic flows; less maintenance	More right-of-way costs; more Environmental Document analysis and review; minor inconvenience to local motorists to drive additional distance; some small redwood trees will be removed; requires some redesign; would have to extend the north end project limit by 1,000 feet	+	**3**
AL	13	Identify alternative routes for STAA trucks									Under review by local agency and there are not many local alternate routes; therefore, rejected		**2**
AL	14	Detour traffic around the project via SR 197 and SR 199											**3**
AL	15	Reduce design speed from 70 to 55 mph	–	+	0	0	0	0	0	Turning movements from SR 197 to US 101 would be improved because of slower traffic and less sight distance needed; possible to have shorter acceleration lanes	Would need a design exception	0	**3**
AL	16	Use lightweight fill material to compliment imported borrow									Not practical for this project		**2**

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										Advantages	**Disadvantages**		
AL	17	Use tire derived aggregates for imported borrow									Not practical for this project		**2**
AL	18	Add roundabout at SR 197											
AL	19	Add roundabout at Lake Earl Drive									Not enough traffic conflicts to warrant; opposition from District management because it would slow down the mainline traffic		**2**
AL	20	Relocate the Intersection at SR 197											
AL	21	Grade separation at SR 197											
RB	1	Construct a tunnel under the river									Would not work when water entered the tunnel from a tsunami; very expensive; would impact TS&E; because of these reasons would not meet the need and purpose of the project		**1**
RB	2	Construct separate bridges on each side of the existing bridge								Stays fairly close to existing alignment; improves traffic flows; reduces incidents	Cost of two bridges; problems related to the location of the third lane; driving piles for two bridges; tunnels would be needed to get pedestrians and cyclists to the old bridge; high maintenance issues with the old bridge; because of these disadvantages, this idea is rejected		**1**

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D-1 US 101 Dr.Fine Bridge Replacement

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										Advantages	**Disadvantages**		
RB	3	Construct a suspension bridge in lieu of cast-in-place prestressed box girder	0	–	–	+	+	–	–	Could be a gateway feature to attract tourists; no work in the river; could be more aesthetically pleasing	More right-of-way, very high cost; would likely take more time to redesign and construct; the SR 197 Intersection and Lake Earl Drive would have to be redesigned and relocated; dedicated maintenance crew; traffic management during construction would be complicated because of construction of the bridge buttresses	+	**1**
RB	4	Construct two bridge segments in lieu one: south end to south side of river and south side of river to north side of river									No real advantages; would not likely reduce the number of columns in the river and could make the design more complicated; for these reasons this idea is rejected		**1**
RB	5	Extend the north end of the bridge by 500 feet	0	0	0	–	+	–	–	Minimizes impacts to the two streams and habitats on either side of US 101 north of the river; reduces imported borrow cost	Higher cost for 500 feet additional bridge; stream would be very close to the bridge, which could degrade the habitat; construction impacts would be increased; would require redesign	+	**2**
RB	6	Relocate the bridge 1,000 feet east of the proposed bridge alignment								Fewer piers in the river; avoids the streams on either side US 101 north of the river, may avoid cultural resources	This location most likely would not accommodate a 100-year flood event because of narrow section; would need additional right-of-way, may be difficult to achieve the 70 mph design speed; the major realignment proposed by this idea would not be acceptable; therefore, this idea is rejected		**1**

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										Advantages	**Disadvantages**		
RB	7	Retrofit and widen the existing bridge								Would narrow the project footprint; less right-of-way needed; keeps the alignment straight	Retrofitting and widening the existing bridge would likely be very expensive because of unknowns and a very complex design; still would have the same number of piers in the river; very complex and difficult traffic management during construction; would have to provide stormwater drainage; for these reasons this idea is rejected		**1**
RB	8	Construct a two-lane, 54-foot bridge in lieu of 66-foot-wide bridge (maybe incorporate a signal at SR 197)	–	–	+	0	+	+	+	Saves construction costs (bridge, imported borrow, structural section); more likely to obtain funding for this idea; less environmental disturbance	Could be a problem to backup traffic on the bridge; without a third lane there could be more incidents; not compatible with the route concept report	–	**5**
RB	9	Construct two-lane bridge in lieu of 66-foot-wide bridge and use existing bridge for cars only									High maintenance with existing bridge is the reason for rejecting this idea		**1**
RB	10	Reduce the south end length by 300 feet and use fill with large culverts in lieu of a bridge	0	0	+	+	0	0	+	Reduces the structure cost on land (potential of $9 million); fewer piles to be driven	Would need a larger footprint to accommodate side slopes; may not provide enough hydrologic space; additional fill and culverts	–	**4**
RB	11	Reduce the proposed grade elevation from 5 feet to 3 feet									This height of 5 feet is needed to provide 1,000-foot sight distance; anything less would not meet this requirement and since SR 197 will have to be reconstructed anyway, this idea is rejected		**1**

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										Advantages	**Disadvantages**		
RB	12	Increase the proposed grade elevation from 5 feet to 10 feet									No obvious benefit; would make drainage more challenging		**1**
RB	13	Construct the bridge using an incremental launch construction technique	0	0	0	+	0	0	–	Saves falsework cost; eliminates disturbance to river related to falsework; innovative approach (not previously done in U.S., proven in Japan and Europe); could obtain funding opportunities from FHWA for experimental projects	Additional bridge cost (approximately $5 million more); could require more design time; may be limited number of contractors that do this type of work	+	**3**
RB	14	Use weathering steel girders in lieu of concrete columns to allow design of a longer span length	0	0	–	+	+	+	+	Longer spans will eliminate two piers; reduced construction; eliminates falsework; column foundations are smaller; works better in seismic area	More maintenance (however weathering steel does not need painting); would need larger cranes	+	**4**
RB	15	Use isolation bearing in the bridge superstructure to minimize size of foundations; use concrete	0	0	–	0	0	0	0	Reduces the column foundation size	May require more bridge bearing maintenance	–	**4**
RB	16	Construct bridge using segmental construction technique to eliminate falsework	0	0	0	+	+	0	–	Longer spans can be used, maybe only one pier in the river; eliminates falsework in the river; reduces the length of trestle	Significant cost increase (maybe two times the original concept); requires redesign; a deeper superstructure needed at piers; requires bigger pier foundations	+	**4**
RB	17	Use precast girders (bulb-T) and bridge deck panels to eliminate falsework	0	0	0	+	+	0	0	Eliminates falsework; reduces construction time	Slightly higher cost for precast	+	**4**

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										Advantages	**Disadvantages**		
RB	18	Use existing bridge for construction of new bridge in lieu of a trestle and detour traffic through SR 197 and SR 199 to US 101 near Elk Valley Crossroads	0	0	0	+	0	–	+	Eliminates one set of trestles; saves construction cost; could deliver project earlier	Inconvenient to traveling public; would have to verify that the existing structure could support the cranes; higher traffic management costs; noise would bother residents at night; more traffic into Jed Smith Park; would impact emergency vehicle access; would have strong public opposition	–	**4**
RB	19	Construct a detour using a pontoon bridge during construction	0	0	0	–	0	0	+	Provides access across the river during construction; eliminates one trestle for construction access; allows keeping the existing alignment; reduces right-of-way costs	Cost to provide access road (excavation, easement, and fill issues); rafting cannot be performed; could impact fish migration because of the pontoon bridge	+	**2**
RB	20	Use floating platform to support cranes during construction of the new bridge								Speeds up construction; eliminates one trestle	Somewhat less flexible than a trestle; considerable impacts to habitats and species when dredging the riverbed for a channel in which the platform operates		**1**
RB	21	Include fenders in the bridge columns											**3**
RB	22	Line the river bottom with concrete to allow for a shorter bridge length									Cannot line the river because it is wild and scenic		**1**
RB	23	Use high strength concrete to be able to increase span lengths											**3**
RB	24	Use lightweight concrete											**3**

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										Advantages	**Disadvantages**		
RB	25	Use fiberglass bridge members											**3**
RB	26	Construct bridge on bank and rotate 90 degrees onto columns									Not practical for this project because the bridge would have to be constructed along the river, which is not acceptable and would be very expensive; therefore, this idea is rejected		**1**
RB	27	Use helicopters or dirigibles to place spans									Not practical; not been done before		
RB	28	Use tower crane in the middle of the river to reduce trestle length	0	0	0	+	0	0	0	Significant reduction in trestle length or possibility of elimination	Less flexibility; a trestle allows more maneuverable room; would have to specify in the specifications	+	**3**
RB	29	Incentivize and decentivize contractor									Suggestion: Receive an incentive for every trestle pile not driven or maybe base on the reduction in pile driving noise		**3**
RB	30	Have a cable trolley to place bridge members									Do not want to dictate ways and means to the contractor; therefore rejected. However, could be used as part of idea RB-29		**1**
RB	31	Use precast columns and footings	0	0	0	+	0	+	+	Reduces construction time; completes work in the river quicker	Precast is more expensive than cast-in-place; need a large crane	+	**3**
RB	32	Reduce the size of existing bridge width and use for pedestrians and cyclists								Saves 6 feet of bridge cost; separates pedestrians and cyclists from traffic	Maintenance of old structure; aesthetically unpleasing; the scour issue with the existing bridge would have to be repaired		**1**

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										Advantages	**Disadvantages**		
RB	33	Use build and slide in construction method similar to Hardscrabble Creek Bridge replacement	0	0	0	0	0	0	–	Smaller footprint because stays on existing alignment; shorter lane closures for better traffic management during construction	More cost because two sets of piers have to be provided (one permanent one temporary) ; complicates construction;	+	**2**
RB	34	Construct a separate new pedestrian/cyclist bridge and reduce bridge width by 6 feet	0	0	–	–	–	0	–	Could provide a "phased" project and easier to obtain funding; separates pedestrians/cyclists from traffic; reduces bridge construction cost; less right of way	Constructing a separate structure; risk that the pedestrian/cyclist bridge would not be built; requires redesign	0	**2**
RB	35	Build bridge 30 feet on west side, tear down existing bridge, and build 30 feet on the other side	0	0	0	–	–	–	–	Saves footprint; keeps existing alignment, saves right of way, saves structural section costs	Would take longer to construct; would be higher cost of extra construction activities; complicates traffic control because an extra cross over would be needed	+	**2**
RB	36	Construct a new cantilever pedestrian/cyclist bridge and reduce bridge width by 6 feet	0	0	0	0	+	0	+	Separates pedestrians/cyclists from traffic; reduces bridge construction cost; less right of way	Constructing a separate structure; risk that the pedestrian/cyclist bridge would not be built; requires redesign	–	**4**
RB	37	Construct a variable depth structure (PSR Alternative 4)	0	0	0	+	+	0	0	One less column in the river; nice arch makes it more aesthetically pleasing	Deeper section at the piers and could impact water pass through during a flood event	+	**4**
RB	38	Add substructure to accommodate future bridge widening for four-lane freeway											
PE	1	Screw in piles in lieu of driving									Not common practice and not practical for this project		**1**
PE	2	Expansion blasting in lieu of explosive									Not common practice and not practical for this project		**1**

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PE	3	Temporary rechannel of river via a dike									Too much disruption to a major river is not practical for this project		**1**
PE	4	Auger the bridge column then drive pile to reduce the amount of pile driving time									As designed in specifications as center relief clause		**3**
PE	5	Add bat-friendly nesting features under the bridge											**3**
PE	6	Install nets for fish exclusion											**3**
PE	7	Conduct a habitat assessment											**3**
PE	8	Narrow the pile driving time window									The proposed June 15 to October 15 window is quite short		**2**
PE	9	Use bubble curtains to suppress pile driving vibrations									Does not work well with strong river currents; would likely be directing the contractor via ways and means		**3**
PE	10	Increase the work window in the river from April to October in lieu of May to October									Non negotiable with the agencies		**2**
PE	11	Use overflow channel near south end of the project for a fish detour during construction									Overflow channel elevation is 20 feet higher than the mean river level; therefore, not practical		**2**

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										Advantages	**Disadvantages**		
PE	12	Add habitat mitigation costs to the cost estimate											**3**
PE	13	Add disposal cost for water extracted from coffer dams											**3**
PE	14	Use water extracted from coffer dams for irrigation or dust suppression											**3**
PE	15	Use material excavated from coffer dams for imported borrow											**3**
PE	16	Have see-through bridge rails									As designed		**2**
PE	17	Include Native American design features in the bridge											**3**
PE	18	Combine fish and habitat wetlands mitigation plans											**3**
PE	19	Construct a boat ramp or fishing park											**3**
MT	1	Detour traffic to SR 197 to SR 199 to US 101 during critical construction stages									As designed		**2**

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MT	2	Detour traffic to SR 197 to SR 199 to US 101 for one year									Severe public opposition is likely; would impact Marbled Murrelet habitats		**3**
MT	3	Implement weekend closures											**3**
MT	4	Implement a robust public awareness campaign									Would be necessary if ideas MT-2 and MT-3 were implemented		**3**
MT	5	Construct a foot bridge for access during construction with parking lots at each end									Not practical for this project		**2**
MT	6	Dredge river bottom for ferry service									Not feasible for this project		**2**
MT	7	Construct the SR 197 and Lake Earl Drive Intersections as first order of work to improve traffic management during construction									The intersections would be raised approximately 5 feet and would not be coordinated with other parts of the project construction; therefore, rejected		**2**
MT	8	Signalize the SR 197 Intersection (maybe traffic activated sensors)	–	+	0	0	0	0	0	Help with truck movements; reduces possibility of traffic incidents on westbound SR 197 to southbound US 101	Slight extra cost; may not meet driver expectations on mainline and therefore more incidents	0	**4**

VA PROCESS

VALUE ANALYSIS PROCESS

The Caltrans Value Analysis (VA) process involves 16 activities needed to accomplish a VA Study, organized in three parts: Pre-study, VA Study, and Report. Integral to the Caltrans VA process is the Value Metrics process. Value Metrics provides 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 agreed to 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 value alternatives have been developed, measuring value is a relatively simple matter.

Value Metrics can improve value 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 Value Analysis. The Caltrans VA Study Activity Chart at the end of this narrative identifies the steps in each activity; the individual tasks are discussed below.

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 criteria to be used for evaluation of the project (or process) performance
- Development of an independent project cost estimate
- Project data gathered to be distributed to VA team

In preparation for the VA Study, the team leader will confer 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 will be provided.

Following the initial planning meeting, the team leader will review the data collected for the project and develop a cost model. The team leader will also consult 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 Analysis Phase
3. Creative Phase
4. Evaluation Phase
5. Development Phase
6. Presentation Phase
7. Implementation Phase

Information Phase

At the beginning of the VA Study, the background and decisions that have influenced the development of the project or process are reviewed and understood. The VA Study starts with a meeting with representatives of the stakeholder agencies. Analysis of the project proceeds based on the data provided. The analysis includes reviewing the cost model(s), and becoming familiar with the issues and constraints provided by the stakeholders.

During the information phase, the approach of identifying and measuring project performance criteria is also applied. Specific criteria critical to meeting the project's need and purpose are identified. These criteria are then defined and weighted, and then specific, quantifiable scales are developed in order to measure the effectiveness of various design concepts in addressing project performance. The original design concept is first evaluated using this method resulting in an approximation of the design's effectiveness as an expression of value (performance over cost). As the study progresses and the VA team develop alternative concepts, these can be compared against the "value" baseline established for the original concept. Through this method,

owners gain a much greater understanding of the cost-performance relationships involved in evaluating alternative concepts during the decision-making process.

Function Analysis Phase

Development of the functional requirements of a project is vital to assuring a stakeholder that the facility will meet the stated criteria. The analysis of these functions in terms of actual cost is a primary element in a VA Study. A Function Analysis System Technique (FAST) diagram is developed to help the team better understand the functional relationships of the project. Costs, performance characteristics, and issues are related to the project functions on the FAST diagram to direct the team to the functions where they should focus their efforts.

Creative Phase

During this phase, the VA team generates as many ideas as possible to provide the necessary functions for the project. Judgment of the ideas is not permitted and all ideas are recorded.

Evaluation Phase

The VA team, as a group, evaluates each idea with respect to the functional requirements of the project. Each idea is evaluated against specific criteria established by the VA team and stakeholders. Advantages and disadvantages of each idea are recorded.

Once each idea is fully evaluated, the idea is ranked based on a scale of 1 to 5 to prioritize the development of the ideas.

Development Phase

During the development phase, each idea rated 4 or higher is expanded into a workable solution and documented on the VA Alternative forms. Ideas rated 3 may be written up and included in Section 3 of the report under the heading “Other Considerations,” time permitting. The development consists of the alternative concept, impact on facility operation, life-cycle cost comparisons, and a descriptive evaluation of the advantages and disadvantages of the alternative. Each alternative is documented with a brief narrative to compare it with the original concept. Cost impacts are also prepared for each alternative.

Presentation Phase

The last step of the VA Study is an informal oral presentation of alternatives to the project or process stakeholders. This provides the stakeholders an opportunity to preview the alternatives developed by the VA team, and gain an understanding of the rationale behind them before the draft VA report is published.

Implementation Phase

After the stakeholders have had an opportunity to review the alternatives identified by the VA team, the team leader will conduct 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 will also be made by the VA team leader and a final report will be issued.

This implementation meeting helps to ensure that savings or process improvements are not lost due to a 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 time frame 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: Introduction, 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 report will state what action must 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 report is not required.

Written Report – Final Report

Once all VA alternatives have been either accepted or rejected, the team leader will update the Preliminary Value Analysis Study Report to show the final results of the study. 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 Study Activity Chart

PREPARATION

INITIATE STUDY — 1
- Identify study project
- Identify study roles and responsibilities
- Define study goals
- Select team leader
- Prepare draft Study Charter

ORGANIZE STUDY — 2
- Conduct Pre-Study Meeting
- Select team members
- Identify stakeholders, decision-makers, and technical reviewers
- Identify data collection
- Select study dates
- Determine study logistics
- Update VA Study Charter

PREPARE DATA — 3
- Collect and distribute data
- Develop construction cost models
- Develop highway user benefit / life cycle cost (LCC) model

VA STUDY

Segment 1

INFORM TEAM — 4
- Review study activities and confirm reviewers
- Present design concept
- Present stakeholders' interests
- Review project issues and objectives
- Identify key functions and performance attributes
- Visit project site

ANALYZE FUNCTIONS — 5
- Analyze project data
- Expand project functions
- Prepare FAST diagram
- Determine functional cost drivers

CREATE IDEAS — 6
- Focus on functions
- List all ideas
- Apply creativity and innovation techniques (group and individual)

EVALUATE IDEAS — 7
- Apply key performance attributes
- Consider cost impacts
- List advantages and disadvantages
- Rate each idea
- Rank all ideas
- Assign alternatives for development

Segment 2

DEVELOP ALTERNATIVES — 8
- Develop alternative concepts
- Prepare sketches and calculations
- Measure performance
- Estimate costs, LCC benefits/costs

CRITIQUE ALTERNATIVES — 9
- VA Alternatives Technical Review
- VA Alternatives Team Consensus Review
- Identify mutually exclusive groups of alternatives
- Identify VA strategies
- Validate performance

PRESENT ALTERNATIVES* — 10
- Present findings
- Document feedback
- Confirm pending reviews
- Prepare preliminary report

**Interim presentation of study findings*

Segment 3

ASSESS ALTERNATIVES** — 11
- Review Preliminary Report
- Assess alternatives for project acceptance
- Prepare draft implementation dispositions

***Activities performed by PDT, Technical Reviewers, and Stakeholders*

RESOLVE ALTERNATIVES — 12
- Review implementation dispositions
- Resolve implementation actions with decision-makers and stakeholders
- Edit alternatives
- Revisit rejected alternatives, if needed

PRESENT RESULTS* — 13
- Present results
- Obtain management approval on implemented alternatives
- Summarize performance, cost, and value improvements

**Final presentation of study results*

REPORT

DOCUMENT STUDY — 14
- Document process and study findings
- Distribute Preliminary VA Report
- Distribute electronic report to HQ VA Branch
- Conduct Implementation Meeting

VA IMPLEMENTATION ACTION MEMO — 15
(If Conditionally Accepted Alternatives exist)
- Publish memo to document action plan to complete study
- Resolve Conditionally Accepted Alternatives

PUBLISH RESULTS — 16
- Document process and study results
- Incorporate all comments and implementation actions
- Distribute Final VA Report
- Distribute electronic report to HQ VA Branch
- Update VA Study Summary Report (VASSR)
- Provide HQ the Final VA Report in PDF format

*Note: The dashed boxes indicate steps that **may** not be required in some VA Studies.*

Day 1 – Tuesday, July 7

Kick-Off Meeting

8:00 VA Team Kick Off Meeting - Introductions (All) and VA Process Overview (VA Team Leader)
8:15 Project Overview (Project Manager and Engineers)
10:00 Stakeholder Issues and Concerns Discussion
10:30 Value Performance Attribute Determination and Ranking of Original Design Concept
11:30 ***Conclusion of Kick-Off Meeting***
11:30 Lunch
12:15 Project Site Visit
4:00 Adjourn

Day 2 – Wednesday, July 8

8:00 Site Visit Observations
8:30 Team Review of Review Project Information, Cost Estimate, and Cost Model
9:00 Function Analysis/Fast Diagram
10:30 Cost/Function and Performance/Function Analysis
11:00 Team Brainstorming
11:30 Lunch
12:30 Team Brainstorming (Continued)
1:30 Evaluation of Ideas
4:00 Adjourn

Day 3 – Thursday, July 9

8:00 Evaluation of Ideas (Continued)
11:30 Lunch
1:00 Evaluation of Ideas (Continued) - Team Member Assignments for Development
2:00 Review Alternative Development Process
2:15 Develop and Document VA Alternatives to the Original Design Concept
4:30 Adjourn

Day 4 – Tuesday, July 14

8:00 Develop and Document VA Alternatives to the Original Design Concept (Continued)
10:00 ***Technical Review of proposed VA Alternatives (Technical Reviewers)***
11:30 Lunch
12:30 Develop and Document VA Alternatives (Continued)
4:00 Adjourn

Day 5 – Wednesday, July 15

8:00 Develop and Document VA Alternatives (Continued)
11:30 Lunch
1:00 Complete Alternative Development
4:00 Adjourn

Day 6 – Thursday, July 16

8:00 Identify and Rank VA Strategies
11:00 Develop Management Presentation
11:30 Lunch
1:00 ***Management Presentation of VA Study Recommendations (Tentative)***
2:30 Adjourn

MEETING ATTENDEES

US 101 Dr. Fine Bridge Replacement
Caltrans District 1

2009							NAME	ORGANIZATION	POSITION	PHONE/CELL	EMAIL
PS	June					IM					
	9	10	24	25	26						
X	X	X	X	X	X	X	Fred Kolano	Value Management Strategies, Inc.	VA Study Team Leader	(970) 216-1739	fred@vms-inc.com
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X	X	X	X	X	X		Doug Wakefield	Del Norte County Local Transportation Comission	Public Member	(707) 954-0121	pricestriping@charter.net
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X	X	X	X	X	X	Ph	Manode Kodsuntie	Caltrans HQ	Structures Design		Manode.Kodsuntie@dot.ca.gov

MEETING ATTENDEES

US 101 Dr. Fine Bridge Replacement
Caltrans District 1

2009							NAME	ORGANIZATION	POSITION	PHONE/CELL	EMAIL
PS	June					IM					
	9	10	24	25	26						
X							Art Reeve	Del Norte County	Director of Public Works		art_reeve@dot.ca.gov
X						X	Mark Suchanek	Caltrans District 1	Deputy District Director - Maintenance and Operations		Mark.Suchanek@dot.ca.gov
X							Naghi Ghafari	Caltrans North Region	VA Coordinator	(916) 274-6009	naghi_ghafari@dot.ca.gov
	X	X	X	X	X	X	Linda Evans	Caltrans District 1	Environmental Coordinator	(707) 441-5840	linda_evans@dot.ca.gov
	X	X	X	X	X	X	Gordon Leppig	California Department of Fish and Game	Staff Environmental Scientist	(707) 441-2062	gleppig@dfg.ca.gov
	X	X	X	X	X	X	Tatiana Ahlstrand	Caltrans District 1	Planning	(707) 441-4540	tatiana_ahlstrand@dot.ca.gov
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	X						Friday Ululani	Caltrans District 1	ACE	(707) 498-4869	Friday_ululani@dot.ca.gov
	X					X	Gary Berrigan	Caltrans District 1	Environmental Senior	(707) 441-5730	gary_berrigan@dot.ca.gov
	X			X			Gail Popham	Caltrans District 1	Associate Environmental Planner - Natural Science	(707) 445-5204	gail_popham@dot.ca.gov

MEETING ATTENDEES

US 101 Dr. Fine Bridge Replacement
Caltrans District 1

2009							NAME	ORGANIZATION	POSITION	PHONE/CELL	EMAIL
PS	June					IM					
	9	10	24	25	26						
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				X			Dennis McBride	Caltrans District 1	Branch Chief, Design	(707) 441-5878	dennis_mcbride@dot.ca.gov
				X			Steve Wiman	Caltrans District 1	Bridge Design	(916) 227-8797	steve_wiman@dot.ca.gov
				X			David Melendrez	Caltrans North Region	Branch Chief	(619) 834-2471	david_melendrez@dot.ca.gov
				X			Troy Arseneau	Caltrans District 1	Chief, Traffic Operations	(707) 445-6377	troy_arseneau@dot.ca.gov
						X	Cindy Anderson	Caltrans District 1	Environmental	(707) 445-5222	cindy_anderson@dot.ca.gov
						X	Cheryl Willis	Caltrans District 1	Deputy District Director - Planning	(707) 445-6413	cheryl_willis@dot.ca.gov
						X	Terry Davis	Caltrans District 1	Construction	(707) 441-3990	terry_davis@dot.ca.gov
							PS = Pre study Meeting	IM = Implementation Meeting September 21, 2009			

Value Management Strategies, Inc.

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Value Management Strategies, Inc.

Value Analysis Study Report

US 101 DR. FINE BRIDGE REPLACEMENT

CALTRANS DISTRICT 1 – DEL NORTE COUNTY, CA

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December 2009

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