JACOBS

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October 30, 2013

Nevada Department of Transportation
1263 - South Stewart Street
Carson City, Nevada 89712

Attention: Mr. Pedro Rodriquez, PE
Project Manager

Subject: USA Parkway (SR 439)
Storey and Lyon Counties, Nevada
Value Engineering Study Report Submittal

Dear Mr. Rodriquez,

In accordance with your request for value engineering (VE) services and risk identification/assessment, we are pleased to submit to you the electronic copy of our VE Study Report in pdf format for the USA Parkway (SR 439) Project in Storey and Lyon Counties, Nevada. A bound copy will also be sent to you for your files.

This should constitute the submittal of deliverable work items as per your request. Should you have any questions on the value engineering recommendations, or desire that we become involved in future phases of the project, please contact this office.

Our VE team has enjoyed working on this interesting project, and we look forward to working with the Nevada Department of Transportation on future projects.

Sincerely,

Jacobs Engineering Group Inc.

Bryan Gant, PE
Project Manager

Enclosure

Value Engineering Study Report

USA Parkway (SR 439) Project

Storey and Lyon Counties, Nevada

October 2013

Prepared For:

USA Parkway SR 439

NEVADA DOT

FHWA

Prepared by:

JACOBS

FOREWARD

This Value Engineering Study Report presents the recommendations of a value engineering study and risk identification/assessment of the USA Parkway (SR 439) Project in Storey and Lyon Counties, Nevada, and is submitted in accordance with the agreement between the Nevada Department of Transportation (NDOT) and the Jacobs Engineering Group Inc. (Jacobs).

This is to certify that the value engineering study was led by the undersigned Certified Value Specialist and was conducted in accordance with standard value engineering principles and practices.

Steven L. Kautz, PE, CVS
Value Engineering Team Leader

EXECUTIVE SUMMARY

NDOT, with assistance from Jacobs, is currently exploring alternative alignments for the completion of USA Parkway in accordance with the National Environmental Policy Act (NEPA). The project area is located in Storey and Lyon Counties, Nevada, southwest of Fernley.

USA Parkway is being planned as a critical link between US 50 and I-80. Currently, US 395 through Carson City, SR 341 through Virginia City, or US 95A through Fernley are used to connect the Reno metro area with locations south and east; the proposed USA Parkway alignment will help improve that connectivity. In addition, the USA Parkway alignment will provide access to the development of the Tahoe-Reno Industrial Center.

Approximately 6 miles of the USA Parkway alignment have been paved starting at the interchange with I-80 about 10 miles east of Reno. The existing paved roadway consists of four-lane divided arterial roadway, with open median and minimal shoulders. This proposed project will extend the roadway south from Storey County into Lyon County and tie into US 50 in Silver Springs, a distance of approximately 13 miles.

Overall project description, site plan, vicinity map, construction cost estimate, and related information are included within Section I of this report. The VE study was based upon that information and information provided by Jacobs and Wood Rogers in their design briefing to the VE team on October 21, 2013. Information crucial to the success of this study was obtained from these sources and the VE team would like to thank the professionals from the Jacobs team for their valuable contributions throughout the study.

The standard practice for VE studies should begin with converting the existing design or process into value engineering language, i.e., function definitions which describe the intended use of the project or process as an active verb and measurable noun. A six-step job plan is followed using the VE techniques, methodology, and a multi-disciplined team.

The intent of the VE team is not to find fault or pick at design choices. The intent is to revisit functions that represent the intentions of the design and its components and offer additional or new alternatives to satisfy those functions. A new set of eyes looks at a problem that has been in the hopper for several years and presents some additional thoughts, technology, and innovation to satisfy the owner’s needs.

Our objectives are to provide the broadest range of solutions possible to satisfy the user's needs at the lowest life-cycle cost. The intent of the VE team is to furnish other ways to accomplish what needs to be done without impairing quality, reliability, or function. The VE team strives to minimize operation and maintenance demands, reduce energy costs with efficient project operation, and utilize recyclable products and sustainable building materials whenever possible.

At the request of NDOT, a general risk identification/assessment was also conducted to list any identifiable risks to the project.

The VE study team concentrated their efforts on functional aspects of the project while developing the following alternatives during their studies and recommends them for implementation by the owner. These recommendations are presented in greater detail in Section V and Appendix B. If additional information is required during the decision making process, please contact the VE team member whose discipline is involved. Their respective telephone numbers are listed in Appendix A.

The costs and savings shown below are in second quarter 2013 dollars, as reflected in the designer's 30% Construction Cost Estimate, dated June 25, 2013.

VE -1: **Construction Phasing.**
Function: Optimize Project.
Stay with the original concept of building all 4-lanes of the divided rural facility in lieu of construction phasing to consider an interim build condition of 2 lanes with truck climbing lanes initially.
Potential Savings: $0

VE-2: **Barrier System.**
Function: Controls Traffic.
Install 77,295' of concrete barrier rail in various locations, as proposed, instead of using cable rail or guardrail as alternatives.
Potential Savings: $0

VE-3: **Type of Access/Facility.**
Function: Carries Traffic.
Controlled access facility was investigated but stayed with original concept of 4-lane divided arterial due to anticipated cost implications and future development ROW impacts.
Potential Savings: $0

VE4: **Pavement Section.**
Function: Support Loads.
Looked at reducing the asphalt pavement and increasing the base, but opted to stay with the original concept of 8" of dense grade asphalt pavement on 12" Type 1, Class B aggregate base.
Potential Savings: $0

VE-5: **Alternative Pavement Type.**
Function: Support Loads.
The original concept of 8" of dense grade asphalt pavement on 12" Type 1, Class B aggregate base was favored over the alternative of 10" PCC pavement on 3" asphalt on 6" base..
Potential Savings: $0

VE-6: **Delivery Method.**
Function: Procure Contractor.
Deliver the project through a Construction Manager At-Risk (CMAR) contract rather than the assumed design-bid-build. Cost savings can not be identified at this time, however, savings are anticipated due to reduction of known risks and potential contractor innovation.
Potential Savings: Unknown at this time

VE-7: **Pipe Material.**
Function: Resist Forces, Pass Flows.
Team recommends original concept of using RCP pipe for culvert crossings in lieu of alternatives investigated such as HDPE, CMP, and PE pipe.
Potential Savings: $0

VE-8: **Horizontal Alignment.**
Function: Define Route.
Consider realignment of north end of alignment to: (1) further straighten curves realigning facility north, away from the existing graded section, (2) straighten south curve of "horseshoe" curve to the west, cutting through the existing mountain with ultimate goal of increasing posted speed to 55 MPH.
Potential Savings: Unknown at this time

VE-9: **Riprap.**
Function: Prevent Erosion.
Team recommends to reduce 80% of the riprap quantity by eliminating the riprap and substituting no lining.
Potential Savings: $3,800,000

VE-10: **Utility Locations.**
Function: Accommodate Services.
Team recommends establishing a dedicated utility corridor on both sides and parallel to the roadway facility outside the required roadway ROW. Suggest increasing ROW limits on both sides of the facility.
Potential Savings: Unknown at this time

VE-11: **Drainage at US 50.**
Function: Convey Runoff.
Team recommends downstream drainage analysis beyond US 50 to Lahontan Reservoir as well as sediment loading and transport analysis to the crossing at US 50 to determine the extent of the impacts prior to final design.
Potential Savings: Unknown at this time

VE-12: **Cut Slope Stabilization.**
Function: Prevent Erosion/Rock Fall.
Team recommends eliminating rock slope armoring pending additional geotechnical investigation.
Potential Savings: $2.5M

If the recommended VE alternatives summarized above are fully implemented, initial costs will potentially reduce project costs by $6.3M. The potential reduction of construction cost ($58,691,462) is 10.7% percent.

TABLE OF CONTENTS

I INFORMATION PHASE

A. VE Study Methodology

The VE team followed value engineering methodology precisely, using the following six-step plan:

Phase I - Information

The VE team leader began the study sessions with a briefing to the team, reviewing VE principles, methodology, and study goals. It was decided to concentrate study efforts first on those functions involving the largest dollar amounts because of their impacts on the overall project. Based on the construction cost estimate, a project cost model was developed and given to the team (shown in Section II).

As part of the information phase of the VE study, the design documents from Jacobs that are listed at the end of this section were studied and discussed by each VE team member. The VE team then identified the components of the project and their specific functions. A design briefing meeting was given to the VE team on October 21, 2013. Notes from this briefing are contained in Appendix A of this report.

Phase II - Speculation

The entire team participated in the creativity effort, brainstorming various ideas for alternative ways to accomplish the function areas identified in Items for Speculation, in Section II.

A general risk identification/assessment exercise was also conducted to list any identifiable risks to the project and the Risk Identification/Assessment is shown in Section II.

Phase III - Evaluation

The team then evaluated the items identified in Section II, selecting those items to develop further. The VE team tried to run the alignment alternatives through a criteria/idea matrix analysis. In this matrix, alternatives are compared using various criteria, including in every case, satisfying the study item's function.

An alternative must satisfy the function criteria either "very well" or "excellent" or it is dropped from further consideration. The top ranking alternatives, depending on how closely their ratings are grouped, are subjected to an advantages/disadvantages analysis for final ranking. The double sieve system for ranking of alternatives minimizes team members from forcing a favorite solution.

Phase IV - Development

Individual team members are assigned tasks on the basis of their separate fields of expertise pertaining to the highest ranking alternatives. Additional help and expertise may be brought in as needed. Telephone calls are made and other contacts pertaining to previous applications of the alternatives are contacted.

The VE proposals and other recommendations and comments are contained in Appendix B of this report.

Phase V - Presentation

The VE team leader and team members made a presentation of the study recommendations on October 24, 2013. The minutes of the presentation are contained in Appendix A of this report. Telephone numbers of the team leader and team members are also included in Appendix A for reference if contacts are required to clarify any items.

B. General Project Information

1. Project Description

Currently, USA Parkway begins 10 miles east of Reno at an interchange with Interstate 80 and proceeds south on paved roadway for 5.4 miles to serve the Tahoe-Reno Industrial Center (TRIC). The continued southern extension of USA Parkway to US 50 has been envisioned for some time as a way to more directly link US 95 and US 50 to the Reno metro area and provides a means of access to future developments in the area.

The proposed project extends the existing paved roadway approximately 13 miles farther south through the Virginia Mountain Range from Storey County into Lyon County to connect to US 50 near Silver Springs. The first 4.4 miles of this extension have been rough graded, but no pavement or other improvements have been constructed. The remaining 8.6 miles represents brand new roadway alignment.

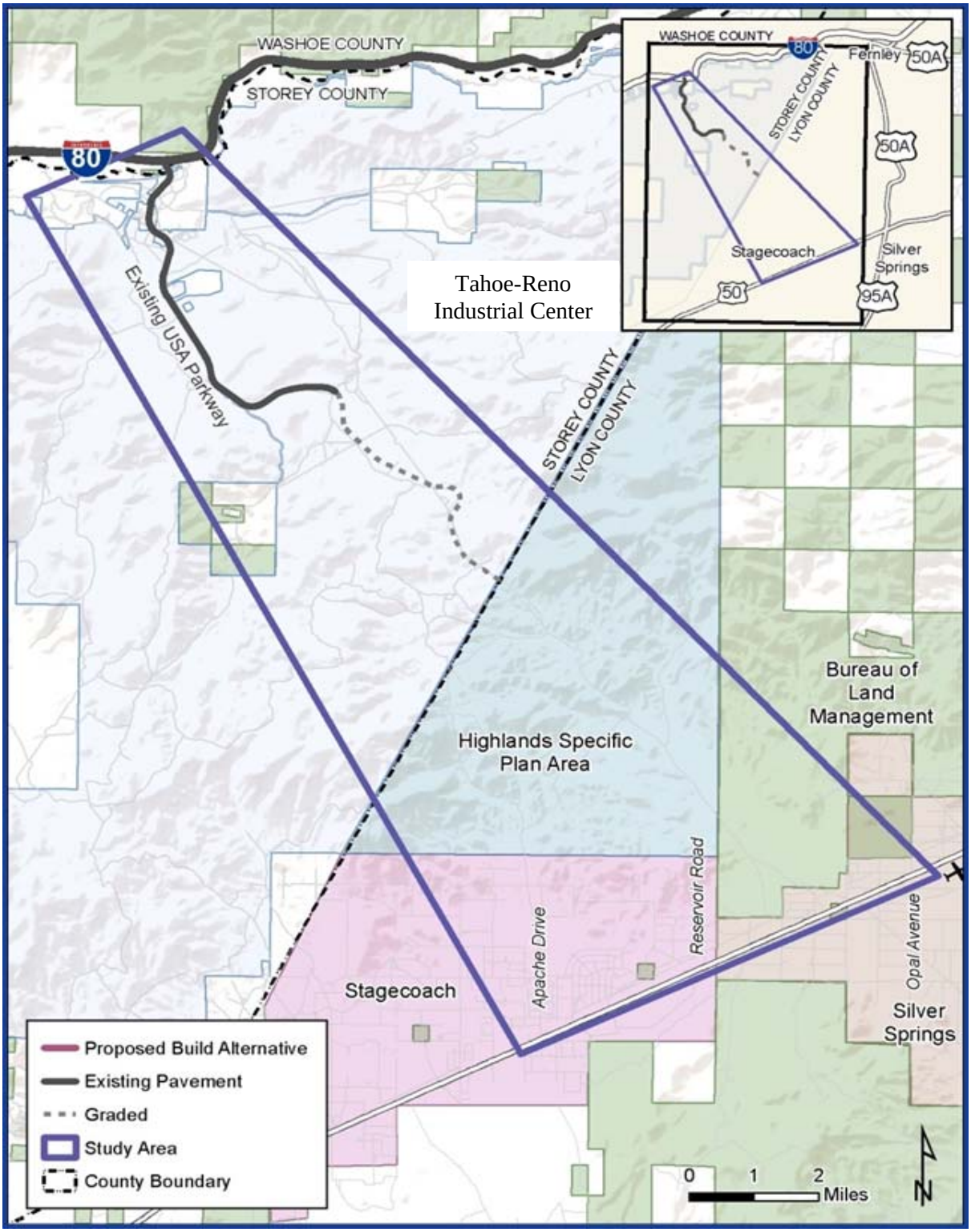
2. Project Documents

The following listed documents were provided by the Jacobs project team in order to facilitate the value engineering review process. Also provided and shown in the Table of Contents and at the end of this section are selected project documents.

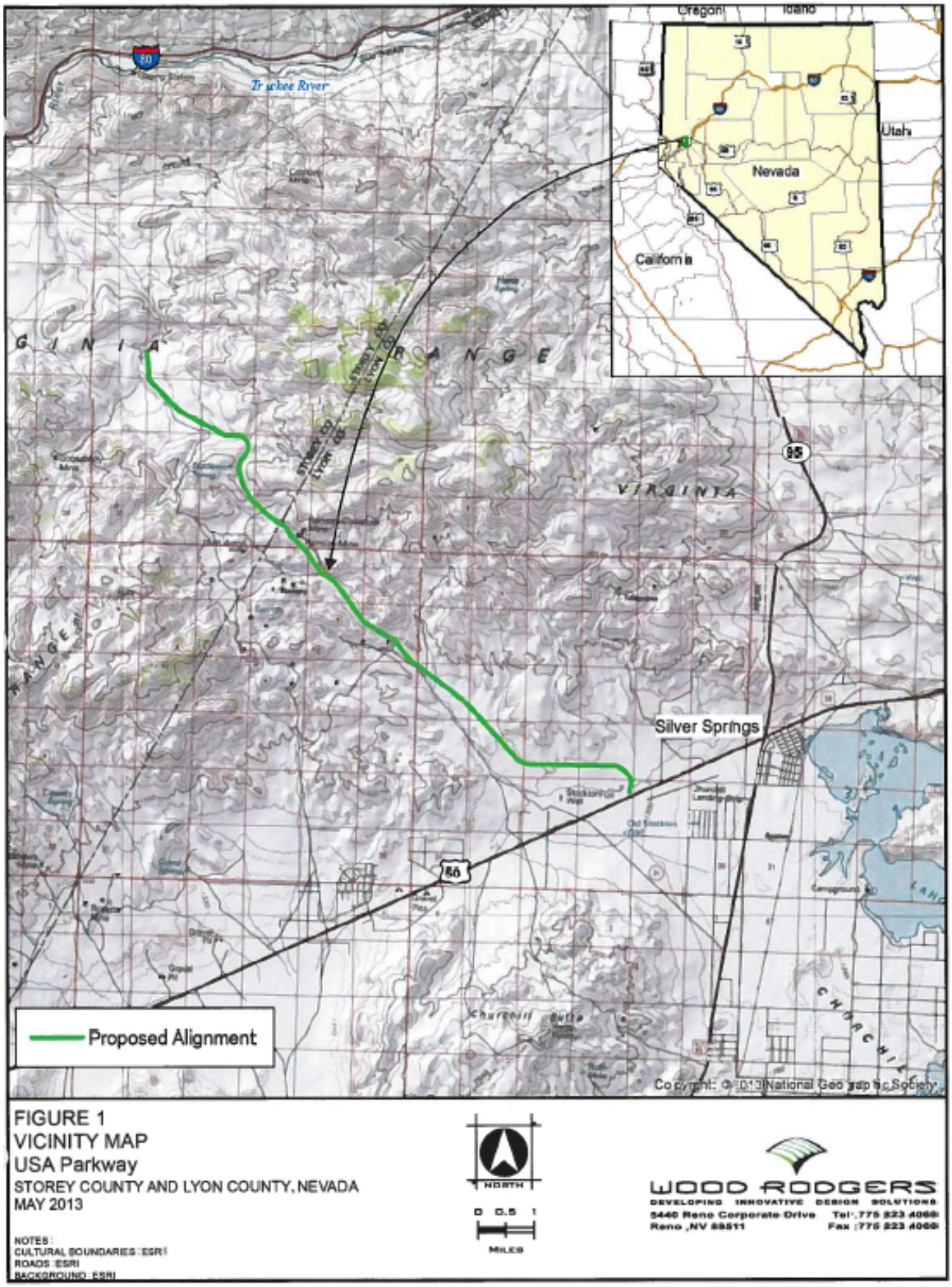
- 30% Design Plan Set dated May 23, 2013
- 30% Construction Cost Estimate dated June 25, 2013

- Design Standards Compliance Analysis dated November 17. 2013
- Field Alternatives Review dated May 3, 2012
- Tech Memo - Preliminary Roadway Design dated February 22, 2013
- Conceptual Geotechnical Report dated April 30, 2013
- Preliminary Design Report dated May 2013

Project Site Plan



Vicinity Map



30% Construction Cost Estimate

Project: USA Parkway
Project Number: W4X54800
Date: 25 June 2013

USA PARKWAY 30% CONSTRUCTION COST ESTIMATE

NO.	BID ITEM NO.	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL COST
1	2010120	CLEARING AND GRUBBING	278	ACRE	$1,500.00	$417,000
2	2021000	REMOVAL OF STRUCTURES & OBSTRUCTIONS	1	LS	$25,000.00	$25,000
3	2030140	ROADWAY EXCAVATION	1,815,000	CUYD	$4.50	$8,167,500
4	2030230	BORROW EMBANKMENT	10,000	CUYD	$6.00	$60,000
5	2030515	DRAINAGE EXCAVATION	3,328	CUYD	$25.00	$83,200
6	2030604	BASE PREPARATION	315	SQYD	$25.00	$7,875
7	2030656	NONWOVEN GEOTEXTILE (DRAINAGE)	80,499	SQYD	$1.00	$80,499
8	2030670	NONWOVEN GEOTEXTILE (ROADWAY)	595,696	SQYD	$1.00	$595,696
9	2060500	STRUCTURE EXCAVATION	13,309	CUYD	$25.00	$332,725
10	2070500	BACKFILL	10,497	CUYD	$25.00	$262,425
11	2070504	GRANULAR BACKFILL	20,207	CUYD	$30.00	$606,210
12	3020130	TYPE 1 CLASS B AGGREGATE BASE (12 INCH)	390,000	TON	$8.00	$3,120,000
13	3020140	TYPE 1 CLASS B AGGREGATE BASE (DRAINAGE)	32	CUYD	$45.00	$1,440
14	4020190	PLANTMIX BITUMINOUS SURFACING (TYPE 2C)(WET)(8 INCH)	260,000	TON	$75.00	$19,500,000
15	4030120	PLANTMIX OPEN-GRADED SURFACING (3/4 INCH)(WET)	23,000	TON	$90.00	$2,070,000
16	5020160	CONCRETE BARRIER RAIL	77,295	LINFT	$28.00	$2,164,260
17	5020730	CLASS A CONCRETE (ISLAND PAVING)	69	CUYD	$300.00	$20,700
18	5020515	CLASS AA CONCRETE (MINOR)	3,434	CUYD	$800.00	$2,747,200
19	5050500	REINFORCING STEEL	699,973	POUND	$1.00	$699,973
20	6030140	15 INCH REINFORCED CONCRETE PIPE, CLASS III	2,411	LINFT	$50.00	$120,550
21	6030170	18 INCH REINFORCED CONCRETE PIPE, CLASS III	1,860	LINFT	$60.00	$111,600
22	6030230	24 INCH REINFORCED CONCRETE PIPE, CLASS III	1,846	LINFT	$70.00	$129,220
23	6030290	30 INCH REINFORCED CONCRETE PIPE, CLASS III	3,689	LINFT	$80.00	$295,120
24	6030350	36 INCH REINFORCED CONCRETE PIPE, CLASS III	2,998	LINFT	$98.00	$293,804
25	6030440	48 INCH REINFORCED CONCRETE PIPE, CLASS III	253	LINFT	$142.00	$35,926
26	6040205	12-INCH CORR. METAL PIPE (16 GAGE)	847	LINFT	$50.00	$42,350
27	6050140	12 INCH HIGH DENSITY POLYETHYLENE PIPE, TYPE S	16	LINFT	$50.00	$800
28	6090504	STRUCTURAL STEEL GRATES	40,985	POUND	$2.50	$102,463
29	6100170	RIPRAP (CLASS 150)	18,460	CUYD	$25.00	$461,500
30	6100190	RIPRAP (CLASS 300)	10,165	CUYD	$40.00	$406,600
31	6100200	RIPRAP (CLASS 400)	22,458	CUYD	$40.00	$898,320
32	6100210	RIPRAP (CLASS 550)	55,992	CUYD	$40.00	$2,239,680
33	6100220	RIPRAP (CLASS 700)	31,431	CUYD	$35.00	$1,100,085

Project: USA Parkway
Project Number: W4X54800
Date: 25 June 2013

USA PARKWAY 30% CONSTRUCTION COST ESTIMATE

NO.	BID ITEM NO.	ITEM DESCRIPTION	QUANTITY	UNIT	UNIT COST	TOTAL COST
34	6100480	RIPRAP BEDDING (CLASS 400)	5,024	CUYD	$35.00	$175,840
35	6100490	RIPRAP BEDDING, (CLASS 550)	9,398	CUYD	$35.00	$328,930
36	6100500	RIPRAP BEDDING, (CLASS 700)	4,291	CUYD	$40.00	$171,640
37	6100540	SELECTED ROCK SLOPE	71,600	CUYD	$35.00	$2,506,000
38	6130170	CLASS A CONCRETE CURB (TYPE 2)	1,500	LINFT	$20.00	$30,000
39	6130690	CLASS A CONCRETE CURB AND GUTTER (TYPE 5)	500	LINFT	$25.00	$12,500
40	6161000	TYPE C-NV-4B FENCE	137,000	LINFT	$3.00	$411,000
41	6170800	36-FOOT PRECAST CATTLE GUARD	4	EACH	$20,000.00	$80,000
42	6180350	GUARDRAIL TERMINAL (TANGENTIAL)	25	EACH	$2,600.00	$65,000
43	6180400	GUARDRAIL- BARRIER RAIL CONNECTION (TRIPLE CORRUGATION)	25	EACH	$1,500.00	$37,500
44	6180550	GALVANIZED GUARDRAIL (TRIPLE CORRUGATION)	2,185	LINFT	$40.00	$87,400
45	6231000	TRAFFIC SIGNAL	1	LS	$250,000.00	$250,000
46	6251000	RENT TRAFFIC CONTROL DEVICES	1	LS	$15,000.00	$15,000
47	6270508	PERMANENT SIGNS (GROUND MOUNTED)(METAL SUPPORTS)	1	LS	$50,000.00	$50,000
48	6280004	MOBILIZATION	1	LS	$3,180,000.00	$3,180,000
49	6320890	EPOXY PAVEMENT STRIPING (8 INCH BROKEN WHITE)	13	MILE	$3,500.00	$45,500
50	6320940	EPOXY PAVEMENT STRIPING (8 INCH SOLID WHITE)	13	MILE	$3,500.00	$45,500
51	6321030	EPOXY PAVEMENT STRIPING (8 INCH SOLID YELLOW)	13	MILE	$3,500.00	$45,500
52	6340580	PERMANENT PAVEMENT MARKING FILM (TYPE 2) (24-INCH SOLID WHITE)	192	LINFT	$50.00	$9,600
53	6340650	PERMANENT PAVEMENT MARKING FILM (TYPE 2) (24-INCH SOLID YELLOW)	300	LINFT	$50.00	$15,000
54	6370003	TEMPORARY POLLUTION CONTROL	1	LS	$225,000.00	$225,000
55	6410544	IMPACT ATTENUATOR (55 MPH)	8	EACH	$20,000.00	$160,000
56	650100	UTILITY RELOCATION AND ACCESS ROADS	1	LS	$700,000.00	$700,000
57	650200	WILDLIFE CROSSING	1	LS	$50,000.00	$50,000
					SUBTOTAL	$55,896,631
					5% CONTINGENCY	$2,794,832
					ENGINEER'S ESTIMATE	$58,691,462
					PROPOSED RANGE	*$50,000,000 - $63,000,000*

II SPECULATION PHASE

A. Summary of VE Effort and Risk Identification/Assessment

Value engineering is not a critical review, constructability review, or cost cutting exercise. It is a problem solving technique that bypasses learned responses to produce alternative solutions achieving all required functions of the original design at the least cost over the life of the facility. It is a team effort which follows an established, organized, job plan and problem identification format that promotes objectivity and stimulates creativity. When the VE methodology is followed precisely, beneficial results are assured.

A value engineering team must be willing to challenge criteria and opinions, many of which may have been maintained by historical continuity or outdated policy or practices and not by repeated assessments of their current validity. Value engineering follows a methodology of distinct phases, relies upon teamwork, and the increase in creativity resulting from the synergism of a multi-disciplined group. It searches for and uses current technology to achieve the **value engineering goal: To creatively furnish technically sound alternatives to satisfy the user's needs at the lowest life-cycle cost.**

Value engineering examines systems or designs and breaks them into components which are then described in terms of intended use. The intended use (the purpose for the component's existence) called a function, is described in just two words, an active verb and a measurable noun.

Generally, ideas are put through two sieves, a criteria/idea matrix followed by an advantages/ disadvantages analysis. The top alternatives surviving these procedures are identified. The top ranked of these is developed as the recommended solution and estimates are prepared, where possible. Redesign costs and hours are estimated, where possible, to reflect implementation impacts to assist management in their decision making process.

Estimated savings resulting from the use of the recommended alternatives are calculated using life cycle costs recognizing the time value of money where applicable and redesign costs are subtracted to show net savings.

Management should receive more than one answer to every major problem for flexibility in decision-making. One answer to a problem promotes only "yes-no" decisions. Worse, it promotes "yes" decisions to partially satisfactory solutions and "no" to some which are almost satisfactory.

The recommendations and comments shown in Section V and Appendix B demonstrate that philosophy as far as possible.

B. Cost Model

A cost model of a design's components, including the identification of the component's function, prioritizes opportunities for value improvement. A function analysis further pinpoints poor value in greater detail. When cost exceeds worth, it indicates critical areas for the VE team to concentrate on during their alternative development efforts. Such indicated poor worth functions are studied in the order of their impact on project costs. The **Cost Model** developed for this project is shown following this section.

ITEM/FUNCTION COST MODEL

PROJECT: **USA Parkway (SR 439)**

VE STUDY ITEM: **Total Project**

BID ITEM/Function(s)	%	PERCENTAGE OF STUDY ITEM (0 10 20 30 40 50 60 70 80 90 100)	TOTAL (IN $)
CLEARING AND GRUBBING / Clear area	0.7%		$417,000
REMOVAL OF STRUCTURES	0.0%		$25,000
ROADWAY EXCAVATOIN	16.1%		$8,994,770
STRUCTURE EXCAVATOIN	0.6%		$332,725
BACKFILL	1.6%		$868,635
AGGREGATE BASE COURSES	5.6%		$3,121,440
PLANTMIX BITUMINOUS SURFACE	34.8%		$19,500,000
PLANTMIX BITUMINOUS OPEN-GRADED	3.7%		$2,070,000
CONCRETE STRUCTURES	10.1%		$5,632,133
PIPES	1.8%		$1,029,370
CATCH BASINS	0.2%		$102,463
RIPRAP	14.8%		$8,288,595
CONCRETE CURBS AND GUTTERS	0.1%		$42,500
FENCING	1.2%		$680,900
TRAFFIC CONTROLS	0.6%		$315,000
MOBILIZATION	5.7%		$3,180,000
PAVEMENT MARKINGS	0.3%		$161,100
POLLUTION CONTROL	0.4%		$225,000
VEHICULAR IMPACT ATTENUATORS	0.3%		$160,000
UTILITY RELOCATION AND ACCESS ROADS	1.3%		$700,000
WILDLIFE CROSSING	0.1%		$50,000
SUBTOTAL	100%		$55,896,631
CONTINGENCY (%5)	___	Note: Contingency Markup is 5%	$2,794,832
	___		
TOTAL	100%	**TOTAL CONSTRUCTION COST** (Total Estimated Construction Cost in 2nd Quarter 2013 Dollars)	**$58,691,462**

C. Items for Speculation

Ideas are generated through brainstorming each poor value function. **Items for Speculation** were generated and are listed below.

Items for Speculation

1. Riprap
2. Delivery Method
3. Pavement Section
4. Construction Phasing
5. Barrier System
6. Type of Access/Facility
7. Typical Section
8. Slope Stabilization
9. Vertical Alignment
10. Horizontal Alignment
11. Utility Location
12. Wildlife Crossing
13. Aesthetics/Landscaping
14. Alternative Pavement Type
15. Drainage at US50
16. Pipe Material

D. Risk Identification/Assessment

A general risk identification/assessment was also conducted to list any identifiable risks to the project. This **Risk Identification/Assessment** is shown following this section and shows either a "low", "medium", or "high" risk potential for each risk.

RISK ASSESSMENT

PROJECT: USA Parkway (SR 439) DATE:

	RISK ITEMS FOR ASSESSMENT	LOW	MED	HIGH
1.	Right-of-Way	X		
2.	Slope Stabilization	X		
3.	Roadway Overexcavation		X	
4.	Erosion	X		
5.	Drainage		X	
6.	Cultural Resources			X
7.	Wildlife			X
8.	Outfall into Truckee	X		
9.	Utility			X
10.	Funding			X
11.	Federal Participation			X
12.	Economy (Cost of Materials)	X		
13.	Economy (Boom or Bust)	X		
14.	Political Support	X		
15.	Availability of Materials	X		
16.	Cost Contingency			X
17.				
18.				
19.				
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III EVALUATION PHASE

During this phase of the VE study, an analysis of each item generated during the speculation phase was conducted. The VE study proposals and recommendations and comments developed for these items are summarized in Section V and included in their entirety in Appendix B of this report. Ideas were judged based on the ability to satisfy function and then evaluated in terms of alternative comparisons to weighted criteria and in terms of advantages and disadvantages.

IV DEVELOPMENT PHASE

During this phase of the study, the best viable alternatives from the evaluation phase were further developed and then compared to the original concept. Only general cost differences were determined between alternatives and the original concept.

V PRESENTATION PHASE

A. Summary of VE Recommendations by Cost

This report documents the results of the VE study. Each viable alternative is presented as a specific VE proposal in this report. A **Summary of VE Recommendations by Cost** is shown below. The detailed **VE Study Proposals** for these recommendations are included in Appendix B of this report.

The VE presentation was held on October 24, 2013. The **VE Presentation Notes** are included in Appendix A of this report.

VE -1:	Construction Phasing.	Potential Savings: $0
VE-2:	Barrier System.	Potential Savings: $0
VE-3:	Type of Access/Facility.	Potential Savings: $0
VE4:	Pavement Section.	Potential Savings: $0
VE-5:	Alternative Pavement Type.	Potential Savings: $0
VE-6:	Delivery Method.	Potential Savings: Unknown at this time
VE-7:	Pipe Material.	Potential Savings: $0
VE-8:	Horizontal Alignment.	Potential Savings: Unknown at this time.
VE-9:	Riprap.	Potential Savings: $3.8M
VE-10:	Utility Locations.	Potential Savings: Unknown, at this time
VE-11:	Drainage at US 50.	Potential Savings: Unknown at this time
VE-12:	Cut Slope Stabilization.	Potential Savings: $2.5M

Total Potential Recommended Savings is $6.3M
(or 10.7% of the Construction Cost ($58,691,462)

APPENDIX

A. VE Team and Meetings

1. VE Study Team Participants
2. Design Briefing Meeting Notes
3. VE Presentation Notes

B. VE Study Worksheets

1. VE Study Proposal VE-1 (Construction Phasing)
2. VE Study Proposal VE-1 (Barrier System)
3. VE Study Proposal VE-1 (Type of Access/Facility)
4. VE Study Proposal VE-1 (Pavement Section)
5. VE Study Proposal VE-1 (Alternative Pavement Type)
6. VE Study Proposal VE-1 (Delivery Method)
7. VE Study Proposal VE-1 (Pipe Material)
8. VE Study Proposal VE-1 (Horizontal Alignment)
9. VE Study Proposal VE-1 (Riprap)
10. VE Study Proposal VE-1 (Utility Locations)
11. VE Study Proposal VE-1 (Drainage at US 50)
12. VE Study Proposal VE-1 (Cut Slope Stabilization)

Appendix A

A. VE Team and Meetings

1. VE Study Team Participants

Names of VE team members, client representatives, and design firm personnel are as follows:

VE Team Members	Title/Discipline	Phone No.	Email Address
Steve Kautz	VE Team Leader	(425)308-9817	slkautz7@gmail.com
Kim Daily	VE Coordinator-Jacobs	(512)904-1668	kimberly.daily@jacobs.com
Chuck Price	Drainage/Utilities-Jacobs	(425) 452-8000	chuck.price@jacobs.com
David "Pat" Patterson	Roadways-NDOT	(775)888-7681	dpatterson@dot.state.nv.us
Jim Moore	Drainage-NDOT	(775)888-7799	jmoore2@dot.state.nv.us
Mark Caffaratti	Construction-NDOT	(775)888-7325	mcaffaratti@dot.state.nv.us
Kathy Mechum	Traffic-NDOT	(775)888-7559	kmechum@dot.state.nv.us
Edgar Leon	Traffic-NDOT	(775)888-7563	eleon@dot.state.nv.us
Mike Griswold	Geotech-NDOT	(775)888-7781	mgriswold@dot.state.nv.us
Wil Young	Materials-NDOT	(775)888-7788	wyoung@dot.state.nv.us
Ed Ely	Maintenance-NDOT	(775)575-7974	eely@dot.state.nv.us
Louis Paley	Maintenance-NDOT	(775)575-2566	lpaley@dot.state.nv.us
Dale Lindsey	Performance Analysis-NDOT	(775)888-7190	dlinsey@dot.state.nv.us

Owner/Designer	Organization	Phone No.	Email Address
Pedro Rodriquez	PM-NDOT	(775)888-7320	prodriquez@dot.state.nv.us
Alauddin Khan	NDOT		akhan@dot.state.nv.us
Bryan Gant	PM-Jacobs	(775)850-5107	bryan.gant@jacobs.com
Steve Hagel	Design PM - Jacobs	(702)813-1664	steven.hagel@jacobs.com
Mickey Smith	Wood Rogers	(775)853-7455	msmith@woodrogers.com
Jon Simpson	Wood Rogers	(775)823-5258	jsimpson@woodrogers.com

2. Design Briefing Meeting Notes

DATE: October 21, 2013

TIME: 9:00 a.m.

LOCATION: Hilton Garden Inn - Board Room A
Reno, Nevada

ATTENDEES:

Steve Kautz
Kim Daily – Jacobs
Chuck Price – Jacobs
David "Pat" Patterson – NDOT
Jim Moore – NDOT
Mark Caffaratti – NDOT
Kathy Mechum – NDOT
Edgar Leon – NDOT
Mike Griswold – NDOT
Wil Young – NDOT
Ed Ely – NDOT
Louis Paley – NDOT
Alauddin Khan – NDOT
Dale Lindsey – NDOT
Pedro Rodriquez – NDOT
Steve Hagel – Jacobs
Jon Simpson – Wood Rogers
Mickey Smith – Wood Rogers

Presented by Steve Hagel (Jacobs), Jon Simpson (Wood Rogers) and Mickey Smith (Wood Rogers)

Introductions – Jacobs, NDOT

Contract – Environmental and Preliminary Design
Wood Rogers – Survey, drainage and geotech

Project overview – PM is Bryan Gant, Pedro is NDOT PM

What is the project? Developer has built 5 miles, 2-lane. Dotted line is graded out. Plans indicate widening. Reminder is not graded, all new alignment and is 8.6 miles. Do not anticipate widening developer portion right now. Developer did not design to NDOT standards. Do need to upgrade developer portion. Shown in the report. A lot of areas within developer portion does not meet NDOT geometric standards, especially for design speed. Currently posted at 45mph, design speed is 45mph. Issues with access…all in developer section.

Not tying into Ramsey lease. Tying in to the east.
Terrain – fairly flat, 2-3% gradient. Mountainous terrain toward the middle.

Major features – industrial center. 100K acres, 30k developable., highlands development, BLM land. ROW on the project developer agrees to donate ROW. ROW width not set yet. Direct impacts would be at tie in to Rt 50, several single family parcels. There are dirt roads that follow alignment as access to utilities.

Have gone thru preferred alignment determination. No NEPA yet.

Existing port of USA Parkway. Interchange at I-80 built by developer. Roadside hazards in developer segment. NDOT identified what it would take to upgrade. Developer section built within the last 10 years.

Ownership…most likely NDOT ownership. Developer portion not considered part of this VE study. VE study will concentrate on last 13 miles. Developer section is 5.5 miles.

Considered multiple alignments. Purple dotted is selected. Initial layout showed high-tee at US50. Would be good until traffic increased. Ramsey Weeks is straight shot to 95A. However there are schools and cemetery. Eventually, could be a grade separated interchange. Ramsey Weeks Cutoff is a county road. Cutoff thru residential area.

Decision to not do a site visit…thought was mapping and photos is good. Non-complicated on new alignment. Access is 4-wheel drive. Can't access final 3 miles of the project (have to walk it).

Existing graded portion…end of paved to county line. Preferred alignment utilized this alignment. Requires widening to fit section. Significant amount of grading. One curve, 6% grade – steep. One curve does not meet 60mph design speed, meets 55mph with widening. Otherwise would require significant grading. 600K CY. Decision is to hold primarily due to environmental aspects and cost ($4M in grading).

End of paved section – 9 huge culverts. Why not a bridge? This is on the paved section. This section does meet flow requirements, however probably 10-12 culverts that don't meet flow requirements.

Brief facts of the alignment selection…Proposed USA Parkway Section slide.

Significant amount of riprap as id'ed in cost estimate. Focused on horizontal alignment. Reno Engineering did alignment for developer. Jacobs came up with preliminary alignment based on this alignment to meet NDOT standards. Staked new alignment and solicited alternatives from NDOT.

Looked at vertical….total earthwork is 2M cy cut/2M cy fill (balanced). Lots of rock cuts. Settled on 1.5:1 cut and 1.5:1 fill.

Tried to add curves on horizontal to minimize impacts. Tight environmental corridor, however. So Jacobs straightened out the alignment – minimize earthwork, impact to washes.

Looked at photos. Ramsey Mine – Most severe mountainous, environmental concerns. Ramsey Mine – cultural resources item. Numerous historical sites identified. Alignment set to try to minimize impacts to these sites. Old gold and silver mine. Photo of existing power lines. Following the alignment of the power lines. There will be minimal power line relocation. Access road to power line will be impacted heavily.

Consideration for utility corridor on one side of the road or the other. Plans don't show this. Expect that utility corridor would be on cut slope. Location of utility corridor has not been determined. Earthwork increase potential.

Looking south, existing mountainous entering alluvial flats.

Show tie in at highway 50. NDOT is constructing frontage roads on US 50 currently. Tie in is high-T. handful of takes required. Huge drainage issues.

Typical section – 2 lanes in each direction. Traffic numbers represent 2017 opening year. 6600 ADT, 2037 ADT 20,000. High percentage of trucks forecasted (15%)….thought was it was graded, built the full section. Study did not meet warrants for trucking climbing lanes, however if only two lanes were constructed, climbing lanes maybe warranted. 30' min stripe to strip median if there are no barriers.

Shoulders on the outside are standard. Barrier on the outside means 10' shoulder, otherwise 12'.

Tie in at US50 with 14' paved median. Typical section necks down in the mountainous area – 30' of separation between travel lanes. Non-mountainous areas are 50' separation.

Site distance on curves – studied center median barrier. Used in some areas only due to site distance issues.

Barrier rail on the outside in areas due to drainage, riprap.

Major Design Issues – Slide
Geotechnical Issues:
Bulk of project goes thru bedrock; tendency to weather and degrade. Worrisome is long term weathering of the slopes. Makes bigger maintenance issue. Joints and seams where material has been altered to clay goo. Drainage issues.

R values came out pretty good (30-50). Material should perform well under roadway. Vegetative riprip on slopes studied. Everything cut could be used as fill, just depends on areas. Structural pavement section developed by NDOT. Drilled at 1000' spacing in one direction. Couple isolated locations with lower R values. Expect more investigation as design proceeds.

Rock armoring considered. Rock riprap number is big…try to refine this as design advances.

Major design issues
Drainage Issues:
At US50, studies on flow show substantial flow. Some show overtopping 50. Need to study this area more. Three different crossings in this area. A lot of debris that comes down the canyon. Upstream system is to capture sediment. Designed for a 50-year flow crossing. Anything above 50-year would overflow US50. Can't raise without backing up water into properties adjacent to the roadway.

One culvert, box, 5x6. Increasing the size of the box raised the roadway causing backup to adjacent properties. Channels increased costs significantly because of the bad soils. In the mountainous area, there will be lots of sediment.

There are 4 major crossing along the roadway. Most of the flow is sheet flow. Mountainous section – thru ravines. Channels on both sides of the roadway. Flows

coming from both sides. Riprap channels on both sides at this point. Need to study bedrock there. Steeper gradients.

Crosses drainway a couple of time. Existing channels at the top end of the project. Channel is deep, over excavated, appears sized to be able to add riprap to it. Currently not lining.

Volumes of sediment….do we know how much? Has not been studied. Suggest high impact sediment study. Also look at sheet flow in regard to hydroplaning, etc. No pictures of the existing culverts. Chuck would consider looking downstream to try to avoid potential downstream issues. No new drainage paths, using as much as possible the existing drainage paths.

Thunderstorms this July. Pavement ripped out up north. Significant impacts on channels. Discussion on unpredictability of the performance of the soil because of the type of soil. Andacites have a tendency to weather more quickly. Function of minerality and condition of rock. Rain is not that frequent here so that if there a clog, maintenance would most likely have time to go out and clean it before the next storm. Suggest study (design study) to study existing sediment issues at the I-50 interchange.

Call Steve Hagel if VE team has questions.

There will be snowmelt, but is not as significant as the rain. Can get rain on snow event. No flooding on roadway in the 25 and 50 year events. Snow melts on roadway typically. Crest of roadway is at about 5,000 ft. Most likely would have to plow snow.

Alternatives – looked at lots of minor and a couple of major. Highpoint of the job from south to north is 2-3% thru alluvial to 6% in the mountains. 6% grade in the snow areas are typical. Lots of horses and cows! Talking about wildlife crossings. Currently studying a horse wildlife crossing. Not sure if horses will use these crossings. Horses will group up during the winter but are not migratory. There are cows, also, that are privately owned free range.

Need to study the fencing around the project due to the horses. The horses are an environmental issue.

Agency participants – Federal, NDOT and BLM (cooperating).

Currently in the Environmental Assessement. Early 2014 for decision document. Final design and construction as ????. Currently in FY 2016. May get pushed out due to lack of funding.

Looking at pictures. Windy area.

Designer and Owner…anything off the table?
Existing USA Roadway portion is off the table. Just the paved section is off the table. Ramsey Weeks tie in is off the table. Public has received the preferred alternative. NDOT is in discussion with county about Ramsey Weeks.

There is an airport close by – it's GA. Talk about upgrading airport to bring in 707, like a freight center.

Long term plans are grade separation, depends on funding and traffic. Could be phased.

Off the table is not lowering Opal or US50. US50 would most likely go over Opal. Mapping doesn't include updates to US50.

Question regarding angle of why the tie in at US50 is not a 90. Trying to avoid disgruntled property owners. Kinda following property lines. Biggest issue the airport. Can't change the alignment of Opal south of US50.

Looked at alternatives to the west…apache and reservoir. These options are off the table. More expensive, not really feasible.

No budget set….assumes that developer will push for lowest cost possible. Developer is tasked to find the money and construction. State is assisting in getting ROW. Plan is to get as much federal funding as possible. Soul source issues maybe with that.

Two-lane facility could handle 2016 traffic. Not sure at what point the 2 lanes would have to be expanded to 4 lanes. Steve will find out.

Exhaustive cost benefit analysis was done. Came up with a 9.1 cost:benefit number – extremely high. Incredibly good! That's if it's all 4 lanes.

The design briefing ended at approximately 11:00 am.

3. VE Presentation Notes

DATE: October 24, 2013

TIME: 10:00 a.m.

LOCATION: Hilton Garden Inn - Board Room A
Reno, Nevada

ATTENDEES:

Steve Kautz
Kim Daily – Jacobs
Chuck Price – Jacobs
David "Pat" Patterson – NDOT
Jim Moore – NDOT
Mark Caffaratti – NDOT
Kathy Mechum – NDOT
Edgar Leon – NDOT
Mike Griswold – NDOT
Dale Lindsey – NDOT
Pedro Rodriquez – NDOT
Steve Hagel – Jacobs
Bryan Gant – Jacobs
Mickey Smith – Wood Rogers

Presenters:
Facilitator (Steve Kautz)
VE01 – Construction Phasing (Mark Caffaratti)
VE02 – Barrier System (Dale Lindsey)
VE03 – Type of Access/Facility (Chuck Price)
VE04 – Pavement Section (Chuck Price)
VE05 – Alternative Pavement Type (Chuck Price)
VE06 – Delivery Method (Mark Caffaratti/Kim Daily)
VE07 – Pipe Material (Jim Moore)
VE08 – Horizontal Alignment (Pat Patterson)
VE09 – Riprap (Mike Griswold)
VE10 – Utility Locations (Pat Patterson)
VE11 – Drainage at US50 (Jim Moore)
VE12 – Slope Stabilization (Mike Griswold)

Steve starts presentation at 10:10am. Generally thought design was good. Introductions were made. Steve handed out the sign-in sheet. A report will be coming out next week documenting the findings.
Methodology and process used in value engineering, conducted risk identification and assessment.
Trying to satisfy users/owners needs at lowest lifecycle cost.

Good team put together.

Reviewed VE process. Reviewed project and identified high dollar items. Started looking at ideas on Tuesday. Not all ideas were presented into proposals. Did some screening and added costs where possible.

Resulted in presentation today. VE Team does not get involved in implementation. Client can call VE team if there is a question.

Show project from I-80 to US50, portion that is paved, portion that is graded.

Looked at cost model. Break cost into items. 80-20 rule – 5 items stand out: roadway excavation, plant mix; others.

Discussed items for speculation. Some fell out, i.e. landscape.

Took a couple hours looking at risk. Half were low risk. Didn't spend a lot of time looking at low risks. Several were medium risks. Discussed. Bryan Gant – what does high risk on utilities mean? Steve – disruptive, came up with idea. Weren't sure when development was coming about.

Cultural resources, mine, petroglyphs was high. Wildlife is high – horses. Bryan Gant – burrowing owls and golden eagles were found on the existing alignment.

Not sure where funding was coming from. Not sure about Federal participation.
Concern about 5% contingency on a 30% complete set of plans.

VE Proposals – Looked at 16, presenting 12.
VE01 – Construction phasing. Looked at saving money. Looked at reducing section and building out in steps. Looked at several concepts of two lanes. Looked at 2 lanes, building one side of full build out. Results was not large savings. Phasing is more complex. Original concept was recommended. Other alternatives were two-lanes with truck climbing lanes – initial saves money but pushes cost out. Anticipated grading for

future development. Next phase would be building to full-build. Didn't think it would be much of a benefit to have to balance out earthwork. Discussed advantages and disadvantages. Alternatives didn't bring much overall savings. Traffic control on phasing idea would add more cost and complexity. (Steve) – Funding is a problem. (Bryan) This question will be asked. (Pedro) Especially from Developer. (Chuck) Could be a lot of changes in project due to negotiations.

VE02 – Looking for big ticket item. Barrier Rail. Horizontal and vertical is all tied together. Considered cable rail and guardrail. Wasn't really any place in median where clearzones were adequate. Guardrail is more expensive. In the end, stay with barrier rail. Looked at lower cost of barrier rail vs. cost of guardrail. Looked at constant slope barrier rail. Initial cost is more, but over time, may result in a savings. Good job at placing it appropriately.

VE03 – Type of Access/Facility. Existing is a 4-lane arterial. Concerns being a highway with limited access. Driveways could be an issue. Thought is that it would be too costly since frontage roads would be necessary. Stayed with original due to reduced ROW impacts compared to limited access facility. Suggest consideration for access control. (Pedro) Would have to follow permitting process. (Pat) Access points will depend on type of road. (Steve Hagel) Decision has been made – road will be a minor rural arterial.

VE04 – Pavement Section. Wil Young is sick today. Existing section is asphalt. Looked at reducing section. In discussion with geotech, R values vary. There were soft spots needed overexcavation. Didn't recommend any changes due to R value risks and soft spots. Cracks could occur earlier if section were reduced due to freeze-thaw. Also looked at reducing shoulder area. However, NDOT will not consider shoulder thickness reduction. Could result in transverse cracking again due to freeze-thaw cycles. Typically lots of pressure to reduce cost. Not so on this project. Maybe want to reconsider once budget/funding is set. Advantages vs disadvantages.

VE05 – Alternative Pavement Type. This is concrete versus asphalt. Replace original with 10" PCC. Recommendation is to stay with original concept. Asphalt is about $10M lower than PCC, however higher maintenance costs and more rehab work would be required. Would be a good candidate for PCC due to high truck traffic. If this is an economic development project, PCC may be more appropriate. Over 30-years, there could be a $1M savings, however didn't look at all costs. Lots of reasons to consider PCC during design.

Steve Hagel – What is advantages and disadvantages for? (Steve K) – Advantages and disadvantages are for recommended option. (Pat) Advantages and disadvantages are for

recommended option. Cost savings with PCC over concrete. (Steve H) – Surprised, usually PCC is more expensive. (Pat) Pressure from concrete lobby to use more concrete which may result in better prices. Wil ran the numbers from the NDOT lab. (Mike) PCC prices have come more in line with asphalt costs. (Pat) Got the pricing from NDOT process but didn't take into account the quantities. Could be less due to amount. Using weighted average – last 5 years of historical bid data. Probably most likely a $6M savings. (Chuck) Need final defined budget to get closer on the savings. (Pat) May result in more savings if other ideas are implemented.

VE06 – Delivery Method. Mark looking at it from administrative side. Recommend using a CMAR for this project. Bring contract in early, have everything negotiated out. Higher admin costs up front but smoother work during construction. No change orders. Maybe not the cheapest price. Advantages versus disadvantages. Minimize construction risk. Risk reserve agreed upon before construction begins. More admin meetings and discussion up front. (Kim) discussed availability payments. (Dale) Tolling is not allowed. It is in the gray area of legislation. (Pedro) Project Neon is being developed thru an availability contract. Thing with this project is NDOT wants to move forward with NEON but not this project. Politicians want to fund it, not TxDOT. Developer does not want to maintain the project. (Mark) DBM would be more like a P3 project.

VE07 – Alternative pipe materials. Currently this project has RCP with a little bit of HDPE. Looked at HDPE, CMP and PE. Mostly used to cross culverts which HDPE is not allowed. Recommend staying with original concept. Could look at replacing some of the CMP with PE at the slope protectors. Also consider replacing RCP with HDPE in non-loading areas.

VE08- Horizontal alignments. Discussed the issue at the horseshoe curve. Looked at straightening out horseshoe curve in addition to looking at other north section. Understanding there are issues on these curves. Not sure how much vertical was driving the horizontal. Advantages versus disadvantages. Concerns about design speed. Also with the grades. Trucks are going to be having an issue maintaining the downhill speeds, having trouble staying slow. Felt the advantages would be to maintain a constant design speed and improve travel time. Understood that there may be some serious cuts in there. Looked at cutting in mountain, developer may be interested in excess cut materials. (Steve Hagel) – Designer spent a lot of time on this issue. Vertical was important consideration. Enormous cut at the top of the hill but also enormous fill…came close to balancing alternatives. Decision for original alignment was based on costs, AASHTO providing guidance – how well does horizontal and vertical fit to the original terrain which realigning would result in a big "scar", and what is the environmental impact. These considerations led to descision. (Steve K.) Could add walls to reduce cuts. (Steve

Hagel) Decision has not yet been made, could look at this in final design. (Pat) Discussing alternatives. Has concern about substandard radius. NDOT typically doesn't post 5MPH under the design speed. (Kathy) NDOT policy in the I-80 days was design at 70MPH, post at 60MPH. Over the years, 85th percentile is used. NDOT is liable if the project is NOT posted to the 85th percentile. (Steve Hagel) Further discussion on 85th percentile. (Bryan) Reminder that there is a 6% incline so it's a little different.

VE09 – Riprap. Looked at alternatives – concrete lining, vegetative lining and no lining. Probably no cost savings in concrete lining, no water for vegetative lining. Focused on no lining option. Noticed there was a large amount of riprap in the north end of the project. Seemed to be reasonably hard materials in the region which could support the intermittent water in the areas. Lower areas in the alluvial area, may still require riprap. Eliminate 80% of riprap. Save approximately $3.8M. (Bryan) Percent of riprap on entire job seems to be high percentage wise of remainder of project. (Pedro) Riprap used to dissipating energy. (Mike) Could be potential savings from mining riprap on site. During design, look for viable sources for riprap.

VE10 – Location of utilities. Current schematic shows utilities in the roadway shoulder. (Bryan) Proposed section or existing section. (Pat) Proposed. (Pedro) From exhibit. (Pat) Suggest creating utility corridors. Utility costs can "kill" a project. If PCC section is implemented, NDOT does not want to cut the PCC. So a utility corridor on each side of the road could be beneficial. Plays into future planning. Current exhibit shows utilities in a place NDOT would not allow. (Bryan and Steve Hagel) – Concern in the areas of big cuts. (Pat) NDOT will not permit utilities within the roadway prism. (Steve Hagel) – Comes into lifecycle. Perhaps barrier rail along entire project and run utilities behind the barrier rail. (Pat) Discuss paying for utility relocation now and in the future. Could result in the huge future cost savings. (Bryan) Somewhat follow the utility line but not be on top of the utility lines. (Pat) Overhead lines are not as big of an impact as the underground utilities. Consider development which may require fiber and other utilities. Team would like to see facility as a high speed roadway between I-80 and US50. Advantages and disadvantages. Developer to "pony up" for additional ROW.

VE11 – Drainage at the high-tee intersection at US50. This is more of "as the project moves along", consider additional analyses regarding sediment and flows. Advantages and disadvantages. Thought is that if future maintenance costs can be reduced, cost of analyses can be reduced.

VE12 – Cut slope stabilization. Thought this may be included in riprap discussion but team decided to split this out. Rather than benching out, looked at installing armoring. Have been used at the I-580. Plus don't want to see big cut scars. Also used on SR 28 –

two-lane road around Lake Tahoe. Original concept shows using slope stabilization in a lot of places. Team suggests that there are areas where slope armoring will not be necessary. Determine during final design as more geotechnical information becomes available. Cost savings of $2.5M could be realized if slope armoring is not used on all places as shown on the current schematic. Look at as design progresses.

Steve – Concludes the presentation. Result was about a 10.7% cost savings. Any questions or comments or discussion? Report will be submitted next week.

Chuck – Wildlife crossing estimate was shy ($50K). Contingency of 5% is low. (Pat) 5% contingency is NDOT minimum. Currently being looked at. (Pedro) Contingency is based on direction from NDOT administration.

(Pat) Overall, pretty good design for 30% design schematic. Drainage may be too far ahead for this point. Suggest making this a more desirable facility at this time, before negotiations.

Bryan Gant – Thank you for your work. Pedro – Yes, thank you for your work.
Steve – It was a team effort. Talked about satisfying function and adding quality.
Bryan – Understood that these questions will probably come up.

Steve Kautz thanked NDOT and the Jacobs design team.

The presentation concluded at approximately 11:40 p.m.

Appendix B

B. VE Study Worksheets

1. VE Study Proposal VE-1 (Construction Phasing)
2. VE Study Proposal VE-1 (Barrier System)
3. VE Study Proposal VE-1 (Type of Access/Facility)
4. VE Study Proposal VE-1 (Pavement Section)
5. VE Study Proposal VE-1 (Alternative Pavement Type)
6. VE Study Proposal VE-1 (Delivery Method)
7. VE Study Proposal VE-1 (Pipe Material)
8. VE Study Proposal VE-1 (Horizontal Alignment)
9. VE Study Proposal VE-1 (Riprap)
10. VE Study Proposal VE-1 (Utility Locations)
11. VE Study Proposal VE-1 (Drainage at US 50)
12. VE Study Proposal VE-1 (Cut Slope Stabilization)

VALUE ENGINEERING PROPOSAL

PROJECT : USA Parkway (SR 439)

LOCATION :

STUDY NO. : VE- 01

STUDY ITEM : Construction Phasing

ITEM'S FUNCTION(S) : Optimize Project

ORIGINAL CONCEPT

Build 4-lane, divided rural facility.

VE CONCEPT

Stay with original concept of full build-out for now. The team thought an interim build condition (2 lanes with truck climbing lanes - Alternative 2) would be worth further investigation. Anticipated 25% cost savings in plant mix (~$5M) implementing Alternative 2.

ADVANTAGES / DISADVANTAGES

Advantages

1 Future costs are less.
2
3
4

Disadvantages

1 Initial cost is more.
2 Higher initial maintenance cost.
3
4

ADDITIONAL NOTES

We recommend the design team investigate the additional cost savings of initial construction and the costs associated with future build-out: saw-cut and removal of plantmix and base, remobilization, traffic control, new plantmix. Also investigated partial interim build-out (divided), partial interim build-out, partial interim build-out (turning/passing lane) and partial interim build-out (divided) and partial interim build-out with partial grading.

COSTS	INITIAL	LIFE CYCLE	TOTAL
ORIGINAL CONCEPT	$0	$0	$0
VE CONCEPT	$0	$0	$0
SAVINGS (rounded)	$0	$0	$0

IMPLEMENTATION COST DETAIL:		
	IMPLEMENTATION COSTS	N/A
	NET SAVINGS	**$0**

VALUE ENGINEERING PROPOSAL

PROJECT : USA Parkway (SR 439)
LOCATION:

STUDY NO. : VE-01
STUDY ITEM : Construction Phasing
ITEM'S FUNCTION(S): Optimize Project

NO.	ALTERNATIVE	DESCRIPTION
1.	Full build-out	4-lane divided arterial, rural section
2.	Partial (interim) build-out (divided)	2-lane divided arterial, rural section with truck climbing lanes, assumes full width grading
3.	Partial (interim) build-out	2-lane arterial, rural section with truck climbing lanes, assumes full width grading
4.	Partial (interim) build-out (turn/passing lane)	2-lane arterial with center turn/passing lane, asumes full width grading
5.	Partial (interim) build-out*	2-lane arterial, rural section with truck climbing lanes, assumes partial width grading
6.	Partial (interim) build-out (turn/passing lane)*	2-lane arterial with center turn/passing lane, asumes partial width grading
7.		
8.	*partial grading	

VALUE ENGINEERING PROPOSAL

PROJECT : USA Parkway (SR 439)

LOCATION:

STUDY NO. : VE-01

STUDY ITEM : Construction Phasing

ITEM'S FUNCTION(S): Optimize Project

CRITERIA	RAW SCORE (WEIGHT)
A Safety	20
B Initial Cost	3
C Maintenance Cost	
D Future Build-out Cost	10
E Stakeholder Support	6
F Continuity of Design	8
G	
H	

How Important

4 - Major preference

3 - Medium preference

2 - Minor preference

1 - Letter/Letter - no preference each scored one point

	B	C	D	E	F	G	H
A	4A	4A	4A	4A	4A		
B	3B	2D	4E	3F			
C	3D	2E	2F				
D	3D	2D					
E	3F						
F							
G							

Note : Drop Criteria with a Raw Score of 1

(Criteria which gets dropped may be considered in Advantages/Disadvantages Analysis)

Fwd: USA

Steve Kautz [slkautz7@gmail.com]

Sent: Monday, October 21, 2013 6:59 PM

To: Daily, Kimberly A.; Price, Chuck

VE-1 Construction Phasing

FYI

Sent from my iPhone

Begin forwarded message:

From: "Hagel, Steven A." <Steven.Hagel@jacobs.com>
Date: October 21, 2013, 3:45:08 PM PDT
To: "'slkautz7@gmail.com'" <slkautz7@gmail.com>
Cc: "Gant, Bryan" <Bryan.Gant@jacobs.com>
Subject: FW: USA

FYI

Steve Hagel, PE | Jacobs | Manager of Projects
775.850.5110 office | 702.813.1664 cell | 775.850.5115 fax
985 Damonte Ranch Parkway, Suite 100, Reno, NV 89521
steven.hagel@jacobs.com

From: Karachepone, John S.
Sent: Monday, October 21, 2013 3:43 PM
To: Hagel, Steven A.
Subject: RE: USA

Daily truck percentage = 24%
In peak commuting hours the truck percentage is half of daily and is 12%

John Karachepone
Jacobs
Project Manager | Transportation, Las Vegas
702.938.5508
702.938.5454 fax
john.karachepone@jacobs.com

www.jacobs.com

From: Hagel, Steven A.
Sent: Monday, October 21, 2013 3:36 PM
To: Karachepone, John S.
Subject: RE: USA

Thanks – what did we determine for % trucks?

Steve Hagel, PE | Jacobs | Manager of Projects
775.850.5110 office | 702.813.1664 cell | 775.850.5115 fax

985 Damonte Ranch Parkway, Suite 100, Reno, NV 89521
steven.hagel@jacobs.com

From: Karachepone, John S.
Sent: Monday, October 21, 2013 3:35 PM
To: Hagel, Steven A.
Subject: USA

Hi Steve:
All the work we did assumed that the project would be built in one single step – ie. In opening year go straight to 4-lane section.
There are a large number of trucks projected.
Highland development is not expected to begin (add traffic to the network) until year 2020.
I did a quick estimate type growth rate test.
Based on just the volumes (truck impact neglected) = we should cross the threshold into needing the 4-lane cross-section about year **2030**.
Of course, a lot depends on how fast Highlands Springs develops, or if they develop at all.
Thanks,
John

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VALUE ENGINEERING PROPOSAL

PROJECT : USA Parkway (SR 439)

LOCATION :

STUDY NO. : VE-01

STUDY ITEM : Construction Phasing

ITEM'S FUNCTION(S) : Optimize Project

SPECULATION - ALTERNATIVES

1. Full build-out
2. Partial (interim) build-out (divided)
3. Partial (interim) build-out
4. Partial (interim) build-out (turn/passing lane)
5. Partial (interim) build-out*
6. Partial (interim) build-out (turn/passing lane)*
7.
8. *partial grading

Note: Alternative Numbers are repeated at top of Matrix.

MATRIX WEIGHTING OF ALTERNATIVES

CRITERIA	WEIGHT	1	2	3	4	5	6	7	8
* Satisfies Function: Construction Phasing	20	5 / 100.0	4 / 80.0	3 / 60.0	3.5 / 70.0	3 / 60.0	3 / 60.0		
Safety	20	5 / 100.0	4 / 80.0						
Initial Cost	3	3 / 9.0	5 / 15.0						
Maintenance Cost									
Future Build-out Cost	10	5 / 50.0	3 / 30.0						
Stakeholder Support	6	4 / 24.0	4 / 24.0						
Continuity of Design	8	5 / 40.0	3 / 24.0						
Desirability Rank / Total Weighted Value	4x67 268	**1** 323.0	**2** 253.0	60.0	70.0	60.0	60.0		

RANK VALUE: 5 = Excellent 4 = Very Good 3 = Good 2 = Fair 1 = Poor

* Satisfies function is a must criteria. Its weight must be equal to or greater than any other.
Total weights x 4 (very good) = Minimum score for an alternative to be a satisfactory solution.

ADVANTAGES/DISADVANTAGES ANALYSIS

RANK	ALT NO	ADVANTAGES	DISADVANTAGES	FINAL RANK
1	1	Shortest total construction time, minimal traffic control, positive public support (travelling)	More difficult to fund	1
2	2	Easier to fund	Higher uncertainty, additional traffic control for ultimate build-out	2
3				3

RECOMMENDED ALTERNATIVE: Stay with original concept of full build-out for now. The team thought this suggestion would be worth further investigation. Based on initial cost, an interim condition may be warranted. We recommend the designer investigate 2-lane facility with truck climbing lanes in lieu of original concept.

VALUE ENGINEERING PROPOSAL

PROJECT : USA Parkway (SR 439)

LOCATION :

STUDY NO. : VE- 02

STUDY ITEM : Barrier System

ITEM'S FUNCTION(S) : Controls Traffic

ORIGINAL CONCEPT

Install 77,295' of concrete barrier rail in various locations.

VE CONCEPT

Alternatives to the barrier rail were looked at: cable rail and guardrail. In the end, cost and proposed cross section dictated of staying with concrete barrier.

ADVANTAGES / DISADVANTAGES

Advantages

1 Lower cost for concrete barrier.
2 Lower maintenance for concrete barrier.
3
4

Disadvantages

1
2
3
4

ADDITIONAL NOTES

Consider constant slope concrete barrier rail.

COSTS	INITIAL	LIFE CYCLE	TOTAL
ORIGINAL CONCEPT	$0	$0	$0
VE CONCEPT	$0	$0	$0
SAVINGS (rounded)	$0	$0	$0

IMPLEMENTATION COST DETAIL:		
	IMPLEMENTATION COSTS	N/A
	NET SAVINGS	**$0**

VALUE ENGINEERING PROPOSAL

PROJECT : USA Parkway (SR 439)

LOCATION:

STUDY NO. : VE-02

STUDY ITEM : Barrier System

ITEM'S FUNCTION(S): Controls Traffic

NO.	ALTERNATIVE	DESCRIPTION
1.	Concrete barrier	77,295' of concrete barrier on both sides including the median
2.	Cable rail	Replace concrete barrier with cable rail in certain locations.
3.		
4.		
5.		
6.		
7.		
8.		

VALUE ENGINEERING PROPOSAL

PROJECT : USA Parkway (SR 439)

LOCATION :

STUDY NO. : VE- 03

STUDY ITEM : Type of Access/Facility

ITEM'S FUNCTION(S) : Carries Traffic

ORIGINAL CONCEPT

4-Lane divided, rural arterial. Future at-grade intersections, 60-mph design speed/55-mph posted speed.

VE CONCEPT

Controlled access facility with frontage roads and interchanges. Controlled access facility was investigated but stayed with original concept of 4-lane divided arterial due to anticipated cost implications and future development ROW impacts.

ADVANTAGES / DISADVANTAGES

Advantages

1 Lower cost
2 Reduced ROW impacts
3
4

Disadvantages

1
2
3
4

ADDITIONAL NOTES

COSTS	INITIAL	LIFE CYCLE	TOTAL
ORIGINAL CONCEPT	$0	$0	$0
VE CONCEPT	$0	$0	$0
SAVINGS (rounded)	$0	$0	$0

IMPLEMENTATION COST DETAIL:		
	IMPLEMENTATION COSTS	N/A
	NET SAVINGS	**$0**

VALUE ENGINEERING PROPOSAL

PROJECT : USA Parkway (SR 439)

LOCATION :

STUDY NO. : VE- 04

STUDY ITEM : Pavement Section

ITEM'S FUNCTION(S) : Support Loads

ORIGINAL CONCEPT

8" of dense grade asphalt pavement on 12" Type 1, Class B aggregate base

VE CONCEPT

Looked at reducing the asphalt pavement and increasing the base but there is concern about pavement performance. Also looked at reducing asphalt on shoulders but concerned about future transverse cracking on roadway. Reduced thickness of asphalt will accelerate future cracking (5-8 years) from the bottom up (fatigue cracking) so the original concept is recommended.

ADVANTAGES / DISADVANTAGES

Advantages

1 Better performance life
2
3
4

Disadvantages

1 Potentially higher cost for original concept
2
3
4

ADDITIONAL NOTES

COSTS	INITIAL	LIFE CYCLE	TOTAL
ORIGINAL CONCEPT	$0	$0	$0
VE CONCEPT	$0	$0	$0
SAVINGS (rounded)	$0	$0	$0

IMPLEMENTATION COST DETAIL:		
	IMPLEMENTATION COSTS	N/A
	NET SAVINGS	**$0**

VALUE ENGINEERING PROPOSAL

PROJECT : USA Parkway (SR 439)

LOCATION :

STUDY NO. : VE- 05

STUDY ITEM : Alternative Pavement Type

ITEM'S FUNCTION(S) : Support Loads

ORIGINAL CONCEPT

8" of dense grade asphalt pavement on 12" Type 1, Class B aggregate base plus wearing course.

VE CONCEPT

Replace asphalt pavement section with 10" PCC pavement on 3" of dense graded asphalt pavement on 6" of base material. Recommendation is to stay with original concept.

ADVANTAGES / DISADVANTAGES

Advantages

1 Lower initial cost of approximately $10M.
2
3
4

Disadvantages

1 Higher rehabilitation and maintenance costs.
2 Rehabilitate asphalt pavement 3 times over 30-year period vs. 2 times for PCC pavement.
3
4

ADDITIONAL NOTES

Initial cost of asphalt pavement is approximately $24M; the initial cost of PCC pavement is approximately $34M. 30-year lifecycle cost for asphalt pavement is approximately $40M including initial cost and rehabilitation. 30-year lifecycle cost for PCC pavement is approximately $39M including initial cost and rehabilitation. Rehabilitation costs discounted 2.8%. Salvage value and user costs are not taken into consideration.

COSTS	INITIAL	LIFE CYCLE	TOTAL
ORIGINAL CONCEPT	$0	$0	$0
VE CONCEPT	$0	$0	$0
SAVINGS (rounded)	$0	$0	$0

IMPLEMENTATION COST DETAIL:		
	IMPLEMENTATION COSTS	N/A
	NET SAVINGS	**$0**

VE-5 – Alternative Pavement Type

13 mi * 5280'/mi = 68640'

120,000 CY

11,500 CY PBS

13 mi * 72'

68,640' * 72'

549120 SY

122026 CY * 27/CY = 244,000

$46/SY

20

$920

+ 3/8 * 20

$54375 PBS

7312500

8812500

549120 SY * 46

$25,259,520 for PBS

+ 1560000 BASE

Initial Cost

= $34,132,020 for PCCP

24,690,000 PBS

Total Initial Cost

– $24M PBS Asphalt Pavement

– $34M PCCP

VE-5 - Alternative Pavement Type

10/23/13

		PBS		PCCP	
~~Original~~ Cost					
Initial Cost ~~Rehab $~~	100 yrs	$4690	40 yrs	$34132	10"
Rehab #1	10	7987	15	4023	2658
Rehab # 2	20	9192	30	4439	2026
Rehab 3	30	10589			
~~Total~~		$40m		$39m	
30-Year Life Cycle Cost ~~Disc~~		$40,664M		$38,817M	
				2.82	

$$f_c = f_i\left(1+\frac{2}{2}\right)^n$$

$$f_i = f_c\left(1+0.028\right)^{\frac{1}{n}}$$

1.028

PBS Rehab

10yr ① $1\frac{1}{2}$" mill, 2" overlay + 0.4

20yr ② 2" mill, $2\frac{1}{2}$" overlay + 0.4

30yr ③ $3\frac{1}{2}$" mill, 3" overlay + 0.4

PCCP Rehab

15yr ① Profile grind, saw & seal spall repair, slab replacement

30yr ② Profile grind, saw & seal spall repair, slab replacement

VALUE ENGINEERING PROPOSAL

PROJECT : USA Parkway (SR 439)
LOCATION :

STUDY NO. : VE- 06
STUDY ITEM : Delivery Method
ITEM'S FUNCTION(S) : Procure Contractor

ORIGINAL CONCEPT

Assumption is design-bid-build.

VE CONCEPT

Recommendation is to deliver the project through a Construction Manager At-Risk (CMAR) contract. Potential for cost savings can not be identified at this time however construction cost savings are anticipated due to reduction of known risks and contractor innovation.

ADVANTAGES / DISADVANTAGES

Advantages

1 Contractor input during design phase allowing for innovation
2 Minimize construction risk
3
4

Disadvantages

1 Higher design cost
2
3
4

ADDITIONAL NOTES

Also investigated design-build (availability payment), design-build-maintain (availability payment) and develop privately.

COSTS	INITIAL	LIFE CYCLE	TOTAL
ORIGINAL CONCEPT	$0	$0	$0
VE CONCEPT	$0	$0	$0
SAVINGS (rounded)	$0	$0	$0

IMPLEMENTATION COST DETAIL:		
	IMPLEMENTATION COSTS	N/A
	NET SAVINGS	**$0**

VALUE ENGINEERING PROPOSAL

PROJECT : USA Parkway (SR 439)
LOCATION:

STUDY NO. : VE-06
STUDY ITEM : Delivery Method
ITEM'S FUNCTION(S): Procure Contractor

NO.	ALTERNATIVE	DESCRIPTION
1.	Design-bid-build (traditional funding)	Tradional delivery, design completed by agency, contractor procured for construction thru bidding process, agency maintained. Funding thru traditional methods (agency).
2.	Design-Build (Availability payment)	Alternative deliver, design and construction completed by contractor procured thru competitive best-value selection, maintained by agency. Funding by contractor paid back over time by agency.
3.	Design-Build-Maintain (Availability payment)	Alternative deliver, design and construction completed by contractor procured thru competitive best-value selection, maintained by contractor. Funding by contractor paid back over time by agency.
4.	CMAR	Alternative delivery, contractor procured thru a competitive qualifications-based process, agency finalizes design with contractor input, contractor builds the project at an agreed price (no change orders). Project is maintained by agency. Funding is thru traditional methods, risk of project cost increasing is eliminated.
5.	Develop privately	Private developer funds, design, constructs and maintains the facility.
6.		
7.		
8.		

VALUE ENGINEERING PROPOSAL

PROJECT : USA Parkway (SR 439)

LOCATION:

STUDY NO. : VE-06

STUDY ITEM : Delivery Method

ITEM'S FUNCTION(S): Procure Contractor

CRITERIA	RAW SCORE (WEIGHT)
A Legality	16
B Cost of implementing delivery method	6
C Quality of product	12
D Alignment of risk	
E Schedule	3
F	
G	
H	

How Important

4 - Major preference

3 - Medium preference

2 - Minor preference

1 - Letter/Letter - no preference each scored one point

	B	C	D	E	F	G	H
A	4A	4A	4A	4A			
B		4C	3B	3B			
C			4C	4C			
D				3E			
E							
F							
G							

Note : Drop Criteria with a Raw Score of 1

(Criteria which gets dropped may be considered in Advantages/Disadvantages Analysis)

VALUE ENGINEERING PROPOSAL

PROJECT : USA Parkway (SR 439)

LOCATION :

STUDY NO. : VE-06

STUDY ITEM : Delivery Method

ITEM'S FUNCTION(S) : Procure Contractor

SPECULATION - ALTERNATIVES

1. Design-bid-build (traditional funding)
2. Design-Build (Availability payment)
3. Design-Build-Maintain (Availability payment)
4. CMAR
5. Develop privately
6.
7.
8.

Note: Alternative Numbers are repeated at top of Matrix.

MATRIX WEIGHTING OF ALTERNATIVES

CRITERIA	WEIGHT	1	2	3	4	5	6	7	8
* Satisfies Function: Delivery Method	16	4 / 64.0	4 / 64.0	4 / 64.0	4 / 64.0	5 / 80.0			
Legality	16	5 / 80.0	3 / 48.0	3 / 48.0	5 / 80.0	5 / 80.0			
Cost of implementing delivery method	6	4 / 24.0	2 / 12.0	1 / 6.0	3 / 18.0	5 / 30.0			
Quality of product	12	4 / 48.0	3 / 36.0	3 / 36.0	5 / 60.0	2 / 24.0			
Alignment of risk									
Schedule	3	3 / 9.0	4 / 12.0	4 / 12.0	3 / 9.0	5 / 15.0			
Desirability Rank / Total Weighted Value	4x53 212	**3** 225.0	172.0	166.0	**1** 231.0	**2** 229.0			

RANK VALUE: 5 = Excellent 4 = Very Good 3 = Good 2 = Fair 1 = Poor

* Satisfies function is a must criteria. Its weight must be equal to or greater than any other.
Total weights x 4 (very good) = Minimum score for an alternative to be a satisfactory solution.

ADVANTAGES/DISADVANTAGES ANALYSIS

RANK	ALT NO	ADVANTAGES	DISADVANTAGES	FINAL RANK
1	4	Contractor's input to design, reduced unexpected costs, strong partnership resulting in improved quality	Higher design cost than traditional delivery	1
2	5	No cost to agency	Potential for not meeting agency standards	2
3	1	Agency control, standard business practice	Apparent low bid	3

RECOMMENDED ALTERNATIVE: In lieu of traditional design-bid-build, recommendation is for Construction Manager At-Risk (CMAR) delivery method. Potential for cost savings due to reduction of known risks and contractor innovation.

VALUE ENGINEERING PROPOSAL

PROJECT : USA Parkway (SR 439)

LOCATION :

STUDY NO. : VE- 07

STUDY ITEM : Pipe Material

ITEM'S FUNCTION(S) : Resist Forces, Pass Flows

ORIGINAL CONCEPT

14,000 LF of various sizes of concrete pipe used for culvert crossings and longitudinal drains, a small amount of HDPE pipe.

VE CONCEPT

Investigated alternative pipe materials for replacing RCP pipe: HDPE, CMP, and PE. Team recommends original concept using RCP due to durability and overall acceptance by NDOT.

ADVANTAGES / DISADVANTAGES

Advantages

1 Fully accepted by NDOT.
2
3
4

Disadvantages

1
2
3
4

ADDITIONAL NOTES

Consider replacing small amount of CMP with PE for embankment protectors which may result in minor cost savings.

COSTS	INITIAL	LIFE CYCLE	TOTAL
ORIGINAL CONCEPT	$0	$0	$0
VE CONCEPT	$0	$0	$0
SAVINGS (rounded)	$0	$0	$0

IMPLEMENTATION COST DETAIL:		
	IMPLEMENTATION COSTS	N/A
	NET SAVINGS	**$0**

VALUE ENGINEERING PROPOSAL

PROJECT : USA Parkway (SR 439)
LOCATION:

STUDY NO. : VE-07
STUDY ITEM : Pipe Material
ITEM'S FUNCTION(S): Resist Forces, Pass Flows

NO.	ALTERNATIVE	DESCRIPTION
1.	Reinforced Concrete pipe (RCP)	14,000 LF of concrete pipe (15" to 48" diameter) primarily used for culvert crossings, minimal amounts of HDPE pipe (12" diameter).
2.	High Density Polyethelyne pipe (HDPE)	Replace all concrete pipe with HDPE pipe.
3.	Corrugated Metal pipe (CMP)	Replace all concrete pipe with CMP.
4.	Flexible Polyethelyne pipe (PE)	Replace all concrete pile with PE pipe.
5.		
6.		
7.		
8.		

VALUE ENGINEERING PROPOSAL

PROJECT : USA Parkway (SR 439)

LOCATION:

STUDY NO. : VE-07

STUDY ITEM : Pipe Material

ITEM'S FUNCTION(S): Resist Forces, Pass Flows

CRITERIA		RAW SCORE (WEIGHT)
A	Load carrying capacity	16
B	Fire resistance	8
C	Cost	1
D	Long-term durability	6
E	Resistance to corrosion	6
F	Ease of installation	1
G		
H		

How Important

4 - Major preference

3 - Medium preference

2 - Minor preference

1 - Letter/Letter - no preference each scored one point

	B	C	D	E	F	G	H
A	4A	3A	3A	2A	4A		
B	3B	1B/1D	2B	2B			
C	2D	2E	1C/1F				
D	1D/1E	2D					
E	3E						
F							
G							

Note : Drop Criteria with a Raw Score of 1

(Criteria which gets dropped may be considered in Advantages/Disadvantages Analysis)

VALUE ENGINEERING PROPOSAL

PROJECT : USA Parkway (SR 439)

LOCATION :

STUDY NO. : VE-07

STUDY ITEM : Pipe Material

ITEM'S FUNCTION(S) : Resist Forces, Pass Flows

SPECULATION - ALTERNATIVES

1. Reinforced Concrete pipe (RCP)
2. High Density Polyethelyne pipe (HDPE)
3. Corrugated Metal pipe (CMP)
4. Flexible Polyethelyne pipe (PE)
5.
6.
7.
8.

Note: Alternative Numbers are repeated at top of Matrix.

MATRIX WEIGHTING OF ALTERNATIVES

CRITERIA	WEIGHT	1	2	3	4	5	6	7	8
* Satisfies Function: Pipe Material	16	5 / 80.0	4 / 64.0	4 / 64.0	3 / 48.0				
Load carrying capacity	16	5 / 80.0	4 / 64.0	4 / 64.0					
Fire resistance	8	5 / 40.0	2 / 16.0	5 / 40.0					
Cost	1	3 / 3.0	4 / 4.0	5 / 5.0					
Long-term durability	6	4 / 24.0	5 / 30.0	3 / 18.0					
Resistance to corrosion	6	4 / 24.0	5 / 30.0	3 / 18.0					
Ease of installation	1	1 / 1.0	5 / 5.0	4 / 4.0					
Desirability Rank / Total Weighted Value	4x54 / 216	**1** / 252.0	**2** / 213.0	**3** / 213.0	48.0				

RANK VALUE: 5 = Excellent 4 = Very Good 3 = Good 2 = Fair 1 = Poor

* Satisfies function is a must criteria. Its weight must be equal to or greater than any other.
Total weights x 4 (very good) = Minimum score for an alternative to be a satisfactory solution.

ADVANTAGES/DISADVANTAGES ANALYSIS

RANK	ALT NO	ADVANTAGES	DISADVANTAGES	FINAL RANK
1	1	Accepted by NDOT		1
2	2		Not fully accepted by NDOT	2
3	3	Accepted by NDOT	Susceptible damage on ends	3

RECOMMENDED ALTERNATIVE: Team recommends using the original concept RCP however, consideration should be given to using PE pipe for embankment protectors and HDPE in limited crossing applications. Small potential cost savings for replacing CMP with PE pipe.

VALUE ENGINEERING PROPOSAL

PROJECT : USA Parkway (SR 439)
LOCATION :
STUDY NO. : VE- 08
STUDY ITEM : Horizontal Alignment
ITEM'S FUNCTION(S) : Define route

ORIGINAL CONCEPT

Horizontal design as per the 30% schematic design - concern regarding the curves in the vicinity of STA 530+00 to the north to the tie-in to existing asphalt at STA 685+00 which may require a lower posted speed (50mph) than the rest of the facility (55mph). Specific concern regarding the horseshoe curve in the vicinity of STA 530+00 to STA 570+00.

VE CONCEPT

Consideration for realignment of north end of alignment to: (1) further straighten curves realigning facility toward the north, away from the existing graded section, (2) straighten south curve of horseshoe curve to the west, cutting through the existing mountain with ultimate goal of increasing posted speed to 55mph.

ADVANTAGES / DISADVANTAGES

Advantages

1 Maintain constant speed throughout the development
2 Improve travel time
3 Improve safety
4

Disadvantages

1 Potential cost increase
2 Requires redesign
3
4

ADDITIONAL NOTES

Potential for excess embankment to be used for other development. Consideration to be given for steeper cut slopes and retaining walls in deep cut areas. Potential increase in initial cost but may result in a safer facility.

COSTS	INITIAL	LIFE CYCLE	TOTAL
ORIGINAL CONCEPT	$0	$0	$0
VE CONCEPT	$0	$0	$0
SAVINGS (rounded)	$0	$0	$0

IMPLEMENTATION COST DETAIL:		
	IMPLEMENTATION COSTS	N/A
	NET SAVINGS	**$0**

VALUE ENGINEERING PROPOSAL

PROJECT : USA Parkway (SR 439)

LOCATION :

STUDY NO. : VE- 09

STUDY ITEM : Riprap

ITEM'S FUNCTION(S) : Prevent erosion

ORIGINAL CONCEPT

Apply riprap for lining ditches (does not include bedding). Approximately 140K CY.

VE CONCEPT

Alternatives to riprap were investigated: concrete lining, vegetative lining, and no lining. Team recommends to reduce 80% of the riprap quantity by eliminating the riprap and substituting with no lining which results in a potential initial savings of ~$3.8M. (140,000 CY * $35/CY * 80%)

ADVANTAGES / DISADVANTAGES

Advantages

1 Lower cost of project
2
3
4

Disadvantages

1 Potential increased risk for washouts
2
3
4

ADDITIONAL NOTES

Potential additional savings could be realized if remaining riprap quantity used was found on site.

COSTS	INITIAL	LIFE CYCLE	TOTAL
ORIGINAL CONCEPT	$4,900,000	$0	$4,900,000
VE CONCEPT	$1,100,000	$0	$1,100,000
SAVINGS (rounded)	$3,800,000	$0	$3,800,000

IMPLEMENTATION COST DETAIL:		
Negligible redesign costs.	IMPLEMENTATION COSTS	N/A
	NET SAVINGS	**$3,800,000**

VALUE ENGINEERING PROPOSAL

PROJECT : USA Parkway (SR 439)
LOCATION:

STUDY NO. : VE-09
STUDY ITEM : Riprap
ITEM'S FUNCTION(S): Prevent erosion

NO.	ALTERNATIVE	DESCRIPTION
1.	Place riprap	Schematic design shows ~140K CY of riprap for ditch lining (not bedding). Assumes that riprap is imported.
2.	Concrete lining	Replace riprap in ditches with concrete paving.
3.	Vegetative lining	Replace riprap in ditches with a vegetative lining in slow flow areas or reshape ditches to result in slower flows that would allow vegetative lining.
4.	No lining	Eliminate riprap.
5.		
6.		
7.		
8.		

VALUE ENGINEERING PROPOSAL

PROJECT : USA Parkway (SR 439)

LOCATION :

STUDY NO. : VE- 10

STUDY ITEM : Utility Locations

ITEM'S FUNCTION(S) : Accommodate services

ORIGINAL CONCEPT

The schematic is showing utilities being placed outside the roadway shoulders in the roadway foreslope on both sides of the road, still within the roadway prism and ditch line.

VE CONCEPT

Team recommends establishing a dedicated utility corridor on both sides of the facility and parallel to the roadway facility outside the required roadway ROW. Suggest possibly increasing the ROW limits on both sides of the facility to accommodate a utility corridor.

ADVANTAGES / DISADVANTAGES

Advantages

1 Reduce utility conflicts
2 Reduce future construction conflicts
3
4

Disadvantages

1 Potential increase in ROW costs
2
3
4

ADDITIONAL NOTES

COSTS	INITIAL	LIFE CYCLE	TOTAL
ORIGINAL CONCEPT	$0	$0	$0
VE CONCEPT	$0	$0	$0
SAVINGS (rounded)	$0	$0	$0

IMPLEMENTATION COST DETAIL:		
	IMPLEMENTATION COSTS	N/A
	NET SAVINGS	**$0**

VALUE ENGINEERING PROPOSAL

PROJECT : USA Parkway (SR 439)
LOCATION :

STUDY NO. : VE- 11
STUDY ITEM : Drainage at US50
ITEM'S FUNCTION(S) : Convey runoff

ORIGINAL CONCEPT

Existing condition - terrain is flat, drainage overflows at US50 and sediment deposits occur. Facilities downstream are not sized adequately to accommodate flow conditions.

VE CONCEPT

This project will cause further impacts to the existing drainage system downstream. Team recommends downstream drainage analysis beyond US50 to Lahontan Reservoir as well as sediment loading and transport analysis to the crossing at US50 to determine the extent of the impacts prior to final design.

ADVANTAGES / DISADVANTAGES

Advantages

1 Possible reduced long term maintenance costs
2 Possible reduction in upstream and downstream impacts to existing system
3 Possible increase in safety for traveling public
4 Possible increase in water quality.

Disadvantages

1 Possible increased initial costs
2 Study cost
3
4

ADDITIONAL NOTES

Future maintenance costs may be significantly reduced and may offset the cost of the analyses if the current conditions can be improved.

COSTS	INITIAL	LIFE CYCLE	TOTAL
ORIGINAL CONCEPT	$0	$0	$0
VE CONCEPT	$0	$0	$0
SAVINGS (rounded)	$0	$0	$0

IMPLEMENTATION COST DETAIL:		
	IMPLEMENTATION COSTS	N/A
	NET SAVINGS	**$0**

VALUE ENGINEERING PROPOSAL

PROJECT : USA Parkway (SR 439)

LOCATION :

STUDY NO. : VE- 12

STUDY ITEM : Cut Slope Stabilization

ITEM'S FUNCTION(S) : Prevent Erosion/Rock Fall

ORIGINAL CONCEPT

Schematic design shows ~72K CY of selected rock slope armoring on cut slopes. It is assumed that the selected rock slope armoring material is imported at $35/CY. No other mitigation measures addressing rock falls are shown in the schematic design.

VE CONCEPT

Team recommends eliminating rock slope armoring pending additional geotechnical investigation.

ADVANTAGES / DISADVANTAGES

Advantages

1 Cost savings up to $2.5M
2
3
4

Disadvantages

1 Increase risks for rock slides or erosion
2
3
4

ADDITIONAL NOTES

Alternatives investigated include: eliminate slope armor, install rock fall fence and revise cut slopes (flatter).

COSTS	INITIAL	LIFE CYCLE	TOTAL
ORIGINAL CONCEPT	$2,500,000	$0	$2,500,000
VE CONCEPT	$0	$0	$0
SAVINGS (rounded)	$2,500,000	$0	$2,500,000

IMPLEMENTATION COST DETAIL:		
No redesign costs.	IMPLEMENTATION COSTS	N/A
	NET SAVINGS	**$2,500,000**

VALUE ENGINEERING PROPOSAL

PROJECT : USA Parkway (SR 439)
LOCATION:

STUDY NO. : VE-12
STUDY ITEM : Cut Slope Stabilization
ITEM'S FUNCTION(S): Prevent Erosion/Rock Fall

NO.	ALTERNATIVE	DESCRIPTION
1.	Slope armoring	Schematic design shows ~72K CY of selected rock slope armoring.
2.	Eliminate slope armoring	No additional material on cut slopes in certain areas.
3.	Install rock fall fence	Include rock fall fence in certain areas.
4.	Revise cut slopes (flatter)	Flatten cut slopes in certain areas depending on existing geotechnical conditions.
5.		
6.		
7.		
8.		