



Value Analysis Report

*FLATHEAD RIVER –
3M NW OF BIG FORK
BR 82-1(5)5
CN 6850*

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Construction Engineering Services Bureau

JANUARY 2014



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Section I

Executive Summary



Development Phase – Executive Summary	
Project: BR 82-1(5)5	CN: 6850
Location: FLATHEAD RIVER-3M NW BIG FORK	Date: JAN. 27 - 31, 2014

INTRODUCTION:

The existing steel bridge known as the "Sportsman's Bridge" provides access across the Flathead River between the towns of Bigfork and Somers. The bridge and road were constructed in 1955. The roadway was widened in 2005. The existing road section has a 31.5 foot top width consisting of two 12-foot lanes and two 3.75-foot shoulders. The existing pavement section consists of approximately 6 inches of plant mix surfacing and approximately 18 inches of crushed base course. Beginning at RP 5.0 and heading west, the existing typical widens to a 40-foot top width. The road is functionally classified as a Rural Minor Arterial.

The bridge is located at a transition between flat terrain located to the west and rolling hills located to the east. The area in the project vicinity is generally rural with farm land located west of the bridge. Residences are located to the north east of the bridge. A fishing access site and the Hanging Rock Subdivision are located to the south and east of the bridge.

The existing bridge is 686 feet in length with a 29' -4" out-to-out width. The structure consists of four main steel girder spans and a concrete approach span located at each end of the structure. The three main piers in the river are solid wall piers founded on timber piling. Cofferdams and unreinforced concrete seals were used to construct the piers.

PROPOSED CONSTRUCTION FEATURES:

- Two 12' Lanes, 8' shoulders and Turning Lanes
 - Grading
 - Gravel – Crushed Aggregate Course (CAC)
 - Plant Mix Surfacing
 - New Bridge (3 Span, 735' 8" Long, 51' 2.5" Wide)
 - 2 – 12' Lanes and 2 - 8' Shoulders
 - Includes 9' wide Shared Use Path
 - Dedicated left and right turn lanes at Hanging Rock Drive
 - New Right of Way
 - Fishing Access Site Mitigation

PROPOSED SCOPE OF WORK AT THE AGR STAGE:

The proposed scope of work is to replace the existing bridge and approaches to the structure over the Flathead River on MT P-82 at RP 5.58. The project begins at RP 5.0 and proceeds east to RP 6.4. The structure is functionally obsolete based on deck width and ADT. The structure also ranked high for seismic retrofit because it is a fracture critical two-girder system. The project alignment is to be shifted to the south as determined by MDT through a risk assessment and public input.



Development Phase – Executive Summary - continued	
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The alignment shift will impact the Montana Fish, Wildlife and Park (FWP) fishing access site (FAS) located at the south east corner of the bridge. Impacts to the fishing access site are subject to Section 4(f) review. The FAS road will be rerouted to connect to Hanging Rock Road. A slip right turn lane will be added to Highway 82 at Hanging Rock Road. The current posted speed limit on the roadway is 70 mph. The design speed selected for the project in the Preliminary Field Review Report (PFR) is 55 mph, noting that this is appropriate for a rural minor arterial in rolling terrain. Flathead County and FWP have requested that a shared use path be included with the project as part of the Flathead County's master trail plan. The path will be provided along the north side of the bridge and will taper into the roadway shoulder beyond the guardrail runs at each end of the bridge.

CONSTRAINTS:

- Fish Wildlife and Parks – fishing access site
- Environmental issues
- Right of Way acquisition shown as high risk

CONSIDERATIONS:

- New offset alignment
- Liquefaction may occur during a high seismic event at the end bents
- Deep Water Foundation constructability
- Flathead County Master Trail Plan

FINDINGS AND RECOMMENDATIONS:

1A - New Alignment or Existing- Evaluate Bridge Foundation Types

1B - New Alignment – Evaluate Ground Improvements Beneath Approach Embankments

2A - Existing Alignment – With Detour Bridge During Construction

2B - Existing Alignment – With Road Closure During Construction

3A - Either Alignment – Eliminate Shared Use Path

3B - Either Alignment – Design For Future Expansion For Shared Use Path



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POTENTIAL CONSTRUCTION COST SAVINGS #1A & #2B & #3B: \$ 4,990,000
(This is the VA Team's Recommendation)

POTENTIAL CONSTRUCTION COST SAVINGS #1A & #1B & #3B: \$ 3,810,000

POTENTIAL CONSTRUCTION COST SAVINGS #1A & #2A & #3B: \$ 3,110,000

CONST. COST SAVINGS	\$ 4.99M
W/MOBILIZATION (23%)	\$ 6.14M
W/CONTINGENCY (15%)	\$ 7.06M
W/CE (10%)	\$ 7.77M
W/IDC (9.12%)	\$ 8.48M
R/W SAVINGS	\$ 1.25M

TOTAL POTENTIAL COST SAVINGS: \$ 9.73 Million

POTENTIAL COST SAVINGS: #1A & #1B & #3B: \$ 7.72 M

POTENTIAL COST SAVINGS: #1A & #2A & #3B: \$ 6.53 M

DESIGN COMMENTS:

- DC # 1 – Floating Detour Bridge
- DC # 2 – Incentive/Disincentive Construction Schedule
- DC # 3 – National Bid Advertisement
- DC # 4 – Bid Alternatives
- DC # 5 – Prequalified Contractors
- DC # 6 – Innovating Contracting

VALUE ADDED IDEAS:

- Add lighting or conduit to shared use path along the structure
- Extend the separated path along the length of the project to include the fishing access

ACKNOWLEDGEMENTS:

The VA would like to acknowledge and thank Kevin Malone and the consultant, Morrison Maierle, Inc., for gathering all the project information and presenting the project to the VA Team at the beginning of the study.



Section II

VA Study Worksheet



Value Analysis – Study Identification			
Project: BR 82-1(5)5		CN: 6850	
Location: FLATHEAD RIVER-3M NW BIG FORK		Date: JAN. 27 - 31, 2014	
VA Team Members			
Name	Title	Organization	Phone
Chuck Nemfakos	Innovative Contracting Eng.	MDT – CES Bureau	444-9323
Rich Dombrowski	Geotechnical Engineer	Tetra Tech	543-3045
Greg Gabel	Hydraulic Engineer	DOWL HKM	869-6312
Stephanie Brandenberger	Bridge Engineer	MDT – Bridge (GTF)	444-7675
Shane Pegram	Bridge Reviewer	MDT – CES Bureau	444-6289
Drew Sielbach	Structures Engineer	FHWA	441-3907
Mathew Mogstad	Civil Eng. Specialist IV	MDT – Road Design	444-6231
Ray Sacks	Constructability Reviewer	MDT – CES Bureau	523-5827
Gerry Brown	Constructability Reviewer	MDT – CES Bureau	538-1325

Project Description	
Length: 1.4 Miles	Projected Traffic: 5600 ADT-2014 & 8000 ADT-2034
Design Speed: 55 MPH	Funding Type: BR
Project Award Date: 2015	Cost: \$ 24.3M W/DC

MAJOR PROJECT ELEMENTS:

Route Condition and Geometry
<p>The existing steel bridge known as the "Sportsman's Bridge" provides access across the Flathead River between the towns of Bigfork and Somers. The bridge and road were constructed in 1955. The roadway was widened in 2005. The existing road section has a 31.5 foot top width consisting of two 12-foot lanes and two 3.75-foot shoulders. The existing pavement section consists of approximately 6 inches of plant mix surfacing and approximately 18 inches of crushed base course. The existing bridge has a 24 foot top. Beginning at RP 5.0 and heading east to RP 6.4, the existing typical widens to a 40-foot top width. The route connects to Highway 93 at Somers to the west and Highway 35 east of the project. The road is functionally classified as a Rural Minor Arterial.</p> <p>The bridge is located at a transition between flat terrain located to the west and rolling hills located to the east. The area in the project vicinity is generally rural with farm land located west of the bridge. Residences are located to the north east of the bridge. A fishing access site and the Hanging Rock Subdivision are located to the south and east of the bridge.</p>



Investigation Phase – Sources	
Project: BR 82-1(5)5	CN: 6850
Location: FLATHEAD RIVER-3M NW BIG FORK	Date: JAN. 27 - 31, 2014

Authorizing Persons			
Name	Title	Organization	Phone
Ed Toavs	District Administrator	MDT – MSLA	523-5800
Shane Stack	District Preconstruction Eng.	MDT – MSLA	523-5830
Robert Vosen	District Construction Eng.	MDT – MSLA	751-2020
Ben Nunnallee	District Projects Engineer	MDT – MSLA	523-5846
Jim Walther	Preconstruction Engineer	MDT - Helena	444-6005
Paul Ferry	Highways Engineer	MDT – Helena	444-6244
Kevin Christensen	Construction Engineer	MDT – Helena	444-6008
Gene Kaufman	Operations Engineer	FHWA	441-3915
Dwane Kailey	Chief Engineer	MDT - Helena	444-6414
Kevin Malone	Consultant Design Eng.	MDT – Helena	444-9369

Personal Contacts			
Name	Title	Organization	Phone
Kevin Malone	Consultant Project Engineer	MDT	444-9369
Charlie Brisko	Project Manager	MMI	495-3442
Jim Scoles	Senior Structure Engineer	MMI	495-3443
Jake Gunther	Road Design	MMI	442-3050
Greg Zeihen	Surfacing Engineer	MDT	444-6707
Darin Reynolds	Pavement Design Engineer	MDT	444-7650
Fred Beal	Bridge Reviewer	MDT	444-9232
Justin	Engineer	Flexi Float	713-468-1706
Gabe Priebe	Traffic Design Section Supervisor	MDT	444-5446
Ivan Ulberg	Traffic Design Engineer	MDT	444-6217
Rick Ferreira	Bridging	Mabey Bridge	916-996-6223
Bill Tamietti	President	Tamietti Const.	727-4922



Investigation Phase – Sources	
Project: BR 82-1(5)5	CN: 6850
Location: FLATHEAD RIVER-3M NW BIG FORK	Date: JAN. 27 - 31, 2014

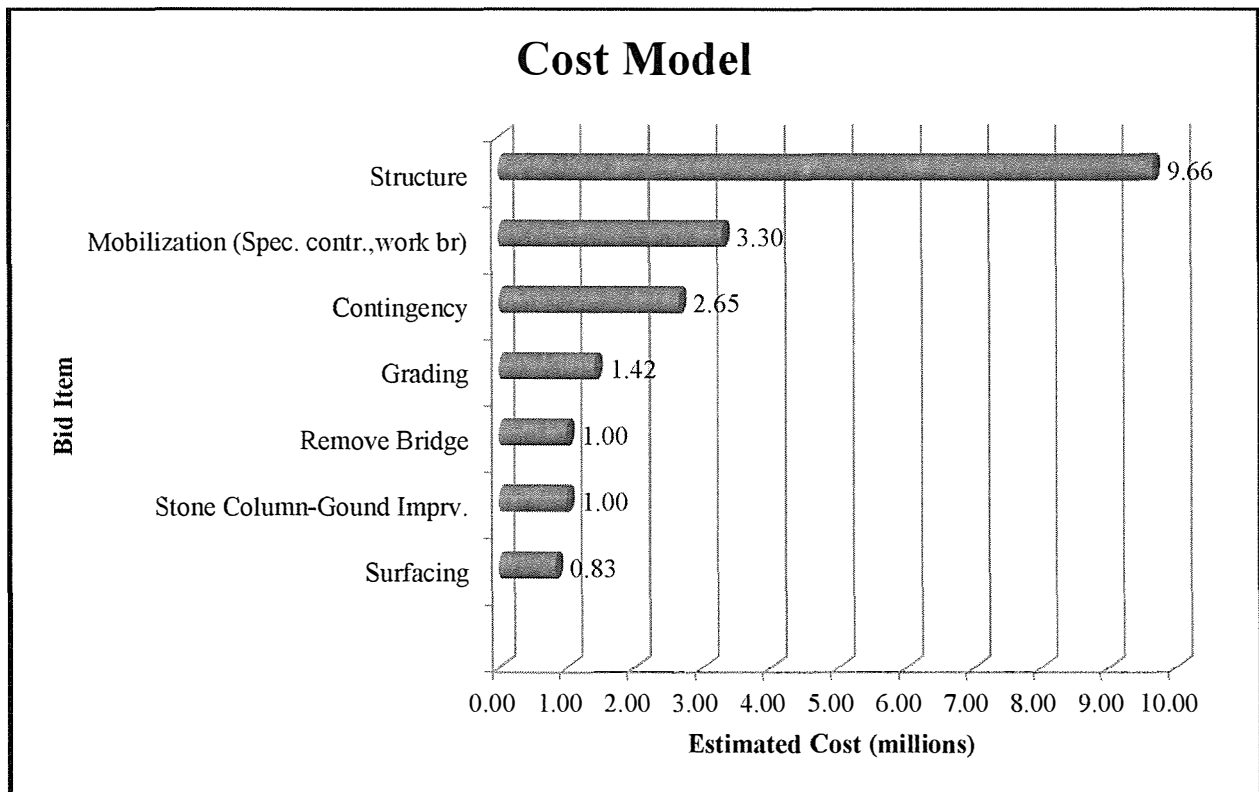
Documents and Abstracts	
References	Notes
Preliminary Findings Report (PFR)	October 2009
Traffic Noise Impact Assessment	May 2012
Scoping Meeting Minutes	June 2012
Traffic Analysis	October 2012
Preliminary Hydraulics Report	February 2013
Structure Selection Memo	February 2013
Alignment and Grade Review (AGR)	July 2013
Project Estimate	September 2013
Biological Resources Report (BRR)	October 2013
Soil Survey & Geotechnical Work	January 2014



Investigation Phase – Cost Model	
Project: BR 82-1(5)5	CN: 6850
Location: FLATHEAD RIVER-3M NW BIG FORK	Date: JAN. 27 - 31, 2014

Construction Cost (in millions)		\$20.32		
Bid Item	Cost (in millions)	Percent Of Total Cost	Running Total	Running Percent
Structure	9.66	47.5%	9.66	47.5%
Mobilization	3.30	16.2%	12.96	63.8%
Contingency	2.65	13.0%	15.61	76.8%
Grading	1.42	7.0%	17.03	83.8%
Remove Bridge	1.00	4.9%	18.03	88.7%
Stone Column-Gound Imprv.	1.00	4.9%	19.03	93.7%
Surfacing	0.83	4.1%	19.86	97.7%

* Mobilization includes Work Bridge, Specialty Contractor



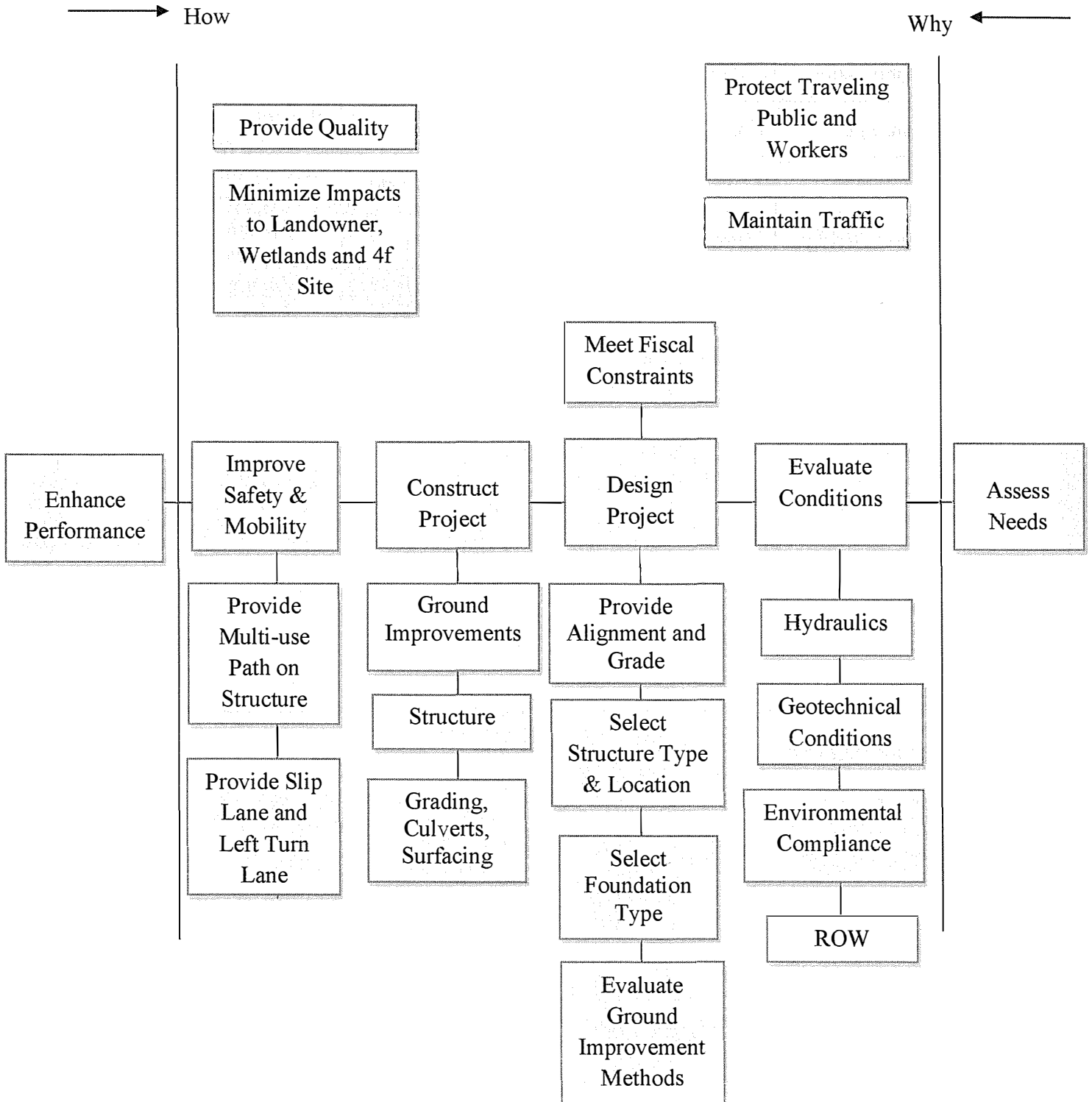


Investigation Phase – Function Analysis	
Project: BR 82-1(5)5	CN: 6850
Location: FLATHEAD RIVER-3M NW BIG FORK	Date: JAN. 27 - 31, 2014

Item #	Description	Function		Cost (in millions)	Worth (in millions)	Comments
		Verb	Noun			
A	Structure	Cross	River	9.66	8.00	Review Foundation Type, Detour Structure
B	Mobilization	Establish	Construction Methods	3.30	2.75	% Reduction on items shown
C	Contingency	Mitigates	Unknowns	2.65	2.65	Possible % Reduction on items shown
D	Grading	Establish	Grade	1.42	1.00	Reduce quantity thru realignment
E	Remove Bridge	Eliminate	Obstacle	1.00	0.75	Foundation removal elevation
F	Stone Columns	Improve	Soil	1.00	0.75	Review method
G	Surfacing	Supports	Traffic	0.83	0.75	Reduce quantity
	TOTALS			19.86	16.65	



Investigation Phase – FAST Diagram	
Project: BR 82-1(5)5	CN: 6850
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Speculation Phase – Brainstorming	
Project: BR 82-1(5)5	CN: 6850
Location: FLATHEAD RIVER-3M NW BIG FORK	Date: JAN. 27 - 31, 2014

Final#	Temp#	Brainstorming Idea	Function
	1	Rehabilitate and Widen in PFR	
	2	Do Nothing	
A	3	Evaluate Bridge Foundation Types	A,B,C
B	4	Close Road During Construction	A,B,C,D,E,F,G
C	5	Use Existing Alignment w/detour Bridge	A,B,C,D,E,F,G
D	6	Eliminate Shared Use Path	A,B,C,D,G
E	7	Design Bridge for Future Shared Use Path	A,B,C,D,G
F	8	Evaluate Ground Improvements Beneath Approach Embankments	A,B,C,F
	9	Evaluate Bridge Location	
	10	Shift Alignment to North side of PTW	
	11	Relocate Fishing Access West Side	
G	12	Evaluate Super Structure Types	A,B,C,D,G
	13	Tunnel under River	
	14	Evaluate Deck Type	
	15	Pulverize and widen PTW	
	16	Notch, Widen and Overlay	
	17	Eliminate Slip and Turn Lanes	
	18	Eliminate Fishing Access Realignment	
	19	Extend Project limits to the east	
	20	Ferry Boat	
	21	Leave Existing Bridge for Pedestrian Walkway	
	22	Floating Bridge Design	
	23	Draw Bridge	
	24	Floating Detour Bridge – DC # 1	
	25	Eliminate Special Borrow	
H	26	Accelerated Bridge Design	A,B,C,E
	27	Incentive/Disincentive Construction Schedule –DC # 2	
	28	National Bid Advertisement – DC # 3	
	29	Relocate P-82	
	30	Light Weight Fill	
	31	Bid Alternatives – DC # 4	
	32	Micro piles	
	33	Prequalified Contractors –DC # 5	
	34	Innovating Contracting – DC # 6	
I	35	Surfacing Treatment – combines idea # 15,16, 25	B,D,G
J	36	Geometric Evaluation – combines idea # 11,17,18,19,37	A,B,C,D,E,F,G
	37	Steeper Inslopes	



Evaluation Phase						
Project: BR 82-1(5)5				CN: 6850		
Location: FLATHEAD RIVER-3M NW BIG FORK				Date: JAN. 27 - 31, 2014		
Temp #	Perm #	Creative Idea Listing	Idea Evaluation		Idea Rating	
			Advantages	Disadvantages		
A	Proposed Alignment or Existing 1A	Evaluate Bridge Foundation Types	Cost Savings, Seismic Performance, Constructability, Improve Design With Static Load Test	Increased Mobilization	4	Stephanie, Rich, Drew
B	Existing Alignment 2B	Use Existing Alignment with Road Closure During Construction	Cost Savings, Reduced Construction Time, Minimizes Foot Print, Use Existing Structure for Work Bridge	Public Inconvenience, Traffic Control – Advanced Signing	3	Matt, Shane, Greg
C	Existing Alignment 2A	Use Existing Alignment w/detour Bridge	Cost Savings, Reduced Construction Time, Minimizes Foot Print, Use Existing Structure for Work Bridge, Reduces Need for Ground Improvement, Reduces Risk	Detour Bridge Cost	5	Matt, Shane, Greg
D	Either Alignment 3A	Eliminate Shared Use Path	Decreases Bridge Cost, Minimizes Footprint, Enables Work Bridge Location	Public Interest, May not Comply With Future County Trail Master Plan	3	Chuck
E	Either Alignment 3B	Design Bridge for Future Shared Use Path	Decreases Bridge Cost, Minimizes Footprint, Enables Work Bridge Location	Public Interest, May not Comply With Future County Trail Master Plan, Future Design & Construction Costs	2	Chuck



Evaluation Phase						
Project: BR 82-1(5)5				CN: 6850		
Location: FLATHEAD RIVER-3M NW BIG FORK				Date: JAN. 27 - 31, 2014		
Temp #	Perm #	Creative Idea Listing	Idea Evaluation		Idea Rating	
			Advantages	Disadvantages		
F	Proposed 1B & Existing 2A	Evaluate Ground Improvements Beneath Approach Embankments	Cost Savings, Constructability, Reduces Risk	Possible Construction Monitoring Costs, May Increase Construction Time/Sequencing	5	Rich, Drew, Stephanie
G		Evaluate Super Structure Types	Cost Savings, Reduce Piers, Reduce Footprint, May Improve Grade, Improved Hydraulics, Improves Boater Safety	May be Fracture Critical	2	
H	Combine w/2B	Accelerated Bridge Design	Reduced Construction Time	May Increase Costs	3	Include with B
I	Existing Alignment - Combine w/2A or 2B	Surfacing Treatment – Combines Idea # 15,16, 25	Recycles Existing Materials, Cost Savings		3	Include with B or C
J	Existing Alignment - Combine w/2A or 2B	Geometric Evaluation – Combines Idea # 11,17,18,19,37	Reduces Cost, Reduces Footprint, Meets Design Criteria	Unknown 4f Impacts	3	Include with B or C

- 1 = New Alignment
 2 = Existing Alignment
 3 = Either Alignment



Development Phase - Recommendations	
Project: BR 82-1(5)5	CN: 6850
Location: FLATHEAD RIVER-3M NW BIG FORK	Date: JAN. 27 - 31, 2014
Recommendation #1A – New Alignment or Existing - Evaluate Bridge Foundation Types	

ORIGINAL DESIGN:

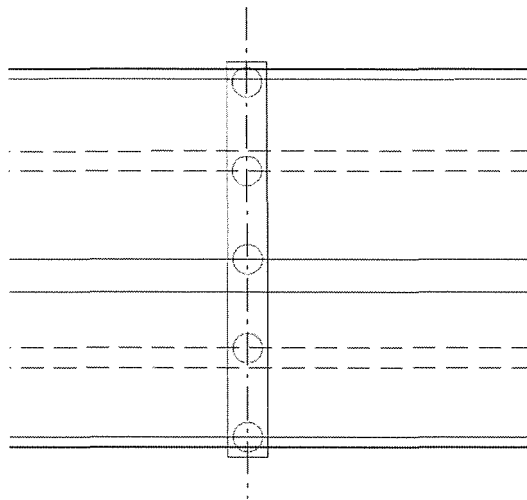
The original foundation design is pile founded piers installed with a cofferdam and seal. Piles would be 24" diameter x 1/2" wall thickness steel pipe piles.

RECOMMENDED DESIGN:

5-48" diameter x 1" wall thickness steel pipe piles

JUSTIFICATION:

- Eliminates need for cofferdam
- Improves constructability
- Reduces potential environmental impacts
- Reduces construction time
- Reduces costs
- Reduces contractor risk compared with other foundation options



5-48" diameter x 1" wall thickness steel pipe piles. 3D spacing.

POTENTIAL COST SAVINGS = \$2.20 M



Development Phase – Calculations	
Project: BR 82-1(5)5	CN: 6850
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Recommendation #1A – New Alignment or Existing - Evaluate Bridge Foundation Types	

QUANTITIES AND COSTS

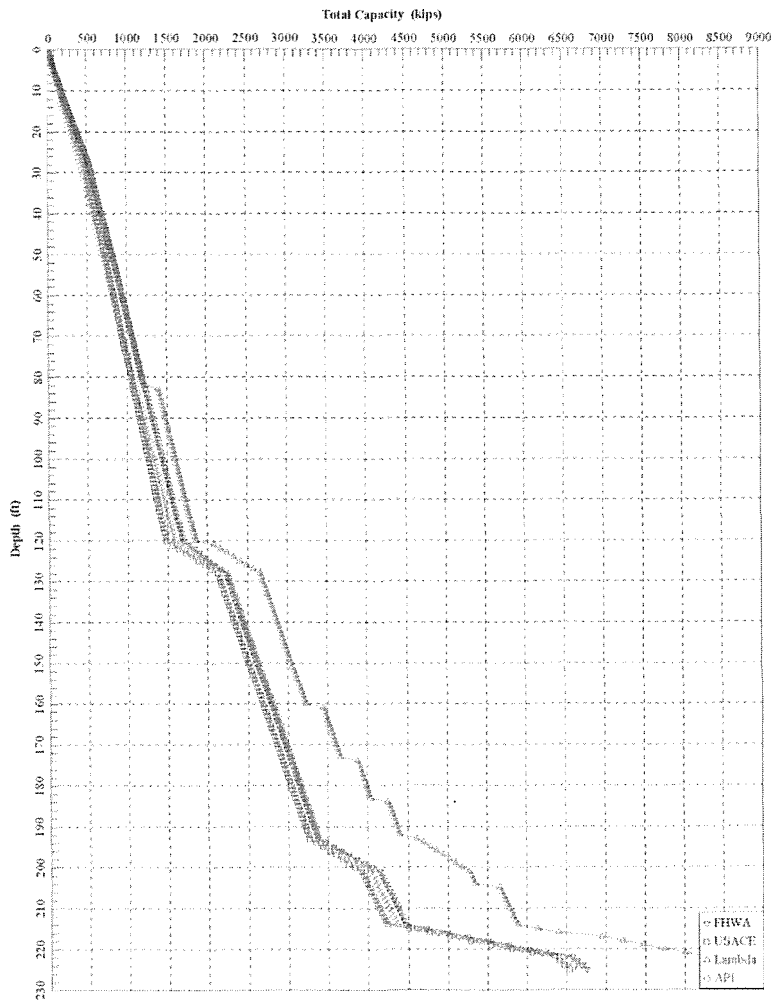
Pipe Pile Diameter (in)	Wall Thickness (in)	End Area of Steel (sq. in)	Steel Strength - fy (psi)	Design Strength - Strength (0.33)x fy	Required Allowable Load per Bent (lbs)	Estimated Number of Piles required Per Bent	Design Number of Piles per Bent	Length of each Pile at Bent 2 from Deck to Bedrock +5 feet (ft)	Length of each Pile at Bent 3 from Deck to Bedrock +5 feet (ft)	Total Pile Length at Bent 2 (ft)	Total Pile Length at Bent 3 (ft)	Total Pile Length at River Piers (ft)	Cost per foot of Pile (\$)	Total Cost of Pile	Cost to Drive Pile Per Day	Pile Driving Production - days per pile	Total Days Required to Drive Pile	Total Cost of Pile Driving and Drive Hammer	Mobilization of Equipment - to Cranes and Pile Driving and Drive Hammer	Total Cost
24	0.5	36.9	50,000	16,500	8,000,000	13.1	7.0	220	257	1,540	1,799	3,339	\$153	\$510,867	\$5,000	2	28	\$140,000	\$140,000	\$790,867
24	0.75	54.8	50,000	16,500	8,000,000	8.8	5.0	220	257	1,100	1,285	2,385	\$417	\$994,545	\$10,000	3	30	\$300,000	\$140,000	\$1,434,545
48	1	148	50,000	16,500	8,000,000	3.3	3.0	220	257	660	771	1,431	\$661	\$945,891	\$15,000	5	30	\$450,000	\$140,000	\$1,535,891
72	1.25	278	50,000	16,500	8,000,000	1.7														
72	1.5	332	50,000	16,500	8,000,000	1.5														

Cost Estimate does not include:
 - cost to drill out plug for rebar placement
 - rebar or concrete placed in pile following driving



Development Phase – Calculations	
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Recommendation #1A –New Alignment or Existing - Evaluate Bridge Foundation Types	

PILE CAPACITY 4' PILE

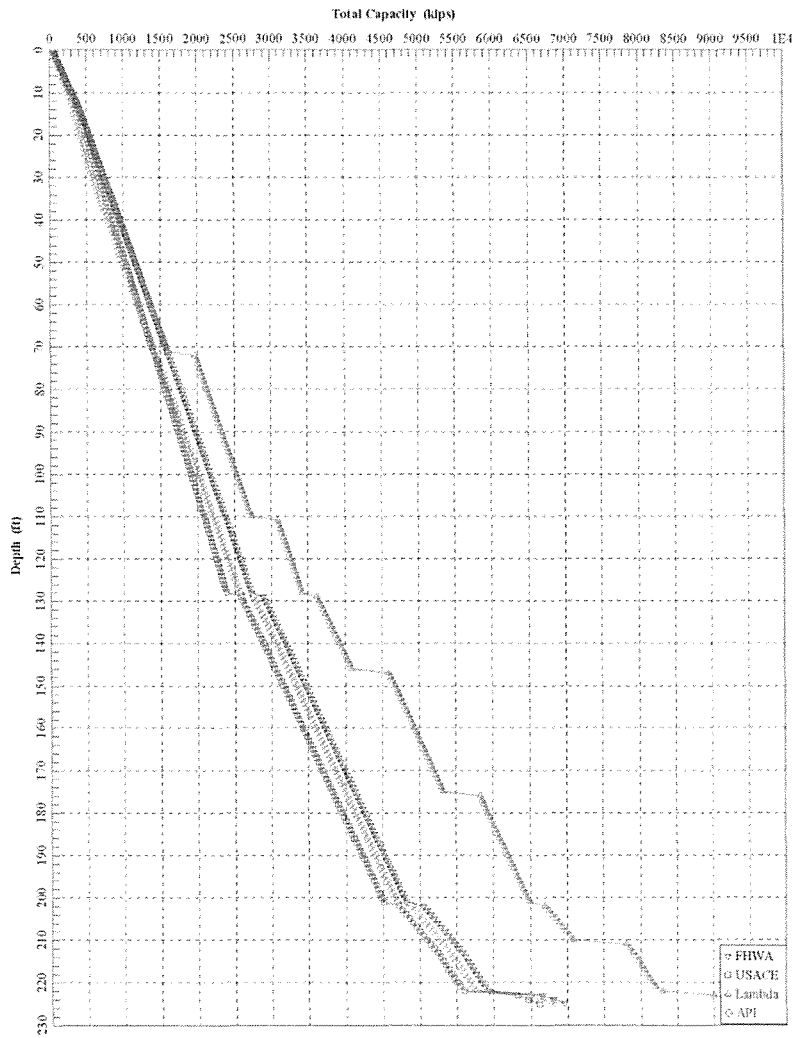


ST-103 Location: 4 foot Pipe Piles - 1.25" Wall thickness - Driven to Bedrock at 222 feet



Development Phase – Calculations	
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Recommendation #1A – New Alignment or Existing - Evaluate Bridge Foundation Types	

PILE CAPACITY 6' PILE



ST-103 Location: 6-foot Pipe Piles - 1.25" Wall thickness - Driven to Bedrock at 222 feet



Development Phase - Recommendations	
Project: BR 82-1(5)5	CN: 6850
Location: FLATHEAD RIVER-3M NW BIG FORK	Date: JAN. 27 - 31, 2014
Recommendation #1B – New Alignment – Evaluate Ground Improvements Beneath Approach Embankments – Compaction Grouting	

ORIGINAL DESIGN (Sketches Attached – No):

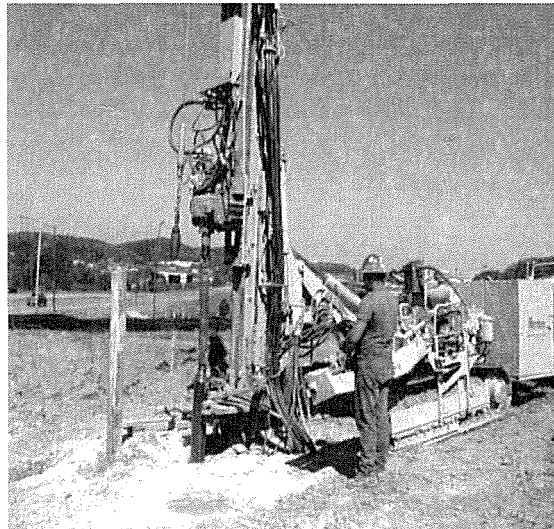
Stone columns used to mitigate potential for liquefaction and lateral spreading at both abutments.

PROPOSED CHANGES:

Improve the soil properties at both abutments using compaction grouting.

JUSTIFICATION:

Compaction grouting improves soil density and increases soil strength. Anticipated reduced mobilization cost and less equipment, can limit treatment to target zone in soil profile, can stage grout pattern/ hole layout as needed. This process will have a decreased construction time over the original design.

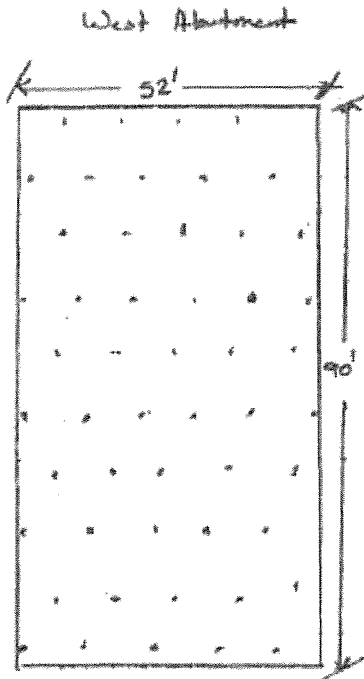


POTENTIAL COST SAVINGS = \$0.7M

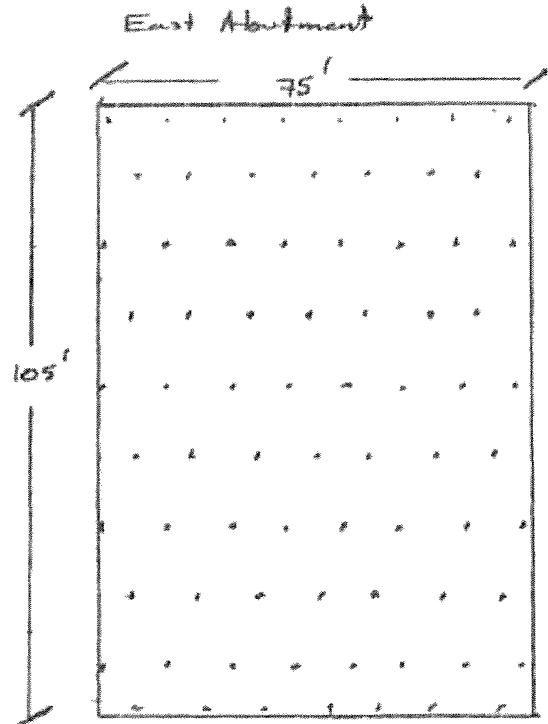


Development Phase - Calculations	
Project: BR 82-1(5)5	CN: 6850
Location: FLATHEAD RIVER-3M NW BIG FORK	Date: JAN. 27 - 31, 2014
Recommendation #1B - New Alignment - Evaluate Ground Improvements Beneath Approach Embankments - Compaction Grouting	

1" - 30'



8 to 10' spacing
 Depth 20'
 Linear Footage $55 \times 20' = 1100'$



8 x 10' spacing
 Depth 40'
 Linear Footage $75 \times 40' = 3000'$

Costs

- 1) Mobilization \$20,000
- 2) Installation \$50 to 60.00 / linear ft
 - a) West abutment = \$66,000
 - b) East abutment = \$180,000

Total \$266,000

say \$300,000

Grout, 900psi
 4 to 5^{1/2} ft borehole
 less equipment to make
 3' size spacing depending
 on your take



Development Phase – Calculations	
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Recommendation #1B – New Alignment – Evaluate Ground Improvements Beneath Approach Embankments – Compaction Grouting	

Compaction Grouting

Off-Alignment

- Mobilization – Less equipment: drill, grout plant, compressor
- Limit grout to target zones in profile
- Stage spacing of boreholes – typical 8'-10' spacing
- Grout approximately 300 psi – yeild 4 to 5 ft³ / lineal ft of borehole
- West End Bent Area 52' x 90' depth 20' – 55 holes. 1100'
- East End Bent Area 75' x 105' depth 40' – 75 holes 3000'
- Production = 1 hole per 1 to 2 hours
- Costs
 - Mobilization = \$20,000
 - Installation = \$266,000
 - West 1100' * \$60/ft = \$66,000
 - East 3000' * \$60/ft = \$180,000
 - Total = \$266,000 * 1.15 = \$300,000

On-Alignment

- Condition soil below fill
- Mobilization – same equipment
- Drill can penetrate embankment fill and be installed below embankment prism
- Since site is preconsolidated – fewer boreholes and greater spacing
- Stage drilling
- Higher overburden confinement – can grout higher pressure if necessary

Cost Difference = Original \$1.00 M - Proposed \$0.30M = Savings \$0.70M



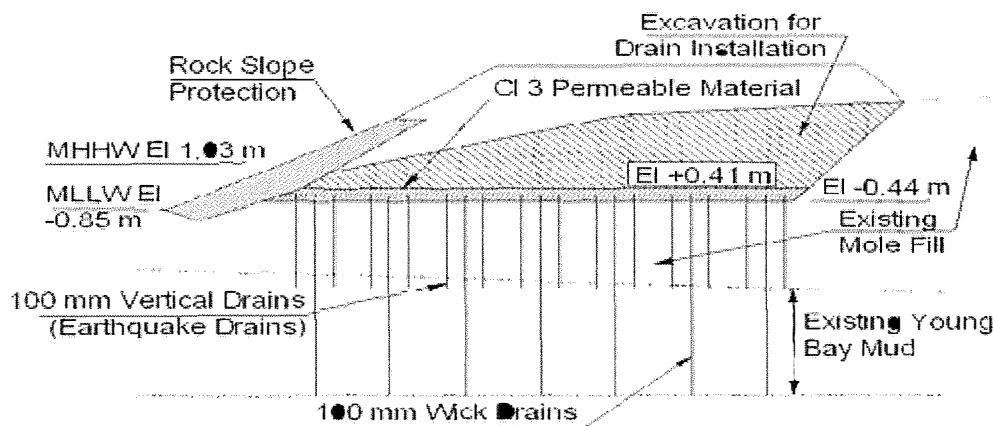
Development Phase – Recommendations	
Project: BR 82-1(5)5	CN: 6850
Location: FLATHEAD RIVER-3M NW BIG FORK	Date: JAN. 27 - 31, 2014
Recommendation #1B – New Alignment – Evaluate Ground Improvements Beneath Approach Embankments	

ORIGINAL DESIGN:

Not addressed

RECOMMENDED DESIGN:

Install wick drains and then a soil preload with surcharge to consolidate soft soil layers at the abutments.



JUSTIFICATION:

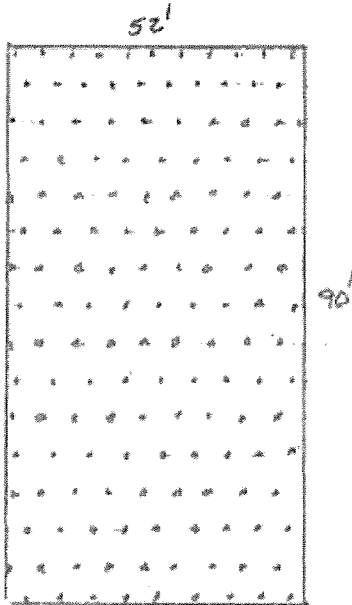
- Pre-consolidation of the abutment subgrade soil will increase soil density through consolidation and increase soil strength.
- Decreases time rate of settlement and reduce potential for future approach embankment settlement through surcharge preload resulting in an improved ride and reduced maintenance.
- Anticipate reduced mobilization costs and less equipment.
- Expected reduced time of embankment construction versus original proposal.
- Can be supplemented with perforated plastic earthquake drains.

POTENTIAL COST SAVINGS = \$0.85M



Development Phase - Calculations	
Project: BR 82-1(5)5	CN: 6850
Location: FLATHEAD RIVER-3M NW BIG FORK	Date: JAN. 27 - 31, 2014
Recommendation #1B - New Alignment - Evaluate Ground Improvements Beneath Approach Embankments - Wick Drains, Surcharge and Earthquake Drains	

West Abutment



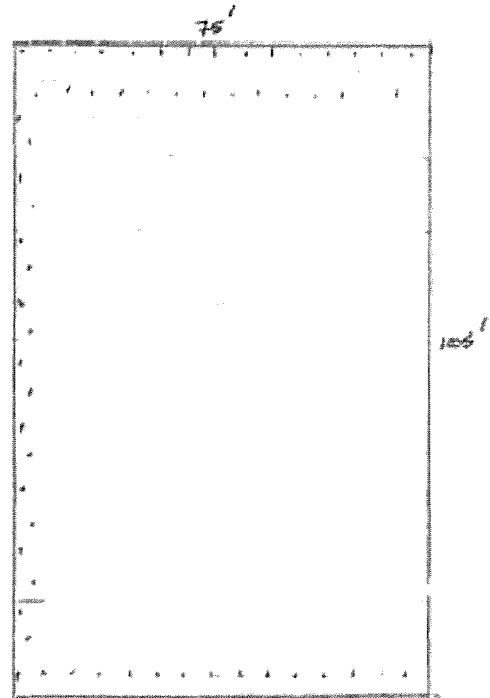
5' Spacing
 Depth 40'
 $160 \times 40 = 6400 \text{ LF}$
 $\$6.75/\text{LF install cost}$
 $= 43200$

Costs Wick Drains
 a) West abutment 43200
 b) East Abutment 74500
 Total 117700
 say 15% cont
 total \$135,500

Earthquake Drains

$\approx 690,000$ per End Bent estimate from contractor/supplier
HB Drain

East Abutment



5' Spacing
 $15 @ 10/\text{row} = 150$
 $9 \times 14/\text{row} = 126$
 276
 $276 \times 40 = 11040 \text{ LF}$
 $11040 \text{ LF} \times 6.75/\text{LF} = 74500$



Development Phase –Calculations	
Project: BR 82-1(5)5	CN: 6850
Location: FLATHEAD RIVER-3M NW BIG FORK	Date: JAN. 27 - 31, 2014
Recommendation #1B – New Alignment – Evaluate Ground Improvements Beneath Approach Embankments – Wick Drains, Surcharge and Earthquake Drains	

Wick Drains, Surcharge

Off-Alignment

- Mobilization – Less equipment
- West End Bent Area 52' x 90' depth 40' – 160 wicks 6,400'
- East End Bent Area 75' x 105' depth 40' – 275 wicks 11,000'
- Accelerates consolidation settlement
- Densify sand, increase effective stress in
- Spacing 5'-6' apart
- Costs
 - Installation
 - West 6,400' * \$6.75/ft = \$43,200
 - East 11,000' * \$6.75/ft = \$74,500
 - Total = \$117,700 * 1.15 = \$135,550

Cost Difference = Original \$1.00 M - Proposed \$0.15M = Savings \$0.85M

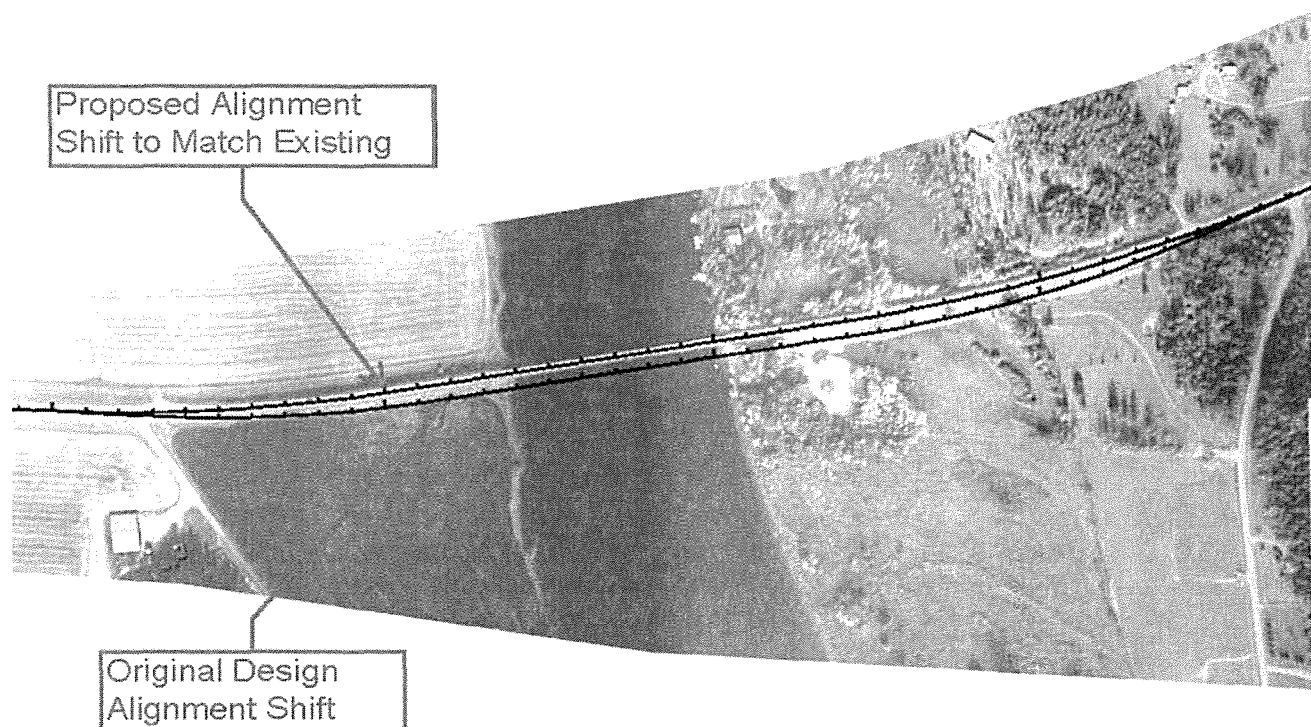
Earthquake Drains

- Supplemental seismic protection
- Perforated plastic pipe sheathed with geotextile
- Install to depth and spacing
- Dissipates pore pressure during seismic event
- Installed by Caltrans on many projects
- Total cost is \$180,000 - cost per end bent is \$90,000 (supplier provided information)



Development Phase - Recommendations	
Project: BR 82-1(5)5	CN: 6850
Location: FLATHEAD RIVER-3M NW BIG FORK	Date: JAN. 27 - 31, 2014
Recommendation #2A –Existing Alignment – With Detour Bridge During Construction	

ORIGINAL & PROPOSED DESIGN:



JUSTIFICATION:

Moving the proposed alignment to the existing alignment will reduce unclassified borrow material, eliminate the need for special borrow by increasing the crushed aggregate course slightly, ROW costs and impacts to fishing site access.

ADVANTAGES:

- Reduces Borrow material
- Minimized Ground Improvements
- Time savings
- Ability for an accelerated schedule
- Minimized ROW Impacts

DISADVANTAGES:

- Detour around site
- Cost of Detour Bridge

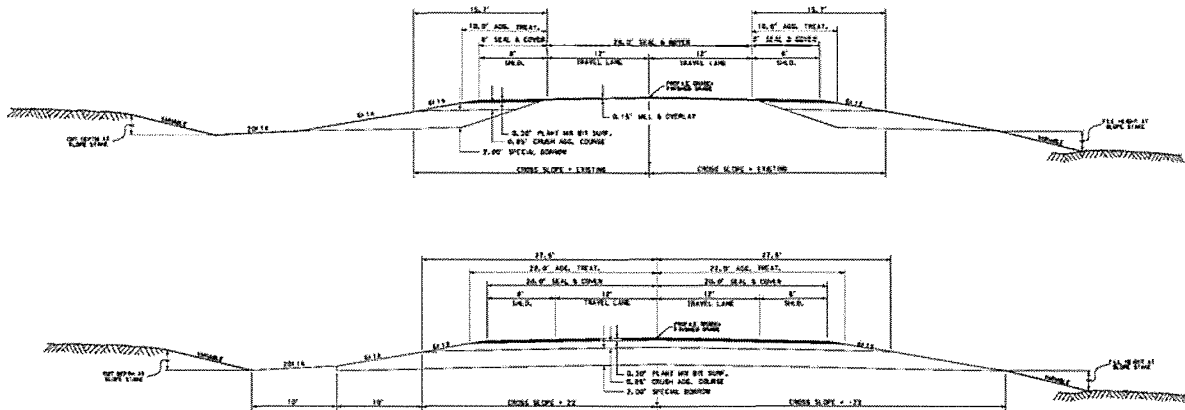


Development Phase – Sketches	
Project: BR 82-1(5)5	CN: 6850
Location: FLATHEAD RIVER-3M NW BIG FORK	Date: JAN. 27 - 31, 2014
Recommendation #2A – Existing Alignment – With Detour Bridge During Construction	

ORIGINAL DESIGN:

The original design is a 0.15' mill/fill with an overlay and widen of 0.30' of PMS over 0.85' of CAC with a subsurface of 2.0' of special borrow at the ends of the project. When the design alignment leaves the existing alignment, a full reconstruct with the same surfacing recommendation minus the mill/fill is proposed up to the bridge ends. The original design also calls for standard slope flattening and ditch sections.

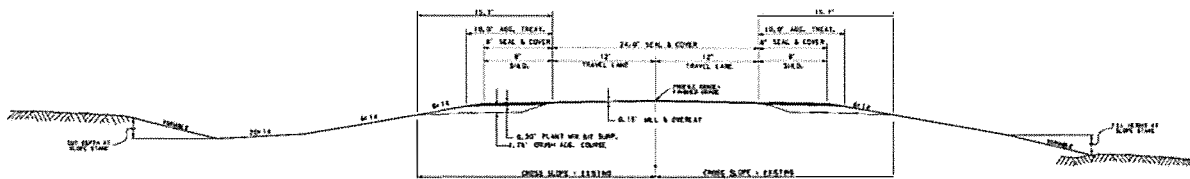
TYPICAL SECTIONS



RECOMMENDED DESIGN:

The recommended design is to stay on existing alignment and stick with the overlay and widen. The surfacing recommendation is 0.15' mill/fill and with an overlay and wide on 0.30' of PMS over 1.75' of CAC. The special borrow can be eliminated for this recommendation. The slope flattening can also be changed to a barn roof section with 6:1 slopes to the clear zone and 2:1 slopes at the hinge point for the fill sections of the project. Standard ditch sections will also be used for the cut sections.

PROPOSED TYPICAL SECTIONS





Development Phase – Calculations	
Project: BR 82-1(5)5	CN: 6850
Location: FLATHEAD RIVER-3M NW BIG FORK	Date: JAN. 27 - 31, 2014
Recommendation #2A – Existing Alignment – With Detour Bridge During Construction	

Original:

Item Number	Quantity	Description	Unit	Average Bid Prices		Adjusted Unit Prices	
				Unit Price	Amount	Unit Price	Amount
				Dollars	Dollars	Dollars	Dollars
203020200	156885	EXCAVATION-UNCLASS BORROW	CUYD	\$5.22	\$818,940.00	\$5.50	\$862,868.00
203020310	31095	SPECIAL BORROW-NEAT LINE	CUYD	\$15.00	\$466,425.00	\$12.16	\$378,115.00
301020340	10981	CRUSHED AGGREGATE COURSE	CUYD	\$23.87	\$262,116.00	\$26.57	\$291,765.00
301020625	32487	AGGREGATE TREATMENT	SQYD	\$0.39	\$12,670.00	\$0.43	\$13,969.00
301020718	34850	COVER-TYPE 1	SQYD	\$0.55	\$19,168.00	\$0.52	\$18,122.00
401020045	6553	PLANT MIX SURF GR S-3/4 IN	TON	\$29.70	\$194,624.00	\$29.21	\$191,413.00
402020092	354	ASPHALT CEMENT PG 64-28	TON	\$685.05	\$242,508.00	\$693.01	\$245,326.00
402020368	63	EMULSIFIED ASPHALT CRS-2P	TON	\$602.16	\$37,936.00	\$607.24	\$38,256.00
					\$2,054,387.00		\$2,039,834.00

Proposed

Item Number	Quantity	Description	Unit	Average Bid Prices		Adjusted Unit Prices	
				Unit Price	Amount	Unit Price	Amount
				Dollars	Dollars	Dollars	Dollars
203020200	50470	EXCAVATION-UNCLASS BORROW	CUYD	\$5.22	\$263,453.00	\$5.50	\$277,585.00
301020340	8845	CRUSHED AGGREGATE COURSE	CUYD	\$23.87	\$211,130.00	\$26.57	\$235,012.00
301020625	17237	AGGREGATE TREATMENT	SQYD	\$0.39	\$6,722.00	\$0.43	\$7,412.00
301020718	33271	COVER-TYPE 1	SQYD	\$0.55	\$18,299.00	\$0.52	\$17,301.00
401020045	4971	PLANT MIX SURF GR S-3/4 IN	TON	\$29.70	\$147,639.00	\$29.21	\$145,203.00
402020092	269	ASPHALT CEMENT PG 64-28	TON	\$685.05	\$184,278.00	\$693.01	\$186,420.00
402020368	56.6	EMULSIFIED ASPHALT CRS-2P	TON	\$602.16	\$34,082.00	\$607.24	\$34,370.00
411010000	18501	COLD MILLING	SQYD	\$1.52	\$28,122.00		\$28,122.00
					\$893,725.00		\$931,425.00

Cost Difference = Original \$2,039,834 - Proposed \$931,425 = Savings \$1,108,409



Development Phase –Calculations	
Project: BR 82-1(5)5	CN: 6850
Location: FLATHEAD RIVER-3M NW BIG FORK	Date: JAN. 27 - 31, 2014
Recommendation #2A – Existing Alignment – With Detour Bridge During Construction	

Right of Way Calculations:

Parcel ^[1]	Average of Min and Max Risk Cost ^[1]	Area Impacted	Risk Cost Per Acre	Most Likely Risk Cost ^[1]	Area Impacted	Risk Cost Per Acre
3	\$102,000	0.82	\$124,390	\$120,000	0.82	\$146,341
4	\$550,000	0.75	\$733,333	\$850,000	0.75	\$1,133,333
5	\$250,000	0.85	\$294,118	\$250,000	0.85	\$294,118
Average of All Three Parcels			\$383,947			\$524,597
Average of Parcels 3 & 4			\$209,254			\$220,230

[1] Cost based on Flathead River - 3 Mi. NW Big Fork Right-of-Way Risk Assessment

Assumed Cost per Acre Ranges from \$210,000 to \$524,597

Average Cost per Acre = \$367,000

Right-of-Ways Savings from staying on existing roadway alignment.

West Side of bridge
1.9 acres

East Side of bridge
1.5 acres

Total Acreage =	3.4	acres
-----------------	-----	-------

Right-of-Way Savings =	\$1,250,000
(3.4 acres x \$367,000 per acre)	



Development Phase – Calculations	
Project: BR 82-1(5)5	CN: 6850
Location: FLATHEAD RIVER-3M NW BIG FORK	Date: JAN. 27 - 31, 2014
Recommendation #2A – Existing Alignment – With Detour Bridge During Construction	

FWP BOAT RAMP SAVINGS FROM USING THE EXISTING ALIGNMENT

Moving the alignment back onto existing PTW will still impact the boat ramp next to the existing roadway.

Cost Associated with replacing this boat ramp only. All costs were based on a 90% engineer estimate on a Stipek Fishing Access Site (FWP #7113717), a similar boat ramp/parking site.

Cost for replacement of the single boat ramp.

Items	Units	Quantity	Unit Price	Total
Clearing & Grubbing	LS	1	\$3,000	\$3,000
Boat Ramp	LS	1	\$30,000	\$30,000
Gravel	CY	150	\$20	\$3,000
			Subtotal	\$36,000
			Unlisted Items	10% \$4,000
			TOTAL	\$40,000

Total cost for the boat ramp improvements

Stipek Boat Ramp Total Cost = \$182,000 but included a 1 miles gravel access road

Remove 3,000 CY from the Gravel Cost at \$20/Cy = \$60,000

Remove Mobilization Cost \$16,500

Used a total cost of Boat Ramp replacement \$105,000

\$105,000 - \$35,000 =

\$70,000

FWP Boat Ramp Saving if we keep on existing PTW = \$70,000

Roadwork = \$1.11 M, Soil Improvements = \$ 0.70M, Boat Ramp = \$0.07 M

Right of Way = \$1.25 M - not included in CN (construction costs)

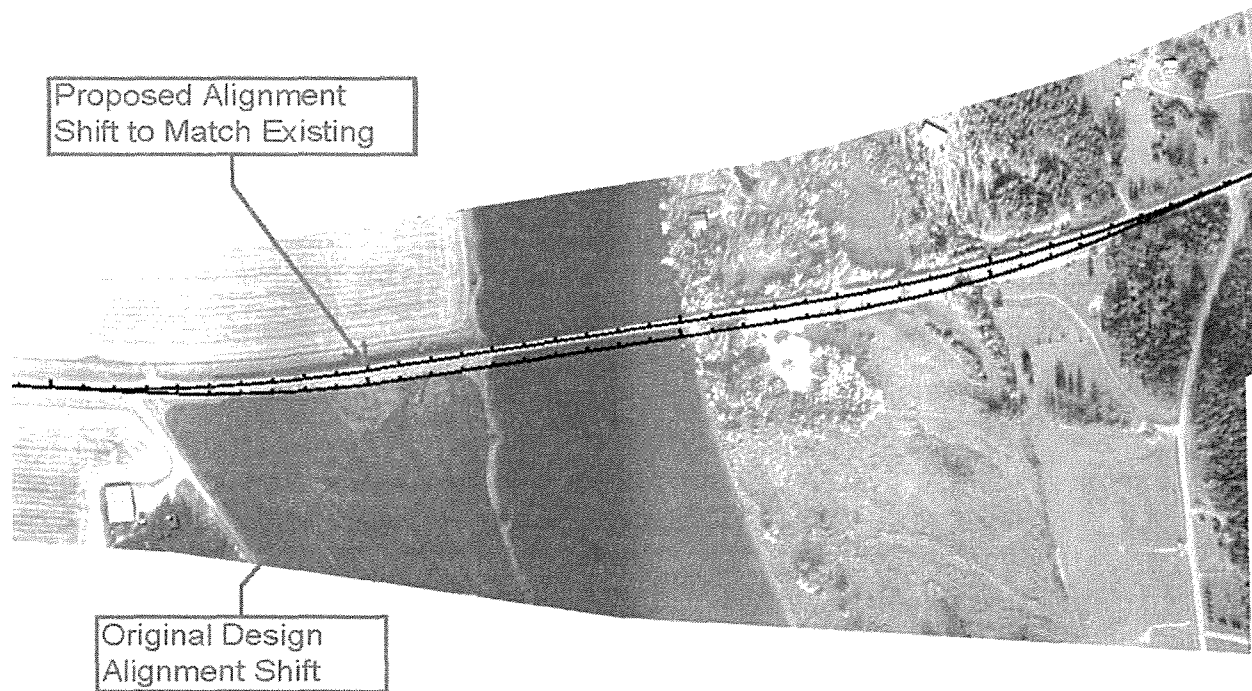
Detour Bridge = (\$ 1.75)

Potential Cost Savings = Value Added



Development Phase - Recommendations	
Project: BR 82-1(5)5	CN: 6850
Location: FLATHEAD RIVER-3M NW BIG FORK	Date: JAN. 27 - 31, 2014
Recommendation #2B – Existing Alignment – With Road Closure During Construction	

ORIGINAL & PROPOSED DESIGN:



JUSTIFICATION:

Moving the proposed alignment to the existing alignment will reduce unclassified borrow material, eliminate the need for special borrow by increasing the crushed aggregate course slightly, ROW costs and impacts to fishing site access.

ADVANTAGES:

- Reduces Borrow material
- Minimized Ground Improvements
- Time savings
- Ability for an accelerated schedule
- Minimized ROW Impacts

DISADVANTAGES:

- Detour around site

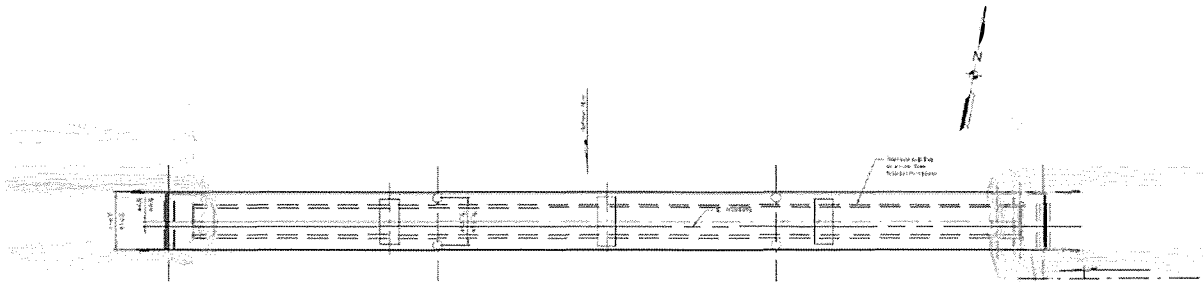


Development Phase – Recommendations	
Project: BR 82-1(5)5	CN: 6850
Location: FLATHEAD RIVER-3M NW BIG FORK	Date: JAN. 27 - 31, 2014
Recommendation #2B – Existing Alignment – With Road Closure During Construction	

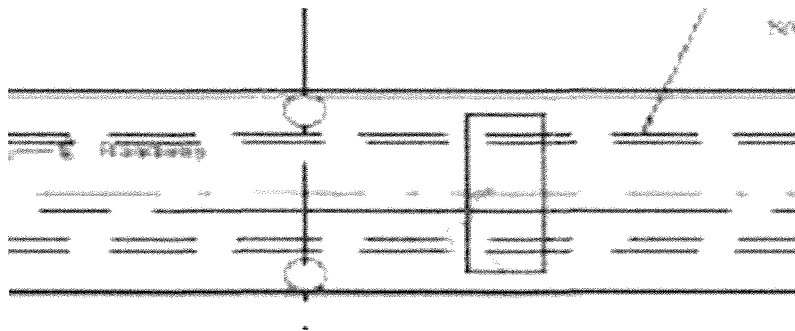
RECOMMENDED DESIGN:

Minimize road closure:

- Accelerated Schedule
 - Incentive/Disincentive
- Accelerated Bridge Construction Methods
 - Construct foundations both sides of the existing structure prior to closure
 - Precast Bent 2 and 3 caps
- Schedule Letting Date to coincide construction during minimum traffic
 - June, July and August are peak traffic counts
 - Start no-closure bridge construction during peak traffic
 - Coincides with low bull trout counts
 - Begin closure in September



Construct Exterior Piles on Outside of Existing Structure



Roadwork = \$1.11 M, Soil Improvements = \$ 0.70M, Boat Ramp = \$0.07 M

Right of Way = \$1.25 M - not included in CN (construction costs)

Potential Cost Savings = \$1.88 M



Development Phase - Recommendations	
Project: BR 82-1(5)5	CN: 6850
Location: FLATHEAD RIVER-3M NW BIG FORK	Date: JAN. 27 - 31, 2014
Recommendation #3A – Either Alignment – Eliminate Shared Use Path	

ORIGINAL DESIGN:

Includes an 9' wide shared use path

PROPOSED CHANGES:

Eliminate shared use path

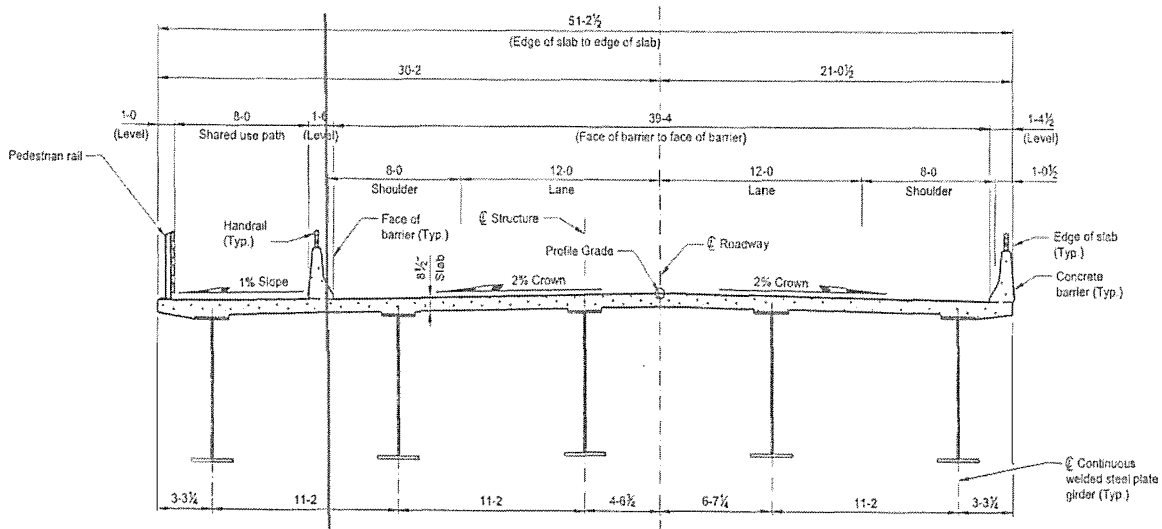
JUSTIFICATION:

Advantages

- Cost savings

Disadvantages

- Does not fit with Flathead County Master Plan



Estimated Cost = 735L * 9W = 6615 SF * \$250/SF = \$1.65 M

Potential Cost Savings = \$1.65 M



Development Phase - Recommendations	
Project: BR 82-1(5)5	CN: 6850
Location: FLATHEAD RIVER-3M NW BIG FORK	Date: JAN. 27 - 31, 2014
Recommendation #3B – Either Alignment – Design For Future Expansion For Shared Use Path	

ORIGINAL DESIGN:

Includes an 9' wide shared use path

PROPOSED CHANGES:

Build bridge foundation and superstructure to accommodate future Shared Use Path. Construct Path when trail connection is constructed.

JUSTIFICATION:

Advantages

- Cost savings
- Fits with Flathead County Master Plan

Disadvantages

- Does not construct trail now

Potential Cost Savings = $735L * 9W = 6615 SF * \$130/SF = \$0.91 M$



Cantilevered Path on the Yellowstone River

Potential Cost Savings = \$0.91 M



Development Phase – Summary of Cost Savings	
Project: BR 82-1(5)5	CN: 6850
Location: FLATHEAD RIVER-3M NW BIG FORK	Date: JAN. 27 - 31, 2014

POTENTIAL CONSTRUCTION COST SAVINGS #1A & #2B & #3B: \$ 4,990,000
(This is the VA Team's Recommendation)

POTENTIAL CONSTRUCTION COST SAVINGS #1A & #1B & #3B: \$ 3,810,000

POTENTIAL CONSTRUCTION COST SAVINGS #1A & #2A & #3B: \$ 3,110,000

CONST. COST SAVINGS	\$ 4.99M
W/MOBILIZATION (23%)	\$ 6.14M
W/CONTINGENCY (15%)	\$ 7.06M
W/CE (10%)	\$ 7.77M
W/IDC (9.12%)	\$ 8.48M
R/W SAVINGS	\$ 1.25M

TOTAL POTENTIAL COST SAVINGS: \$ 9.73 Million

POTENTIAL COST SAVINGS: #1A & #1B & #3B = \$ 7.72 M
 POTENTIAL COST SAVINGS: #1A & #2A & #3B = \$ 6.53 M

DESIGN COMMENTS:

- DC # 1 – Floating Detour Bridge
- DC # 2 – Incentive/Disincentive Construction Schedule
- DC # 3 – National Bid Advertisement
- DC # 4 – Bid Alternatives
- DC # 5 – Prequalified Contractors
- DC # 6 – Innovating Contracting

VALUE ADDED IDEAS

- Add lighting or conduit to shared use path along the structure
- Extend the separated path along the length of the project to include the fishing access



Section III

Presentation



Flathead River – 3 M NW Big Fork

BR 82-1(5)5

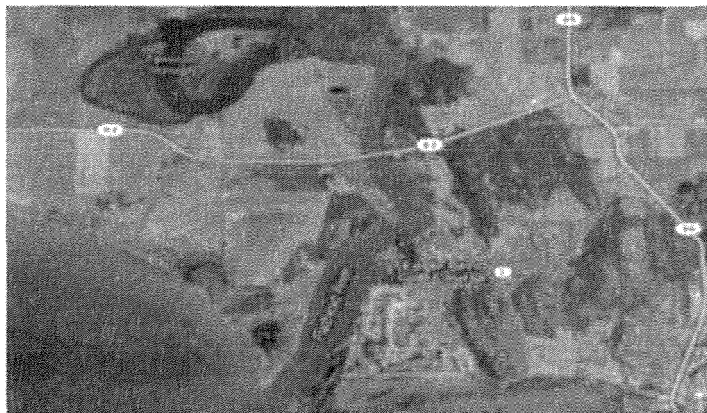
CN: 6850

January 27 – 31, 2014

VA STUDY PRESENTATION

INTRODUCTION

- OPENING REMARKS (Jake Goettle – VA Engineer)
- PRESENTATION (VA Study Team Members)





AGENDA

- VA TEAM MEMBERS
- PROJECT OVERVIEW – HISTORY
- CONSTRAINTS/CONSIDERATIONS
- VA STUDY RECOMMENDATIONS
- SUMMARY OF RECOMMENDATIONS
- DESIGN COMMENTS
- QUESTIONS/COMMENTS

VA TEAM MEMBERS

- Chuck Nemfakos, MDT – CES Bureau (Team Leader)
- Rich Dombrowski, Tetra Tech – Geotechnical Engineer
- Greg Gabel, DOWL HKM – Hydraulic Engineer
- Stephanie Brandenberger, MDT – Bridge Engineer
- Shane Pegram, MDT – Bridge Reviewer
- Mathew Mogstad, MDT – Civil Eng. Specialist IV-Road Design
- Drew Sielbach, FHWA – Structures Engineer

Facilitators

- Gerry Brown, MDT – CES Bureau
- Ray Sacks, MDT – CES Bureau

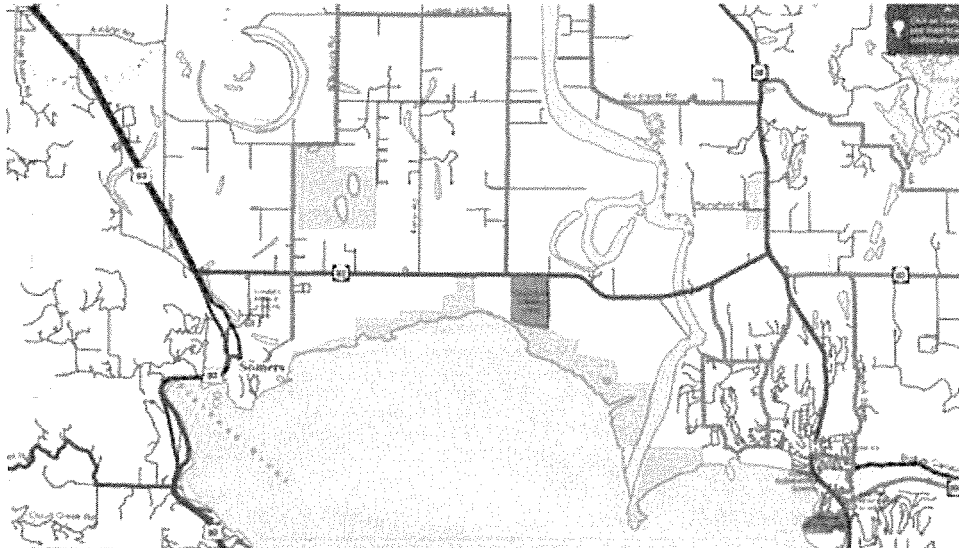


PROJECT OVERVIEW - HISTORY

History

- PFR – October 2009
- Scoping Meeting Minutes – June 2012
- AGR – July 2013
- Project Estimate – September 2013
- Biological Resources Report – October 2013
- Soil Survey & Geotechnical Work – January 2014

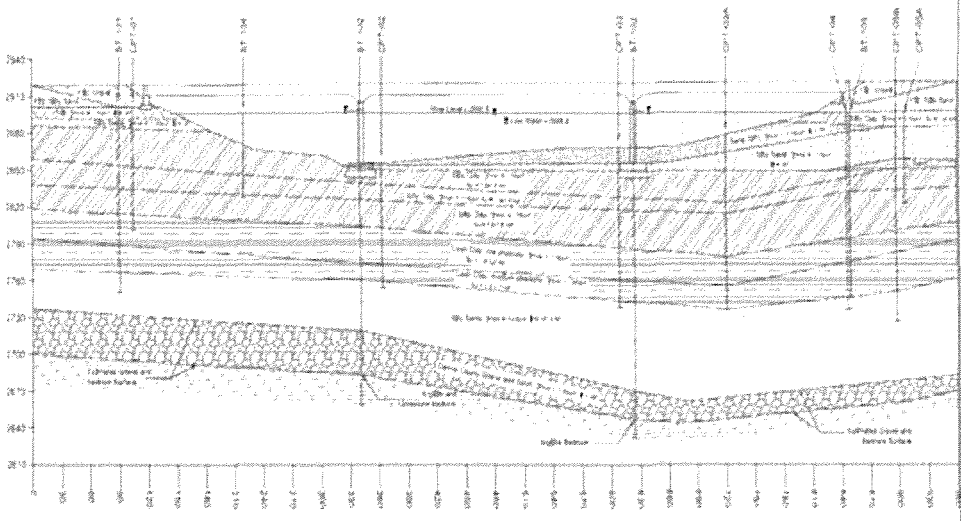
MAP



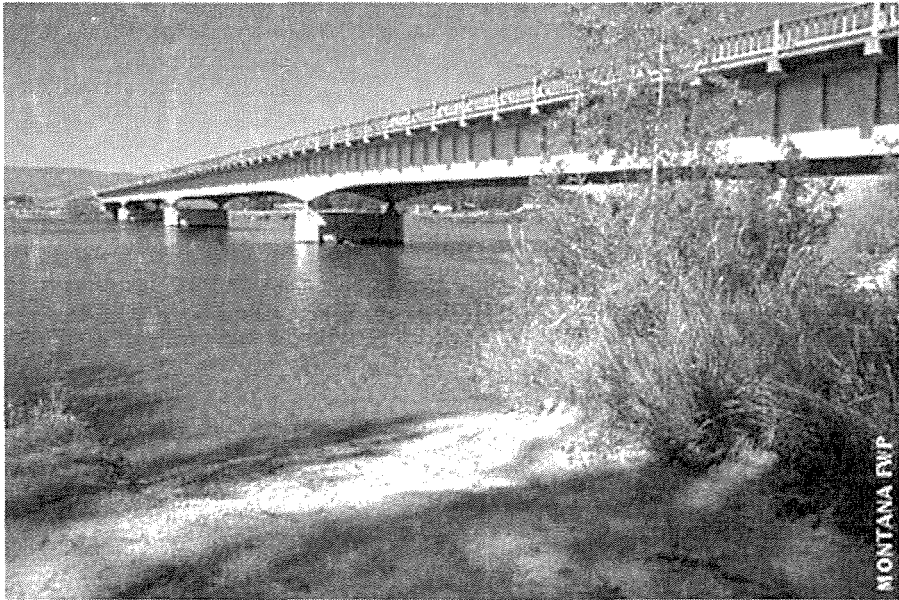


SUBSURFACE PROFILES SKETCH

Flathead River - 3M NW of Bigfork



SOUTH SIDE OF THE EXISTING BRIDGE





PROJECT OVERVIEW – HISTORY

(Continued)

- PROPOSED CONSTRUCTION FEATURES
 - Grading
 - Gravel – Crushed Aggregate Course (CAC)
 - Plant Mix Surfacing
 - New Bridge (3 Span, 735' 8" Long, 51' 2.5" Wide)
 - 2 – 12' Lanes and 2 - 8' Shoulders
 - Includes 9' wide Shared Use Path
 - Dedicated left and right turn lanes at Hanging Rock Drive
 - New Right of Way
 - Fishing Access Site Mitigation
- COST ESTIMATE: \$ 24.3 M w/IDC
- FUNDING: BR

CONSTRAINTS/CONSIDERATIONS

CONSTRAINTS

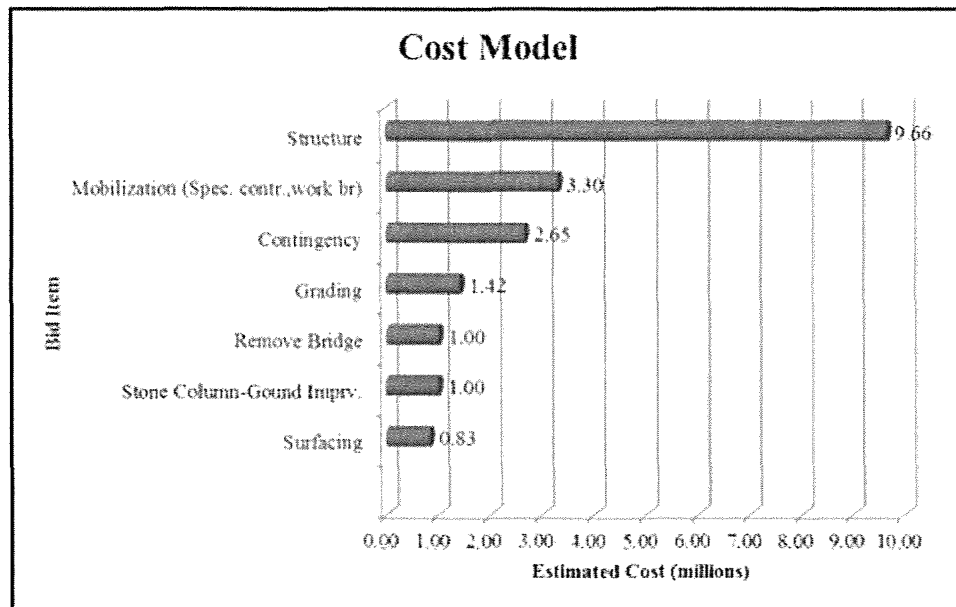
- Fish Wildlife and Parks – 4(f) fishing access site
- Environmental issues
- Right of Way acquisition shown as high risk

CONSIDERATIONS

- New offset alignment
- Liquefaction may occur during a high seismic event at the end bents
- Deep water foundation constructability
- Flathead County Master Trail Plan



PROJECT COST MODEL

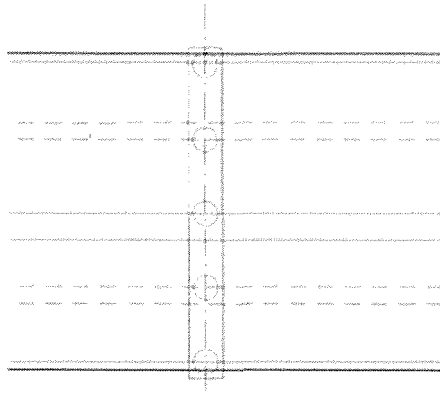


VA STUDY RECOMMENDATIONS

1. 1A - New Alignment or Existing - Evaluate Bridge Foundation Types
2. 1B - New Alignment – Evaluate Ground Improvements Beneath Approach Embankments
3. 2A - Existing Alignment – With Detour Bridge During Construction
4. 2B - Existing Alignment – With Road Closure During Construction
5. 3A - Either Alignment – Eliminate Shared Use Path
6. 3B - Either Alignment – Design For Future Expansion For Shared Use Path



RECOMMENDATION #1A – New Alignment - Evaluate Bridge Foundation Types



5-48" diameter x 1" wall thickness
steel pipe piles. 3D spacing.

Other Options

- 3-72" Diameter Piles
- 2 Rows of 5-48" Diameter Piles for additional stiffness
- 2-96" Diameter Piles for accelerated construction
- Must meet "no rise" requirement

RECOMMENDATION #1A – New Alignment - Evaluate Bridge Foundation Types

Proposed foundation 5-48" piles

- Eliminates need for cofferdam
- Improves constructability
- Reduces potential environmental impacts
- Reduces construction time
- Reduces costs
- Reduces contractor risk compared with other foundation options

POTENTIAL COST SAVINGS = \$2.20 M

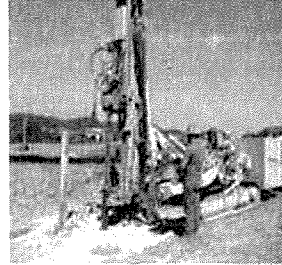


Recommendation #1B – New Alignment – Evaluate Ground Improvements Beneath Approach Embankments

Improve Soil Properties Using Compaction Grouting

Original Design: Stone columns used to mitigate potential for liquefaction and lateral spreading at both abutments.

Proposed Change: Improve the soil properties at both abutments using compaction grouting.



Justification: Compaction grouting improves soil density and increases soil strength. Anticipated reduced mobilization cost and less equipment, can limit treatment to target zone in soil profile, can stage grout pattern/ hole layout as needed. Decreased construction time.

POTENTIAL COST SAVINGS = \$0.7M

Recommendation #1B – New Alignment – Evaluate Ground Improvements Beneath Approach Embankments

Reduce time- rate of anticipated Soil Settlement at Abutments Using Wick Drains and Preload with surcharge.

Original Design: Not addressed

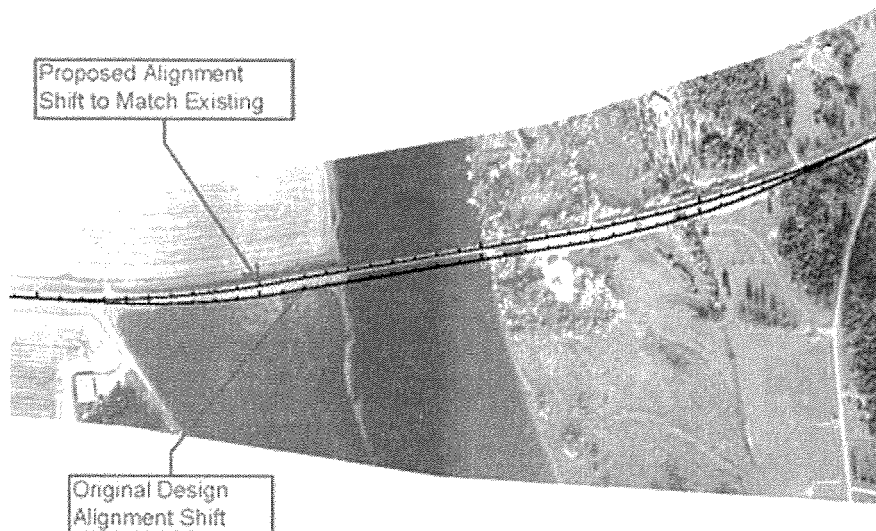
Proposed Change: Install wick drains and then a soil preload with surcharge to consolidate soft soil layers at the abutments.

Justification: Pre-consolidation of the abutment subgrade soil will increase soil density through consolidation and increase soil strength. Decreases time rate of settlement and reduce potential for future approach embankment settlement through surcharge preload resulting in an improved ride and reduced maintenance. Anticipate reduced mobilization costs and less equipment. Expected reduced time of embankment construction versus original proposal. Can be supplemented with perforated plastic earthquake drains.

POTENTIAL COST SAVINGS = \$0.85M



Recommendation #2A – Existing Alignment – With Detour Bridge During Construction



Recommendation #2A – Existing Alignment – With Detour Bridge During Construction

ADVANTAGES:

- Cost Savings
- Reduced Construction Time
- Minimizes Foot Print
- Use Existing Structure for Work Bridge
- Reduces Need for Ground Improvement
- Reduces Risk

DISADVANTAGES:

- Cost of Detour Bridge



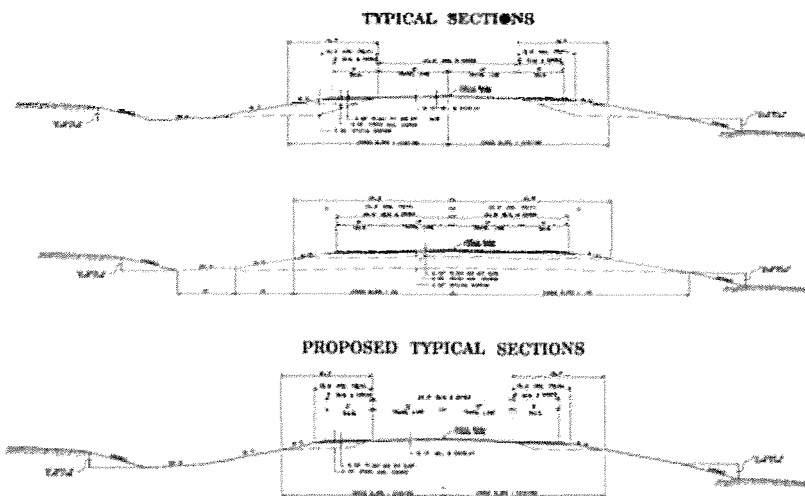
Recommendation #2A – Existing Alignment – With Detour Bridge During Construction

Detour Bridge Construction:

- Consultant had estimated work bridge cost at \$1.5 million
- Estimated Costs using bid item Construct/Maintain Detour
- Researched alternate detour bridge methods to compare costs
 - o Flexifloat moduie pontoons
 - o Mabey/ Bailey Bridge with intermediate piers
 - o Mabey/Bailey Bridge with Flexifloat piers
- Discussed with local contractor
 - o Would use barge for work platform instead of work bridge
 - o Did not recommend using a detour bridge
 - o Commented that they would prefer to build drilled shaft foundations
- Research indicated that a reasonable estimate for a detour bridge and road approaches was \$1.75 million.

Recommendation #2A – Existing Alignment – With Detour Bridge During Construction

Road Work





Recommendation #2A – Existing Alignment – With Detour Bridge During Construction

No anticipated ground improvement needed below embankment fills unless determined after additional geotechnical investigation and analysis.

Original Design: Stone columns used to mitigate potential for liquefaction and lateral spreading in conjunction with preloading.

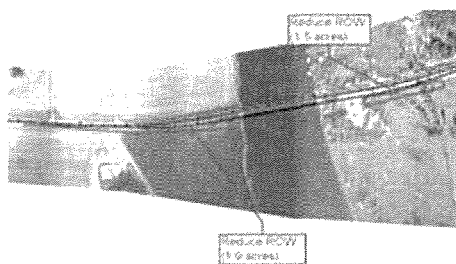
Proposed Change: No ground improvement necessary unless required after geotechnical investigation and analysis of soil conditions beneath existing embankment.

Justification: Existing embankment placed in 1955 provided surcharge load to subgrade silty sand soil and consolidation of liquefaction prone sands underlying the site. Leave existing timber pile foundation in-place to function as slope reinforcement. Installation of timber piling should have provided some beneficial soil densification of the underlying sands.

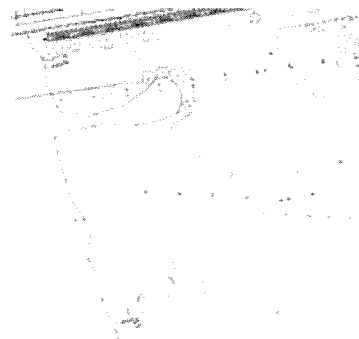
Recommendation #2A – Existing Alignment – With Detour Bridge During Construction

Right of Way

- 3.4 Acres
- \$367,000 per acre



FWP Fishing Access Site





Recommendation #2A – Existing Alignment – With Detour Bridge During Construction

Additional Cost of Detour Bridge and Approaches = (\$ 1.75M)

Road Work = \$ 1.11M

Soil Improvements = \$ 0.70 M (Could be as high as \$1M)

FWP Fishing Access Site = \$ 0.07 M

POTENTIAL COST SAVINGS = Value Added

Right of Way = \$ 1.25M – not included in CN (construction costs)

Recommendation #2B – Existing Alignment – With Road Closure During Construction

Minimize road closure:

- Accelerated Schedule
 - Incentive/Disincentive
- Accelerated Bridge Construction Methods
 - Construct foundations both sides of the existing structure prior to closure
 - Precast Bent 2 and 3 caps
- Schedule Letting Date to coincide construction during minimum traffic
 - June, July August are peak traffic counts
 - Start no-closure bridge construction during peak traffic
 - Coincides with low bull trout counts
 - Begin closure in September



Recommendation #2B – Existing Alignment – With Road Closure During Construction

~~Cost of Detour Bridge and Approaches = \$ 1.75M~~

Road Work = \$ 1.11M

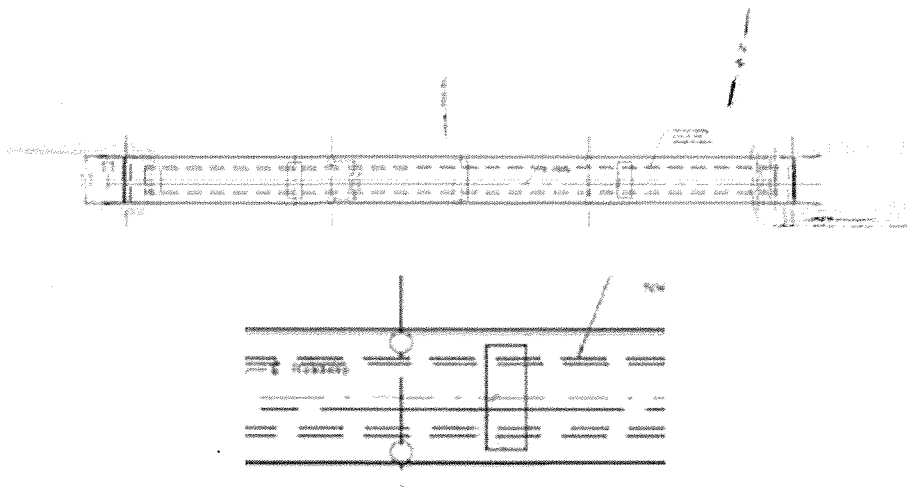
Soil Improvements = \$ 0.70 M (Could be as high as \$1M)

Right of Way = \$ 1.25M – for information only, not included in CN

FWP Fishing Access Site = \$ 0.07 M

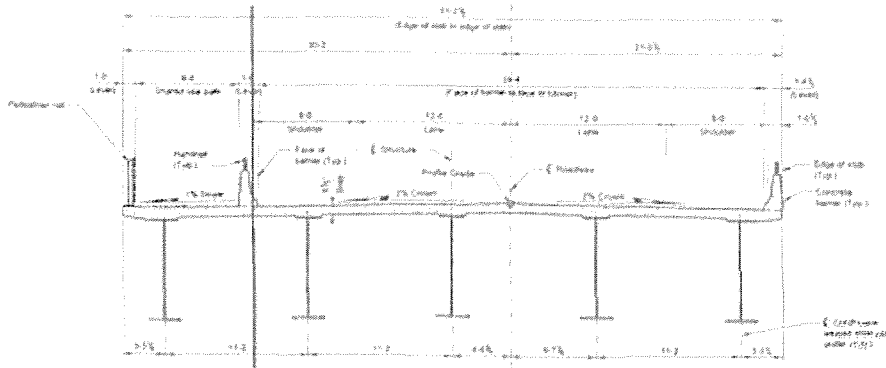
POTENTIAL COST SAVINGS = \$ 1.88 M

Recommendation #2B – Existing Alignment – With Road Closure During Construction





Recommendation #3A – Either Alignment – Eliminate Shared Use Path



Estimated Cost = 735L * 9W = 6615 SF * \$250/SF = \$1.65 M

- Current design does not include a path along the length of the project

Recommendation #3B – Either Alignment – Design For Future Expansion For Shared Use Path

- Build bridge foundation and superstructure to accommodate future Shared Use Path
- Construct Path when trail connection is constructed



Potential Cost Savings = 735L * 9W = 6615 SF * \$130/SF = \$0.91 M

Current design does not include a path along the length of the project



SUMMARY OF RECOMMENDATIONS

1A - New Alignment or Existing - Evaluate Bridge Foundation Types - \$2.20 M

1B - New Alignment – Evaluate Ground Improvements Beneath Approach Embankments - \$ 0.70 M

2A - Existing Alignment – With Detour Bridge During Construction – Value Added

2B - Existing Alignment – With Road Closure During Construction – \$ 1.88 M

3A - Either Alignment – Eliminate Shared Use Path - \$ 1.65 M (for information only)

3B - Either Alignment – Design For Future Expansion For Shared Use Path - \$ 0.91 M

POTENTIAL COST SAVINGS: #1A & #1B & #3B : \$ 3.81M

POTENTIAL COST SAVINGS: #1A & #2A & #3B : \$ 3.11M

POTENTIAL COST SAVINGS: #1A & #2B & #3B : \$ 4.99 M

SUMMARY OF RECOMMENDATIONS

Recommendations #1A & #2B & #3B

CONST. COST SAVINGS	\$ 4.99M
W/MOBILIZATION (23%)	\$ 6.14M
W/CONTINGENCY (15%)	\$ 7.06M
W/CE (10%)	\$ 7.77M
W/IDC (9.12%)	\$ 8.48M
R/W Savings	\$ 1.25M

TOTAL POTENTIAL COST SAVINGS: \$ 9.73 Million

NOTE: POTENTIAL COST SAVINGS: #1A & #1B & #3B : \$ 7.72 M

POTENTIAL COST SAVINGS: #1A & #2A & #3B : \$ 6.53 M



DESIGN COMMENTS

- DC # 1 – Floating Detour Bridge
- DC # 2 – Incentive/Disincentive Contract
- DC # 3 – National Bid Advertisement
- DC # 4 – Bid Alternatives
- DC # 5 – Prequalified Contractors
- DC # 6 – Innovating Contracting

VALUE ADDED IDEAS

- Add lighting or conduit to shared use path along the structure
- Extend the separated path along the length of the project to include the fishing access

QUESTIONS AND COMMENTS

