GROUP, L.L.C.

PROVIDING VALUE ENGINEERING SERVICES

VE 201104

VALUE ENGINEERING STUDY

OF

US 119 PARTRIDGE to OVEN FORK

Letcher County

PROJECT ITEM NUMBER(S): 12-311.35, 12-311.36, 12-311.77

Study was conducted in
Frankfort, Kentucky
June 20-24, 2011

FINAL REPORT: August 31, 2011

Prepared by:

VE GROUP, L.L.C.

In Association With:

KENTUCKY TRANSPORTATION CABINET
~DIVISION OF HIGHWAY DESIGN~

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VALUE ENGINEERING STUDY
TEAM LEADER

William F. Ventry

William F. Ventry, P.E., C.V.S.
C.V.S. Registration No.840603

August 31, 2011
DATE

TABLE OF CONTENTS

TABLE OF CONTENTS

I. EXECUTIVE SUMMARY

INTRODUCTION

This Value Engineering report summarizes the results of the Value Engineering study performed by VE Group, L.L.C., for the Kentucky Transportation Cabinet (KYTC). The study was performed during the week of **June 20-24, 2011.**

The subject of the study was ***US 119 PARTRIDGE to OVEN FORK LETCHER COUNTY*.**

PROJECT DESCRIPTION

Letcher Co. 12-311.35 (Section 2)

- Project Length: Approximately 1.0 mile
- Construction Cost: Approximately $20,670,000
- Bridge at Colliers Creek: Approximately 1899' Long with 14 spans

Letcher Co. 12-311.36 (Section 3)

- Project Length: Approximately 3.0 miles
- Construction Cost: Approximately $52,940,000
- Bridges: Three Mainline and One Approach

Letcher Co. 12-311.77 (Section 4)

- Project Length: Approximately 1.63 miles
- Construction Cost: Approximately $26,000,000
- Bridges: Three Mainline and One Approach

I. EXECUTIVE SUMMARY

METHODOLOGY

The Value Engineering Team followed the basic Value Engineering procedure for conducting this type of analysis.

This process included the following phases:

1. Investigation
2. Speculation
3. Evaluation
4. Development
5. Presentation
6. Report Preparation

Evaluation criteria identified as a basis for the comparison of alternatives included the following:

- Future Maintenance Cost
- Construction Cost
- Right-of-Way Cost
- Design Requirements
- Letting Schedule
- Plans Redesign Time

I. EXECUTIVE SUMMARY

RESULTS – AREAS OF FOCUS

The following Areas of Focus were analyzed by the Value Engineering Team and from these areas the following Value Engineering Alternatives were developed and are recommended for Implementation:

SUMMARY OF RECOMMENDATIONS

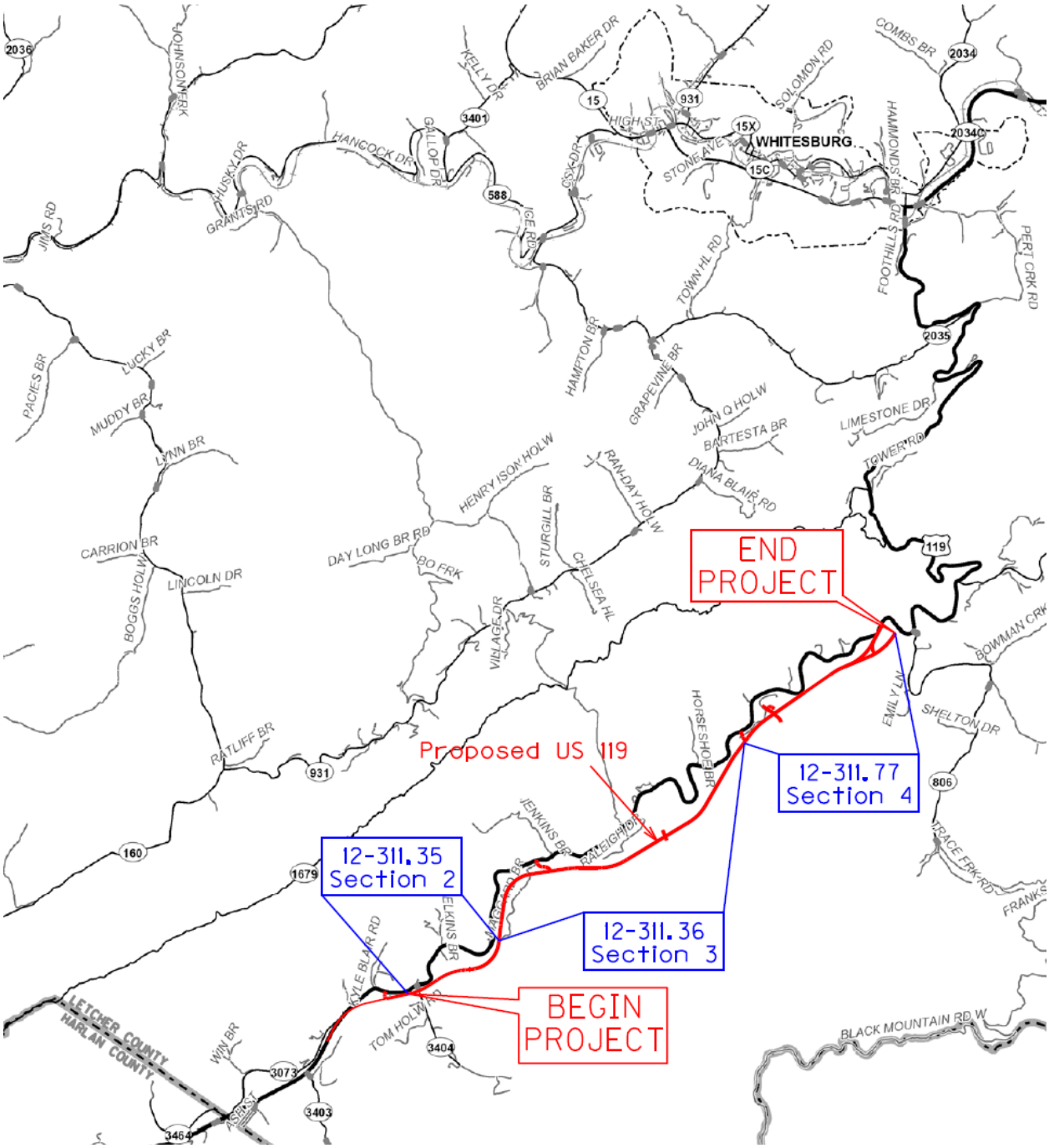
Recommendation Number and Areas of Focus	Description of Recommendation	Const. Cost Savings	Life Cycle Cost(LCC) Savings	VE Team Selected
Recommendation Number 1: ROADWAY EXCAVATION	**VE ALTERNATIVE NO. 1:** Adjust the profile grades.	$ 6,438,561	$ 6,438,561	**X**
Recommendation Number 2: BRIDGE NO. 1 (STA. 44+426)	**VE ALTERNATIVE NO. 2:** Reduce the number of spans.	$ 2,354,520	$ 2,354,520	**X**
Recommendation Number 3: BRIDGE NO. 1 (STA. 44+426)	**VE ALTERNATIVE NO. 3:** Reduce the bridge typical section.	$ 1,891,624	$ 1,891,624	**X**
Recommendation Number 4: BRIDGE NO. 2 (STA. 45+827)	**VE ALTERNATIVE NO. 5:** Relocate the sedimentation ponds.	$ 922,112	$ 922,112	**X**
Recommendation Number 5: BRIDGES NO. 3 (STA. 20+275) AND NO. 6 (STA. 21+932)	**VE ALTERNATIVE NO. 6:** Eliminate both bridges and build one connection at approximate station 50 + 200.	$ 1,711,025	$ 1,711,025	**X**

I. EXECUTIVE SUMMARY

RESULTS – AREAS OF FOCUS

SUMMARY OF RECOMMENDATIONS (*continued)*				
Recommendation Number and Areas of Focus	**Description of Recommendation**	**Const. Cost Savings**	**Life Cycle Cost(LCC) Savings**	**VE Team Selected**
Recommendation Number 6: BRIDGES NO. 2 (STA.45+827), NO. 4 (STA. 50+708), NO. 5 (STA.50+338), NO. 7 (STA.51+515) AND NO. 8 (STA. 51+708)	**VE ALTERNATIVE NO. 7:** Reduce the bridge typical section.	$ 1,344,086	$ 1,344,086	**X**
Recommendation Number 7 PAVEMENT TYPICAL SECTION	**VE ALTERNATIVE NO. 8:** Reduce the shoulders.	$ 2,267,657	$ 2,267,657	**X**
Recommendation Number 8 PAVEMENT TYPICAL SECTION	**VE ALTERNATIVE NO. 9:** Use 2 + 1 lane configuration.	$ 603,437 INCREASE	$ 603,437 INCREASE	**X**
Recommendation Number 9 BOX CULVERTS	**VE ALTERNATIVE NO. 10:** Replace smaller culvert with single pipe.	$ 15,712	$ 15,712	**X**
Summary/combination of VE Team selected Alternatives		**$16,341,860**	**$16,341,860**	**9**

II. LOCATION OF PROJECT



III. TEAM MEMBERS AND PROJECT DESCRIPTION

VALUE ENGINEERING TEAM MEMBERS

NAME	AFFILIATION	EXPERTISE	PHONE
William F. Ventry, P.E., C.V.S.~Life	VE Group, L.L.C.	Project Manager/Team Leader	850/627-3900
Tom Hartley, P.E., C.V.S.	VE Group, L.L.C.	Geometric Design/Constructability/Cost Estimating	850/627-3900
Jerry Potter, P.E.	VE Group, L.L.C.	Structures	850/627-3900
Rodney Little, P.E.	KYTC	Construction	606/678-4017
Brent Sweger, P.E.	KYTC	Traffic, Planning, VE	502/564-3280
Marvin Wolfe, P. E.	KYTC	Structures	502/564-4560

III. TEAM MEMBERS AND PROJECT DESCRIPTION

PROJECT DESCRIPTION

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- Project Length: Approximately 1.0 mile
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- Project Length: Approximately 3.0 miles
- Construction Cost: Approximately $52,940,000 (2006)
- Bridges: Three Mainline and One Approach

Letcher Co. 12-311.77 (Section 4)

- Project Length: Approximately 1.63 mies
- Construction Cost: Approximately $26,000,000(2006)
- Bridges: Three Mainline and One Approach

Value Engineering Team Project Summary

- Roadway Plans are in Metric
- Bridge Plans are in English
- Section No. 2 Plans - 95 % Complete
- Section No. 3 Plans - 80 % Complete
- Section No. 4 Plans - 80 % Complete
- ENTRAN Retained to Make Changes and Update Plans (June 2011)
- No Right-of-Way Offer as of June 24, 2011
- Cost Estimate Updated by VE Team for VE Study Areas of Focus which shows Significant Increase from 2006 Estimate.

The Department has defined the goals of this project to be safety and level-of-service improvements to US 119 between the communities of Partridge and Oven Fork. This project is also part of an overall goal to rebuild US 119 over Pine Mountain and tie to KY 15 in Whitesburg. These projects have been goals of the KYTC for over 30 years. Although several studies have been conducted over the past 30 years to find feasible ways to achieve these goals, various funding problems, constructability issues, and potential environmental impacts, have frustrated these efforts. The latest effort began in 1991 when a study was done to find the most feasible US 119 corridor from the end of previous US 119 improvements at Partridge to Whitesburg. This study was a comprehensive review of the most feasible relocation corridors in a 40 square mile area surrounding the project. Over two dozen corridors were studies, including the existing US 119 corridor. Each corridor studies the feasibility of various methods to cross Pine Mountain such as tunnels, cut-throughs, or roadway improvements. After much debate and meetings with the public, the DYC made the decision to proceed with relocating US 119 in the existing corridor.

III. TEAM MEMBERS AND PROJECT DESCRIPTION

PROJECT DESCRIPTION *(continued)*

Having made a decision to relocate US 119 in the existing corridor, preliminary studies were done to develop alternative alignments. Three major alignment controls exist in this corridor:

1. Relocations. The Poor Fork valley has a thriving community of residential housing and small businesses. There is a recognized need to find alternative that minimize the impacts to this community. Almost all of the above noted community is on the north side of the Poor Fork. This face makes the south side attractive for relocating US 119. For approximately 66% of the project length, the south side of the Poor Fork has been extensively mined and is currently owned by a mining company. This too makes the south side attractive for relocating US 119.

2. The Poor Fork. The Poor Fork is a major tributary to the Cumberland River and is designated as an *Outstanding Kentucky Water Resource* in the project. An alignment that takes advantage of this railroad bed would help to minimize impacts to the Poor Fork.

3. The Geology of Pine Mountain. Pine Mountain is unique in beauty and geology. Its carious rock strata dip very steeply to the southeast making excavation into the mountains southern slope quite unstable and expensive. All alternatives need to minimize excavations into the southern slope of the mountain. This is most easily accomplished by locating an alignment on the south side of the Poor Fork.

To satisfy the above controls, 3 alternative alignments were studies in the project corridor. All 3 took advantage of the old railroad bed and generally avoided large excavations on the south side of Pine Mountain. However, for the purpose of cost analysis, Alternative #1 was studied with 2 channel changes of the Poor Fork and Alternative #2 was studied with one. The alignments of both Alternatives #1 and 2 also had major impacts on two structures that were determined to *National Registry* potential. Alternative #3 did not have any channel changes of the Poor Fork, had fewer relocations than the other Alternatives, and did not significantly impact potential *National Registry* property. For these reasons, Alternative #3 was chosen as the *Recommended* alternative and was presented at the Public Hearing.

Since the Recommended Alternative is a total relocation of US 119, maintenance of traffic will be accomplished by constructing the new sections of US 119 while traffic continues on the existing roadway.

The project as currently designed is to construct a new roadway on the opposite side of the Cumberland River from where the existing roadway is located.

The new typical section will consist of two 12’ lanes with 12’ shoulders on each side. The project will **be** located in an area where there is active mining. There is one deep mine and one strip mine.

III. TEAM MEMBERS AND PROJECT DESCRIPTION

PROJECT DESCRIPTION *(continued)*

Earthwork will have to be disposed of at four currently identified waste sites.

As part of the new alignment, there will be 7 new bridges. One of the bridges will be approximately 1500' long because of the meandering river channel. Some of the bridges will be to connect the existing roadway to the new roadway.

IV. INVESTIGATION PHASE

VALUE ENGINEERING STUDY BRIEFING *US 119 PARTRIDGE to OVEN FORK LETCHER COUNTY* **June 20-24, 2011**		
NAME	**AFFILIATION**	**PHONE**
Bill Ventry	VE Group, L.L.C.	850/627-3900
Tom Hartley	VE Group, L.L.C.	850/627-3900
Jerry Potter	VE Group, L.L.C.	850/627-3900
Rodney Little	KYTC	606/678-4017
Brent Sweger	KYTC	502/564-3280
Marvin Wolfe	KYTC	502/564-4560
Mary Holbrook	KYTC	606/433-7791
Chris James	KYTC	606/433-7791
Chuck Allen	KYTC	502/564-3280
Boday Borres	KYTC	502/564-3280

IV. INVESTIGATION PHASE

STUDY RESOURCES *US 119 PARTRIDGE to OVEN FORK LETCHER COUNTY* **June 20-24, 2011**		
NAME	**AFFILIATION**	**PHONE**
Nasby Stroop	KYTC, Construction	502/564-4780
Chris James	KYTC, District 12	606/433-7791
Mary Holbrook	KYTC, District 12	606/433-7791

IV. INVESTIGATION PHASE

FUNCTIONAL ANALYSIS WORKSHEET

US 119 PARTRIDGE to OVEN FORK LETCHER COUNTY
June 20-24, 2011

ITEM	FUNCT. VERB	FUNCT. NOUN	* TYPE	(Note 2006 $) COST	WORTH	VALUE INDEX
Roadway Excavation	Establish Provide	Grades Typical	B S	$ 43,000,000	$ 30,000,000	1.43
Bridge No. 1	Span Span	River Railroad	B B	$ 6,300,000	$ 5,300,000	1.18
Bridge No. 2	Avoid Avoid	Conflict Relocation	S S	$ 500,000	$ 200,000	2.50
Bridges No. 3 & No. 6	Span Provide	River Connection	B S	$ 800,000	$ 100,000	8.00
Bridge No. 4	Span Span	River Railroad	B B	$ 1,100,000	$ 1,000,000	1.10
Bridge No. 5	Span	River	B	$ 1,000,000	$ 900,000	1.10
Bridge No. 7	Span	River	B	$ 750,000	$ 675,000	1.10
Bridge No. 8	Span	River	B	$ 750,000	$ 675,000	1.10
Bridge No. 9	Span Provide	River Connection	B S	$ 500,000	$ 500,000	1.00
Pavement	Support	Vehicles	B	$ 4,000,000	$ 3,400,000	1,18
Drainage	Convey	Water	B	$ 500,000	$ 500,000	1.10
Box Culverts	Convey	Water	B	$ 1,000,000	$ 500,000	2.00
Temporary Seeding	Control	Erosion	B	$ 1,700,000	$ 1,700,000	1.00
Right-of-Way	Acquire	Rights	B	$ 4,000,000	$ 3,000,000	1.33

*
B – Basic S – Secondary

** Note: This worksheet is a tool of the Value Engineering process and is only used for determining the areas that the Value Engineering Team should focus on for possible alternatives. The column for COST indicates the approximate amount of the cost as shown in the cost estimate. The column for WORTH is an estimated cost for the lowest possible alternative that would provide the FUNCTION shown. Many times the lowest cost alternatives are not considered implementable but are used only to establish a worth for a function. A value index greater than 1.00 indicates the Value Engineering Team intends to focus on this area of the project.

IV. INVESTIGATION PHASE

The following areas have a value index greater than 1.00 as shown on the Functional Analysis Worksheet and therefore have been identified by the Value Engineering Team as areas of focus and investigation for the Value Engineering process:

A. ROADWAY EXCAVATION

B. BRIDGE NO. 1 (STATION 44+426)

C. BRIDGE NO. 2 (STATION 45+827)

D. BRIDGES NO. 3 (STATION 20+275) AND 6 (STATION 21+932)

E. BRIDGES NO. 2 (STATION 45+827), 4 (STATION 50+708, 5 (STATION 50+338), 7 (STATION 51+515) AND 8 (STATION 51+708)

F. PAVEMENT TYPICAL SECTION

G. BOX CULVERTS

V. SPECULATION PHASE

Ideas generated, utilizing the brainstorming method, for performing the functions of previously identified areas of focus.

A. ROADWAY EXCAVATION

- Adjust the profile grades
- Utilize waste in the fill sections at clear zone (False Cut)
- Use railroad alignment for the new roadway

B. BRIDGE NO. 1 (STATION 44+426)

- Reduce the number of spans
- Reduce the bridge typical section
- Eliminate the railroad span and use either CON/SPAN or vertical walls

C. BRIDGE NO. 2 (STATION 45+827)

- Relocate the sedimentation ponds
- Realign the mainline

D. BRIDGES NO. 3 (STATION 20+275) AND 6 (STATION 21+932)

- Eliminate both bridges and connections
- Eliminate both bridges and build one connection at approximate station 50 + 200

E. BRIDGES NO. 2 (STATION 45+827), 4 (STATION 50+708, 5 (STATION`50+338), 7 (STATION 51+515) AND 8 (STATION 51+708)

- Reduce the bridge typical section

F. PAVEMENT TYPICAL SECTION

- Reduce the shoulders to 2.4 m(8') with 1.2M(4') paved
- Use 2 + 1 lane configuration

G. BOX CULVERTS

- Replace smaller culverts with single or multiple pipes
- Replace large culverts with CON/SPAN

VI. EVALUATION PHASE

◆ ALTERNATIVES

The following Alternatives were formulated during the "eliminate and combine" portion of the Evaluation Phase.

A. ROADWAY EXCAVATION

Value Engineering Alternative No. 1: Adjust the profile grades and/or utilize waste in the fill sections at clear zone (False Cut).

B. BRIDGE NO. 1 (STATION 44+426)

Value Engineering Alternative No. 2: Reduce the number of spans.

Value Engineering Alternative No. 3: Reduce the bridge typical section.

Value Engineering Alternative No. 4: Eliminate the railroad span and use either CON/SPAN or vertical walls.

C. BRIDGE NO. 2 (STATION 45+827)

Value Engineering Alternative No. 5: Relocate the sedimentation ponds.

D. BRIDGES NO. 3 (STATION 20+275) AND 6 (STATION 21+932)

Value Engineering Alternative No. 6: Eliminate both bridges and build one connection at approximate station 50 + 200.

E. BRIDGES NO. 2 (STATION 45+827), 4 (STATION 50+708, 5 (STATION 50+338), 7 (STATION 51+515) AND 8 (STATION 51+708)

Value Engineering Alternative No. 7: Reduce the bridge typical section.

VI. EVALUATION PHASE

◆ ALTERNATIVES

F. PAVEMENT TYPICAL SECTION

Value Engineering Alternative No. 8: Reduce the shoulders to 2.4M (8') with 1.2M (4') paved.

Value Engineering Alternative No. 9: Use 2 + 1 lane configuration.

G. BOX CULVERTS

Value Engineering Alternative No. 10: Replace smaller culverts with single or multiple pipes and/or replace large culverts with CON/SPAN, if feasible.

VI. EVALUATION PHASE

◆ ADVANTAGES AND DISADVANTAGES

The following Advantages and Disadvantages were developed for the Value Engineering Alternatives previously generated during the speculation phase. It also includes the Advantages and Disadvantages for the Original Design.

A. ROADWAY EXCAVATION

Original Design: Utilize grades less than 4 %.

Advantages

- No redesign
- Flat grades
- No Right-of-Way change

Disadvantages

- Large waste Right-of-Way required
- High construction cost

Conclusion
CARRY FORWARD FOR FURTHER DEVELOPMENT AND EVALUATION.

Value Engineering Alternative No. 1: Adjust the profile grades and/or utilize waste in the fill sections at clear zone (False Cut).

Advantages

- Reduced waste disposal
- May be less Right-of-Way needed for waste
- Lower construction cost

Disadvantages

- Steeper grades
- More time for redesign

Conclusion
CARRY FORWARD FOR FURTHER DEVELOPMENT AND EVALUATION

VI. EVALUATION PHASE

◆ ADVANTAGES AND DISADVANTAGES

B. BRIDGE NO. 1 (STATION 44+426)

Original Design: 14 spans, AASHTO Type 7.

Advantages

- Design is complete
- Open space use under bridge

Disadvantages

- Higher construction cost
- Higher bridge maintenance because more bridge area
- Some spans over natural ground

Conclusion
CARRY FORWARD FOR FURTHER DEVELOPMENT AND EVALUATION.

Value Engineering Alternative No. 2: Reduce the number of spans.

Advantages

- Less construction cost
- Less bridge maintenance because less bridge area
- Less construction time

Disadvantages

- Redesign of plans

Conclusion
CARRY FORWARD FOR FURTHER DEVELOPMENT AND EVALUATION.

VI. EVALUATION PHASE

◆ ADVANTAGES AND DISADVANTAGES

B. BRIDGE NO. 1 (STATION 44+426) ***(continued)***

Value Engineering Alternative No. 3: Reduce the bridge typical section.

Advantages

- Less construction cost
- Less bridge maintenance because less bridge area

Disadvantages

- Less shoulder for emergency pull offs
- Redesign of plans

Conclusion
CARRY FORWARD FOR FURTHER DEVELOPMENT AND EVALUATION.

Value Engineering Alternative No. 4: Eliminate the railroad span and use either CON/SPAN or vertical walls.

Advantages

- May be reduced construction cost
- Easier construction

Disadvantages

- Redesign of plans

Conclusion
CARRY FORWARD FOR FURTHER DEVELOPMENT AND EVALUATION.

VI. EVALUATION PHASE

◆ ADVANTAGES AND DISADVANTAGES

C. BRIDGE NO. 2 (STATION 45+827)

Original Design: Single span, AASHTO Type 8, over retention pond.

Advantages

- No involvement with the retention pond

Disadvantages

- Higher construction cost
- Higher bridge maintenance because more bridge area

Conclusion
CARRY FORWARD FOR FURTHER DEVELOPMENT AND EVALUATION.

Value Engineering Alternative No. 5: Relocate the sedimentation ponds.

Advantages

- Less construction cost
- No bridge maintenance

Disadvantages

- May require some additional Right-of-Way
- Possible environmental impact
- Requires approval of the coal company

Conclusion
CARRY FORWARD FOR FURTHER DEVELOPMENT AND EVALUATION.

VI. EVALUATION PHASE

◆ ADVANTAGES AND DISADVANTAGES

D. BRIDGES NO. 3 (STATION 20+275) AND 6 (STATION 21+932)

Original Design: Two 3 span AASHTO girder bridges for access connection.

Advantages

- Would have two access points

Disadvantages

- Requires two additional bridges
- Low use connections
- Higher construction cost
- Higher bridge maintenance because more bridge area

Conclusion
CARRY FORWARD FOR FURTHER DEVELOPMENT AND EVALUATION.

Value Engineering Alternative No. 6: Eliminate both bridges and build one connection at approximate station 50 + 200.

Advantages

- Less construction cost
- Less bridge maintenance because less bridge area
- Less environmental impact than constructing bridges over water

Disadvantages

- None apparent

Conclusion
CARRY FORWARD FOR FURTHER DEVELOPMENT AND EVALUATION.

VI. EVALUATION PHASE

◆ ADVANTAGES AND DISADVANTAGES

E. BRIDGES NO. 2 (STATION 45+827), 4 (STATION 50+708, 5 (STATION 50+338), 7 (STATION 51+515) AND 8 (STATION 51+708)

Original Design: **Two 3.6 m (12') lanes and two 3.6 m (12') shoulders with bridge railings.**

Advantages

- More area for emergency pull offs

Disadvantages

- Higher construction cost
- Higher bridge maintenance because more bridge area

Conclusion

CARRY FORWARD FOR FURTHER DEVELOPMENT AND EVALUATION.

Value Engineering Alternative No. 7: Reduce the bridge typical section.

Advantages

- Less construction cost
- Less bridge maintenance because less bridge area

Disadvantages

- Less shoulder for emergency pull offs
- Redesign of plans

Conclusion

CARRY FORWARD FOR FURTHER DEVELOPMENT AND EVALUATION.

VI. EVALUATION PHASE

◆ ADVANTAGES AND DISADVANTAGES

F. PAVEMENT TYPICAL SECTION

Original Design: Two 3.6 m (12') lanes and two 3.6 m (12') shoulders with 3.3 m (10') paved.

Advantages

- More area for pull offs

Disadvantages

- Higher construction cost
- Higher maintenance because more pavement area

Conclusion
CARRY FORWARD FOR FURTHER DEVELOPMENT AND EVALUATION.

Value Engineering Alternative No. 8: Reduce the shoulders to 2.4 m (8') with 1.2 m (4')paved.

Advantages

- Less construction cost
- Less maintenance because less pavement area
- Less Right-of-Way

Disadvantages

- Less shoulder for emergency pull offs

Conclusion
CARRY FORWARD FOR FURTHER DEVELOPMENT AND EVALUATION.

VI. EVALUATION PHASE

◆ ADVANTAGES AND DISADVANTAGES

F. PAVEMENT TYPICAL SECTION *(continued)*

Value Engineering Alternative No. 9: Use 2 + 1 lane configuration.

Advantages

- Better level of service

Disadvantages

- Less shoulder for emergency pull offs

Conclusion
CARRY FORWARD FOR FURTHER DEVELOPMENT AND EVALUATION.

VI. EVALUATION PHASE

◆ ADVANTAGES AND DISADVANTAGES

G. BOX CULVERTS

Original Design: Cast-in-place culvert at various locations.

Advantages

- No redesign of plans

Disadvantages

- Higher construction cost

Conclusion
CARRY FORWARD FOR FURTHER DEVELOPMENT AND EVALUATION.

Value Engineering Alternative No. 10: ***Replace smaller culverts with single or multiple pipes and/or replace large culverts with CON/SPAN, if feasible.***

Advantages

- Less construction cost
- Less construction time

Disadvantages

- Redesign of plans

Conclusion
CARRY FORWARD FOR FURTHER DEVELOPMENT AND EVALUATION.

VII. DEVELOPMENT PHASE

A. ROADWAY EXCAVATION

- **ORIGINAL DESIGN**
- ***Value Engineering Alternative No. 1: Adjust the profile grades and/or utilize waste in the fill sections at clear zone (False Cut).***

B. BRIDGE NO. 1 (STATION 44+426)

- **ORIGINAL DESIGN**
- ***Value Engineering Alternative No. 2: Reduce the number of spans.***
- ***Value Engineering Alternative No. 3: Reduce the bridge typical section.***
- ***Value Engineering Alternative No. 4: Eliminate the railroad span and use either CO/SPAN or vertical walls.***

C. BRIDGE NO. 2 (STATION 45+827)

- **ORIGINAL DESIGN**
- ***Value Engineering Alternative No. 5: Relocate the sedimentation ponds.***

D. BRIDGES NO. 3 (STATION 20+275) AND 6 (STATION 21+932)

- **ORIGINAL DESIGN**
- ***Value Engineering Alternative No. 6: Eliminate both bridges and build one connection at approximate station 50 + 200.***

E. BRIDGES NO. 2 (STATION 45+827), 4 (STATION 50+708, 5 (STATION 50+338), 7 (STATION 51+515) AND 8 (STATION 51+708)

- **ORIGINAL DESIGN**
- ***Value Engineering Alternative No. 7: Reduce the bridge typical section.***

F. PAVEMENT TYPICAL SECTION

- **ORIGINAL DESIGN**
- ***Value Engineering Alternative No. 8: Reduce the shoulders to 2.4 m (8') with 1.2 m (4') paved.***
- ***Value Engineering Alternative No. 9: Use 2 + 1 lane configuration.***

VII. DEVELOPMENT PHASE

G. BOX CULVERTS

- **ORIGINAL DESIGN**
- ***Value Engineering Alternative No. 10: Replace smaller culverts with single or multiple pipes and/or replace large culverts with CON/SPAN, if feasible.***

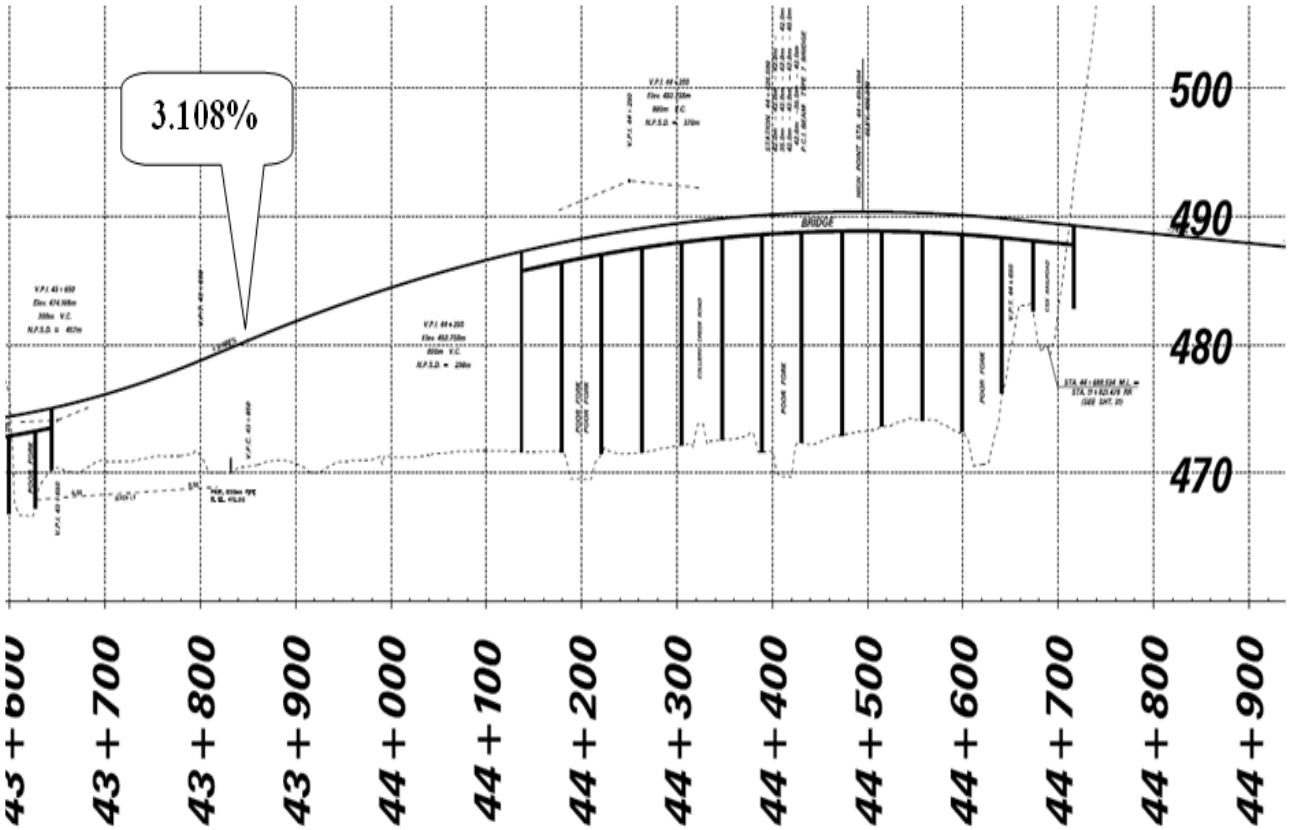
VII. DEVELOPMENT PHASE

A. ROADWAY EXCAVATION

Original Design

The earthwork required for this project is extensive. This project will generate waste material, and four sites have been identified to dispose of up to 14,160,000 cubic meters of excess material.

The maximum grades are at the beginning and end of the projects. The beginning of the project is a 3.108% grade and the temporary connection on the end of the project is a -3.701% grade. In between profile grades are less than 1.7%.

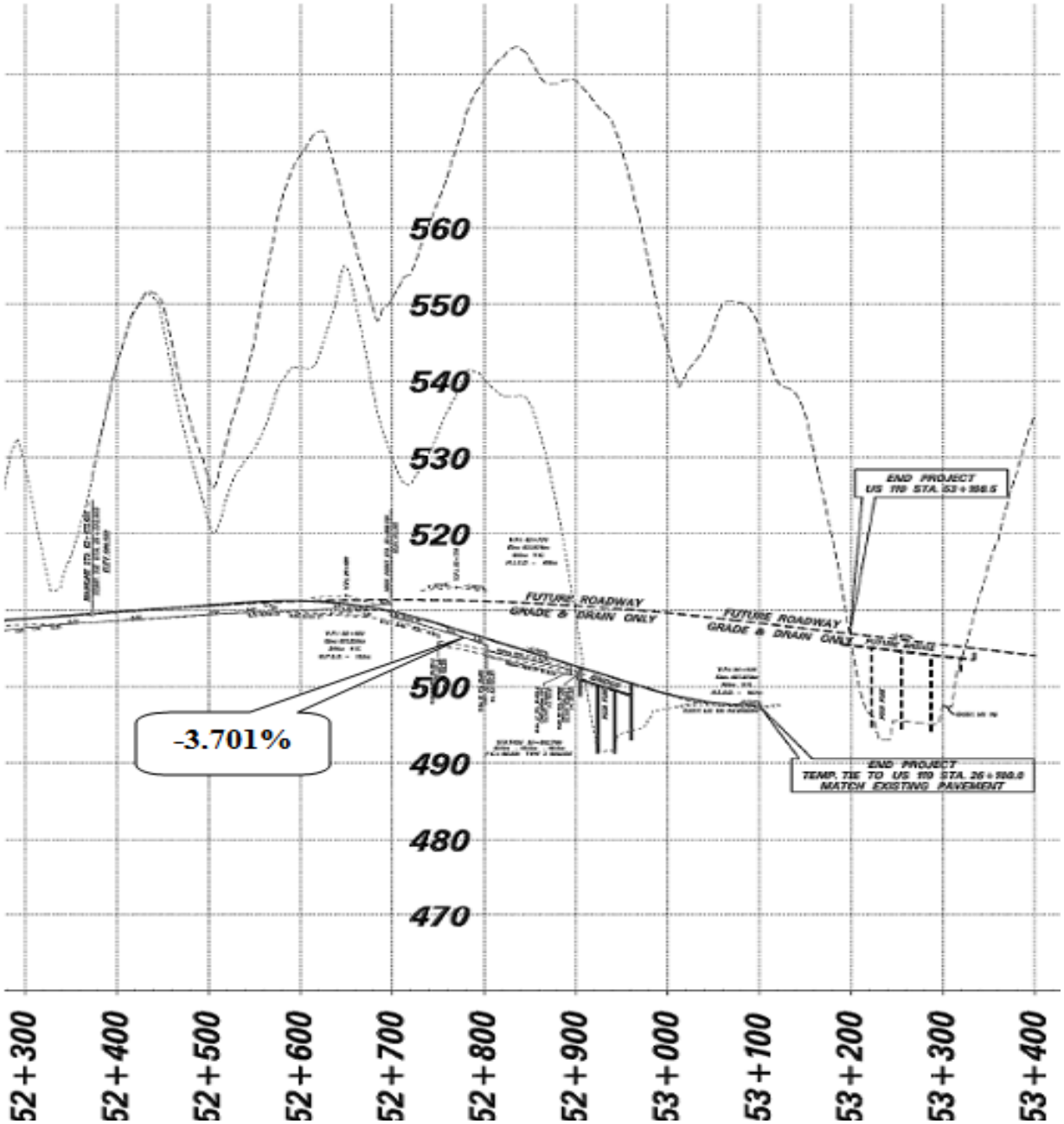


BEGIN PROJECT

VII. DEVELOPMENT PHASE

A. ROADWAY EXCAVATION

Original Design *(continued)*

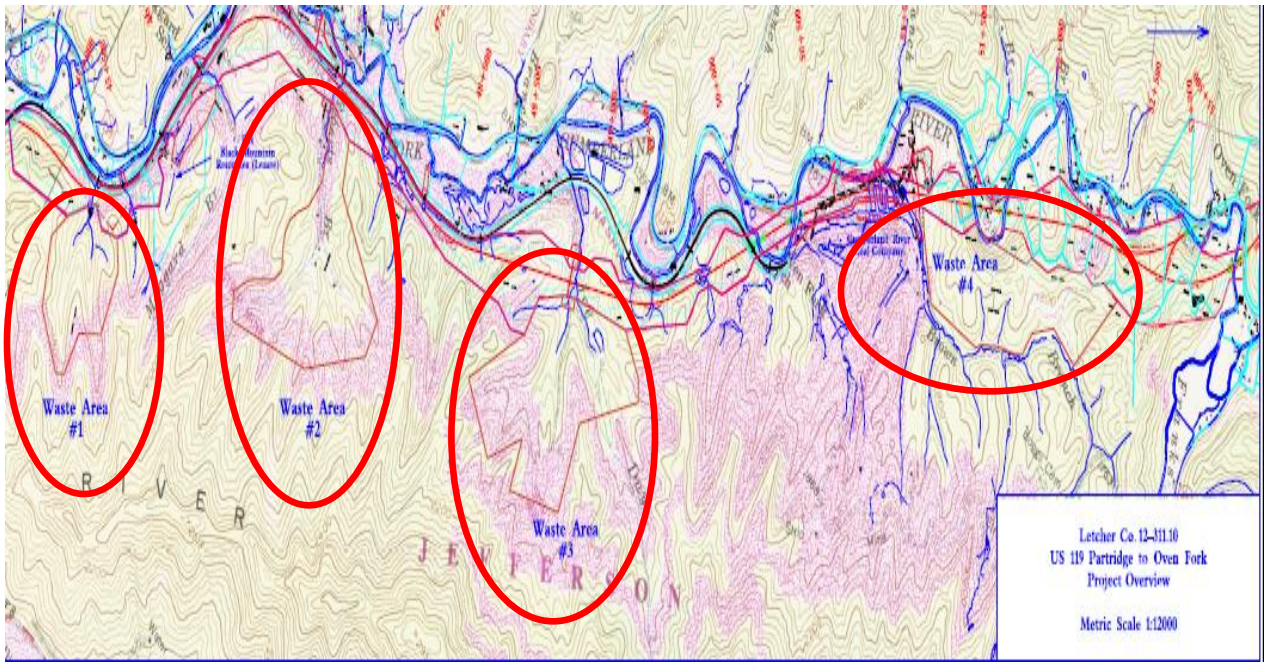


END PROJECT

VII. DEVELOPMENT PHASE

A. ROADWAY EXCAVATION

Original Design *(continued)*



WASTE AREA SITES

1. **Waste Area #1 = 2,000,000 cubic meters**
2. **Waste Area #2 = 3,250,000 cubic meters**
3. **Waste Area #3 = 4,710,000 cubic meters**
4. **Waste Area #4 = 4,200,000 cubic meters**

These shallow grades create considerable cuts and minimal fill sections to create the excess material that will be disposed of in the areas identified.

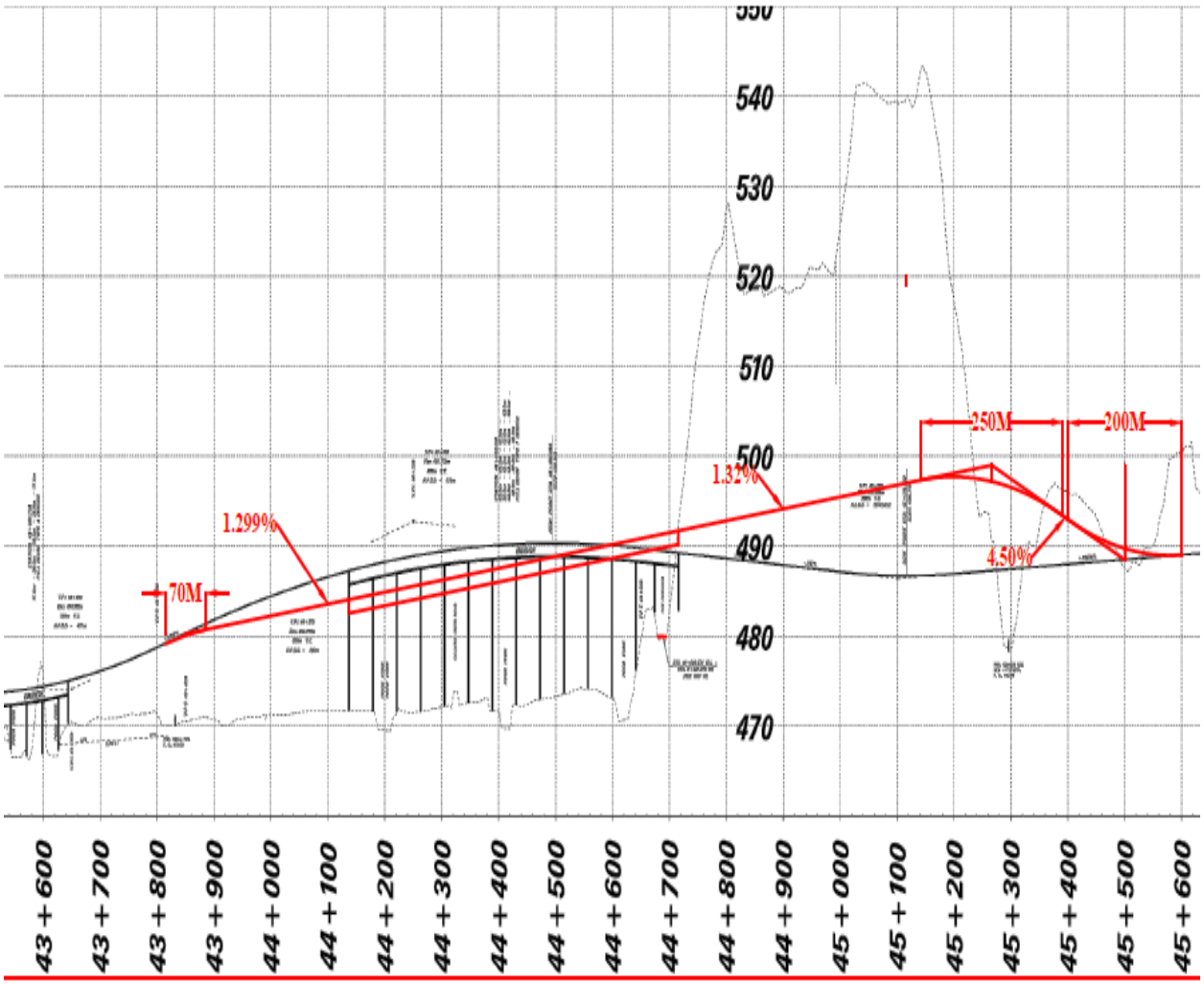
VII. DEVELOPMENT PHASE

A. ROADWAY EXCAVATION

Value Engineering Alternative No. 1: Adjust the profile grades and/or utilize waste in the fill sections at clear zone (False-Cut).

This Value Engineering Alternative will reduce the amount of roadway excavation and reduce the amount of waste material to be disposed of in the waste sites by raising the profile grade in two locations:

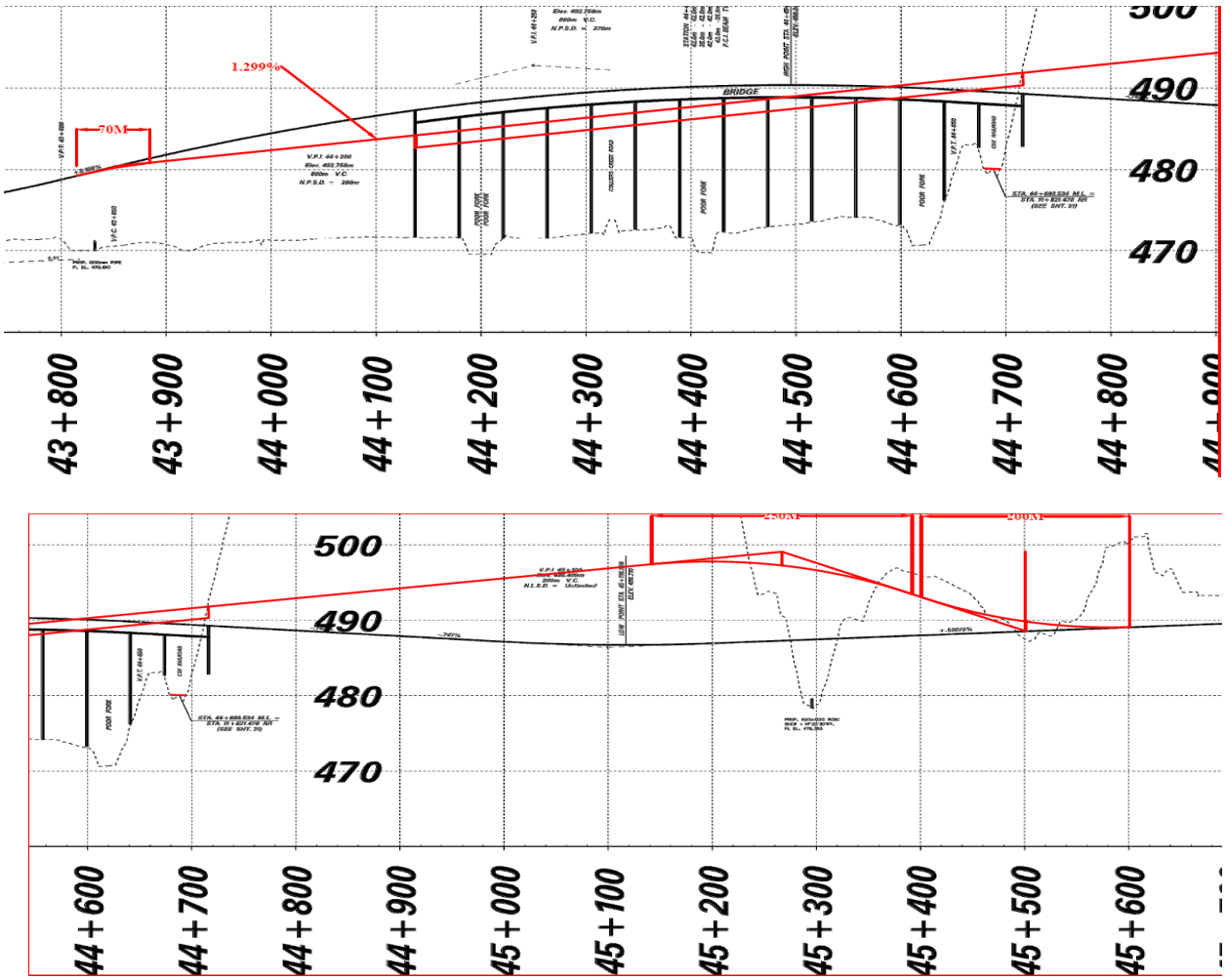
1. STA 43+800 to STA 45+500 – grades revised to +1.299% and -4.512%
2. STA 48+300 to STA 49+400 – grades revised to +4.000% and -4.000%



VII. DEVELOPMENT PHASE

A. ROADWAY EXCAVATION

Value Engineering Alternative No. 1: Adjust the profile grades and/or utilize waste in the fill sections at clear zone (False-Cut) continued.



VALUE ENGINEERING ALTERNATIVE PROFILE GRADES

These two locations are the only locations that the vertical geometry can be adjusted without impacting the railroad, the Poor Fork of the Cumberland River or moving the horizontal alignment.

Because of the locations of where the grades are raised, the capacity of Waste Area #1 can be reduced by approximately 34% and the capacity of Waste Area #3 can be reduced 14%.

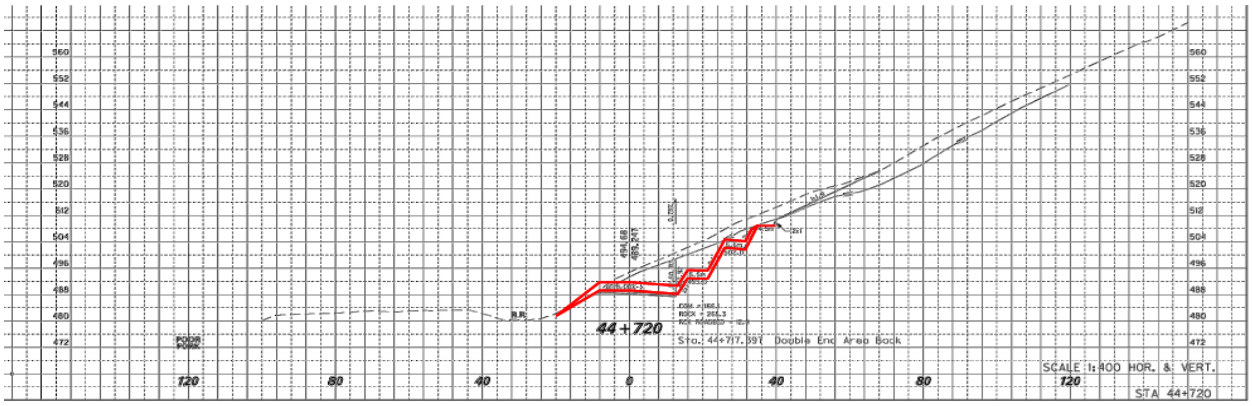
This new profile grade will lengthen and raise the east end of the bridge. The bridge will also be on a vertical tangent section.

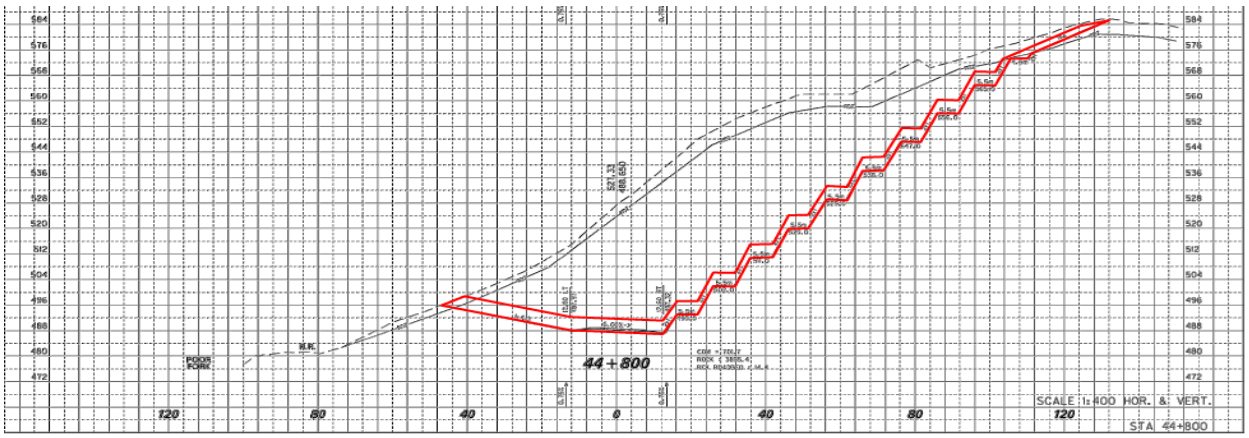
VII. DEVELOPMENT PHASE

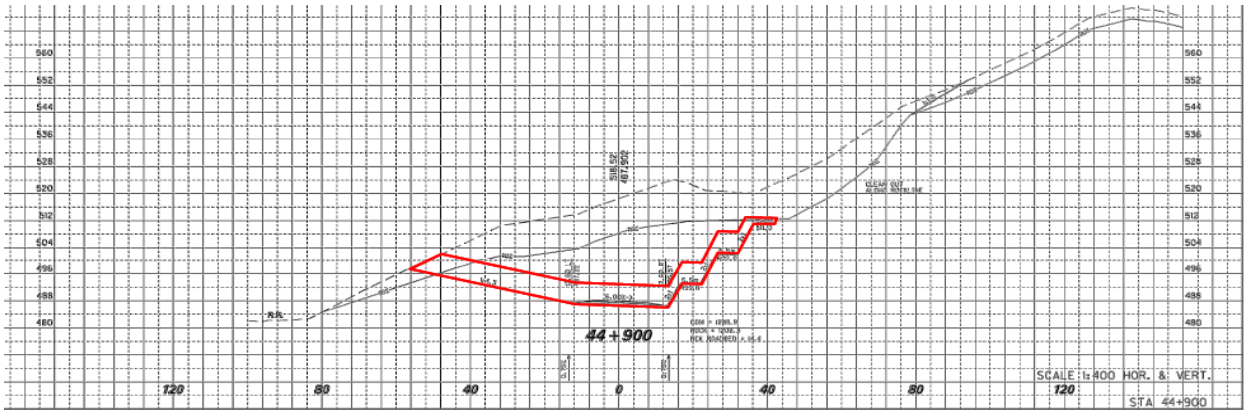
A. ROADWAY EXCAVATION

Value Engineering Alternative No. 1: Adjust the profile grades and/or utilize waste in the fill sections at clear zone (False-Cut) continued.

The following cross sections for this area will be modified approximately as shown.



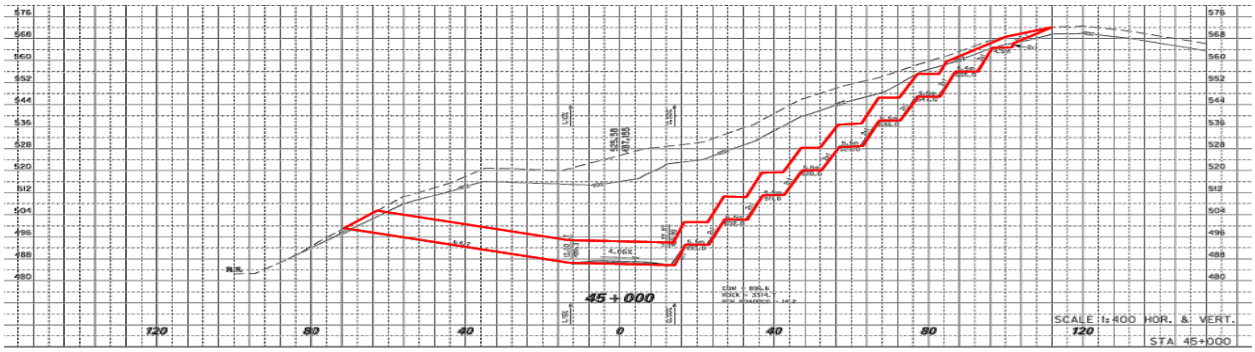


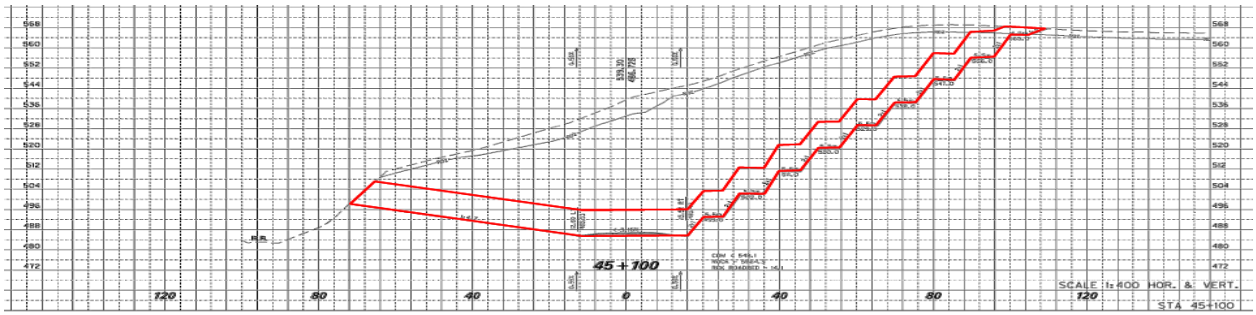


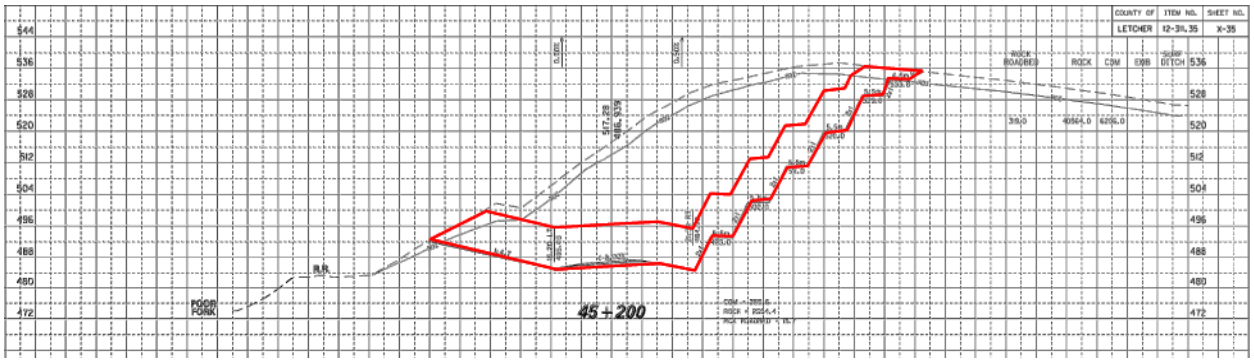
VII. DEVELOPMENT PHASE

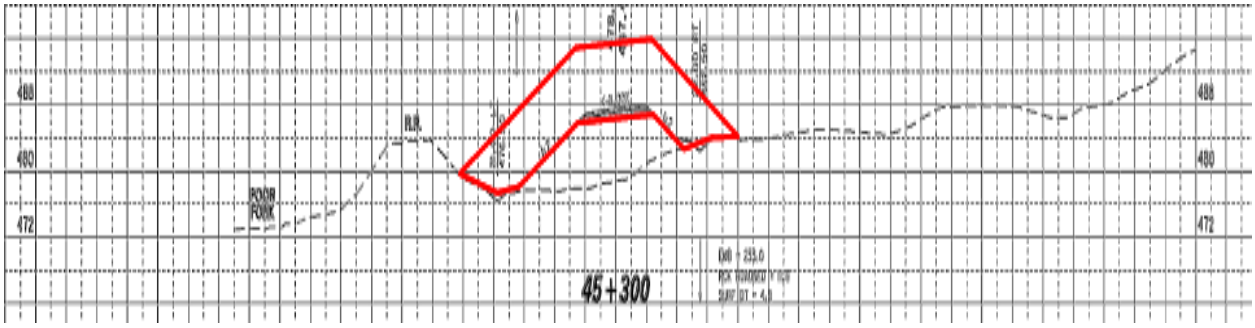
A. ROADWAY EXCAVATION

Value Engineering Alternative No. 1: Adjust the profile grades and/or utilize waste in the fill sections at clear zone (False-Cut) continued.





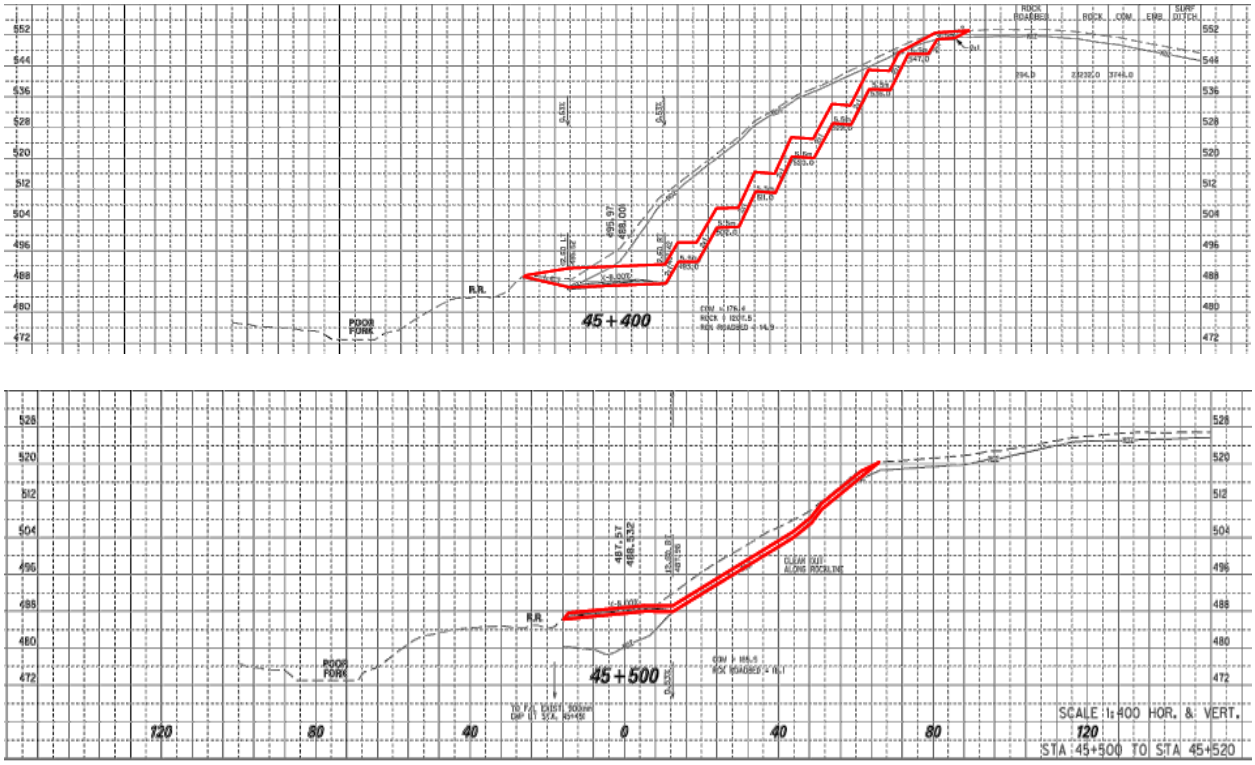




VII. DEVELOPMENT PHASE

A. ROADWAY EXCAVATION

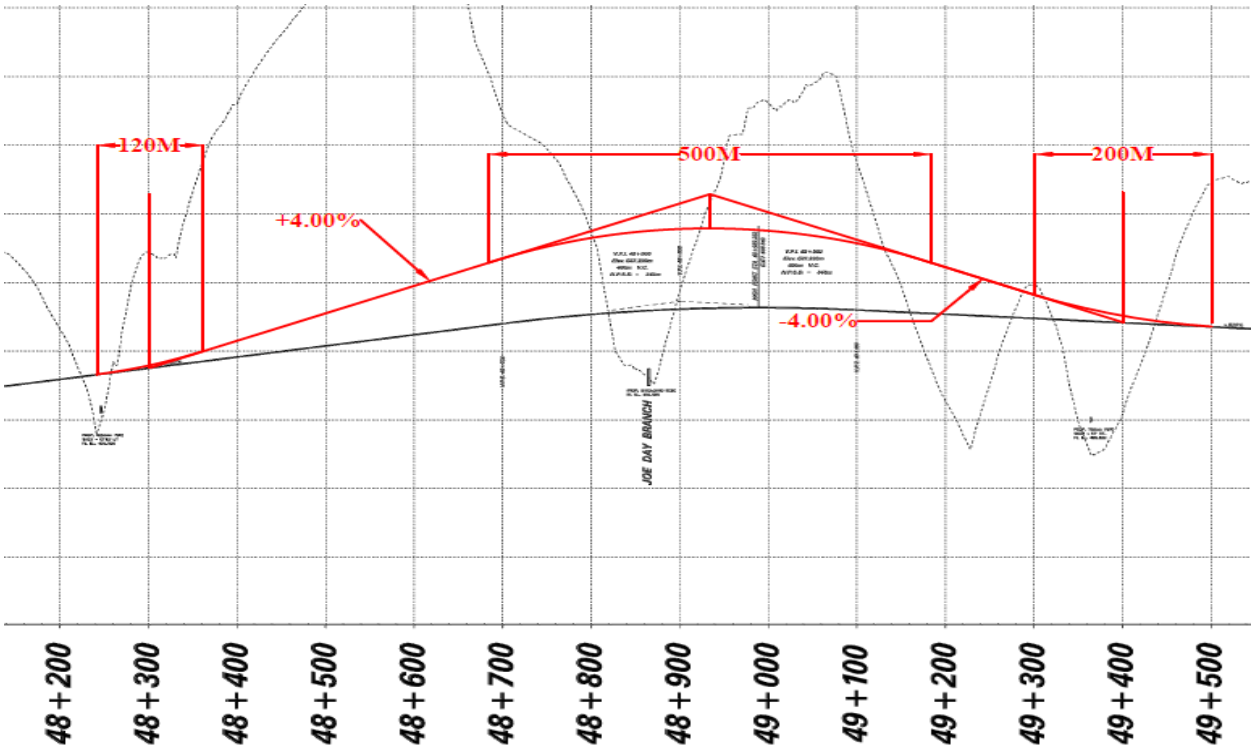
Value Engineering Alternative No. 1: Adjust the profile grades and/or utilize waste in the fill sections at clear zone (False-Cut) continued.



VII. DEVELOPMENT PHASE

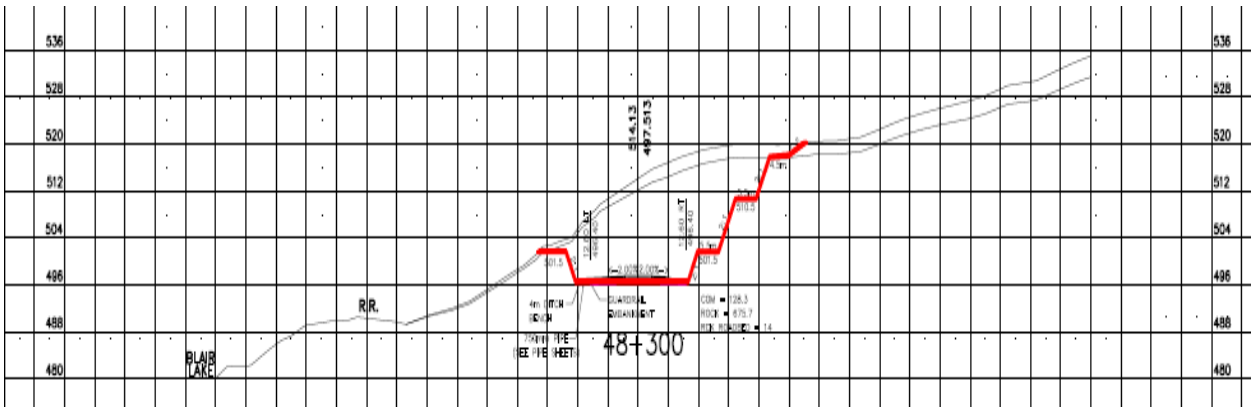
A. ROADWAY EXCAVATION

Value Engineering Alternative No. 1: Adjust the profile grades and/or utilize waste in the fill sections at clear zone (False-Cut) continued.



VALUE ENGINEERING ALTERNATIVE PROFILE GRADES

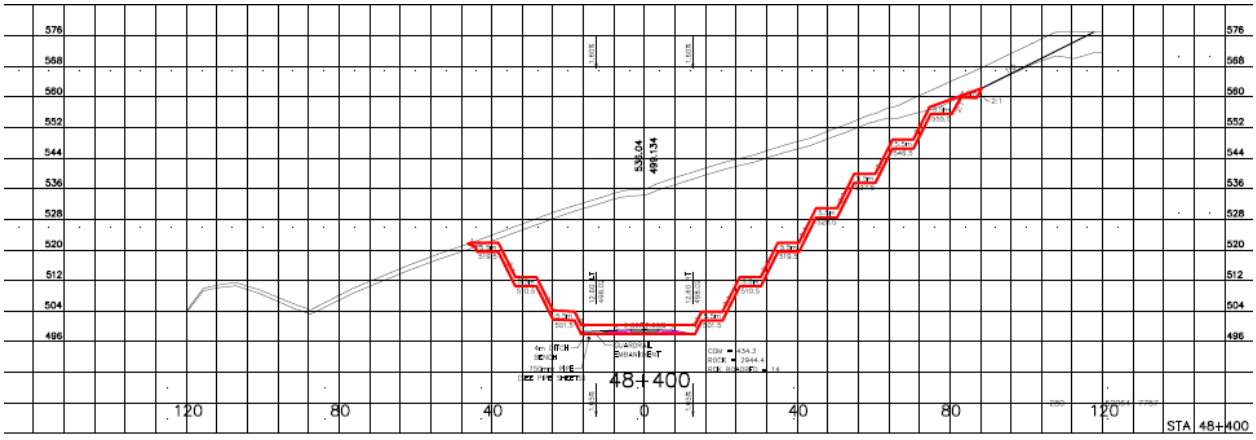
The following cross sections for this area will be modified approximately as shown.

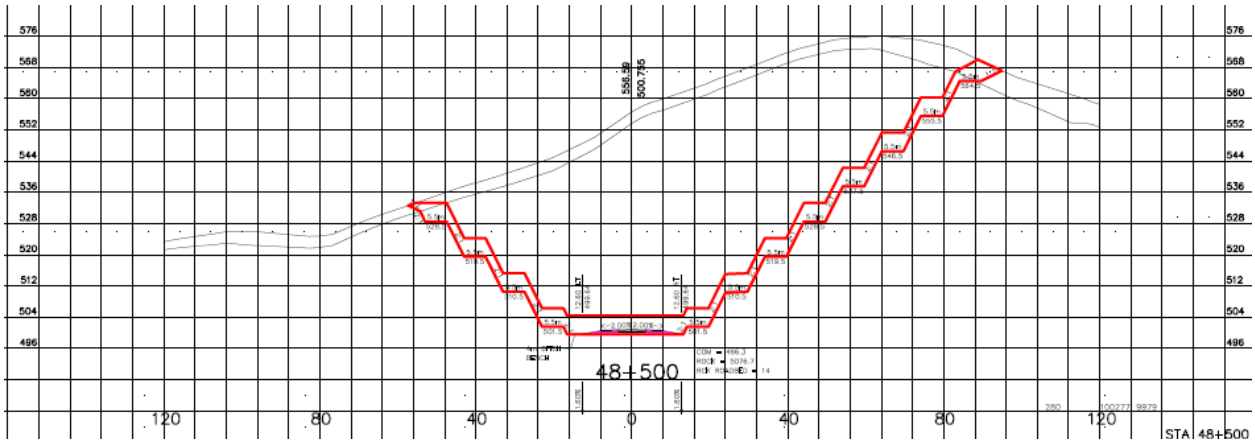


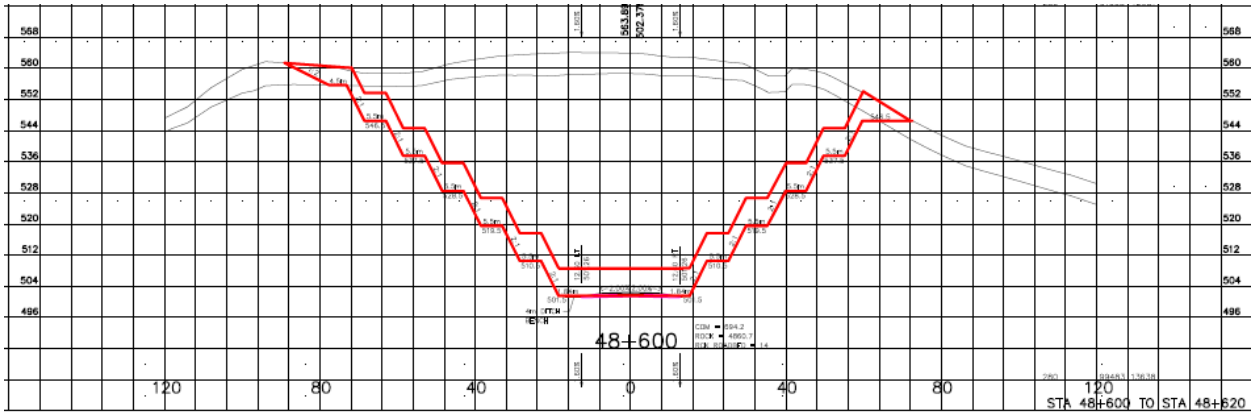
VII. DEVELOPMENT PHASE

A. ROADWAY EXCAVATION

Value Engineering Alternative No. 1: Adjust the profile grades and/or utilize waste in the fill sections at clear zone (False-Cut) continued.



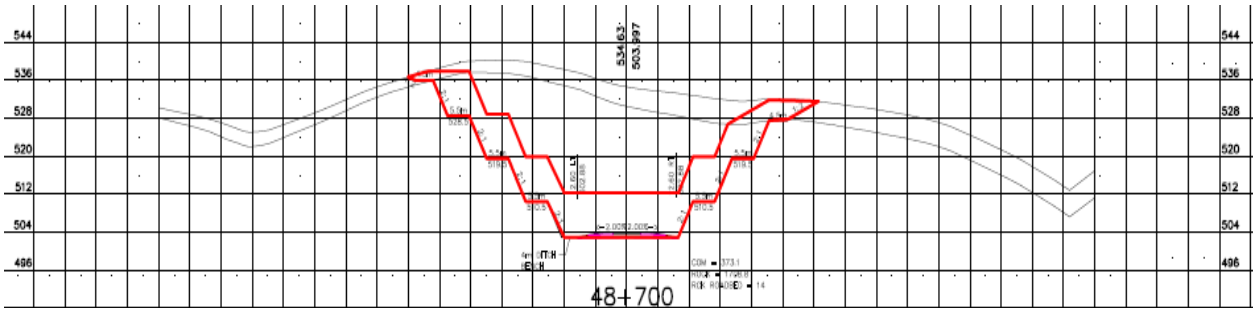


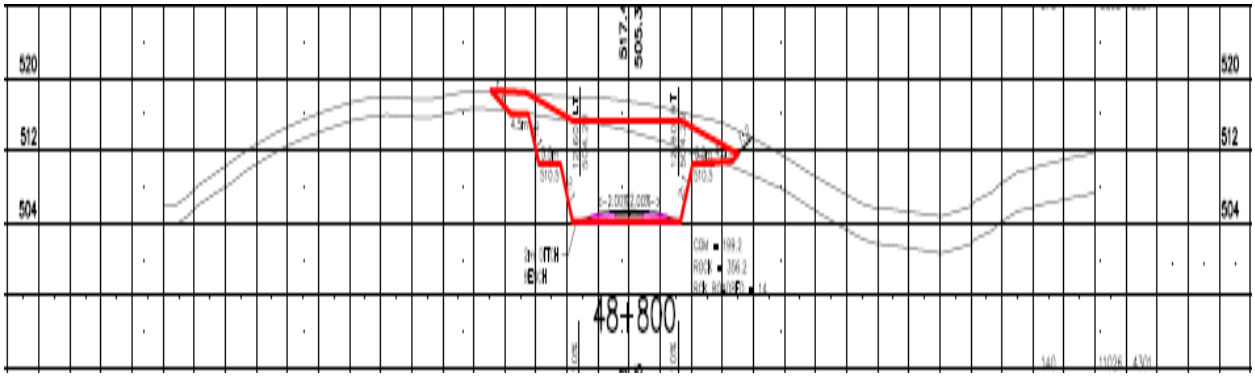


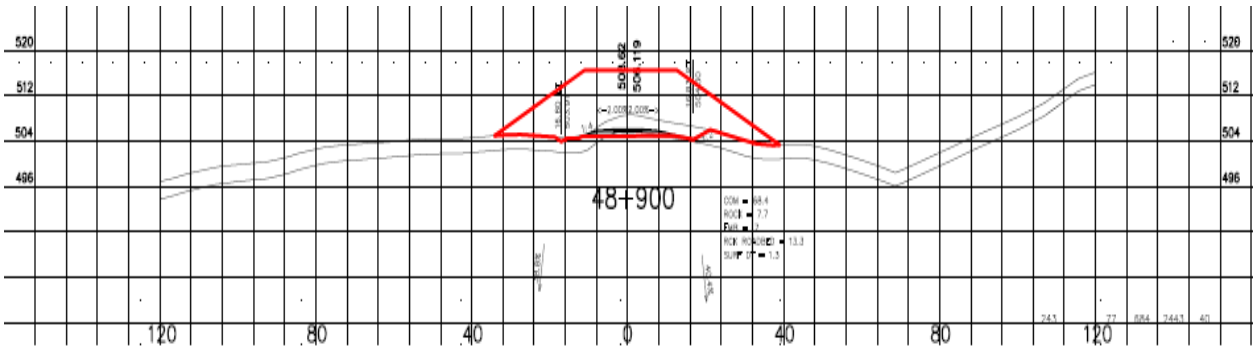
VII. DEVELOPMENT PHASE

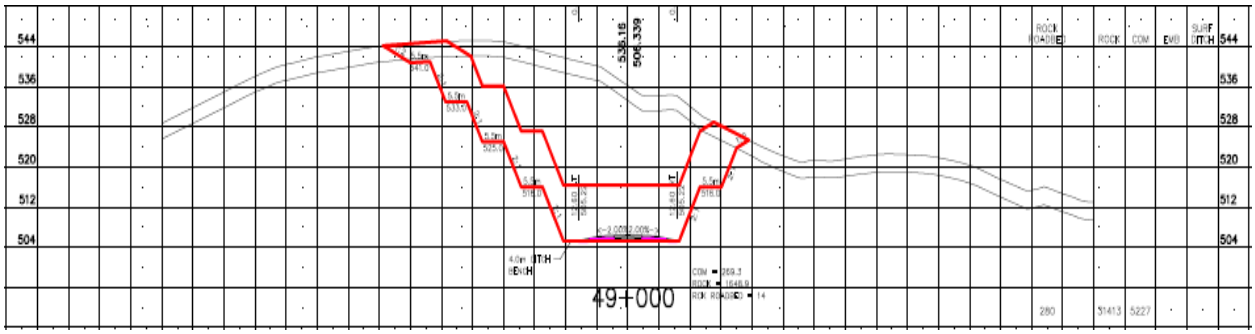
A. ROADWAY EXCAVATION

Value Engineering Alternative No. 1: Adjust the profile grades and/or utilize waste in the fill sections at clear zone (False-Cut) continued.





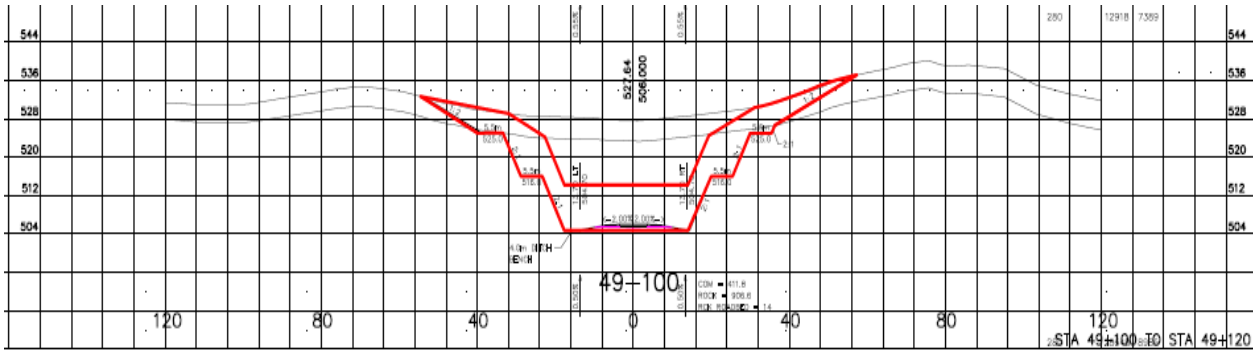


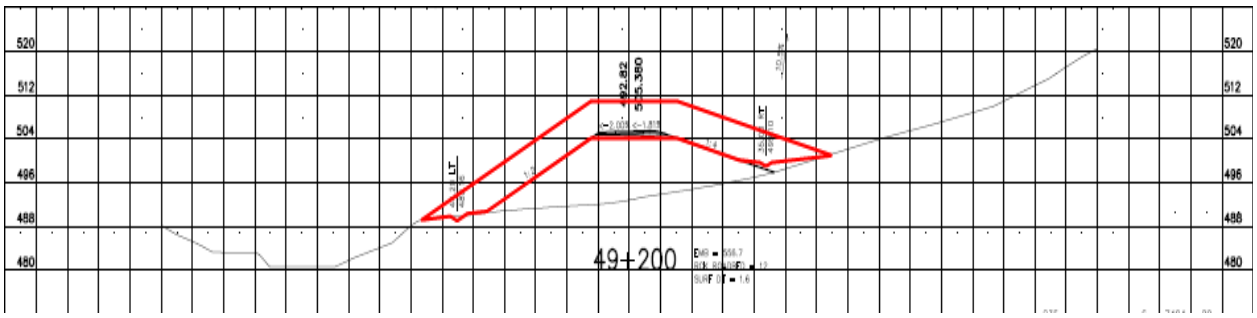


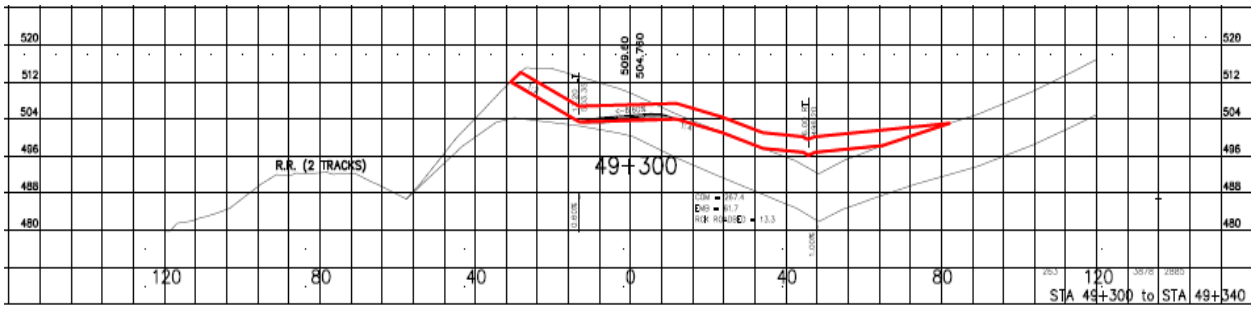
VII. DEVELOPMENT PHASE

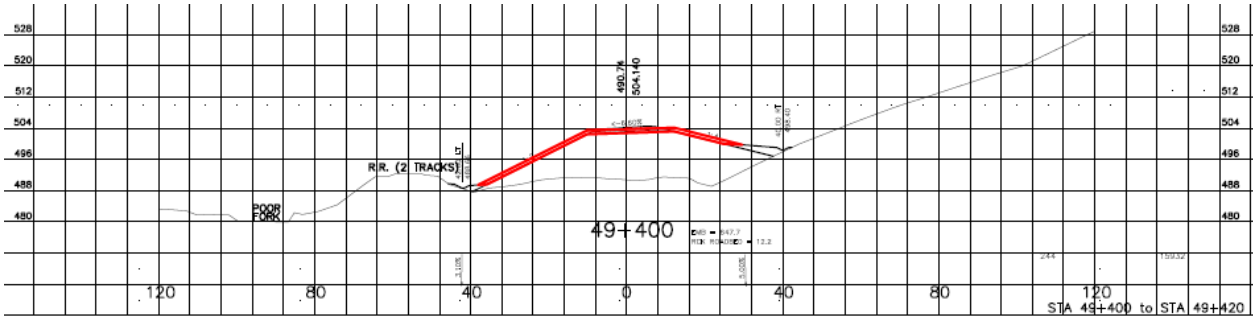
A. ROADWAY EXCAVATION

Value Engineering Alternative No. 1: Adjust the profile grades and/or utilize waste in the fill sections at clear zone (False-Cut) continued.









ROADWAY EXCAVATION
VALUE ENGINEERING ALTERNATIVE NO. 1
COST COMPARISON SHEET

DESCRIPTION	UNITS	UNIT COST	PROP'D QTY.	PROP'D COST	V.E. QTY.	V.E. COST
ROADWAY EXCAVATION	m^3	$4.00	11293847.0	$45,175,388	9954529.0	$39,818,116
BRIDGE #1	sf	$100.00	97488.5	$9,748,850	98001.8	$9,800,180
1520 X 1220 REINFORCED CONCRETE BOX CULVERT	m	$1,640.00	44.0	$72,160	72.0	$118,080
2440 X 2440 REINFORCED CONCRETE BOX CULVERT	m	$2,800.00	56.0	$156,800	100.0	$280,000
1050 MM PIPE (48+250)	m	$343.83	15.0	$5,157	19.0	$6,533
750 MM PIPE (49+400)	m	$256.92	20.0	$5,138	24.0	$6,166
SUBTOTAL				**$55,163,494**		**$50,029,075**
MOBILIZATION (THIS IS SUB+CONTIN. X % =)		**4.5%**		$2,978,829		$2,701,570
INDIRECT COST		**0.0%**		$0		$0
ENGINEERING & CONTINGENCIES		**20.0%**		$11,032,699		$10,005,815
				$0	-	$0
GRAND TOTAL				**$69,175,022**		**$62,736,460**

POSSIBLE SAVINGS: $6,438,561

VII. DEVELOPMENT PHASE

A. COST COMPARISON SHEET BACK UP CALCULATIONS

	STA	AREA	VOL		
	44720	120.61	3618.3		
	44800	572.76	57276		
	44900	684.43	68443		
	45000	1387.94	138794		
	45100	1764.78	176478		
	45200	1225.16	122516		
	45300	541.83	54183		
	45400	520.32	52032		
	45500	101.98	10198		
			683,538	$ 4.00	$ 2,734,153.20
WASTE AREA #1			2,000,000.00	m^3	
	REDUCTION		34%		
	STA	AREA	VOL		
	48300	24.97	2497		
	48400	312.64	31264		
	48500	697.15	69715		
	48600	1043.03	104303		
	48700	828.82	82882		
	48800	450.87	45087		
	48900	555.54	55554		
	49000	893.7	89370		
	49100	756.55	75655		
	49200	586.7	58670		
	49300	347.32	34732		
	49400	60.51	6051		
			655,780	$ 4.00	$ 2,623,120.00
WASTE AREA #3			4,710,000.00	m^3	
	REDUCTION		14%		

The areas were pulled from CADD.

VII. DEVELOPMENT PHASE

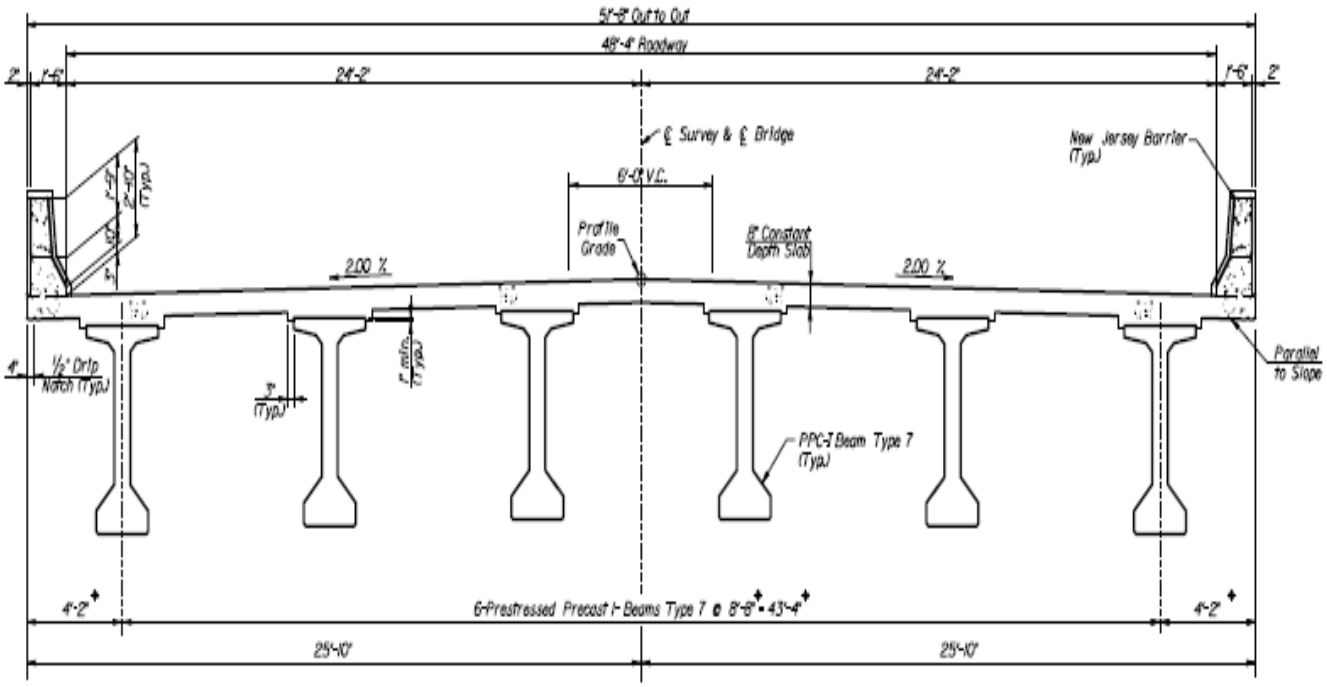
B. BRIDGE NO. 1 (STATION 44+426)

Original Design

Bridge No. 25296 in the Original Design is a new 14 span structure crossing the Poor Fork of the Cumberland River at three locations, KY 3404 (Colliers Creek Road) and the CSX Railroad.

The total bridge length is 1899'-2 5/8" with a 51'-4" out to out and provides for two twelve foot travel lanes, two twelve foot shoulders and two 1'-6" barriers for a 97493.16 SF deck area.

The framing consists of 6 lines of AASHTO Type 7 PCI Beams and skew angles that vary from 40 degrees right to zero and back to 45 degrees right. The Poor Fork of the Cumberland River is crossed by spans 2, 7, and 12. Pier heights average 50'. The span lengths vary from 115' to 139' with the majority being 139'.



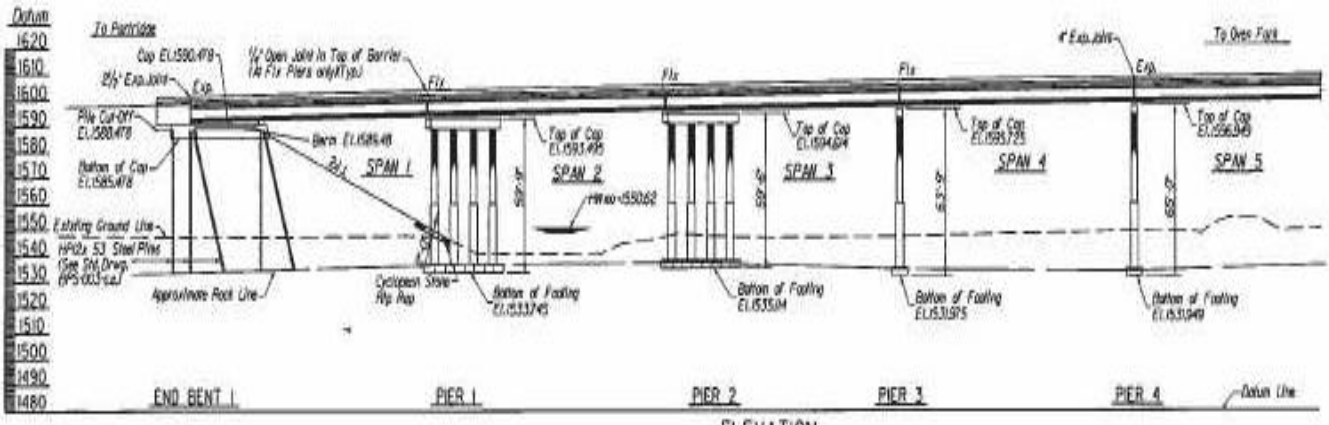
NORMAL TYPICAL SECTION

+ Dimension varies depending on section location. See Framing Plan Sheets S60-S62.

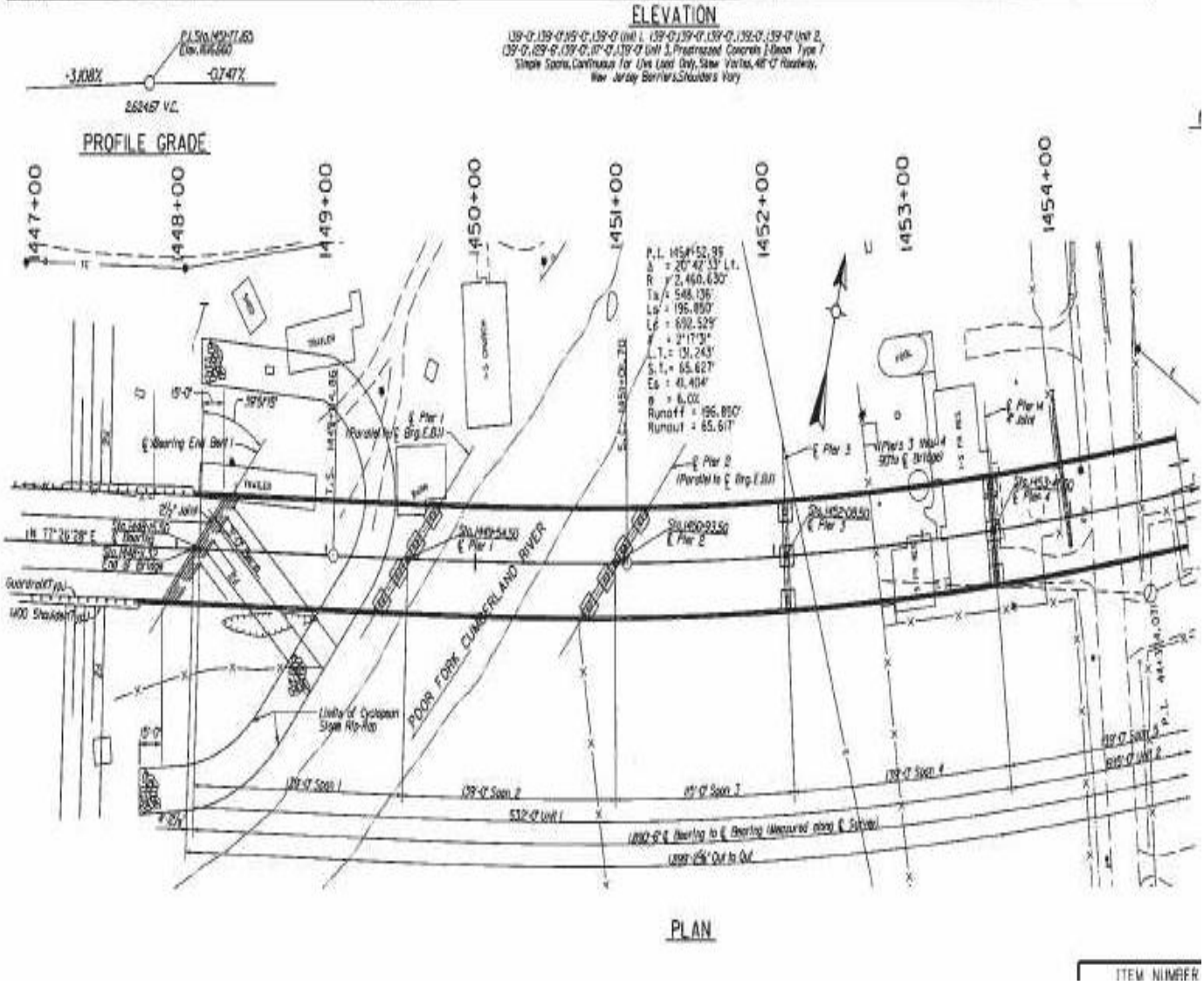
VII. DEVELOPMENT PHASE

B. BRIDGE NO. 1 (STATION 44+426)

Original Design *(continued)*



ELEVATION

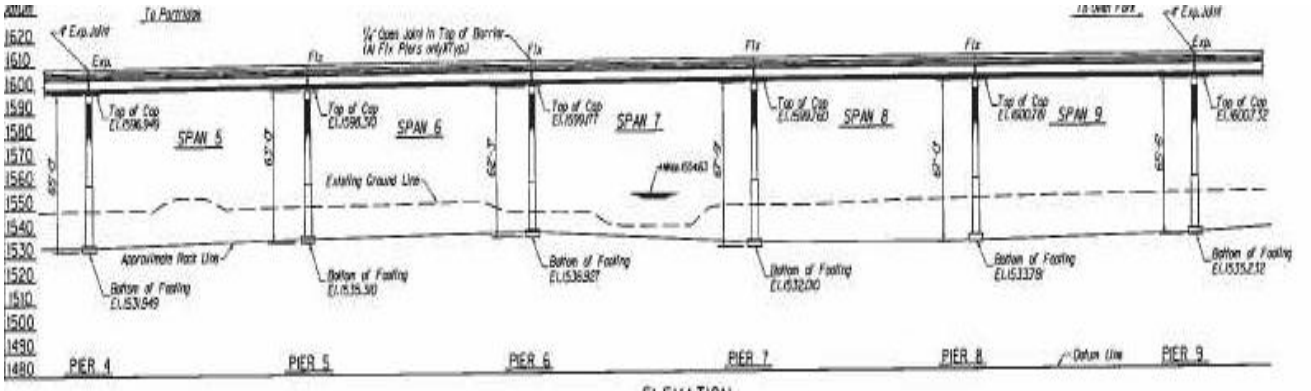


PLAN

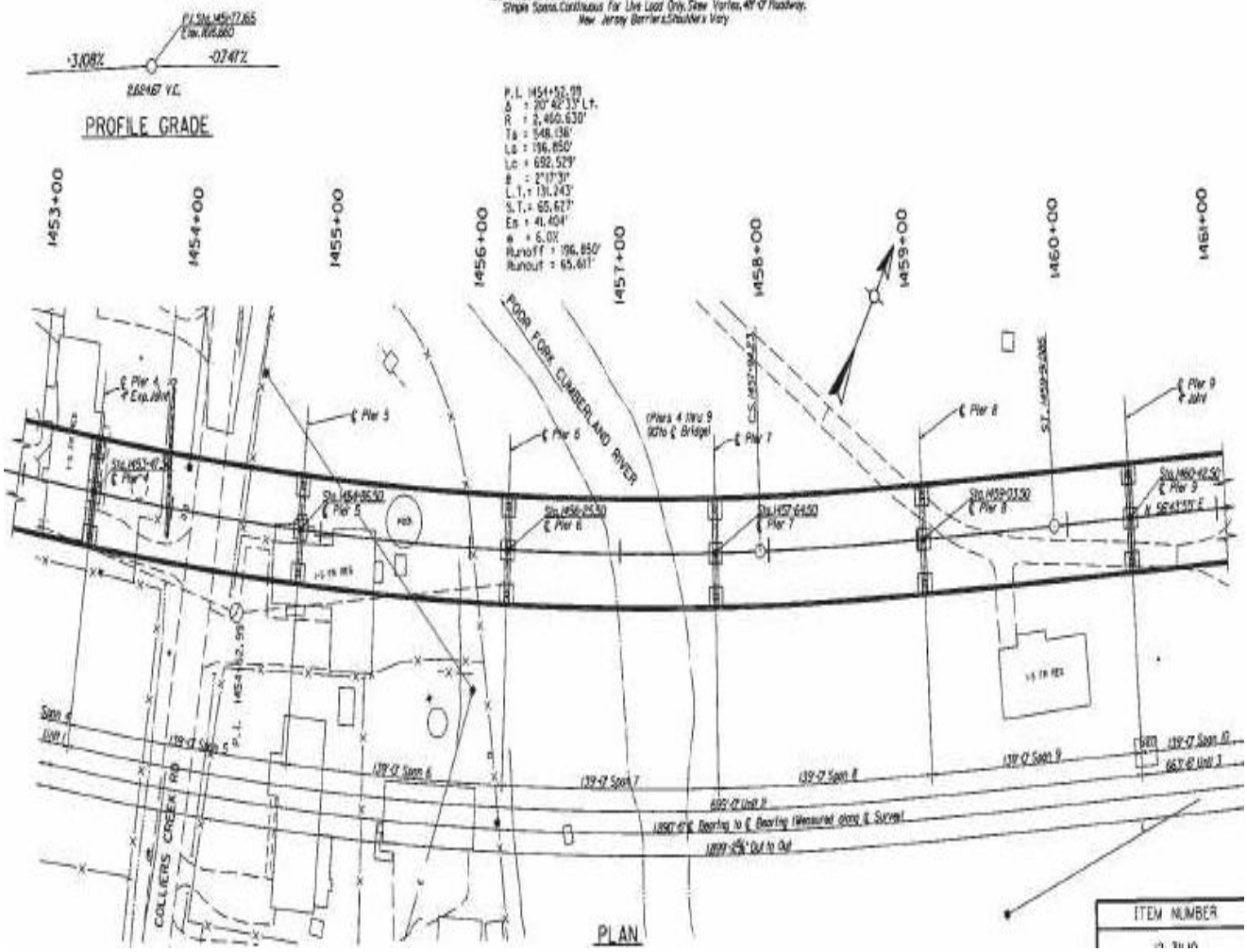
VII. DEVELOPMENT PHASE

B. BRIDGE NO. 1 (STATION 44+426)

Original Design *(continued)*



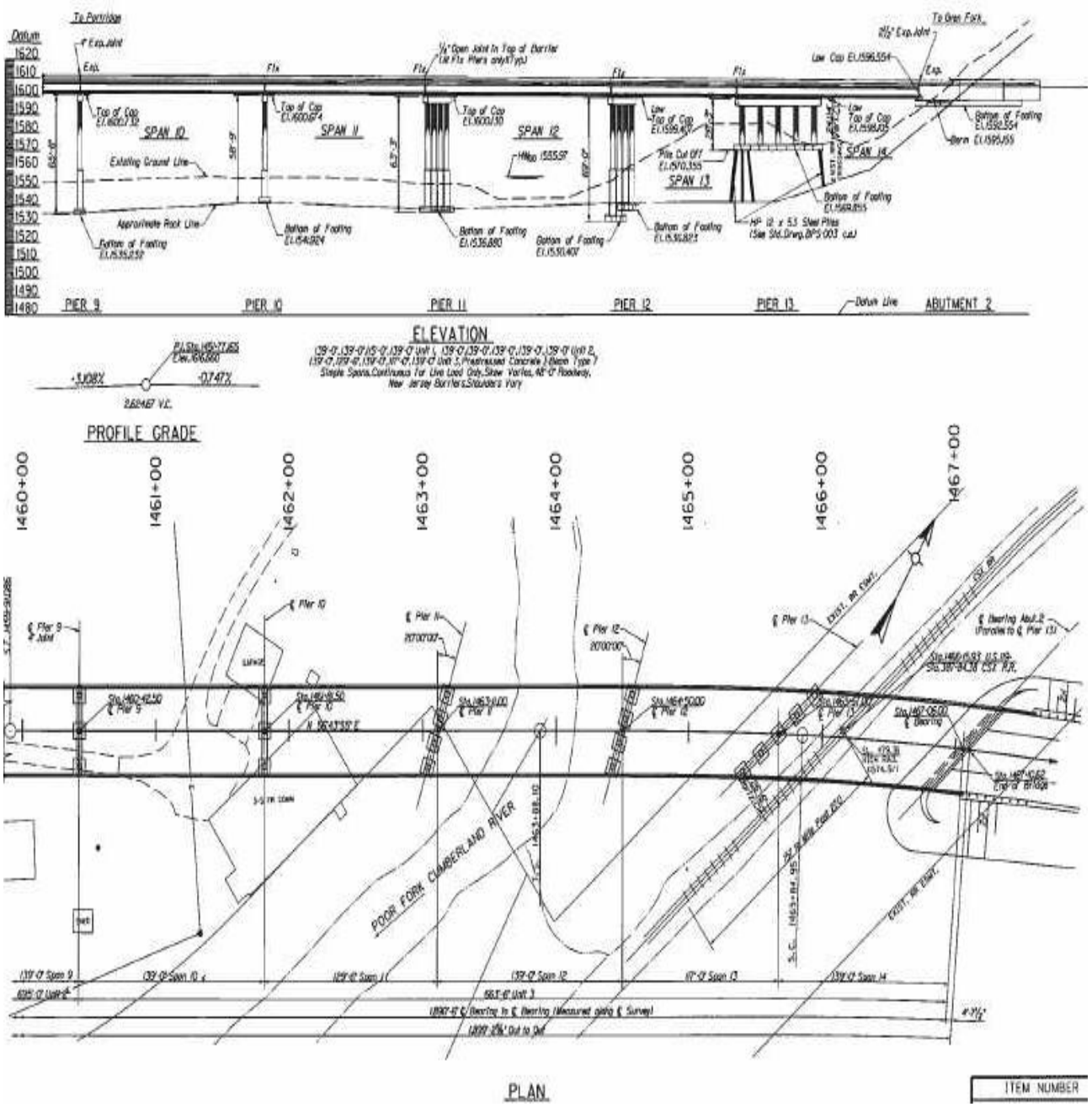
ELEVATION



VII. DEVELOPMENT PHASE

B. BRIDGE NO. 1 (STATION 44+426)

Original Design *(continued)*



VII. DEVELOPMENT PHASE

B. BRIDGE NO. 1 (STATION 44+426)

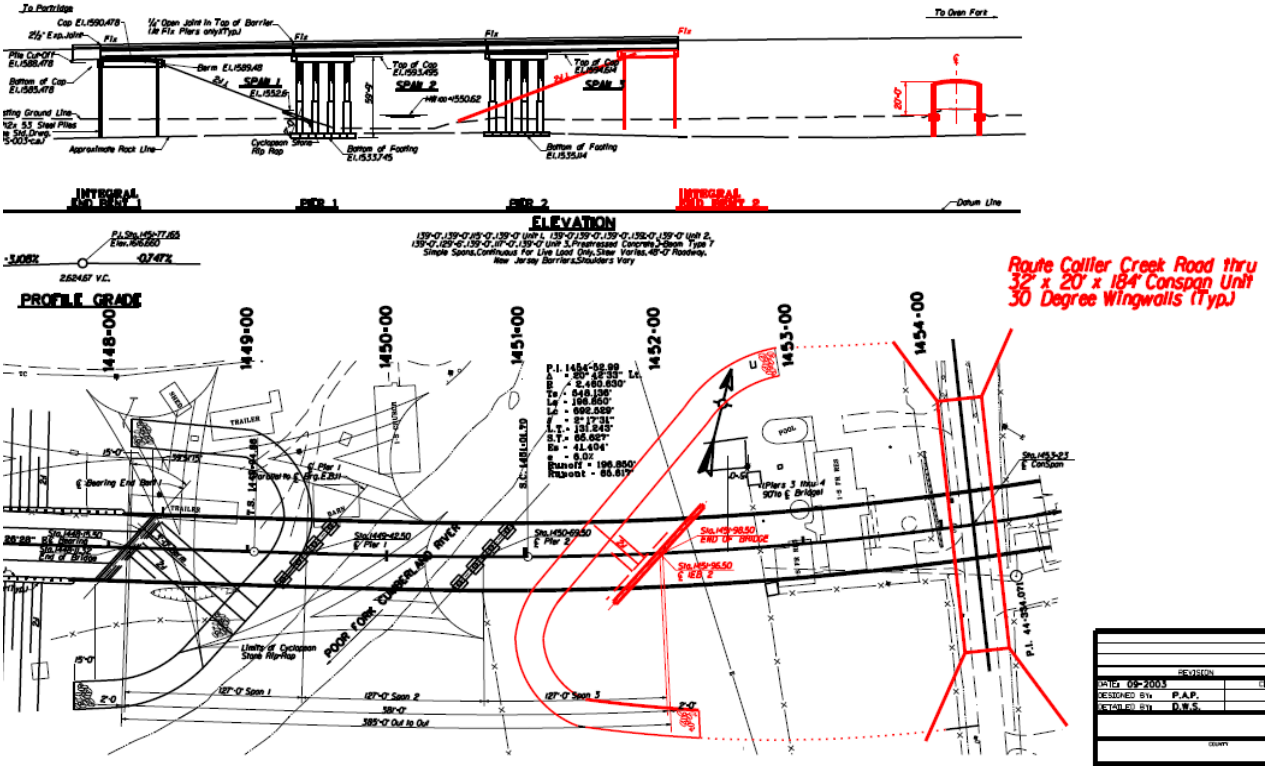
Value Engineering Alternative No. 2: Reduce the number of spans.

This Alternative reduces the number of spans of the bridge by using embankment in some sections between the Poor Fork channels that meander under the bridge and by enclosing KY 3404 (Colliers Creek Road) in a CON/SPAN type structure in the embankment section. This will reduce the number of spans to 10 and provide two three-span bridges and one four span bridge. The Alternative will result in an additional of 653 ft. (199m) of roadway pavement and guardrail on each side. The alternative consists of three bridges each beginning and ending at the stations shown:

BRIDGE NO. 1A

Begin Bridge at	Station 1448+11.2	(44+138.45) (the beginning of the original design)
End Bridge at	Station 1451+90	(44+253.9)

The alternate bridge begins at the beginning station of the original design and has a length of 378.8’ with three 127’ spans. It spans only the West Poor Fork Channel. All substructure units are skewed parallel to the channel.



VII. DEVELOPMENT PHASE

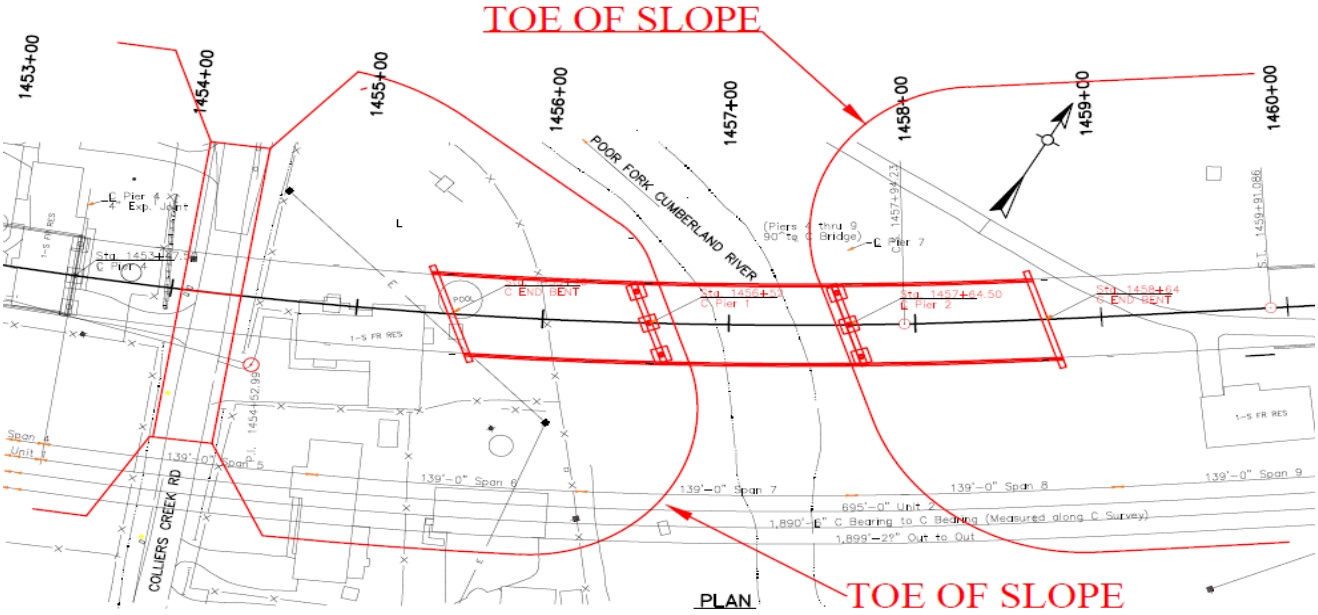
B. BRIDGE NO. 1 (STATION 44+426)

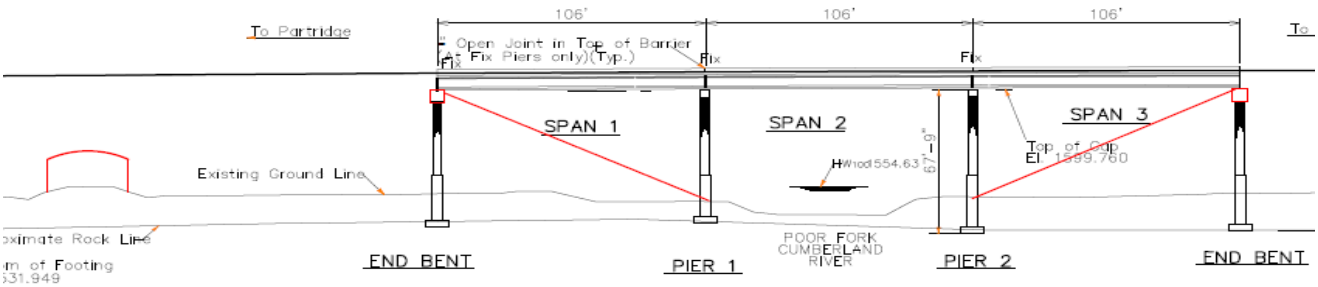
Value Engineering Alternative No. 2: Reduce the number of spans (continued).

BRIDGE NO. 1B

Begin Bridge at	Station 1455+46	(44+362.42)
End Bridge at	Station 1458+64	(44+459.35)

The alternate bridge is 318’ in length and spans only the middle channel of the Poor Fork of the Cumberland River. It consists of three 106’ spans. The substructure units are skewed parallel to the channel.





VII. DEVELOPMENT PHASE

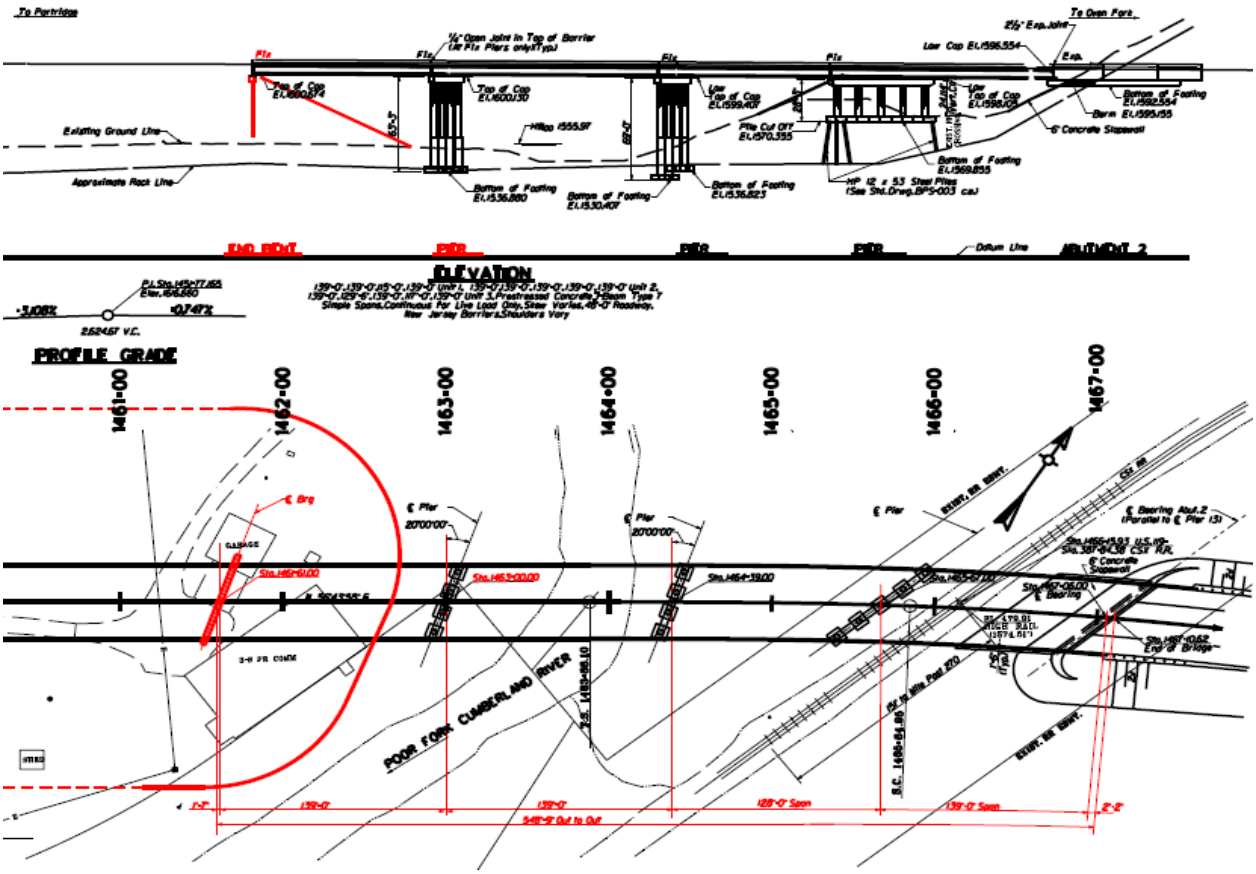
B. BRIDGE NO. 1 (STATION 44+426)

Value Engineering Alternative No. 2: Reduce the number of spans (continued).

BRIDGE NO. 1 C

Begin Bridge at Station 1461+61 (44+549.87)
End Bridge at Station 1467+10.62 (44+717.81)

The alternate bridge is 549.62' in length and spans the East Channel of the Poor Fork of the Cumberland River and the CSX Railroad. It consists of four spans varying in length from 128' to 139'. The substructure units are skewed parallel to the channel and railroad.



The gap between the proposed bridges will be filled with embankment with 2 to 1 side slopes and normal roadway pavement. The toe of the fill does not encroach on the existing river section or the existing US 119 Roadway. There will be a need to extend the current Proposed R/W & C/A limits from Station 1457 + 64 (44+429) to Station 1487 + 10 (45+327).

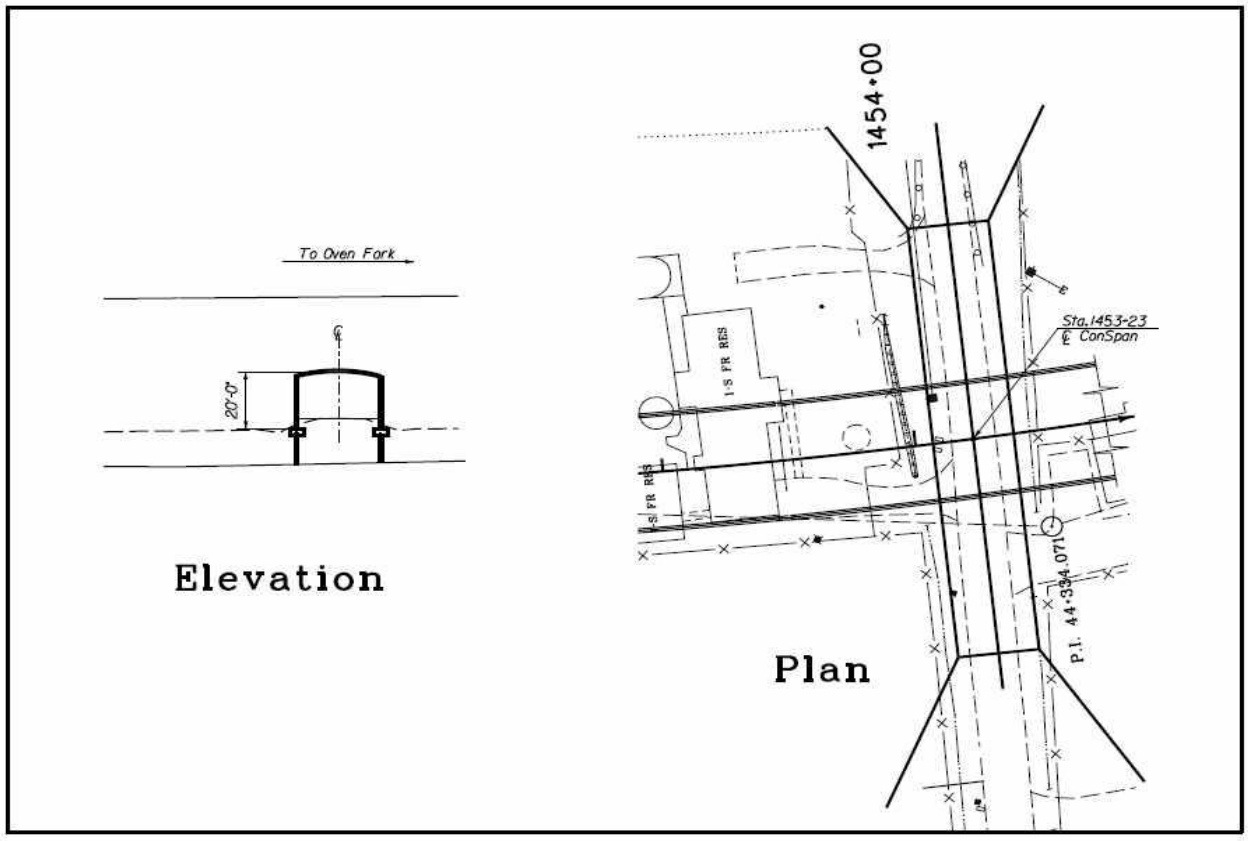
VII. DEVELOPMENT PHASE

B. BRIDGE NO. 1 (STATION 44+426) *(continued)*

Value Engineering Alternative No. 2: Reduce the number of spans (continued).

KY 3404 (Colliers Creed Road) will be placed inside of a CON/SPAN type structure that has a 32’ Span and provides 17’ (5.18 m vertical clearance over the roadway.

The structure will be approximately 184’ (56 m) in length with 30 degree wingwalls at each end.



BRIDGE NO. 1 (STATION 44+426)
VALUE ENGINEERING ALTERNATIVE N0. 2
COST COMPARISON SHEET

DESCRIPTION	UNITS	UNIT COST	PROP'D QTY.	PROP'D COST	V.E. QTY.	V.E. COST
Bridge	sf	$100.00	97492.6	$9,749,260	63982.5	$6,398,248
CON/SPAN	ls	$500,000.00	0	$0	1.0	$500,000
Guardrail	lf	$15.50		$0	1306.0	$20,243
Embankment	m^3	$4.00		$0	190827.0	$763,308
Bridge End Connectors	ea	$2,227.00		$0	8.0	$17,816
DGA	MT	$20.93		$0	1592.0	$33,321
Asphalt Surface	MT	$72.12		$0	231.0	$16,660
Asphalt Base	MT	$59.42		$0	1189.0	$70,650
Drainage Blanket-Asphalt	MT	$39.99		$0	1119.0	$44,749
Asphalt Curing Seal	MT	$593.78		$0	6.0	$3,563
Emulsified Asphalt RS-2	MT	$791.30		$0	2.0	$1,583
Asphalt Seal Aggregate	MT	$94.54		$0	16.0	$1,513
				$9,749,260		**$7,871,652**
Mobilization	ls	**4.5%**		$526,460		$425,069
ENGINEERING & CONTINGENCIES		**20.0%**		$1,949,852		$1,574,330
GRAND TOTAL				**$12,225,572**		**$9,871,052**

POSSIBLE SAVINGS: $2,354,520

VII. DEVELOPMENT PHASE

B. COST COMPARISON SHEET BACK UP CALCULATIONS

Quantities for Alternative 2

Item	Length Ft	Width Ft	Area SF
Original Bridge	1899.22	51.333	97492.66
Bridge 1A	378.8	51.333	19444.94
Bridge 1C	318	51.333	16323.89
Bridge 1C	549.62	51.333	28213.64
			63982.48

	Ft	Lin Meter	Two Sides	FT	Lin Meter
Guard Rail	653	199	2	1306	398

Embankment	Top W ft	Bot W ft	depth ft	Area SF	Length ft	Vol CF	Vol CM
Area 1	52	292	60	10320	356	3673920	104034
Area 2	52	292	60	10320	297	3065040	86793
						6738960	190827

Bridge End Connectors	8

VII. DEVELOPMENT PHASE

B. COST COMPARISON SHEET BACK UP CALCULATIONS (*continued)*

	Original	Alternate	Net Difference		Unit Price	Net Cost Change
DGA	0	1592	1592	Mton	$ 20.93	$33,327
Asphalt Surface	0	231	231	Mton	$ 72.12	$16,644
Asphalt Base	0	1189	1189	Mton	$ 59.42	$70,645
Drainage Blanket-Asphalt	0	1119	1119	Mton	$ 39.99	$44,748
Asphalt Curing Seal	0	6	6	Mton	$ 593.78	$3,499
Emulsified Asphalt RS-2	0	2	2	Mton	$ 791.30	$1,531
Asphalt Seal Aggregate	0	16	16	Mton	$ 94.54	$1,519
Roadway Excavation	0	0	0	CU m	$ 4.00	$0
						$171,913

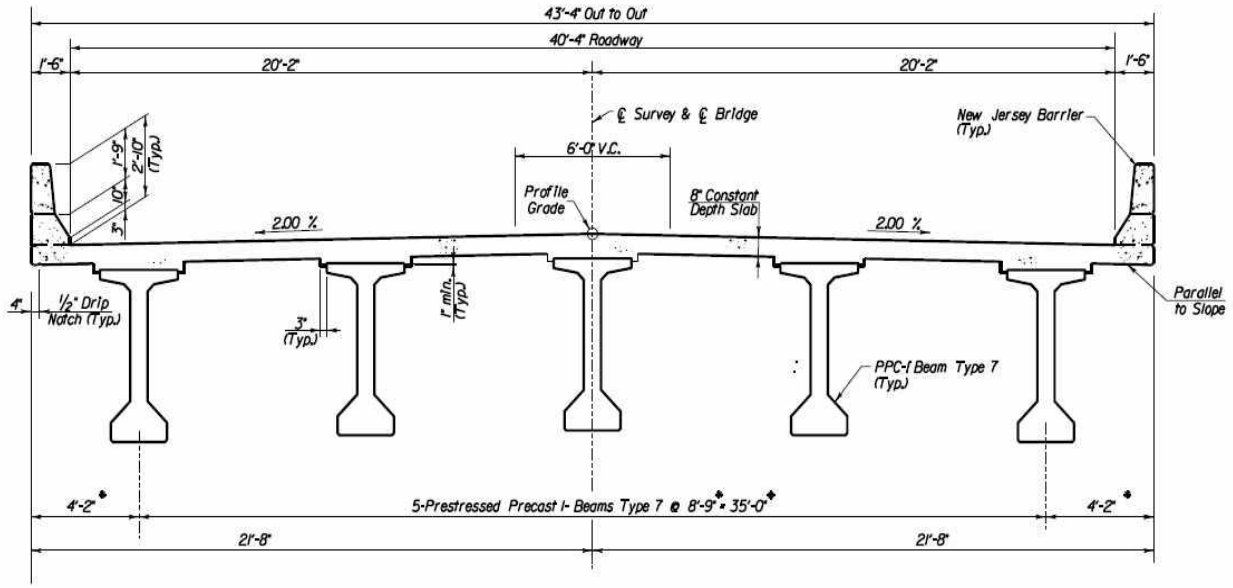
(does not include add-ons)

VII. DEVELOPMENT PHASE

B. BRIDGE NO. 1 (STATION 44+426)

Value Engineering Alternative No. 3: Reduce the bridge typical section.

The Alternative reduces the bridge width to 43’ 4” out to out providing for two 8’ shoulders instead of 12’ shoulders.



NORMAL TYPICAL SECTION

* Dimension varies depending on section location. See Framing Plan Sheets S60-S62.

BRIDGE NO. 1 (STA. 44+426)
VALUE ENGINEERING ALTERNATIVE NO. 3
COST COMPARISON SHEET

DESCRIPTION	UNITS	UNIT COST	PROP'D QTY.	PROP'D COST	V.E. QTY.	V.E. COST
Bridge	sf	$100/sf	97,492.6	$9,749,260	82,299.53	$8,229,953
SUBTOTAL				**$9,749,260**		**$8,229,953**
MOBILIZATION		**4.5%**		$ 526,460		$444,417
Engineering & Contingencies		**20.0%**		$1,949,852		$1,645,991
GRAND TOTAL				**$12,225,572**		**$10,320,361**

POSSIBLE SAVINGS: $1,905,211

VII. DEVELOPMENT PHASE

B. BRIDGE NO. 1 (STATION 44+426)

Value Engineering Alternative No. 4: Eliminate the railroad span and use either CON/SPAN or vertical walls.

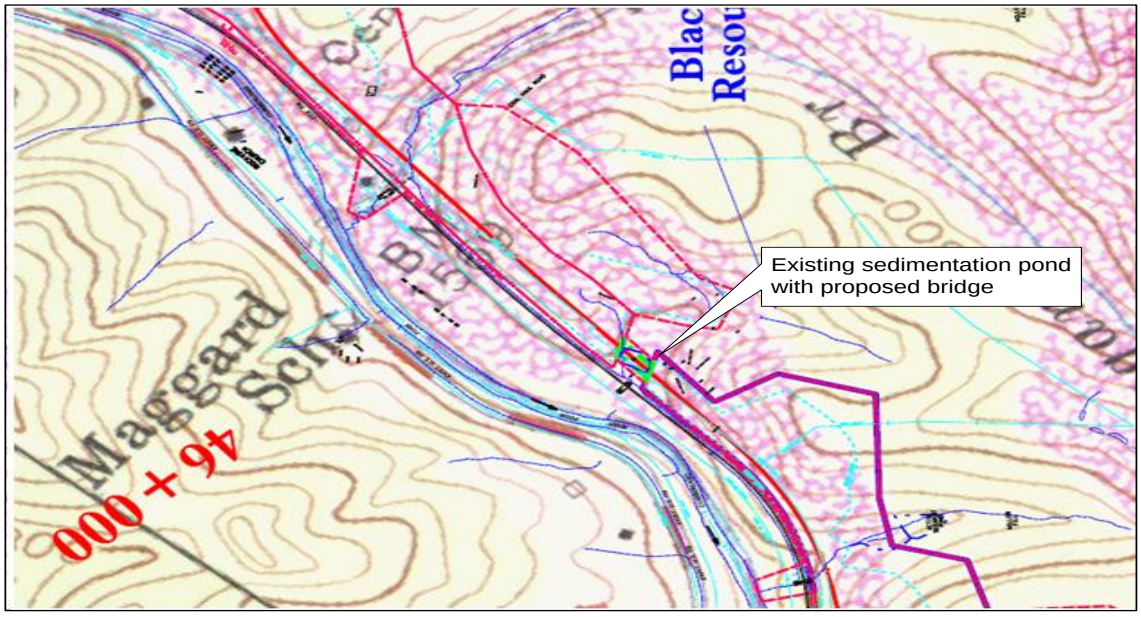
Dropped from further development during the Evaluation/Development Phases after estimates reflected the cost would be significantly greater than the as design alternative. The high cost was caused by the length of the CON/SPAN structure required for the railroad due to the skew with the mainline.

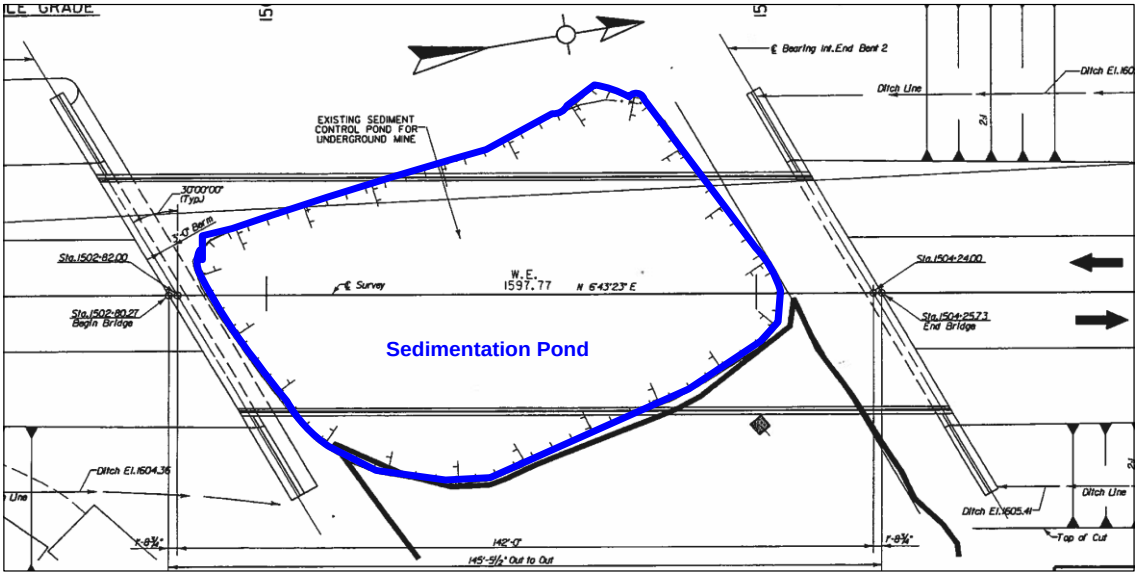
VII. DEVELOPMENT PHASE

C. BRIDGE NO. 2 (STATION 45+827)

Original Design

The Original Design has a single span bridge over the sedimentation pond at station 45+827. This is to accommodate the current mining operations in this vicinity.



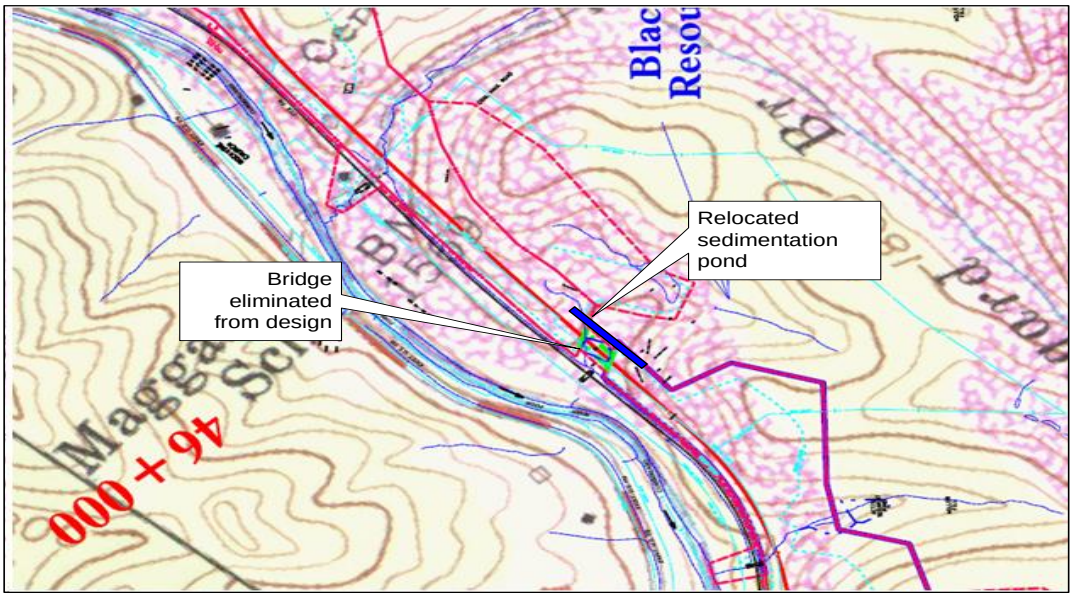


VII. DEVELOPMENT PHASE

C. BRIDGE NO. 2 (STATION 45+827)

Value Engineering Alternative No. 5: Relocate the sedimentation ponds.

Relocate sedimentation pond and eliminate bridge



This Alternative is to relocate the sedimentation pond to avoid the need to build a structure to span it. This will allow the mine operations to continue while reducing the construction and long-term bridge maintenance costs. On January 29, 2003, KYTC staff met with representatives of the Division of Surface Mining Reclamation and Enforcement (DSMRE), Mine Safety Health Administration (MSHA), and Black Mountain Resources (the mine operator). The decision was made and documented that "the pond could likely be moved east of its current location onto areas now used for haul road and storage." Additionally, "DSMRE and MSHA agreed that if the pond could be relocated as discussed, it could meet regulatory requirements."

The volume of the sedimentation pond is approximately 2400 (30 x 20 x 4) cubic meters. There appears to be some flexibility in the location and design of pond. One option is to rebuild it in a linear shape parallel to the new roadway's toe of slope. A 100m long by 6m wide by 4m deep would accommodate the necessary volume. There are other variations on these dimensions that could be used to optimize layout for site conditions. A culvert pipe would be needed underneath the roadway to allow for overflow.

To minimize liability to KYTC, negotiations with the mine operator to require them to build the new pond and drain the existing. Relocation costs would be compensated as part of the Right-of-Way settlement. The mine operator could also be given the option to relocate the pond to another part of the property.

BRIDGE NO. 2 (STA. 45+827)
VALUE ENGINEERING ALTERNATIVE NO. 5
COST COMPARISON SHEET

DESCRIPTION	UNITS	UNIT COST	PROP'D QTY.	PROP'D COST	V.E. QTY.	V.E. COST
Earthwork for new pond	m^3	$4.00	0.0	$0	2400.0	$9,600
R/W for pond	Hectare	$500.00	0.0	$0	0.4	$200
Bridge (estimated at roughly $100/sf)	m^2	$1,076.00	700.0	$753,200	0.0	$0
750mm (30in) culvert pipe	m	$230.38	0.0	$0	35.0	$8,063
				$0		$0
				$0		$0
				$0		$0
				$0		$0
				$0		$0
				$0		$0
SUBTOTAL				**$753,200**		**$17,863**
MOBILIZATION (THIS IS SUB+CONTIN. X % =)		**4.5%**		$40,673		$965
MOT		**0.0%**		$0		$0
ENGINEERING & CONTINGENCIES		**20.0%**		$150,640		$3,573
GRAND TOTAL				**$944,513**		**$22,401**

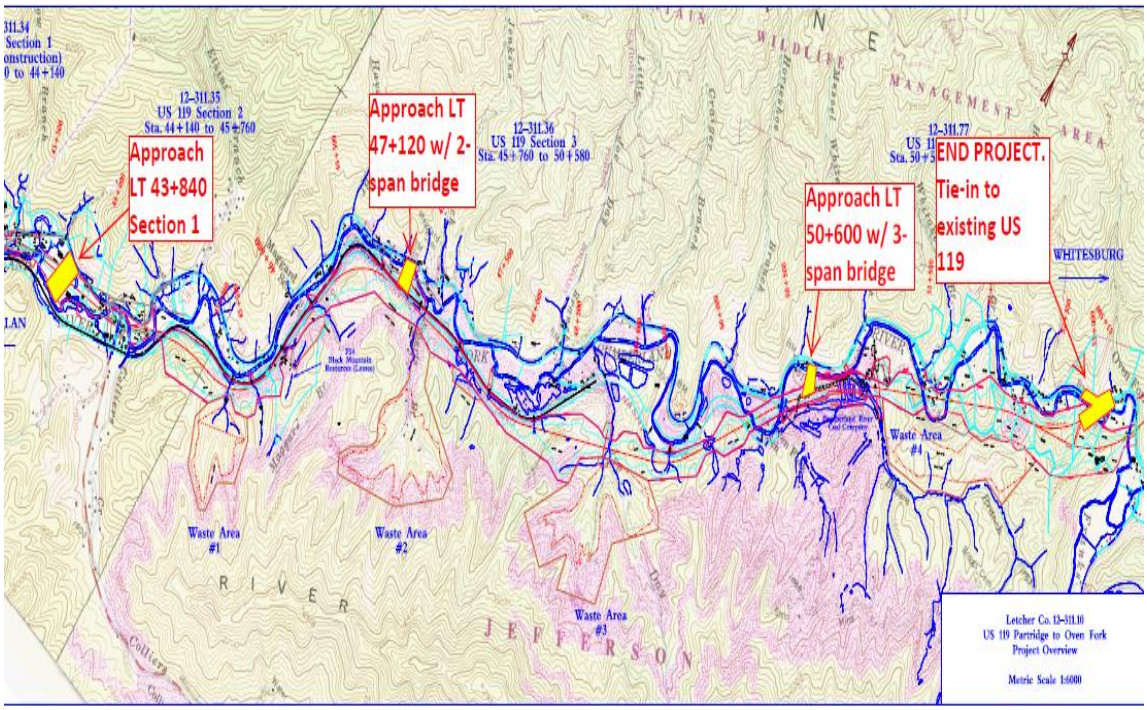
POSSIBLE SAVINGS: $922,112

VII. DEVELOPMENT PHASE

D. BRIDGES NO. 3 (STATION 20+275) AND 6 (STATION 21+932)

Original Design

The Original Design provides for access and connectivity from existing US 119 to relocated US 119 utilizing proposed approach roads located left of Station 43+840 (section 1, currently under construction), left of Station 47+120 (including 2-span bridge), left of Station 50+600 (including 3-span bridge), and the tie-in at the end of the project, left of approximate Station 53+000.



ORIGINAL DESIGN ACCESS POINTS

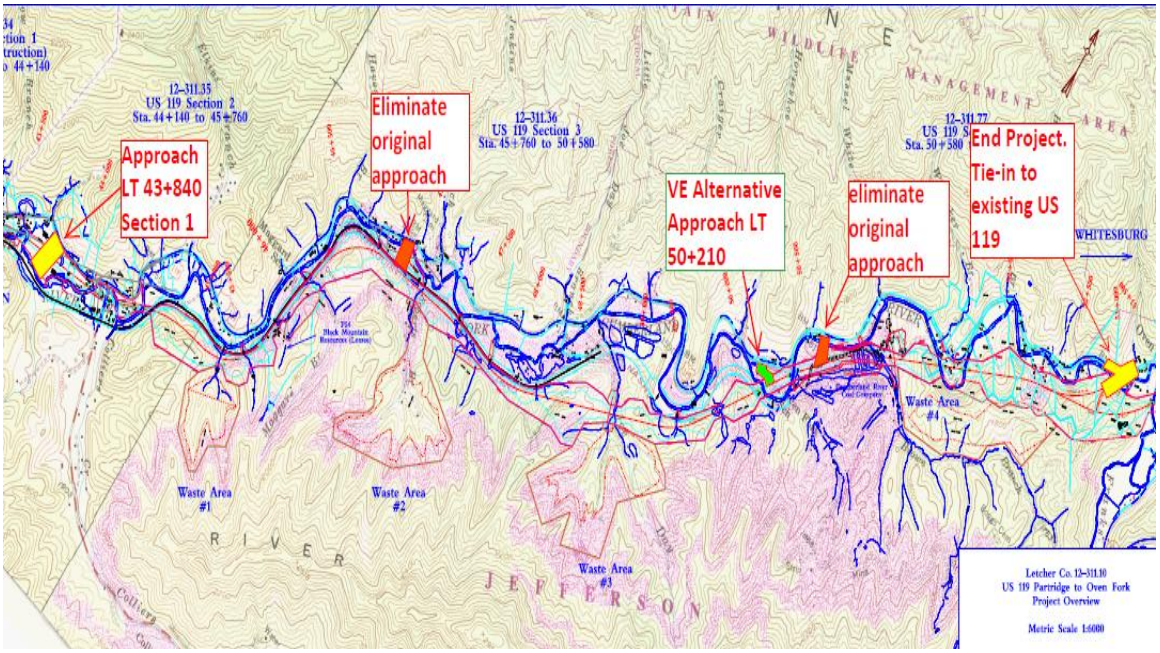
VII. DEVELOPMENT PHASE

D. BRIDGES NO. 3 (STATION 20+275) AND 6 (STATION 21+932)

Value Engineering Alternative No. 6: Eliminate both bridges and build one connection at approximate station 50 + 200.

The Value Engineering Team recommends eliminating the currently designed approach roads left of Station 47+120 and left of Station 50+600, both of which include new bridges (2-span on the 1st and a 3-span on the 2nd) over the Poor Fork of the Cumberland River, and replacing these approach roads with a single access road located left of approximate mainline Station 50+210. At this location the new roadway and the existing US 119 are both aligned on the north side of the Poor Fork; therefore no bridge is needed to construct a connector road in this vicinity.

The Value Engineering Alternative would result in lower project costs, shorter construction time, and no temporary environmental impacts due to construction of the two bridges, while maintaining access between the parallel roadways.

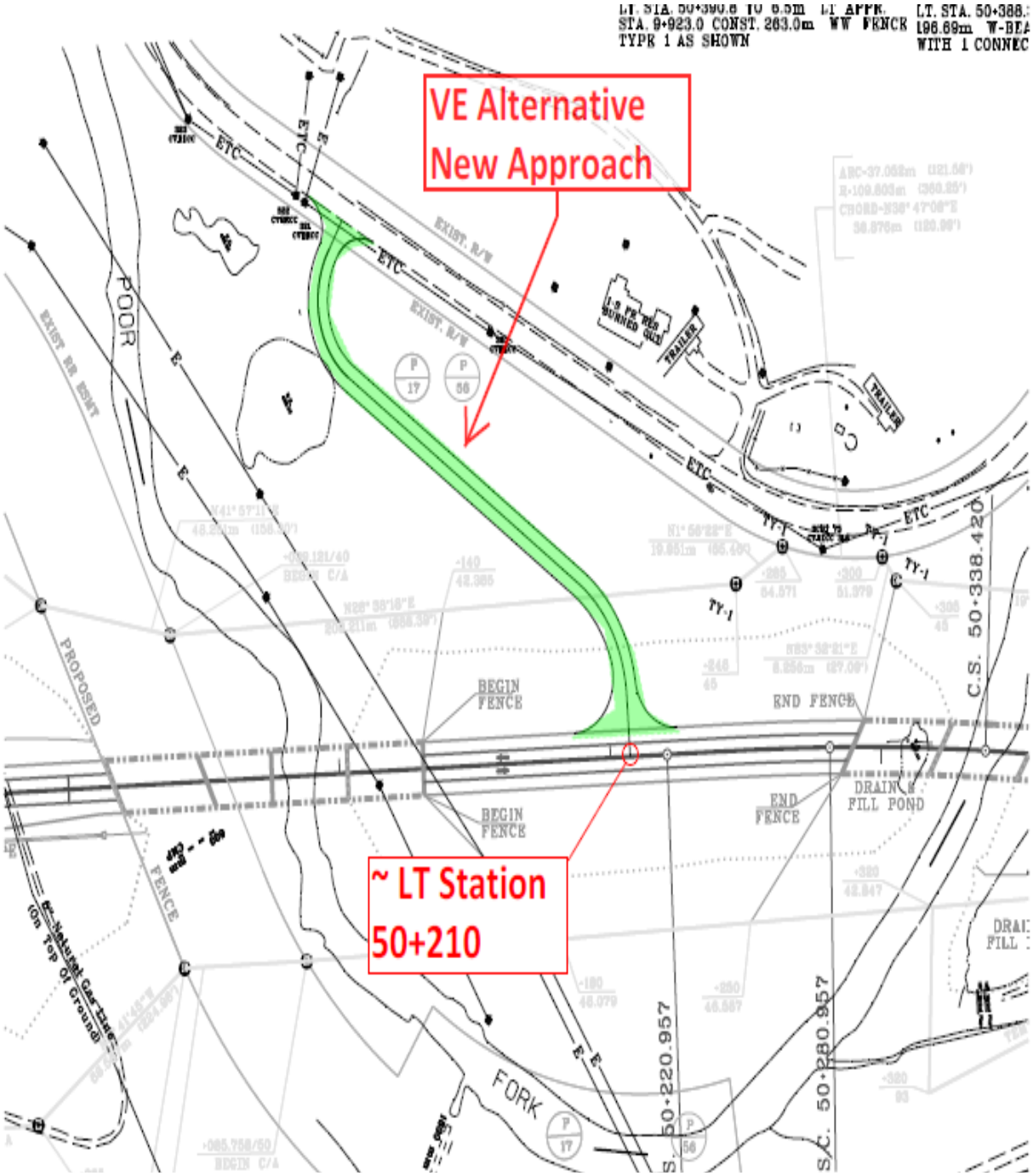


VALUE ENGINEERING ALTERNATIVE ACCESS POINTS

VII. DEVELOPMENT PHASE

D. BRIDGES NO. 3 (STATION 20+275) AND 6 (STATION 21+932)

Value Engineering Alternative No. 6: Eliminate both bridges and build one connection at approximate station 50 + 20 (continued).



BRIDGES NO. 3 (STATION 20+275) AND 6 (STATION 21 + 932)
(ACCESS ROADS TO EXISTING US 119)
VALUE ENGINEERING ALTERNATIVE NO. 6
COST COMPARISON SHEET

DESCRIPTION	UNITS	UNIT COST	PROP'D QTY.	PROP'D COST	V.E. QTY.	V.E. COST
Dense Graded Aggregate Base	MT	$20.93	1035.0	$21,663	708.0	$14,818
Class 2 Asphalt Surface 9.5 B	MT	$72.12	241.0	$17,381	165.0	$11,900
Class 2 Asphalt Base 25.0 D	MT	$59.42	321.0	$19,074	220.0	$13,072
Class 3 Asphalt Base 25.0D	MT	$54.25	482.0	$26,149	330.0	$17,903
Emulsified Asphalt RS-2	MT	$791.30	1.8	$1,407	1.2	$963
Asphalt Seal Aggregate	MT	$94.54	14.8	$1,397	10.1	$956
Guardrail-Steel W-Beam S Face	m	$51.00	570.0	$29,070	390.0	$19,890
Guardrail Bridge End Connector	ea	$2,227.00	8.0	$17,816	0.0	$0
Bridge #3 (2-span)	ls	$524,000.00	1.0	$524,000	0.0	$0
Bridge #6 (3-span)	LS	$786,000.00	1.0	$786,000	0.0	$0
SUBTOTAL				**$1,443,956**		**$79,502**
MOBILIZATION (THIS IS SUB+CONTIN. X % =)		**4.5%**		$77,974		$4,293
				$0		$0
ENGINEERING & CONTINGENCIES		**20.0%**		$288,791		$15,900
				$0	-	$0
GRAND TOTAL				**$1,810,721**		**$99,695**

POSSIBLE SAVINGS: $1,711,025

VII. DEVELOPMENT PHASE

D. COST COMPARISON SHEET BACK UP CALCULATIONS

CALCULATIONS FOR VALUE ALTERNATIVE NO. 6

Delete originally designed two approach roads to existing US 119, and add one access road LT ~ 50+210.

Approach LT M/L Sta 47+120	217	Meters (M)	pavement length
Approach LT M/L Sta 50+600	68		
			Lump Sum = LS
Total Length	285	M	Metric Ton = Mton

Asphalt unit weight = 2.35 kilograms/square meter/millimeter of depth (Kg/SM/mm)
Dense Graded Aggregate Base (DGA) unit weight = 2.46 (Kg/SM/mm)

Deleting these items for Original two access roads	Length (M)	# Sides	Width (M)	Depth (mm)	Rate	Quantity	UNITS
DGA (Paved portion)	285	1	12	100	2.46	841	Mton
DGA (Stabilized portion)	285	2	0.6	230	2.46	194	Mton
Asphalt Surface	285	1	12	30	2.35	241	Mton
CL 2 Asphalt Base	285	2	2.4	100	2.35	321	Mton
CL3 Base traffic lane	285	2	3.6	100	2.35	482	Mton
				Courses			
Emulsified Asphalt RS-2	285	2	1.2	2	1.3	1.8	Mton
Asphalt Seal Aggregate	285	2	1.2	2	10.8	14.8	Mton
Guardrail-Steel W-Beam S Face	285	2				570	Meters
Items needed for Recommended alternate single access road:							
LT Station 50+210; ~195 Meters in length							
DGA (Paved portion)	195	1	12	100	2.46	576	Mton
DGA (Stabilized portion)	195	2	0.6	230	2.46	132	Mton
Asphalt Surface	195	1	12	30	2.35	165	Mton
CL 2 Asphalt Base shoulder	195	2	2.4	100	2.35	220	Mton
CL3 Base traffic lane	195	2	3.6	100	2.35	330	Mton
				Courses			
Emulsified Asphalt RS-2	195	2	1.2	2	1.3	1.2	Mton
Asphalt Seal Aggregate	195	2	1.2	2	10.8	10.1	Mton
Guardrail-Steel W-Beam S Face	195	2				390	Meters

VII. DEVELOPMENT PHASE

D. COST COMPARISON SHEET BACK UP CALCULATIONS

COMPARISON VALUE ALTERNATIVE NO. 6: ***(continued)***

	Original	Alternate	Net Difference		Unit Price	Net Cost Change
DGA	1035	708	-327	Mton	$ 20.93	($6,844)
Asphalt Surface	241	165	-76	Mton	$ 72.12	($5,481)
CL 2 Asphalt Base shoulder	321	220	-101	Mton	$ 59.42	($6,001)
CL3 Asphalt Base traffic lane	482	330	-152	Mton	$ 54.25	($8,246)
Emulsified Asphalt RS-2	1.8	1.2	-0.6	Mton	$ 791.30	($444)
Asphalt Seal Aggregate	14.8	10.1	-4.7	Mton	$ 94.54	($441)
Guardrail-Steel W-Beam S Face	570	390	-180	M	$ 51.00	($9,180)
Guardrail Bridge End Connecto	8	0	-8	Each	$ 2,227.00	($17,816)
Bridge #3 (2-span)	1	0	-1	LS	$ 524,000.00	($524,000)
Bridge #6 (3-span)	1	0	-1	LS	$ 786,000.00	($786,000)
				Net Total Difference =		**($1,364,454)**
		(does not include add-ons)				

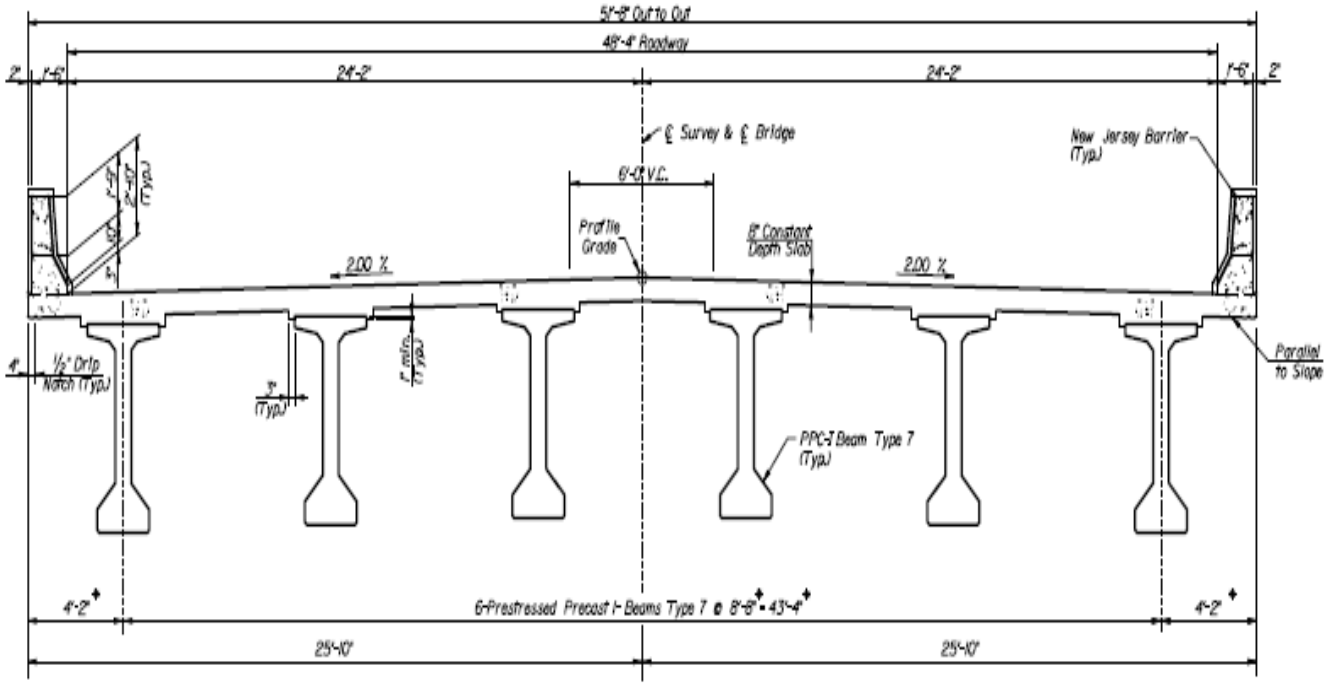
VII. DEVELOPMENT PHASE

E. BRIDGES NO. 2 (STATION 45+827), 4 (STATION 50+708, 5 (STATION 50+338), 7 (STATION 51+515) AND 8 (STATION 51+708)

Original Design

The Original Design is for a roadway width of 51’-4” out to out which provides for two twelve-foot lanes, two twelve-foot shoulders and two 1’-6” barriers.

The bridges carry US 119 over a sedimentation pond and four crossings of the Poor Fork channel. Bridge 4 also spans the CSX Railroad.



NORMAL TYPICAL SECTION

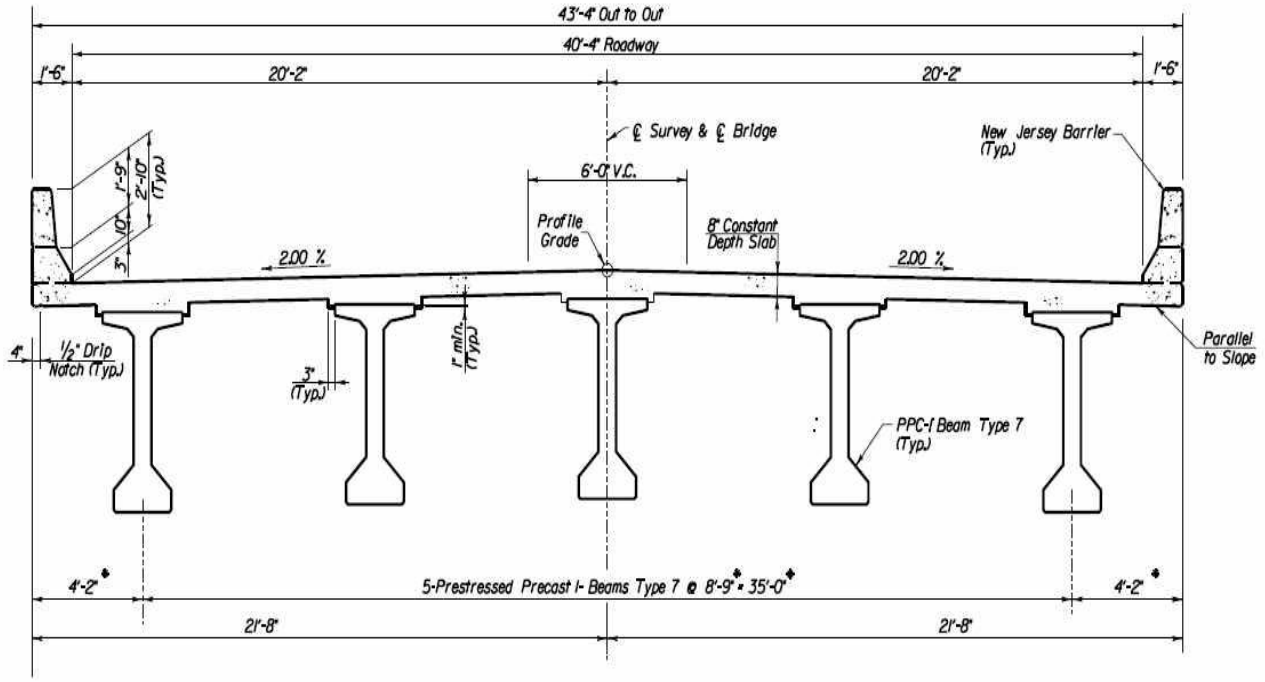
* Dimension varies depending on section location. See Framing Plan Sheets S60-S62.

VII. DEVELOPMENT PHASE

E. BRIDGES NO. 2 (STATION 45+827), 4 (STATION 50+708, 5 (STATION 50+338), 7 (STATION 51+515) AND 8 (STATION 51+708)

Value Engineering Alternative No. 7: Reduce the bridge typical section.

The Alternative reduces the bridge width to 43'-4" and provides for two twelve foot travel lanes, two eight foot shoulders and two 1'-6" barriers. The Alternative typical section is shown below:



NORMAL TYPICAL SECTION

* Dimension varies depending on section location. See Framing Plan Sheets S60-S62.

BRIDGES NO. 2, NO. 4, NO. 5, NO. 7 and NO. 8
VALUE ENGINEERING ALTERNATIVE NO. 7
COST COMPARISON SHEET

DESCRIPTION	UNITS	UNIT COST	PROP'D QTY.	PROP'D COST	V.E. QTY.	V.E. COST
Bridge Area	sf	$100.00/sf	69,480	$6,948,000	58,652	$5,865,200
SUBTOTAL				**$6,948,000**		**$5,865,200**
MOBILIZATION		**4.5%**		$312,660		$263,934
Engineering & Contingencies		**20.0%**		$1,389,600		$1,173,040
GRAND TOTAL				**$8,650,260**		**$7,302,174**

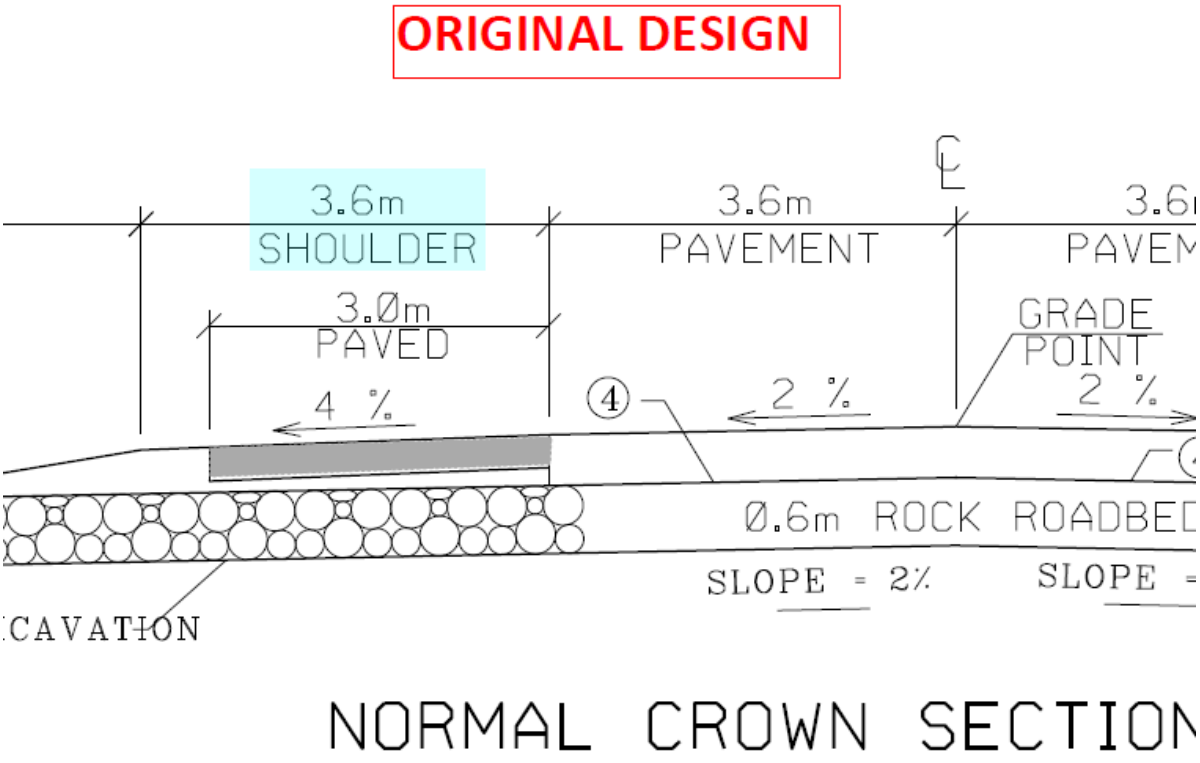
POSSIBLE SAVINGS: $1,344,086

VII. DEVELOPMENT PHASE

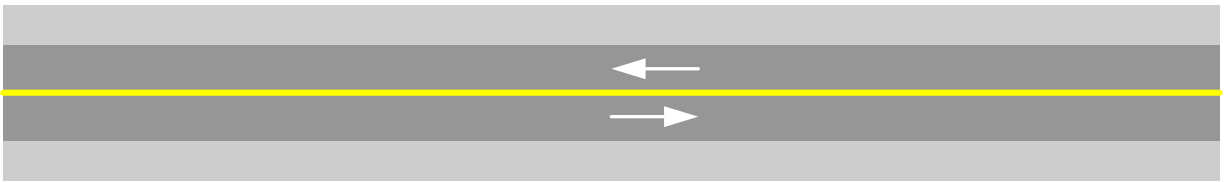
F. PAVEMENT TYPICAL SECTION

Original Design

The Original Design for the mainline typical section specifies 3.6 meter (12 foot) shoulders with 3.0 meters (10 foot) of the shoulder being paved using dense graded aggregate base (DGA), asphalt drainage blanket, asphalt base, and asphalt surface.



The Original Design is for two 3.6m travel lanes with 3.6m (3.0m paved) shoulders. This totals 13.2m wide typical cross section of mainline pavement.



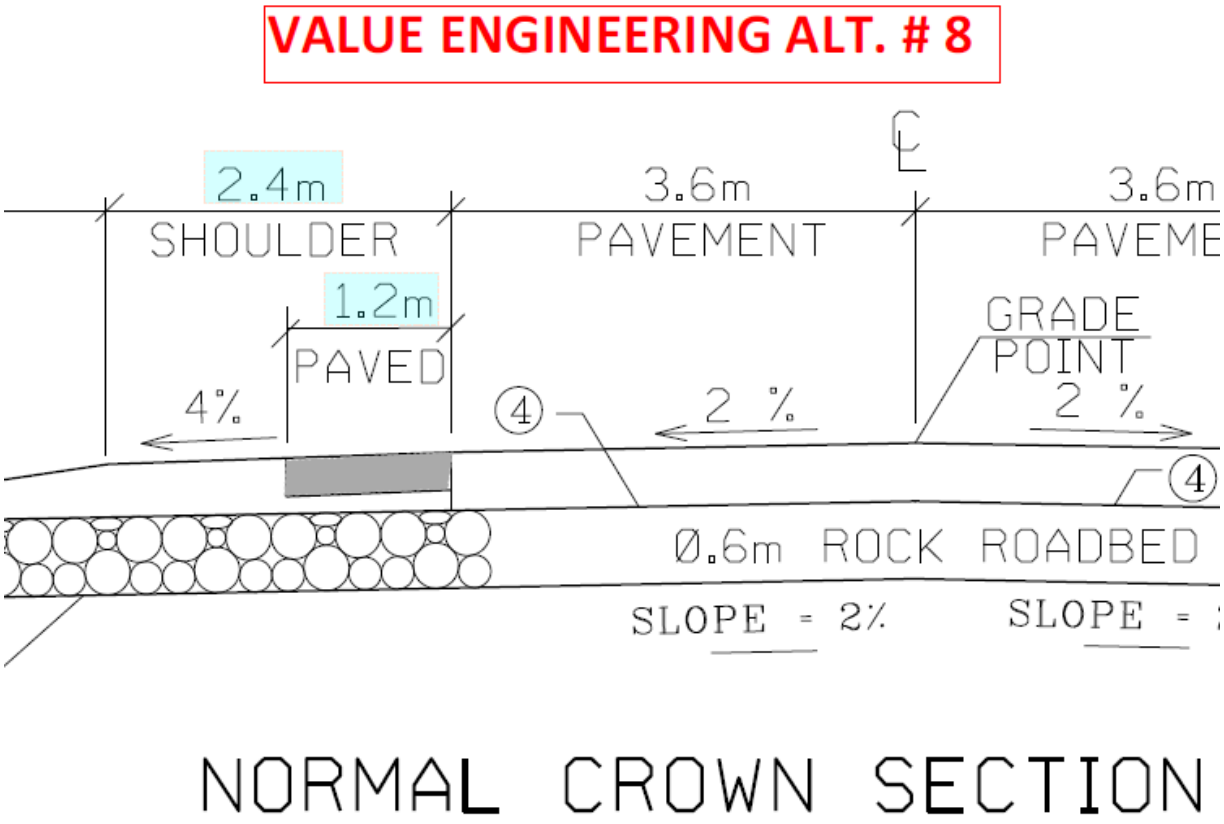
VII. DEVELOPMENT PHASE

F. PAVEMENT TYPICAL SECTION

Value Engineering Alternative No. 8: Reduce the shoulders to 2.4M (8') with 1.2M (4') paved.

The Value Engineering Team recommends using 2.4 meter (8 foot) shoulders with 1.2 meters (4 feet) being paved; the remaining outside 1.2 meters (4 feet) of shoulder will be constructed using full depth DGA with an asphalt seal coat. This Alternative would provide 2.4 meters (8 foot) of useable, stabilized shoulder for emergency pullovers and would still provide adequate edge support for traffic lane pavement. In addition to using less material quantities for shoulder construction, this proposal for the typical section revision will reduce excavation limits through cut sections by 2.4 meters, resulting in less roadway excavation volume.

This Value Engineering Alternative will result in a project cost savings and reduction in construction time while still providing a suitable shoulder.



NORMAL CROWN SECTION

PAVEMENT TYPICAL SECTION (SHOULDER WIDTH)
VALUE ENGINEERING ALTERNATIVE N0. 8
COST COMPARISON SHEET

DESCRIPTION	UNITS	UNIT COST	PROP'D QTY.	PROP'D COST	V.E. QTY.	V.E. COST
Dense Graded Aggregate Base	MT	$20.93	18311.6	$383,261	20871.2	$436,835
Class 3 Asphalt Surface 9.5 B	MT	$72.12	2821.4	$203,480	1128.6	$81,392
Class 2 Asphalt Base 25.0 D	MT	$59.42	9404.7	$558,827	3761.9	$223,531
Drainage Blanket Type II-Asphalt	MT	$39.99	18809.4	$752,188	7523.8	$300,875
Asphalt Curing Seal	MT	$593.78	72.0	$42,774	28.8	$17,109
Emulsified Asphalt RS-2	MT	$791.30	20.8	$16,467	41.6	$32,935
Asphalt Seal Aggregate	MT	$94.54	172.9	$16,345	345.8	$32,689
Roadway Excavation	m^3	$4.00	720272.0	$2,881,088	480181.0	$1,920,724
				$0		$0
				$0		$0
SUBTOTAL				**$4,854,430**		**$3,046,090**
MOBILIZATION (THIS IS SUB+CONTIN. X % =)		**4.5%**		$262,139		$164,489
				$0		$0
ENGINEERING & CONTINGENCIES		**20.0%**		$970,886		$609,218
				$0	-	$0
GRAND TOTAL				**$6,087,455**		**$3,819,797**

POSSIBLE SAVINGS: $2,267,657

VII. DEVELOPMENT PHASE

F. COST COMPARISON SHEET BACK UP CALCULATIONS

CALCULATIONS FOR ALTERNATIVE NO. 8

2.4 Meter (M) SHOULDER (1.2 M PAVED) IN LIEU OF ORIGINAL PROPOSED 3.6 M SHOULDER (3.0 PAVED)

Begin Station 44+720 End Station 52+373

Total Length 7653 Meters (M)

bridge lengths (deduct) 983

Net pavement 6670 M Metric Ton = Mton

Asphalt unit weight = 2.35 kilograms/square meter/millimeter of depth (Kg/SM/mm)
Dense Graded Aggregate Base (DGA) unit weight = 2.46 (Kg/SM/mm)

Original Design	Length (M)	# Sides	Width (M)	Depth (mm)	Rate	Quantity	UNITS
DGA (Paved portion)	6670	2	3	100	2.46	9845	Mton
DGA (Stabilized portion)	6670	2	0.6	430	2.46	8467	Mton
Asphalt Surface	6670	2	3	30	2.35	2821	Mton
Asphalt Base	6670	2	3	100	2.35	9405	Mton
Drainage Blanket-Asphalt	6670	2	3	200	2.35	18809	Mton
				Courses			
Asphalt Curing Seal	6670	2	3	2	0.9	72	Mton
Emulsified Asphalt RS-2	6670	2	0.6	2	1.3	21	Mton
Asphalt Seal Aggregate	6670	2	0.6	2	10.8	173	Mton
Recommended VE:							
DGA (Paved portion)	6670	2	1.2	100	2.46	3938	Mton
DGA (Stabilized portion)	6670	2	1.2	430	2.46	16933	Mton
Asphalt Surface	6670	2	1.2	30	2.35	1129	Mton
Asphalt Base	6670	2	1.2	100	2.35	3762	Mton
Drainage Blanket-Asphalt	6670	2	1.2	200	2.35	7524	Mton
				Courses			
Asphalt Curing Seal	6670	2	1.2	2	0.9	29	Mton
Emulsified Asphalt RS-2	6670	2	1.2	2	1.3	42	Mton
Asphalt Seal Aggregate	6670	2	1.2	2	10.8	346	Mton

F. COST COMPARISON SHEET BACK UP CALCULATIONS

COMPARISON VALUE ENGINEERING ALTERNATIVE NO. 8: *(continued)*

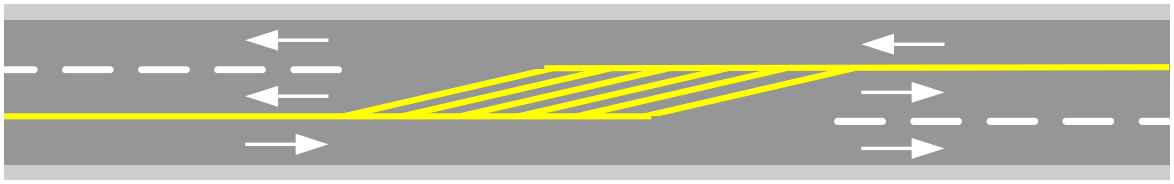
	Original	Alternate	Net Difference		Unit Price	Net Cost Change
DGA	18312	20871	2560	Mton	$ 20.93	$53,574
Asphalt Surface	2821	1129	-1693	Mton	$ 72.12	($122,088)
Asphalt Base	9405	3762	-5643	Mton	$ 59.42	($335,296)
Drainage Blanket-Asphalt	18809	7524	-11286	Mton	$ 39.99	($451,313)
Asphalt Curing Seal	72	29	-43	Mton	$ 593.78	($25,664)
Emulsified Asphalt RS-2	21	42	21	Mton	$ 791.30	$16,467
Asphalt Seal Aggregate	173	346	173	Mton	$ 94.54	$16,345
Roadway Excavation	720272	480181	-240091	CU M	$ 4.00	($960,364)
					Net Total Difference =	**($1,808,339)**
		(does not include add-ons)				

VII. DEVELOPMENT PHASE

F. PAVEMENT TYPICAL SECTION

Value Engineering Alternative No. 9: Use 2 + 1 lane configuration.

This Alternative changes the pavement cross section to a 2+1 roadway configuration.



This Alternative changes the pavement cross section to a 2+1 roadway configuration. By implementing this, the level of service for the roadway will be higher than the original design. Per the definition in the Highway Capacity Manual 2010 (Chapter 15), this route, after being upgraded would be classified as a Class 1 two-lane highway. For Class 1, LOS is determined by two measures of effectiveness:

1. Average travel speed (ATS)
2. Percent time spent following (PTSF)

The Original Design addresses ATS by designing to have a 100 km/hr design speed. This will raise the ATS from the existing US119, which currently contains many curves that must be driven at speeds less than 50 km/hr. On the other hand, the Original Design, does not provide for passing lanes; the grades and sight distance of the original design will allow for drivers to pass using the lane in the opposite direction when adequate gaps in traffic exist. A driver may get caught driving behind a slow moving vehicle and feel uncomfortable passing even when a passing opportunity exists. The 2+1 alternate gives alternating safe locations, every one to two miles, for drivers to pass, therefore greatly improving the PTSF. This may be especially important when a queue of vehicles occurs behind a slow vehicle traveling westbound from Pine Mountain.

Implementation of the 2+1 configuration may be done within the original cross section template width. The current pavement width is 13.2m. For this recommendation, the two outside travel lanes are 3.5m, the center alternating lane is 3.8m and the paved shoulders are 1.2m. The original pavement design will need to be revised to accommodate the additional travel lane. This increases the full depth pavement from 7.2m to 10.8m and reduces the shoulder pavement from 6.0m to 2.4m.

VII. DEVELOPMENT PHASE

F. PAVEMENT TYPICAL SECTION

Value Engineering Alternative No. 9: Use 2 + 1 lane configuration (continued).

VALUE ENGINEERING ALTERNATIVE EXAMPLE OF 2 + 1 ROADWAY

PAVEMENT TYPICAL SECTION
VALUE ENGINEERING ALTERNATIVE NO. 9
COST COMPARISON SHEET

DESCRIPTION	UNITS	UNIT COST	PROP'D QTY.	PROP'D COST	V.E. QTY.	V.E. COST
DGA Mainline	MT	$20.93	11814.0	$247,267	35442.0	$741,801
Drainage Blanket Mainline	MT	$39.99	11286.0	$451,327	16928.0	$676,951
Asphalt Curing Mainline	MT	$593.78	86.0	$51,065	130.0	$77,191
Asphalt Base Mainline	MT	$59.42	22571.0	$1,341,169	33857.0	$2,011,783
Asphalt Surface Mainline	MT	$72.12	3386.0	$244,198	5079.0	$366,297
DGA Shoulder	MT	$20.93	18312.0	$383,270	12405.0	$259,637
Drainage Blanket Shoulder	MT	$39.99	18809.0	$752,172	7524.0	$300,885
Asphalt Curing Shoulder	MT	$593.78	72.0	$42,752	29.0	$17,220
Asphalt Base Shoulder	MT	$59.42	9405.0	$558,845	3762.0	$223,538
Asphalt Surface Shoulder	MT	$72.12	2821.0	$203,451	1129.0	$81,423
SUBTOTAL				**$4,275,516**		**$4,756,726**
MOBILIZATION (THIS IS SUB+CONTIN. X % =)		**4.5%**		$230,878		$256,863
MOT		**0.0%**		$0		$0
ENGINEERING & CONTINGENCIES		**20.0%**		$855,103		$951,345
GRAND TOTAL				**$5,361,497**		**$5,964,935**

POSSIBLE INCREASE: $603,437

VII. DEVELOPMENT PHASE

F. COST COMPARISON SHEET BACK UP CALCULATIONS

Mainline Pavement Calculations

Material	Length (m)	# Sides	Width (m)	Depth (mm)	Rate	Quantity	UNITS
DGA (Paved portion)	6670	1	7.2	100	2.46	11814	Mton
DGA (Stabilized portion)	6670	0	0	0	2.46	0	Mton
Asphalt Surface	6670	1	7.2	30	2.35	3386	Mton
Asphalt Base	6670	1	7.2	200	2.35	22571	Mton
Drainage Blanket-Asphalt	6670	1	7.2	100	2.35	11286	Mton
				Courses			
Asphalt Curing Seal	6670	1	7.2	2	0.9	86	Mton
Emulsified Asphalt RS-2	6670	0	0	2	1.3	0	Mton
Asphalt Seal Aggregate	6670	0	0	2	10.8	0	Mton
Recommended:							
DGA (Paved portion)	6670	2	10.8	100	2.46	35442	Mton
DGA (Stabilized portion)	6670	0	0	0	2.46	0	Mton
Asphalt Surface	6670	1	10.8	30	2.35	5079	Mton
Asphalt Base	6670	1	10.8	200	2.35	33857	Mton
Drainage Blanket-Asphalt	6670	1	10.8	100	2.35	16928	Mton
				Courses			
Asphalt Curing Seal	6670	1	10.8	2	0.9	130	Mton
Emulsified Asphalt RS-2	6670	0	0	2	1.3	0	Mton
Asphalt Seal Aggregate	6670	0	0	2	10.8	0	Mton

F. COST COMPARISON SHEET BACK UP CALCULATIONS *(continued)*

Shoulder Pavement Calculations

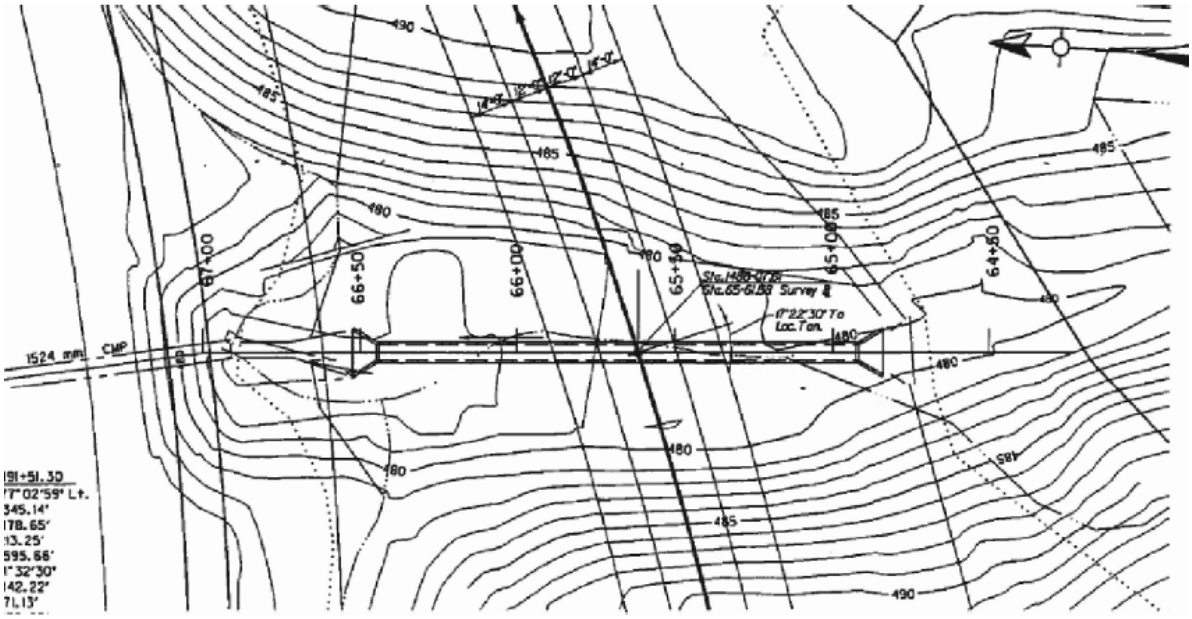
Material	Length (m)	# Sides	Width (m)	Depth (mm)	Rate	Quantity	UNITS
DGA (Paved portion)	6670	2	3	100	2.46	9845	Mton
DGA (Stabilized portion)	6670	0	0	430	2.46	0	Mton
Asphalt Surface	6670	2	3	30	2.35	2821	Mton
Asphalt Base	6670	2	3	100	2.35	9405	Mton
Drainage Blanket-Asphalt	6670	2	3	200	2.35	18809	Mton
				Courses			
Asphalt Curing Seal	6670	2	3	2	0.9	72	Mton
Emulsified Asphalt RS-2	6670	2	0.6	2	1.3	21	Mton
Asphalt Seal Aggregate	6670	2	0.6	2	10.8	173	Mton
Recommended:							
DGA (Paved portion)	6670	2	1.2	100	2.46	3938	Mton
DGA (Stabilized portion)	6670	0	0	430	2.46	0	Mton
Asphalt Surface	6670	2	1.2	30	2.35	1129	Mton
Asphalt Base	6670	2	1.2	100	2.35	3762	Mton
Drainage Blanket-Asphalt	6670	2	1.2	200	2.35	7524	Mton
				Courses			
Asphalt Curing Seal	6670	2	1.2	2	0.9	29	Mton
Emulsified Asphalt RS-2	6670	2	1.2	2	1.3	42	Mton
Asphalt Seal Aggregate	6670	2	1.2	2	10.8	346	Mton

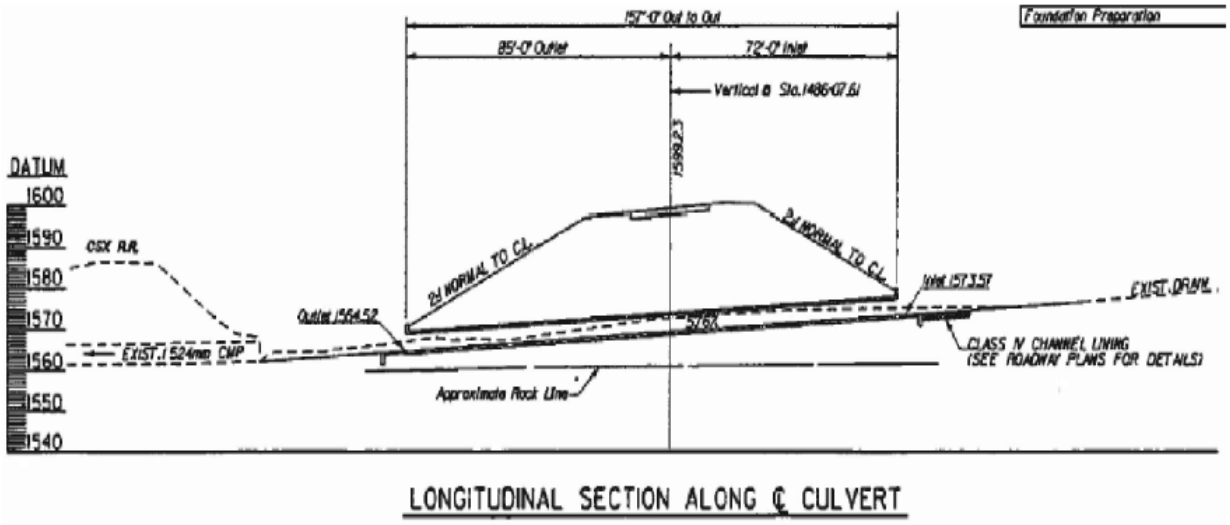
VII. DEVELOPMENT PHASE

G. BOX CULVERTS

Original Design

The Original Design is for a single cell, 5’ X 4’ Reinforced Concrete Box Culvert, 157’ (47.85m) in length with a 17 degree +/- skew.





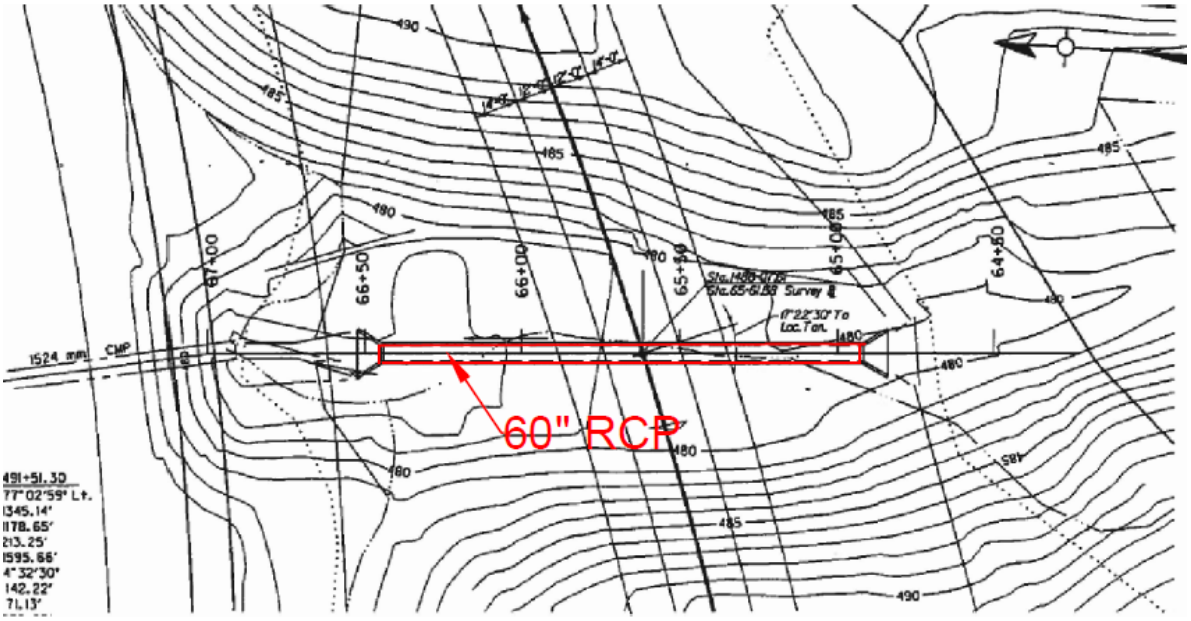
LONGITUDINAL SECTION ALONG ℄ CULVERT

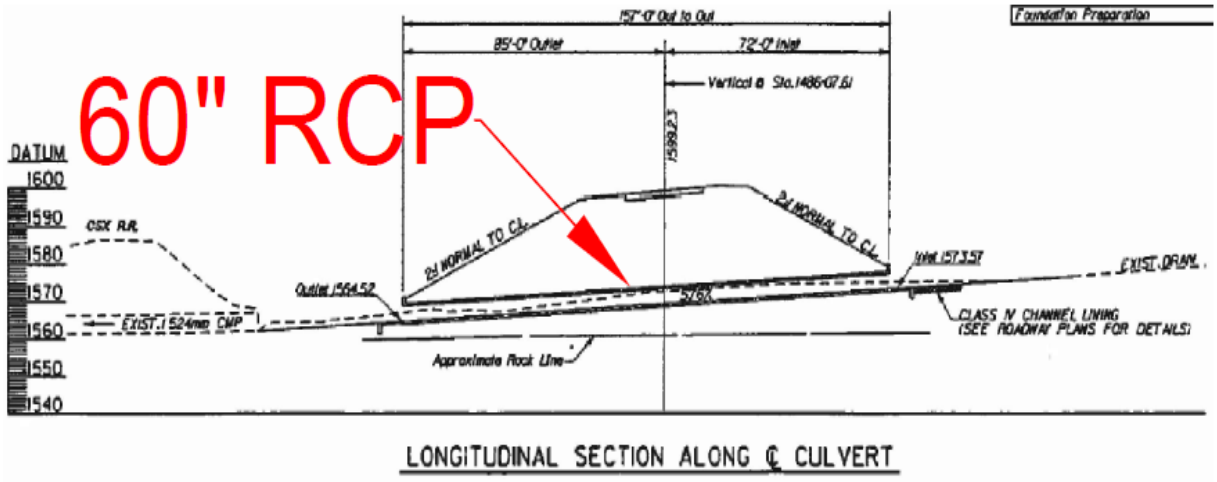
VII. DEVELOPMENT PHASE

G. BOX CULVERTS

Value Engineering Alternative No. 10: Replace smaller culverts with single or multiple pipes and/or replace large culverts with CON/SPAN, if feasible.

This Alternative is to replace the original design with a 60" (1.52 m) Pipe Culvert and two culvert headwalls. The Original Design opening is 20 ft^2 and this alternate provides an opening of 19.63 ft^2.

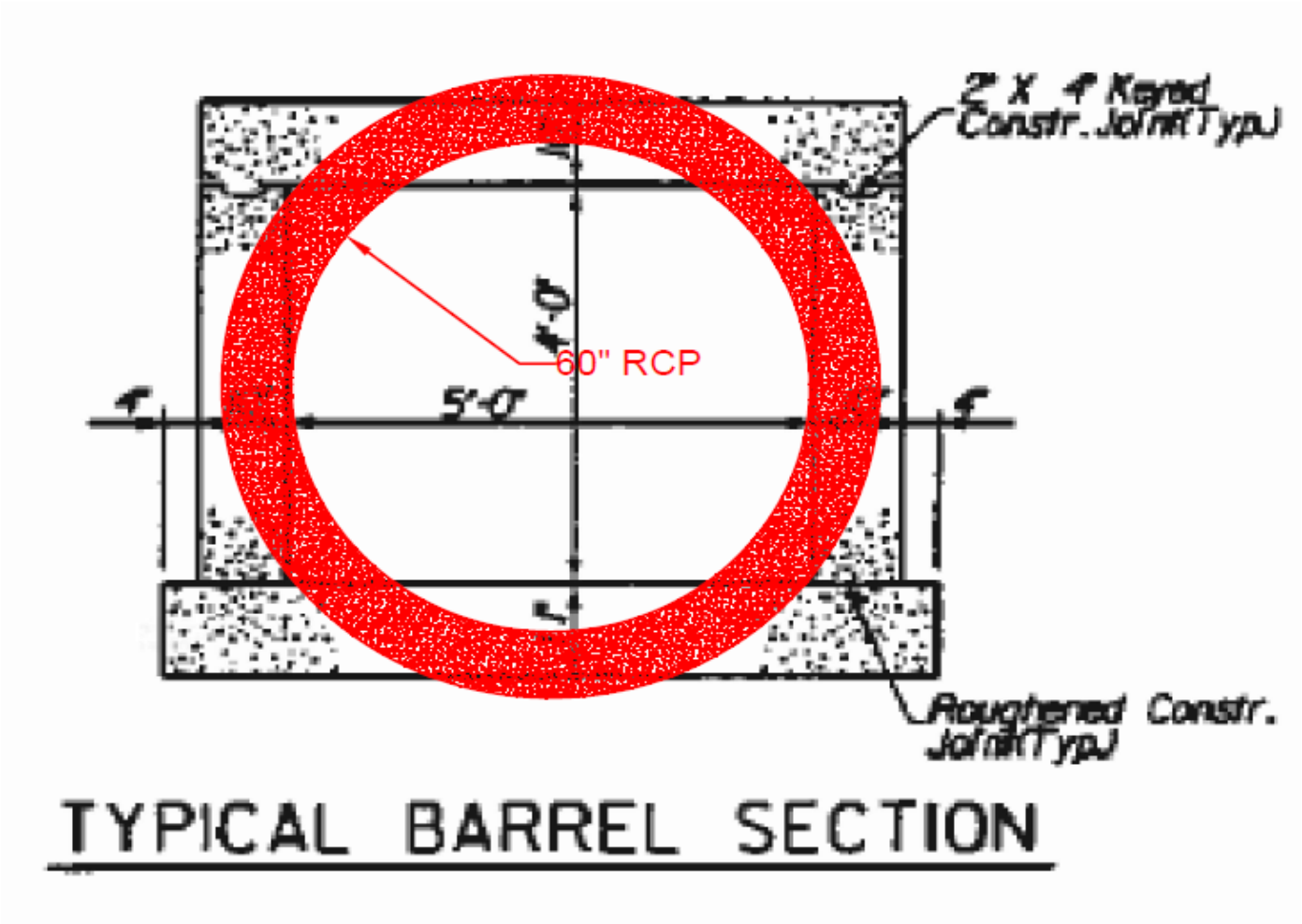




VII. DEVELOPMENT PHASE

G. BOX CULVERTS

Value Engineering Alternative No. 10: Replace smaller culverts with single or multiple pipes and/or replace large culverts with CON/SPAN, if feasible, (continued).



TYPICAL BARREL SECTION

BOX CULVERTS
VALUE ENGINEERING ALTERNATIVE NO. 10
COST COMPARISON SHEET

DESCRIPTION	UNITS	UNIT COST	PROP'D QTY.	PROP'D COST	V.E. QTY.	V.E. COST
Class A Concrete	m^3	$517.57	95.9	$49,635	7.05	$3,649
60" Culvert Pipe	Lin Meter	$876.31	0	$0	47.85	$41,931
Steel Reinforcement	kg	1.92	4773	$9,164	312	$599
SUBTOTAL				**$58,799**		**$46,179**
MOBILIZATION		**4.5%**		$2,646		$2,078
Engineering & Contingencies		**20.0%**		$11,760		$9,236
GRAND TOTAL				**$73,205**		**$57,493**

POSSIBLE SAVINGS: $15,712.00

VII. DEVELOPMENT PHASE

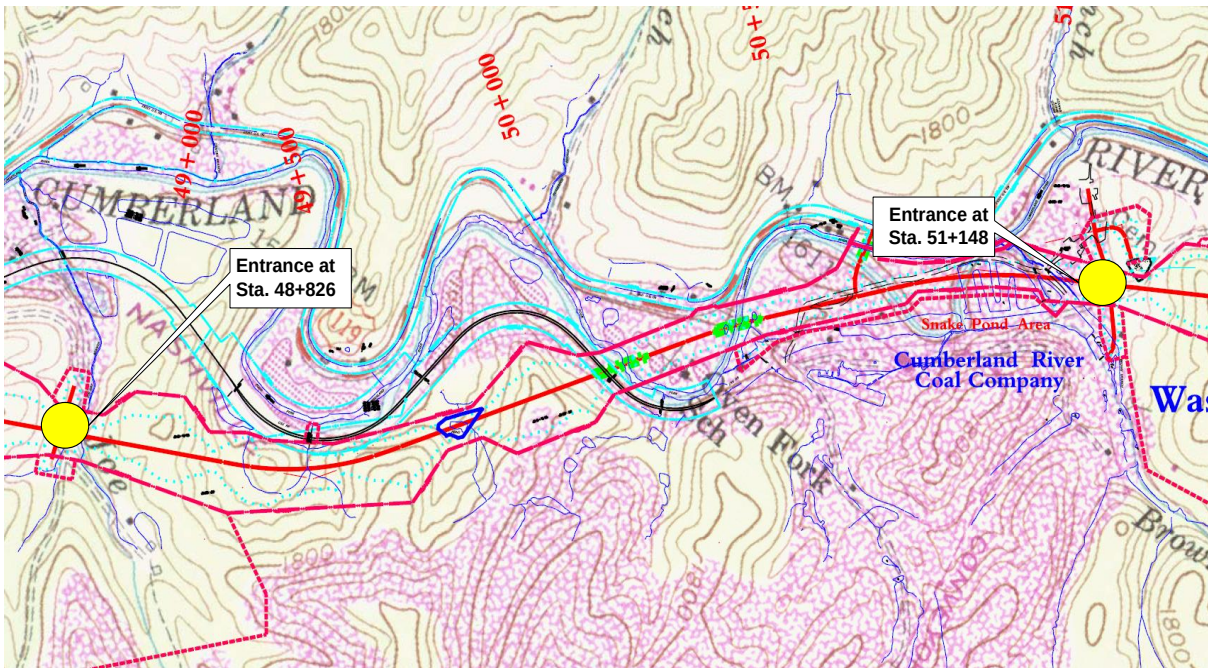
H. DESIGN COMMENTS

Design Comment #1: Add turning lanes at entrances

In addition to the accesses to the existing US 119, there are two entrances that have been designed at Stations 48+826 and 51+148. Currently, neither of the entrances has turning lanes along the mainline.

It is recommended that the design be modified to add left turning lanes and right turning lanes (or tapers) for both directions at each entrance. US 119 is classified as a principal arterial and therefore functions primarily as a means for high-speed, long distance travel. Turning vehicles that slow or stop along the route will negatively affect the roadway function (LOS) and also create conflicts that may cause crashes.

Each of the entrances currently lead to large strip mining operations. Traffic from workers in the near term and potentially a much larger volume of traffic generated from development on the reclaimed land in the future warrant the consideration of adding the turning lanes onto US 119. If they are not added during construction, it will be difficult and expensive to add them after this project is complete; likely they would not be added at a later date.



VIII. FINAL PRESENTATION ATTENDEE SHEET

US 119 PARTRIDGE to OVEN FORK LETCHER COUNTY
June 20-June 24, 2011

NAME	AFFILIATION	PHONE
Bill Ventry	VE Group, L.L.C.	850/627-3900
Tom Hartley	VE Group, L.L.C.	850/627-3900
Jerry Potter	VE Group, L.L.C.	850/627-3900
Rodney Little	KYTC	606/678-4017
Brent Sweger	KYTC	502/564-3280
Marvin Wolfe	KYTC	502/564-4560
Mary Holbrook	KYTC	606/433-7791
Chris James	KYTC	606/433-7791
Chuck Allen	KYTC	502/564-3280
Bill Morris	ENTRAN	859/233-2100
Dwayne Beshear	ENTRAN	859/233-2100
Robert Lewis	KYTC	502/564-3730
Jeff Jasper	KYTC	502/564-3280
Kevin Damron	KYTC	502/564-3730
Michael Loyselle	FHWA	502/223-6748

IX. VE PUNCH LIST

ITEM NO.	12-311.35,.36 & .77	PROJECT COUNTY:	LETCHER	DATE OF STUDY:	6/20-24, 2011	

VE Alternative #	Description	VE Team	Implemented Life Cycle Cost Savings	Original Cost	Alternative Cost	Initial Cost Saving	Tot. Present Worth Life Cycle Cost Savings	Remarks
	Roadway/Earthwork/Pavement							
1	Adjust the profile grades.	X		$69,175,022	$62,736,460	$6,438,561	$6,438,561	
8	Reduce the shoulders.	X		$6,087,455	$3,819,797	$2,267,657	$2,267,657	
9	Use 2 + 1 lane configuration.	X		$5,361,497	$5,964,935	($603,437)		
	Drainage							
10	Replace smaller culvert a with single pipe.	X		$73,205	$57,493	$15,712	$15,712	
	Structures							
2	Reduce the number of spans.	X		$12,225,572	$9,871,052	$2,354,520	$2,354,520	
3	Reduce the bridge typical section.	X		$12,225,572	$10,320,361	$1.905,211	$1,905,211	
5	Relocate the sedimentation ponds.	X		$944,513	$22,401	$922,112	$922,112	
6	Eliminate 2 bridges & build 1 access road.	X		$1,810,721	$99,695	$1,711,025	$1,711,025	
7	Reduce the bridge typical section.	X		$8,650,260	$7,302,174	$1,344,086	$1,344,086	

DESIGN SUGGESTIONS

Design Suggestion #	Description	Activity	Implemented Life Cycle	Remarks
1	Consider trun lanes at two locations.			

X. FHWA TABLES

	FHWA CATEGORIES				
RECOMENDATIONS	**Safety**	**Environment**	**Operation**	**Construction**	**Other**
Recommendation Number 1: ROADWAY EXCAVATION. VE ALTERNATIVE NO. 1: Adjust the profile grades.					**X**
Recommendation Number 2: BRIDGE NO. 1 (STA. 44+426). VE ALTERNATIVE NO. 2: Reduce the number of spans.					**X**
Recommendation Number 3: BRIDGE NO. 1 (STA. 44+426). VE ALTERNATIVE NO. 3: Reduce the bridge typical section.					**X**
Recommendation Number 4: BRIDGE NO. 2 (STA. 45+827). VE ALTERNATIVE NO. 5: Relocate the sedimentation ponds.					**X**
Recommendation Number 5: BRIDGES NO. 3 (STA. 20+275) AND NO. 6 (STA. 21+932). VE ALTERNATIVE NO. 6: Eliminate both bridges and build one connection at approximate station 50 + 200.					**X**
Recommendation Number 6: BRIDGES NO. 2 (STA.45+827), NO. 4 (STA. 50+708), NO. 5 (STA.50+338), NO. 7 (STA.51+515) AND NO. 8 (STA. 51+708). VE ALTERNATIVE NO. 7: Reduce the bridge typical section.					**X**
Recommendation Number 7: PAVEMENT TYPICAL SECTION. VE ALTERNATIVE NO. 8: Reduce the shoulders.					**X**
Recommendation Number 8: PAVEMENT TYPICAL SECTION VE ALTERNATIVE NO. 9: Use 2 + 1 lane configuration.			**X**		
Recommendation Number 9: BOX CULVERTS. VE ALTERNATIVE NO. 10: Replace smaller culvert with single pipe.					**X**
TOTAL			**1**		**8**