Georgia Department of Transportation

Bridge Replacement SR 3 Alternate/ John B. Gordon Highway Over Ochlockonee River

BR000-0001-00(363), P.I. No. 0001363

Thomas County, Georgia

Value Engineering Study Report

March 2010

Designer

GDOT District 4

Value Engineering Consultant

Lewis & Zimmerman Associates

an ARCADIS company

an ARCADIS company

Lewis & Zimmerman
Associates
9861 Broken Land Parkway
Suite 254
Columbia, Maryland 21046
Tel: 301.984.9590
Fax: 410.381.0109
email: info@lza.com
www.lza.com

Mr. Matthew J. Sanders, AVS
Value Engineering Specialist
Georgia Department of Transportation - Engineering Services
One Georgia Center – 5th Floor
600 West Peachtree Street
Atlanta, Georgia 30308

Re: Bridge Replacement SR 3 Alternate / John B. Gordon Highway
Over Ochlockonee River
BR000-0001-00(363) P.I. No. 0001363
Value Engineering Study Report

Date:
March 5, 2010

Contact:
David Hamilton

Phone:
253.229.7703

Email:
dahamilton@lza.com

Our ref:
LZ083355.0000

Dear Mr. Sanders:

Lewis & Zimmerman Associates, Inc. is pleased to submit two paper copies and one electronic copy of the referenced value engineering (VE) study report documenting the study that took place February 16 - 19, 2010. The objective of the VE effort was to identify opportunities to enhance the value of the traffic and bridge improvements over the Ochlockonee River.

The VE team developed several ideas to reduce the construction effort by lowering the profile on the southern end of the bridge and adding a crest to the bridge. Another key idea would close SR 3 temporarily, use a detour, and move the alignment back to the existing roadway location. This second alternative would greatly reduce the amount of embankment required and streamline construction.

We thank you for your assistance during the course of the VE team's work. Please do not hesitate to call us if you or any of the reviewers have any questions regarding the information presented in this report.

Sincerely yours,

LEWIS & ZIMMERMAN ASSOCIATES, INC.
an ARCADIS company

David A. Hamilton, PE, CVS, CCE, LEED^{AP}
Vice President/VE Team Leader

Attachment

TABLE OF CONTENTS

EXECUTIVE SUMMARY

INTRODUCTION

This value engineering (VE) study report documents the events and results of the VE workshop conducted by Lewis & Zimmerman Associates, Inc. for the Georgia Department of Transportation (GDOT). The subject of the study was the Bridge Replacement SR 3 Alternate / John B. Gordon Highway Over Ochlockonee River, BR000-0001-00(363) P.I. No. 0001363 located in Thomas County, GA. The design was nearing the 100 percent design completion stage at the time of the VE study.

The GDOT District 4 design team has provided information for the VE team to use as the basis for this study, which was conducted February 16-19, 2010, at GDOT's Atlanta, Georgia, headquarters.

The VE team was comprised of a highway engineer, a bridge engineer, construction specialist, and a Certified Value Specialist (CVS) team leader. The team used the following six-phase VE job plan to guide its deliberations.

- Information Gathering Phase
- Function Identification and Analysis Phase
- Creative Idea Generation Phase
- Evaluation/Judgment of Creative Ideas Phase
- Alternative Development Phase
- Presentation Phase

PROJECT DESCRIPTION

Bridge project BR0001-0001-00(363) is a bridge replacement on State Route 3 Alternate over Ochlockonee River approximately six miles north of Thomasville, Georgia. Since the existing bridge has a sufficiency rating of less than 50 and a substructure condition code of 4 or less, the bridge should be scheduled for replacement rather than improved. The existing roadway has a state route classification of rural major collector and has a speed limit of 55 mph. The current average daily traffic (ADT) is 2,100 with projected traffic for the year 2008 of 2,200 ADT and a year 2028 of 3,500 ADT. The estimated truck traffic on the road accounts for 10 percent of the total ADT. Land use in the area is primarily forestry.

Bridge Description

This project will replace the structurally deficient bridge on SR 3 Alternate over the Ochlockonee River with a new 1,515 ft. long reinforced concrete bridge. The typical bridge section uses six bulb tee beams spaced at 7 ft. on center over the entire bridge length. The bridge is a 16-span structure that consists of eight AASHTO bulb tee beam spans and eight AASHTO Type II beam spans. Spans #1 through 3 are 140 feet in length, Span #4 (main channel) is 135 feet in length, Spans #5 through 8 are 120 feet in length, and Spans #9 through 16 are 60 feet in length. The total project length is 0.91 miles as presented in Figure 2 in Section Three of this report.

Project Cost and Schedule

This project has a total estimated construction cost of $10.6M, plus right-of-way and utilities, and is scheduled to be out for bid in June 2010.

CONCERNS AND OBJECTIVES

This project encompasses the replacement of the existing bridge over the Ochlockonee River on SR 3 Alternate and is nearing the 100 percent design completion stage. The following key concerns were noted by the team as they reviewed the project.

- Ability to incorporate possible VE alternatives and still maintain the project schedule
- Right-of-way for the project is already acquired
- Wetland mitigation is required for 5.9 acres
- The hydraulic report written in 2005 uses different span lengths than the current design
- Traffic must be diverted from the existing bridge during construction of the new facilities
- A large amount of import soil is required for the new, higher roadway profile

With this background, the VE team was tasked with identifying opportunities that will enhance the functionality of the project and reduce the quantity of embankment required.

RESULTS OF THE STUDY

The value engineering team developed eight alternatives and two design suggestions to address the concerns noted above with the emphasis being on reducing the total life cycle cost to replace the bridge. All of the alternatives are shown on the following Summary of Value Engineering Alternatives table and detailed in Section Two of the report. The following highlights those alternatives having the greatest potential impact on the project.

Profile Adjustments

Adjustments to the bridge profile are possible to reduce the amount of embankment on the north bridge abutment. Adding a crest to the bridge would help lower the ends of the structure, reducing the overall embankment requirement but still meeting the minimum 100-year flood elevation. This change would result in a potential savings in the range of $224,000. Further expanding this idea and using 2:1 slopes with guardrails would increase the total potential cost savings to slightly more than $266,000 and reduce the amount of wetland mitigation. Reference Alt. No. P-1.

Detour Option

To streamline construction and reduce the embankment requirements, the use of a detour should be further explored. If the traffic is diverted it would be possible to reuse the existing alignment with a lower profile, reducing the amount of pavement and embankment while saving approximately $975,000. Reference Alt. No. A-1.

Travel Lane Width
Reduction in the travel lanes from 12 ft. wide to 11 ft. wide for the total alignment length including the bridge would reduce the pavement quantities and result in savings in the range of $410,000. Reference Alt. No. S-1.

Bridge Design
Optimization in the beam spacing may allow the use of five lines of slightly larger AASHTO beams for the bridge than the six smaller beams included in the current design. The use of fewer but larger beams would result in cost savings of approximately $116,000. Reference Alt. No. B-3.

2005 Hydraulic Study
The 2005 Hydraulic Study may need to be rerun to match the span lengths and bridge geometrics used in the current design. Since the span lengths in the current design are somewhat longer than that assumed in the 2005 study, backwater elevations and scour velocities, theoretically, could be slightly lower. Also, further modeling may allow other options to be considered, such as eliminating one of the 16 spans. Eliminating even one of the short, 60 ft. long spans could result in cost savings up to $300,000.

SUMMARY OF POTENTIAL COST SAVINGS

PROJECT: **BRIDGE REPLACEMENT SR 3 ALTERNATE / JOHN B. GORDON HIGHWAY OVER OCHLOCKONEE RIVER**
BR000-0001-00(363) P.I. No. 0001363
Thomas County, GA

ALT. NO.	DESCRIPTION	ORIGINAL COST	ALTERNATIVE COST	PRESENT WORTH OF COST SAVINGS: INITIAL COST SAVINGS	PRESENT WORTH OF COST SAVINGS: RECURRING COST SAVINGS	PRESENT WORTH OF COST SAVINGS: TOTAL PW LCC SAVINGS
ALIGNMENT (A)						
A-1	Build a new bridge (1,515 feet) on the existing (old) alignment and detour traffic during construction.	$1,492,000	$515,000	$977,000	$0	$977,000
A-2	Move the project beginning point on the south end from STA 218+00 to STA 225+00.	$68,000	$0	$68,000	$0	$68,000
A-3	Move the project end point on the north end from STA 266+22 to STA 262+50.	$33,000	$0	$33,000	$0	$33,000
PROFILE (P)						
P-1	Modify the SR 3 Alternate profile to add a crest on the bridge and lower the southern approach profile.	$241,000	$16,800	$224,200	$0	$224,200
P-1.1	Modify the SR 3 Alternate profile to add a crest on the bridge, lower the southern approach profile, and use 2:1 slopes with guardrails.	$322,900	$56,100	$266,800	$0	$266,800
SECTION (S)						
S-1	Use 11ft wide travel lanes in lieu of 12ft wide for the total length of the project, including the bridge.	$410,000	$0	$410,000	$0	$410,000
S-2	Use 2:1 slopes at guardrail locations in lieu of 4:1 slopes.	$168,000	$48,000	$120,000	$0	$120,000

SUMMARY OF POTENTIAL COST SAVINGS

PROJECT: **BRIDGE REPLACEMENT SR 3 ALTERNATE / JOHN B. GORDON HIGHWAY OVER OCHLOCKONEE RIVER**
BR000-0001-00(363) P.I. No. 0001363
Thomas County, GA

ALT. NO.	DESCRIPTION	ORIGINAL COST	ALTERNATIVE COST	INITIAL COST SAVINGS	RECURRING COST SAVINGS	TOTAL PW LCC SAVINGS
			PRESENT WORTH OF COST SAVINGS			
BRIDGE (B)						
B-3	Use five lines of larger beams in lieu of six smaller beams and change from BT-72's to BT-74's.	$1,096,000	$980,000	$116,000	$0	$116,000
B-6	Use all steel H-piles or all PSC concrete piles in lieu of mixing pile types.	DESIGN SUGGESTION				
B-12	Revise the hydraulic study to match the span configuration and bridge length shown in the final plans.	DESIGN SUGGESTION				

STUDY RESULTS

GENERAL

The results of this value engineering study conducted on the Bridge Replacement SR 3 Alternate / John B. Gordon Highway Over Ochlockonee River project portray the benefits that can be realized by GDOT, the owner, Thomas County, the users and the GDOT design team. The results will directly affect the project's design and will require coordination among GDOT staff to determine the disposition of each alternative.

During the conduct of the study, many ideas for potential value enhancement were conceived and evaluated by the team for technical merit, applicability to the project, implementability considering the project's status, and the ability to meet the owner's project value objectives. Research performed on those ideas considered to have potential to enhance the value of the project resulted in the development of individual alternatives identifying specific changes to the project as a whole or to individual elements that comprise the project. These may be in the form of VE alternatives (accompanied by cost estimates) or design suggestions (typically without cost estimates). For each alternative developed the following information is provided:

- A summary of the original design
- A description of the proposed change to the project
- Sketches and design calculations, if appropriate
- A capital cost comparison and life cycle discounted present worth cost comparison of the alternative and original design, where appropriate
- A descriptive evaluation of the advantages and disadvantages of selecting the alternative
- A brief narrative to compare the original design and the proposed change and provide a rationale for implementing the change into the project

The capital cost comparisons used unit quantities contained in the project cost estimate prepared by the designers, whenever possible. If unit quantities were not available, published data bases, such as the one produced by the RSMeans Company, or team member or owner data bases were consulted. A composite markup of 10 percent, as described in Section Four of the report, was used to generate an all-inclusive project cost for the construction items being compared.

Each design suggestion contains the same information as the VE alternatives, except that no cost information is usually included. Design suggestions are presented to bring attention to areas of the design that, in the opinion of the VE team, should be changed for reasons other than cost. Examples of these reasons include improved facility operation, ease of maintenance, ease of construction, safer working conditions, reduction in project risk, etc. In addition, some ideas cannot be quantified in terms of cost with the design information provided; these are also presented as design suggestions and are intended to improve the quality of the project.

Each alternative or design suggestion developed is identified with an alternative number (Alt. No.) to track it through the value analysis process and thus facilitating referencing between the Creative Idea

Listing and Evaluation worksheets, the alternatives, and the Summary of Potential Cost Savings table. The Alt. No. includes a prefix that refers to a major project element listed below:

PROJECT ELEMENT	PREFIX
Alignment	A
Profile	P
Section	S
Bridge	B

Summaries of the alternatives and design suggestions are provided on the Summary of Potential Cost Savings tables. The tables are divided into project elements for the convenience of the reviewer and are used to divide the results section. The complete documentation of the developed alternatives and design suggestions follow each of the Summary of Potential Cost Savings tables.

KEY ISSUES

This project is being developed to improve traffic operations, replace the structurally deficient bridge on SR 3 Alternate over the Ochlockonee River with a new 1,515 ft. long reinforced concrete bridge, and reduce future maintenance costs. To achieve these goals it will be necessary to route traffic onto a new parallel alignment, construct a new bridge, raise the profile to meet the 100-year flood elevation, and tie the alignment back into SR 3 Alternate on the north and south banks of the Ochlockonee River. The new raised profile will require a substantial amount of new embankment with some use of guardrail on the 2:1 slopes.

STUDY OBJECTIVES

To assist GDOT in achieving its project goals in a cost-effective manner, it convened this VE study. The study team was tasked with identifying specific changes to the current design that will enhance its value by improving functionality, saving cost, or a combination of the two.

RESULTS OF THE STUDY

Research of the ideas identified as having potential for enhancing the value of the project resulted in the development of eight alternatives for consideration by the GDOT. These alternatives address the key issues described above and are detailed in the remainder of this section of the report. The alternatives with the greatest potential to impact the key issues noted above include the following:

Profile Adjustments

Adjustments to the bridge profile are possible to reduce the amount of embankment on the north bridge abutment. Adding a crest to the bridge would help lower the ends of the structure, reducing the overall embankment requirement but still meeting the minimum 100-year flood elevation. This change would result in a potential savings in the range of $224,000. Further expanding this idea and using 2:1 slopes with guardrails would increase the total potential cost savings to slightly more than $266,000 and reduce the amount of wetland mitigation. Reference Alt. No. P-1.

Detour Option
To streamline construction and reduce the embankment requirements, the use of a detour should be further explored. If the traffic is diverted it would be possible to reuse the existing alignment with a lower profile, reducing the amount of pavement and embankment while saving approximately $975,000. Reference Alt. No. A-1.

Travel Lane Width
Reduction in the travel lanes from 12 ft. wide to 11 ft. wide for the total alignment length including the bridge would reduce the pavement quantities and result in savings in the range of $410,000. Reference Alt. No. S-1.

Bridge Design
Optimization in the beam spacing may allow the use of five lines of slightly larger AASHTO beams for the bridge than the six smaller beams included in the current design. The use of fewer but larger beams would result in cost savings of approximately $116,000. Reference Alt. No. B-3.

2005 Hydraulic Study
The 2005 Hydraulic Study may need to be rerun to match the span lengths and bridge geometrics used in the current design. Since the span lengths in the current design are somewhat longer than that assumed in the 2005 study, backwater elevations and scour velocities, theoretically, could be slightly lower. Also, further modeling may allow other options to be considered, such as eliminating one of the 16 spans. Eliminating even one of the short, 60 ft. long spans could result in cost savings up to $300,000. Additional modeling would be required, but it may yield large rewards if the backwater and scour velocity impacts are deemed to be acceptable.

EVALUATION OF ALTERNATIVES AND DESIGN SUGGESTIONS

When reviewing the study results, the reader should consider each part of an alternative or design suggestion on its own merit. There may be a tendency to disregard an alternative because of a concern about one part of it. Each area within an alternative or design suggestion that is acceptable should be considered for use in the final design, even if the entire alternative or design suggestion is not implemented. Variations of these alternatives and design suggestions by the owner or designer are encouraged.

All alternatives and design suggestions were developed independently of each other to provide a broad range of options to consider for implementation. Therefore, some of them are "mutually exclusive," so acceptance of one may preclude the acceptance of another. In addition, some of the alternatives may be interrelated, so acceptance of one or more may not yield the total of the cost savings shown for each alternative. Design suggestions could also be interrelated thus precluding a part of one or more suggestions from being implemented if another design suggestion is also implemented.

The reader should evaluate all alternatives carefully in order to select the combination of ideas with the greatest beneficial impact on the project. Once this has been accomplished, the total cost savings resulting from the VE study can be calculated based on implementing a revised, all-inclusive design solution.

SUMMARY OF POTENTIAL COST SAVINGS

PROJECT: **BRIDGE REPLACEMENT SR 3 ALTERNATE / JOHN B. GORDON HIGHWAY OVER OCHLOCKONEE RIVER**
BR000-0001-00(363) P.I. No. 0001363
Thomas County, GA

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VALUE ENGINEERING ALTERNATIVE

PROJECT: **BRIDGE REPLACEMENT SR 3 ALTERNATE / JOHN B. GORDON HIGHWAY OVER OCHLOCKONEE RIVER**
BR000-0001-00(363) P.I. No. 0001363
Thomas County, GA

ALTERNATIVE NO.: **A-1**

DESCRIPTION: **BUILD A NEW 1,515-FT.-LONG BRIDGE ON EXISTING ALIGNMENT, DETOUR TRAFFIC DURING CONSTRUCTION**

SHEET NO.: **1 of 14**

ORIGINAL DESIGN: (sketch attached)

The original design includes the construction of a new bridge and roadway on a parallel alignment. The existing bridge and alignment will be used to maintain traffic during construction.

ALTERNATIVE: (sketch attached)

Detour the traffic during construction and build the new bridge and roadway on the existing alignment. Two possible detour routes could be explored, one approximately eight miles long using CR 159/US 19/SR 300 to the north, and a five-mile long detour to the south using SR 3/US 84/CR 247. The attached sketch identifies the two possible detour routes.

ADVANTAGES:

- Reduces construction materials and labor
- Reduces construction duration
- Reduces earthwork and wetland mitigation

DISADVANTAGES:

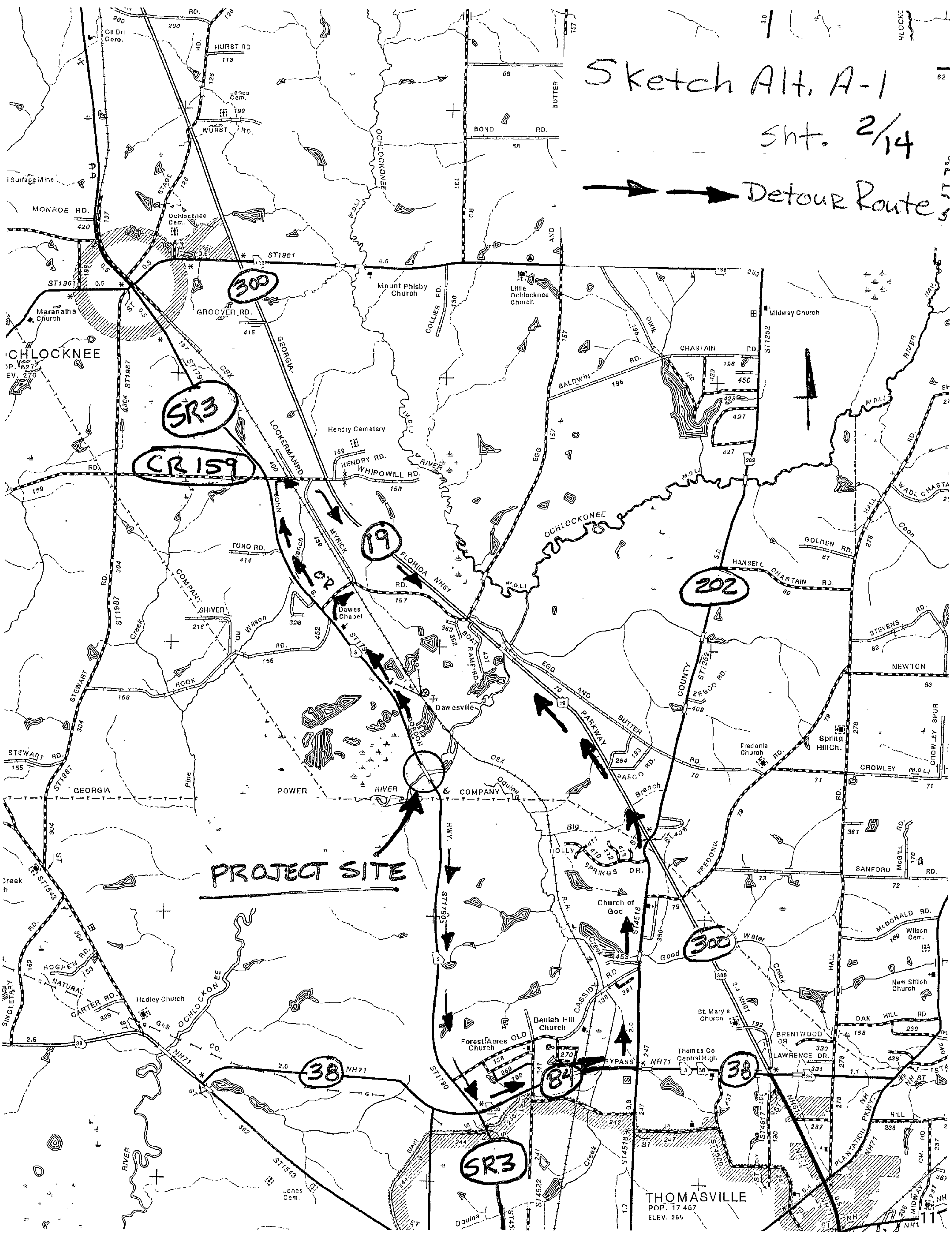
- Longer travel time for local traffic during construction

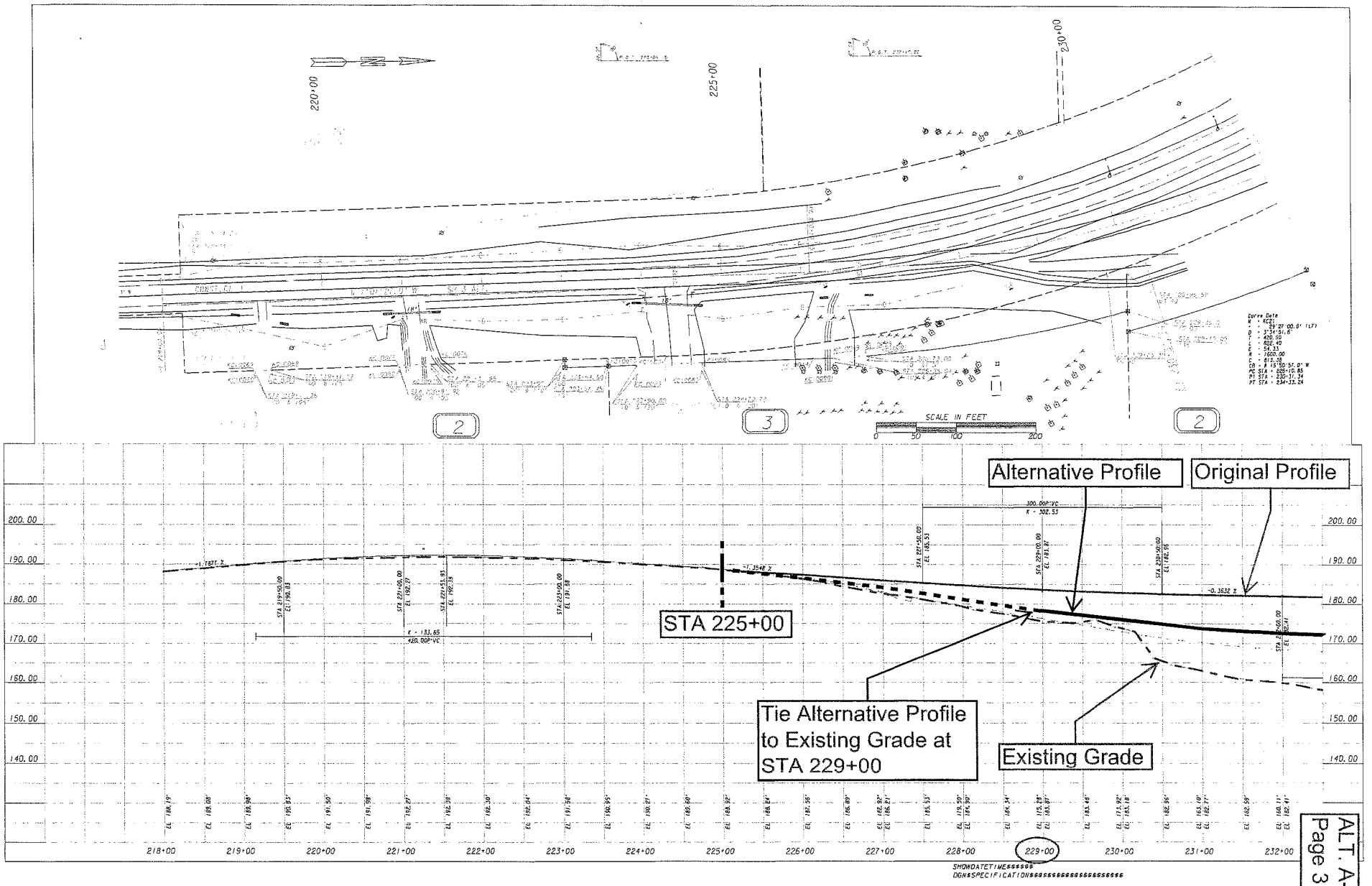
DISCUSSION:

The original design requires a large amount of roadway embankment to build the new roadway. If the traffic is detoured, the project could be built along the existing alignment which would reduce earthwork and pavement since the new roadway would be shorter. Since the traffic volumes are relatively low (2,200 vpd) and there is a four-lane alternate route for through traffic (US 19/SR 300), detouring is a logical option. There are a limited number of residences along this rural section of SR 3 Alternate so disruptions will be manageable. The cost savings noted below assumes the traffic control cost in the current estimate is maintained, even though traffic maintenance at the project site will not be needed. It is assumed that these funds will be used in this alternative to offset the cost of the detour route signs and barricades.

This alternative uses the lower profile presented in Alt. No. P-1.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 1,492,000	—	$ 1,492,000
ALTERNATIVE	$ 515,000	—	$ 515,000
SAVINGS	$ 977,000	—	$ 977,000


Sketch Alt. A-1
Sht. 2/14
Detour Route
PROJECT SITE
SR3
CR159
19
300
202
38
84
OCHLOCKNEE
THOMASVILLE
POP. 17,457
ELEV. 265
Dawesville
Dawes Chapel
Hendry Cemetery
Mount Phisby Church
Little Ochlocknee Church
Midway Church
Maranatha Church
Ochlocknee Cem.
Jones Cem.
Hadley Church
Church of God
Beulah Hill Church
Forest Acres Church
St. Mary's Church
Thomas Co. Central High
Fredonia Church
Spring Hill Ch.
New Shiloh Church
Wilson Cem.
Oil Drl Corp.
HURST RD
WURST RD.
MONROE RD.
GROOVER RD.
BOND RD.
WHIPOWILL RD.
HENDRY RD.
TURQ RD.
LOCKERMAN RD
JOHN B. CR
MYRICK
FLORIDA NH61
GEORGIA-
BOAT RAMP RD
EGG AND BUTTER
PARKWAY
PASCO RD.
ZEBCO RD.
COUNTY
BALDWIN RD.
CHASTAIN RD.
HANSELL CHASTAIN RD.
GOLDEN RD.
STEVENS RD.
NEWTON
CROWLEY
CROWLEY SPUR
SANFORD RD.
McDONALD RD.
OAK HILL RD
BRENTWOOD DR.
LAWRENCE DR.
HOLLY SPRINGS DR.
CASSIDY RD.
BYPASS NH71
STEWART RD.
SHIVER RD.
ROOK RD.
HOGPEN RD.
NATURAL
CARTER RD.
SINGLETARY
PLANTATION PKWY
OCHLOCKONEE RIVER
GEORGIA POWER COMPANY
CSX
ST1961
ST1987
ST1790
ST4518
ST1252
ST1543
NH71
NH61
HWY.
Oquina
Big Creek
Wilson Creek
Water Creek
Coon
Pine



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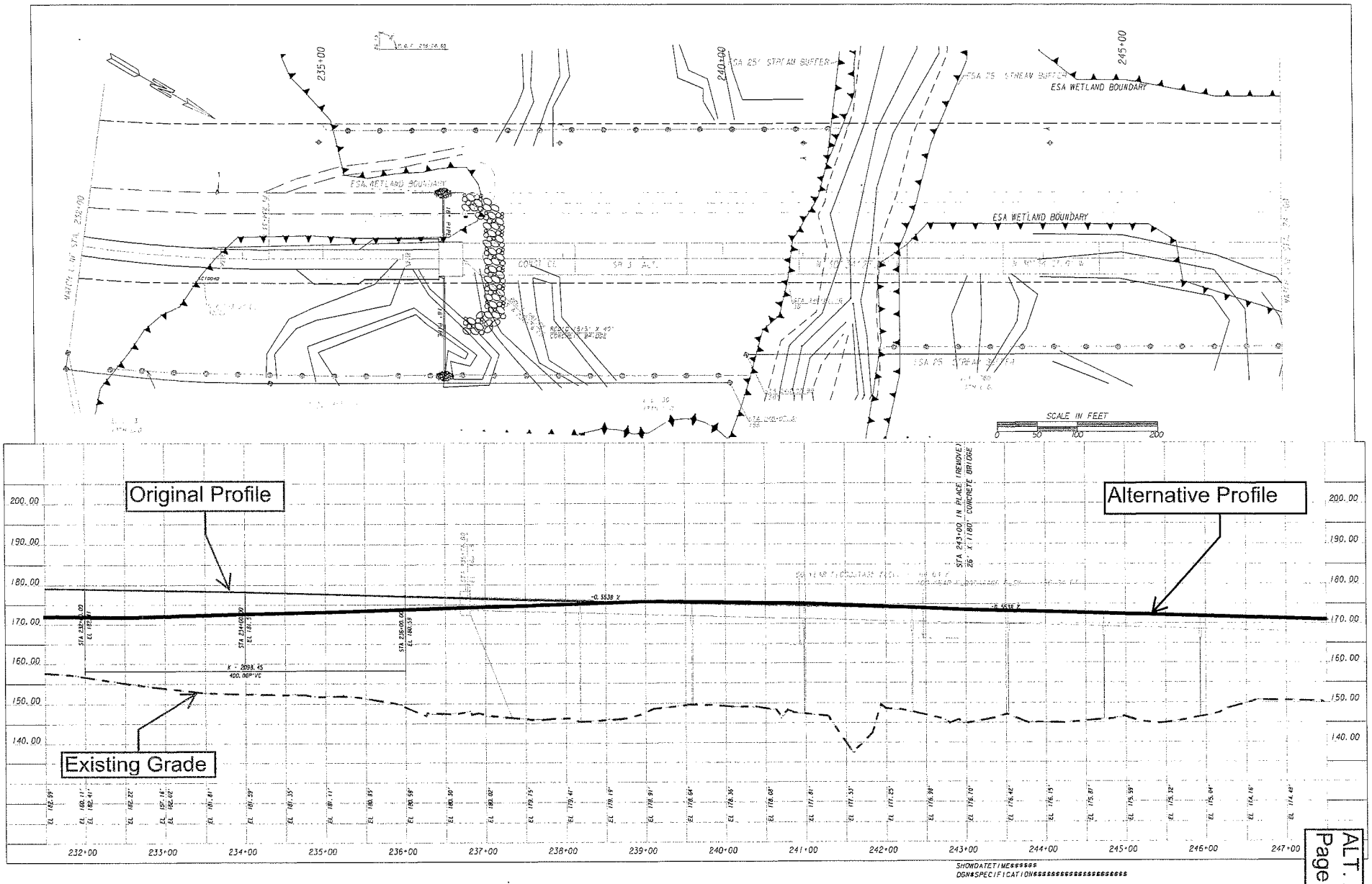
ALT. A-1
Page 3 of 14



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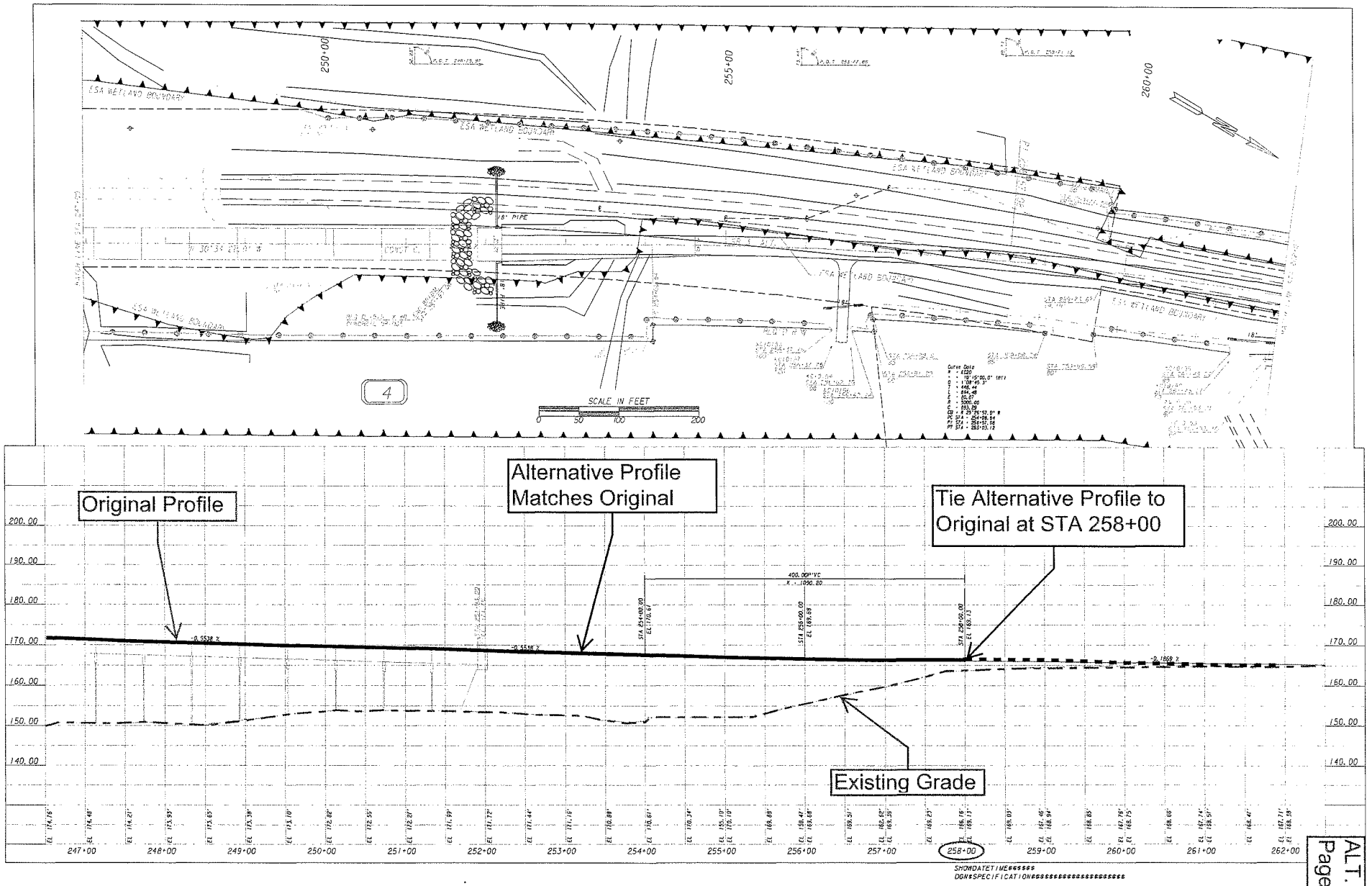
Page 4 of 14



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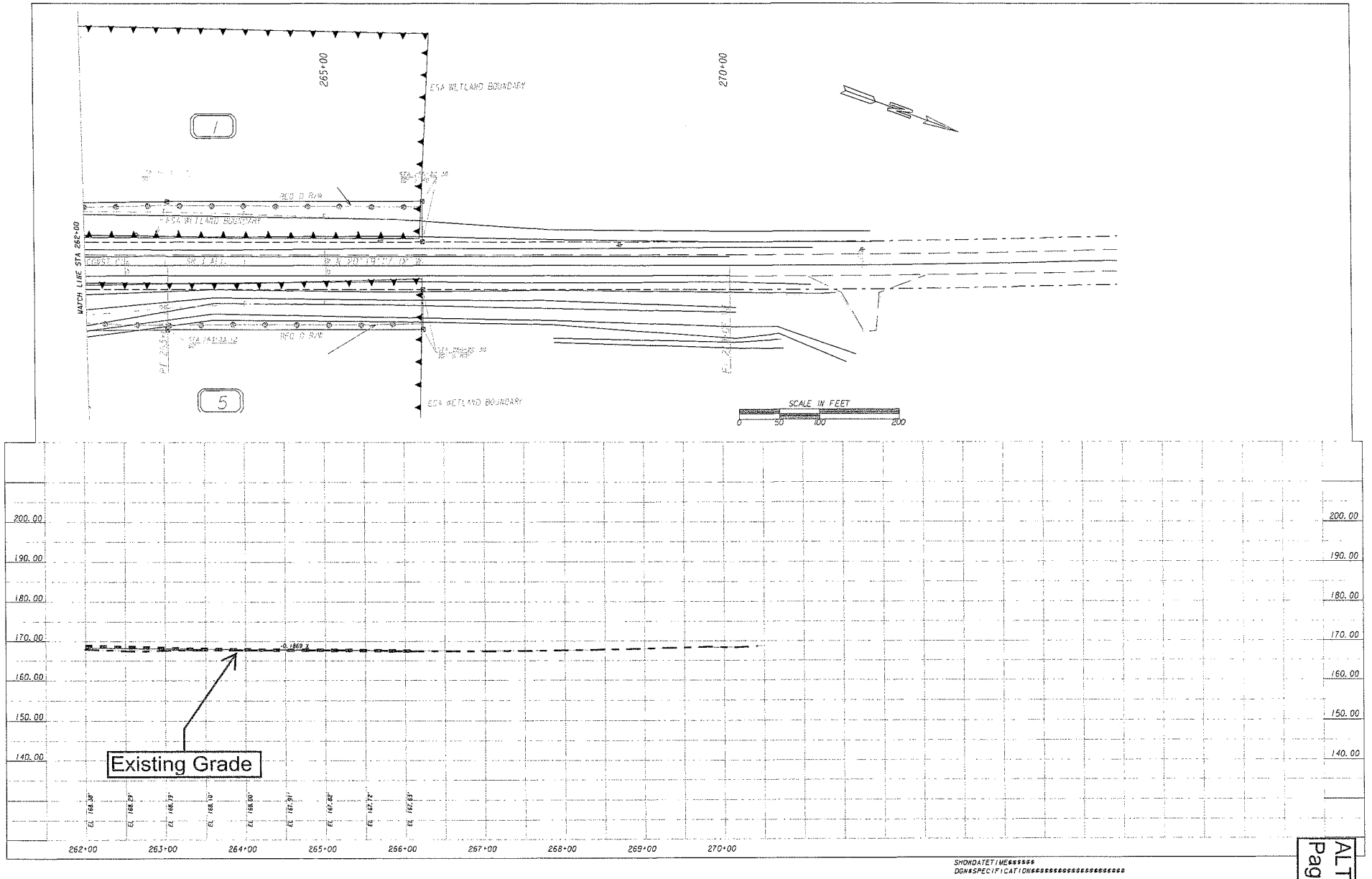

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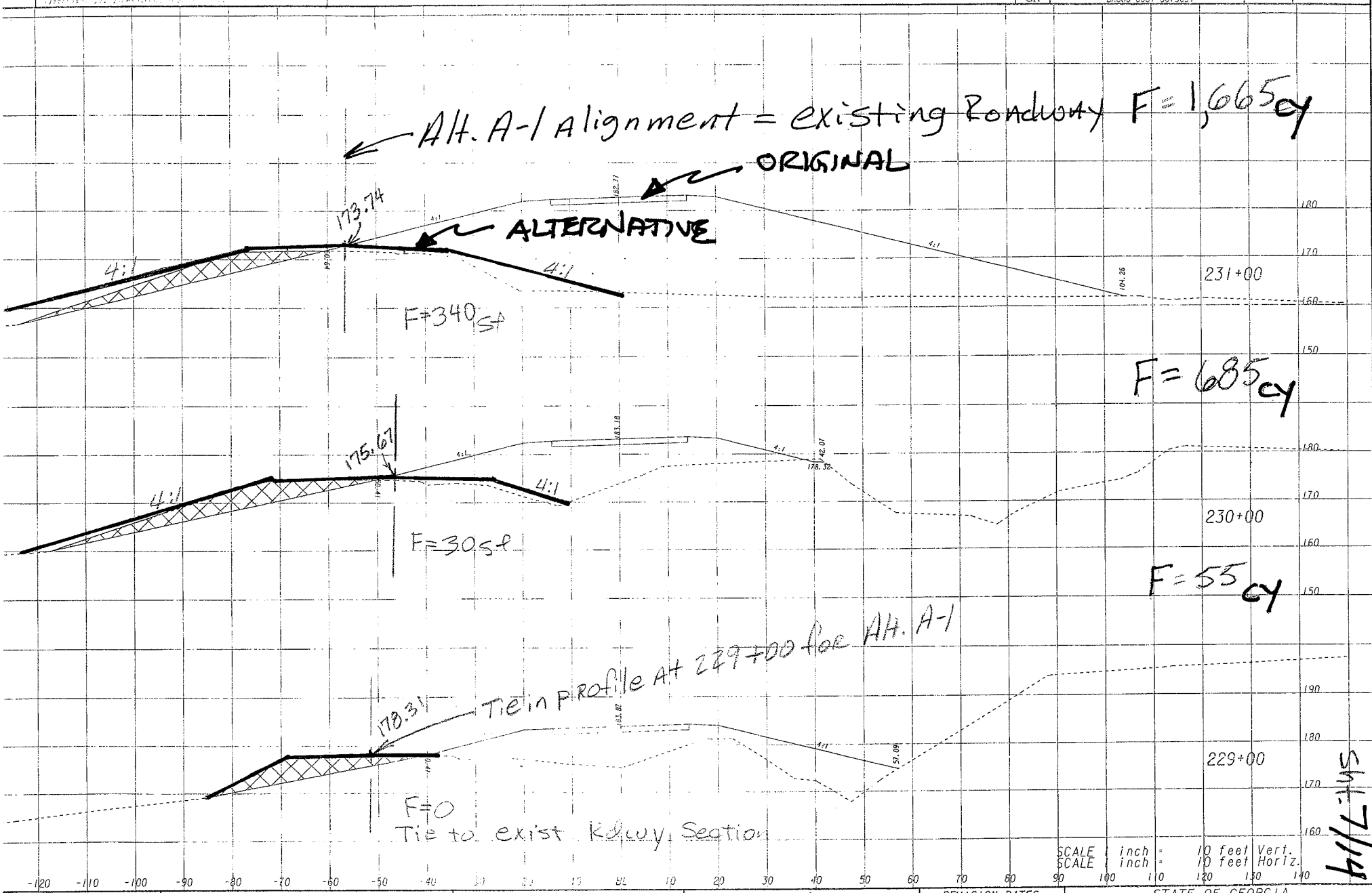

SCALE 1 inch = 10 feet Vert.
SCALE 1 inch = 10 feet Horiz.

ROAD BED TO BE REMOVED

Sketch
Alt. A-1

REVISION DATES

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE:
CROSS SECTIONS

Sht. 7/14 ALT. NO. A-1

STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
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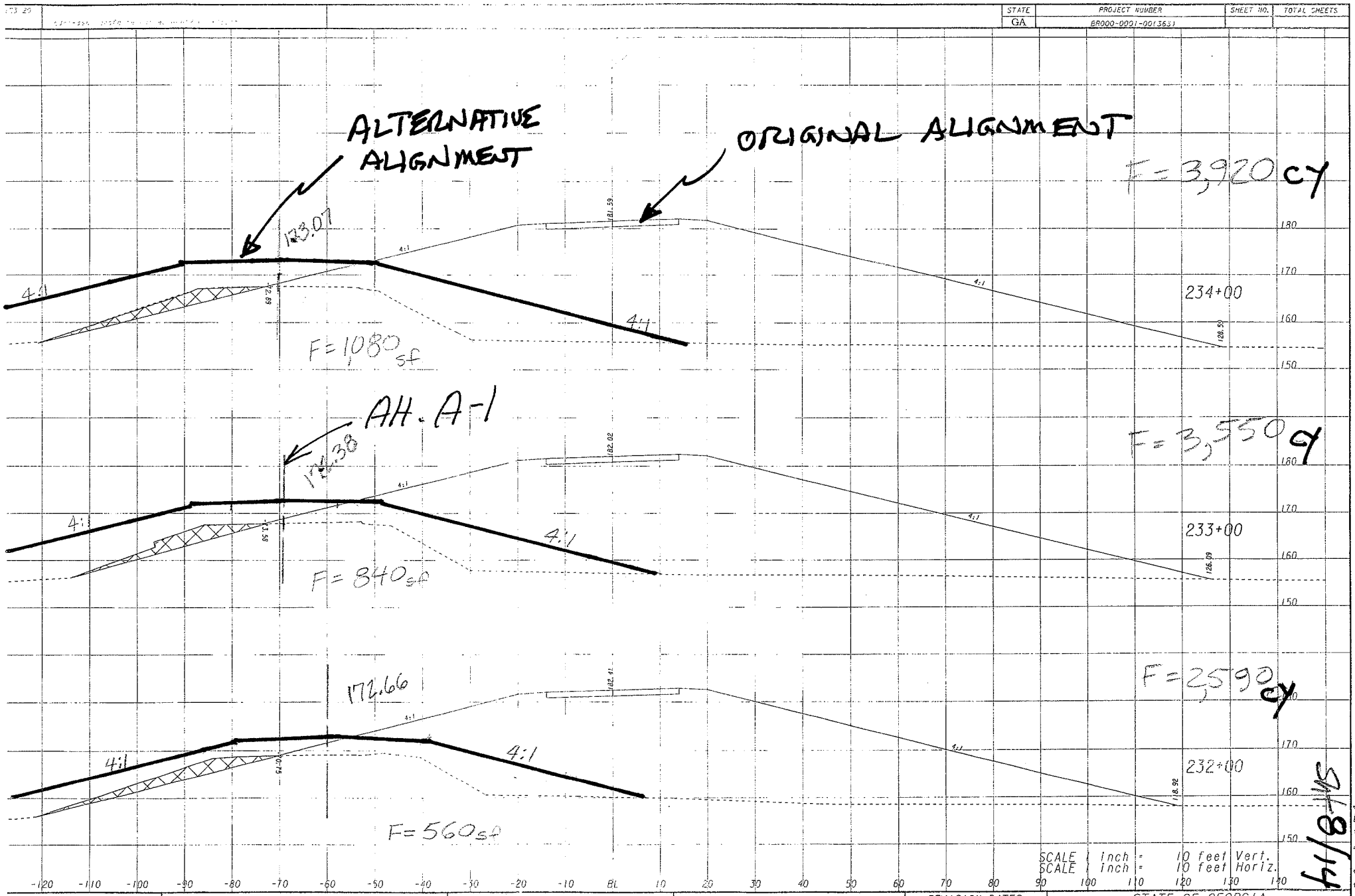

Sketch
Alt. A-1

REVISION DATES

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE:
CROSS SECTIONS

4/18/05 ALT. NO. A-1

STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
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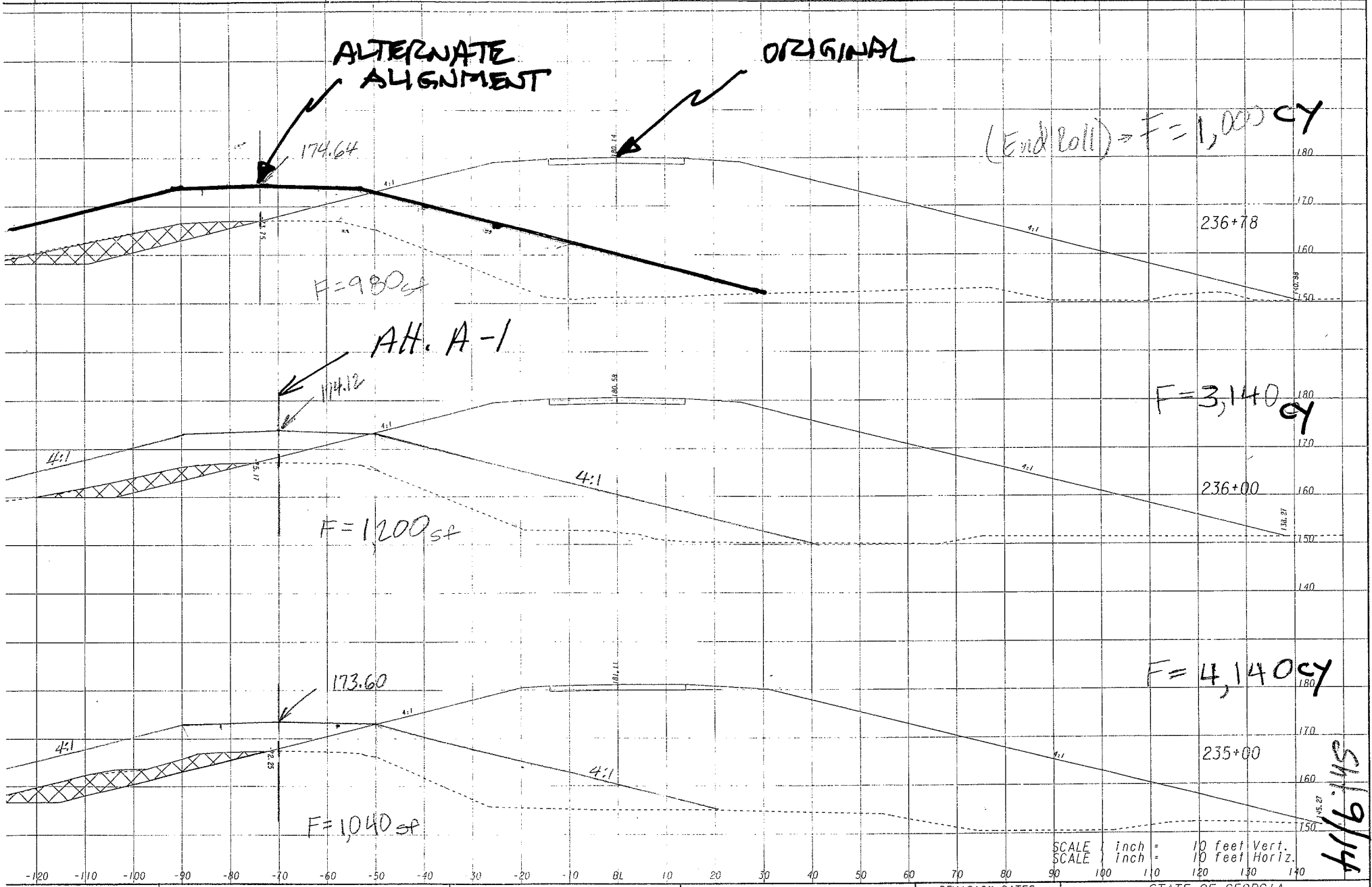

ROAD BED TO BE REMOVED

Sketch
Alt. A-1

REVISION DATES

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE:
CROSS SECTIONS

SHT. NO. 9/14 ALT. NO. A-1

STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
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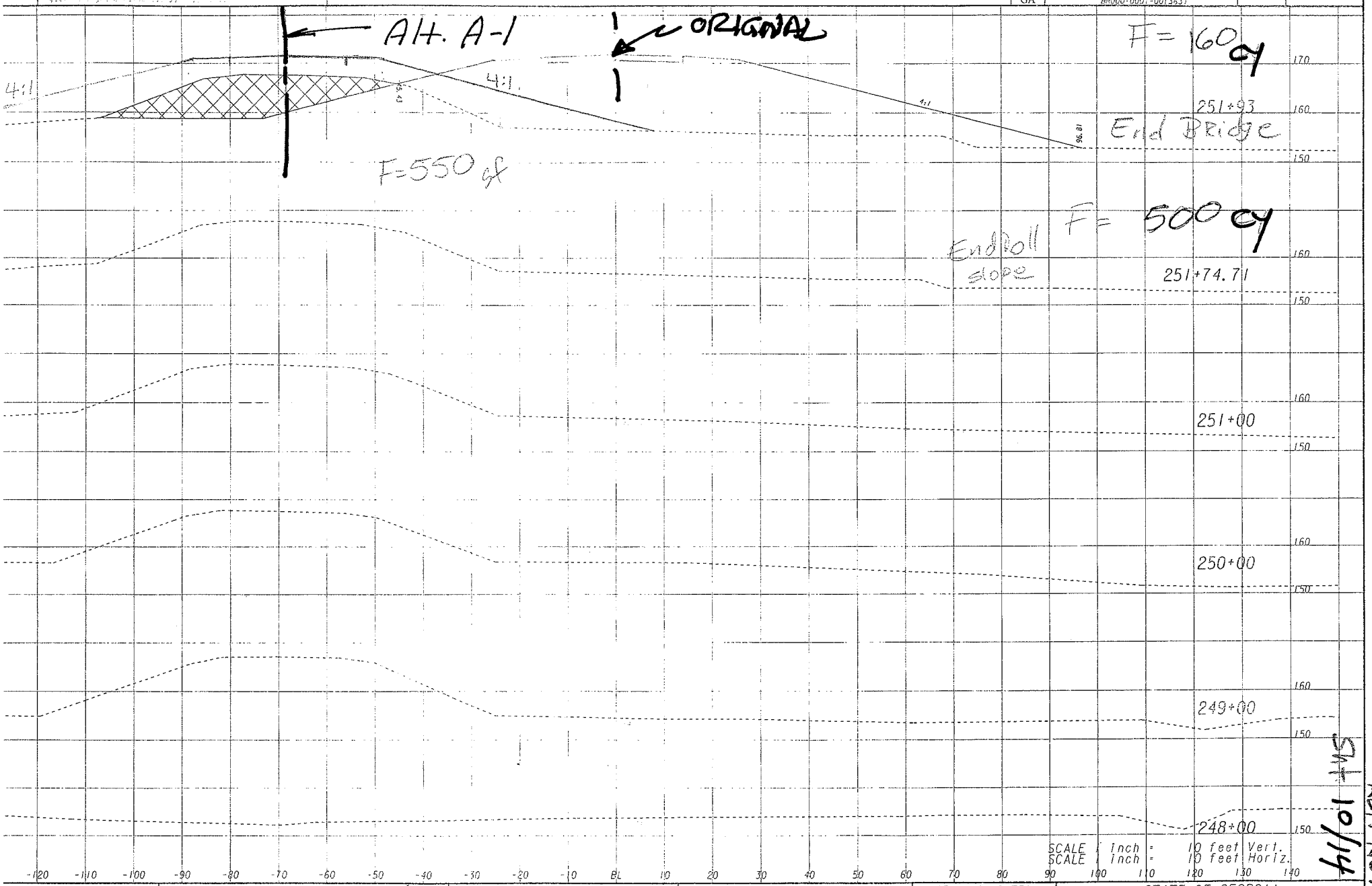


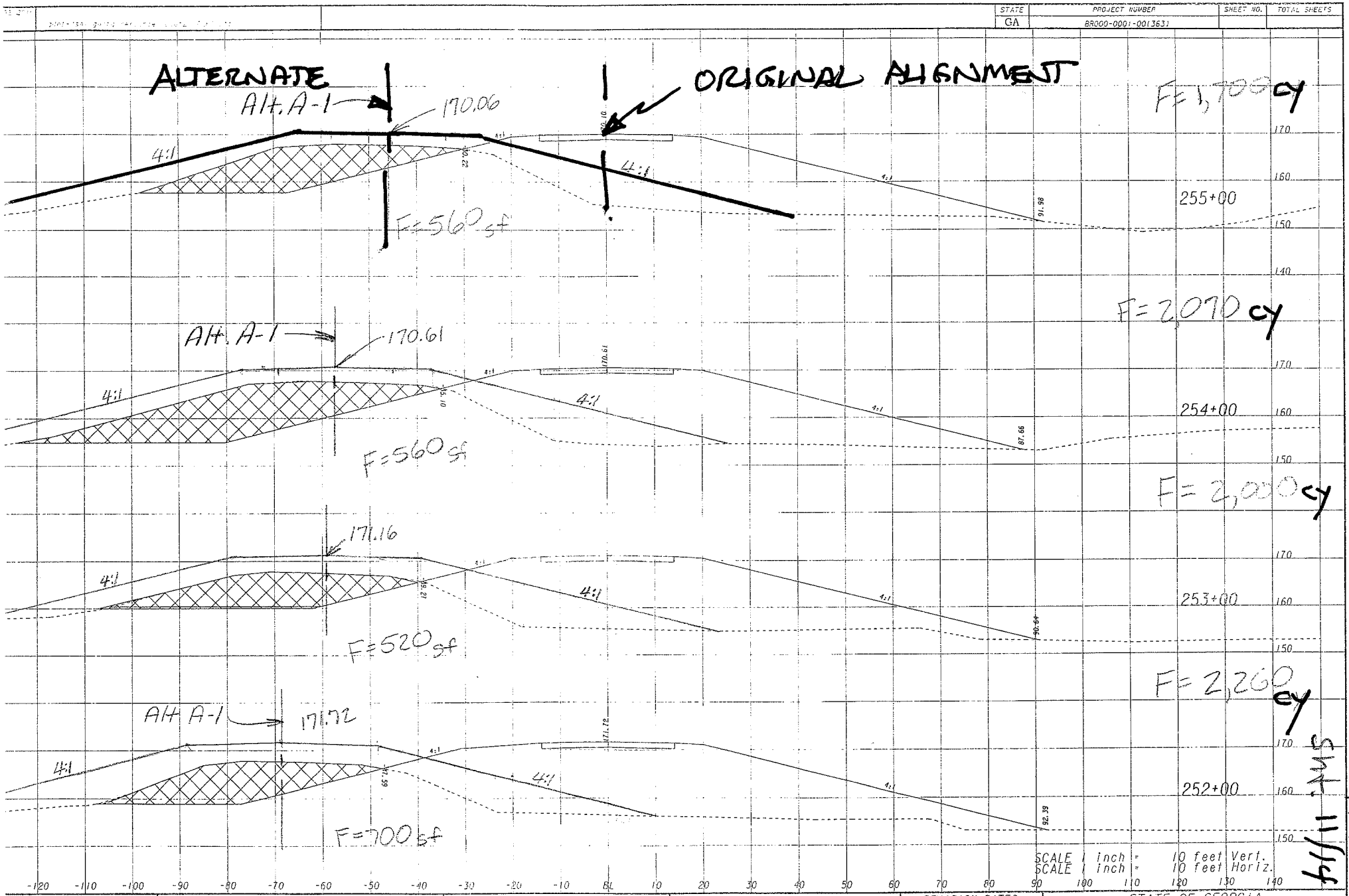
ROAD BED TO BE REMOVED

Sketch
Alt. A-1

REVISION DATES	STATE OF GEORGIA DEPARTMENT OF TRANSPORTATION
	OFFICE: CROSS SECTIONS

Sht 10/14

ALT. NO. A-1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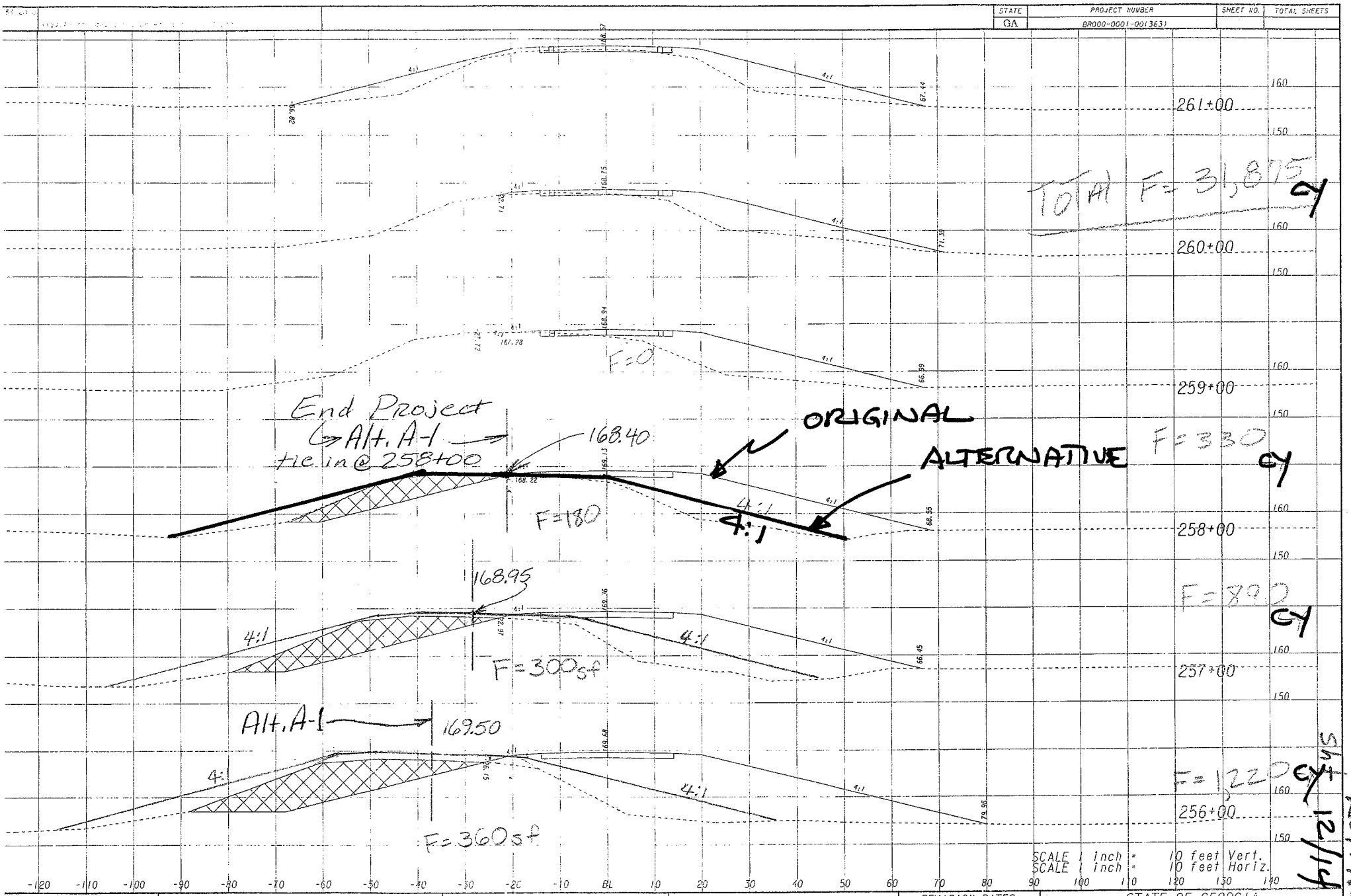
GA
PROJECT NUMBER
BR000-0001-0013631
SHEET NO.
TOTAL SHEETS
ALTERNATE
Alt. A-1
170.06
ORIGINAL ALIGNMENT
F=1,700 cy
4:1
4:1
4:1
F=560 sf
255+00
Alt. A-1
170.61
F=2,070 cy
4:1
4:1
4:1
F=560 sf
254+00
Alt. A-1
171.16
F=2,000 cy
4:1
4:1
4:1
F=520 sf
253+00
Alt. A-1
171.72
F=2,260 cy
4:1
4:1
4:1
F=700 sf
252+00
SCALE 1 inch = 10 feet Vert.
SCALE 1 inch = 10 feet Horiz.
ROAD BED TO BE REMOVED
Sketch
Alt. A-1
REVISION DATES
STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE:
CROSS SECTIONS
SHT. NO. 11/14
ALT NO. A-1


STATE
GA
PROJECT NUMBER
BR000-0001-001363
SHEET NO.
TOTAL SHEETS
261+00
260+00
259+00
258+00
257+00
256+00
TOTAL F= 31,875 cy
F=0
End Project
Alt. A-1
tie in @ 258+00
168.40
ORIGINAL
ALTERNATIVE
F= 330 cy
F=180
4:1
168.95
F= 900 cy
F=300sf
Alt. A-1
169.50
F= 1220 cy
F=360sf
SCALE 1 inch = 10 feet Vert.
SCALE 1 inch = 10 feet Horiz.
ROAD BED TO BE REMOVED
Sketch
Alt. A-1
REVISION DATES
STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE:
CROSS SECTIONS
Sht 12/14
ALT. NO. A-1

PROJECT: **BRIDGE REPLACEMENT SR 3 ALTERNATE / JOHN B. GORDON HWY. OVER OCHLOCKONEE RIVER**
BR000-0001-00(363) P.I. No. 0001363
Thomas County, GA

ALTERNATIVE NO.: **A-1**

SHEET NO.: **13 of 14**

Alternate Design Earthwork embankment required = 31,875 CY (Fill)

Use swell on "Fill" to determine amount of Borrow Material required = 31,875 CY / (1 - 0.2) = **40,000 CY+/-**

Alternate design pavement area required:

Alternate Design Project will start at Sta 229+00 and end at Sta 258+00
Overlay area is from Sta 229+00 231+00 = (200' x 28') / 9sf/sy = **623 SY**
Overlay will consist of 135#/SY of 19.5mm and Asphaltic Conc. Leveling as required

Full depth pavement area from Sta 231+00 to Sta 236+48 (begin approach slab) and from (end approach slab) Sta 252+23 to Sta 258+00 = [(548' + 577') x 28'] / 9sf/sy = **3,500 SY**

Full Depth Pavement Unit Cost ($/SY): ($/Ton unit costs are from the GaDOT project cost estimate)

9.5mm:	135#/SY x Ton/2,000# x $81.00/Ton	=	$5.46/SY
19mm:	220#/SY x Ton/2,000# x $85.00/Ton	=	$9.35/SY
25mm:	330#/SY x Ton/2,000# x $82.00/Ton	=	$13.53/SY
8" GAB:	.67ft x 147#/CF x Ton/2,000# x 9SF/SY x $15.02/Ton	=	$6.66/SY
	Total Pavement Section Unit Cost	=	**$35.00/SY**

Use $5.46/SY for 9.5mm overlay

Use $3.46/SY for average Asphaltic conc. Leveling overlay

1185'/3310' x 100% = 40% +/- of other roadway items

Bridge
Since this design on the existing roadway alignment this Alternate uses the same profile that is shown / proposed in Alternate P-1 of this VE Study report.

Lower profile will save 12ft (2:1 slope at 6' height) of bridge length.

Bridge area saved = (12 ft x 42.25 ft) = 507 SF

COST WORKSHEET

PROJECT: **BRIDGE REPLACEMENT SR 3 ALTERNATE / JOHN B. GORDON HWY. OVER OCHLOCKONEE RIVER**
BR000-0001-00(363) P.I. No. 0001363
Thomas County, GA

ALTERNATIVE NO.: **A-1**

SHEET NO.: **14 of 14**

PROJECT ITEM		ORIGINAL ESTIMATE			ALTERNATIVE ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
Pavement Section cost from GaDOT project cost estimate	LS	1	$328,760.00	$328,760			
Unclass. Excavation	CY	81,003	$2.66	$215,468			
Borrow Material	CY	75,172	$3.78	$284,150			
Traffic Control	LS	1	$35,000.00	$35,000			
Clearing and Grubbing	LS	1	$98,000.00	$98,000			
Temp. Erosion control	LS	1	$184,000.00	$184,000			
Perm. Erosion Control	LS	1	$62,000.00	$62,000			
Signing and Striping	LS	1	$40,000.00	$40,000			
Temp. Barrier	LF	1,456	$34.83	$50,712			
12 lin ft of bridge saved	SF	507	$115.00	$58,305			
Overlay 135#/sy of 9.5mm	SY				623	$5.46	$3,402
Asph. Conc Leveling as required	SY				623	$3.46	$2,156
Full-depth pavement section	SY				3,500	$35.00	$122,500
Earthwork borrow required	CY				40,000	$3.78	$151,200
Traffic Control incl detour	LS				1	$35,000.00	$35,000
Clearing and Grubbing	LS				0.4	$98,000.00	$39,200
Temp. Erosion control	LS				0.4	$184,000.00	$73,600
Perm. Erosion Control	LS				0.4	$62,000.00	$24,800
Signing and Striping	LS				0.4	$40,000.00	$16,000
Subtotal				$1,356,395			$467,858
Markup (%) at 10%				$135,640			$46,786
TOTAL				$1,492,035			$514,644
TOTAL ROUNDED				$1,492,000			$515,000

VALUE ENGINEERING ALTERNATIVE

PROJECT:	**BRIDGE REPLACEMENT SR 3 ALTERNATE / JOHN B. GORDON HIGHWAY OVER OCHLOCKONEE RIVER** ***BR000-0001-00(363) P.I. No. 0001363*** ***Thomas County, GA***	ALTERNATIVE NO.: **A-2**
DESCRIPTION:	**MOVE THE PROJECT BEGINNING POINT ON THE SOUTH END FROM STA 218+00 TO 225+00**	SHEET NO.: **1 of 5**

ORIGINAL DESIGN: (sketch attached)

The original design shows the project beginning point at STA 218+00. This segment of the project is in a tangent section of the roadway for a length of 810.85 ft.

ALTERNATIVE: (sketch attached)

Change the project beginning point from STA 218+00 to STA 225+00, 700 feet to the north.

ADVANTAGES:

- Reduces paving area
- Reduces construction disruption area
- Reduces construction time

DISADVANTAGES:

- Final overlay area will be shorter

DISCUSSION:

It appears that the project limits start 700 feet before the new profile begins. This portion on the south end appears to be a tangent length outside of the new profile and alignment area. Since the new profile does not start until STA 225+00, there is no compelling justification for overlaying this section of roadway.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 68,000	—	$ 68,000
ALTERNATIVE	$ 0	—	$ 0
SAVINGS	$ 68,000	—	$ 68,000

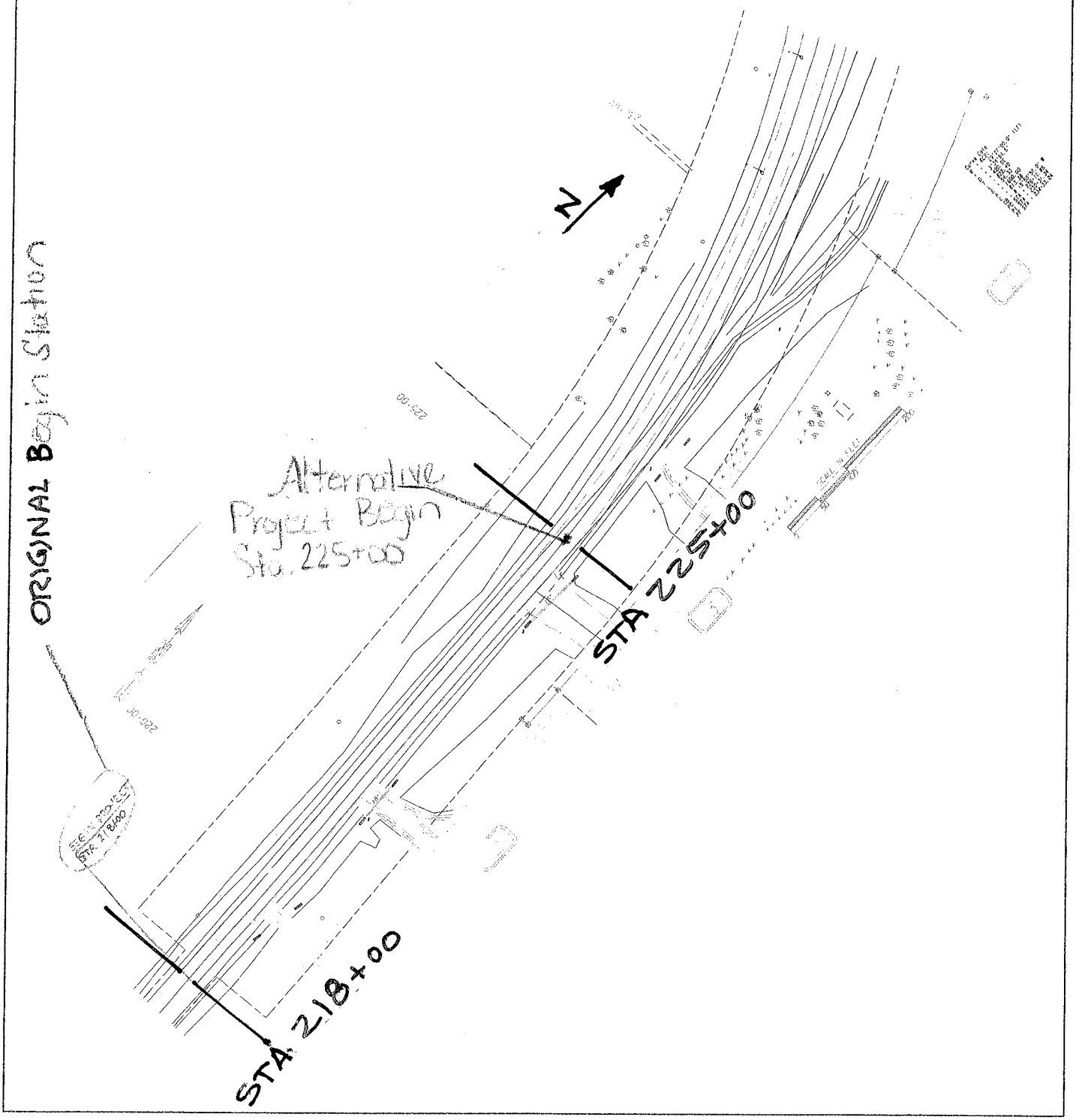
SKETCH

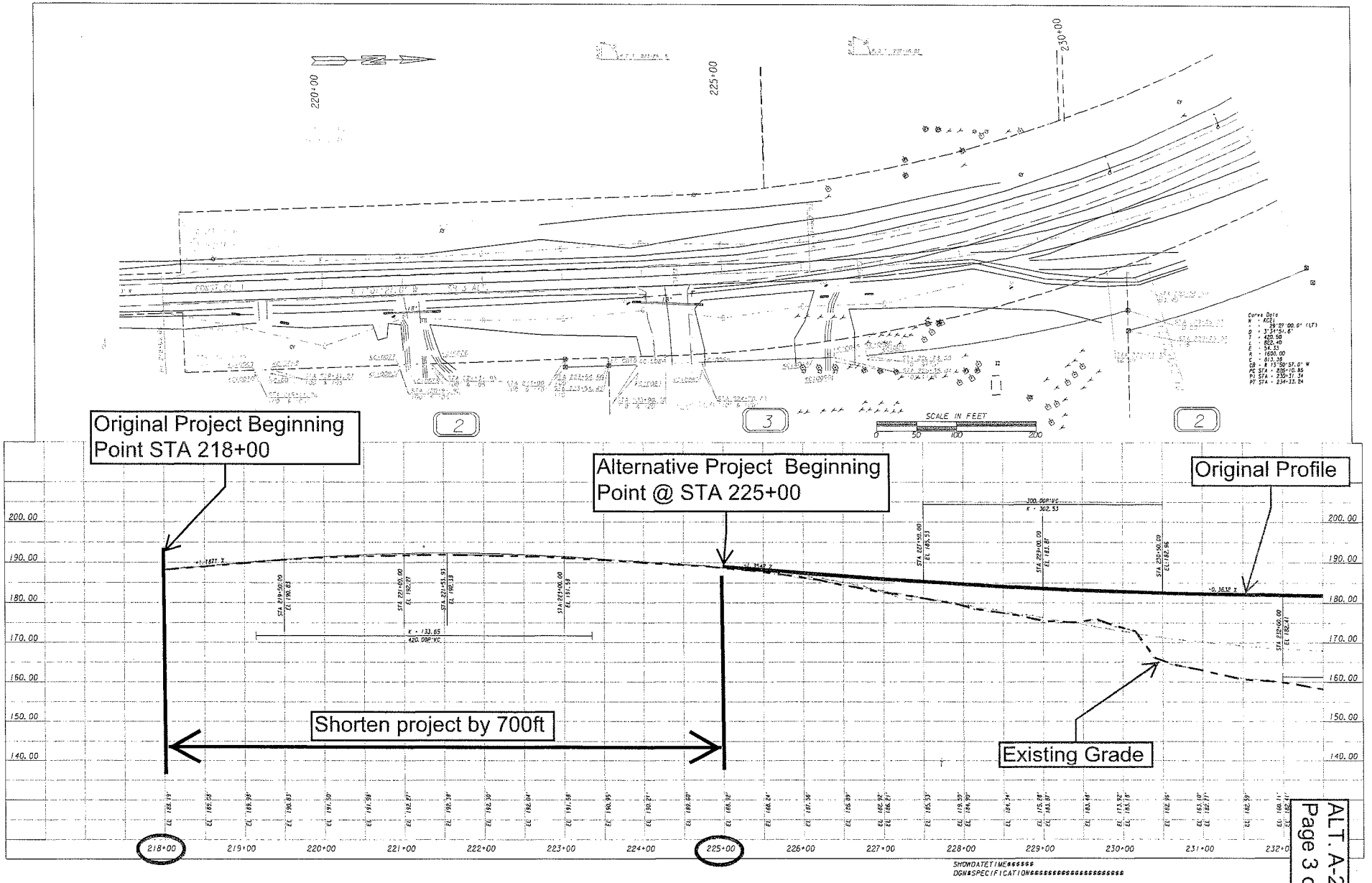
PROJECT: **BRIDGE REPLACEMENT SR 3 ALTERNATE / JOHN B. GORDON HWY. OVER OCHLOCKONEE RIVER**
BR000-0001-00(363) P.I. No. 0001363
Thomas County, GA

ALTERNATIVE NO.: A-2

ORIGINAL DESIGN ☐ ALTERNATIVE DESIGN ☐ BOTH ☒

SHEET NO.: 2 of 5





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ALT. A-2
Page 3 of 5

PROJECT: **BRIDGE REPLACEMENT SR 3 ALTERNATE / JOHN B. GORDON HWY. OVER OCHLOCKONEE RIVER**
BR000-0001-00(363) P.I. No. 0001363
Thomas County, GA

ALTERNATIVE NO.: **A-2**

SHEET NO.: **4 of 5**

Full Depth Pavement Unit Cost ($/SY): ($/Ton unit costs are from the GDOT project cost estimate)

9.5mm: 135#/SY x Ton/2,000# x $81.00/Ton = $5.46/SY

19mm: 220#/SY x Ton/2,000# x $85.00/Ton = $9.35/SY

25mm: 330#/SY x Ton/2,000# x $82.00/Ton = $13.53/SY

8" GAB: 0.67ft x 147#/CF x Ton/2,000# x 9SF/SY x $15.02/Ton = $6.66/SY

Total Pavement Section Unit Cost = $35.00/SY

Roadway Area Calculations

STA 218+00 to STA 220+00 (roadway overlay)

$$200\text{ft} \times 22\text{ft} = \frac{4400\text{ SF}}{9\text{SF/SY}} = \textbf{489 SY (Total Overlay Area)}$$

(full depth paved shoulders)

$$200\text{ft} \times 6\text{ft} = \frac{1200\text{ SF}}{9\text{SF/SY}} = 133\text{ SY}$$

STA 220+00 to 225+00 (full depth roadway and shoulders)

$$500\text{ft} \times 28\text{ft} = \frac{14{,}000\text{ SF}}{9\text{SF/SY}} = 1{,}556\text{ SY}$$

Total full depth pavement area = 1,556 SY + 133 SY = 1,689 SY (Total Full Depth Pavement Area)

COST WORKSHEET

PROJECT: **BRIDGE REPLACEMENT SR 3 ALTERNATE / JOHN B. GORDON HWY. OVER OCHLOCKONEE RIVER**
BR000-0001-00(363) P.I. No. 0001363
Thomas County, GA

ALTERNATIVE NO.: **A-2**

SHEET NO.: **5 of 5**

PROJECT ITEM		ORIGINAL ESTIMATE			ALTERNATIVE ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
Full Depth Pavement Area	SY	1,689	35.00	59,115			
Overlay Area	SY	489	5.46	2,670			
Subtotal				61,785			
Markup (%) at 10%				6,179			
TOTAL				67,964			
TOTAL ROUNDED				68,000			

VALUE ENGINEERING ALTERNATIVE

PROJECT: **BRIDGE REPLACEMENT SR 3 ALTERNATE / JOHN B. GORDON HIGHWAY OVER OCHLOCKONEE RIVER**
BR000-0001-00(363) P.I. No. 0001363
Thomas County, GA

ALTERNATIVE NO.: **A-3**

DESCRIPTION: **MOVE THE NORTH LIMITS OF THE PROJECT END POINT FROM STA 266+22.30 TO STA 263+50**

SHEET NO.: **1 of 4**

ORIGINAL DESIGN: (sketch attached)

The original design shows the project end point at STA 266+22.30. This portion of the roadway is in a 319.18 ft. long tangent section.

ALTERNATIVE: (sketch attached)

Move the project end point from STA 266+22.30 to STA 263+50, shortening the total project length by 272 ft.

ADVANTAGES:

- Reduces pavement overlay area
- Reduces construction disruption
- Reduces time required for paving

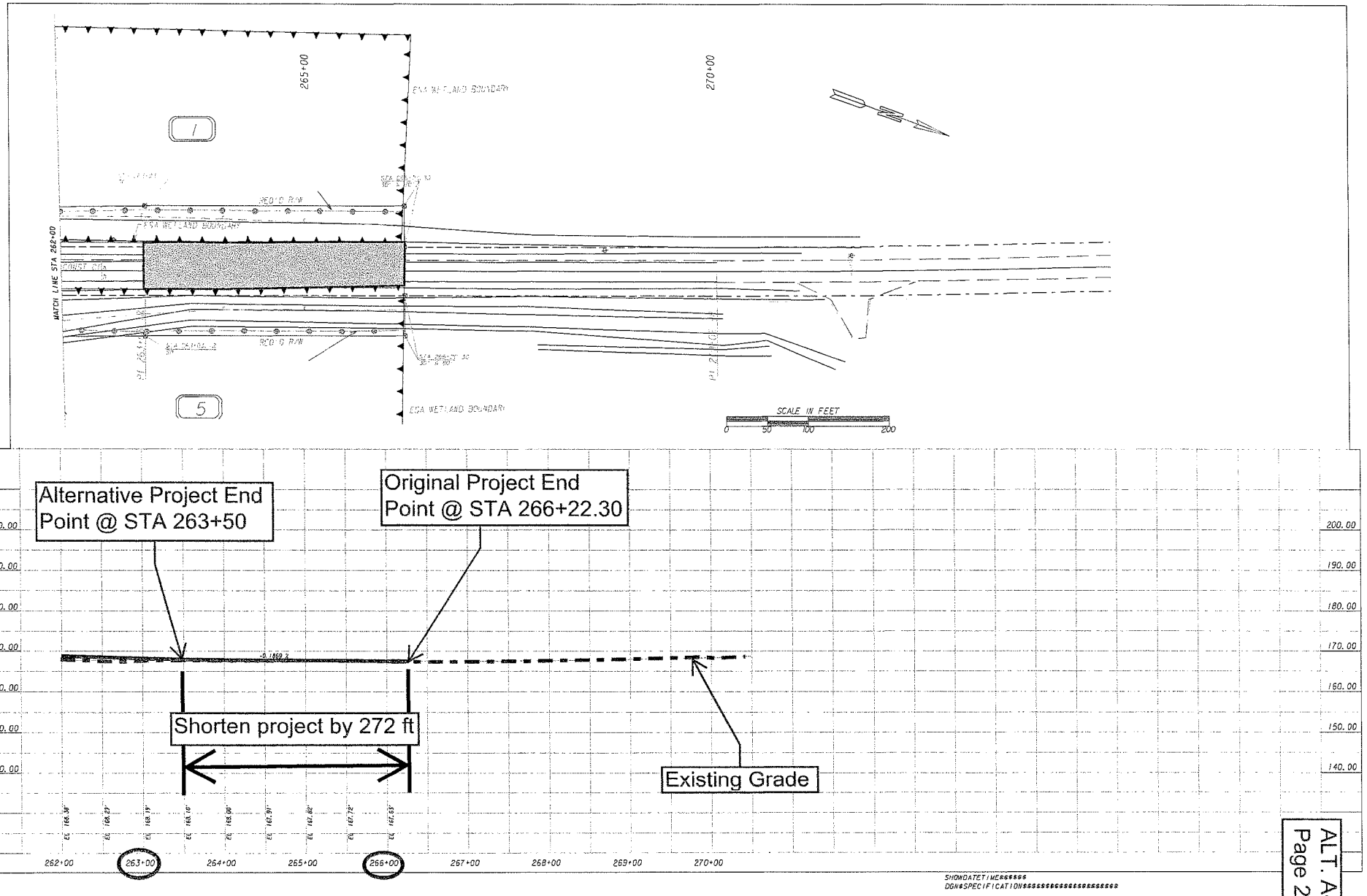
DISADVANTAGES:

- The right-of-way is already purchased for full length of the project

DISCUSSION:

Evaluation of the project limits revealed that the total length of this tangent section is not required and could be shortened to reduce the pavement area. The profile shows that this segment of roadway is at the existing grade and an overlay is being applied even though no changes are being made to the profile or alignment. Reducing the length of overlay in this area does not affect the functionality of the roadway.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 32,600	—	$ 32,600
ALTERNATIVE	$ 0	—	$ 0
SAVINGS	$ 32,600	—	$ 32,600



ALT. A-3
Page 2 of 4

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PROJECT: **BRIDGE REPLACEMENT SR 3 ALTERNATE / JOHN B. GORDON HWY. OVER OCHLOCKONEE RIVER**
BR000-0001-00(363) P.I. No. 0001363
Thomas County, GA

ALTERNATIVE NO.: **A-3**

SHEET NO.: **3 of 4**

Full Depth Pavement Unit Cost ($/SY): ($/Ton unit costs are from the GDOT project cost estimate)

9.5mm:	135#/SY x Ton/2,000# x $81.00/Ton	=	$5.46/SY
19mm:	220#/SY x Ton/2,000# x $85.00/Ton	=	$9.35/SY
25mm:	330#/SY x Ton/2,000# x $82.00/Ton	=	$13.53/SY
8" GAB:	0.67ft x 147#/CF x Ton/2,000# x 9SF/SY x $15.02/Ton	=	$6.66/SY
	Total Pavement Section Unit Cost	=	**$35.00/SY**

Pavement Area Saved

STA 263+50 to STA 266+22.30 (full depth section)

272.30ft x 28ft wide = 7624 SF

= 7,624SF/ 9 SF/SY = 847SY

Total Cost Saving **= 847SY x $35.00/SY = $29,645**

COST WORKSHEET

PROJECT: **BRIDGE REPLACEMENT SR 3 ALTERNATE / JOHN B. GORDON HWY. OVER OCHLOCKONEE RIVER**
BR000-0001-00(363) P.I. No. 0001363
Thomas County, GA

ALTERNATIVE NO.: **A-3**

SHEET NO.: **4 of 4**

PROJECT ITEM		ORIGINAL ESTIMATE			ALTERNATIVE ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
Full Depth Pavement	SY	847	35.00	29,645			
Subtotal				29,645			
Markup (%) at 10%				2,965			
TOTAL				32,610			
TOTAL ROUNDED				33,000			

VALUE ENGINEERING ALTERNATIVE

PROJECT: **BRIDGE REPLACEMENT SR 3 ALTERNATE / JOHN B. GORDON HIGHWAY OVER OCHLOCKONEE RIVER**
BR000-0001-00(363) P.I. No. 0001363
Thomas County, GA

ALTERNATIVE NO.: **P-1**

DESCRIPTION: **MODIFY THE PROFILE TO ADD A CREST ON THE BRIDGE AND LOWER THE SOUTHERN APPROACH PROFILE**

SHEET NO.: **1 of 13**

ORIGINAL DESIGN: (sketch attached)

The original design for the bridge shows a profile with a continuous -0.5538% grade across the bridge from south to north. Fills for this section are in excess of 25ft. deep.

ALTERNATIVE: (sketch attached)

Modify the profile to add a crest on the bridge and lower the approach on the south to reduce embankment depths by up to 10 feet.

ADVANTAGES:

- Reduces wetland mitigation
- Reduces construction duration and facilitates staged construction
- Reduces earthwork embankment

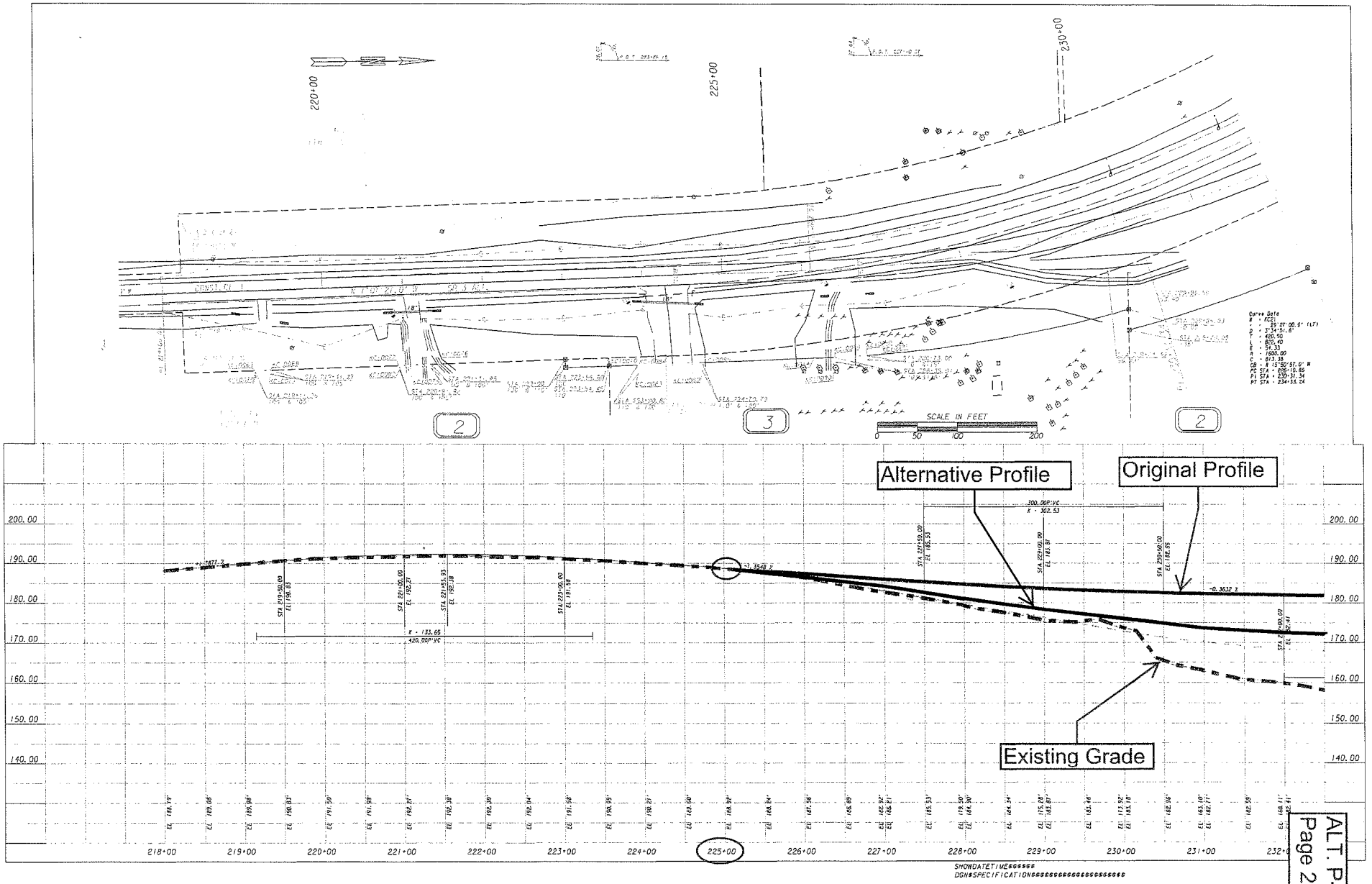
DISADVANTAGES:

- Profile needs to be adjusted

DISCUSSION:

The original design profile can be lowered 5 to 10 feet on the southern approach to the bridge and still clear the 100-year flood stage by 1 foot (Elevation 167.24). Lowering the profile will save more than 42,000 CY of roadway embankment on the realignment and reduce wetland impacts since the fills require less footprint. It would also allow the vertical alignment to be tied back into the existing roadway sooner.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 241,000	—	$ 241,000
ALTERNATIVE	$ 17,000	—	$ 17,000
SAVINGS	$ 224,000	—	$ 224,000



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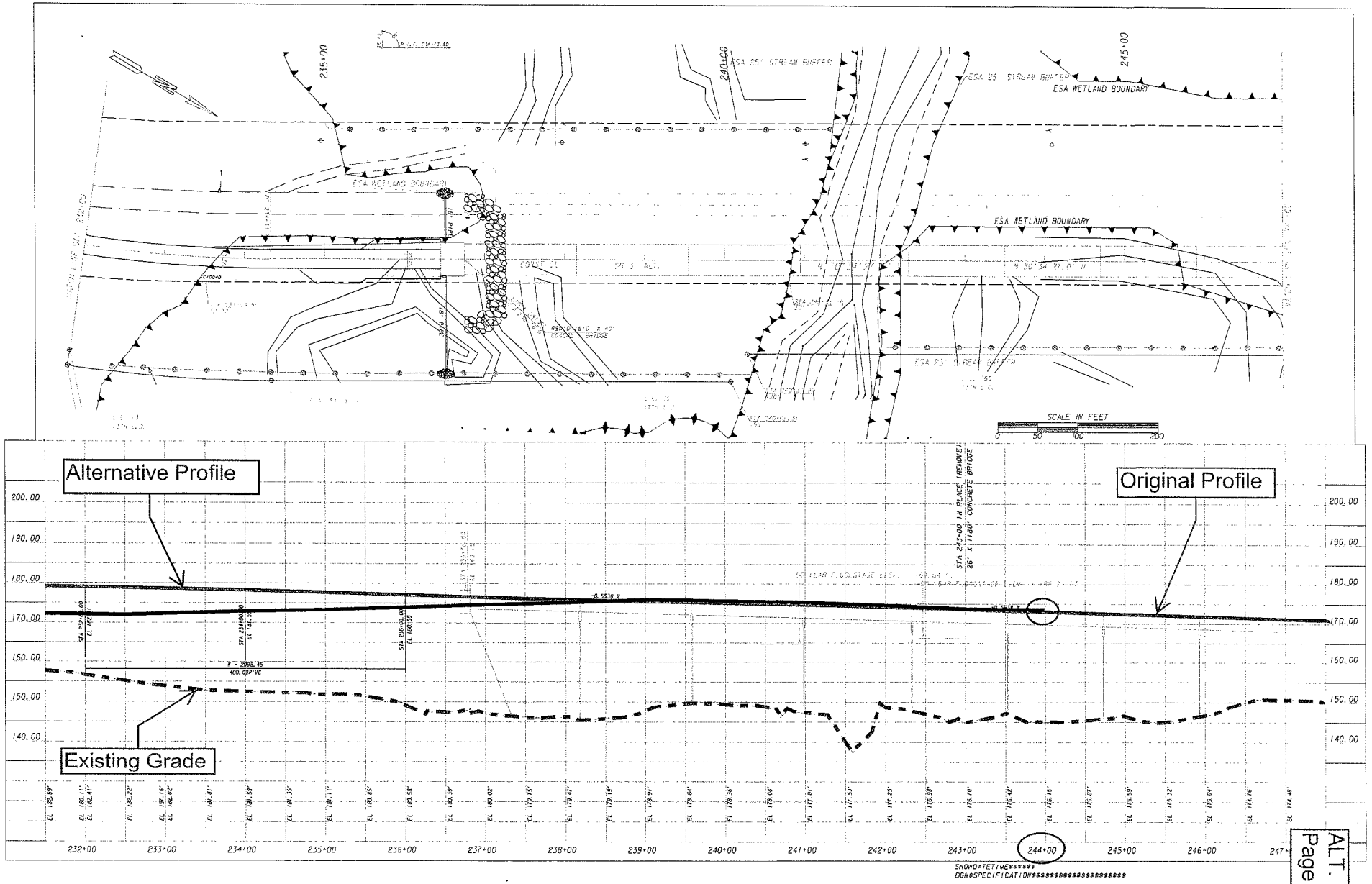

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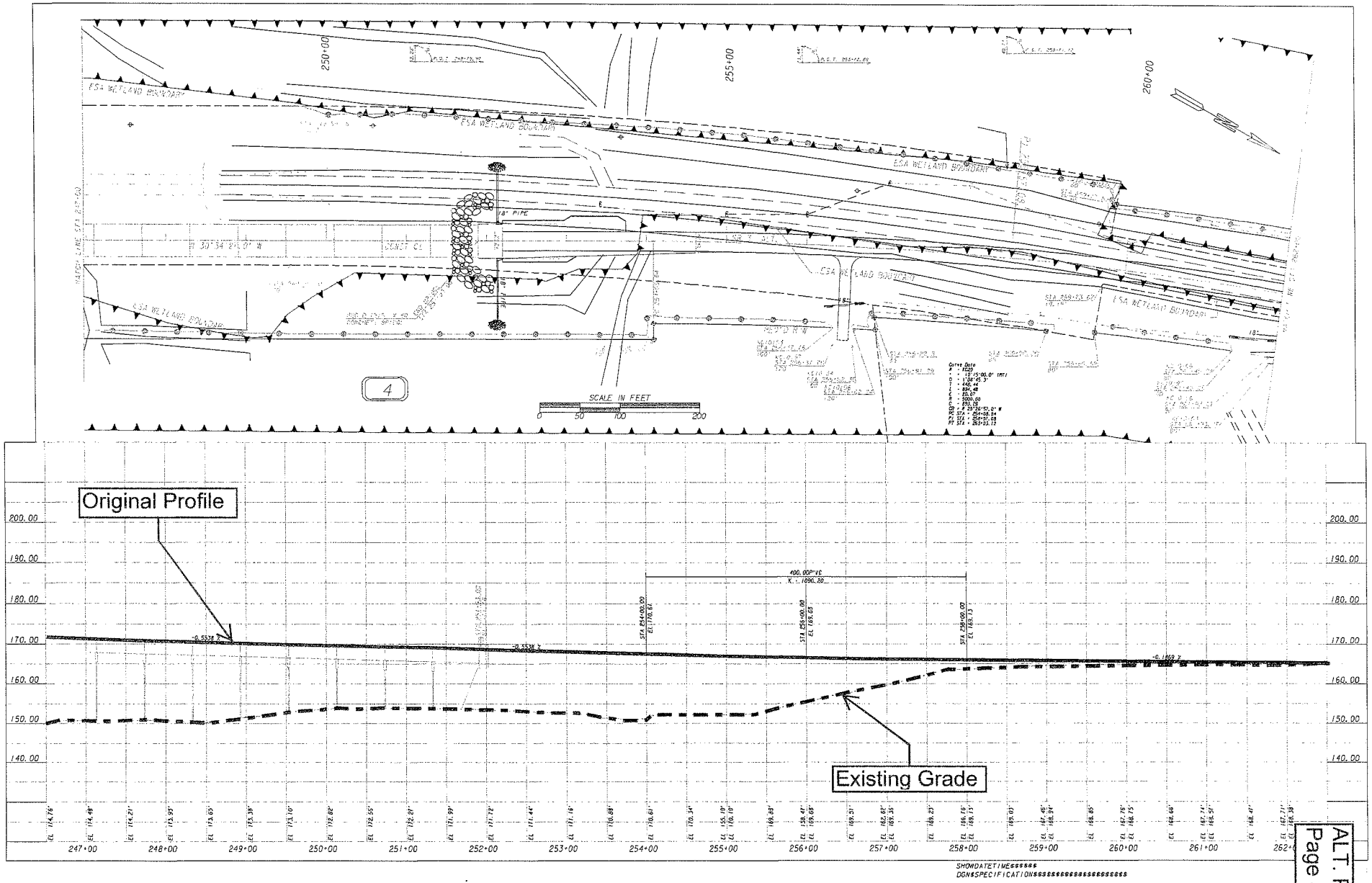
ALT. P-1
Page 3 of 13



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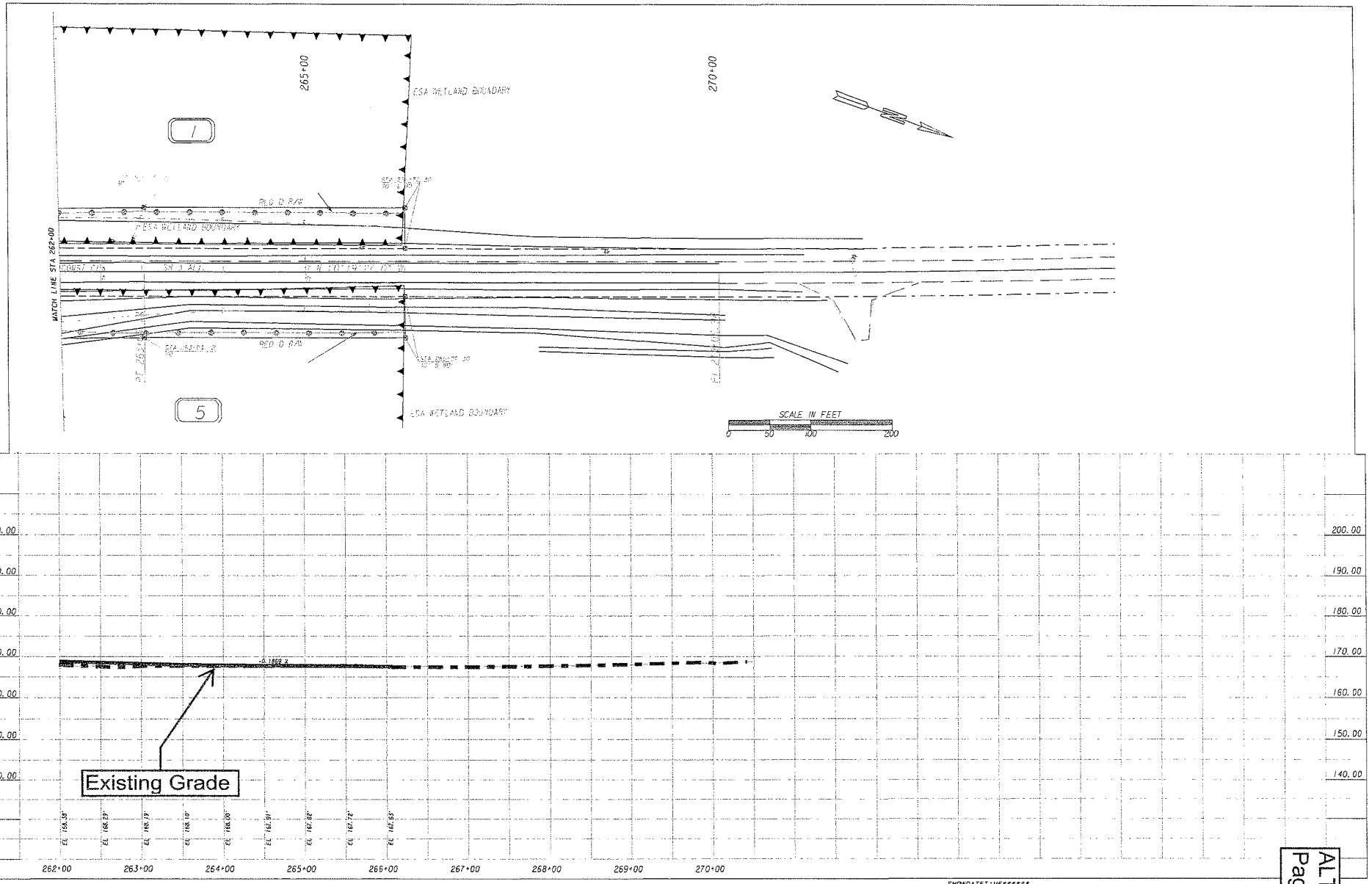
ALT. P-1
Page 4 of 13



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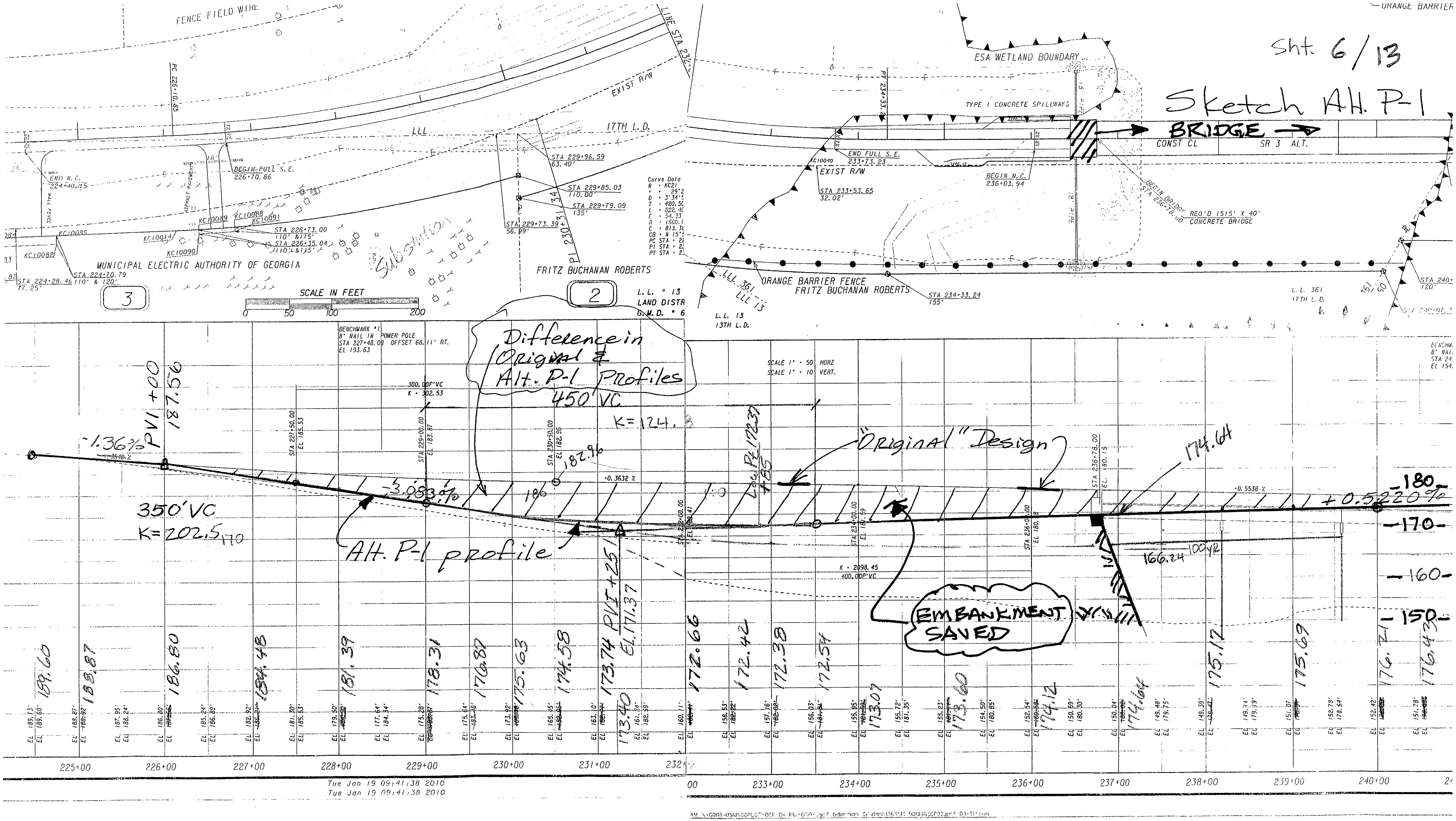
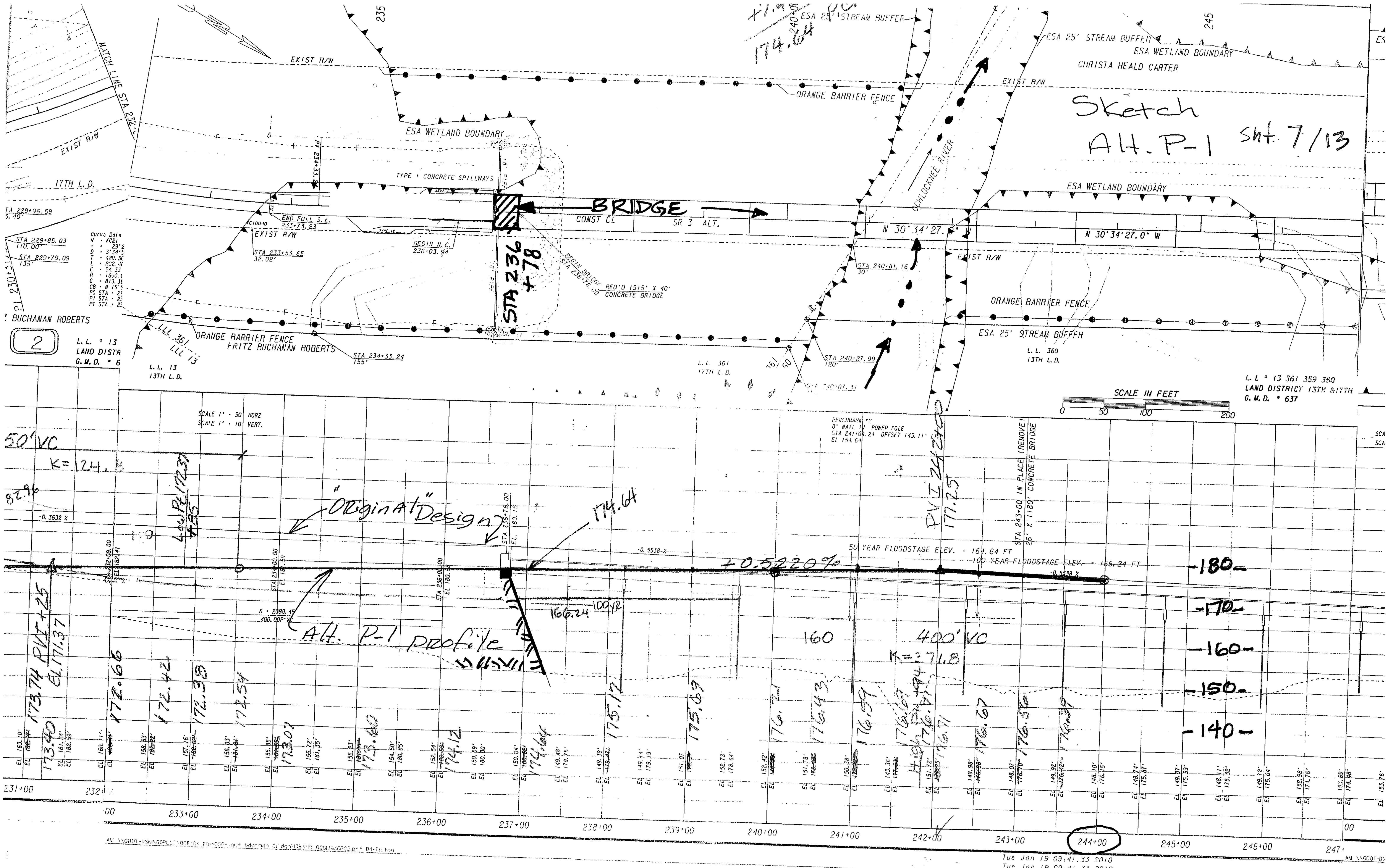
ALT. P-1
Page 5 of 13


Sht. 6/13
Sketch Alt. P-1
BRIDGE
MUNICIPAL ELECTRIC AUTHORITY OF GEORGIA
FRITZ BUCHANAN ROBERTS
ESA WETLAND BOUNDARY
TYPE I CONCRETE SPILLWAYS
ORANGE BARRIER FENCE
REQ'D 1515' X 40' CONCRETE BRIDGE
SCALE IN FEET
Difference in Original & Alt. P-1 Profiles
"Original" Design
Alt. P-1 profile
EMBANKMENT SAVED
350' VC
K= 202.5
450' VC
K= 124.
-1.36% PVI +00 187.56
PVI +25 EL. 171.37
174.64
+0.5220%
166.24 100YR
Tue Jan 19 09:41:38 2010

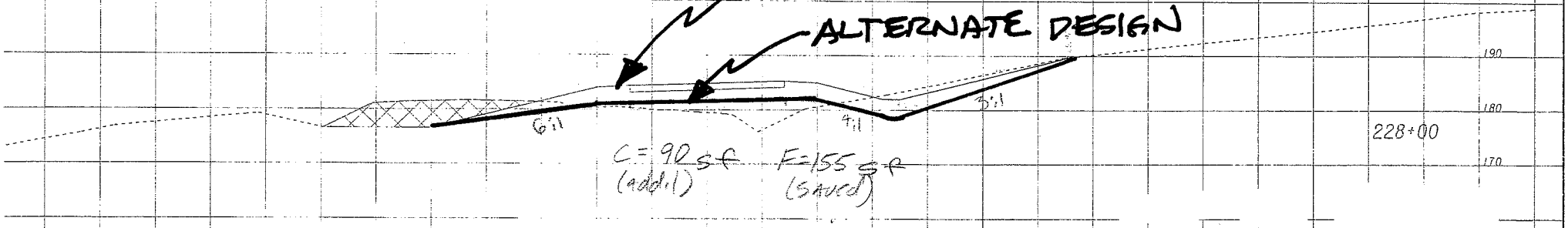

Sketch
Alt. P-1 Sht. 7/13
BRIDGE
STA 236 +78
MATCH LINE STA 232+
EXIST R/W
ESA WETLAND BOUNDARY
ORANGE BARRIER FENCE
TYPE I CONCRETE SPILLWAYS
ESA 25' STREAM BUFFER
CHRISTA HEALD CARTER
OCHLOCKNEE RIVER
CONST CL
SR 3 ALT.
N 30°34'27.0" W
END FULL S.E. 233+73.23
BEGIN N.C. 236+03.94
BEGIN BRIDGE STA 236+78.00
REQ'D 1515' X 40' CONCRETE BRIDGE
STA 233+53.65 32.02'
STA 234+33.24 155'
STA 240+81.16 30'
STA 240+27.99 120'
STA 229+96.59
STA 229+85.03 110.00'
STA 229+79.09 135'
FRITZ BUCHANAN ROBERTS
L.L. 361 13TH L.D.
L.L. 360 13TH L.D.
L.L. 13 361 359 360 LAND DISTRICT 13TH &17TH G.M.D. 637
SCALE IN FEET 0 50 100 200
174.64
SCALE 1" = 50' HORZ
SCALE 1" = 10' VERT.
50' VC
K = 124.
"Original Design"
Low Pt 172.37 +85
Alt. P-1 profile
166.24 100 yr
-0.3632 %
-0.5538 %
+0.5220%
K = 2098.45
400.00' VC
50 YEAR FLOODSTAGE ELEV. = 164.64 FT
100 YEAR FLOODSTAGE ELEV. = 166.24 FT
BENCHMARK #2 6" NAIL IN POWER POLE STA 241+08.24 OFFSET 145.11' LT EL 154.64
PVI 242+00 177.25
STA 243+00 IN PLACE (REMOVE) 26' X 1180' CONCRETE BRIDGE
400' VC
K = 71.8
PVI +25 EL 171.37
-180-
-170-
-160-
-150-
-140-
173.74
173.40
172.66
172.42
172.38
172.54
173.07
173.60
174.12
174.64
175.17
175.69
176.21
176.43
176.59
176.69
176.71
176.67
176.56
176.39
231+00
232+00
233+00
234+00
235+00
236+00
237+00
238+00
239+00
240+00
241+00
242+00
243+00
244+00
245+00
246+00
247+
Tue Jan 19 09:41:33 2010

STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
GA	BR000-0001-00(363)		

CUT = 425 CY FILL = 1,210 CY

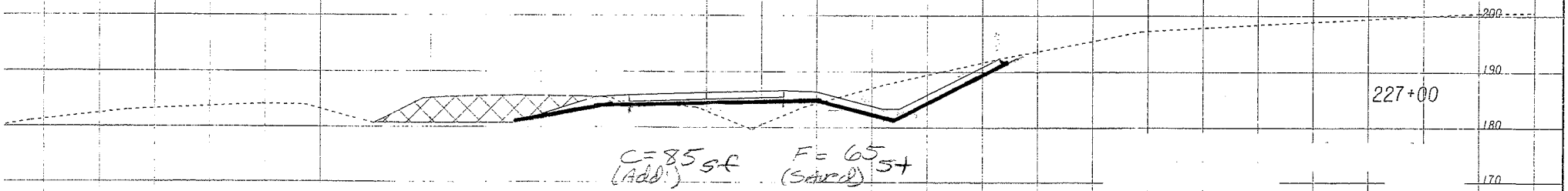
ORIGINAL DESIGN

ALTERNATE DESIGN



C = 90 SF (add'l) F = 155 SF (saved)

CUT = 320 CY FILL = 405 CY



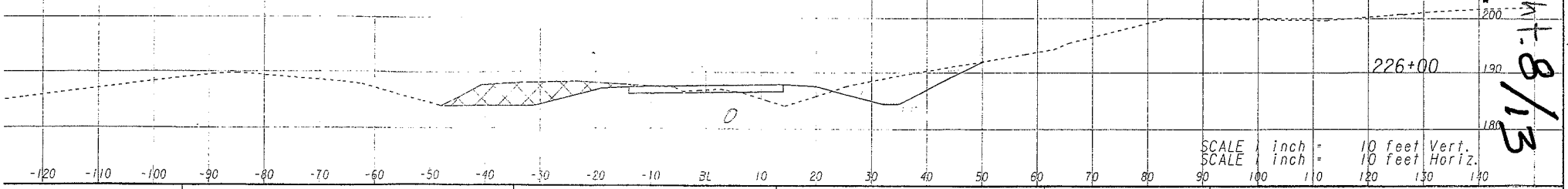
C = 85 SF (Add'l) F = 65 SF (Saved)

STAGE 3

~~1. WHEN CONSTRUCTION OF ROADWAY AND BRIDGE ON SR3 ALT HAS BEEN COMPLETED.~~
REDIRECT TRAFFIC FROM OLD SR3 ALT TO NEW SR3 ALT

2. REMOVE OLD ROAD AND BRIDGE

CUT = 155 CY FILL = 120 CY



SCALE 1 inch = 10 feet Vert.
SCALE 1 inch = 10 feet Horiz.

Sht. 8/13

ALT. NO. P-1

ROAD BED TO BE REMOVED

GEORGIA
DEPARTMENT
OF
TRANSPORTATION

Sketch
Alt. P-1

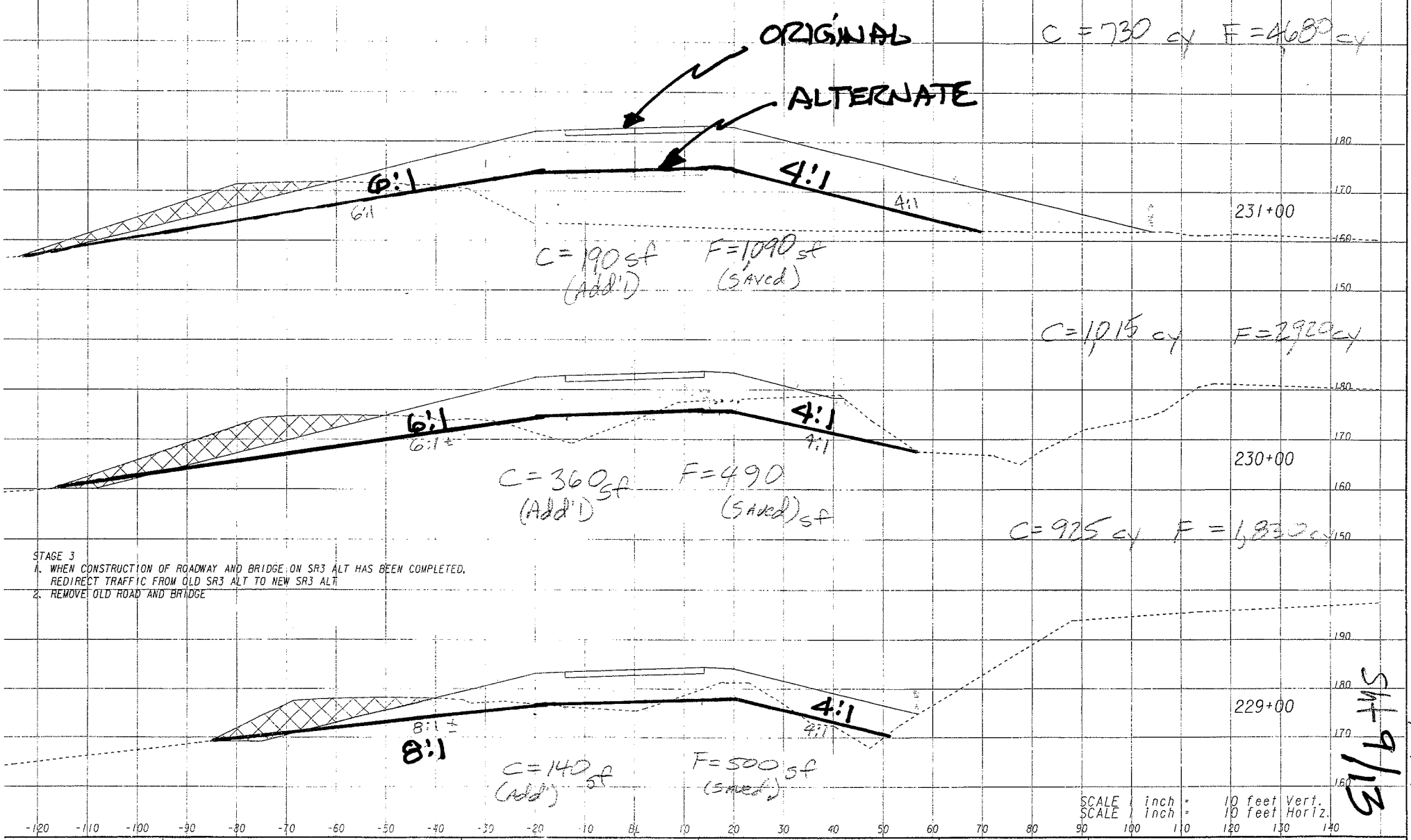
REVISION DATES

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE:

CROSS SECTIONS
CONSTRUCTION STAGING

Systems Inc.

STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
GA	BR00G-0001-0013631		



STAGE 3
1. WHEN CONSTRUCTION OF ROADWAY AND BRIDGE ON SR3 ALT HAS BEEN COMPLETED, REDIRECT TRAFFIC FROM OLD SR3 ALT TO NEW SR3 ALT
2. REMOVE OLD ROAD AND BRIDGE

SCALE 1 inch = 10 feet Vert.
SCALE 1 inch = 10 feet Horiz.

Sht 9/13

ALT. NO. P-1

ROAD BED TO BE REMOVED

GEORGIA
DEPARTMENT
OF

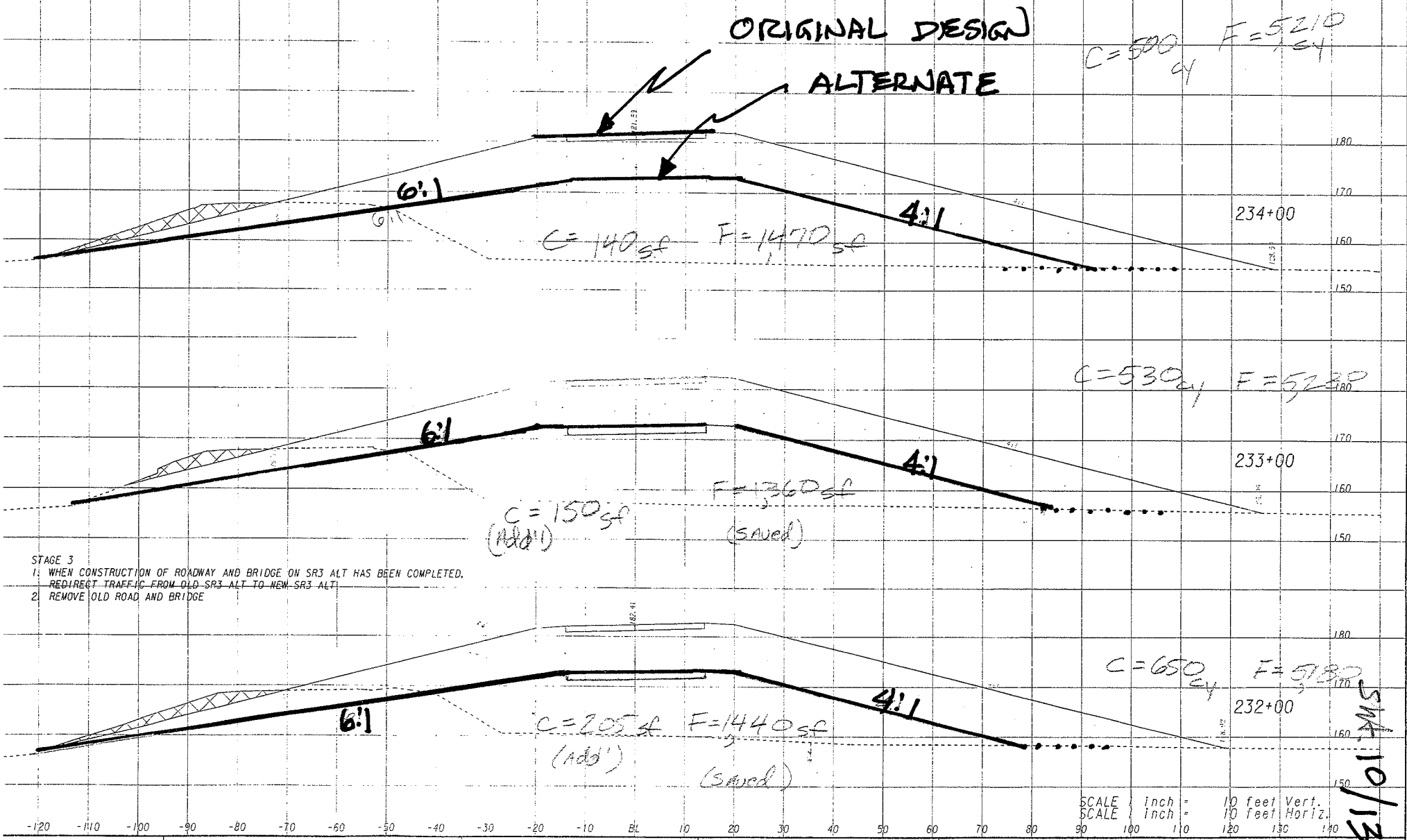
Sketch
P-1

REVISION DATES

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE:

CROSS SECTIONS
CONSTRUCTION STAGING

STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
GA	BRGOO-0001-001363		



STAGE 3
1. WHEN CONSTRUCTION OF ROADWAY AND BRIDGE ON SR3 ALT HAS BEEN COMPLETED, REDIRECT TRAFFIC FROM OLD SR3 ALT TO NEW SR3 ALT.
2. REMOVE OLD ROAD AND BRIDGE

SCALE 1 inch = 10 feet Vert.
SCALE 1 inch = 10 feet Horiz.

ROAD BED TO BE REMOVED

GEORGIA
DEPARTMENT
OF

Sketch P-1

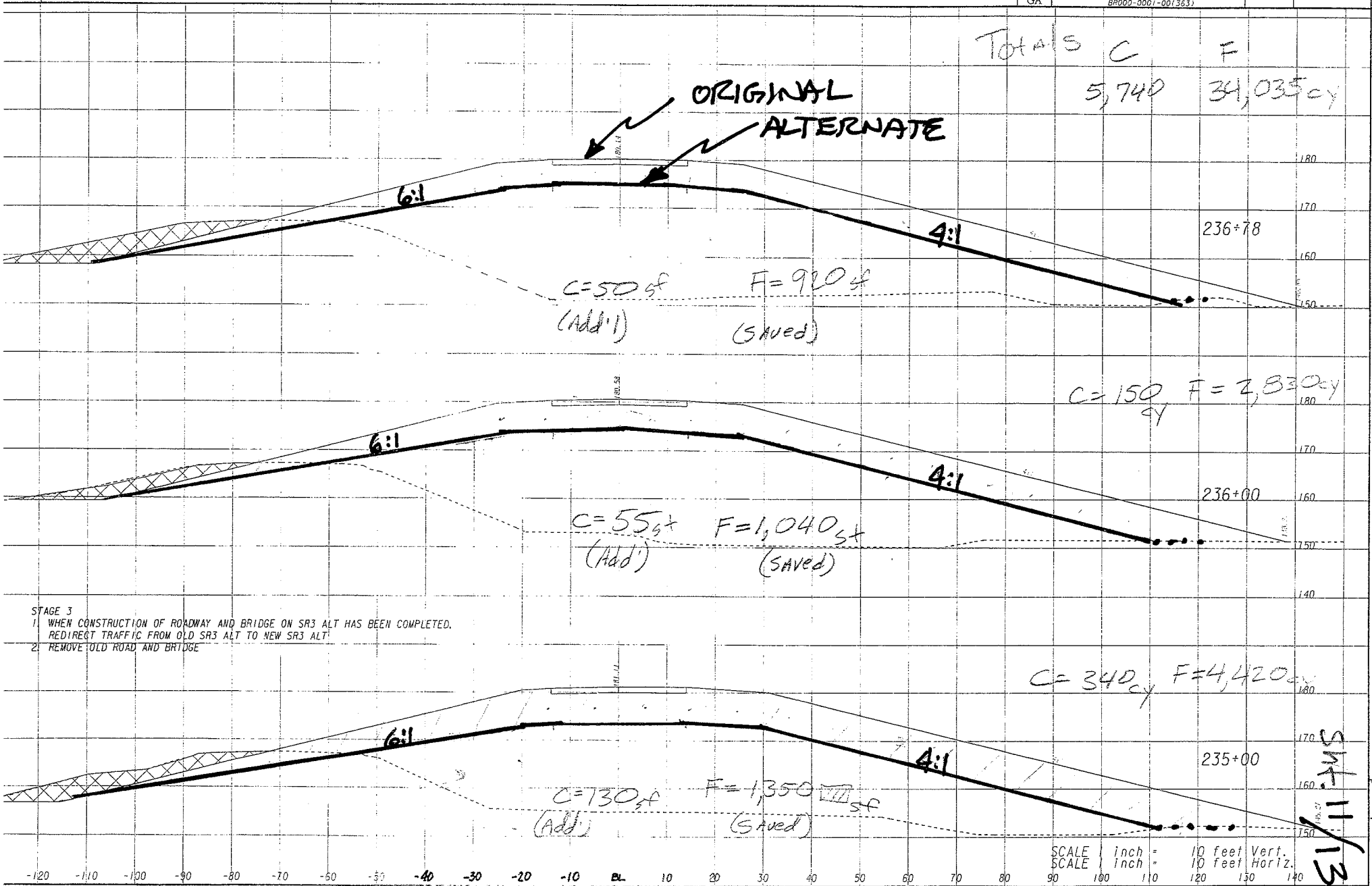
REVISION DATES

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE:

CROSS SECTIONS
CONSTRUCTION STAGING

Sht. 10/13 ALT. No. P-1

STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
GA	BR000-0001-00(363)		



STAGE 3
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SCALE 1 inch = 10 feet Vert.
SCALE 1 inch = 10 feet Horiz.

SHT. 11 / 13

ALT. NO. P-1

ROAD BED TO BE REMOVED

GEORGIA DEPARTMENT OF

Sketch P-1

REVISION DATES

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE:

CROSS SECTIONS
CONSTRUCTION STAGING

PROJECT:	**BRIDGE REPLACEMENT SR 3 ALTERNATE / JOHN B. GORDON HWY. OVER OCHLOCKONEE RIVER** ***BR000-0001-00(363) P.I. No. 0001363*** ***Thomas County, GA***	ALTERNATIVE NO.:	**P-1**
		SHEET NO.:	**12 of 13**

Earthwork

Earthwork Embankment for this area STA 226+00 to STA 236+78

Use 20% shrinkage factor

Earthwork embankment (fill) saved with Alternate Design profile = 34,035 CY

Additional Unclassified Excavation with Alternate Design = 5,740 CY

Quantities calculated from attached X-sections

Use "swell the fill" method: 34,035 CY / (1 - 0.20) = 42,540 CY (Total Borrow quantity saved)

Lower profile will save 12ft (using 2:1 slope and 6ft fill height) of bridge length.

Bridge

The bridge is shortened by 12ft.

Bridge area saved = (12 ft long x 42.25 ft wide) = 507 SF

COST WORKSHEET

PROJECT: **BRIDGE REPLACEMENT SR 3 ALTERNATE / JOHN B. GORDON HWY. OVER OCHLOCKONEE RIVER**
BR000-0001-00(363) P.I. No. 0001363
Thomas County, GA

ALTERNATIVE NO.: **P-1**

SHEET NO.: **13 of 13**

PROJECT ITEM		ORIGINAL ESTIMATE			ALTERNATIVE ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
Borrow saved	CY	42,540	$3.78	$160,801			
12 LF of bridge saved	SF	507	$115.00	$58,305			
Additional excavation	CY				5,740	$2.66	$15,268
Subtotal				$219,106			$15,268
Markup (%) at 10%				$21,911			$1,527
TOTAL				$241,017			$16,795
TOTAL ROUNDED				$241,000			$17,000

VALUE ENGINEERING ALTERNATIVE

PROJECT: **BRIDGE REPLACEMENT SR 3 ALTERNATE / JOHN B. GORDON HIGHWAY OVER OCHLOCKONEE RIVER**
BR000-0001-00(363) P.I. No. 0001363
Thomas County, GA

ALTERNATIVE NO.: **P-1.1**

DESCRIPTION: **MODIFY THE PROFILE TO ADD A CREST ON THE BRIDGE AND LOWER THE APPROACH ON THE SOUTH END; USE 2:1 SLOPES INSTEAD OF 4:1 AT GUARDRAIL LOCATIONS**

SHEET NO.: **1 of 12**

ORIGINAL DESIGN: (sketch attached)

The existing bridge profile is a continuous -0.5538% grade across the bridge from south to north. Fill slopes at guardrail locations are 4:1.

ALTERNATIVE: (sketch attached)

Modify the profile to add a crest on the bridge and lower the south end approach. Use 2:1 slopes in lieu of 4:1 slopes at guardrail locations.

ADVANTAGES:

- Reduces embankment quantities
- Reduces labor and equipment requirements
- Reduces impacts on wetlands
- Reduces truck traffic, dust and noise during construction

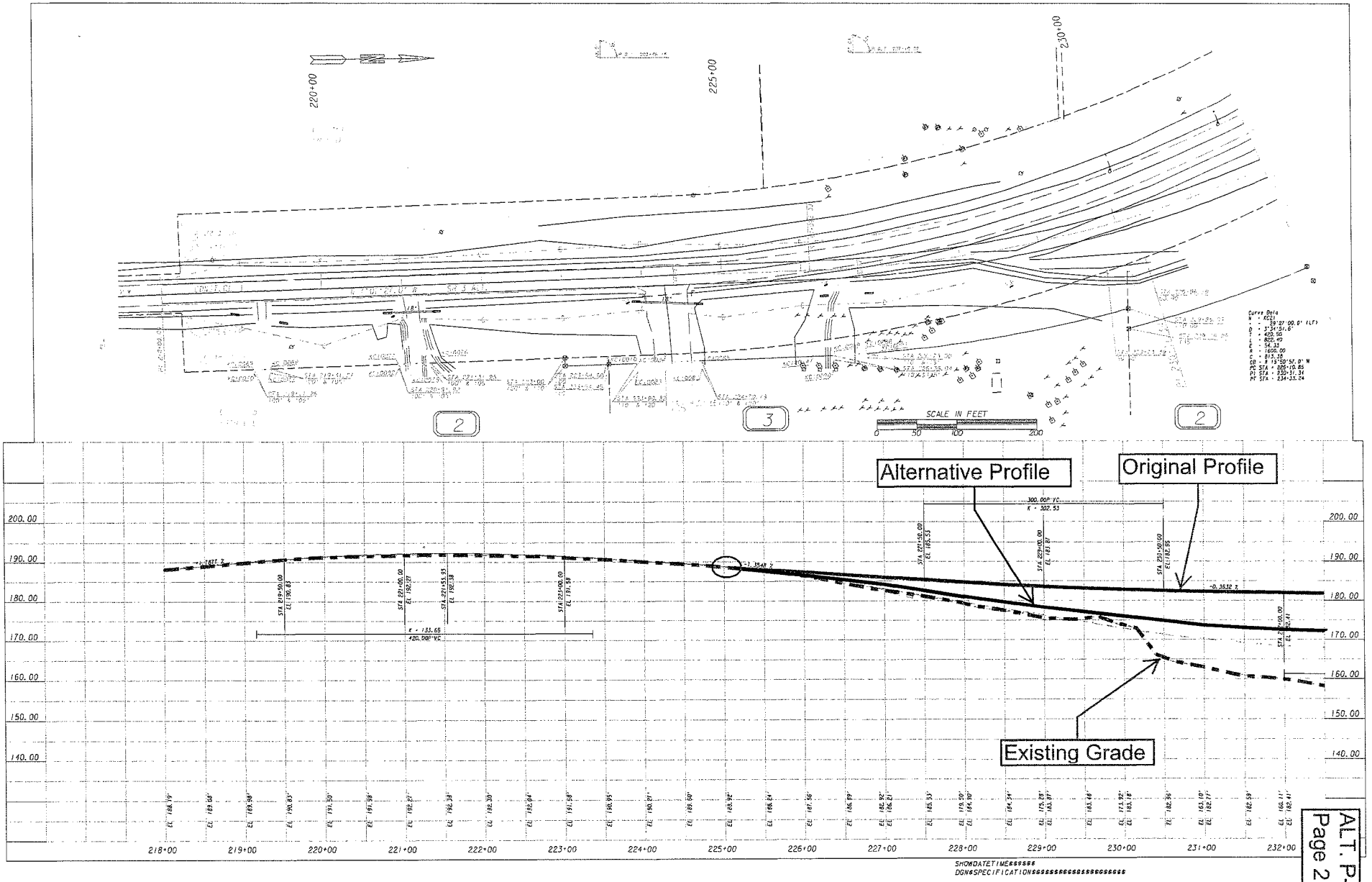
DISADVANTAGES:

- Additional guardrail required

DISCUSSION:

The original design profile can be lowered 5 to 10 feet on the southern approach to the bridge and still clear the 100-year flood stage by 1 foot (Elevation 167.24). Lowering the profile will save a large amount of roadway embankment on the realignment and allows the vertical alignment to be tied back into the existing roadway sooner, reducing borrow material and full-depth pavement. It also results in a slightly shorter bridge by 12 feet. The amount of guardrail in the current plan assumes that most of the guardrail is on 4:1 slopes. This alternative would change from 4:1 slopes to 2:1 slopes behind the entire length of guardrail to save embankment. The total amount of guardrail would be increased by 400 LF.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 323,000	—	$ 323,000
ALTERNATIVE	$ 56,000	—	$ 56,000
SAVINGS	$ 267,000	—	$ 267,000



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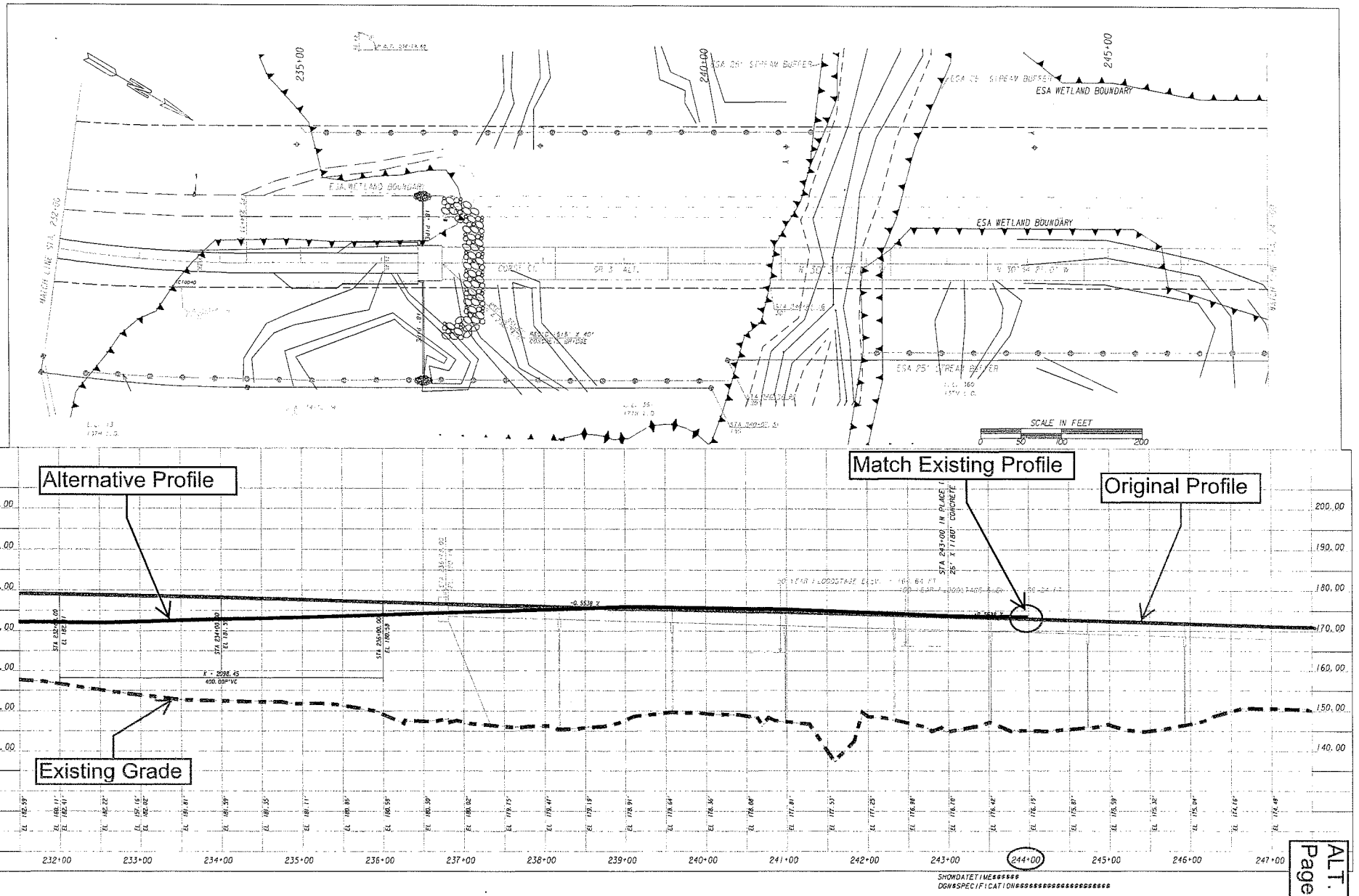
ALT. P-1.1
Page 2 of 12



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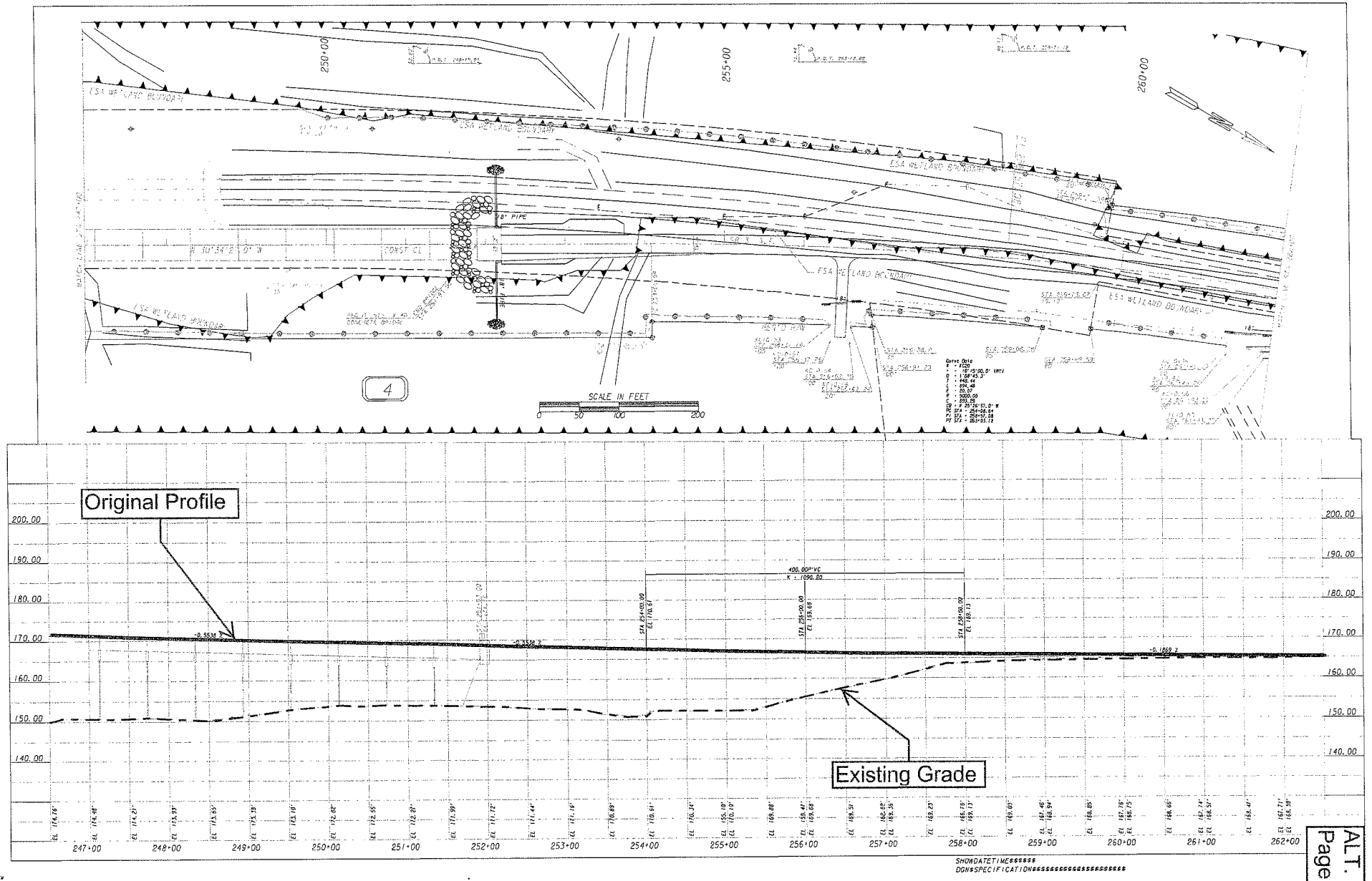
ALT. P-1.1
Page 3 of 12



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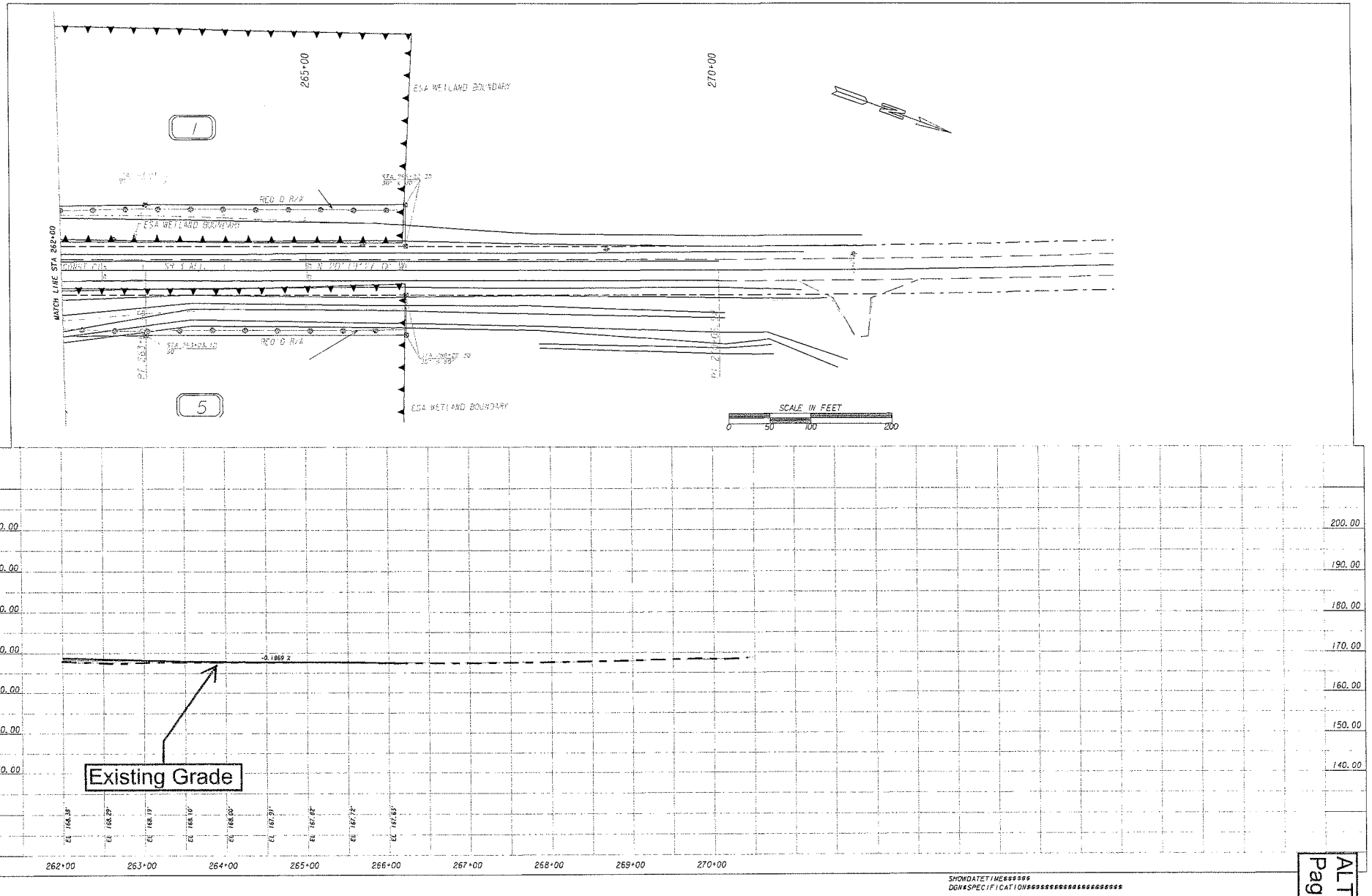
ALT. P-1.1
Page 4 of 12



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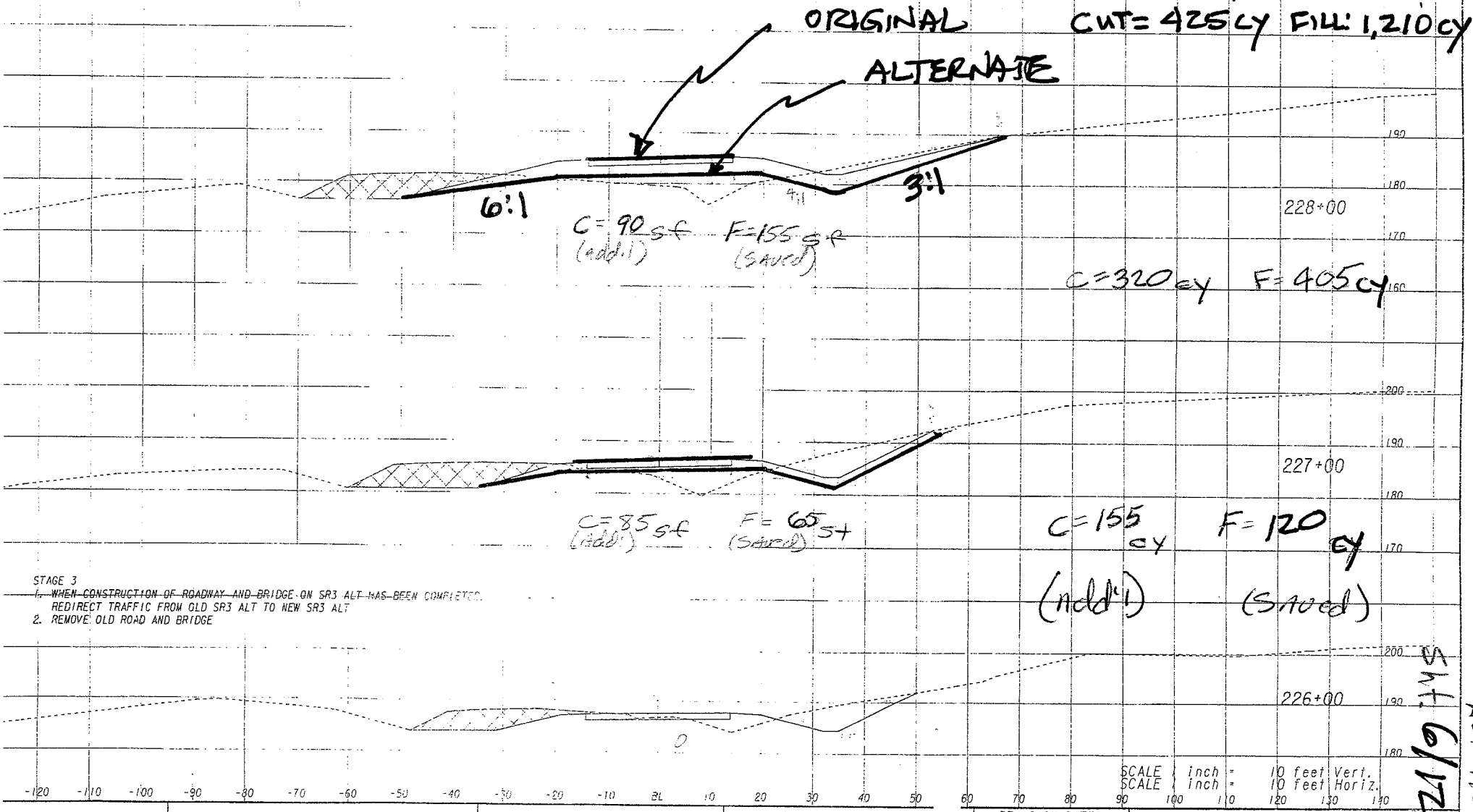
ALT. P-1.1
Page 5 of 12

STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
GA	BRDGO-000(-00(363)		



STAGE 3

~~1. WHEN CONSTRUCTION OF ROADWAY AND BRIDGE ON SR3 ALT HAS BEEN COMPLETED,~~
REDIRECT TRAFFIC FROM OLD SR3 ALT TO NEW SR3 ALT

2. REMOVE OLD ROAD AND BRIDGE

SCALE 1 inch = 10 feet Vert.
SCALE 1 inch = 10 feet Horiz.

ROAD BED TO BE REMOVED

GEORGIA DEPARTMENT OF TRANSPORTATION

Sketch Alt. P-1.1

REVISION DATES

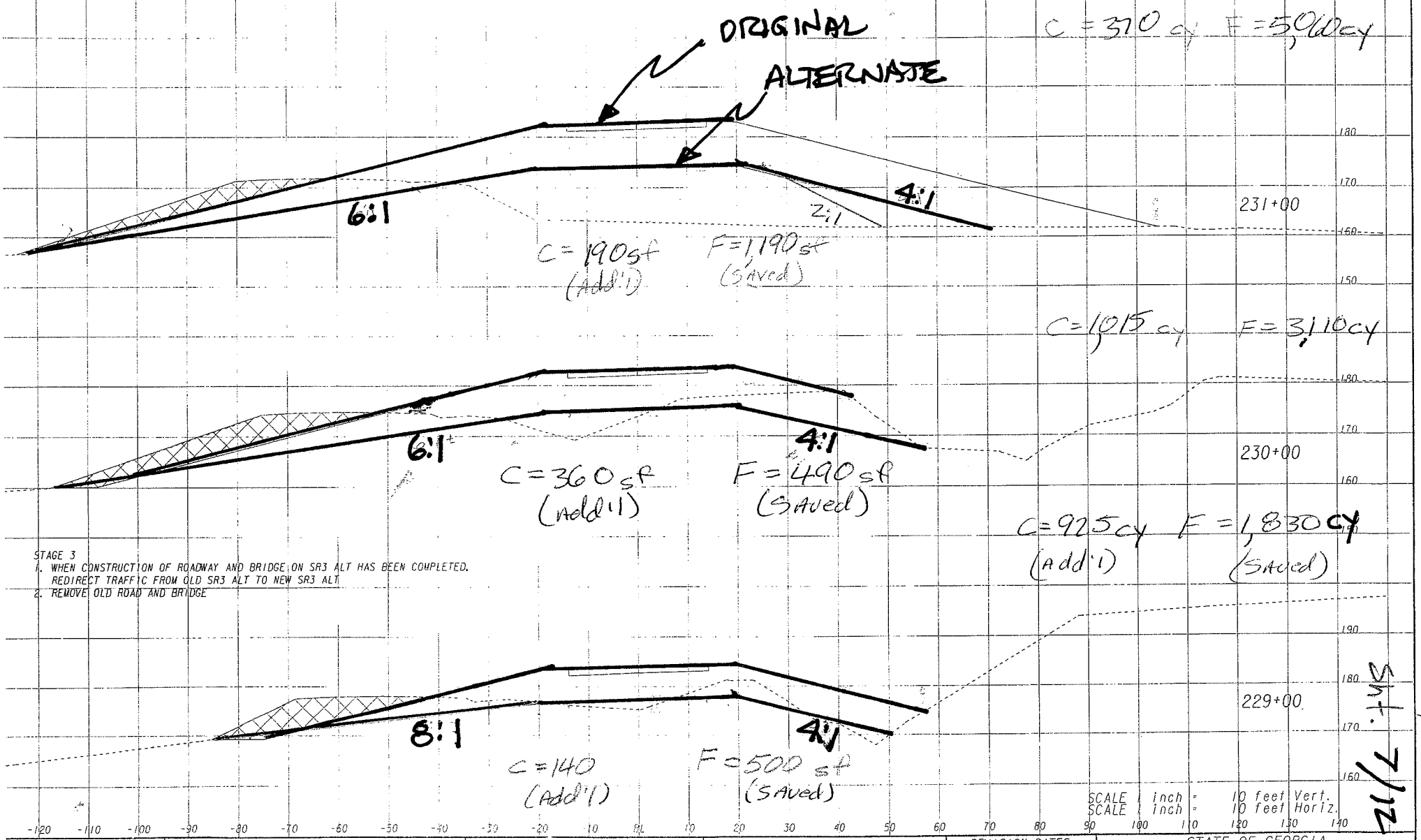
STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE:

CROSS SECTIONS
CONSTRUCTION STAGING

SHEET NO. 6 OF 12

ALT. NO. P-1.1

STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
GA	BR000-0001-00(363)		



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SCALE 1 inch = 10 feet Horiz.

ROAD BED TO BE REMOVED

GEORGIA
DEPARTMENT
OF

Sketch
Alt. P.I.1

REVISION DATES

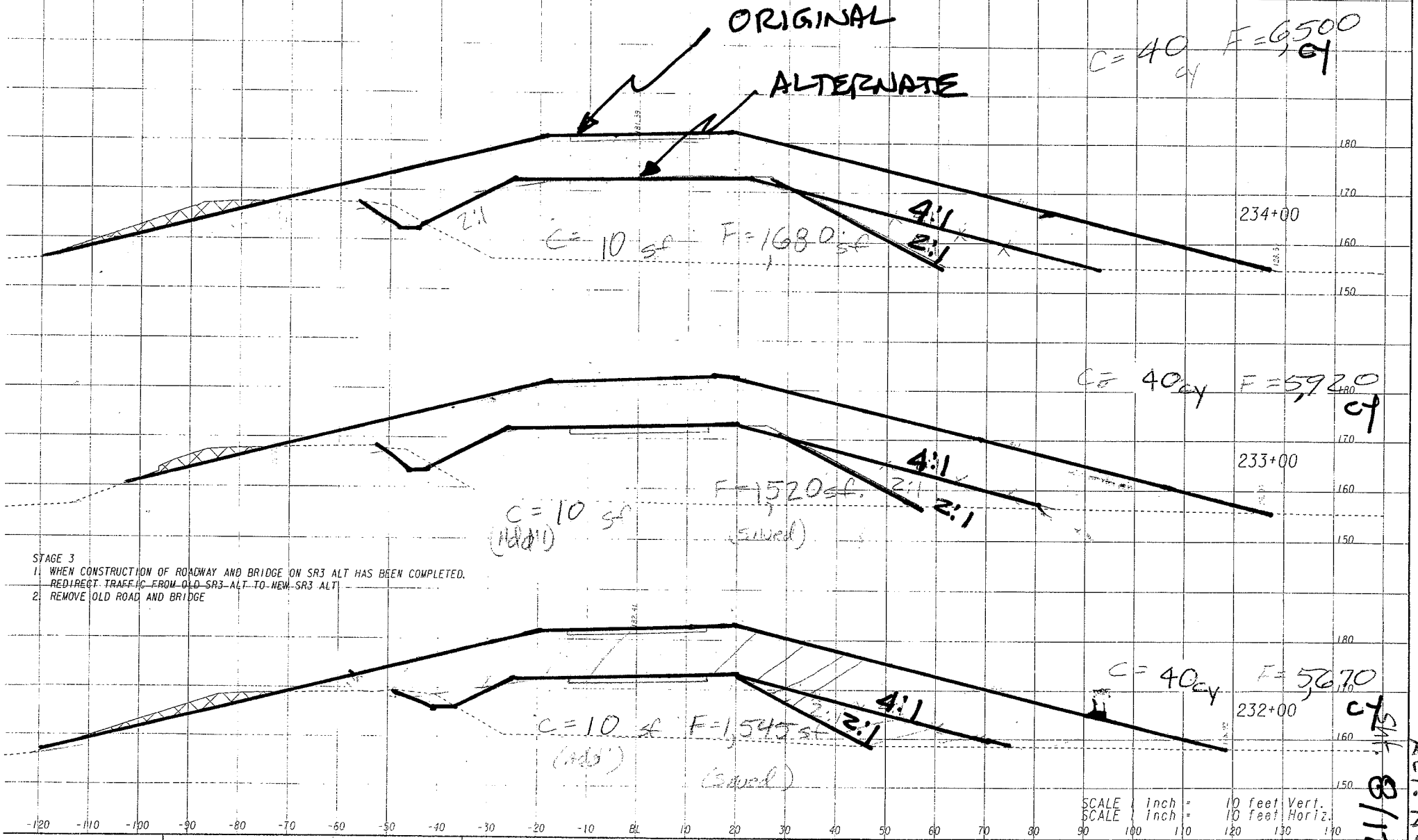
STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE:

CROSS SECTIONS
CONSTRUCTION STAGING

SHT. NO. 7 / 12

ALT. NO. P.I.1

STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
GA	BRDG-000:-00(363)		



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ROAD BED TO BE REMOVED

GEORGIA
DEPARTMENT
OF

Sketch
A.H. Pl.1

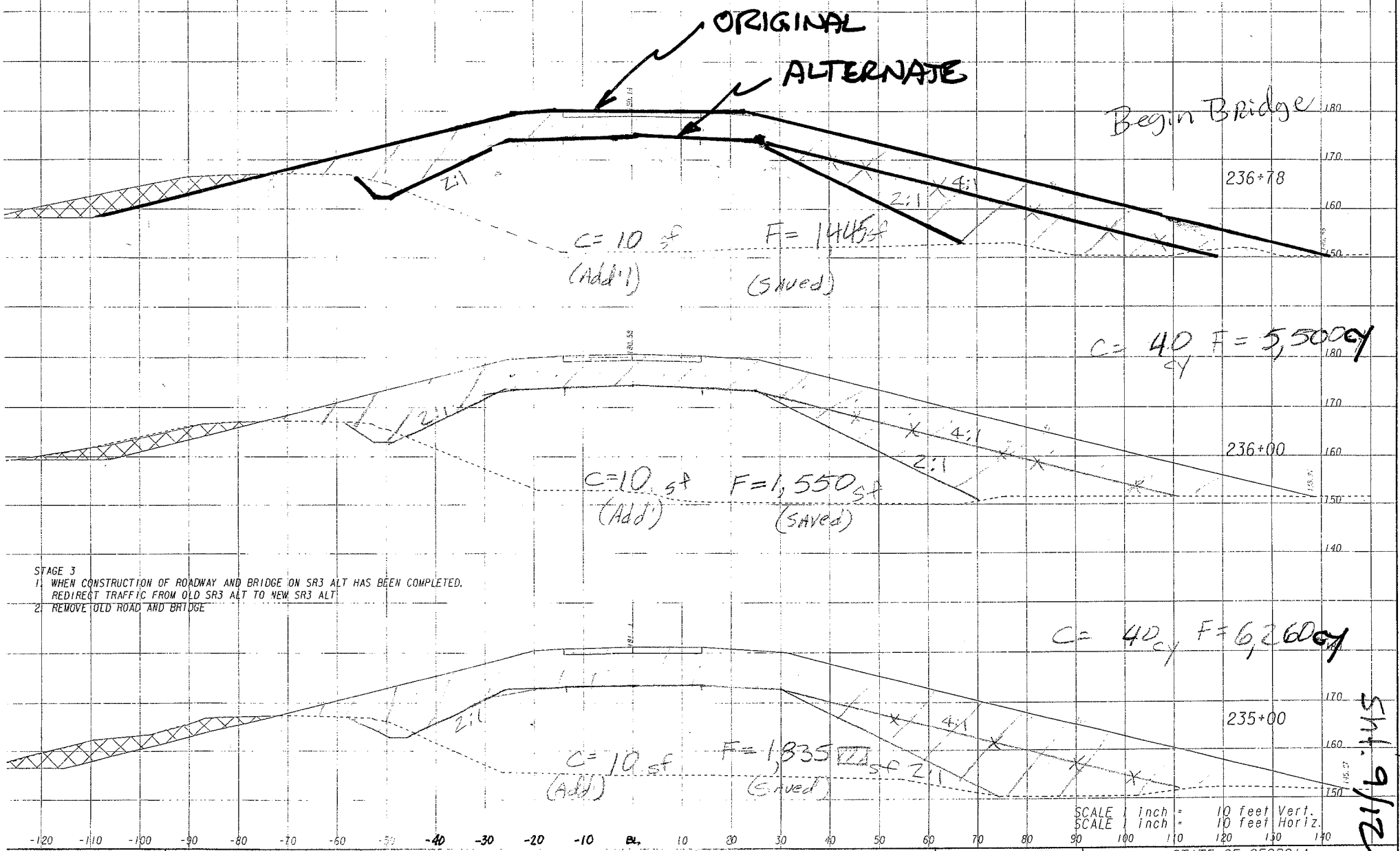
REVISION DATES

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE:

CROSS SECTIONS
CONSTRUCTION STAGING

ALT. NO. Pl.1
SHT. 8/12

STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
GA	BRDGG-0001-001363		



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SCALE 1 inch = 10 feet Vert.
SCALE 1 inch = 10 feet Horiz.

ROAD BED TO BE REMOVED

GEORGIA DEPARTMENT OF

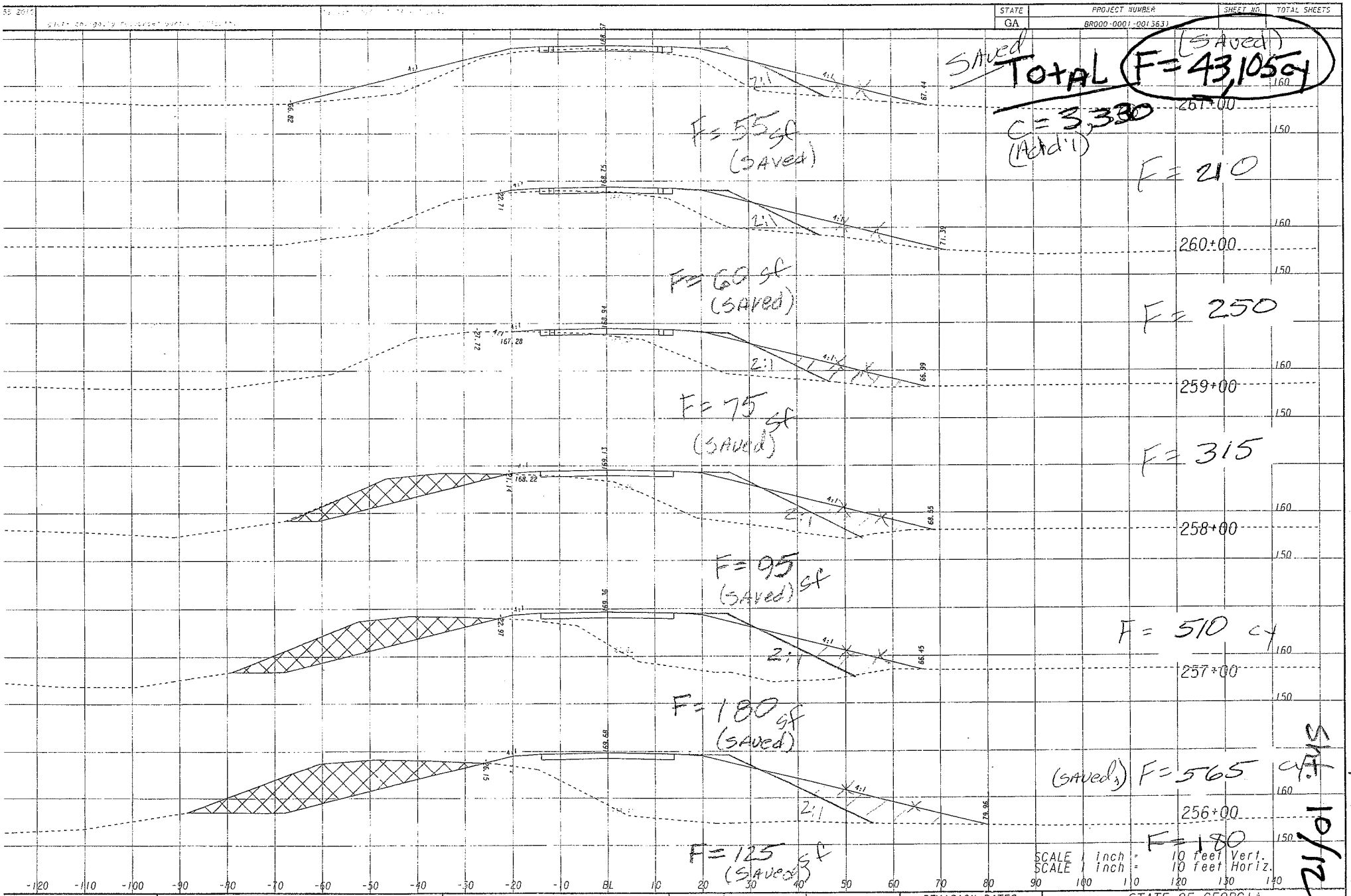
Sketch
AH Pl.1

REVISION DATES

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE:

CROSS SECTIONS
CONSTRUCTION STAGING

Sht. 9/12
ALT. NO. Pl. 1


STATE
GA
PROJECT NUMBER
BR000-0001-001363
SHEET NO.
TOTAL SHEETS
Saved Total F=43,105 cy (Saved)
C=3,330 (Add'l)
261+00
F=55 sf (Saved)
F=210
260+00
F=60 sf (Saved)
F=250
259+00
F=75 sf (Saved)
F=315
258+00
F=95 sf (Saved)
F=510 cy
257+00
F=180 sf (Saved)
(Saved) F=565 cy
256+00
F=180
F=125 sf (Saved)
SCALE 1 inch = 10 feet Vert.
SCALE 1 inch = 10 feet Horiz.
ROAD BED TO BE REMOVED
Sketch Alt P1.1
REVISION DATES
STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE:
CROSS SECTIONS
Sht. 10 of 12
ALT. NO. P1.1

PROJECT: **BRIDGE REPLACEMENT SR 3 ALTERNATE / JOHN B. GORDON HWY. OVER OCHLOCKONEE RIVER**
BR000-0001-00(363) P.I. No. 0001363
Thomas County, GA

ALTERNATIVE NO.: **P-1.1**

SHEET NO.: **11 of 12**

COST ASSUMPTIONS

Use 20% shrinkage factor

Earthwork embankment (fill) saved with **Alternate Design** profile = 43,105 CY

Additional Unclassified Excavation with Alternate Design = 3,330 CY

Quantities calculated from attached X-sections

Use "swell the fill" method using 20% swell: 43,105 CY / (1-0.20) = 53,880 CY (Total Borrow Saved)

Required Guardrail for Alternative P-1.1 is 1,900 linear feet

COST WORKSHEET

PROJECT: **BRIDGE REPLACEMENT SR 3 ALTERNATE / JOHN B. GORDON HWY. OVER OCHLOCKONEE RIVER**
BR000-0001-00(363) P.I. No. 0001363
Thomas County, GA

ALTERNATIVE NO.: **P-1.1**

SHEET NO.: **12 of 12**

PROJECT ITEM		ORIGINAL ESTIMATE			ALTERNATIVE ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
Borrow saved	CY	53,880	$3.78	$203,666			
12 lin ft of bridge saved	SF	507	$115.00	$58,305			
Guardrail "W"	LF	1,563	$17.00	$26,571			
Guardrail "T"	LF	84	$60.00	$5,040			
Additional excavation	CY				3,330	$2.66	$8,858
Guardrail "W"	LF				1,900	$17.00	$32,300
Guardrail "T"	LF				84	$60.00	$5,040
Guardrail Anch. Tp 1 (Add'l)	EA				2	$565.00	$1,130
Guardrail Anch. Tp 12 (Add'l)	EA				2	$1,820.00	$3,640
Subtotal				$293,582			$50,968
Markup (%) at 10%				$29,358			$5,097
TOTAL				$322,940			$56,065
TOTAL ROUNDED				$323,000			$56,000

VALUE ENGINEERING ALTERNATIVE

PROJECT: **BRIDGE REPLACEMENT SR 3 ALTERNATE / JOHN B. GORDON HIGHWAY OVER OCHLOCKONEE RIVER**
BR000-0001-00(363) P.I. No. 0001363
Thomas County, GA

ALTERNATIVE NO.: **S-1**

DESCRIPTION: **USE 11-FT.-WIDE LANES IN LIEU OF 12-FT.-WIDE LANES (38 FT. IN LIEU OF 40 FT. ROADWAY SECTION) FOR THE TOTAL LENGTH OF THE PROJECT**

SHEET NO.: **1 of 6**

ORIGINAL DESIGN: (sketch attached)

The original section consists of two 12-ft.-wide travel lanes with 8-ft.-wide rural shoulders with 2 feet paved. The total roadway section is 40 ft. wide. The bridge also uses 12-ft.-wide travel lanes and 8-ft.-wide shoulders for a total gutter to gutter width of 40 feet.

ALTERNATIVE: (sketch attached)

Reduce the travel lanes on the roadway and bridge from 12-ft.-wide to 11-ft.-wide lanes and use a 38-ft.-wide roadway section for the full length of the project from STA 218+00 to STA 266+22.30, including the bridge.

ADVANTAGES:

- Reduces paving materials and labor
- Reduces future maintenance
- Reduces storm water runoff

DISADVANTAGES:

- Narrower lanes

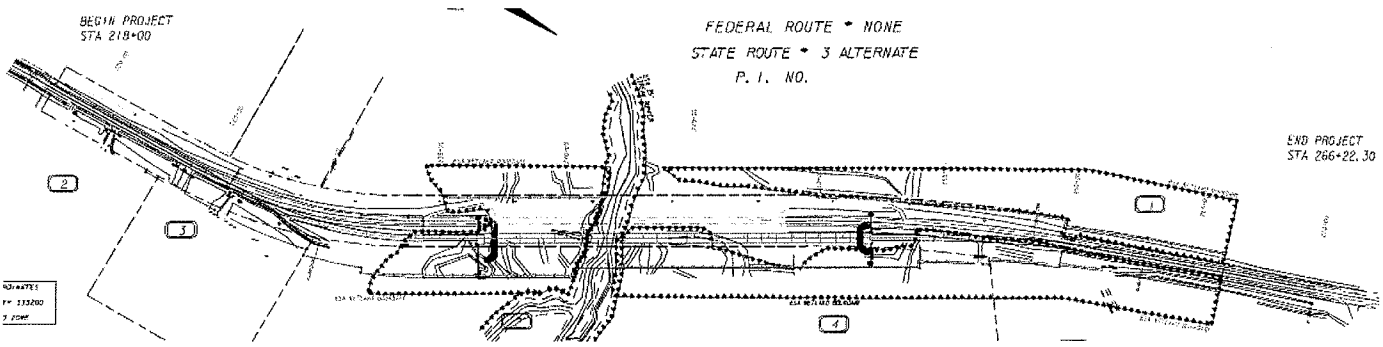
DISCUSSION:

Reducing the width of the travel lanes and eliminating 2 feet of pavement is a reasonable consideration in light of the relatively low traffic volumes (3,500 VPD) projected for the year 2028.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 410,000	—	$ 410,000
ALTERNATIVE	$ 0	—	$ 0
SAVINGS	$ 410,000	—	$ 410,000

SKETCH

PROJECT:	**BRIDGE REPLACEMENT SR 3 ALTERNATE / JOHN B. GORDON HWY. OVER OCHLOCKONEE RIVER** ***BR000-0001-00(363) P.I. No. 0001363*** ***Thomas County, GA – Preliminary Engineering Submittal***	ALTERNATIVE NO.: **S-1**
ORIGINAL DESIGN ☐	ALTERNATIVE DESIGN ☐ BOTH ☒	SHEET NO.: **2 of 6**



PROJECT PLAN

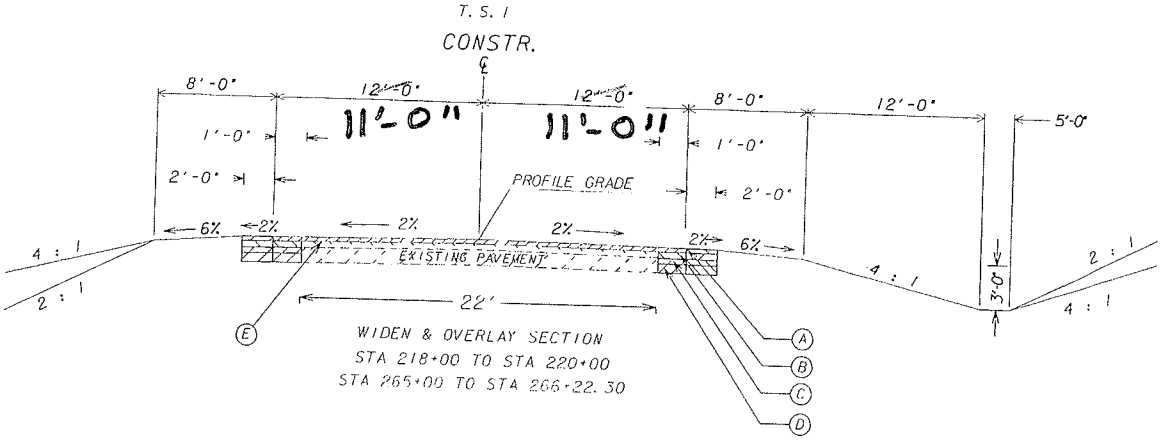
SKETCH

PROJECT: **BRIDGE REPLACEMENT SR 3 ALTERNATE / JOHN B. GORDON HWY. OVER OCHLOCKONEE RIVER**
BR000-0001-00(363) P.I. No. 0001363
Thomas County, GA – Preliminary Engineering Submittal

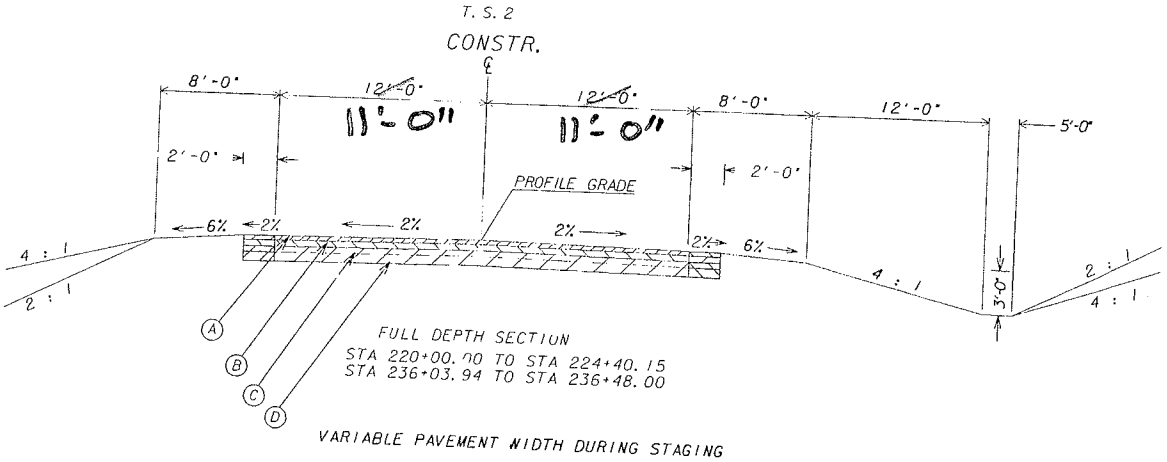
ALTERNATIVE NO.: S-1

ORIGINAL DESIGN ☐ ALTERNATIVE DESIGN ☐ BOTH ☒

SHEET NO.: 3 of 6



ORIGINAL DESIGN ☐ ALTERNATIVE DESIGN ☐ BOTH ☒



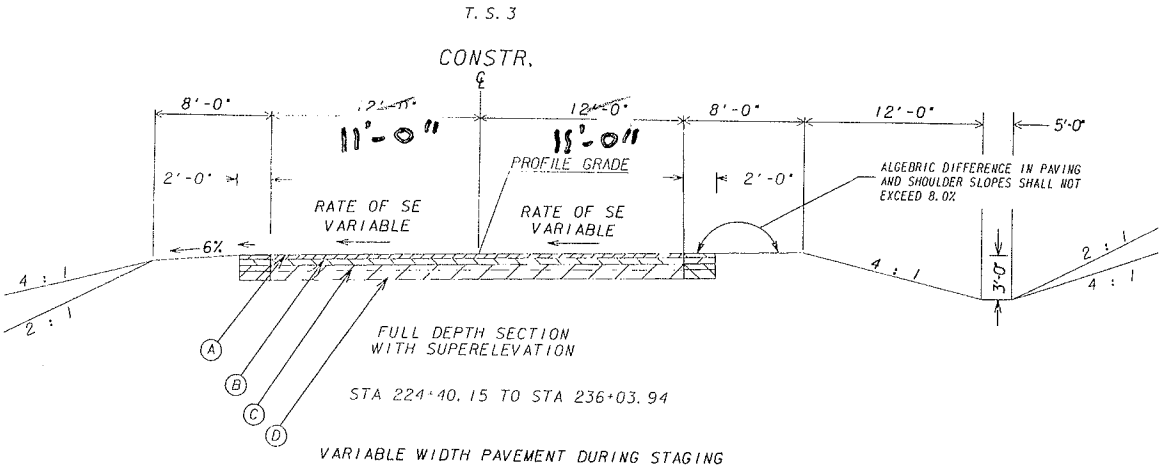
SKETCH

PROJECT: **BRIDGE REPLACEMENT SR 3 ALTERNATE / JOHN B. GORDON HWY. OVER OCHLOCKONEE RIVER**
BR000-0001-00(363) P.I. No. 0001363
Thomas County, GA – Preliminary Engineering Submittal

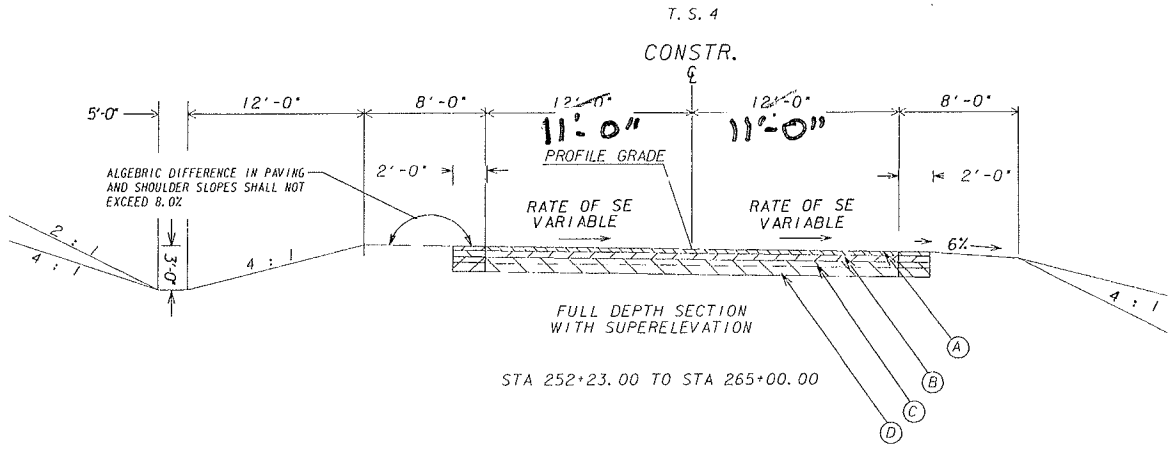
ALTERNATIVE NO.: S-1

ORIGINAL DESIGN ☐ ALTERNATIVE DESIGN ☐ BOTH ☒

SHEET NO.: 4 of 6



ORIGINAL DESIGN ☐ ALTERNATIVE DESIGN ☐ BOTH ☒



PROJECT: **BRIDGE REPLACEMENT SR 3 ALTERNATE / JOHN B. GORDON HWY. OVER OCHLOCKONEE RIVER**
BR000-0001-00(363) P.I. No. 0001363
Thomas County, GA

ALTERNATIVE NO.: **S-1**

SHEET NO.: **5 of 6**

COST CALCULATIONS

Full Depth Pavement Unit Cost ($/SY): ($/Ton unit costs are from the GDOT project cost estimate)

9.5mm: 135#/SY x Ton/2,000# x $81.00/Ton = $5.46/SY

19mm: 220#/SY x Ton/2,000# x $85.00/Ton = $9.35/SY

25mm: 330#/SY x Ton/2,000# x $82.00/Ton = $13.53/SY

8" GAB: 0.67ft x 147#/CF x Ton/2,000# x 9SF/SY x $15.02/Ton = $6.66/SY

Total Pavement Section Unit Cost = $35.00/SY

STA 218+00 to STA 220+00 (overlay section)
200ft x 2ft = $\frac{400\ SF}{9\ SF/SY}$ = 44SY (Overlay Area)

STA 220+00 to STA 236+78 (full depth)
1678ft x 2ft = $\frac{3356\ SF}{9SF/SY}$ = 372SY

STA 251+93 to STA 266+22.30 (full depth)
1429ft x 2ft = $\frac{2858\ SF}{9SF/SY}$ = 318 SY

Total Full Depth Area = 690SY (Full Depth Area)

BRIDGE WIDTH REDUCTION

STA 236+78 to STA 251+93
1,515ft x 2ft = 3,030 SF

= 3,030SF x $115/SF = $348,450

COST WORKSHEET

PROJECT: **BRIDGE REPLACEMENT SR 3 ALTERNATE / JOHN B. GORDON HWY. OVER OCHLOCKONEE RIVER**
BR000-0001-00(363) P.I. No. 0001363
Thomas County, GA

ALTERNATIVE NO.: **S-1**

SHEET NO.: **6 of 6**

PROJECT ITEM		ORIGINAL ESTIMATE			ALTERNATIVE ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
Full Depth Pavement	SY	690	35.00	24,150			
Overlay	SY	44	5.46	240			
Bridge	SF	3,030	115.00	348,450			
Subtotal				372,840			
Markup (%) at 10%				37,284			
TOTAL				410,124			
TOTAL ROUNDED				410,000			

VALUE ENGINEERING ALTERNATIVE

PROJECT:	**BRIDGE REPLACEMENT SR 3 ALTERNATE / JOHN B. GORDON HIGHWAY OVER OCHLOCKONEE RIVER** ***BR000-0001-00(363) P.I. No. 0001363*** ***Thomas County, GA***	ALTERNATIVE NO.: **S-2**
DESCRIPTION:	**USE 2:1 SLOPES AT GUARDRAIL IN LIEU OF 4:1 SLOPES**	SHEET NO.: **1 of 11**

ORIGINAL DESIGN: (sketch attached)

The original design uses 4:1 slopes throughout the project limits in areas with and without guardrails.

ALTERNATIVE: (sketch attached)

Use 2:1 slopes in lieu of 4:1 slopes in areas where guardrail is currently specified.

ADVANTAGES:

- Reduces borrow quantities
- Reduces construction disruption area
- Reduces construction duration

DISADVANTAGES:

- Cross sections need to be modified

DISCUSSION:

There are areas between Station 229+00 to Station 261+00 where 2:1 slopes could be used in lieu of 4:1 slopes, reducing borrow quantities, truck traffic into the area, dust, and noise during construction. The steeper 2:1 slopes are allowed when guardrail is present.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 168,000	—	$ 168,000
ALTERNATIVE	$ 48,000	—	$ 48,000
SAVINGS	$ 120,000	—	$ 120,000

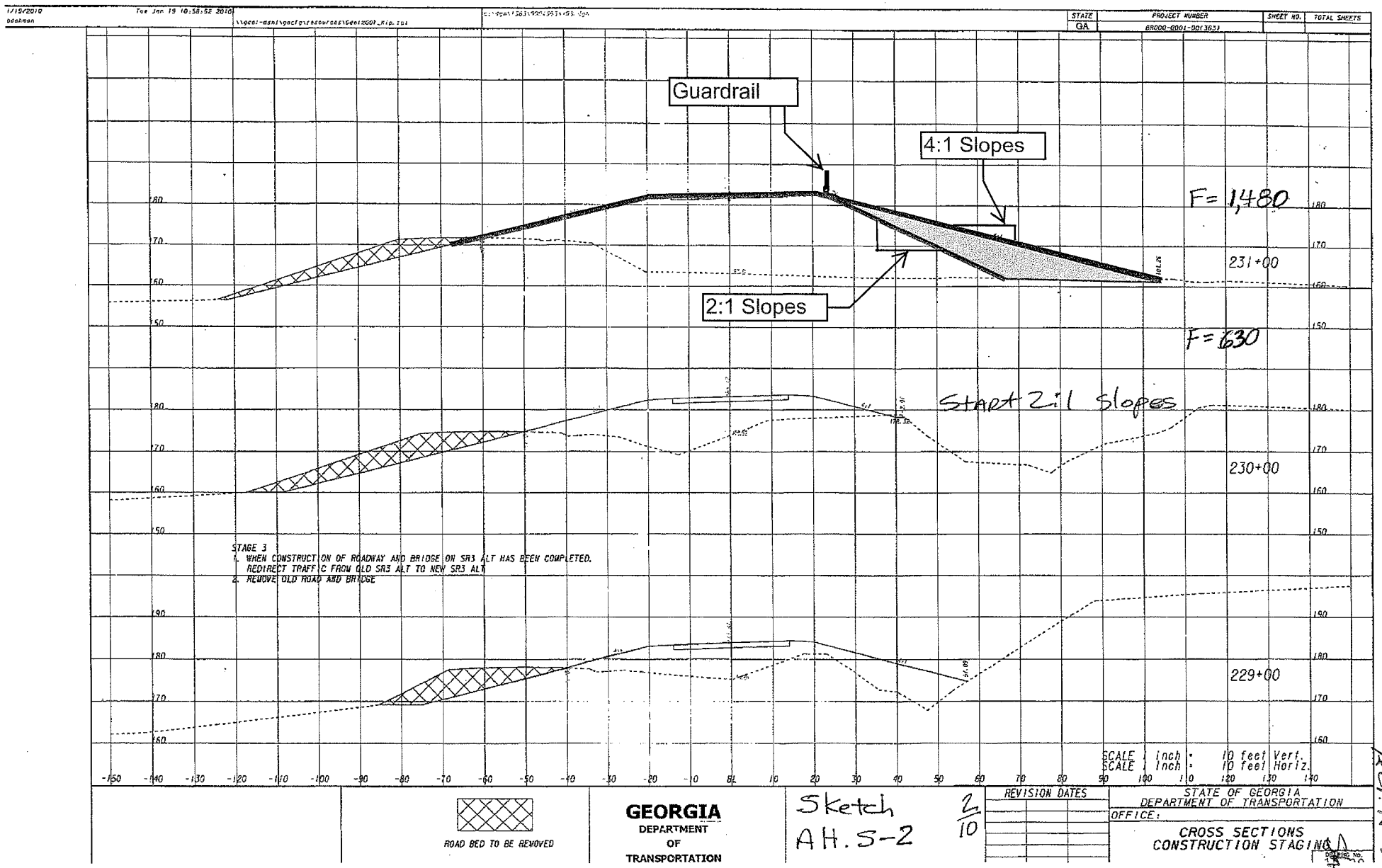
PROJECT: **BRIDGE REPLACEMENT SR 3 ALTERNATE / JOHN B. GORDON HWY. OVER OCHLOCKONEE RIVER**
BR000-0001-00(363) P.I. No. 0001363
Thomas County, GA

ALTERNATIVE NO.: **S-2**

SHEET NO.: **2 of 11**

EARTHWORK QUANTITIES BY STATION

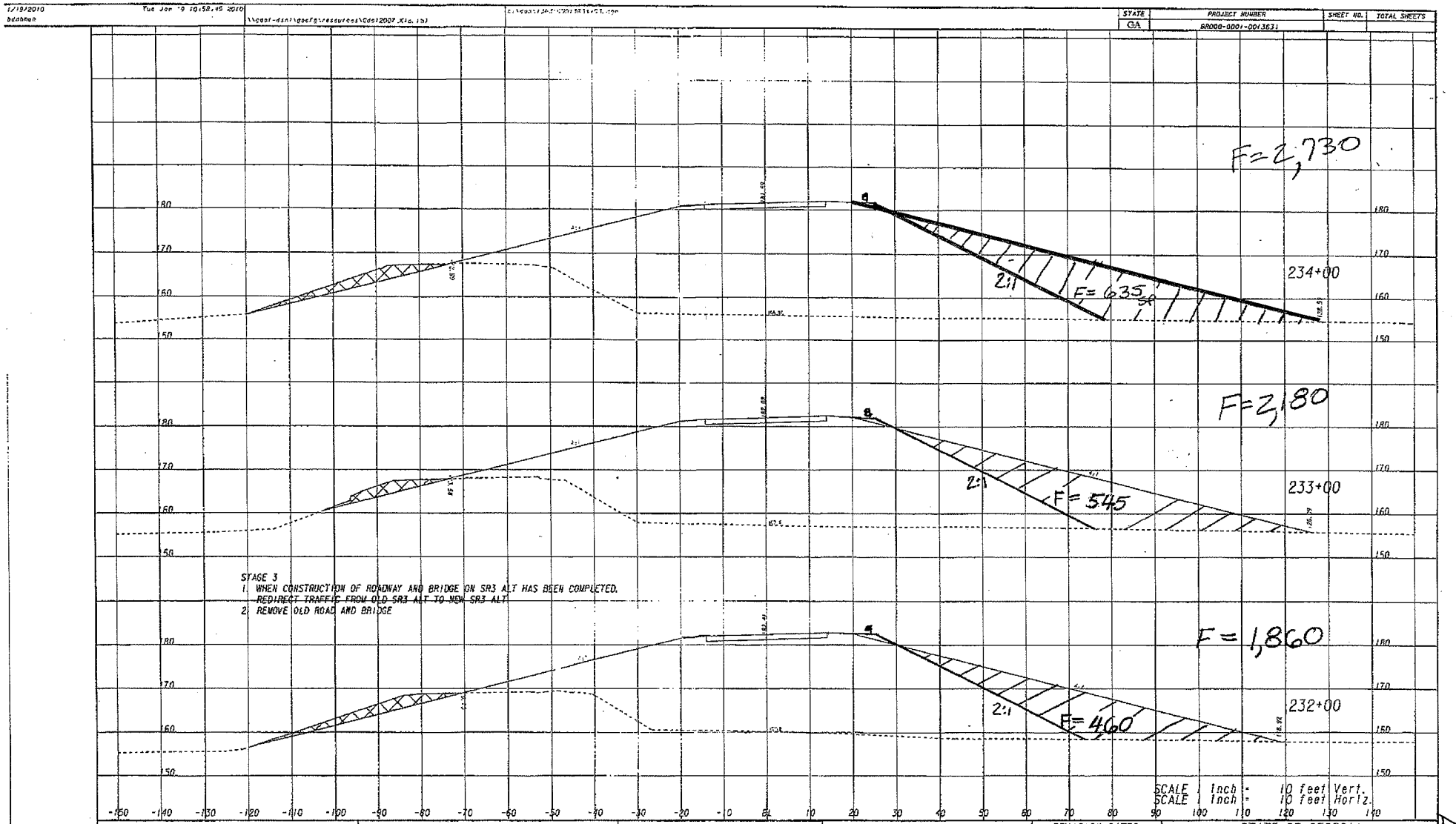
STATION	CY
Sta 229+00	0
Sta 230+00	630
Sta 231+00	1480
Sta 232+00	1860
Sta 233+00	2180
Sta 234+00	2730
Sta 235+00	3000
Sta 236+00	2850
Sta 236+78	700
Sta 251+93	310
Sta 252+00	680
Sta 253+00	690
Sta 254+00	740
Sta 255+00	650
Sta 256+00	460
Sta 257+00	370
Sta 258+00	310
Sta 259+00	250
Sta 260+00	200
Sta 261+00	190
Sta 262+00	190
Sta 263+00	70
TOTAL	**20,540 CY**
Add 20% Swell Factor	**25,675 CY**



ALT. NO. 5-2

BR000-0001-00(363)
Thomas County

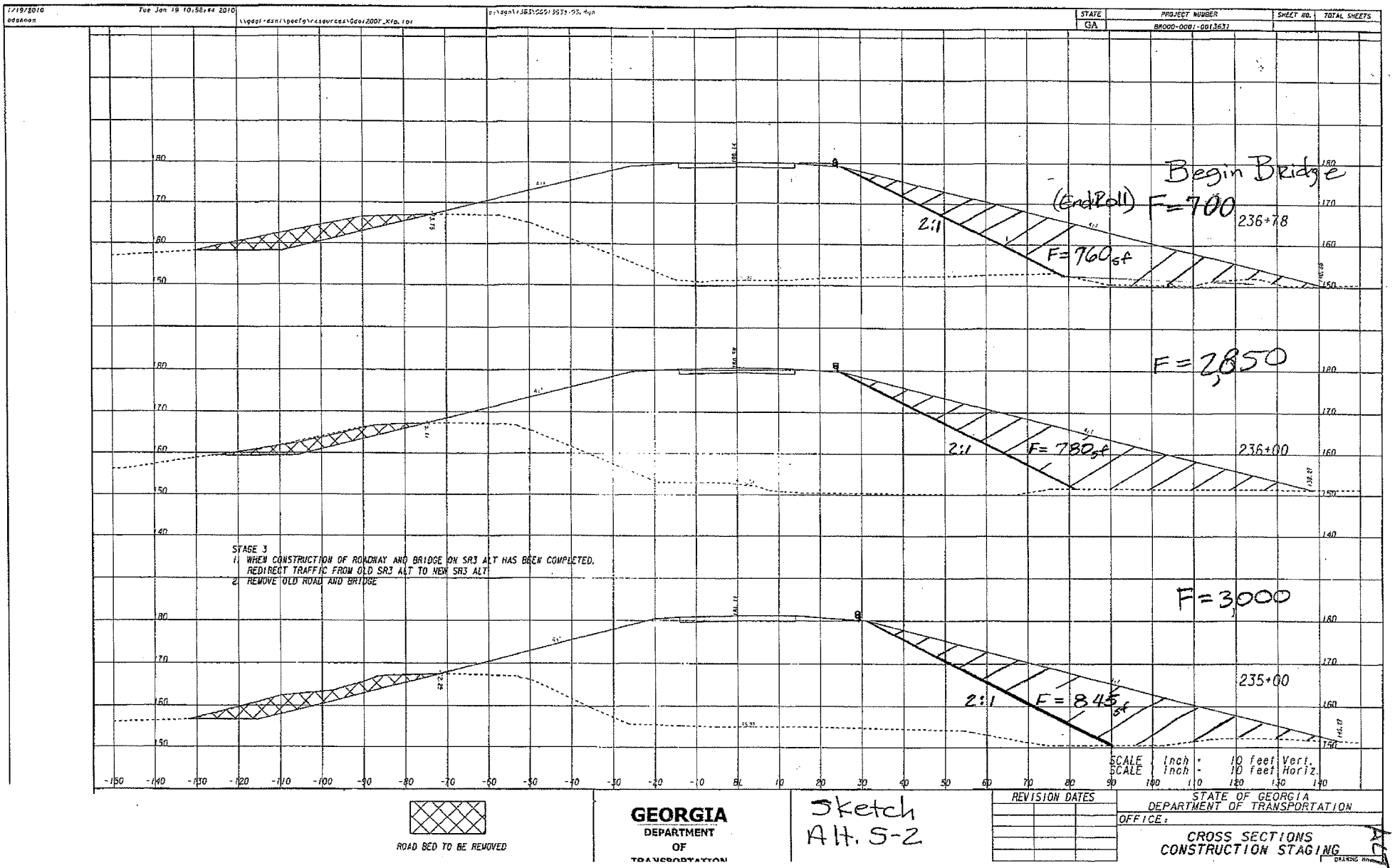
11/11



Alt. No. S-2

BR000-0001-00(363)
Thomas County

11/14



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Thomas County

Alt No. S-2
11/5/10

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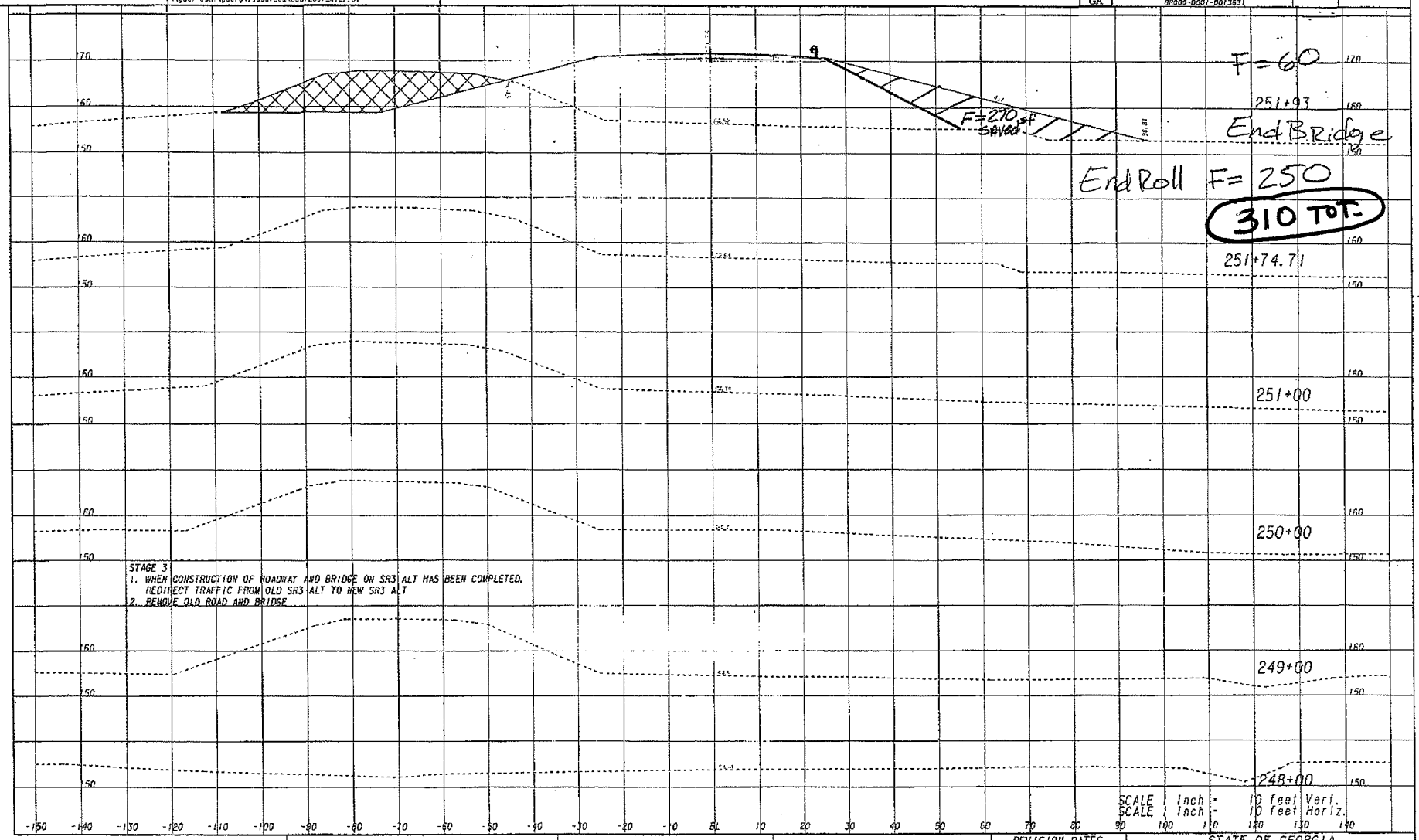
STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
GA	BR000-0001-00(363)		



ROAD BED TO BE REMOVED

GEORGIA
DEPARTMENT
OF
TRANSPORTATION

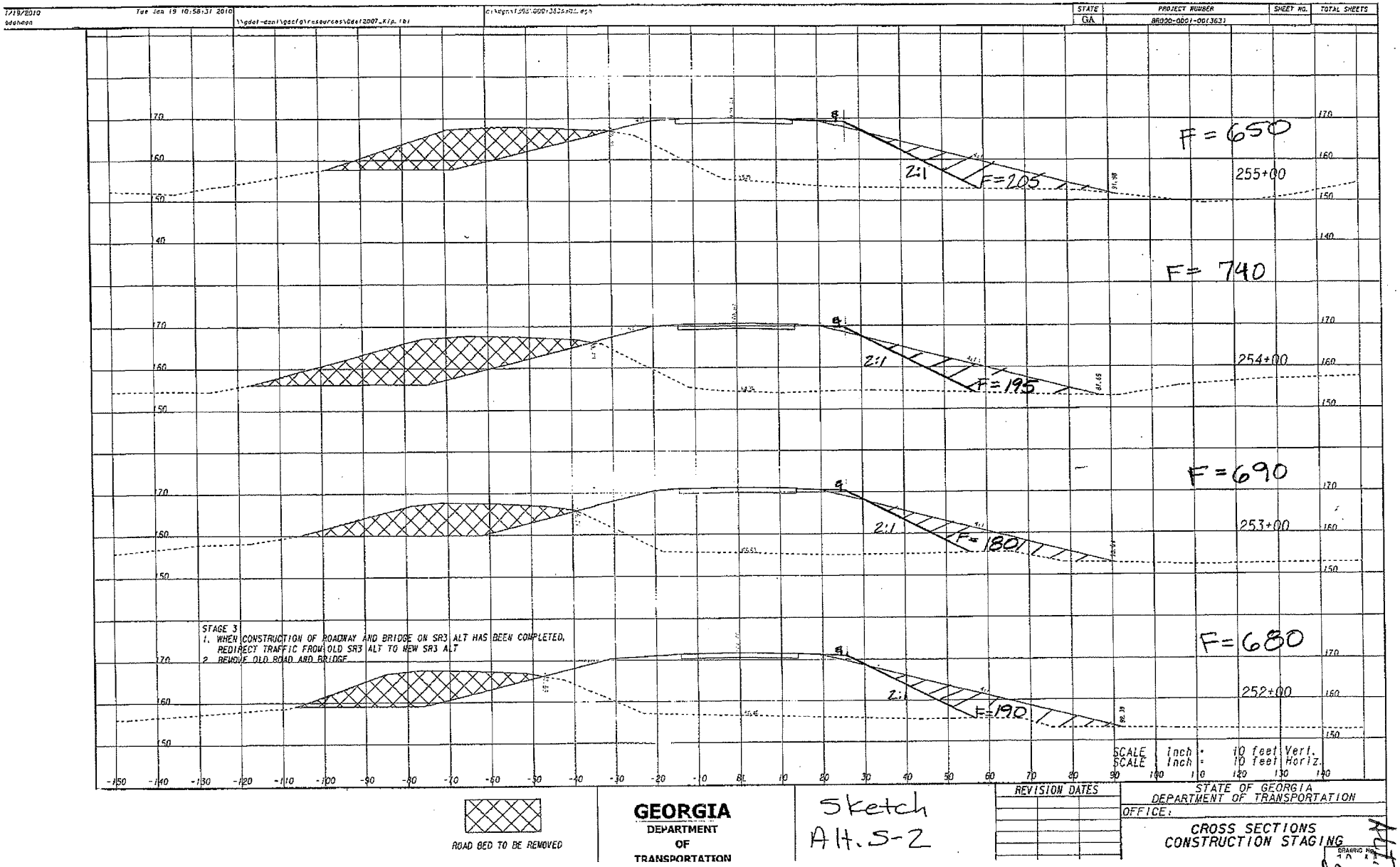
Sketch
Alt. S-2

REVISION DATES

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE:
CROSS SECTIONS
CONSTRUCTION STAGING
DRAWING NO. 10 A2

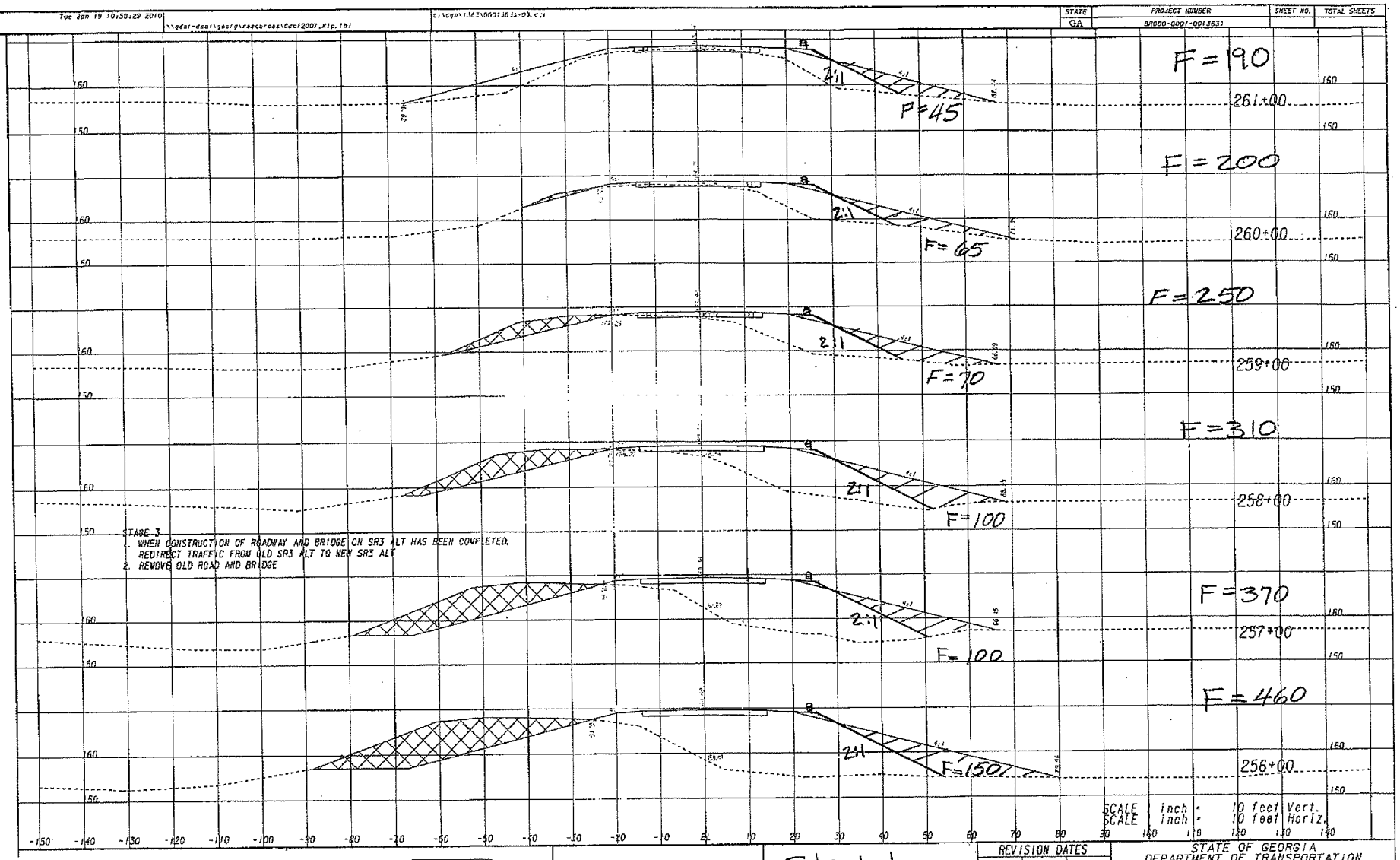
Alt. No. S-2
11/9/11

BR000-0001-00(363)
Thomas County



BR000-0001-00(363)
Thomas County

ALT. NO. S-2
SH. 1 OF 1



ROAD BED TO BE REMOVED

GEORGIA DEPARTMENT OF TRANSPORTATION

Sketch
Alt. S-2

REVISION DATES

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE:

CROSS SECTIONS
CONSTRUCTION STAGING

DRAWING NO. 1 OF 1

BR000-0001-00(363)
Thomas County

11/8 Alt. No. S-2

STATE	PROJECT NUMBER	SHEET NO.	TOTAL SHEETS
GA	6R000-0001-00(363)		

1/19/2010
bdaman

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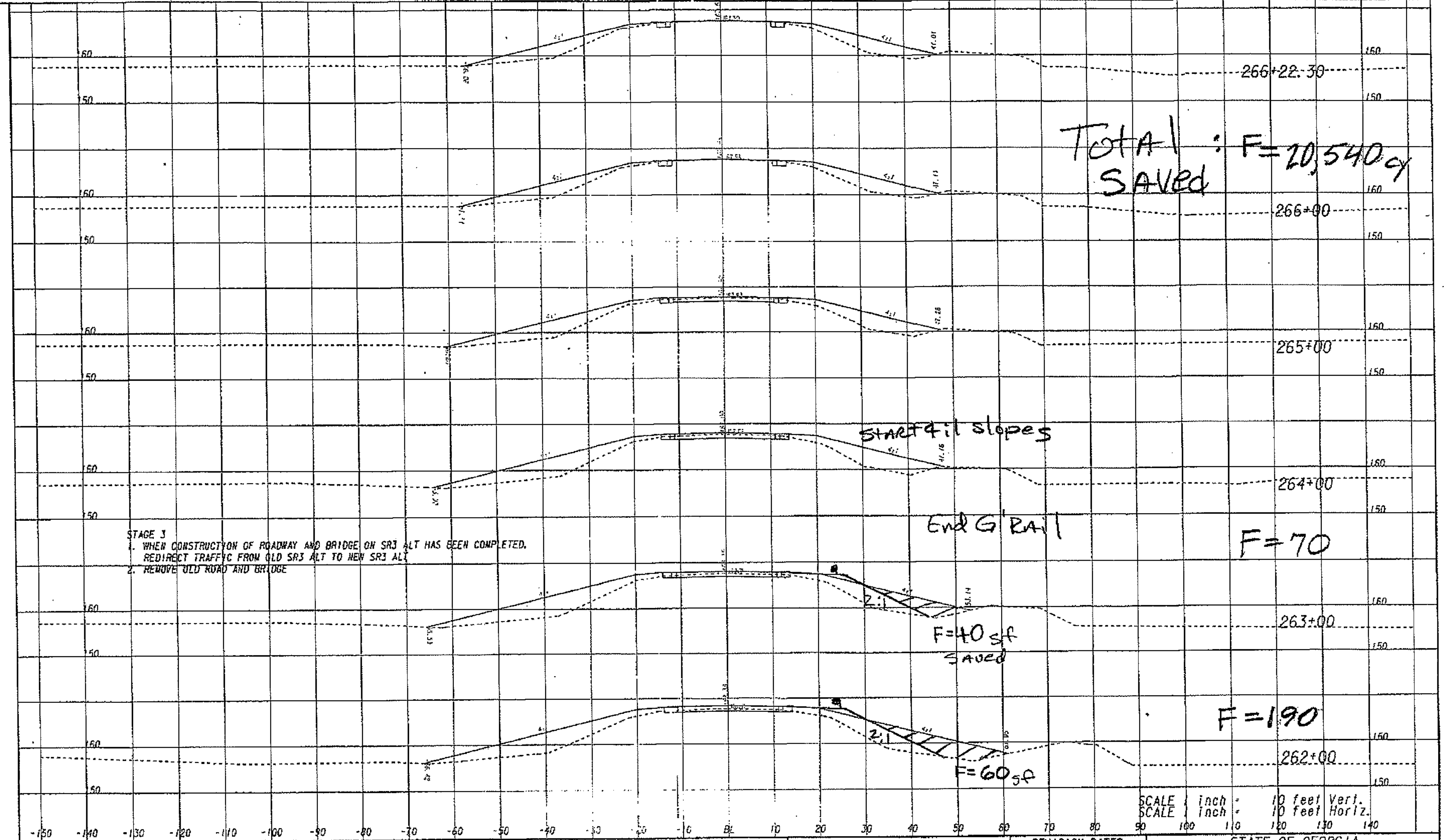


GEORGIA
DEPARTMENT
OF
TRANSPORTATION

REVISION DATES

STATE OF GEORGIA
DEPARTMENT OF TRANSPORTATION
OFFICE:

CROSS SECTIONS
CONSTRUCTION STAGING

ALT. NO. S-2
Sht. 9/11

PROJECT: **BRIDGE REPLACEMENT SR 3 ALTERNATE / JOHN B. GORDON HWY. OVER OCHLOCKONEE RIVER**
BR000-0001-00(363) P.I. No. 0001363
Thomas County, GA

ALTERNATIVE NO.: **S-2**

SHEET NO.: **10 of 11**

COST CALCULATIONS

Use 20% shrinkage factor

Earthwork embankment (fill) saved with **Alternate Design** profile = 20,540 CY (neat quantity)

Quantities calculated from attached cross-sections.

Use "swell the fill" method: 19,585 CY / (1-.20) = **25,675 CY (Total Borrow quantity saved)**

Guardrail
Total Required Guardrail for Alternate S-1 is approximately 2,000 linear feet

2 additional Tp. 1 Anchorages and 2 additional Tp. 12 Anchorages

Wetlands

Wetland mitigation area saved 51,400 sf / 43,560 sf/ac = 1.18 AC

COST WORKSHEET

PROJECT: **BRIDGE REPLACEMENT SR 3 ALTERNATE / JOHN B. GORDON HWY. OVER OCHLOCKONEE RIVER**
BR000-0001-00(363) P.I. No. 0001363
Thomas County, GA

ALTERNATIVE NO.: **S-2**

SHEET NO.: **11 of 11**

PROJECT ITEM		ORIGINAL ESTIMATE			ALTERNATIVE ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
Borrow saved	CY	25,675	$3.78	$97,052			
Guardrail "W"	LF	1,563	$17.00	$26,571			
Guardrail "T"	LF	84	$60.00	$5,040			
Guardrail "W"	LF				2,000	$17.00	$34,000
Guardrail "T"	LF				84	$60.00	$5,040
Guardrail Anch. Tp 1 (Add'l)	EA				2	$565.00	$1,130
Guardrail Anch. Tp 12 (Add'l)	EA				2	$1,820.00	$3,640
Wetland mitigation area saved	AC	1.18	$9,000.00	$10,620			
R/W markup 148%		1.48	$10,620.00	$15,718			
Construction Subtotal				$128,663			$43,810
Const. Mkup 10%				$12,866			$4,381
TOTAL				$167,867			$48,191
TOTAL ROUNDED				$168,000			$48,000

SUMMARY OF POTENTIAL COST SAVINGS

PROJECT: **BRIDGE REPLACEMENT SR 3 ALTERNATE / JOHN B. GORDON HIGHWAY OVER OCHLOCKONEE RIVER**
BR000-0001-00(363) P.I. No. 0001363
Thomas County, GA

ALT. NO.	DESCRIPTION	ORIGINAL COST	ALTERNATIVE COST	INITIAL COST SAVINGS	RECURRING COST SAVINGS	TOTAL PW LCC SAVINGS
		PRESENT WORTH OF COST SAVINGS				
BRIDGE (B)						
B-3	Use five lines of larger beams in lieu of six smaller beams and change from BT-72's to BT-74's.	$1,096,000	$980,000	$116,000	$0	$116,000
B-6	Use all steel H-piles or all PSC concrete piles in lieu of mixing pile types.	DESIGN SUGGESTION				
B-12	Revise the hydraulic study to match the span configuration and bridge length shown in the final plans.	DESIGN SUGGESTION				

VALUE ENGINEERING ALTERNATIVE

PROJECT: **BRIDGE REPLACEMENT SR 3 ALTERNATE / JOHN B. GORDON HIGHWAY OVER OCHLOCKONEE RIVER**
BR000-0001-00(363) P.I. No. 0001363
Thomas County, GA

ALTERNATIVE NO.: **B-3**

DESCRIPTION: **USE FIVE LINES OF LARGER BEAMS IN LIEU OF SIX SMALLER BEAMS AND CHANGE FROM BT-72S TO BT-74S**

SHEET NO.: **1 of 5**

ORIGINAL DESIGN: (sketch attached)

The typical bridge section shows six, precast concrete bulb-tee beams spaced at 7 feet on center over the entire bridge length. The bridge has 16 spans--eight AASHTO bulb tee beam spans and eight AASHTO Type II beam spans. Spans #1 through 3 are 140 ft. in length, Span #4 (main channel) is 135 ft. in length, Spans #5 through 8 are 120 ft. in length and Spans #9 through 16 are 60 feet in length.

ALTERNATIVE: (sketch attached)

Reduce the number of beams in the cross section from six to five beams with a spacing of 8 ft. 9 in. on center. Use AASHTO BT-74 beams in lieu of the BT-72 (Spans #1 through 4) beams and increase the concrete strength in the BT-63 beams to accommodate higher loading on each beam.

ADVANTAGES:

- Fewer beams needed in longer span sections
- Fewer structural members to install

DISADVANTAGES:

- Deck thickness will increase slightly
- Higher concrete compressive strength (f'c) is needed for the beams

DISCUSSION:

Using fewer beams in the structural cross section is a plausible design solution for this structure. The maximum beam spacing as recommended by the GDOT bridge design guide is 10 feet. Increasing the beam spacing increases the deck thickness by 5/8 of an inch, from 7 inches to 7 5/8 inches. Since the beam spacing is increased from 7 feet to 8 ft. 9 in., the following bridge design changes are recommended.

Spans #1-4: Use BT-74 beams with f'c=9,000 psi and 0.6 in. diameter strands (Original: BT-72 8,000 psi, 0.6 in. diameter)
Spans #5-8: Use BT-63 beams with f'c=10,000 psi and 0.6 in. diameter strands (Original: BT-63 8,000 psi, 0.6 in. diameter)

The GDOT bridge manual allows the use of 10,000 psi concrete with bridge office approval. It also mentions that BT-74 beams have been used and fabricators have the forms, but shipping length should be verified. Since this alternative proposes using the same span lengths as the original design, the shipping length is not an issue.

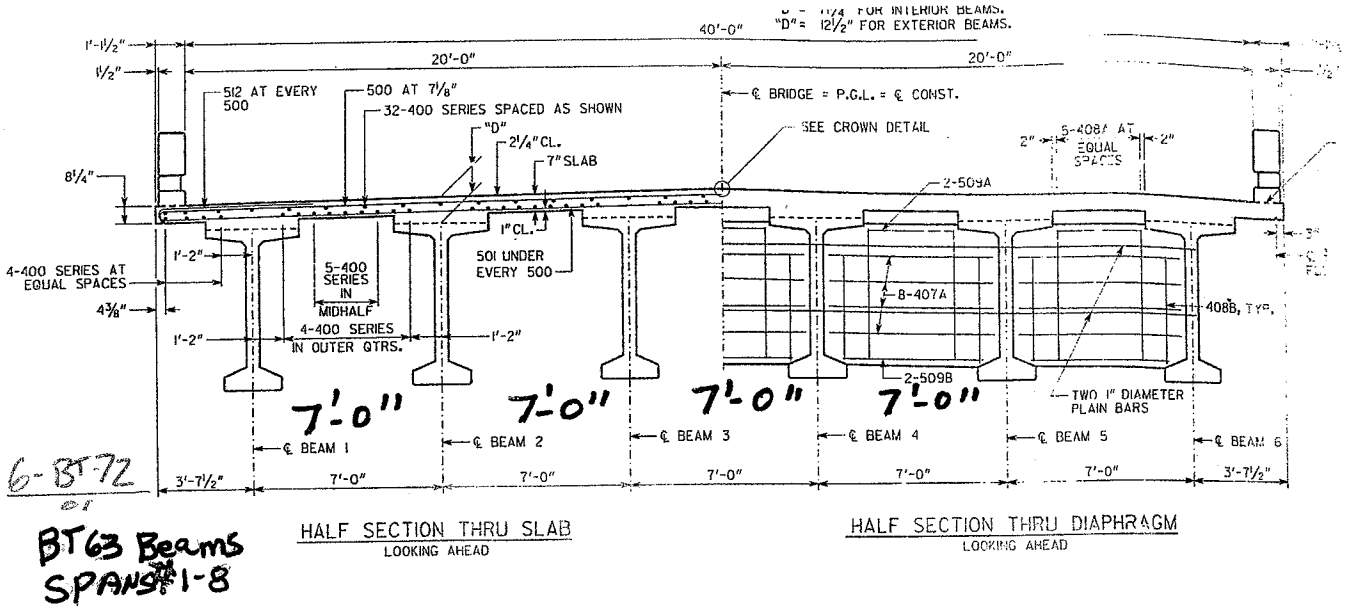
COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN	$ 1,096,000	—	$ 1,096,000
ALTERNATIVE	$ 980,000	—	$ 980,000
SAVINGS	$ 116,000	—	$ 116,000

SKETCH

PROJECT: **BRIDGE REPLACEMENT SR 3 ALTERNATE / JOHN B. GORDON HWY. OVER OCHLOCKONEE RIVER**
BR000-0001-00(363) P.I. No. 0001363
Thomas County, GA

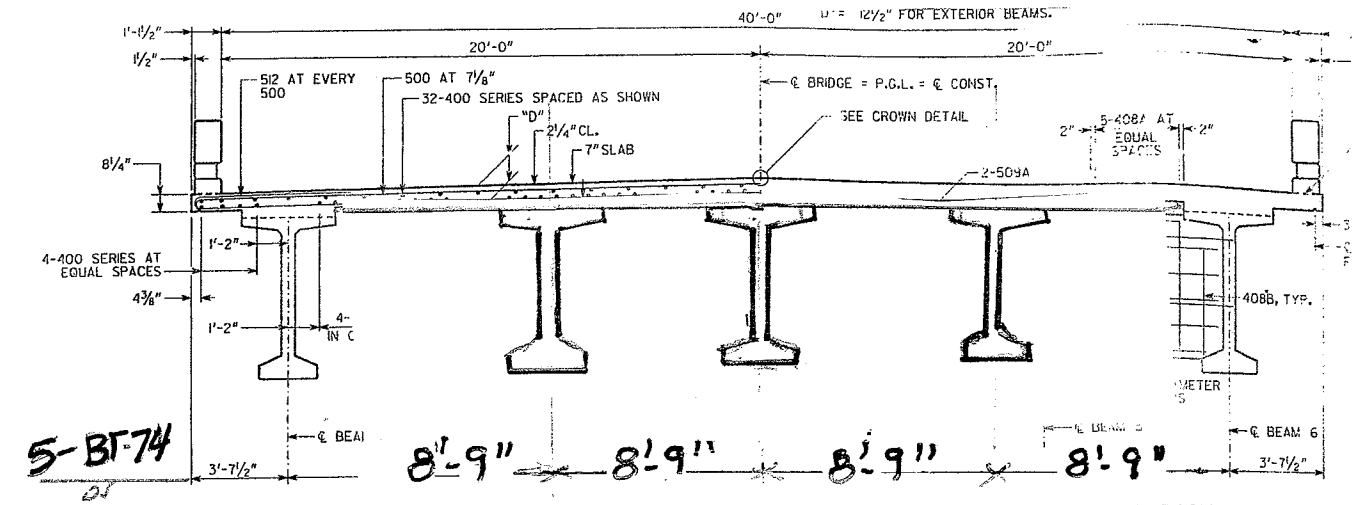
ALTERNATIVE NO.: B-3

ORIGINAL DESIGN ☐ ALTERNATIVE DESIGN ☐ BOTH ☒ SHEET NO.: **2 of 5**



6-BT-72 of BT63 Beams SPANS #1-8

ORIGINAL DESIGN



5-BT-74 of BT63 Beams SPANS #1-8

ALTERNATIVE DESIGN

PROJECT: **BRIDGE REPLACEMENT SR 3 ALTERNATE / JOHN B. GORDON HWY. OVER OCHLOCKONEE RIVER**
BR000-0001-00(363) P.I. No. 0001363
Thomas County, GA

ALTERNATIVE NO.: **B-3**

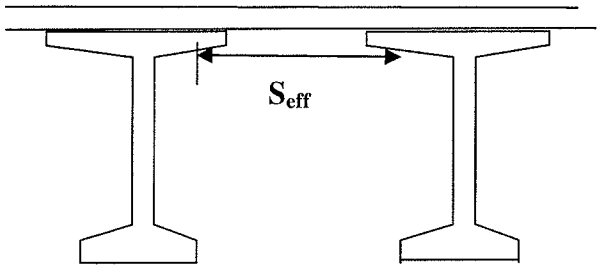
SHEET NO.: **3 of 5**

Deck Design

Spans # 1-8

Change Beam Spacing From 7'-0" to 8'-9" for BT-72 and BT-63 Spans.

New effective slab length = S_{eff} = 8.75'- 3.5'/2 = 6.875ft
Using the BRSLAB07 output in the GDOT Bridge Manual (2 ¼"cover) for S_{eff} = 6'-11" ;
Required Deck thickness is 7 5/8in
Reinforcing Required = 11 - #4 bars



Beam Design Changes

Changing the spacing requires the BT-72 beams to be change to BT-74 beams and the BT-63 beams to use higher strength concrete. Based on the GDOT Beam Design Charts in the Bridge Design Manual figures 3-3 thru 3-9.

Spans #1-4: 140ft span @ 8'-9"spacing : Use f'c = 9,000 psi and 0.6" diameter strands
Spans #5-8: 120ft span @ 8'-9" spacing: Use f'c = 10,000 psi and 0.6" diameter strands

Quantities

Length of BT 72 to BT 74 Spans
BT 72 : 3 spans @ 140ft and 1 span @ 135ft = 555ft x 6 beams = 3330ft BT-74: 555ft x 5 beams= 2775ft

Length of BT 63
BT 72 : 4 spans @ 120ft = 480ft x 6 beams = 2880ft BT-74: 480ft x 5 beams= 2400ft

Deck Concrete Thickness:
7 5/8in (Alternative) - 7in (Original) = 5/8in difference between original and alternative design;
0.625in/12*42.25*(555ft+480ft)/27 = 84 CY

PROJECT: **BRIDGE REPLACEMENT SR 3 ALTERNATE / JOHN B. GORDON HWY. OVER OCHLOCKONEE RIVER**
BR000-0001-00(363) P.I. No. 0001363
Thomas County, GA

ALTERNATIVE NO.: **B-3**

SHEET NO.: **4 of 5**

Deck Design

Deck Reinforcing:

Original design: 9-#4 in 5 bays = 45 bars

Alternative : 11-#4 in 4 bays= 44 bars

Assume no change in bar wt.

Costs:

Current Mean Item summary cost for AASHTO Bulb Tee beams is lower than what is shown in the DTEST. Conservatively beam prices from the Dec 2009 Mean Item Summary are used to estimate cost savings.

- BT-63: $ 55.09/ LF
- BT-72: $165.11/LF
- BT-74: $168.38/LF

COST WORKSHEET

PROJECT: **BRIDGE REPLACEMENT SR 3 ALTERNATE / JOHN B. GORDON HWY. OVER OCHLOCKONEE RIVER**
BR000-0001-00(363) P.I. No. 0001363
Thomas County, GA

ALTERNATIVE NO.: **B-3**

SHEET NO.: **5 of 5**

PROJECT ITEM		ORIGINAL ESTIMATE			ALTERNATIVE ESTIMATE		
ITEM	UNITS	NO. OF UNITS	COST/ UNIT	TOTAL	NO. OF UNITS	COST/ UNIT	TOTAL
AASHTO BT-72 PSC beams	LF	3,330	165.11	549,816			
AASHTO BT-74 PSC beams	LF				2,775	168.38	467,255
AASHTO BT-63 PSC beams	LF	2,880	155.09	446,659	2,400	155.09	372,216
Class AA Concrete Deck	CY				84	612.00	51,408
Subtotal				996,475			890,879
Markup (%) at 10%				99,648			89,088
TOTAL				1,096,123			979,967
TOTAL ROUNDED				1,096,000			980,000

VALUE ENGINEERING ALTERNATIVE

PROJECT:	**BRIDGE REPLACEMENT SR 3 ALTERNATE / JOHN B. GORDON HIGHWAY OVER OCHLOCKONEE RIVER** ***BR000-0001-00(363) P.I. No. 0001363*** ***Thomas County, GA***	ALTERNATIVE NO.: **B-6**
DESCRIPTION:	**USE ALL STEEL OR PRESTRESSED CONCRETE PILES IN LIEU OF MIXING PILE TYPES**	SHEET NO.: **1 of 1**

ORIGINAL DESIGN:

The original design specifies precast concrete piles at the bridge abutments and steel H-piles for the concrete intermediate bents.

ALTERNATIVE:

Change to either all steel or all concrete piles to simplify the equipment required and ordering of materials.

ADVANTAGES:

- All piles can be driven with the same equipment, reducing mobilization cost
- Pile materials can be ordered from a single supplier
- Pre-drilling will not be required if all steel piles are required

DISADVANTAGES:

- May change foundation design

DISCUSSION:

By specifying only one pile type, the pile-driving operation can be performed with the same equipment over the entire length of the project instead of having two different rigs. Flexibility is improved since the driving hammer, leads, and set-up can be used at any of the pier locations on the project. Due to the bridge length, it is most likely that more than one pile-driving rig will be needed. Having two or more pile-driving rigs available at any one time improves the reliability of the pile-driving operation and reduces the risk. Having a single pile type may also limit the number of sub-contractors required to construct the project, particularly if steel piles are chosen and no pre-drilling or jetting/spudding is needed.

Additionally, if only one pile material is selected, the contractor can place a single order, simplifying procurement responsibilities and material delivery schedules.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN			
ALTERNATIVE	DESIGN SUGGESTION		
SAVINGS			

VALUE ENGINEERING ALTERNATIVE

PROJECT:	**BRIDGE REPLACEMENT SR 3 ALTERNATE / JOHN B. GORDON HIGHWAY OVER OCHLOCKONEE RIVER** ***BR000-0001-00(363) P.I. No. 0001363*** ***Thomas County, GA***	ALTERNATIVE NO.: **B-12**
DESCRIPTION:	**REVISE HYDRAULICS STUDY TO MATCH THE SPAN CONFIGURATION SHOWN IN FINAL PLANS**	SHEET NO.: **1 of 1**

ORIGINAL DESIGN:

The original hydraulics study conducted in 2005 modeled a bridge using a 24-span structure with 23 60 ft.long spans and a 95 ft. span crossing the channel. The piers are modeled as steel H-pile bents except at the channel crossing, where there are concrete intermediate bents.

The final plans show a 16-span bridge with variable span lengths: Spans #1-3 = 140 feet, Span #4 (main channel) = 135 feet, Spans #5-8 =120 feet, and Spans #9-16 = 60 feet. Spans #1- 8 are supported concrete intermediate bents and #9-16 are supported on prestressed precast concrete pile bents. Abutments are prestressed precast concrete pile supported bents at either end.

ALTERNATIVE:

Revise the hydraulics study and analyze the current span configuration for backwater and scour velocity. Evaluate the possibility of using a slightly shorter bridge length.

ADVANTAGES:

- Revised analysis could produce results that justify shorter bridge length, optimizing span lengths, lower profile, or some combination of these alternatives

DISADVANTAGES:

- Additional hydraulic analysis is required

DISCUSSION:

The hydraulics study for this project was performed for a bridge that consisted of 24 spans. The spans were mostly 60 feet in length with one span at the channel crossing 95 feet in length. All elevations, velocities, and scour calculations are based on this older layout.

The project drawings show larger openings at the channel crossing and the north and south approach spans than that modeled in the 2005 hydraulic study. The wider openings may reduce the obstructions in the channel, the backwater elevation, and scour velocities enabling a shorter bridge to be considered. The current cost of the bridge is $115/SF and shortening the bridge by one end span (60 feet) could reduce the project cost by $300,000. Re-running the analysis would simulate the hydraulic conditions for the current design and provide needed information regarding possible optimizations to the bridge length.

COST SUMMARY	INITIAL COST	PRESENT WORTH RECURRING COSTS	PRESENT WORTH LIFE-CYCLE COST
ORIGINAL DESIGN			
ALTERNATIVE	DESIGN SUGGESTION		
SAVINGS			

PROJECT DESCRIPTION

Bridge project BR0001-0001-00(363) is a bridge replacement on State Route 3 Alternate over the Ochlockonee River approximately six miles north of Thomasville, Georgia. Since the existing bridge has a sufficiency rating of less than 50 and a substructure condition code of 4 or less, the bridge should be scheduled for replacement rather than improved.

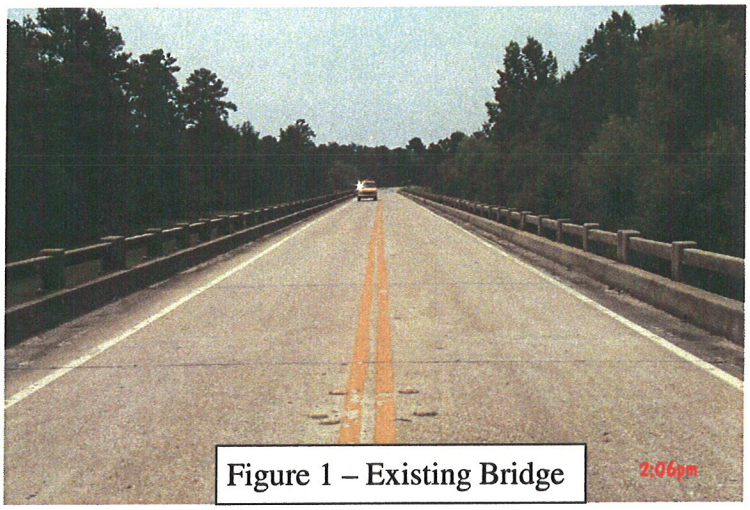


Figure 1 – Existing Bridge

The existing roadway, shown in Figure 1, has a state route classification of a rural major collector and has a speed limit of 55 mph. The current ADT is 2,100 with projected traffic for the year 2008 of 2,200 ADT and a year 2028 of 3,500 ADT. The estimated truck traffic on the road accounts for 10 percent of the total ADT. Land use in the area is primarily forestry.

Bridge Description

This project will replace the structurally deficient bridge on SR 3 Alternate over the Ochlockonee River with a new 1,515 ft. long reinforced concrete bridge. The typical bridge section uses six bulb-tee beams spaced at 7 ft. over the entire bridge length. The bridge is a 16-span structure that consists of eight AASHTO bulb tee-beam spans and eight AASHTO Type II beam spans. Spans #1 through 3 are 140 feet in length, Span #4 (main channel) is 135 feet in length, Spans #5 through 8 are 120 feet in length, and Spans #9 through 16 are 60 feet in length. The total project length is 0.91 miles as presented in Figure 2.

Figure 2

BRIDGE REPLACEMENT: SR 3 ALTERNATE / JOHN B. GORDON HIGHWAY OVER OCHLOCKONEE RIVER
BR0001-0001-00(363) - P.I. NO. 0001363, THOMAS COUNTY

Length of Project

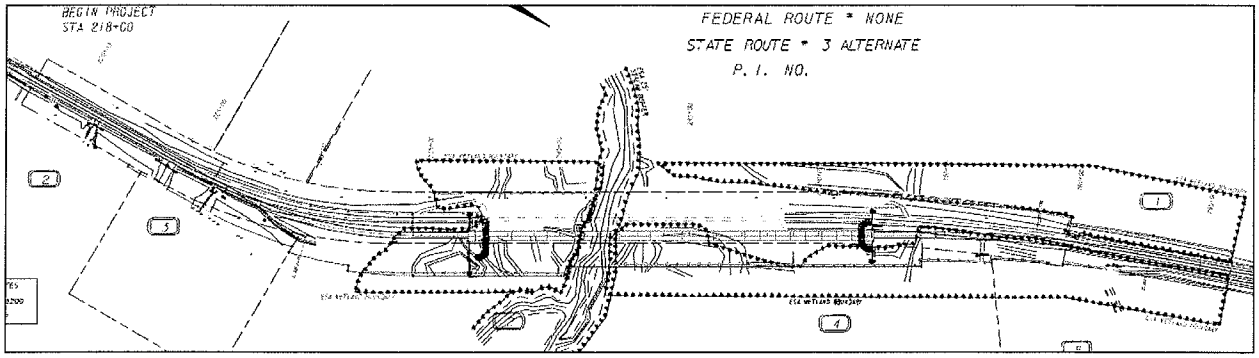
	Miles
Net Length of Roadway	0.627
Net Length of Bridges	0.287
Net Length of Project	0.913
Net Length of Exceptions	0.000
Net Length of Project	0.913

Project Cost and Schedule

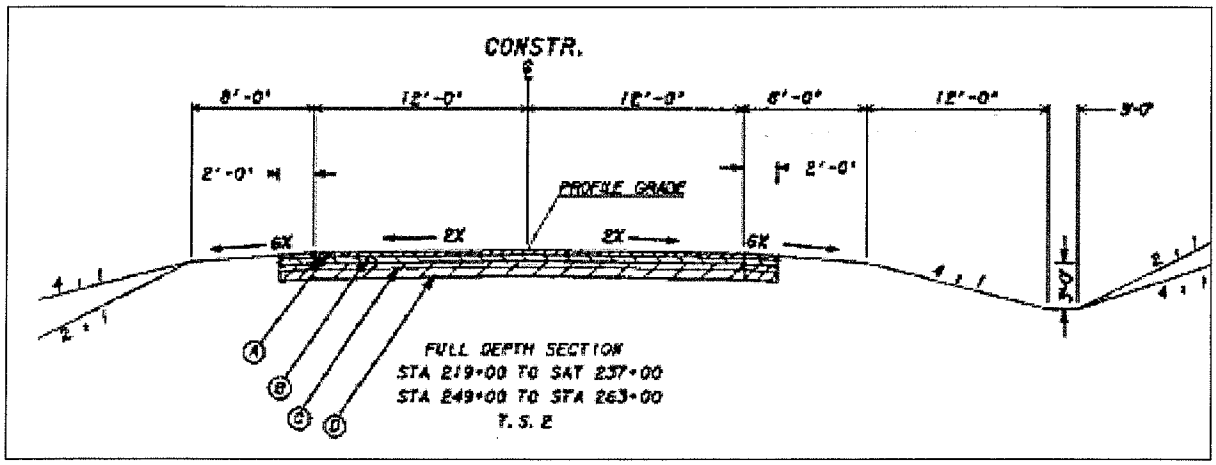
This project has a total estimated construction cost of $10.6M, plus right-of-way and utilities, and is scheduled for construction starting in FY 2011.

Project Exhibits

The following exhibits present the project plan, profile, section, and supporting data.

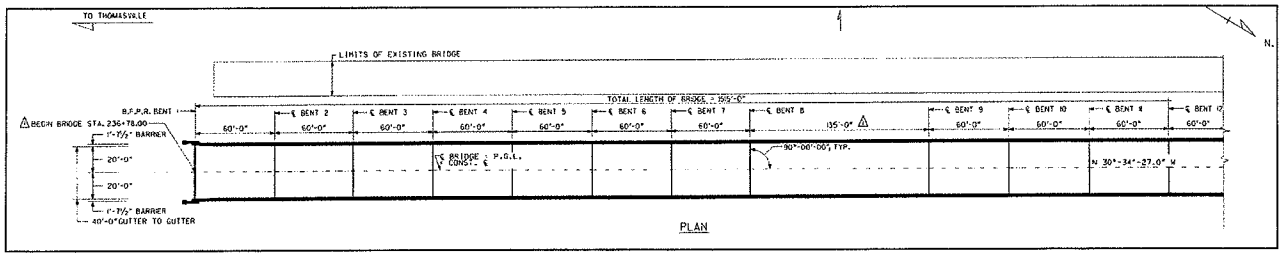


PROJECT ALIGNMENT

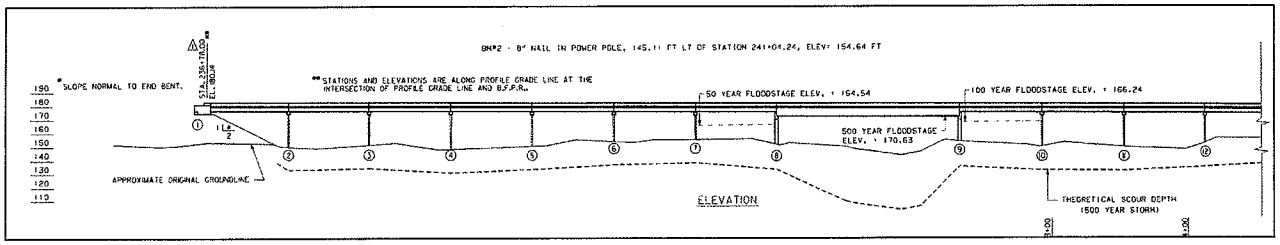


TYPICAL SECTION

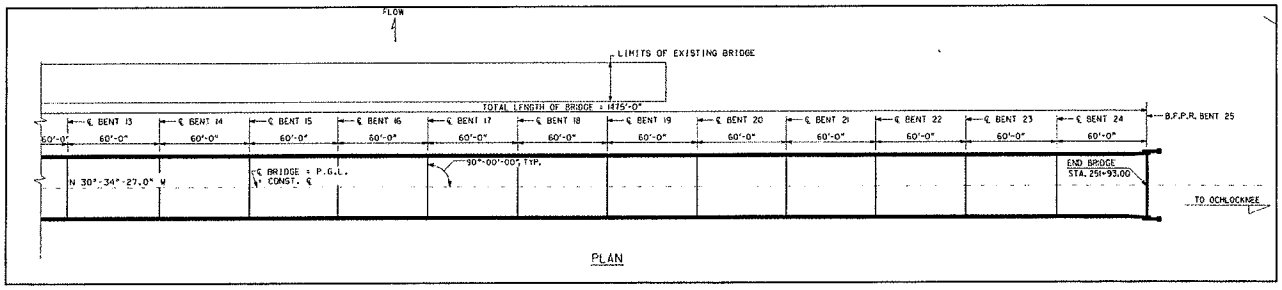
BRIDGE PLAN AND ELEVATIONS



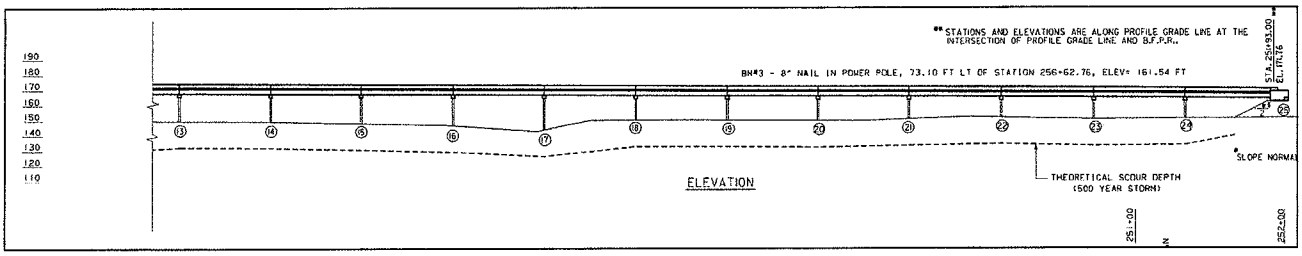
BRIDGE PLAN (South End)



BRIDGE ELEVATION (South End)



BRIDGE PLAN (North End)



BRIDGE ELEVATION (North End)

HYDRAULIC REPORT SUMMARY
BR0001-001-00(363) Thomas County
SR 3 Alternate (John B. Gordon Highway over the Ochlockonee River

50 YEAR STORM

	EXISTING BRIDGE L= 1180	PROPOSED BRIDGE L= 1475
FLOODSTAGE	164.53	164.54
DISCHARGE THRU BRIDGE (FT^3/S)	35864	35864
DISCHARGE OVER ROADWAY (FT^3/S	0	0
AREA OF BRIDGE OPENING(FT^2)	12796	17580
VELOCITY THRU BRIDGE (FPS)	2.80	2.04
CHANNEL VELOCITY (FPS)	5.77	5.08
BACKWATER(FT)	0.39	0.31
APPROACH W/O BRDG	164.64	164.66
APPROACH W/BRIDGE	165.03	164.97
NATURAL CHANNEL VELOCITY =	2.94	2.52

100 YEAR STORM

	EXISTING BRIDGE L = 1180	PROPOSED BRIDGE L = 1475
FLOODSTAGE	166.18	166.24
DISCHARGE THRU BRIDGE (FT^3/S)	46689	46689
DISCHARGE OVER ROADWAY (FT^3/S	0	0
AREA OF BRIDGE OPENING(FT^2)	12796	19961
VELOCITY THRU BRIDGE (FPS)	3.65	2.34
CHANNEL VELOCITY (FPS)	7.51	5.86
BACKWATER(FT)	0.53	0.42
APPROACH W/O BRDG	166.30	166.32
APPROACH W/BRIDGE	166.83	166.74
NATURAL CHANNEL VELOCITY =	3.11	2.71

VALUE ANALYSIS AND CONCLUSIONS

GENERAL

This section describes the value analysis (VA) procedure used during the VE study conducted for GDOT by Lewis & Zimmerman Associates, Inc. on the Bridge Replacement SR 3 Alternate / John B. Gordon Highway Over Ochlockonee River project, located in Thomas County, GA The workshop was performed as the design neared the 100 percent completion stage as developed by GDOT District 4. GDOT has provided information for the VE team to use as the basis of the study.

A systematic approach was used in the VE study, which was divided into three parts: (1) Preparation Effort, (2) Workshop Effort, and (3) Post-Workshop Effort. A task-flow diagram outlining each of the procedures included in the VE study is attached for reference.

Following this description of the VA procedure, separate narratives and supporting documentation identify the following:

- VE workshop participants
- Economic data
- Cost model
- Function analysis
- Creative ideas and evaluations

PREPARATION EFFORT

Preparation for the workshop consisted of scheduling workshop participants and tasks and gathering necessary project documents for team members to review before attending the workshop. Documents such as those listed below were used as the basis for generating VE alternatives and for determining the cost implications of the selected VE alternatives:

- Bridge Replacement SR 3 Alternate / John B. Gordon Highway Over Ochlockonee River, BR000-0001-00(363) P.I. No. 0001363, Pre-Construction Phase Documents, dated December 8, 2009, prepared by GDOT District 4
- Concept Report - Bridge Replacement SR 3 Alternate / John B. Gordon Highway Over Ochlockonee River, BR000-0001-00(363) P.I. No. 0001363- , dated January 22, 2003, prepared by GDOT
- Project Cost Estimate - Bridge Replacement SR 3 Alternate / John B. Gordon Highway Over Ochlockonee River, BR000-0001-00(363) P.I. No. 0001363- , dated November 24, 2009, prepared by GDOT

Information relating to the project's purpose and need, owner concerns, project stakeholder concerns, design criteria, project constraints, funding sources and availability, regulatory agency approval requirements, and the project's schedule and costs is very important as it provides the VE team with insight about how the project has progressed to its current state.

Value Engineering Study Task Flow Diagram

Preparation Effort

Coordination Project
- Verify Schedule
- Suggest Format for Designer Presentation
- Outline Project Responsibilities
- Outline Needed Background Data
- Define *Project Value Objectives*
- Identify Project Constraints

→

Prepare for Workshop
- Collect Project Data
- Distribute Data to Team Members
- Team Members Become Familiar with Project

→

Construct Cost Models
- Construct Cost Models
- Construct Graphic Function Analysis
- Outline High Cost Areas

→

LCC Model
- Roadway
- Bridges
- MOT
- Energy
- User Impact

Workshop Effort

Information Phase
- Introduction by VETL
- Project Description and Presentation by Designer
- Outline Owner Requirements
- Review Project Data
- Visit Project Site (Alt.)

→

Function Identification and Analysis Phase
- Analyze Project Costs and Energy Usage
- Perform Function Analysis and FAST Diagram
- Identify High Cost and Energy Areas
- Calculate Cost/Worth Ratios
- Identify Paradigms

List Ideas Generated During Function Analysis

→

Speculation Phase
- Introduction by VETL
- Creative Idea Listing:
  - Quantity of ideas
  - Association of Ideas
- Brainstorm
- Do Creative Thinking
  - Group Thinking
  - Individual Thinking
- Use Checklist for Ideas

→

Evaluation Phase
- Eliminate Impractical Ideas
- Rank Ideas with Advantages/ Disadvantages
- Evaluate Alternatives (Include Non-Economic considerations: Safety, Reliability, Environment, Aesthetics, O&M, etc.)
- Select Best Ideas for Implementation

→

Development Phase
- Develop Proposed Alternatives
- Prepare Alternative Design Sketches
- Estimate Costs
- Perform Life Cycle Comparison
  - Initial Cost
  - Redesign Cost
  - O&M Cost
  - LCC Cost

→

Presentation Phase
- Summarize Findings
- Present VE Ideas to Owner/ User/Designer
- Oral Presentation

Post-Workshop Effort

VE Study Report
- Develop Implementation VE Report
- Designer Prepares Responses to VE Report
- Owner Evaluates Recommendations

→

Implementation Phase
- Participate in Implementation Meeting with Owner/User/ Designer/ VE Team, as needed
- Prepare Final VE Report

→

Final Acceptance
- Redesign by Designer

Project cost information provided by the designers is used by the VE team as the basis for a comparative analysis with similar projects. To prepare for this exercise, the VE team leader used the Estimate Report for file "BR000-0001-00(363)_2006-07-25", prepared by GDOT, dated January 24, 2010, to develop a cost model for the project. The model was used to distribute the total project cost among the various elements of the project. The VE team used this model to identify the high-cost elements that drive the project and the elements providing little or no value so that the team could focus on reducing or eliminating their impact.

VALUE ENGINEERING WORKSHOP EFFORT

The VE workshop was a three-and-one-half-day effort beginning with an orientation/kickoff meeting on Tuesday, February 16, 2010, and concluding with the final VE presentation on Friday, February 19, 2010. During the workshop, the VE Job Plan was followed in compliance with the U.S. Federal Highway Administration guidelines for conducting a VE study. The Job Plan guided the search for alternatives to mitigate or eliminate high-cost drivers, secondary functions providing little or no value, and potential project risks. Alternatives to specifically address the owner's project concerns and enhance value by improving operations, reducing maintenance requirements, enhancing constructability, and providing missing functions were also considered. The Job Plan includes six phases:

- Information Phase
- Function Identification and Analysis Phase
- Creative/Speculation Phase
- Evaluation of Creative Ideas Phase
- Alternative Development Phase
- Presentation Phase

Information Phase

At the beginning of the study, the decisions that have influenced the project's design and proposed construction methods have to be reviewed and understood. For this reason, the workshop began with a presentation of the project by GDOT and the designers to the VE team. The presentation highlighted the information provided in the documentation reviewed by the VE team before the workshop and expanded on it to include a history of the project's development and any underlying influences that caused the design to develop to its current state. During this presentation, VE team members were given the opportunity to ask questions and obtain clarification about the information provided.

Function Identification and Analysis Phase

Having gained some information on the project, the VE team proceeded to define the functions provided by the project, identifying the costs to provide these functions, and determining whether the value provided by the functions has been optimized. Function analysis is a means of evaluating a project to see if the expenditures actually perform the requirements of the project or if there are disproportionate amounts of money spent on support functions. Elements performing support functions add cost to the project but have a relatively low worth to the basic function.

Function is defined as the intended use of a physical or process element. The team attempted to identify functions in the simplest manner using measurable noun/verb word combinations. To accomplish this,

the team first looked at the project in its entirety and randomly listed its functions, which were recorded on Random Function Analysis Worksheets (provided in the Function Identification and Analysis section). Then the individual function(s) of the major components of the project depicted on the cost models were identified.

After identifying the functions, the team classified the functions according to the following:

Abbreviation	Type of Function	Definition
HO	Higher Order	The primary reason the project is being considered or project goal.
B	Basic	A function that must occur for the project to meet its higher order functions.
S	Secondary	A function that occurs because of the concept or process selected and may or may not be necessary.
R/S	Required Secondary	A secondary function that may not be necessary to perform the basic function but must be included to satisfy other requirements or the project cannot proceed.
G	Goal	Secondary goal of the project.
O	Objective	Criteria to be met
LO	Lower Order	A function that serves as a project input.

Higher order and basic functions provide value, while secondary functions tend to reduce value. The goal of the next job phase is to reduce the impact of secondary functions and thereby enhance project value.

To further clarify the impact of the various functions, the team assigned costs to provide the functions or group of functions indicated by a specific project element using the cost estimate and cost models. Where possible, they seek to find the lowest cost, or worth, to perform the function. This is accomplished using published data from other sources or team knowledge obtained from working on other similar projects to establish cost goals and then comparing them to the current costs. By identifying the cost and worth of a function or group of functions, cost/worth ratios were calculated. Cost/worth ratios greater than one indicated that less than optimum value was being provided. Those project functions or elements with high cost/worth ratios became prime targets for value improvement.

As well as looking at areas with high cost/worth ratios, the team used the cost models previously prepared to seek out the areas where most of the project funds are being applied. Because of the absolute magnitude of these high-cost elements or functions, they also became initial targets for value enhancement.

Overall, these exercises stimulated the VE team members to focus on apparently low value areas and initially channel their creative idea development in these places.

Creative/Speculation Phase

This VE study phase involved the creation and listing of ideas. Starting with the functions or project elements with high cost/worth ratios, a high absolute cost compared to other elements in the project, and secondary functions providing little or no value and using the classic brainstorming technique, the VE team began to generate as many ideas as possible to provide the necessary functions at a lower total life

cycle cost, or to improve the quality of the project. Ideas for improving operation and maintenance, reducing project risk, and simplifying constructability were also encouraged. At this stage of the process, the VE team was looking for a large quantity of ideas and free association of ideas. A Creative Idea Listing worksheet was generated and organized by the function or project element being addressed.

GDOT may wish to review these creative lists since they may contain ideas that were not pursued by the VE team but can be further evaluated for potential use in the design.

Evaluation Phase

Since the goal of the Creative/Speculation Phase was to conceive as many ideas as possible without regard for technical merit or applicability to the project goals, the Evaluation Phase focused on identifying those ideas that do respond to the project value objectives and are worthy of additional research and development before being presented to the owner. The selection process consisted of the VE team evaluating the ideas originated during the Creative/Speculation Phase based on GDOT's value objectives identified through conversations during the opening presentation. Based on the team's understanding of the owner's value objectives, each idea was compared with the present design concept, and the advantages and disadvantages of each idea were discussed. How well an idea met the design criteria was also reviewed.

Based on the results of these reviews, the VE team rated the idea by consensus using a scale of 1 to 5, with 5 or 4 indicating an idea with the greatest potential to be technically sound and provide cost savings or improvements in other areas of the project, 3 indicating an idea that provides marginal value but could be used if the project was having budget problems, 2 indicating an idea with a major technical flaw, and 1 indicating an idea that does not respond to project requirements. Generally, ideas rated 4 and 5 are pursued in the next phase and presented to the owner during the Presentation Phase.

The team also used the designation "DS" to indicate a design suggestion, which is an idea that may not have specific quantifiable cost savings but may reduce project risk, improve constructability, help to minimize claims, enhance operability, ease maintenance, reduce schedule time, or enhance project value in other ways. Design suggestions could also increase a project's cost but provide value in areas not currently addressed. These are also developed in the next phase of the VE process.

Development Phase

In this phase, each highly rated idea was expanded into a workable solution designated as a VE alternative. The development consisted of describing the current design and the alternative solution, preparing a life cycle cost comparison where applicable, describing the advantages and disadvantages of the proposed alternative solution, and writing a brief narrative to compare the original design to the proposed change and provide a rationale for implementing the idea into the design. Sketches and design calculations, where appropriate, were also prepared in this part of the study. The VE alternatives are included in Section Two of this report.

Design suggestions include the same information as the alternatives except that no cost analysis is performed. They too are included Section Two.

Presentation Phase

The goals of the last phase of the workshop were to summarize the results of the study, to prepare draft Summary of Potential Cost Savings worksheets to hand out at the presentation, and to present the key VE alternatives to GDOT and the District 4 design team. The presentation was held on Friday, February 19, 2010, at the GDOT Headquarters office in Atlanta, Georgia. The purpose of the meeting was to provide the attendees with an overview of the suggestions for value enhancement resulting from the VE study and afford them the opportunity to ask questions to clarify specific aspects of the alternatives presented. Procedures for implementing the results of the study were discussed, and arrangements were made for the reviewers of the VE report to contact the VE team in order to obtain further clarifications, if necessary. Draft copies of the Summary of Potential Cost Savings worksheets were given to the owner and design team to facilitate a timely review and speedy implementation of the selected ideas.

POST-WORKSHOP EFFORT

The post-workshop portion of the VE study consisted of the preparation of this VE Study Report. Personnel from GDOT will analyze each alternative and prepare a response, recommending incorporation of the alternative into the project, offering modifications before implementation, or presenting reasons for rejection. LZA is available at your convenience as you review the alternatives. Please do not hesitate to call on us for clarification or further information as you consider an implementation approach.

Upon completing their reviews, GDOT will decide which alternatives to implement.

VALUE ENGINEERING WORKSHOP PARTICIPANTS

The VE team was organized to provide specific expertise in the unique project elements involved with the Ochlockonee River Bridge replacement project. The multidisciplinary team comprised professionals with highway design and construction experience and a working knowledge of VE procedures. The following lists the VE team members:

Participant	Specialization	Affiliation
Joe Leoni, PE	Highway Design	ARCADIS U.S., Inc.
Jim Aitken, PE	Bridge Engineer	ARCADIS U.S., Inc.
Vinique Word, PE	Civil/Constructability	Delon Hampton Associates
David Hamilton, PE, CVS, CCE	VE Team Leader/Civil	Lewis & Zimmerman Associates

DESIGNER'S PRESENTATION

An overview of the project was presented on Tuesday, February 16, 2010, by representatives from GDOT and the District 4 design team. The purpose of this meeting, in addition to being an integral part of the Information Phase of the VE study, was to bring the VE team up-to-speed regarding the overall project specifics. Additionally, the meeting afforded the owner and design team the opportunity to highlight in greater detail those areas of the project requiring additional or special attention. An attendance list for the meeting is attached.

VALUE ENGINEERING TEAM'S PRESENTATION

A VE presentation was conducted by the VE team on Friday, February 19, 2010, at the GDOT Headquarters office in Atlanta, Georgia, to review VE alternatives with the owner and representatives from the District 4 design team. Copies of the Draft Summary of Potential Cost Savings worksheet were provided to the attendees. Attendees checked off their names on the attendance list from the opening presentation.

VE STUDY SIGN-IN SHEET

Project No.: BR000-0001-00(363) County: Thomas PI No.: 0001363 Date: Feb. 16-19, 2010

Days 1	Days 4	NAME	EMPLOYEE ID NO.	DOT OFFICE OR COMPANY	PHONE NUMBER	EMAIL ADDRESS
✓	✓	Lisa L. Myers	00244168	Engineering Services	404-631-1770	lmyers@dot.ga.gov
✓	✓	Matt Sanders	00284154	Engineering Services	404-631-1752	msanders@dot.ga.gov
✓		Ken Werho	00258268	Traffic Operations	404-635-8144	kwerho@dot.ga.gov
✓	✓	Jim Aitken		ARCADIS - Structures	770-384-6565	Jim.Aitken@arcadis-us.com.
✓	✓	JoeLeoni		ARCADIS	770-3846564	joe.Leoni@arcadis-us.com
✓	✓	Vinique Word		Delon Hampton	404-819-8438	vword@delonhampton.com
✓	✓	DAVE HAMILTON		LZA	253.229.7703	DAHAMILTON@LZA.COM
✓		Bill DuVall	00299945	Bridge Design	404-631-1993	bduvall@dot.ga.gov

✓ Check all that apply

15 Attended Project Overview(Day 1)

7 VIA VIDEO FROM D-4

9 Attended Project Presentation (Day 4)

3 VIA VIDEO

VE STUDY SIGN-IN SHEET

Project No.: BR000-0001-00(363) County: Thomas PI No.: 0001363 Date: Feb. 16-19, 2010

1	4	NAME	EMPLOYEE ID NO.	DOT OFFICE OR COMPANY	PHONE NUMBER	EMAIL ADDRESS
✓	✓	Basil Dahman	00359215	Dist 4 Design	229 386 3467	Bdahman@Dot.Ga.Gov
✓	✓	Dennis Carter	00362348 (?)	D-4 Environmental	229-386-3046	DeCarter@dot.ga.gov
✓		Tracy Bullard	00898446	D4 Design	229 386 3039	tbullard@dot.ga.gov
✓		Brent Thomas	00255901	D4 Pre Construction	229-386-3300	bthomas@dot.ga.gov
✓		Jason Wiggins	00941871	D4 DESIGN	229-391-2541	jwiggins
✓		Scott Chambers	00307126	D4 Const	229 386 3304	schambers@dot.ga.gov
✓	✓	Sandy Griffin	00364578	D4 PM	229-386-3618	sgriffin@.....

✓ Check all that apply ____ Attended Project Overview(Day 1) ____ Attended Project Presentation (Day 4)

ECONOMIC DATA

The comparisons of life cycle costs between the VE alternatives and the current design solutions were performed on the basis of discounted present worth. To accomplish this, the VE team developed economic criteria to use in its calculations based on information gathered from GDOT and the District 4 design team. The following parameters were used when calculating discounted present worth; however, the schedule for the project is temporarily deferred and classified as long range.

Year of Analysis:	2010
Right of Way Purchase	2010
Construction Completion Date:	2012
Planning Period (n):	30 years
Discount Rate (i):	3%

When computing capital costs, direct material, labor, and equipment costs are marked up using a markup of 10 percent for Engineering and Construction Inspection.

Pavement Unit Cost ($/SY)

The following square yard cost was developed by the VE team for all pavement work based on the values provided in the GDOT cost estimate:

9.5mm Superpave:	135#/SY x Ton/2,000# x $81.00/Ton	=	$5.46/SY
19mm Superpave:	220#/SY x Ton/2,000# x $85.00/Ton	=	$9.35/SY
25mm Superpave:	330#/SY x Ton/2,000# x $82.00/Ton	=	$13.53/SY
8" GAB:	0.67ft x 147#/CF x Ton/2,000# x 9SF/SY x $15.02/Ton	=	$6.66/SY
	Total Pavement Section Unit Cost	=	**$35.00/SY**

COST MODEL

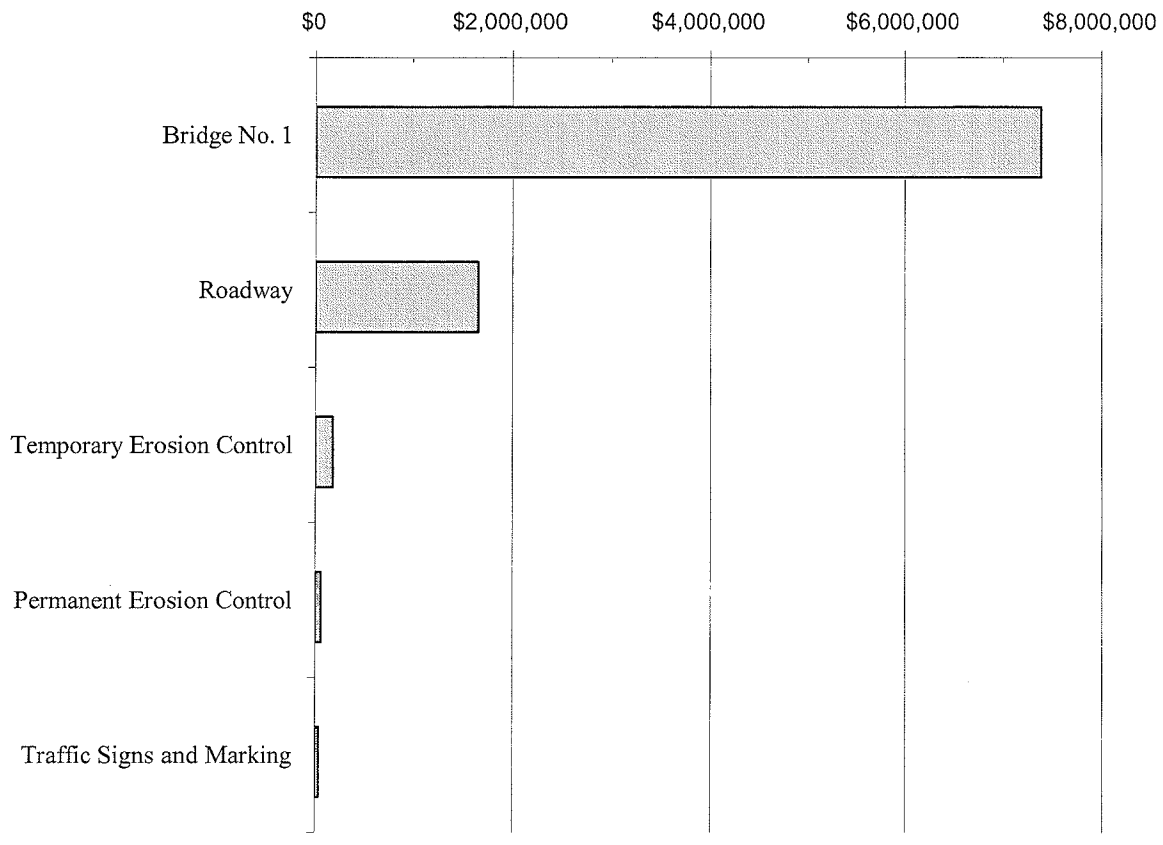
The VE team prepared a Pareto Chart, or Cost Histogram, for the project that follows this page. This Cost Histogram displays the major construction elements identified in the cost estimate prepared by the designer in descending order of magnitude and thus identifies the high cost areas in the project. The high cost elements provide the VE team with one focus for its work during the study.

The cost model quickly reveals that the bridge is the significant element in the project and the width and length of the structure are the project's key drivers.

COST HISTOGRAM

PROJECT: **BRIDGE REPLACEMENT SR 3 ALT. / JOHN B. GORDON HWY. OVER OCHLOCKONEE RIVER**
BR000-0001-00(363), P.I. No. 0001363

TOTAL PROJECT		COST	PERCENT	CUM. PERCENT
Bridge No. 1		7,377,626	79.12%	79.12%
Roadway		1,661,650	17.82%	96.95%
Temporary Erosion Control		184,000	1.97%	98.92%
Permanent Erosion Control		61,338	0.66%	99.58%
Traffic Signs and Marking		39,444	0.42%	100.00%
Construction & Right of Way - Subtotal		***9,324,058***	100.00%	
Engineering and Inspection	5.00%	466,203		
Construction Contingency	4.00%	372,962		
Fuel Adjustment		359,379		
Total Liquid AC Adjustment		126,229		
Utility Cost Estimate		0		
Utility Contingency		0		
TOTAL PROJECT COST		**$ 10,648,831**	Comp Markup:	14.21%



FUNCTION ANALYSIS

A function analysis was performed to (1) understand the project purpose and need, (2) define the requirements for each project element, (3) ensure a complete and thorough understanding by the VE team of the basic function(s) needed to attain the given project's purpose and need, (4) identify other public goals, and (5) identify secondary functions that should be addressed by the VE team. The Random Function Analysis worksheet completed by the team for the project in its entirety and the various elements follow.

This project is quite well focused and is intended to "eliminate deficiencies" in the bridge crossection and structure. Reinvestment in the bridge is needed due to its age and low sufficiency rating.

RANDOM FUNCTION ANALYSIS

PROJECT: **BRIDGE REPLACEMENT SR 3 ALTERNATE / JOHN B. GORDON HIGHWAY OVER OCHLOCKONEE RIVER**
BR000-0001-00(363) P.I. No. 0001363
Thomas County, GA

SHEET NO.: **1 of 1**

DESCRIPTION		FUNCTION		
		VERB	NOUN	KIND
PROJECT	***(Magnitude of Function Cost $$)***	***Minimize***	***Accidents***	***HO***
Bridge	***$$$$***	***Span***	***Waterway***	***B***
	$	***Upgrade***	***Corridor***	***B***
		Increase	Sufficiency	RS
Bridge Width & Geometrics		Improve	Functionality	RS
	$$$$	***Renew***	***Infrastructure***	***B***
Bridge Length	***$$***	Minimize	Backwater	RS
		Document	History	RS
		Increase	Life	G
		Maintain	Aesthetics	RS
		Reduce	Maintenance	G
		Improve	Durability	G
		Meet	Criteria	G
Shoulder Width on Bridge	***$$***	Improve	Geometrics	RS
		Spend	Money	S
		Connect	***Population***	***HO***
		Avoid	Utilities	S
Utilities	***$***	Relocate	Utilities	RS
		Minimize	Impacts	G
Environmental Constraints	***$***	Protect	Species	RS
Bridge Elevation Above Flood Levels	***$$***	Assure	Access	RS
		Protect	Slopes	RS
Parallel Roadway vs Detour	***$$$***	Transition	Improvements	G
		Control	Budget	G
		Maintain	Schedule	G
Parallel Roadway vs Detour	***$$$***	Minimize	Disruption	RS

Function defined as: Action Verb, Measurable Noun

Kind: B = Basic; S = Secondary; RS = Required Secondary; HO = Higher Order; LO = Lower Order; G = Goal

CREATIVE IDEA LISTING AND EVALUATION OF IDEAS

During the Creative/Speculation Phase, numerous ideas were generated for the project using conventional brainstorming techniques. These ideas were recorded and are shown with their corresponding ranking on the attached Creative Idea Listing Worksheets. For the convenience of tracking an idea through the VA process, the ideas were grouped into the following project elements and numbered according to the order in which they were conceived. The following letter prefixes were used to identify the project elements.

PROJECT ELEMENT	PREFIX
Alignment	A
Profile	P
Section	S
Bridge	B

The ideas were ranked on a qualitative scale of 1 to 5 on how well the VE team believed the idea met the project purpose and need criteria. To assist the team in evaluating the creative ideas, the advantages and disadvantages of each new idea compared to the existing design solution were discussed based on the owner's value objectives for the project. The following are the top value objectives for this project:

- Improve bridge sufficiency ratings
- Enhance functionality
- Reduce crash frequency and severity
- Maintain access during construction
- Reduce wetland impacts
- Reduce user impacts

After discussing each idea, the team evaluated the ideas by consensus. Final analysis produced ten ideas rated 4 or 5 or design suggestions to research and develop into formal VE alternatives to be included in Section Two of the report. Highly rated ideas that were not developed further may have been combined with another related idea or discarded as a result of additional research indicating the concept as not being cost effective or technically feasible. The reader is encouraged to review the Creative Idea Listing and Evaluation worksheet since it may suggest additional ideas that can be applied to the design.

CREATIVE IDEA LISTING

PROJECT:	**BRIDGE REPLACEMENT SR 3 ALTERNATE / JOHN B. GORDON HWY. OVER OCHLOCKONEE RIVER** ***BR000-0001-00(363) P.I. No. 0001363*** ***Thomas County, GA***	SHEET NO.:	**1 of 2**

NO.	IDEA DESCRIPTION	RATING
ALIGNMENT (A)		
A-1	Place new bridge on existing alignment; detour traffic during construction.	4
A-1.1	Place the new bridge on the existing alignment and build a new 1,180LF long bridge.	2
A-2	Move the project beginning point on the south end from STA 218 to STA 225.	4
A-3	Move the project end point on the north end from STA 266+22 to STA 262+50.	4
PROFILE (P)		
P-1	Modify the profile, add a crest on the bridge, and lower the approach ends.	4
P-1.1	Lower the grade and use 2:1 slopes with a guardrail.	4
P-2	Raise the profile on the north end of the bridge at STA 252 to be above the 100-year flood level.	2
SECTION (S)		
S-1	Use 11 ft. wide lanes in lieu of 12 ft. wide and reduce the width of the section from 40 feet to 38 feet.	5
S-2	Use 2:1 slopes at the guardrail section in lieu of 4:1 slopes.	4
BRIDGE (B)		
B-1	Repair the existing bridge in lieu of replacing.	Drop
B-2	Shorten the bridge to match the existing length of 1,180.LF in lieu of 1,515 LF.	2
B-3	Use larger beam section and eliminate a beam line; use five beams in lieu of six beams.	4
B-4	Use 40 ft. wide bridge in lieu of 42.25 ft. wide bridge.	Drop
B-5	Optimize the span lengths and raise the profile, similar to Alt. No. P-1.	2
B-6	Use all PSC piles or all steel piles.	DS
B-7	Shorten the bridge but add back one or two Conspan type overflows.	1
B-8	Re-run the hydraulic study match the current bridge geometrics.	DS

Rating: 1→3 = Not to be developed 4 = Varying degrees of development potential 5 = Most likely to be developed
DS = Design suggestion ABD = Already being done

CREATIVE IDEA LISTING

PROJECT:	**BRIDGE REPLACEMENT SR 3 ALTERNATE / JOHN B. GORDON HWY. OVER OCHLOCKONEE RIVER** ***BR000-0001-00(363) P.I. No. 0001363*** ***Thomas County, GA***	SHEET NO.:	**2 of 2**

NO.	IDEA DESCRIPTION	RATING
BRIDGE (B) (cont.)		
B-9	Build a new bridge at the existing (old) elevation and length, minimal road improvements.	Drop
B-10	Build a 1,800 LF long bridge and eliminate some of the embankment section.	Drop
B-11	Jack the existing bridge and repair as needed.	1
B-12	Revise hydraulics report and optimize the span configuration.	DS
CONSTRUCTION MANAGEMENT/PHASING (CM)		
CM-1	Detour the traffic and close the road during construction.	See A-1
CM-2	Build a detour bridge on-site; place new bridge on the existing alignment.	4
CM-3	Find a shorter detour route.	4
CM-4	Build a temporary bridge with an on-site detour.	2
CM-5	Add a contractor option for all PSC piles or all steel piles.	DS
CM-6	Take SR 3 Alternate off of the State of Georgia system.	Drop
CM-7	Review the cost estimate for test piles, which looks very high. Demolition cost for the existing bridge needs to be increased.	Cost Comment

Rating: 1→3 = Not to be developed 4 = Varying degrees of development potential 5 = Most likely to be developed
DS = Design suggestion ABD = Already being done

VALUE ENGINEERING STUDY AGENDA

Lewis & Zimmerman Associates, Inc. (LZA) will facilitate a 30-hour value engineering (VE) study on the Preliminary Engineering Submittal for the **Bridge Replacement SR 3 Alternate / John B. Gordon Highway over Ochlockonee River, BR000-0001-00(363), P.I. No. 0001363**, Thomas County, Georgia. The project is located 6 miles north of Thomasville, GA and consists of a total of 0.913 miles of improvements including a 1,515LF two lane replacement bridge. The Georgia Department of Transportation (GDOT) project management and District 4 design team will be available to formally present the project at the beginning of the workshop; attend a presentation of the VE alternatives at the conclusion of the VE study; and be available to answer questions during the VE study effort.

The VE study will follow the outline described below and be conducted February 16 - 19, 2010 at the offices of:

GDOT
600 West Peachtree Street
4th Floor, Conference Room (406)
Atlanta, Georgia 30308

The point-of-contact is Ms. Lisa Myers, GDOT Value Engineering Coordinator, who may be reached at 404-631-1770, or Matt Sanders, AVS, GDOT Value Engineering Specialist, 404-631-1752.

PROJECT DATA

Project #	P.I. No.	Description
BR000-0001-00(363)	0001363	Bridge Replacement SR 3 Alternate / John B. Gordon Highway over Ochlockonee River
Roadways	0.627 mi	
Bridges	0.287mi	
Gross Length of Project	0.913 mi	

VE STUDY AGENDA

Tuesday, February 16, 2010

8:00 am - 9:00 am — **VE Team Members Arrive and Review Documents**

9:00 am – 11:00 am — **Owner's/Designer's Presentation - *(5th Fl. Engr. Services Conf. Rm)***

The District #4 design team will present information concerning the project including, but not limited to: the Purpose and Need for the project, rationale for design; criteria for specific areas of study, project constraints and the reasons for design decisions.

11:00 am – 12:00 noon **VE Team Reviews Project Documents**

12:00 noon - 1:00 pm **Lunch**

1:00 pm - 2:00 pm **Information Phase**

The VE team will continue their familiarization with the cost models and project data for each area of study. The cost models will be refined, as necessary. The VE team will define the function of each project element or system in the cost model, select the primary or basic functions, and determine the worth, or least cost, to provide the function. Cost/worth or value index ratios will be calculated, and high cost/low worth areas for study identified. In addition, the VE team will continue defining the function of each element/system to gain a thorough understanding of the projects' Purpose and Need.

2:00 pm – 3:00 pm **Function Analysis**

The team will identify all project functions required to meet the established purpose and need. Functions will be identified as to basic, required secondary, secondary, or project goals.

3:00 pm - 5:00 pm **Speculation Phase**

The VE team will conduct a brainstorming session and list as many ideas as possible for consideration. The aim is to obtain a large quantity of ideas through free association, by eliminating roadblocks to creativity and deferring judgment.

Wednesday, February 17, 2010

8:00 am - 10:00 am **Speculation Phase (cont.)**

The VE team will continue the brainstorming exercise to capture ideas to improve the project in terms of initial and life cycle cost, technical aspects, schedule, and constructibility issues.

10:00 am – 12:00 noon **Analysis Phase**

The VE team will analyze the ideas listed in the creative phase and select the best ideas for further development.

12:00 noon - 1:00 pm **Lunch**

1:00 pm - 5:00 pm **Development Phase**

VE team will develop creative ideas into alternate design solutions. Initial and life cycle cost estimates comparing original and proposed alternatives will be prepared. Selected alternatives for change will be developed and supported with sketches, calculations and written substantiation.

Thursday, February 18, 2010

8:00 am – 12:00 noon	**Development Phase (cont.)**
12:00 noon - 1:00 pm	**Lunch**
1:00 pm - 5:00 pm	**Development Phase (cont.)**

Upon completion of the Development Phase, the VE team leader will prepare the summary worksheets based on the alternatives developed by the VE team. The summary worksheets form the basis of the informal oral presentation to be made to GDOT, local representatives, and the District #4 design team representatives. The team will review all documentation and prepare for the presentation.

Friday, February 19, 2010

8:00 am - 9:00 am	**Development Phase and Preparation for Presentation**
9:00 am – 12:00 noon	**Presentation Phase – *(5th Fl. Engr. Services Conf. Rm)***

Upon completion of the Development Phase, the VE team leader will prepare the summary worksheets based on the alternatives developed by the VE team. The summary worksheets form the basis of the informal oral presentation to be made to GDOT, local representatives, and the design team representatives. The team will review all documentation and prepare for the presentation.

Noon - Adjourn

POST-STUDY PHASE

Upon completion of the value engineering study, the VE team leader will prepare the Value Engineering Study Report and submit it to GDOT. The report will include the following material:

- Project description and design concept of project
- Cost models and graphic function analysis worksheets
- Value engineering alternatives: original design and proposed alternatives, including sketches, design calculations and initial and life cycle estimates
- Potential contract savings (capital construction and life cycle costs)

The GDOT design team will independently review the VE alternatives and classify them as accepted, accepted with modifications, needs further study, or rejected—accompanied by the reasons for rejection. A meeting with all stakeholders will then be convened to decide which VE alternatives to implement.

VE TEAM MEMBERS

David Hamilton, PE, CVS, CCE, LEED [AP]	VE Team Leader/Civil	Lewis & Zimmerman Assoc.
Joe Leoni, PE	Highway Design Engineer	ARCADIS
Jim Aiken, PE	Structural Engineer	ARCADIS
Vinique Word, PE	Construction Engineer	Delon Hampton