GRE
GREAT RIVER ENGINEERING

January 31, 2007

MoDOT Design Division
ATTN: Jay Bestgen
1320 Creek Trail Dr.
Jefferson City, MO 65109

Re: Practical Design – 2007 Awards for Excellence
Bridge No. 20200021 over Silver Creek in Cedar County
Project No. BRO-BO20(10)

Dear Mr. Bestgen:

Cedar County Bridge No. 20200021 over Silver Creek was closed to traffic after being damaged beyond repair by a motor vehicle. At that time the County Commission had Great River Engineering complete a preliminary design on for the replacement structure. The resulting structure was a three span 120 foot long bridge. In order for the bridge to be accessible during periods of heavy rainfall events, the existing roadway would have to be built up for a significant distance. The estimated cost of the replacement structure and approach roadway work was over $494,000. The cost of the replacement structure was beyond the funding the County had unless it canceled other projects that were already scheduled for design and construction.

During this time MoDOT begun to implement Practical Design, therefore we were able to design the structure for a storm event that worked in this application, rather than meeting a predetermined requirement. This resulted in a shorter bridge length allowing for a 100 foot long single span bridge. With this type of structure, no piers were necessary and the potential for long term maintenance issues for debris removal from the piers were avoided.

Due to the reduced amount of roadway construction the necessary amount of right-of-way was reduced thereby impacting the adjoining property owners less. The simple span bridge that was allowed by practical design meant that the contractor did not have to work in the creek channel. This reduced delays in construction and allowed the contractor to finish the project in 66 working days instead of the estimated 120 working days needed to complete the original design.

The engineer's estimate for the final project was within 5% of the actual cost for the project. Therefore we believe that the original design estimate of $494,368.22 is an accurate estimate of how much the bridge replacement would have cost if MoDOT had not implemented practical design. Please review the attached cost estimate to see the cost savings and material savings associated with practical design.

This project was one of the first County Bridge replacement projects to fully implement MoDOT's practical design philosophy. The final project was constructed for $277,721.21 and reduced construction time and cost by approximately 45%. We believe it is the perfect example at how practical design provides for a logical design solution that results in less construction time and reduced costs while still meeting the needs of the public.

Should you have any question or require additional information, feel free to contact our office.

Sincerely,
GREAT RIVER ENGINEERING

Spencer Jones, P.E.

Brian M. Orr, P.E.

2826 S. Ingram Mill Road, Springfield, MO 65804 Phone: 417-886-7171 Fax: 417-886-7591 www.greatrivereng.com

CEDAR COUNTY
BRIDGE NO. 20200021 over Silver Creek
BRO-B020(10)

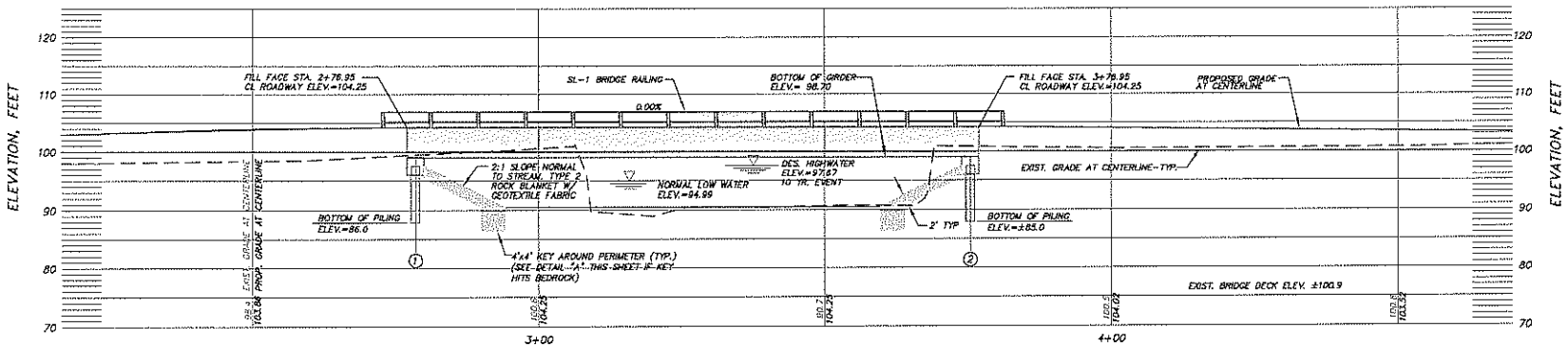
ORGINAL REPLACEMENT STRUCTURE ESTIMATE

LINE	ITEM	DESCRIPTION	UNITS	QUANTITY	UNIT PRICE	AMOUNT
ROADWAY ITEMS						
1	201	CLEARING & GRUBBING	L.S.	1	$ 8,000.00	$ 8,000.00
2	203	EXCAVATION FOR ROADWAY - UNCLASSIFIED	C.Y.	1424	$ 7.50	$ 10,680.00
3	203	EMBANKMENT IN PLACE	C.Y.	14593	$ 7.50	$ 109,447.50
4	310	5" AGGREGATE ROAD SURFACE	S.Y.	3000	$ 5.00	$ 15,000.00
5	606	GUARD RAIL (W beam Type A)	L.F.	836	$ 14.50	$ 12,122.00
6	606	25' TERMINAL GUARD RAIL SECTION	EA.	4	$ 750.00	$ 3,000.00
7	607	FENCING (5-STRAND BARBED WIRE)	L.F.	1400	$ 8.00	$ 11,200.00
8	607	16' GATE	EACH	4	$ 500.00	$ 2,000.00
9	611	TYPE II ROCK BLANKET	C.Y.	891	$ 35.00	$ 31,185.00
10	616	MOVABLE BARRICADES	EA.	4	$ 250.00	$ 1,000.00
11	616	CONST. SIGNS	EA.	4	$ 100.00	$ 400.00
12	618	MOBILIZATION	L.S.	1	$ 15,000.00	$ 15,000.00
13	624	GEO-FABRIC	S.Y.	1343	$ 3.00	$ 4,029.00
14	713	SL-1 TO TYPE"A" TRANSITION SECTION	EA.	4	$ 500.00	$ 2,000.00
15	725	18" CMP	L.F.	34	$ 30.00	$ 1,020.00
16	801/805	FINAL SEEDING, FERTILIZER	AC.	1	$ 3,000.00	$ 3,000.00
17	802	MULCHING	AC.	1	$ 3,000.00	$ 3,000.00
BRIDGE ITEMS						
18	216	REMOVAL OF BRIDGE	L.S.	1	$ 5,000.00	$ 5,000.00
19	206	EXCAVATION FOR BRIDGE	L.S.	1	$ 15,000.00	$ 15,000.00
20	702	STRUCTURAL STEEL PILING	L.F.	165	$ 50.00	$ 8,250.00
21	703	CLASS B2 CONC.	C.Y.	116	$ 475.00	$ 55,100.00
22	703	CLASS B1 CONC.	C.Y.	104	$ 450.00	$ 46,800.00
23	716	PLAIN NEOPRENE BEARING PADS	EA.	6	$ 100.00	$ 600.00
24	716	LAMINATED BEARING PADS	EA.	6	$ 300.00	$ 1,800.00
25	705	PRESTRESSED CONCRETE I-GIRDERS (30')	EA.	6	$ 6,000.00	$ 36,000.00
26	705	PRESTRESSED CONCRETE I-GIRDERS (60')	EA.	3	$ 8,000.00	$ 24,000.00
27	705	PRESTRESSED CONCRETE DECK PANELS	S.Y.	223	$ 80.00	$ 17,840.00
28	706	REINFORCING STEEL (Substructure)	Lbs.	16,960	$ 0.93	$ 15,772.80
29	706	REINFORCING STEEL (Superstructure)	Lbs.	26,744	$ 0.93	$ 24,871.92
30	713	SL-1 BRIDGE RAILING	L.F.	250	$ 45.00	$ 11,250.00
			TOTAL CONTRACT			$ 494,368.22

PRACTICAL DESIGN WINNING BID BY CONTRACTOR

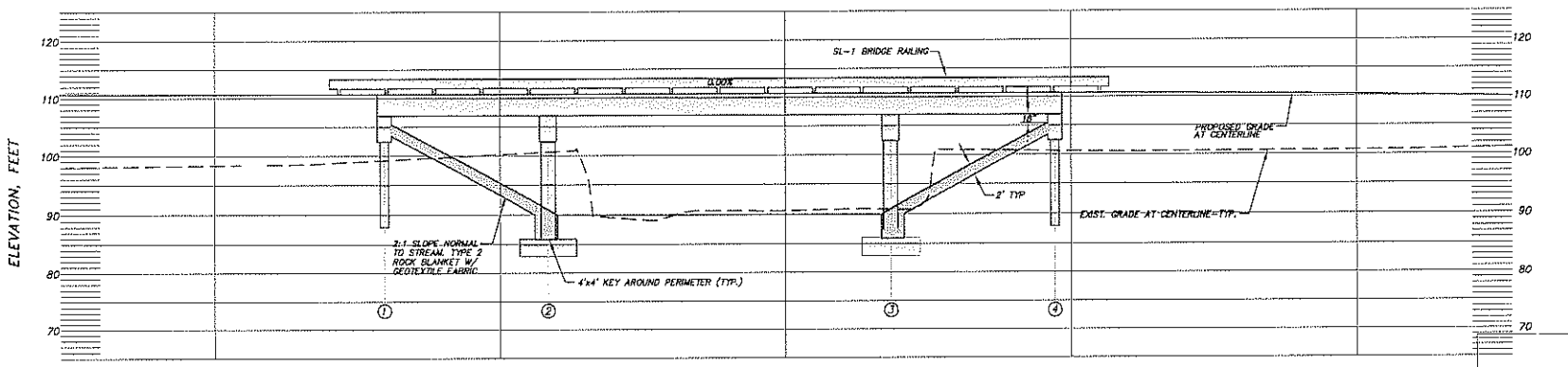
LINE	ITEM	DESCRIPTION	UNITS	QUANTITY	UNIT PRICE	AMOUNT
ROADWAY ITEMS						
1	201	CLEARING & GRUBBING	L.S.	1	$ 2,000.00	$ 2,000.00
2	203	EXCAVATION FOR ROADWAY - UNCLASSIFIED	C.Y.	195	$ 8.00	$ 1,560.00
3	203	EMBANKMENT IN PLACE W/ COMPACTION	C.Y.	1760	$ 9.00	$ 15,840.00
4	310	5" AGGREGATE ROAD SURFACE	S.Y.	1447	$ 5.00	$ 7,235.00
5	606	GUARD RAIL (W beam Type A)	L.F.	137.5	$ 21.15	$ 2,908.13
6	606	25' TERMINAL GUARD RAIL SECTION	EA.	4	$ 1,045.00	$ 4,180.00
7	607	FENCING (5-STRAND BARBED WIRE)	L.F.	771	$ 10.00	$ 7,710.00
8	607	16' GATE	EACH	2	$ 800.00	$ 1,600.00
9	611	TYPE II ROCK BLANKET	C.Y.	601	$ 30.00	$ 18,030.00
10	616	MOVABLE BARRICADES	EA.	4	$ 200.00	$ 800.00
11	616	CONST. SIGNS	EA.	2	$ 60.00	$ 120.00
12	618	MOBILIZATION	L.S.	1	$ 15,000.00	$ 15,000.00
13	624	GEO-FABRIC	S.Y.	983	$ 3.50	$ 3,440.50
14	713	SL-1 TO TYPE"A" TRANSITION SECTION	EA.	4	$ 825.00	$ 3,300.00
15	725	15" CMP	L.F.	75	$ 30.00	$ 2,250.00
16	801/805	FINAL SEEDING, FERTILIZER	AC.	0.3	$ 3,500.00	$ 1,050.00
17	802	MULCHING	AC.	0.3	$ 3,500.00	$ 1,050.00
BRIDGE ITEMS						
18	216	REMOVAL OF EXISTING BRIDGE	L.S.	1	$ 3,000.00	$ 3,000.00
19	206	EXCAVATION FOR STRUCTURE - UNCLASSIFIED	L.S.	1	$ 5,000.00	$ 5,000.00
20	701	PRE-BORE FOR PILING	L.F.	102	$ 71.00	$ 7,242.00
20	702	STRUCTURAL STEEL PILING	L.F.	117	$ 50.00	$ 5,850.00
21	703	CLASS B2 CONC.	C.Y.	74	$ 430.00	$ 31,820.00
22	703	CLASS B1 CONC.	C.Y.	29.2	$ 470.00	$ 13,724.00
23	716	PLAIN NEOPRENE BEARING PADS	EA.	8	$ 65.00	$ 520.00
24	705	PRESTRESSED CONCRETE I-GIRDERS	EA.	4	$ 19,500.00	$ 78,000.00
25	705	PRESTRESSED CONCRETE DECK PANELS	S.Y.	132	$ 115.00	$ 15,180.00
26	706	REINFORCING STEEL (Substructure)	Lbs.	4,118	$ 0.94	$ 3,870.92
27	706	REINFORCING STEEL (Superstructure)	Lbs.	16,923	$ 0.94	$ 15,907.62
28	713	SL-1 BRIDGE RAILING	L.F.	216.66	$ 44.00	$ 9,533.04
			TOTAL CONTRACT			$ 277,721.21

TYPE IV CONC. I – GIRDER BRIDGE
SPAN 100'-0"



PRACTICAL DESIGN STRUCTURE
GENERAL ELEVATION
ALONG CENTERLINE OF ROADWAY
1"=20' HOR. 1"=20' VERT.

TYPE IV CONC. I – GIRDER BRIDGE
SPAN ARRANGEMENT 30'-0" – 60'-0" – 30'-0"



ORIGINAL DESIGN STRUCTURE
GENERAL ELEVATION
ALONG CENTERLINE OF ROADWAY
1"=20' HOR. 1"=20' VERT.

No.	Revision/Issue	Date

GRE
GREAT RIVER ENGINEERING
225 S. SIXTH ST. STE. 2950 MINNEAPOLIS, MN 55402
TEL: (612) 338-2129 FAX: (612) 338-1535
www.greatriverengineering.com

CHECKED BY: ____
DRAWN BY: ____
JOB NUMBER: 06-1103
FILE NAME: 02.06

CEDAR COUNTY BRIDGE NO. 20200021
CEDAR COUNTY, MISSOURI

ONE TO ONE

SHEET
OF

UTILITY CONTACTS

TELEPHONE

TERRY LOCKHART
ALLTEL
509 W. ALDRICH RD
PO BOX 160
BOLIVAR, MO 65613
(417) 326-1031

ELECTRIC

JIM DAVIS
SAC OSAGO ELECTRIC COOPERATIVE
1113 S. MAIN
PO BOX 111
EL DORADO SPRINGS, MO 64744
(417) 876-2721

CONSTRUCTION PLANS
BRIDGE REPLACEMENT PROJECT
FOR
BRIDGE NO. 20200021
OVER SILVER CREEK
CEDAR COUNTY, MISSOURI
PROJECT NO. BRO-BO20(10)

CEDAR COUNTY
COUNTY ROAD CR 1651
SILVER CREEK
PROJECT NO. : BRO-BO20(10)

DESIGN DESIGNATION

FUCTIONAL CLASSIFICATION = RURAL LOCAL

A.D.T - 2005 = <250 A.D.T.-2025 = <250

D = 50% T = 10%

V = 30 MPH

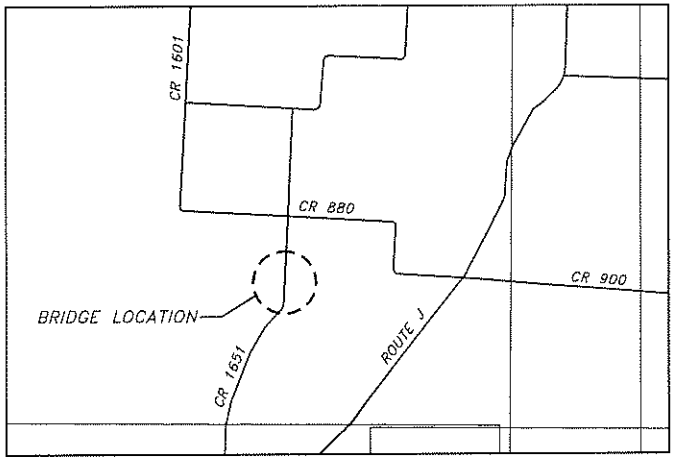
N
W E
S

GRAPHIC SCALE

(IN FEET)
1 inch = 3,000 ft.

LEGEND

PROPOSED CONTOUR
PROPOSED FENCE
NEW RIGHT OF WAY
TEMP. CONSTRUCTION EASEMENT



GENERAL LOCATION MAP

CEDAR COUNTY, MISSOURI
SECTION 35 TOWNSHIP 35 NORTH, RANGE 26 WEST

CEDAR COUNTY COMMISSION

PRESIDING COMMISSIONER KENNETH WHITESELL JR.
ASSOCIATE COMMISSIONER BYRON L. HAMILTON
ASSOCIATE COMMISSIONER JOHN FOX

SHEET INDEX

DESCRIPTION	SHEET NO.
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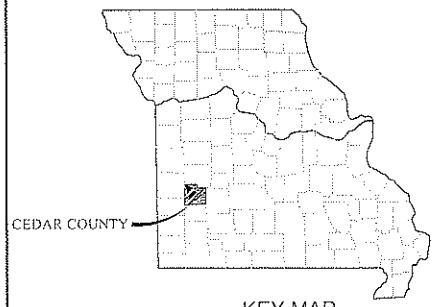


KEY MAP
SHOWING LOCATION OF COUNTY
NOT TO SCALE

MISSOURI ONE CALL SYSTEM, INC.
1-800-344-7483
STOP, CALL BEFORE YOU DIG

STATE OF MISSOURI
SPENCER H. BURNS
NUMBER
PROFESSIONAL ENGINEER

SUBMITTED AND RECOMMENDED

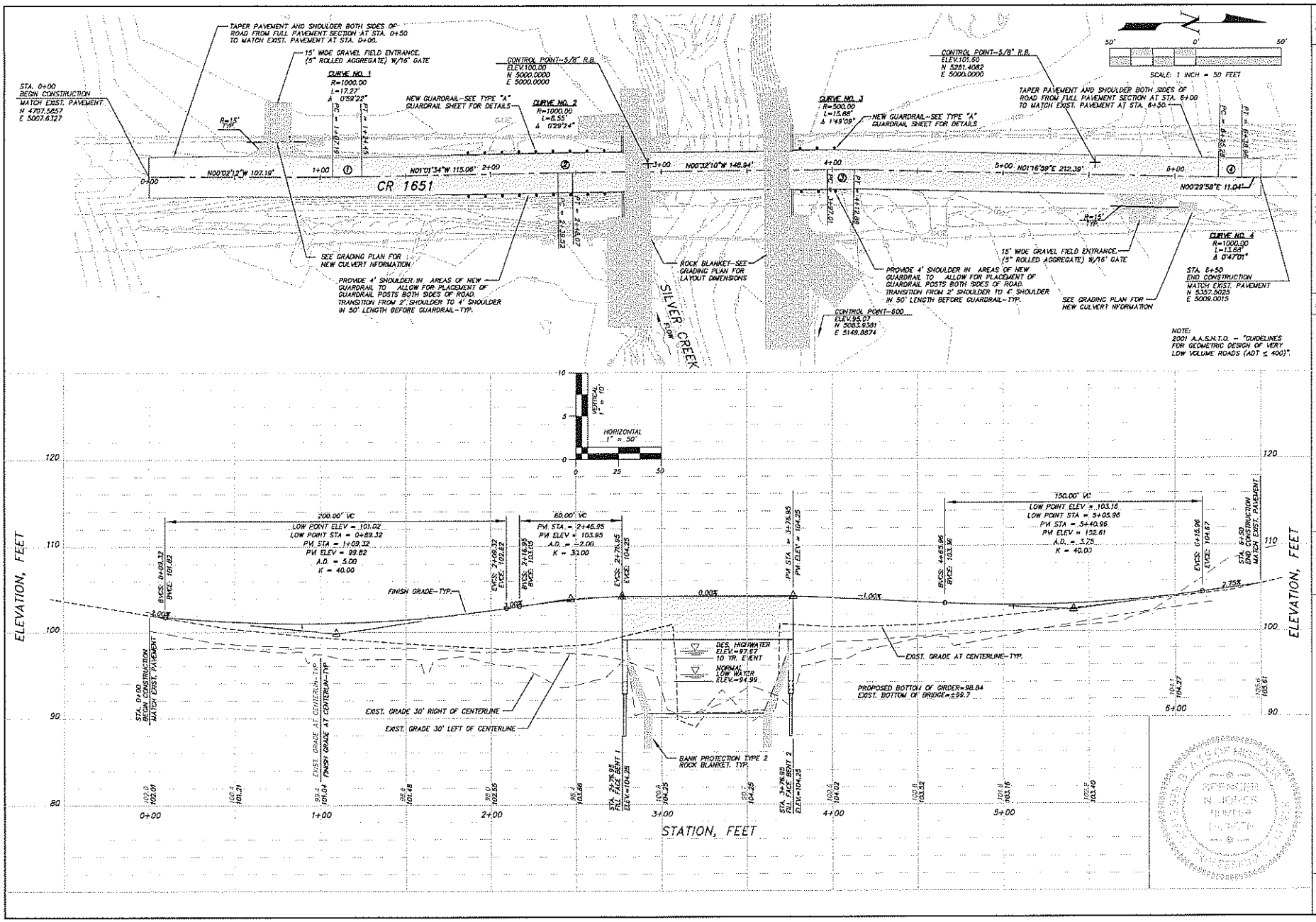
PRESIDING COMMISSIONER DATE

No.	Revision/Issue	Date

GRE
GREAT RIVER ENGINEERING
2121 S. MEGAN RD. SPRINGFIELD, MO 65804
PHONE: (417) 886-7100 FAX: (417) 886-7101
www.greatriverengineering.com

DESIGNED BY: SHL
DRAWN BY: JCG
JOB NUMBER: 05-1002
FILE NAME: 01.DWG

CEDAR COUNTY BRIDGE NO. 20200021
CEDAR COUNTY, MISSOURI
COVER SHEET



GREAT RIVER ENGINEERING

No.	Revision/Issue	Date

CHECKED BY:
DRAWN BY:
JOB NUMBER: 06-1002
FILE NAME: 06_BR

CEDAR COUNTY BRIDGE NO. 20200021
CEDAR COUNTY, MISSOURI

ROADWAY PLAN AND PROFILE

SHEET 4 OF 8

POINT	NORTHING	EASTING
1	N 4984.3192	E 4983.9573
2	N 4955.3203	E 4964.1912
3	N 4939.2267	E 4974.1917
4	N 4964.2121	E 4972.5150
5	N 4984.0653	E 4958.9584
6	N 5000.5845	E 4958.8040
7	N 5001.8477	E 5093.7947
8	N 4976.8488	E 5094.0287
9	N 4976.2594	E 5031.0348
10	N 4984.7590	E 5030.9552

POINT	NORTHING	EASTING
11	N 5084.2680	E 4976.0218
12	N 5090.3302	E 4958.4133
13	N 5063.6630	E 4961.7604
14	N 5067.8063	E 4962.4022
15	N 5068.9780	E 5107.3964
16	N 5093.9769	E 5107.1625
17	N 5093.6226	E 5069.3096
18	N 5109.8457	E 5062.6763
19	N 5125.7430	E 5063.3818
20	N 5093.3172	E 5036.6552
21	N 5093.2542	E 5029.9400
22	N 5084.7184	E 5030.0198

RIP-RAP LAYOUT PLAN

GRADING PLAN

5'x10' TYPE II RIP-RAP BLANKET-ROCK d50 18" DEEP W/ GEO FABRIC

35'-15" CMP @ 1.43%
FL UPSTREAM=97.5
FL DOWNSTREAM =97.0

40'-15" CMP @ 3.8%
FL UPSTREAM=101.50
FL DOWNSTREAM =100.0

REMOVE AND RELOCATE EXIST. FENCE AS SHOWN FOR NEW ROADWAY CONSTRUCTION. NEW FENCE TYPE TO MATCH EXIST.

2' DEEP LAYER OF TYPE II ROCK BLANKET AND GEOTEXTILE FABRIC-TYP.

CR 1651

SILVER CREEK

FLOW

SCALE: 1 INCH = 40 FEET

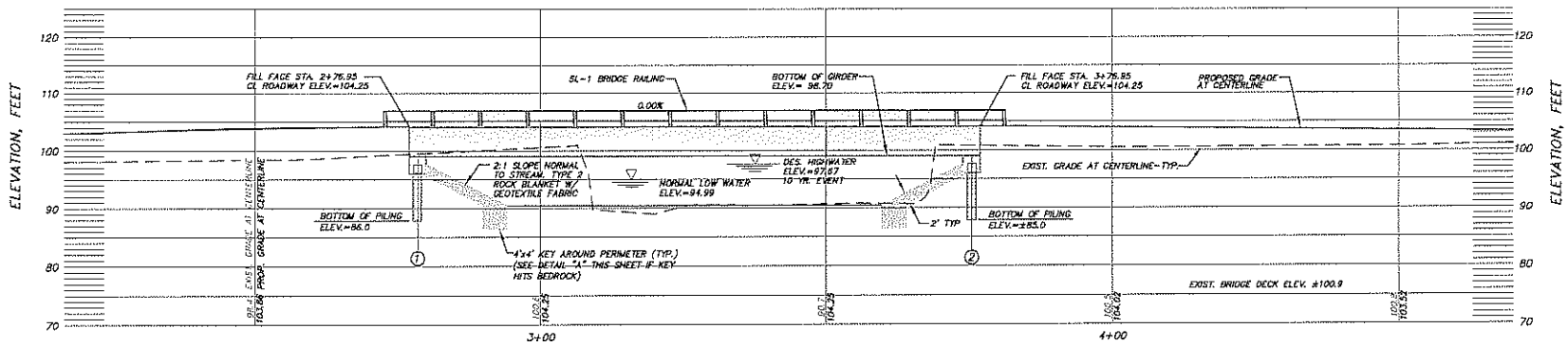
GREAT RIVER ENGINEERING

CEDAR COUNTY BRIDGE NO. 20200021
CEDAR COUNTY, MISSOURI

GRADING PLAN

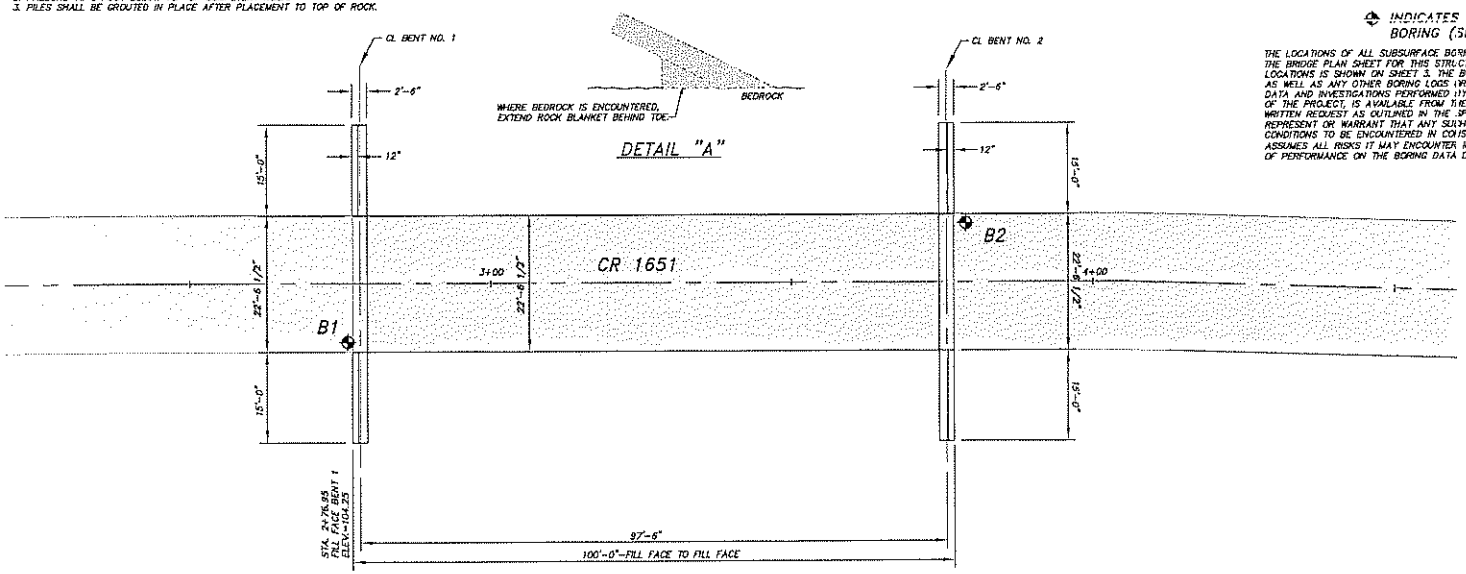
SHEET 5 OF 21

TYPE IV CONC. I – GIRDER BRIDGE
SPAN 100'-0"



GENERAL ELEVATION
ALONG CENTERLINE OF ROADWAY
1"=20' HOR. 1"=20' VERT.

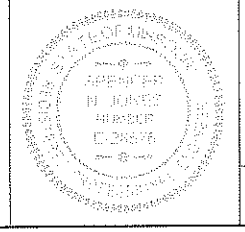
NOTES:
1. PILES FOR BENTS 1 AND 2 SHALL BE PRE BORED.
2. PREBORE TO 3 FOOT BELOW TOP OF COMPETENT ROCK.
3. PILES SHALL BE GROUTED IN PLACE AFTER PLACEMENT TO TOP OF ROCK.



PLAN VIEW
1"=20' HOR. 1"=20' VERT.

◆ INDICATES LOCATION OF BORING (SEE SHEET 3.)

THE LOCATIONS OF ALL SUBSURFACE BORINGS FOR THIS STRUCTURE ARE SHOWN ON THE BRIDGE PLAN SHEET FOR THIS STRUCTURE. BORING DATA FOR THE NUMBERED LOCATIONS IS SHOWN ON SHEET 3. THE BORING DATA FOR ALL LOCATIONS INDICATED, AS WELL AS ANY OTHER BORING LOGS OR OTHER FACTUAL RECORDS OF SUBSURFACE DATA AND INVESTIGATIONS PERFORMED BY PALMORTON AND PARRISH FOR THE DESIGN OF THE PROJECT, IS AVAILABLE FROM THE ENGINEER OR PROJECT CONTACT UPON WRITTEN REQUEST AS OUTLINED IN THE SPECIAL PROVISIONS. THE ENGINEER DOES NOT REPRESENT OR WARRANT THAT ANY SUCH BORING DATA ACCURATELY DEPICTS THE CONDITIONS TO BE ENCOUNTERED IN CONSTRUCTING THIS PROJECT. A CONTRACTOR ASSUMES ALL RISKS IT MAY ENCOUNTER IN BASING IT'S BID PRICES, TIME OR SCHEDULE OF PERFORMANCE ON THE BORING DATA DEPICTED HERE.



No.	Revision/Issue	Date
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GRE
GREAT RIVER ENGINEERING
1504 S. NORTH RES ROAD SPRINGFIELD MO 65804
PHONE (417) 886-7101 FAX (417) 886-7219
www.greatriverengineering.com

CHECKED BY:
DRAWN BY:
JOB NUMBER: 20-1027
FILE NAME: 07_GE_

CEDAR COUNTY BRIDGE NO. 20200021
CEDAR COUNTY, MISSOURI

ONE TO ONE

2007 APPLICATION FORM

(required for each entry)

Job No. BRO-B020(10) **Route** Cart Road 202 **County** Cedar

STIP Description (Scoping or Construction, state which STIP) 05-09☒ 06-10☐ 07-11☐

This project was to replace the existing defiecent bridge across Silver Creek on Cart Road 202 in Cedar County, Missouri. The project was funded through the Highway Bridge Replacement and Rehabilitation Program (HBRRP). The project consisted of construction of a single span 100-foot long bridge with 2-lanes.

Project Manager (could have both)

MoDOT C.B. Alexander (District 7- Bridge Engineer) **Consultant** Great River Engineering of Springfield

Active core team members as approved by the MoDOT PM (may include consultants)

Cedar County Commission	Kenneth Whitesell	_____
Cedar County Commission	Byron Hamilton	_____
Cedar County Commission	John Fox	_____
Great River Engineering of Spfld	Spencer Jones/ Brian Orr	_____

Project Contacts (will have both for consultant entry)

District C.B. Alexander (District 7 - Bridge Engineer) **Consultant** $_____

STIP budget $_____ or **Award cost** $277,721.21

Value Engineering study during design? yes☒ no☐ (if yes) **Project Stage** Preliminary Design

VE Contact person Great River Engineering of Springfield

Construction-stage VE (VECP)? yes☐ no☐ (if yes) **Explain** _____

_____

_____

Total VECP savings $_____ **VECP Contact Person** _____

Why is this entry the "poster" image for MoDOT's practical design philosophy?

(In layman's terms - 100 words or fewer – attach additional sheet if necessary) _____

The Silver Creek Bridge was closed to traffic after being damaged in an accident. Under the previous design criteria, Cedar County could not afford to replace the structure using the HBRRP. By implementing practical design, Cedar County was able to construct a structure and approach roadway for a storm event that worked in this location rather than meeting a predetermined requirement. The resulting structure was a simple span bridge that eliminated debris catching piers and their associated maintenance. Finally, Cedar County was able to replace the structure at half the cost of the originally planned bridge.

Send entries to: MoDOT Design Division, ATTN: Jay Bestgen
1320 Creek Trail Dr.
Jefferson City, Missouri 65109