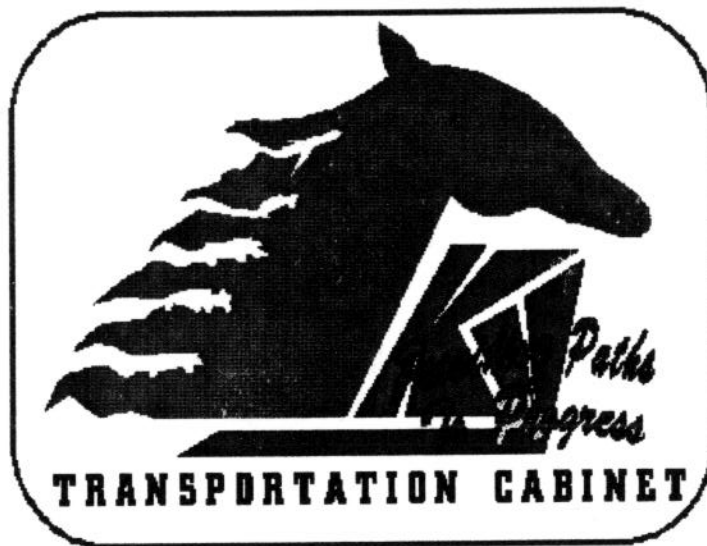


**VALUE ENGINEERING SUMMARY  
OF  
CALLOWAY COUNTY  
KY 80  
MURRAY-MAYFIELD ROAD  
SECTION III**



**APRIL 26-30, 1999**

## Value Engineering - Study Identification

Project: FD04 018 8518 014D Team: 5  
 Location: Calloway Co. Date: April 27, 1999

### VE TEAM MEMBERS

Name	Title	Organization	Telephone
Tim Layson	Trans. Engr. Supv.	Construction	(270) 824-7080
Deanna Harris	T.E. I	Construction	(606) 784-8388
Patrick Deming	Tran. Eng. I	Design	(606) 341-2700
Tom Clouse	T.E. II	Design	(606) 677-4017
Chuck Allen	E.I.T. II	Design	(606) 666-8841
Tom Jobe	T.E.B.M.	Operations	(502) 766-5066
Evan Wisniewski	Tech Systems/ Program Engineer	FHWA	(502) 233-6740

### PROJECT DESCRIPTION

Length: <u>13.853 KM</u>	Cost:	Type of Funds: <u>Federal &amp; State</u>
Design Speed: <u>100 KM/hr</u>	Projected Traffic: <u>2015 - 3000 ADT</u>	
Projected Award Date:		
Major Project Elements:		
<ol style="list-style-type: none"> <li>1. Bridge @ Sta. 501 + 585</li> <li>2. Bridge @ Sta. 501 + 774.50</li> <li>3. EMB in Place</li> <li>4. Granular Emb.</li> <li>5. Clearing &amp; Grubbing</li> <li>6. Traffic Control</li> <li>7. Method II</li> <li>8. DGA</li> </ol>		

### ROUTE CONDITION / GEOMETRY

Adjacent Segments: All adjacent segments in design phase	Overall Route:
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## Investigation Phase - Sources

Date: April 27, 1999Team: 5

### AUTHORIZING PERSONS

Name	Position	Telephone
Robert Semones	C.O.V.E. T.E. Specialist	
Joette Fields	C.O.V.E.	

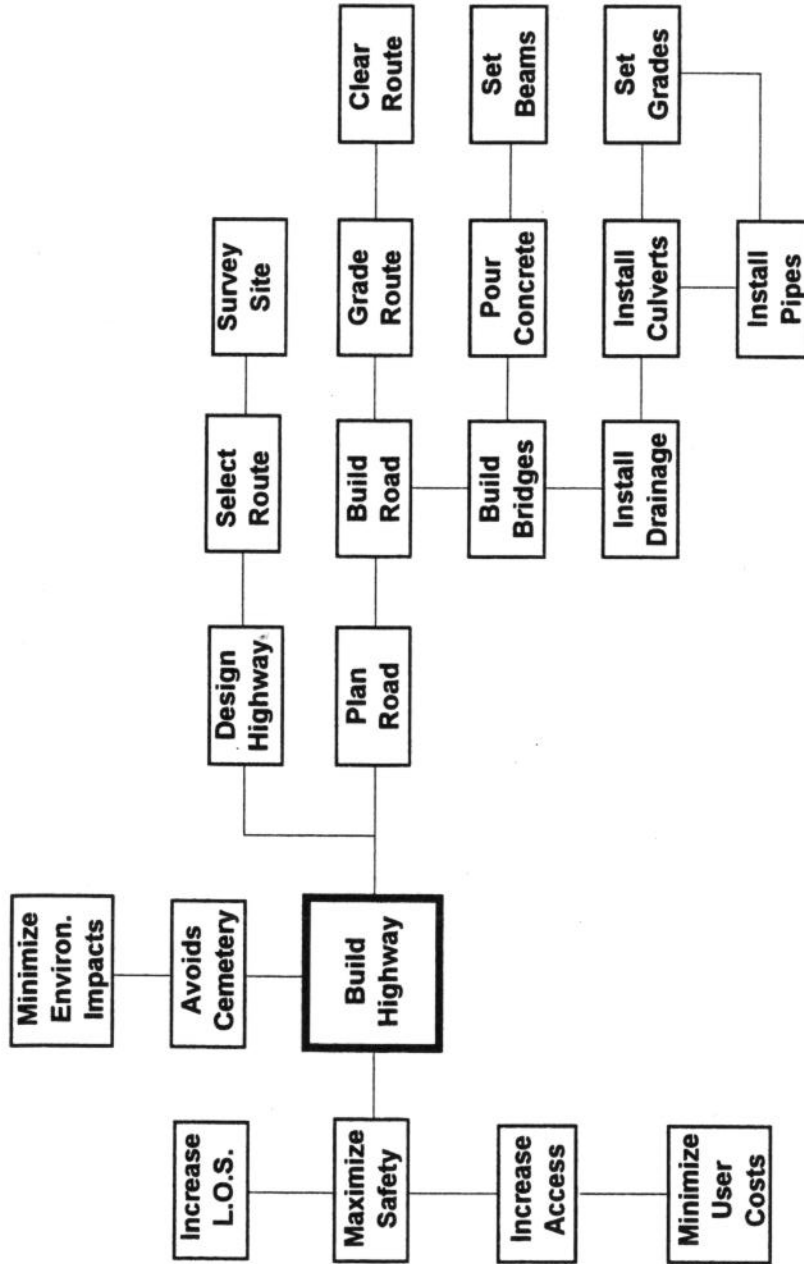
### PERSONAL CONTACTS

Contacts	Telephone	Notes
Ray Adams	(606) 248-6600	Vaughn & Melton
Ken E. Corder	(606) 248-6600	Vaughn & Melton
BILL MCKINNEY		CO. BRIDGES
JASON GARNER		CONTECH

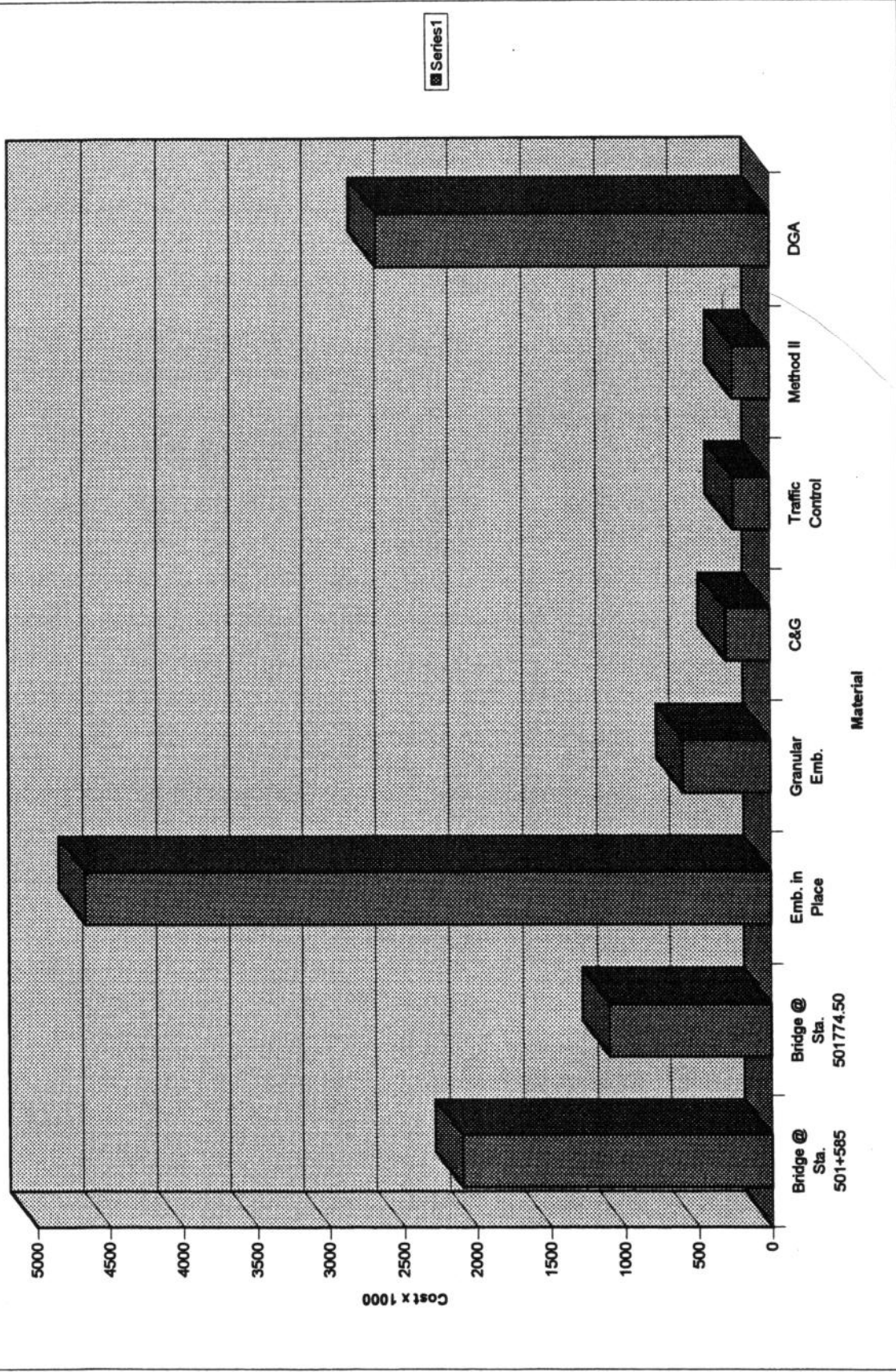
### DOCUMENTS / ABSTRACTS

References	Notes
Estimate sheet	BRIDGE PLANS IN McCLAIN CO. OVER GREEN RIVER
Plan sheets	
Cross sections	
Geotechnical Report	
Design Executive sum	
Traffic forecast	
1998 Std. Specs. for Road & Bridge Const. Standard Drawings	

**Team #5**  
**F.A.S.T Report**  
 FD04 018 8518 014 D



Team #5 Cost Model





# Speculation Phase - Brainstorming

Date: April 27, 1999

Team: 5

Item: \_\_\_\_\_

Function: \_\_\_\_\_

- Eliminate Stripping
- Use high performance concrete
- Eliminate one bridge
- Move bridge out of spiral
- Combine bridges
- Eliminate seeding on roadbed
- Eliminate granular Emb
- Change bridge to culvert
- Make culvert 90°
- Change from Emb to Exc
- Change box culvert to 3 - 6' pipes
- Use selective clearing & grubbing
- Narrow median
- 2 lane initial - 4 lane ultimate
- Do nothing
- Reduce traffic control
- DGA for erosion control
- Reinforce earth abutments
- Multi-plate arch pipes (for culvert)
- Change alignment

Item: \_\_\_\_\_

Function: \_\_\_\_\_

- Change bridge rail
- Build retaining walls
- Close cross streets
- Eliminate detour by phasing
- Increase span lengths
- Eliminate c/a fence in flood plain

SHEET OF

### Evaluation Phase

Date: April 28, 1999		Team No. 5		
IDEA #	CREATIVE IDEA LISTING	IDEA EVALUATION		IDEA RATING
		Advantages	Disadvantages	
1	Eliminate Stripping	Cost, Eliminates item, Speeds construction	DGA Sooner. Erosion, Rework DGA	1
2	Revise creek & floodway crossing	Cost, Lower Maint.	Lower Aesthetics, scour	2
3	Box culvert	Cost, easier const.	Shorter life span, less durable	2
4	2-lane initial - 4-lane ultimate	Cost, lower maintenance	Politics, safety, requires future funding	3

FD04-016-8518-014D



FD04-018-8518-014D

SHEET \_\_\_ OF \_\_\_

# Evaluation Phase - Matrix Analysis

Date: April 28, 1999

Idea: Eliminate Stripping

		Criteria						
Eliminate Stripping		MEETS FUNCTION	COST	CONSTRUCTABILITY	AESTHETICS			
Alternatives	Weights	10	10	8	4		Totals	Rank
Strip Roadbed 6"	4	40	10	16	16		82	2
Place DGA	3	30	40	32	12		114	1

NOTE: First Alternative is the Original Design Item

FD04-018-8518-014D

SHEET \_\_\_ OF \_\_\_

## Evaluation Phase - Matrix Analysis

Date: April 28, 1999

Idea: Span Floodplain Alternate

		Criteria							Totals	Rank
		MEETS FUNCTION	ENVIRON. IMPACTS	COST	MAINTENANCE	CONSTRUCTABILITY	TIME	SAFETY		
Alternatives	Weights	10	7	10	7	7	5	8		
Bridges @ Sta 501 + 585 Sta 501 + 774.50		5 50	3 21	3 30	2 14	3 21	3 15	3 24	175	6
2 set PRL Bridges										
1 set PRL Bridges		5 50	4 28	4 40	4 28	4 28	4 20	5 40	234	1
1 single bridge		5 50	4 28	5 50	4 28	4 28	5 25	3 24	233	2
1 set PRL Bridge + Culv.		4 40	2 14	4 40	3 21	3 21	4 20	4 32	168	3
1 single + culv.		4 40	2 14	4 40	3 21	4 28	4 20	3 24	187	4
1 single bridge span entire floodway		5 50	5 35	2 20	3 21	4 28	3 15	2 16	185	5
1 set PRL bridge span entire floodway		5 50	5 35	1 10	3 21	3 21	2 10	3 24	171	7

**NOTE: First Alternative is the Original Design Item**

FD04-018-8518-014D

SHEET \_\_\_ OF \_\_\_

### Evaluation Phase - Matrix Analysis

Date: April 28, 1999

Idea: Box Culvert Alternate

		Criteria							Totals	Rank
		MEETS FUNCTION	ENVIRON. IMPACTS	COST	MAINTENANCE	CONSTRUCTABILITY	SAFETY	AESTHETICS		
Box Culvert @ Sta. 503 + 842 30° Rc. Skew										
Alternatives	Weights	10	7	10	8	6	4	5		
3.6 m x 2.4 m Box Culv.	50	3	3	5	3	4	4	4	195	2
Constr. on 90°	40	2	3	4	4	4	3	3	171	3
Multi plated pipe	50	3	4	4	5	4	3	3	204	1
3 - 6' Dia. Pipe	30	2	2	1	3	3	2	2	112	4

NOTE: First Alternative is the Original Design Item

FD04-018-8518-014D

SHEET      OF     

# Evaluation Phase - Matrix Analysis

Date: April 28, 1999

Idea: 2 lane initial - 4 lane ultimate

2 lane initial - 4 lane ultimate	Criteria							Totals	Rank
	MEETS FUNCTION	SAFETY	COST	MAINTENANCE	TIME				
Alternatives	Weights	10	9	10	7	5			
4 lane	50	5	5	2	2	3	15	144	2
2 lane	50	5	3	4	4	3	15	160	1

NOTE: First Alternative is the Original Design Item

## VALUE ENGINEERING RECOMMENDATION

FORM 20 DEC 1996

Page 1 of

PROJECT: **FD04 018 8518 014 D SEC III**  
LOCATION **Calloway County**  
STUDY DATE: **4/26/99 thru 4/29/99**

IDENTIFICATION NUMBER: **Proposal 1 - Team 5**  
FUNCTION OF COMPONENT BEING CHANGED: **Water Crossing**  
DESCRIPTIVE TITLE OF RECOMMENDATION:  
**Combining 4 proposed structures into 2 structures**

### ORIGINAL DESIGN:

**Construct 2-55M, 3 span bridges crossing the West Fork of Clark River. Also, construct 2-110M, 4 span bridges for back water relief for the West Fork of Clark River.**

### RECOMMENDED CHANGE:

**Construct 2-165M, 4 span bridges crossing the West Fork of Clark River as well as providing back water relief for the floodplain.**

SUMMARY OF COST ANALYSIS			
	First Cost	O & M Costs (Present Worth)	Total LC Cost (Present Worth)
ORIGINAL DESIGN	\$2,224,000	\$166,000	\$2,390,000
RECOMMENDED DESIGN	\$1,990,000	\$120,000	\$2,110,000
ESTIMATED SAVINGS OR (COST)	\$234,000	\$46,000	\$280,000

## VALUE ENGINEERING RECOMMENDATION

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IDENTIFICATION NUMBER: **Proposal 1 - Team 5**

Page of

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### ADVANTAGES:

- 1 Less construction time**
- 2 Higher constructability**
- 3 More economical**
- 4 Less Maintenance costs**
- 5 Less environmental impact**

### DISADVANTAGES:

### JUSTIFICATION:

**Alternate No. 1 meets the required function, which is crossing a waterway as well as providing back water relief for the floodplain.**

**Constructing 2 structures as opposed to constructing 4 structures results in less construction time; a higher ease of constructability; a more economical project; a lower maintenance cost; without significantly altering the integrity of the project.**

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## VALUE ENGINEERING RECOMMENDATION

**PAGE 1 DISCUSSION (to be later typed on page 1 as Original Design and Recommended Change). Restrict this discussion to this one page only.**

FORM 20 DEC 1996

IDENTIFICATION NUMBER: **Proposal 1 - Team 5**

Page 1A of

**Two things are proposed in this recommendation. The first is to combine the 55m structure spanning the West Fork of Clark River and the 110 m structure spanning the floodway of West Fork of Clark River into one 165m structure that serves both functions. Using one structure would eliminate 4 endbents, saving on cost, construction time, and maintenance.**

**The second proposal is using larger beams to span longer lengths. The original design uses spans of 27m to 35m and the recommendation is to use spans of 41 m. This would eliminate 4 piers; however, larger beams are required. After investigation, it is more economical to use the larger beams.**

**Combining the bridges eliminates discontinuity of the emb. construction needed to connect the two bridges. The proposed embankment is located in the floodway. The construction of this fill would be at a lower level of constructability and may have environmental impacts in the floodway.**

**Regardless of the acceptance of this proposal, it is strongly recommended that the bridges at sta. 501+530 be moved to 501+537.25, which will remove them from a spiral curve and place them in a tangent section.**

# VALUE ENGINEERING RECOMMENDATION

FORM 20 DEC 1996

## COST ESTIMATE - FIRST COST

IDENTIFICATION NUMBER: **Proposal 1 - Team 5**

Page  of

Cost Item	Units	Unit Cost		Original Design		Recommended Design	
		\$/Unit	Source Code	No. of Units	Total \$	No. of Units	Total \$
<b>EndBents</b>	<b>EA</b>	<b>50</b>	<b>1</b>	<b>8</b>	<b>400</b>		
<b>Piers</b>	<b>EA</b>	<b>68</b>	<b>1</b>	<b>10</b>	<b>680</b>		
<b>Beams</b>	<b>M</b>	<b>0.325</b>	<b>1</b>	<b>1980</b>	<b>643.5</b>		
<b>DECKS</b>	<b>LS</b>	<b>50</b>	<b>1</b>	<b>1</b>	<b>50</b>		
<b>Alternate No. 1</b>							
<b>EndBents</b>	<b>EA</b>	<b>61.5</b>	<b>1</b>			<b>4</b>	<b>246</b>
<b>Piers</b>	<b>EA</b>	<b>85</b>	<b>1</b>			<b>6</b>	<b>510</b>
<b>Beams</b>	<b>M</b>	<b>0.445</b>	<b>1</b>			<b>1650</b>	<b>734.25</b>
<b>DECKS</b>	<b>LS</b>	<b>50</b>	<b>1</b>			<b>1</b>	<b>50</b>

SOURCE CODE:

- |                          |   |                            |
|--------------------------|---|----------------------------|
| 1. Project Cost Estimate | 4. Means Estimating Manual              | 7. Professional Experience |
| 2. CES Data Base         | 5. Richardson's                         | (List Job if applicable)   |
| 3. CACES Data Base       | 6. Vendor Lit Quote (list name/details) | 8. Other Sources (specify) |



## VALUE ENGINEERING RECOMMENDATION

FORM 20 DEC 1996

### COST ESTIMATE - O & M (Life Cycle) COST

IDENTIFICATION NUMBER: **Proposal 1 - Team 5**

Page  of

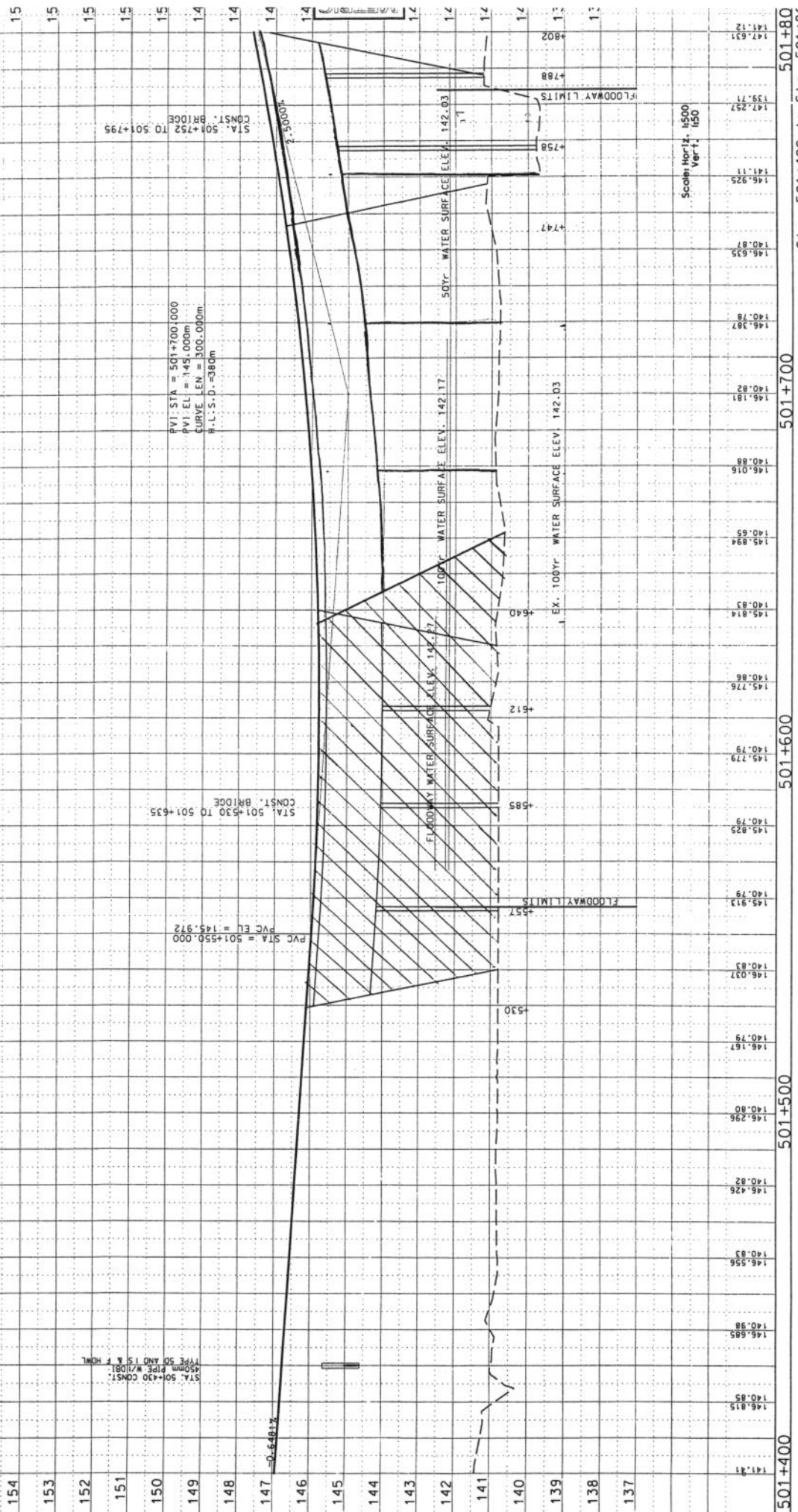
PRESENT WORTH METHOD

LIFE CYCLE PERIOD (YEARS) = **25**

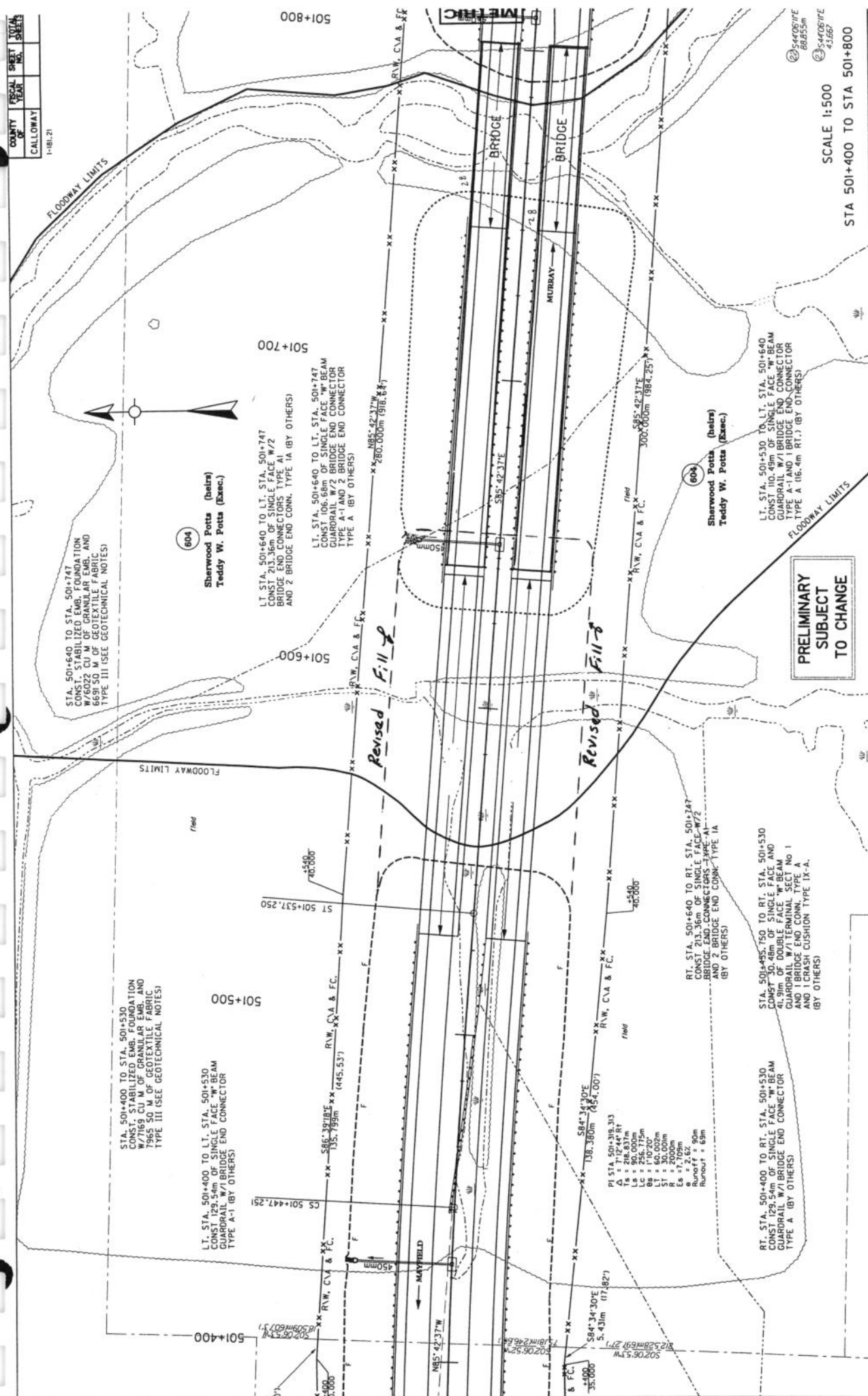
ANNUAL PERCENTAGE RATE = **4%**

\$ x 1000

Initial Costs				Original Design PW \$			Rec. Design PW \$
<b>EndBents</b>				400			246
<b>Piers</b>				680			510
<b>Beams</b>				643.5			734.25
<b>Deck</b>				500			500
<b>Sub Totals of Initial Costs PW \$</b>				<b>\$2,224</b>			<b>\$1,990</b>
Later Costs	In The	PW	Original Design		Recommended Design		
Single Expenditure	Yr	Factor	Est \$	PW \$	Est. \$	PW\$	
<b>Overlay Decks</b>	25	0.3751	115	43		115	43
<b>Expansion Dam</b>	20	0.4564	96	44		48	22
<b>Expansion Dam</b>	25	0.3751	96	36		48	18
<b>Scour Repair</b>	10	0.6756	5	3		5	3
<b>Scour Repair</b>	20	0.4564	25	11		15	7
<b>Scour Repair</b>	30	0.3083	5	2		5	2
<b>Scour Repair</b>	40	0.2083	25	5		15	3
<b>Sub Total of Single Expenditure Costs PW \$</b>				<b>\$144</b>			<b>\$98</b>
Later Costs	For How	PW	Original Design		Recommended Design		
Annual Expense	Many Yrs	Factor	Est \$	PW \$	Est. \$	PW\$	
<b>Maintenance</b>	50	21.842	1	22		1	22
<b>Sub Totals of Annual Expense Costs PW \$</b>				<b>\$22</b>			<b>\$22</b>
<b>Totals PW \$ for Original &amp; Recommended</b>				<b>\$2,390</b>			<b>\$2,110</b>
<b>Total PW \$ Savings (or Added Cost) for Recommended Design</b>						<b>\$280</b>	



501+400 501+500 501+600 501+700 501+800  
Sta. 501+400 to Sta. 501+800



STA. 501+400 TO STA. 501+530  
CONST. STABILIZED EMB. FOUNDATION  
W/7169 CU M. OF GRANULAR EMB. AND  
7965 SQ M. OF GEOTEXTILE FABRIC  
TYPE III (SEE GEOTECHNICAL NOTES)

LT. STA. 501+400 TO LT. STA. 501+530  
CONST. 106.69m OF SINGLE FACE W/ BEAM  
CURB RAIL W/ BRIDGE END CONNECTOR  
TYPE A-1 (BY OTHERS)

ST 501+537.250  
CS 501+447.251  
R.W. C.V.A. & F.C.  
S86°39'18"E 135.795m (445.53')

PI STA. 501+39.33  
Δ = 712°44'RT  
L = 90.000m  
LC = 256.775m  
LT = 60.002m  
ST = 30.000m  
Ea = 17.099m  
e = 2.62'  
Runoff = 99m  
Runout = 69m

S84°34'30"E 5.431m (17.827)  
S84°34'30"E 138.380m (434.00')

RT. STA. 501+640 TO RT. STA. 501+747  
CONST. 213.36m OF SINGLE FACE W/2  
BRIDGE END CONNECTORS TYPE A-1  
AND 2 BRIDGE END CONN. TYPE 1A  
(BY OTHERS)

STA. 501+495.750 TO RT. STA. 501+530  
CONST. 30.48m OF SINGLE FACE AND  
GUARDRAIL W/ TERMINAL SECT No. 1  
AND 1 BRIDGE END CONN. TYPE A  
AND 1 CRASH CUSHION TYPE IX-A.  
(BY OTHERS)

STA. 501+640 TO LT. STA. 501+747  
CONST. 106.69m OF SINGLE FACE W/ BEAM  
CURB RAIL W/ BRIDGE END CONNECTOR  
TYPE A-1 AND 2 BRIDGE END CONNECTOR  
TYPE A (BY OTHERS)

LT. STA. 501+640 TO LT. STA. 501+747  
CONST. 213.36m OF SINGLE FACE W/2  
BRIDGE END CONNECTORS TYPE A-1  
AND 2 BRIDGE END CONN. TYPE 1A  
(BY OTHERS)

RT. STA. 501+530 TO LT. STA. 501+640  
CONST. 110.49m OF SINGLE FACE W/ BEAM  
CURB RAIL W/ BRIDGE END CONNECTOR  
TYPE A (BY OTHERS) AND 1 BRIDGE END CONNECTOR  
TYPE A (116.4m RT.) (BY OTHERS)

STA. 501+640 TO STA. 501+747  
CONST. STABILIZED EMB. FOUNDATION  
W/7602 CU M. OF GRANULAR EMB. AND  
6691 SQ M. OF GEOTEXTILE FABRIC  
TYPE III (SEE GEOTECHNICAL NOTES)

604  
Sherwood Potts (Invs)  
Teddy W. Potts (Exec.)

PRELIMINARY  
SUBJECT  
TO CHANGE

SCALE 1:500  
STA 501+400 TO STA 501+800

23-5440611E  
BB855m  
4.1567

# VALUE ENGINEERING RECOMMENDATION

FORM 20 DEC 1996

Page 1 of

PROJECT: **FD04 018 8518 014 D** **SEC III**  
LOCATION **Calloway County**  
STUDY DATE: **April 26, 1999 thru April 29, 1999**

IDENTIFICATION NUMBER: **Proposal No. 2** **Team No. 5**  
FUNCTION OF COMPONENT BEING CHANGED: **Transport Water**  
DESCRIPTIVE TITLE OF RECOMMENDATION: **Change 3.6M x 2.4M Box Culvert**  
**@ Sta. 503+842 to 3.7M Bit. Coated CM Pipe**

## ORIGINAL DESIGN:

**Construct 62.5 M of 3.6M x 2.4M Box Culvert @ Sta. 503+842**  
**@ 30 degree skew right.**

## RECOMMENDED CHANGE:

**Construct 55M of 3.7m Bit. Coat Corr. Metal Pipe @ Sta. 503+842**  
**@ 30 degree skew right.**

### SUMMARY OF COST ANALYSIS

	First Cost	O & M Costs (Present Worth)	Total LC Cost (Present Worth)
ORIGINAL DESIGN	\$ 195,000.00	\$ 3,000.00	\$ 198,000.00
RECOMMENDED DESIGN	\$ 118,000.00	\$ 3,000.00	\$ 118,000.00
ESTIMATED SAVINGS OR (COST)	\$ 77,000.00	\$ -	\$ 80,000.00

## **VALUE ENGINEERING RECOMMENDATION**

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IDENTIFICATION NUMBER: **Proposal No. 2; Team 5**

Page of

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### ADVANTAGES:

- 1 Easier, faster construction.**
- 2 Lesser Environmental Impact.**
- 3 Lesser initial and life cycle costs.**
- 4 Shortens structure length**

### DISADVANTAGES:

- 1 Shorter life span.**
- 2 Slightly higher maintenance**

### JUSTIFICATION:

**Alternate No. 1 will meet the required function of the component being changed, which is to allow water to pass from the north side of the roadway to the south side.**

**The construction of the 3.7m BCCM pipe is an easier and faster operation than the construction of the 3.6M x 2.4M box culvert. The less time spent in the construction process results in lesser impacts to the environment, not to mention lower labor costs as well as faster completion of the project without compromising the integrity of the project.**

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## VALUE ENGINEERING RECOMMENDATION

FORM 20 DEC 1996

### COST ESTIMATE - FIRST COST

IDENTIFICATION NUMBER: **Proposal No.2 Team 5** Page      of       
Cost X 1000

Cost Item	Units	Unit Cost		Original Design		Recommended Design	
		\$/Unit	Source Code	No. of Units	Total \$	No. of Units	Total \$
3.6 M x 2.4M Box Culvert	LS	\$ 195.00	1	1	\$ 195.00		
3.7 BCCM Pipe	M	1.6	*6			55	\$ 88.00
Headwalls	EA	15	1			2	\$ 30.00
			*6-Jason Garner, Contech, 241-5462				

- SOURCE CODE:
- |                          |   |  |
|--------------------------|---|--|
| 1. Project Cost Estimate | 4. Means Estimating Manual              | 7. Professional Experience<br>(List Job if applicable) |
| 2. CES Data Base         | 5. Richardson's                         | 8. Other Sources (specify)                             |
| 3. CACES Data Base       | 6. Vendor Lit Quote (list name/details) |  |

# VALUE ENGINEERING RECOMMENDATION

FORM 20 DEC 1996

## COST ESTIMATE - O & M (Life Cycle) COST

IDENTIFICATION NUMBER: **Proposal No. 2 Team 5** Page of

PRESENT WORTH METHOD

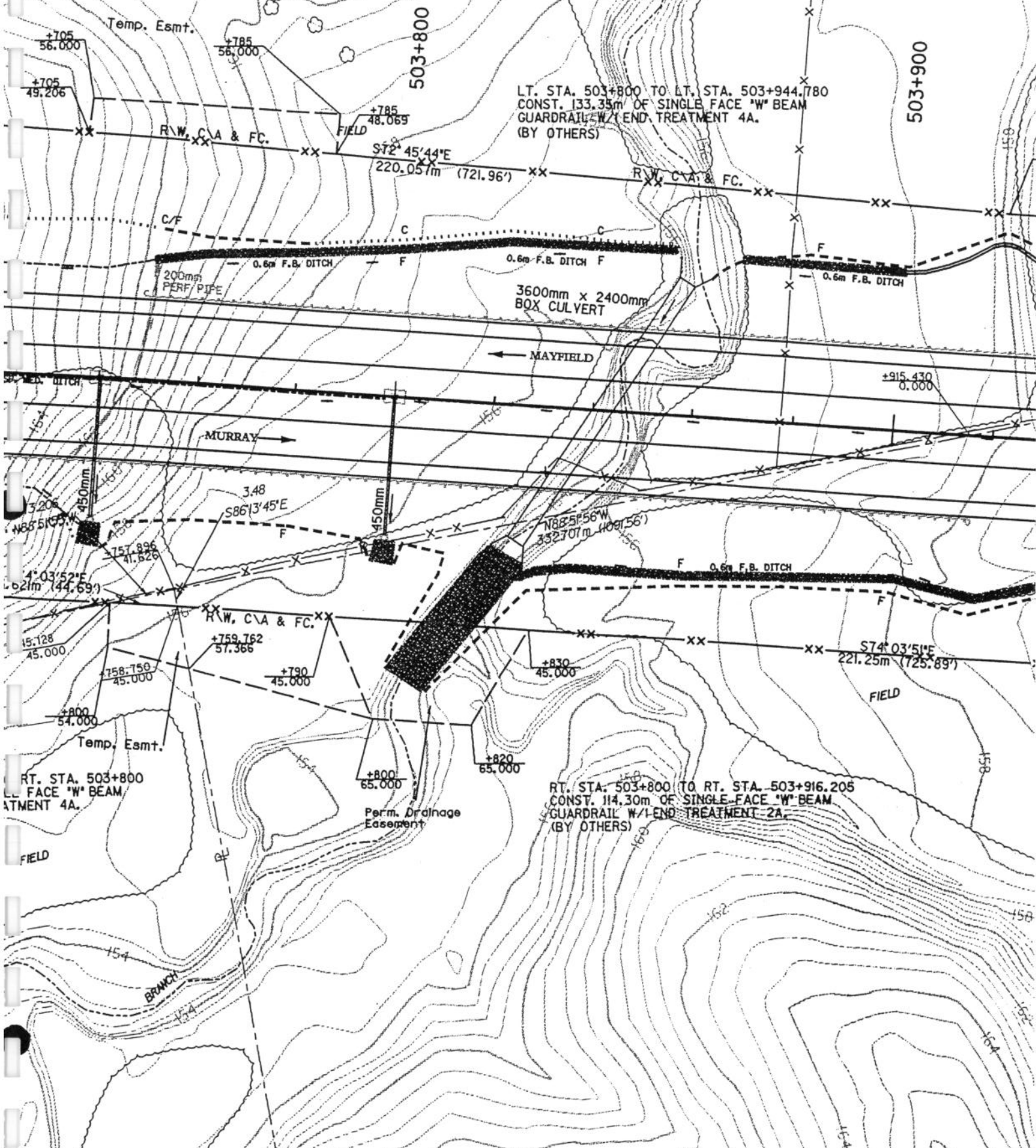
LIFE CYCLE PERIOD (YEARS) = 25 Years  
 ANNUAL PERCENTAGE RATE = 4%

\$ X 1000

Initial Costs				Original Design PW \$			Rec. Design PW \$
Construction				195			118
<b>Sub Totals of Initial Costs PW \$</b>				195			118
Later Costs Single Expenditure	In The Yr	PW Factor	Original Design		Recommended Design		
			Est \$	PW \$	Est. \$	PW\$	
<b>Sub Total of Single Expenditure Costs PW \$</b>				0			
Later Costs Annual Expense	For How Many Yrs	PW Factor	Original Design		Recommended Design		
			Est \$	PW \$	Est. \$	PW\$	
Maintenance	25	15.622	0.2	3		0.2	3
<b>Sub Totals of Annual Expense Costs PW \$</b>				3			3
<b>Totals PW \$ for Original &amp; Recommended</b>				<b>\$198</b>			<b>\$121</b>
<b>Total PW \$ Savings (or Added Cost) for Recommended Design</b>						<b>\$77</b>	

3.565-10 LI. STA. 503+800  
SINGLE FACE 'W' BEAM  
TREATMENT 2A.

# ORIGINAL DESIGN

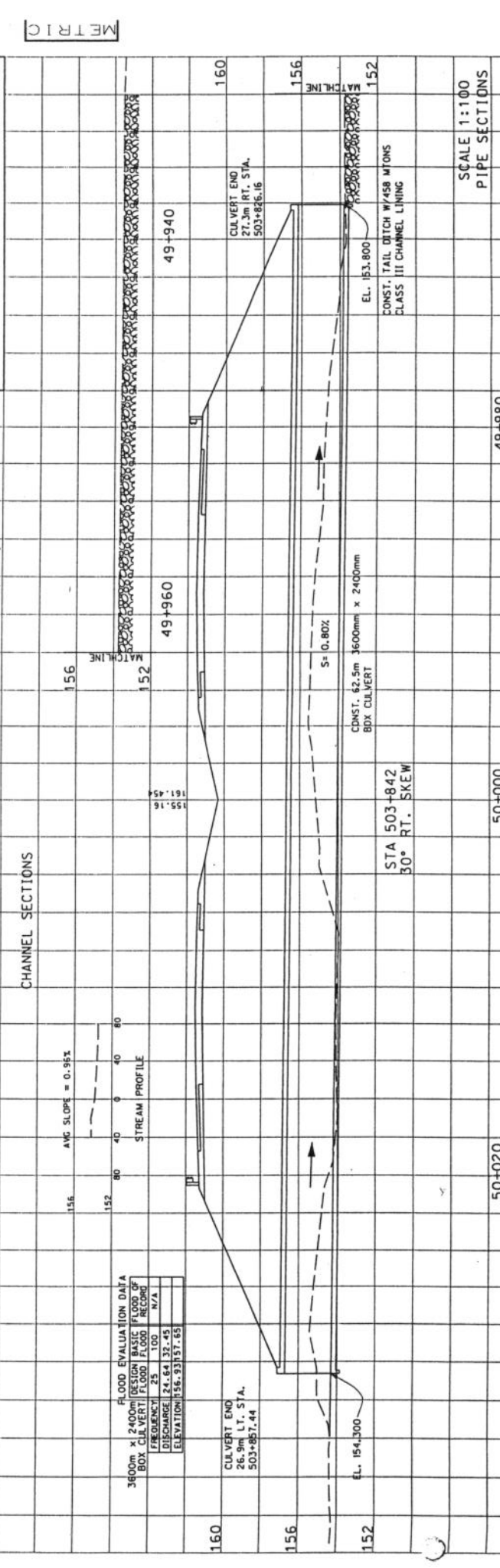
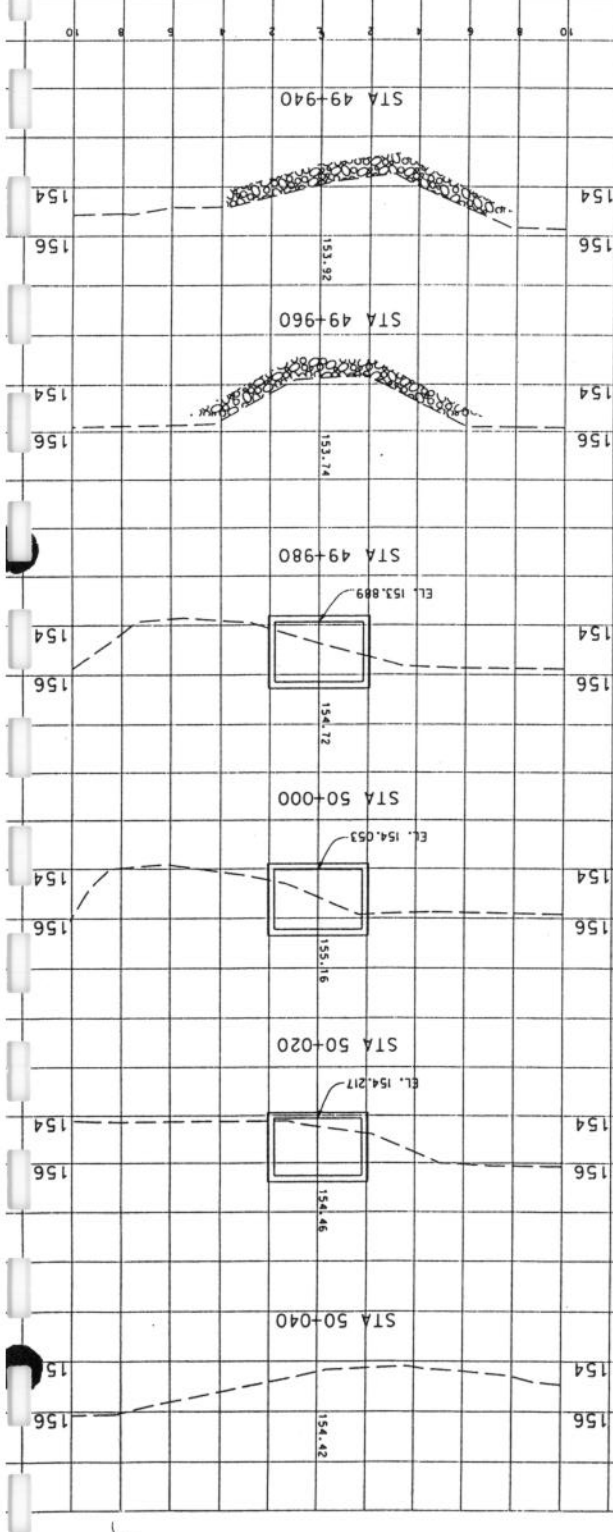
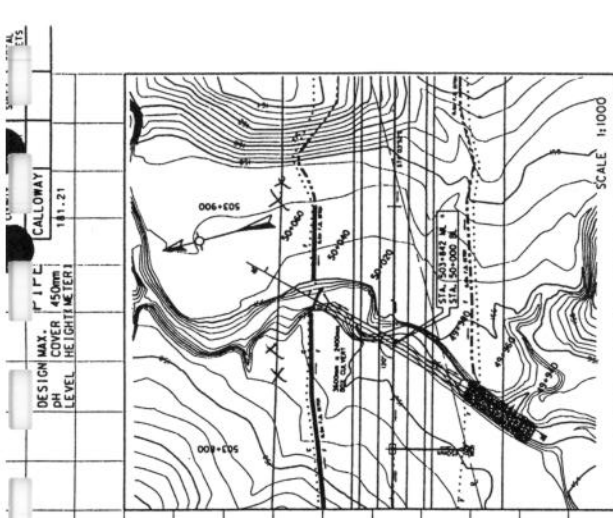


LT. STA. 503+800 TO LT. STA. 503+944.780  
CONST. 133.35m OF SINGLE FACE 'W' BEAM  
GUARDRAIL W/ END TREATMENT 4A.  
(BY OTHERS)

RT. STA. 503+800  
SINGLE FACE 'W' BEAM  
TREATMENT 4A.

RT. STA. 503+800 TO RT. STA. 503+916.205  
CONST. 114.30m OF SINGLE FACE 'W' BEAM  
GUARDRAIL W/ END TREATMENT 2A.  
(BY OTHERS)

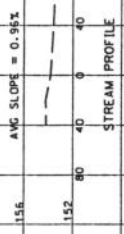




METRIC

FLOOD EVALUATION DATA

3600m x 2400m BOX CULVERT	DESIGN BASIC FLOOD OF 100 YRS
DISCHARGE	24.64 32.45
ELEVATION	156.93 157.65
FREQUENCY	25 100
N/A	N/A



CULVERT END  
26.9m LT. STA.  
503+857.44

CULVERT END  
27.3m RT. STA.  
503+856.16

STA 503+842  
30° RT. SKEW

CDNST. 62.5m  
BOX CULVERT

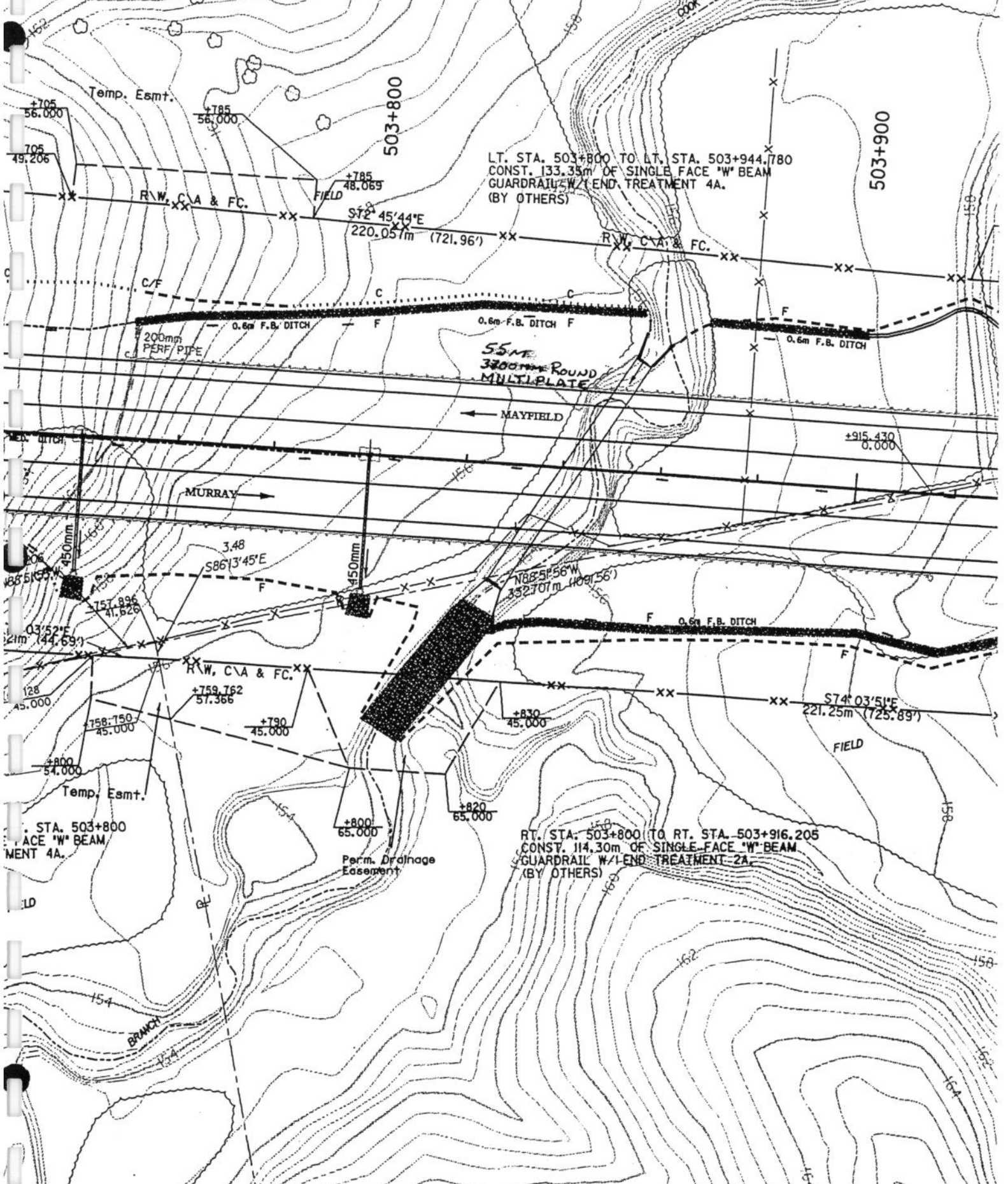
EL. 153.800  
CONST. TAIL DITCH W/45R MTOWS  
CLASS III CHANNEL LINING

SCALE 1:100  
PIPE SECTIONS

ORIGINAL DESIGN

503+800  
SINGLE-FACE 'W' BEAM  
TREATMENT 2A.

# PROPOSED DESIGN

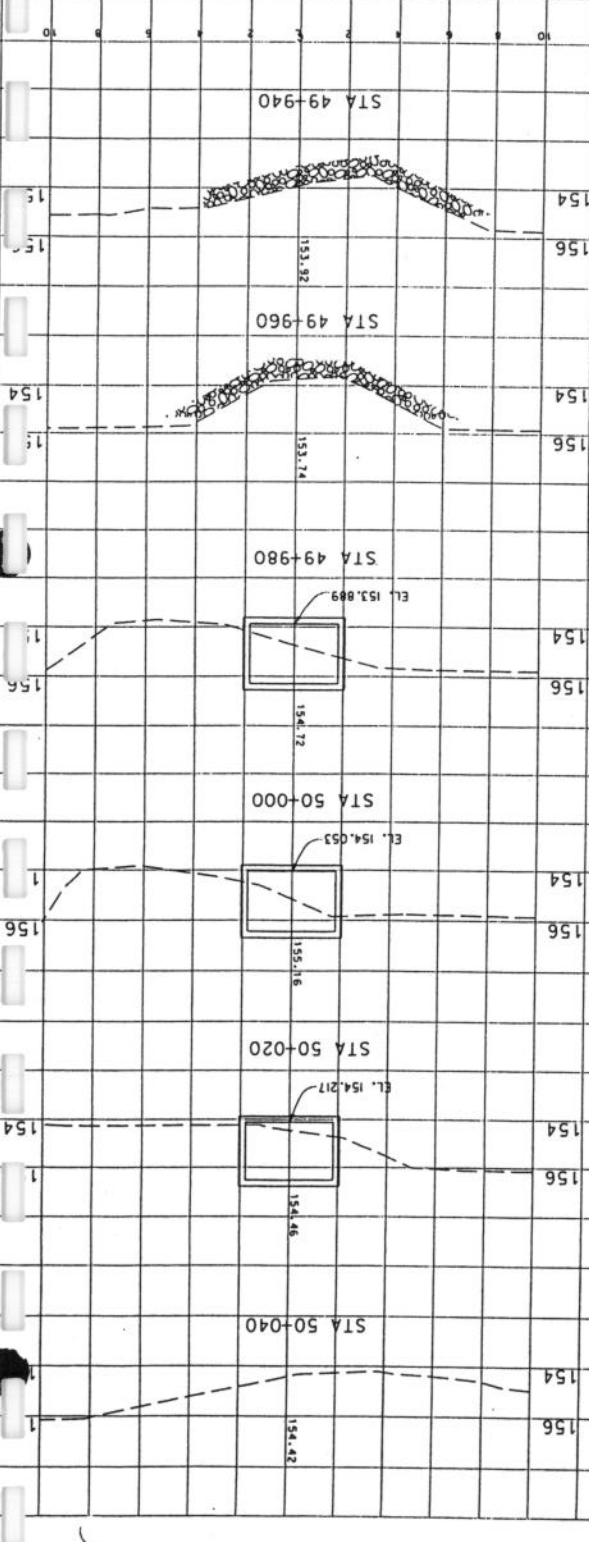
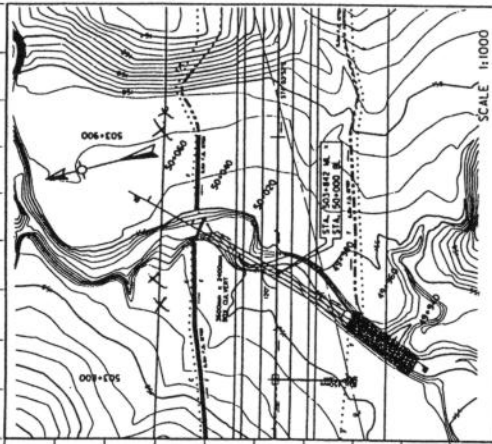


LT. STA. 503+800 TO LT. STA. 503+944.780  
CONST. 133.35m OF SINGLE-FACE 'W' BEAM  
GUARDRAIL W/ END TREATMENT 4A.  
(BY OTHERS)

LT. STA. 503+800  
FACE 'W' BEAM  
TREATMENT 4A.

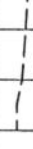
RT. STA. 503+800 TO RT. STA. 503+916.205  
CONST. 114.30m OF SINGLE-FACE 'W' BEAM  
GUARDRAIL W/ END TREATMENT 2A.  
(BY OTHERS)

ICON MAX COVER 1.50M  
PH LEVEL HEIGHT METER 1:11.21



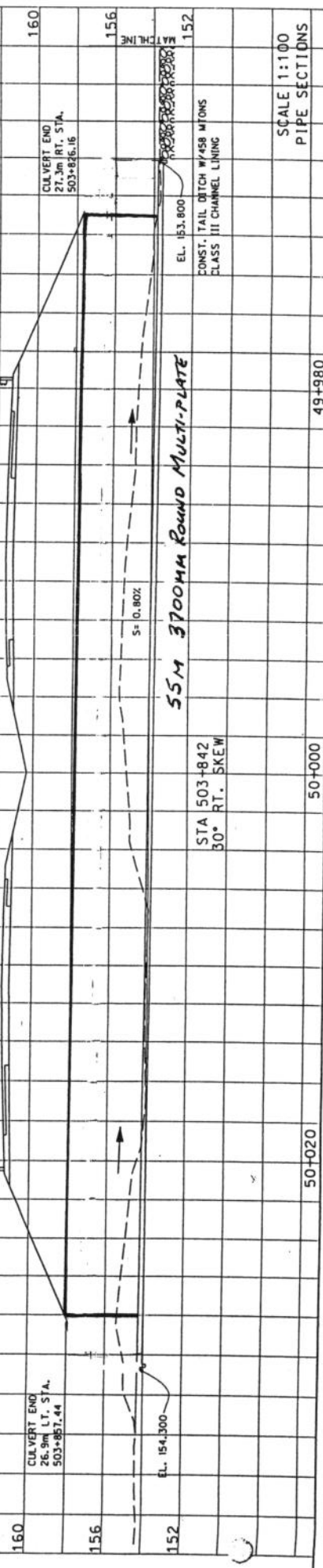
CHANNEL SECTIONS

AVG SLOPE = 0.95%



FLOOD EVALUATION DATA

3600m x 2400mm DESIGN BASIC FLOOD OF BOX CULVERT	FLOOD RECORD
FREQUENCY 25	100
DISCHARGE 24.64	32.45
ELEVATION 156.93	157.65
	N/A



55M 3700MM ROUND MULTI-PLATE

STA 503+842  
30° RT. SKEW

EL. 153.800  
CONST. TAIL DITCH W/458 MTONS CLASS III CHANNEL LINING

SCALE 1:100  
PIPE SECTIONS

PROPOSED DESIGN

# VALUE ENGINEERING RECOMMENDATION

FORM 20 DEC 1996

Page 1 of

PROJECT: **FD04 018 8515 014 D SEC III**  
LOCATION **Calloway County**  
STUDY DATE: **April 26, 1999 thru April 29, 1999**

IDENTIFICATION NUMBER: **Proposal No. 3 Team 5**  
FUNCTION OF COMPONENT BEING CHANGED: **Transporting Traffic**  
DESCRIPTIVE TITLE OF RECOMMENDATION: **Construct 2 lane paved roadway allowing for future widening to 4 lanes.**

## ORIGINAL DESIGN:

**Construct 4 - 3.6M lanes with 1.8M inside shoulder and 3.6M outside shoulder. Two lanes will be utilized for each direction of traffic flow and will be separated by a 12M median section.**

**Pavement Design has not been finalized. Assume that a 200mm DGA 75mm AC Base CI I with 30 mm of AC Surface Class I-O is constructed.**

## RECOMMENDED CHANGE:

**ADT does not warrant a 4 lane highway. The project will be graded to the ultimate 4 lane design with all structures, pipes, culverts, and entrances built. Only two lanes of the four lane section will be paved initially.**

### SUMMARY OF COST ANALYSIS

	First Cost	O & M Costs (Present Worth)	Total LC Cost (Present Worth)
ORIGINAL DESIGN	<b>\$3,783,000</b>	<b>\$494,000</b>	<b>\$4,277,000</b>
RECOMMENDED DESIGN	<b>\$2,015,000</b>	<b>\$2,172,000</b>	<b>\$4,187,000</b>
ESTIMATED SAVINGS OR (COST)	<b>\$1,768,000</b>	<b>-\$1,678,000</b>	<b>\$90,000</b>

## VALUE ENGINEERING RECOMMENDATION

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IDENTIFICATION NUMBER: Proposal No. 3 Team 5 Page of \_\_\_\_\_

### ADVANTAGES:

- 1 Initial construction cost is lower
- 2 Provide traffic relief to KY 121
- 3 Release money to construct other projects

### DISADVANTAGES:

- 1 Two lane -Two way section not as safe as four lane section
- 2 KYTC must plan for future lane construction
- 3 Bikeway planned for shoulder could not be included unless inside shoulder increased to 3.6 m (-\$123,700)
- 4 Less economic development

### JUSTIFICATION:

In a period of limited funds, revising the 4 lane section to 2 lane for entire project would allow the Cabinet to construct other projects. This change would result in a savings of \$ 1,1768,069 for section III. For the entire project length the savings are substantially greater.

The design ADT (3000) does not justify a 4 lane facility.

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# VALUE ENGINEERING RECOMMENDATION

FORM 20 DEC 1996

## COST ESTIMATE - O & M (Life Cycle) COST

IDENTIFICATION NUMBER: Proposal No. 3 Team 5 Page      of     

PRESENT WORTH METHOD  
 LIFE CYCLE PERIOD (YEARS) = 25  
 ANNUAL PERCENTAGE RATE = 4%

Initial Costs				Original Design PW \$		Rec. Design PW \$
4 lane				3783		
2 lane						2015
<b>Sub Totals of Initial Costs PW \$</b>				<b>\$3,783</b>		<b>\$2,015</b>
Later Costs Single Expenditure	In The Yr	PW Factor	Original Design		Recommended Design	
			Est \$	PW \$	Est. \$	PW\$
AC Overlay	10	0.6756	570	385	285	192
Construct 2 lanes	12	0.6246			3028	1891
<b>Sub Total of Single Expenditure Costs PW \$</b>				<b>\$385</b>		<b>\$2,083</b>
Later Costs Annual Expense	For How Many Yrs	PW Factor	Original Design		Recommended Design	
			Est \$	PW \$	Est. \$	PW\$
Maintenance	25	15622	7	109.4	3.5	54.68
	13	9.986			3.5	34.95
<b>Sub Totals of Annual Expense Costs PW \$</b>				<b>109</b>		<b>89.63</b>
<b>Totals PW \$ for Original &amp; Recommended</b>				<b>\$4,277</b>		<b>\$4,187</b>
<b>Total PW \$ Savings (or Added Cost) for Recommended Design</b>					<b>\$90</b>	

## VALUE ENGINEERING RECOMMENDATION

FORM 20 DEC 1996

### COST ESTIMATE - FIRST COST

IDENTIFICATION NUMBER: **Proposal No. 3 Team 5** Page of

Cost Item	Units	Unit Cost		Original Design		Recommended Design	
		\$/Unit	Source Code	No. of Units	Total \$	No. of Units	Total \$
DGA	Mton	15.7	1	73846	\$1,159,382	36923	\$579,691
TBM	Mton	18.77	1	176	\$3,304	88	\$1,652
AC Base CI CI	Mton	43.56	1	6929	\$301,827	3465	\$150,935
AC Surf CI AK/S	Mton	37.47	1	43745	\$1,639,125	21872	\$819,544
AC Base CI CI	Mton	37.47	1	12460	\$466,876	6280	\$235,312
AC Surf CI AK/S	Mton	51.04	1	3898	\$198,954	1949	\$99,477
Anti-Strip	Mton	0.15	1	67133	\$10,070	33566	\$5,035
Add. AC Surface	Mton	37.47	1			3299	

**SOURCE CODE:**

- |                          |   |                            |
|--------------------------|---|----------------------------|
| 1. Project Cost Estimate | 4. Means Estimating Manual              | 7. Professional Experience |
| 2. CES Data Base         | 5. Richardson's                         | (List Job if applicable)   |
| 3. CACES Data Base       | 6. Vendor Lit Quote (list name/details) | 8. Other Sources (specify) |

CONTECH Construction Products Inc.  
7025 W. Highway 22, Box #2, Suite #5, Crestwood, KY 40014

Phone: (502) 241-5462

Fax: (502) 241-0216

### FAX TRANSMITTAL

This fax consists of 5 pages, including this transmittal form.

DATE: 4/29/99

TO: Tom Jobe

FAX NUMBER (502) 564-3324

FROM: Jason Garner, Sales Engineer/Judy Snyder

RE: /

Tom,

I would not recommend a Pipe Arch in this situation  
because we have adequate headroom to put a round structure  
in place. With ~~plat~~ multi-plate pipe arches of this size we are  
limited to small cover heights no matter the gage. For the  
size you would need we are limited to 13' of cover. You have plenty  
of headroom to put a round pipe of 11' or 12' that will yield  
as much or more open area than what you have in place now





# QUOTATION

Quotation No.:

Sheet of:

## CONTECH CONSTRUCTION PRODUCTS INC.

Tom Jobe

DOT Dist. 4

E-town, Ky

Project

Jason Garner

Reply to:

Phone No.

Area Code (502) 241-5462

Date

4/29/99

Seller has based its quoted prices upon all of the (estimated, not guaranteed) quantities listed in this quotation. If Buyer elects to purchase from Seller only a portion of the material quoted, Seller shall have the right to adjust its prices to reflect the impact of all resulting cost.

Item No.	Approx. Quant.	Description	Unit	Unit Price
	200'	11' 10gauge Galv + Asphalt Coated	LF	193.00
	200'	11.5' 10gauge Galv + Asphalt Coated	LF	204.00
	200'	11' 8gauge Galv + Asphalt Coated	LF	223.00
	200'	11.5' 8gauge Galv + Asphalt Coated *	LF	234.00
	200'	13'3" x 9'4" 8gauge Galv + Asphalt Coated	LF	275.00
	200'	Assembly costs for 11' and 11.5' MP	LF	7800
		Minimum cover req. - 24"		
		* Max. allowable cover for MP Arch is 13'		
		* See attached tables for max cover for MP round pipe		

**NOTES:**

- Prices are F.O.B. origin with freight allowed to jobsite with unloading by others.
- Terms: 1/2%-10, NET 30 days from date of invoice, subject to credit approval.
- Sales tax is not included; add when applicable.

THIS QUOTATION CONTAINS THE PARTIES' ENTIRE AGREEMENT WITH RESPECT TO THE PURCHASE AND SALE OF THE PRODUCTS DESCRIBED ABOVE, AND SUPERSEDES ALL PREVIOUS COMMUNICATIONS. CONTECH'S OFFER TO SELL THE PRODUCTS DESCRIBED ABOVE IS EXPRESSLY CONDITIONAL UPON BUYER'S ASSENT TO THE CONDITIONS OF SALE (INCLUDING THOSE RELATING TO "WARRANTIES" AND "BUYER'S REMEDIES AND SELLER'S LIABILITY") THAT APPEAR ON THE REVERSE SIDE TO THIS FROM. BUYER'S SIGNATURE BELOW, OR ACCEPTANCE OF DELIVERY OF THE GOODS DESCRIBED ABOVE, SHALL BE DEEMED AN ACCEPTANCE OF THOSE CONDITIONS OF SALE. SELLER EXPRESSLY REJECTS ANY TERMS AND CONDITIONS THAT ARE DIFFERENT FROM OR IN ADDITION TO THE TERMS AND CONDITIONS SET FORTH ON THE FRONT SIDE AND REVERSE SIDE OF THIS QUOTATION.

The prices quoted above shall remain in effect for 30 days from the date of this Quotation. Seller reserves the right to adjust the prices after 30 days from the date of Quotation, but any such adjustment shall have no effect on the applicability of the Conditions of Sale set forth on the reverse side of this Quotation. Prices quoted apply only to the project specified herein.

### ACCEPTANCE

### CONTECH CONSTRUCTION PRODUCTS INC.

SUBJECT TO BEING AWARDED THIS CONTRACT, WE HEREBY ORDER THE MATERIAL DESCRIBED ABOVE, AT THE PRICES SPECIFIED, SUBJECT TO ALL TERMS AND CONDITIONS APPEARING ON THE FRONT AND REVERSE SIDE OF THIS QUOTATION.

Company \_\_\_\_\_

By \_\_\_\_\_

Title \_\_\_\_\_ Date \_\_\_\_\_

By Jason Garner

Title \_\_\_\_\_



Date 4/22/99

To \_\_\_\_\_

Copies \_\_\_\_\_

From \_\_\_\_\_

Subject \_\_\_\_\_

The following are the open areas for the multi-plate I just referenced:

11' - 96 ft<sup>2</sup>

11.5' - 104.7 ft<sup>2</sup>

12' - 114.2 ft<sup>2</sup>

Going to a round Multi-Plate is also going to save you on ~~so~~ material costs and erection costs, not to mention allow you to put alot more cover on the pipe.

Please give me a call if you have questions.

Thanks

# Height-of-Cover limits<sup>(1)</sup> Pipe and Arches (in feet)

Table 20. H 20, HS 20, and HS 25 Live Load—Round Pipe and Arches

Span, Feet	Minimum Cover, Inches <sup>(2)</sup>	Maximum Cover, Feet						
		Specified Thickness, Inches <sup>(2)(3)</sup>						
		0.111 (12 Ga.)	0.140 (10 Ga.)	0.170 (8 Ga.)	0.188 (7 Ga.)	0.218 (5 Ga.)	0.249 (3 Ga.)	0.280 (1 Ga.)
5.0	12	81	120	157	176	205	234	264
5.5		74	110	143	159	186	213	240
6.0		68	101	131	146	171	195	220
6.5		62	92	121	135	157	180	203
7.0		58	86	112	125	146	168	188
7.5		54	80	105	117	137	156	176
8.0	12	51	75	98	111	128	146	165
8.5	24	48	71	92	103	120	137	155
9.0		45	67	87	97	114	130	146
9.5		43	63	82	92	108	123	139
10.0		40	60	78	87	102	117	132
10.5		39	57	74	83	97	112	126
11.0		37	54	71	79	93	106	120
11.5		35	52	68	76	89	102	114
12.0		34	50	65	73	85	97	110
12.5		32	48	63	70	82	93	106
13.0		31	46	60	67	79	90	101
13.5		30	44	58	65	76	87	98
14.0		29	43	56	62	73	83	94
14.5		28	41	54	60	70	80	91
15.0		27	40	52	58	68	78	88
15.5		26	39	50	56	66	75	85
16.0	24	25	37	49	54	64	73	82
16.5	36	[24] <sup>(4)</sup>	36	47	53	62	71	80
17.0		[24]	35	45	51	60	68	77
17.5		[23]	34	43	49	57	65	74
18.0		[23]	33	42	47	55	63	71
18.5		[21]	[32]	40	45	52	60	68
19.0		[18]	[31]	38	43	50	58	65
19.5			[30]	37	41	48	55	62
20.0			[28]	35	40	47	53	60
20.5			[27]	[34]	38	45	51	57
21.0			[27]	[32]	36	43	49	56
21.5			[25]	[31]	[35]	41	47	53
22.0			[21]	[31]	[33]	39	45	51
22.5				[28]	[32]	38	43	49
23.0				[27]	[31]	36	41	46
23.5	36			[22]	[29]	[34]	40	45
24.0	42			[21]	[28]	[33]	38	43
24.5	48			[20]	[23]	[32]	36	41
25.0					[22]	[31]	[35]	39
25.5					[21]	[25]	[33]	37
26.0	48					[24]	[32]	35

<sup>(1)</sup> Handbook of Steel Drainage and Highway Construction Products, American Iron and Steel Institute.

<sup>(2)</sup> Cover is measured from top of pipe to bottom of flexible pavement or top of rigid pavement.

<sup>(3)</sup> As cover levels approach the maximum, quality backfill materials and their compaction levels become increasingly important to performance.

<sup>(4)</sup> Bracketed values (i.e. [24]) must be arch structures only.

Higher allowable fill heights are possible if 0.3125-inch-thick or 0.375-inch-thick plate is used. However, maximum span is limited to 26 feet for standard design.

**General note**

Height-of-Cover Tables 20 through 24 are presented for the designer's convenience for use in routine applications.

They are based on the design procedures presented herein, using the following values for the soil and steel parameters:

Unit weight of soil—120 Lbs./Ft.<sup>3</sup>

Relative density of compacted backfill—minimum 85% standard per AASHTO T 99

Yield point of steel—33,000 psi



Three 180-inch-diameter MULTI-PLATE structures were installed at Colorado's Lowry Field Airport in 1942. Full bevel ends required reinforced concrete end treatment to resist the hydraulic forces.

# Height-of-Cover limits<sup>(1)</sup> Pipe-Arches (in feet)

Table 22. Pipe-Arches

Size		H20 and H 25 Live Load <sup>(2)</sup>			E 80 Live Load <sup>(3)</sup>			
		Minimum Specified Thickness Required, Inches	Minimum Cover, Inches	Maximum Height-of-Cover over Pipe-Arch for Corner Bearing Pressures of 2 Tons per Ft. <sup>2</sup>	Minimum Specified Thickness Required, Inches	Minimum Cover, Inches	Maximum Height-of-Cover over Pipe-Arch for the Following Corner Bearing Pressures in Tons per Ft. <sup>2</sup>	
2 Tons	3 Tons							
R <sub>c</sub> Corner Radius = 18"	6-1	0.111	12	19	0.111	24	19	—
	6-4			18			15	—
	6-9			17			15	—
	7-0			16			13	—
	7-3			16			12	—
	7-8			15			12	—
	7-11			14			11	—
	8-2			14			10	—
	8-7			13			6	—
	8-10			13			5	—
	9-4			12			—	17
	9-6			12			—	16
	9-9			12			—	16
	10-3			10			—	15
	10-8			8			—	13
	10-11			8			—	13
	11-5			9			—	12
	11-7			9			—	12
R <sub>c</sub> Corner Radius = 31"	11-10	0.140	7	9	0.140	36	—	12
	12-4			6			—	6
	12-6			6			—	6
	12-8			6			—	6
	12-10			6			—	6
	13-3			13 <sup>(4)</sup>			—	9 <sup>(4)</sup>
	13-6			13			—	8
	14-0			12			—	6
	14-2			12			—	6
	14-5			12			—	6
	14-11			12			—	6
	15-4			11			—	6
	15-7			11			—	6
	15-10			10			—	6
	16-3			10			—	14
	16-6			10			—	14
	17-0			10			—	13
	17-2			10			—	13
17-5	10	—	13					
17-11	10	—	11					
18-1	9	—	11					
18-7	9	—	11					
18-9	9	—	11					
19-3	9	—	10					
19-6	9	—	10					
19-8	9	—	10					
19-11	9	—	10					
20-5	8	—	10					
20-7	8	—	10					

**General note**

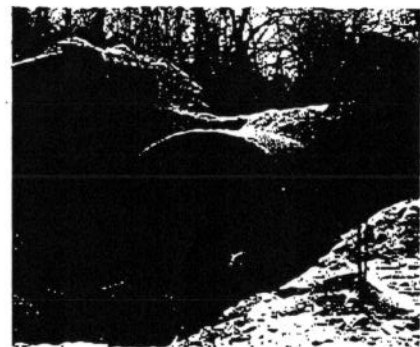
Height-of-Cover Tables 20 through 24 are presented for the designer's convenience for use in routine applications.

They are based on the design procedures presented herein, using the following values for the soil and steel parameters:

Unit weight of soil—120 Lbs./Ft.<sup>3</sup>

Relative density of compacted backfill—minimum 85% standard per AASHTO T 99

Yield point of steel—33,000 psi



MULTI-PLATE Pipe-Arch to replace a deteriorating bridge.

<sup>(1)</sup> Handbook of Steel Drainage and Highway Construction Products, American Iron and Steel Institute.  
<sup>(2)</sup> H 20 and H 25 cover is measured from top of pipe to bottom of flexible pavement or top of rigid pavement.  
<sup>(3)</sup> For E 80, cover is measured from top of pipe to bottom of railroad tie.  
<sup>(4)</sup> Maximum cover increases due to R<sub>c</sub>/R<sub>s</sub>.

As cover levels approach the maximum, quality backfill materials and their compaction levels become increasingly important to performance. Higher allowable fill heights are possible if 0.3125-inch-thick or 0.375-inch-thick plate is used. However, maximum span is limited to 26 feet for standard design.

### DESIGN EXECUTIVE SUMMARY

County CALLOWAY Item No. 1-181.21  
 Federal Project No. \_\_\_\_\_ UPN FD04 018 8518 014 D SECIII  
FD04 018 8515 015 D SEC IV

**Project Description:**

NEW ROUTE FROM MAYFIELD, KY TO US 641 NORTH OF MURRAY , KY.  
 SEC. III FROM RT 1836 NORTH OF COLDWATER TO NEAR KY 299  
 SEC. IV FROM NEAR KY 299 TO US 641

**Roadway Classification:**

Local \_\_\_\_\_ Collector \_\_\_\_\_ Aterial X  
 Interstate \_\_\_\_\_ Rural X Urban \_\_\_\_\_  
 ADT (1993) 2300(SECIV) ADT (2015 ) 3600(SECIV) DHV (2015 ) 430(SECIV)  
 Posted Speed Limit: 55 (rural) X 35 (urban) \_\_\_\_\_

Other (specify) \_\_\_\_\_

Selected Design Speed 100 km/hr

\_\_\_\_\_ Concurrence in a reduced design speed to be obtained from Director of Design

\_\_\_\_\_ Exception to design speed criterial will have to be obtained from FHWA

DESIGN CRITERIA	REQUIRED	UTILIZED	EXISTING
Number of Lanes	<u>4</u>	<u>4</u>	<u>N/A</u>
Pavement Width	<u>3.6m</u>	<u>3.6m</u>	<u>N/A</u>
Shoulder Width, Slope	<u>1.8m @ 4% LT</u> <u>3.6m @ 4% RT</u>	<u>1.8m @ 4% LT</u> <u>3.6m @ 4% RT</u>	<u>N/A</u>
Ditch Width, Slope	<u>5.4m @ 1:6</u>	<u>5.4m @ 1:6</u>	<u>N/A</u>
Bridge Width	<u>12.6m</u>	<u>12.6m</u>	
Earth Cut Slope	<u>1:4 (1:2 over <sup>3</sup>4m)</u>	<u>1:4 (1:<sup>2</sup>/<sub>3</sub> over <sup>3</sup>4m)</u>	
Fill Slope	<u>1:4 (1:2 over <sup>3</sup>4m)</u>	<u>1:4 (1:<sup>2</sup>/<sub>3</sub> over <sup>3</sup>4m)</u>	
<del>Minimum</del> <u>min. Radius</u>	<u>395m</u>	<u>600m</u>	
Maximum Grade	<u>4%</u>	<u>2.5%</u>	
<del>Minimum</del> <u>Maximum Sight Distance</u>	<u>160m</u>	<u>210m</u>	

Access Control Type Partial Controlled

Environmental Action \_\_\_\_\_ Approval Date \_\_\_\_\_

Existing Pavement Depth New Route

- Attachments:
- (1) Provide map showing project location
  - (2) Discussion of all considered alternates, including Do Nothing, and a brief Description of maintenance of traffic schemes
  - (3) 8 1/2" x 11" Typical Section

Submitted By: Luigi T. Bripp, P.E. 12/22/97  
District Preconstruction Engineer Date

Recommended By: Stephen C. Hoeyler 2/2/98  
Location Engineer Date

Approved By: David Kratt 4/28/98  
Acting T.E.B.M. for Location Date

Comments:

John B. Sacksteder 4/30/98  
Director, Division of Design Date

## DISCUSSION OF ALTERNATES

Three build alternates were considered. All begin about 200 meters west of KY 1836 about 0.6 km north of the community of Coldwater and end at US 641 about 2.6 km north of the KY 121/US 641 junction at Murray. Each generally parallels the route of KY 121. All alternatives will require crossing both the west fork of Clark River and the east fork of Rockhouse Creek. The table below compares the three build alternates.

**Alternate "A":** Alternate "A" generally follows the north edge of the project corridor. It is the straightest of all alternates but requires relocation of several blue line streams. It is within 1000 meters of the runway end of the Kyle Oakly Airport. One TVA steel transmission tower would be within the right-of-way.

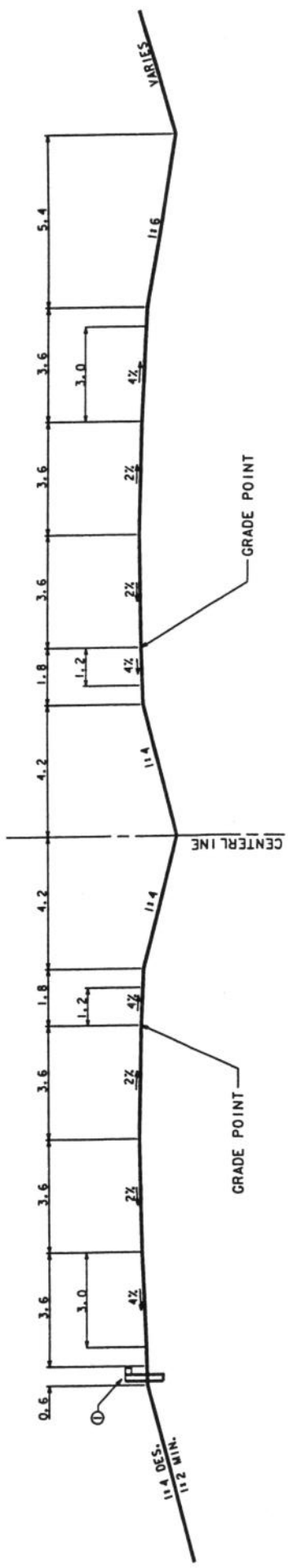
**Alternate "B":** Alternate "B" is generally along the southern edge of the project corridor and is a more curved alignment to avoid blue line stream impact. It is over 1300 meters from the airport. While it passes under a TVA electric transmission line, all towers will be outside the right-of-way. Alternate "B" is closest to the North Calloway Elementary School.

**Alternate "B-C-A":** Alternate "B-C-A" was chosen by the Preliminary Line and Grade review team as the preferred alignment. It is a combination of alternates "A & B" and combines the advantages of both. It avoids cemeteries, minimizes stream impact, and is furthest from both the airport and the school.

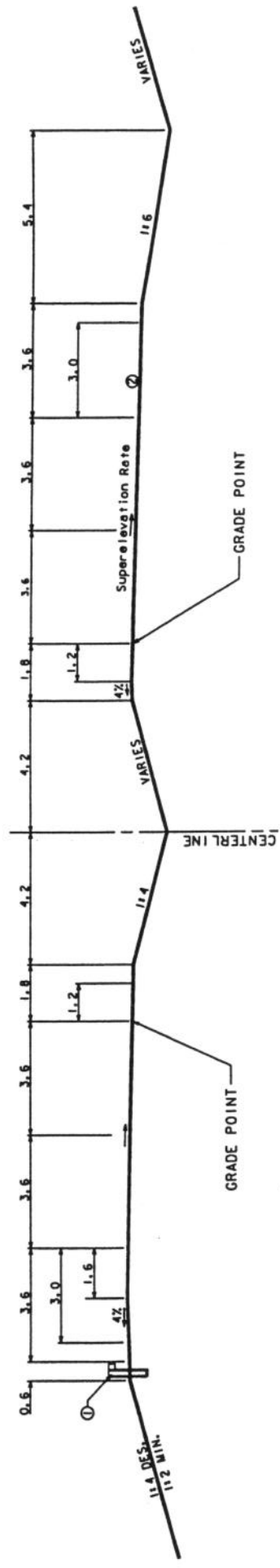
	A	B	B-C-A
Construction Cost	\$29,900,000	\$29,200,000	\$28,900,000
Number Relocations	4	5	3
Number Cemeteries	1	0	0
Utilities	1,160,000	990,000	1,100,000
Right-of-way			4,600,000

**Do-Nothing:** The Do Nothing alternate would require that increasing volumes of traffic, with associated deterioration in level of service, remain on the 2-laned KY 121.

**Traffic Maintenance:** Since this project is on new alignment, traffic maintenance issues will be limited to intersected local roads. Most approach roads will be crossed at near right angles and close to their present grade; therefore approach work will be of short lengths and duration. Most approaches can be constructed part width. If an approach is closed during construction, the contractor will be required to maintain traffic on an adjacent approach. Brinn Road, which serves the North Calloway Elementary School will not be closed during the school year.



NORMAL SECTION



SUPERELEVATED SECTION

NEW CONSTRUCTION : Grade, Drain and Pavement

NOTE: SEE CROSS SECTIONS FOR SLOPES OUTSIDE THE LIMITS OF THE SHOULDER

- ① SHOULDERS SHALL BE WIDENED 0.6m WHERE GUARDRAIL IS TO BE INSTALLED
- ② SUPERELEVATED SHOULDERS SHALL BE CONSTRUCTED TO STANDARD SUPERELEVATION, EXCEPT NOT FLATTER THAN THE SLOPES INDICATED FOR NORMAL SHOULDERS.

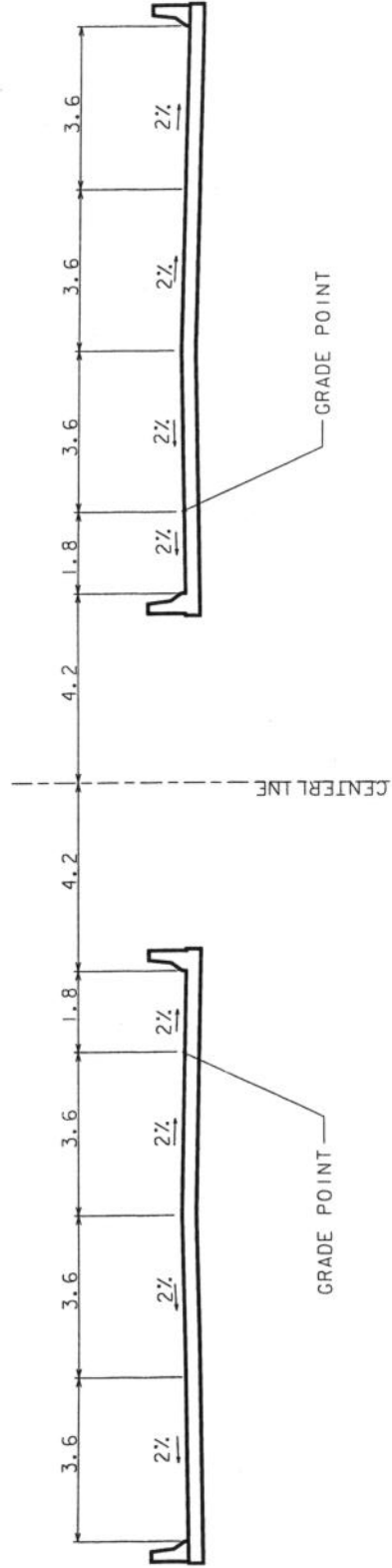
NO SCALE

TYPICAL SECTION SHEET



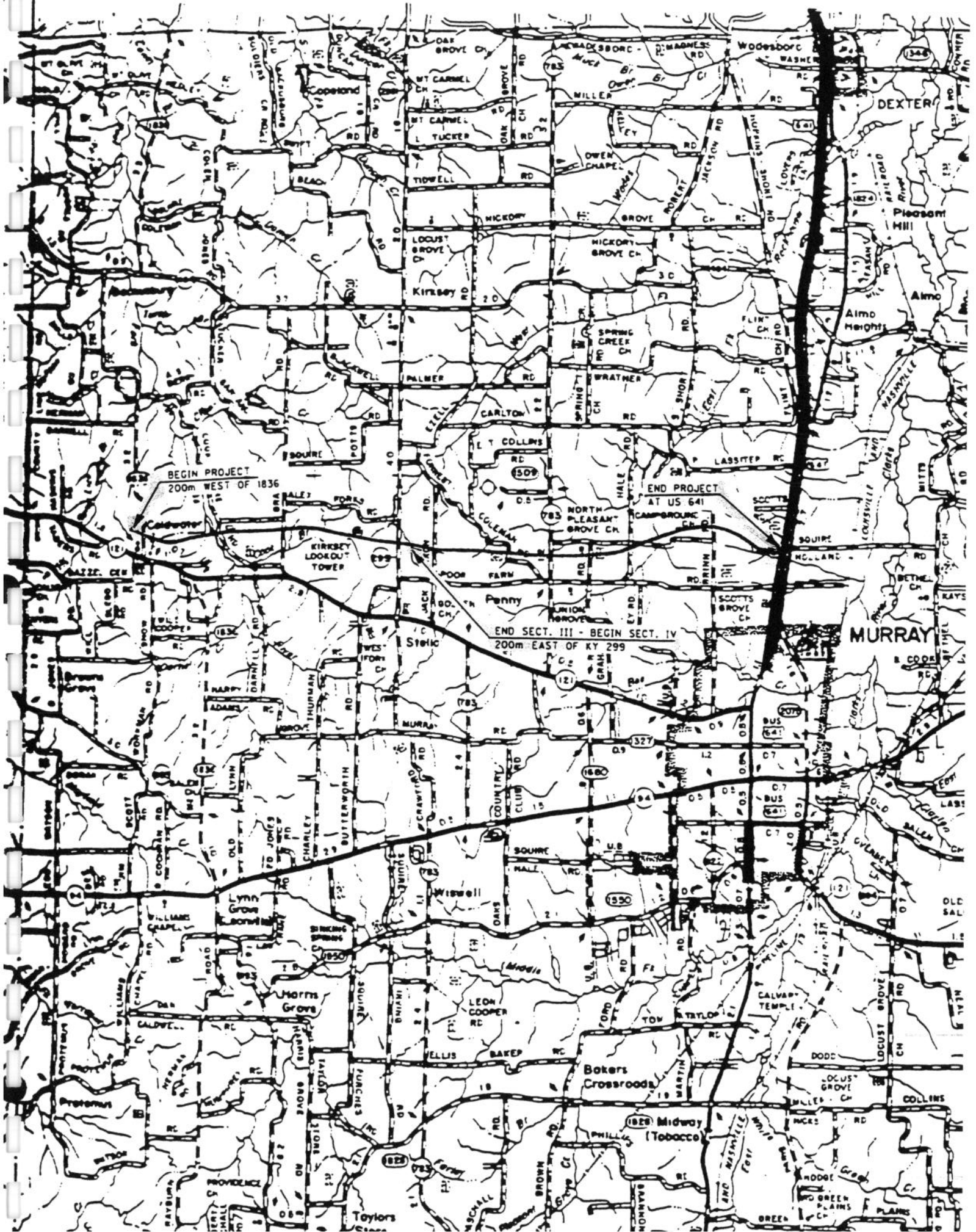
COUNTY	SHEET NO.	TOTAL SHEETS
CALIFORNIA		

METRIC



BRIDGE SECTION

NO SCALE



BEGIN PROJECT  
200m WEST OF 1836

END PROJECT  
AT US 641

END SECT. III - BEGIN SECT. IV  
200m EAST OF KY 299

MURRAY

DEXTER

Almo

Almo Heights

BETHLE

BETHLE

OLD SAL

OLD SAL

COLLINS

Midway  
(Tobacco)

Bokers  
Crossroads

LEON  
COOPER  
RD

Widwell

SOURCE  
HALL

COUNTRY  
CLUB

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KIRKSEY  
LOOKOUT  
TOWER

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TRANSMITTAL MEMORANDUM 99-01

MEMO TO: Design Consultants

FROM: Stephen E. Goodpaster  
Director  
Division of Bridge Design *SEG*

DATE: February 11, 1999

SUBJECT: Unit Prices for Preparing 1999  
Structure Cost Estimates

Attached is a list of unit prices for items commonly used in structures. This 1999 Unit Price List is to be used for the preparation of structure estimates until the next update.

Drilled shaft unit prices are based upon average bid prices for all projects over the last four years. These are listed for information only. Drilled shaft contractors may provide more realistic prices for site-specific conditions.

Please address any questions to this office.

SEG/WHH/rrm

Attachments

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ENGLISH/METRIC UNIT PRICES FOR PREPARING STRUCTURE COST ESTIMATES IN 1999					
		ENGLISH	ENGLISH	METRIC	METRIC
COD	ITEM DESCRIPTION	UNIT	UNIT PRICE	UNIT	UNIT PRICE
	1 DGA Base	Tons	\$14.00	M Ton	\$15.00
2231	Structure Granular Backfill	Cu. Yd.	\$29.00	Cu. M	\$38.00
2355	Guardrail Steel W Beam-S Face A	Lin. Ft.	\$26.00	Meter	\$85.00
2403	Remove Concrete Masonry	Cu. Yd.	\$170.00	Cu. M	\$222.00
2596	Fabric-Geotextile Type I	Sq. Yd.	\$1.50	Sq. M	\$1.80
2597	Fabric-Geotextile Type II	Sq. Yd.	\$1.50	Sq. M	\$1.80
2598	Fabric-Geotextile Type III	Sq. Yd.	\$1.50	Sq. M	\$1.80
2599	Fabric-Geotextile Type IV	Sq. Yd.	\$1.50	Sq. M	\$1.80
2998	Masonry Coating	Sq. Yd.	\$6.50	Sq. M	\$8.00
8001	Structure Excavation (Common)	Cu. Yd.	\$17.00	Cu. M	\$22.00
8002	Structure Excavation (Solid Rock)	Cu. Yd.	\$38.00	Cu. M	\$50.00
8016	Reinf. Concrete Slope Wall 6"/150 MM	Sq. Yd.	\$45.00	Sq. M	\$54.00
8018	Retaining Wall	Sq. Ft.	\$40.00	Sq. M	\$430.00
8019	Cyclopean Stone Rip Rap	Tons	\$25.00	M Ton	\$28.00
8020	Crushed Aggregate Slope Protection	Tons	\$20.00	M Ton	\$22.00
8033	Test Pile	Lin. Ft.	\$36.00	Meter	\$118.00
8046	Piles Steel (HP 12 x 53)/(HP 310 x 79)	Lin. Ft.	\$30.00	Meter	\$98.00
8050	Piles Steel (HP 14 x 73)/(HP 360 x 108)	Lin. Ft.	\$35.00	Meter	\$115.00
8051	Piles Steel (HP 14 x 89)/(HP 360 x 132)	Lin. Ft.	\$39.00	Meter	\$128.00
8060	Piles-Precast Concrete 14"/355 MM	Lin. Ft.	\$31.00	Meter	\$102.00
8094	Pile Points 12"/310 MM	Each	\$100.00	Each	\$100.00
8095	Pile Points 14"/360 MM	Each	\$115.00	Each	\$115.00
8100	Concrete Class "A"	Cu. Yd.	\$330.00	Cu. M	\$432.00
8104	Concrete Class "AA"	Cu. Yd.	\$350.00	Cu. M	\$458.00
8105	Concrete Class "AAA"	Cu. Yd.	\$400.00	Cu. M	\$524.00
8150	Steel Reinforcement	Lbs.	\$0.60	Kg.	\$1.30
8151	Steel Reinforcement Epoxy Coated	Lbs.	\$0.65	Kg.	\$1.40
8160	Structural Steel (Steel Superstructure)	Lbs. *	\$1.10	Kg.*	\$2.40
8160	Structural Steel-Armored Edges, Drains	Lbs. *	\$2.25	Kg.*	\$5.00
8469	Expansion Dam 1 1/2"/40 MM Neoprene	Lin. Ft.	\$75.00	Meter	\$246.00
8470	Expansion Dam 2"/50 MM Neoprene	Lin. Ft.	\$90.00	Meter	\$295.00
8471	Expansion Dam 2 1/2"/60 MM Neoprene	Lin. Ft.	\$110.00	Meter	\$361.00
8472	Expansion Dam 4"/100 MM Neoprene	Lin. Ft.	\$130.00	Meter	\$426.00
8475	Expansion Dam 1 1/2"/40 MM Silicone	Lin. Ft.	\$90.00	Meter	\$295.00
8500	Approach Slab	Sq. Yd.	\$110.00	Sq. M	\$132.00
8526	Concrete Class "AA" Full Depth Patch	Cu. Yd.	\$525.00	Cu. M	\$685.00
8534	Concrete Overlay-Latex	Cu. Yd.	\$750.00	Cu. M	\$980.00
8535	Concrete Overlay-Portland Cement	Cu. Yd.	\$750.00	Cu. M	\$980.00
8549	Blast Cleaning	Sq. Yd.	\$4.50	Sq. M	\$5.40
8551	Machine Prep of Existing Slab	Sq. Yd.	\$10.00	Sq. M	\$12.00

ENGLISH/METRIC UNIT PRICES FOR PREPARING STRUCTURE COST ESTIMATES IN 1999					
COD	ITEM DESCRIPTION	ENGLISH UNIT	ENGLISH UNIT PRICE	METRIC UNIT	METRIC UNIT PRICE
8632	Precast PCI-Beam Type II/Type 2 (915 MM)	Lin. Ft.	\$90.00	Meter	\$295.00
8633	Precast PCI-Beam Type III/Type 3 (1145 MM)	Lin. Ft.	\$90.00	Meter	\$295.00
8634	Precast PCI-Beam Type IV/Type 4 (1370 MM)	Lin. Ft.	\$100.00	Meter	\$328.00
8635	Precast PCI-Beam 66"/Type 6 (1675 MM)	Lin. Ft.	\$130.00	Meter	\$427.00
8636	Precast PCI-Beam 60"/Type 5 (1525 MM)	Lin. Ft.	\$120.00	Meter	\$394.00
8637	Precast PCI-Beam 72"/Type 7 (1830 MM)	Lin. Ft.	\$135.00	Meter	\$443.00
8638	Precast PCI-Beam 78"/Type 8 (1980 MM)	Lin. Ft.	\$140.00	Meter	\$460.00
8639	Precast PCI-Beam 84"/Type 9 (2135 MM)	Lin. Ft.	\$160.00	Meter	\$525.00
8651	Precast PC Box Beam, B 12-48/B 305	Lin. Ft.	\$130.00	Meter	\$426.00
8652	Precast PC Box Beam, B 17-48/B 430	Lin. Ft.	\$130.00	Meter	\$426.00
8653	Precast PC Box Beam, B 21-48/B 535	Lin. Ft.	\$135.00	Meter	\$443.00
8654	Precast PC Box Beam, B 27-48/B 685	Lin. Ft.	\$135.00	Meter	\$443.00
8655	Precast PC Box Beam, B 33-48/B 840	Lin. Ft.	\$145.00	Meter	\$476.00
8656	Precast PC Box Beam, B 42-48/B 1065	Lin. Ft.	\$145.00	Meter	\$476.00
8661	Precast PC Box Beam, CB 12-48/CB 305	Lin. Ft.	\$130.00	Meter	\$426.00
8662	Precast PC Box Beam, CB 17-48/CB 430	Lin. Ft.	\$130.00	Meter	\$426.00
8663	Precast PC Box Beam, CB 21-48/CB 535	Lin. Ft.	\$135.00	Meter	\$443.00
8664	Precast PC Box Beam, CB 27-48/CB 685	Lin. Ft.	\$135.00	Meter	\$443.00
8665	Precast PC Box Beam, CB 33-48/CB 840	Lin. Ft.	\$145.00	Meter	\$476.00
8666	Precast PC Box Beam, CB 42-48/CB 1065	Lin. Ft.	\$145.00	Meter	\$476.00
8667	Spread Precast PC Box Beam, SB 12-48/SB 305	Lin. Ft.	\$150.00	Meter	\$490.00
8668	Spread Precast PC Box Beam, SB 17-48/SB 430	Lin. Ft.	\$150.00	Meter	\$490.00
8669	Spread Precast PC Box Beam, SB 21-48/SB 535	Lin. Ft.	\$150.00	Meter	\$490.00
8670	Spread Precast PC Box Beam, SB 27-48/SB 685	Lin. Ft.	\$150.00	Meter	\$490.00
8671	Spread Precast PC Box Beam, SB 33-48/SB 840	Lin. Ft.	\$150.00	Meter	\$490.00
8672	Spread Precast PC Box Beam, SB 42-48/SB 1065	Lin. Ft.	\$150.00	Meter	\$490.00
8710	Chain Link Fence 4 Ft./1.2 M	Lin. Ft.	\$20.00	Meter	\$66.00
8711	Chain Link Fence 6 Ft./1.8 M	Lin. Ft.	\$25.00	Meter	\$82.00
8712	Chain Link Fence 8 Ft./2.4 M	Lin. Ft.	\$30.00	Meter	\$98.00
8713	Chain Link Fence 9 Ft./2.7 m	Lin. Ft.	\$40.00	Meter	\$131.00
8801	Guardrail-Steel W BM-S Face BR	Lin. Ft.	\$60.00	Meter	\$196.00
8820	Drain Pipe 6"/150 MM	Lin. Ft.	\$70.00	Meter	\$230.00
8821	Drain Pipe 8"/200 MM	Lin. Ft.	\$70.00	Meter	\$230.00
	Drilled Shaft-36"/910mm, Common	Lin. Ft.	\$120.00	Meter	\$395.00
	Drilled Shaft-36"/910mm, Rock	Lin. Ft.	\$390.00	Meter	\$1,280.00
	Drilled Shaft-48"/1220mm, Common	Lin. Ft.	\$280.00	Meter	\$920.00
	Drilled Shaft-48"/1220mm, Rock	Lin. Ft.	\$770.00	Meter	\$2,525.00
	Drilled Shaft-60"/1520mm, Common	Lin. Ft.	\$530.00	Meter	\$1,740.00
	Drilled Shaft-60"/1520mm, Rock	Lin. Ft.	\$1,200.00	Meter	\$3,935.00
	Drilled Shaft-72"/1830mm, Common	Lin. Ft.	\$840.00	Meter	\$2,755.00
	Drilled Shaft-72"/1830mm, Rock	Lin. Ft.	\$1,700.00	Meter	\$5,575.00
	Drilled Shaft-84"/2130mm, Common	Lin. Ft.	\$1,210.00	Meter	\$3,970.00
	Drilled Shaft-84"/2130mm, Rock	Lin. Ft.	\$2,200.00	Meter	\$7,215.00
	Drilled Shaft-96"/2440mm, Common	Lin. Ft.	\$1,560.00	Meter	\$5,120.00
	Drilled Shaft-96"/2440mm, Rock	Lin. Ft.	\$2,760.00	Meter	\$9,055.00

DEPARTMENT OF TRANSPORTION  
 Bureau of Highways  
 ESTIMATE SHEET

Joint Inspection  
 SURFACING SEC III & IV

CALLOWAY COUNTY  
 M NO. 1-181.2

FED. NO. FD04 018 8518 014D  
 FD04 018 8515 015D

Road Name MAYFIELD TO MURRAY ROAD  
 STATION 500+000  
 STATION 513+853  
 Net Length,km 13.853 Type of SURFACING

ITEM	QUANTITY	UNIT	Class Road Collector		AMOUNT
			UNIT	PRICE	
**** GRADE AND DRAIN ****					
2351 GUARDRAIL-STEEL W BEAM-S FACE	3173.73	METER		\$39.21	124,441.95
2352 GUARDRAIL-STEEL W BEAM-D FACE	167.64	METER		\$47.00	7,879.08
2360 GUARDRAIL TERMINAL SECT NO 1	10	EACH		\$63.00	630.00
2363 GUARDRAIL BRIDGE END CONN-TYPE A	13	EACH		\$117.00	1,521.00
2365 CRASH CUSHION TYPE IX-A	4	EACH		\$5,500.00	22,000.00
2369 GUARDRAIL END TREATMENT TYPE 2A	14	EACH		\$382.00	5,348.00
2391 GUARDRAIL END TREATMENT TYPE 4A	10	EACH		\$1,351.00	13,510.00
2387 GUARDRAIL BRIDGE END CONN-TYPE A-1	10	EACH		\$167.00	1,670.00
2650 MAINTAIN AND CONTROL TRAFFIC	1	L.S.		100,000.00	100,000.00
2726 STAKING	1	L.S.		100,000.00	100,000.00
				TOTAL GRADE and DRAIN	\$377,000.03
				Sub-Total	
				15%Eng&Cont.	
				Grand Total	
Cost Per km G.,D.& S.					
Cost Per km G.,D.& S.					
Estimated by	Date	1-99			
Estimated by	Date				

DEPARTMENT OF TRANSPORTION  
Bureau of Highways  
ESTIMATE SHEET

Joint Inspection  
SURFACING SEC III & IV

CALLOWAY COUNTY

LM NO. 1-181.2

FED. NO. FD04 018 8518 014D

FD04 018 8515 015D

Road Name MAYFIELD TO MURRAY ROAD

STATION 500+000

STATION 513+853

Net Length,km 13.853 Type of SURFACING

Class Road Collector  
UNIT

ITEM

QUANTITY UNIT

PRICE

AMOUNT

ITEM	QUANTITY	UNIT	PRICE	AMOUNT
**** SURFACING ****				
1	170,500	M TON	15.70	2,676,850.00
20	407	M TON	18.77	7,639.39
154	16000	M TON	\$43.56	696,960.00
120	101000	M TON	\$37.47	3,784,470.00
120	29000	M TON	\$37.47	1,086,630.00
149	9000	M TON	\$51.04	459,360.00
2562	250	SQ. M.	\$184.79	46,197.50
	1	L.S.	\$175,000.00	175,000.00
270	155,000	EACH	0.15	23,250.00
291	80	M TON	\$461.00	36,880.00
356	658	M TON	\$304.00	200,032.00
NO PAVEMENT DESIGN RECEIVED, EST. BASED ON AN ADJOINING PAVEMENT DESIGN				
TOTAL SURFACING				\$9,193,268.89
TOTAL GRADE & DRAIN				\$377,000.03
SUBTOTAL				\$9,570,268.92
MOBILIZATION 3.0%				\$287,108.07
DEMOBILIZATION 1.5%				\$143,554.03
Cost Per km G.,D.& INC. S.				\$824,567.73
			Sub-Total	\$10,000,931.02
			15%Eng&Cont.	\$1,500,139.65
			Grand Total	\$11,501,070.68
Estimated by	Date	1-99		
Estimated by	Date			

DEPARTMENT OF TRANSPORTION

Bureau of Highways  
ESTIMATE SHEET

Joint Inspection  
SEC. IV

CALLOWAY COUNTY

PROJECT NO. 1-181.22

FED. NO.

Road Name MAYFIELD TO MURRAY ROAD

STATION 506+000

STATION 513+853

Net Length,km 7.853 Type of Const G.D.&Inc.S.

Class Road Collector

ITEM	QUANTITY	UNIT	PRICE	AMOUNT
**** GRADE AND DRAIN ****				
462 CULVERT PIPE - 450 mm	556	M	123.00	68,388.00
464 CULVERT PIPE - 600 mm	206	M	132.75	27,346.50
466 CULVERT PIPE - 750 mm	348	M	150.64	52,422.72
468 CULVERT PIPE - 900 mm	110	M	219.46	24,140.60
471 CULVERT PIPE - 1350 mm	25	M	425.00	10,625.00
440 ENTRANCE PIPE-375mm	67	M	80.18	5,372.06
441 ENTRANCE PIPE-450mm	58	M	82.10	4,761.80
443 ENTRANCE PIPE-600mm	10	M	91.66	916.60
DBL RCBC 3000X2700	1	LS	352,000.00	352,000.00
DBL RCBC 3000X2700	1	LS	159,000.00	159,000.00
RCBC 3600X2100	1	LS	170,000.00	170,000.00
BRIDGE AT ROCKHOUSE CK (E. FORK)	1	LS	1,191,960.00	1,191,960.00
2230 EMBANKMENT	390,000	M^3	8.72	3,400,800.00
2242 WATER	8,293	KL	0.53	4,395.29
2434 RW MARKER RURAL TYPE 1	27	EACH	55.66	1,502.82
2262 RW FENCE - WOVEN WIRE TYPE 1	15,800	M	16.00	252,800.00
1391 METAL END SEC.TY 3-450mm	9	EACH	826.85	7,441.65
1393 METAL END SEC.TY 3-600mm	2	EACH	820.83	1,641.66
1394 METAL END SEC.TY 3-750mm	6	EACH	2,109.82	12,658.92
1505 DROP BOX INLET TY5B	1	EACH	2,300.00	2,300.00
1511 DROP BOX INLET TY5D	17	EACH	2,434.90	41,393.30
1514 DROP BOX INLET TY5E	1	EACH	2,500.00	2,500.00
1517 DROP BOX INLET TY5F	3	EACH	2,500.00	7,500.00
TEMPORARY SILT DITCH	880	M^3	7.59	6,679.20
2545 CLEARING AND GRUBBING	1	L.S.	400,000.00	400,000.00
5959 EXCELSIOR BLANKET	31,823	M^2	1.97	62,691.31
2483 CHANNEL LINING	7013	M TON	20.00	140,260.00
2650 MAINTAIN AND CONTROL TRAFFIC	1	L.S.	250,000.00	250,000.00
SILT TRAP A	68	EACH	717.19	48,768.92
2701 SILT FENCE	110	M	8.76	963.60
2705 SILT CHECK	463	EACH	86.02	39,827.26
2726 STAKING	1	L.S.	100,000.00	100,000.00
5960 FERTILIZER 10-20-20	70.30	M TON	399.27	28,068.68
5966 FERTILIZER 20-10-10	35.10	M TON	357.02	12,531.40
5986 SEED & PROTECT METHOD 2	626,461	M^2	0.46	288,172.06
5992 AGRICULTURAL LIMESTONE	458.40	M TON	38.33	17,570.47
8100 CONCRETE - CLASS A	16.655	M^3	378.54	6,304.58
8150 STEEL REINFORCEMENT	807.660	KG	1.29	1,041.88
			TOTAL GRADE	\$7,204,746.29
			and DRAIN	
			Sub-Total	
			15%Eng&Cont.	
			Grand Total	
Cost Per km	G.,D.& S.			
Cost Per km	G.,D.& S.			
Estimated by	Date			
Estimated by	Date			



DEPARTMENT OF TRANSPORTION  
 Bureau of Highways  
 ESTIMATE SHEET

Joint Inspection  
 SEC. IV

CALLOWAY COUNTY

FED. NO.

Form NO. 1-181.22

Road Name MAYFIELD TO MURRAY ROAD

From STATION 506+000

STATION 513+853

Net Length, km 7.853 Type of Const G.D.&Inc.S.

Class Road Collector  
 UNIT

ITEM	QUANTITY	UNIT	PRICE	AMOUNT
**** SURFACING ****				
	4,481	M TON	15.70	70,351.70
20	407	M TON	15.50	6,308.50
137	1,612	M TON	38.70	62,384.40
246	645	M TON	39.00	25,155.00
270	2,257	EACH	0.15	338.55
2351	87.63	METER	\$36.00	3,154.68
2369	3	EACH	\$550.00	1,650.00
TOTAL SURFACING				\$169,342.83
TOTAL GRADE & DRAIN				\$7,204,746.29
SUBTOTAL				\$7,374,089.12
MOBILIZATION 3.0%				\$221,222.67
DEMOBILIZATION 1.5%				\$110,611.34
Cost Per km G.,D.& S.				\$635,346.40
Sub-Total				\$7,705,923.13
15% Eng&Cont.				\$1,155,888.47
Grand Total				\$8,861,811.60
Estimated by	Date	8-97		
Estimated by	Date			

DEPARTMENT OF TRANSPORTION  
Bureau of Highways  
ESTIMATE SHEET

Joint Inspection  
SECTION III

CALLOWAY COUNTY

EM NO. 1-181.21

FED. NO. FD04 018 8518 014D

Road Name MAYFIELD TO MURRAY ROAD

STATION 500+000

STATION 506+000

Net Length,km 6.000 Type of Const G.D.&Inc.S.

Class Road Collector  
UNIT

ITEM	QUANTITY	UNIT	PRICE	AMOUNT
**** GRADE AND DRAIN ****				
462 CULVERT PIPE - 450 mm	620	M	123.00	76,260.00
464 CULVERT PIPE - 600 mm	131	M	132.75	17,390.25
466 CULVERT PIPE - 750 mm	139	M	150.64	20,938.96
469 CULVERT PIPE - 1050 mm	207	M	219.46	45,428.22
471 CULVERT PIPE - 1350 mm	41	M	425.00	17,425.00
440 ENTRANCE PIPE-375mm	86	M	80.18	6,895.48
441 ENTRANCE PIPE-450mm	34	M	82.10	2,791.40
443 ENTRANCE PIPE-600mm	14	M	91.66	1,283.24
444 ENTRANCE PIPE-750mm	15	M	91.66	1,374.90
RCBC 3600X2400	1	LS	195,000.00	195,000.00
BRIDGE AT CLARK RIVER (W. FORK) STA.501+585	1	LS	2,100,000.00	2,100,000.00
BRIDGE AT CLARK RIVER (W. FORK) STA.501+774.5	1	LS	1,100,000.00	1,100,000.00
2230 EMBANKMENT	535,000	M <sup>3</sup>	8.72	4,665,200.00
2242 WATER	6,336	KL	0.53	3,358.08
2434 R/W MARKER RURAL TYPE 1	29	EACH	55.66	1,614.14
2262 R/W FENCE - WOVEN WIRE TYPE 1	12,600	M	16.00	201,600.00
1391 METAL END SEC.TY 3-450mm	15	EACH	826.85	12,402.75
1393 METAL END SEC.TY 3-600mm	7	EACH	820.83	5,745.81
1394 METAL END SEC.TY 3-750mm	3	EACH	2,109.82	6,329.46
1394 METAL END SEC.TY 3-1050mm	2	EACH	2,109.82	4,219.64
1394 METAL END SEC.TY 4-450mm	2	EACH	2,109.82	4,219.64
1511 DROP BOX INLET TY5D	17	EACH	2,434.90	41,393.30
2223 GRANULAR EMBANKMENT	23,247	M <sup>3</sup>	25.38	590,008.86
2598 GEO. FABRIC TYPE 3	28,979	M <sup>2</sup>	1.51	43,758.29
TEMPORARY SILT DITCH	1270	M <sup>3</sup>	7.59	9,639.30
2545 CLEARING AND GRUBBING	1	L.S.	300,000.00	300,000.00
5959 EXCELSIOR BLANKET	22,497	M <sup>2</sup>	1.97	44,319.09
2483 CHANNEL LINING	3880	M TON	20.00	77,600.00
2650 MAINTAIN AND CONTROL TRAFFIC	1	L.S.	250,000.00	250,000.00
SILT TRAP A	79	EACH	717.19	56,658.01
VEHICULAR GATE	2	EACH		0.00
2705 SILT CHECK	407	EACH	86.02	35,010.14
2726 STAKING	1	L.S.	100,000.00	100,000.00
5960 FERTILIZER 10-20-20	61.40	M TON	399.27	24,515.18
5966 FERTILIZER 20-10-10	30.70	M TON	357.02	10,960.51
5986 SEED & PROTECT METHOD 2	547,534	M <sup>2</sup>	0.46	251,865.64
5992 AGRICULTURAL LIMESTONE	400.70	M TON	38.33	15,358.83
8100 CONCRETE - CLASS A	32.535	M <sup>3</sup>	378.54	12,315.80
8150 STEEL REINFORCEMENT	1268.000	KG	1.29	1,635.72
2091 REMOVE PAVEMENT	812	M <sup>2</sup>	7.48	6,073.76
VEHICULAR GATE	2	EACH	500.00	1,000.00
			TOTAL GRADE	\$10,361,589.40
			and DRAIN	
Cost Per km G.,D.& S.			Sub-Total	
Cost Per km G.,D.& S.			15%Eng&Cont.	
			Grand Total	
Estimated by	Date	1-99		
Estimated by	Date			

DEPARTMENT OF TRANSPORTION  
 Bureau of Highways  
 ESTIMATE SHEET

Joint Inspection  
 SECTION III

CALLOWAY COUNTY

M NO. 1-181.21

FED. NO. FD04 018 8518 014D

Road Name MAYFIELD TO MURRAY ROAD

STATION 500+000

STATION 506+000

Net Length,km 6.000 Type of Const G.D.&Inc.S.

Class Road Collector

UNIT

ITEM

QUANTITY UNIT

PRICE

AMOUNT

	**** SURFACING ****				
1	D G A BASE	4,914	M TON	15.70	77,149.80
20	TRAFFIC BOUND BASE	126	M TON	15.50	1,953.00
137	ASHALT BASE CL CI PG64-22	1,768	M TON	38.70	68,421.60
246	ASHALT SURF CL CI PG64-22	707	M TON	39.00	27,573.00
270	ANTI-STRIP ADD PER TON BIT MIX	2,475	EACH	0.15	371.25
2351	GUARDRAIL-STEEL W BEAM-S FACE	87.63	METER	\$36.00	3,154.68
2369	GUARDRAIL END TREATMENT TYPE 2A	3	EACH	\$550.00	1,650.00
					0.00
	TOTAL SURFACING				\$180,273.33
	TOTAL GRADE & DRAIN				\$10,361,589.40
	SUBTOTAL				\$10,541,862.73
	MOBILIZATION 3.0%				\$316,255.88
	DEMOBILIZATION 1.5%				\$158,127.94
	Cost Per km G.,D.& INC. S.	\$908,279.58		Sub-Total	\$11,016,246.55
				15%Eng&Cont.	\$1,652,436.98
				Grand Total	\$12,668,683.54
	Estimated by	Date	1-99		
	Estimated by	Date			

KENTUCKY TRANSPORTATION CABINET  
Division of Right of Way

**RIGHT OF WAY ESTIMATE**

PAGE # 1 OF 2 PAGES

COUNTY CALLOWAY ITEM NO. 01-0181.21

UNIFORM PROJECT NO. FD52 018 0080 000-020 001D

FED. NO. 000NH 00801 058

ROAD NAME KY HIGHWAY 80 AURORA TO MAYFIELD

HOW MANY ALTERNATES IN THIS ESTIMATE? ONE (Provide breakdown of cost for each alternate)

ALTERNATE <u>3</u> SELECTED ALTERNATE \$ <u>5,600,000</u>	ALTERNATE _____ \$ _____	ALTERNATE _____ \$ _____
---	-----------------------------	-----------------------------

CLASS OF ESTIMATE / PLANS USED:

CL E (NONE)     CL D (TOPO MAP)     CL C (PREL INSP)     CL B (FINAL INSP)     CL A (FINAL PLANS)

PURPOSE OF THE ESTIMATE:

PRE - STUDY     UPDATE FOR INSP.     REQUEST FUNDS     REQUEST ADD'L FUNDS

This estimate is based on the Six Year Plan scheduled authorization date of FY 2000

6 YEAR PLAN ESTIMATE (THIS SECTION)	
AMOUNT AUTHORIZED (THIS SECTION)	
DIFFERENCE IN FUNDING REQUEST	
<b>TOTAL FUNDS NEEDED</b>	<b>5,600,000</b>

WHAT SPECIFICALLY CAUSED THE COST INCREASE / DECREASE?

THIS IS A BREAKOUT OF CALLOWAY COUNTY FUNDS FROM A LONGER STUDY INCLUDING GRAVES COUNTY. THE MINOR DIFFERENCES ARE DUE TO ROUNDINGS AND CONSTITUTE AN INSIGNIFICANT FUNDING CHANGE FROM PREVIOUS ESTIMATES.

WHY WAS THE WORK REQUIRING A CHANGE IN FUNDS NOT ORIGINALLY ANTICIPATED?

THE ORIGINAL ASSIGNMENT WAS A TOTAL PROJECT SCOPING STUDY. THIS REPORT IS FOR A SMALLER SEGMENT OF THE SAME CORRIDOR,

REMARKS:

MINOR ALIGNMENT CHANGES ARE REFLECTED IN THE TOTAL OF THIS ESTIMATE.

COPY TO	C. O. ACQUISITION
	C. O. RELOCATION
	DIST. PRECONSTRUCTION
	DIST. DESIGN
	DIST. RIGHT OF WAY
	DIST. RELOCATION
	DIST. PLANNING

Claudee Galloway 4-21-97  
ESTIMATE PREPARED BY (SIGNATURE) DATE  
W. J. Wilson 4-21-97  
RIGHT OF WAY SUPERVISOR'S SIGNATURE DATE  
For L. J. Wilson

	ALTERNATE NO. 3			SUB TOTALS	ALTERNATE NO. ITEM COST	NUMBER	SUB TOTALS	ALTERNATE NO. ITEM COST	NUMBER	SUB TOTALS
	NUMBER	ITEM COST	NUMBER							
TOTAL PARCELS	117	2,350,000								
CONFORMING BILLBOARDS										
COURT COSTS	50%	1,175,000								
BUILDING REMOVAL	15	41,500								
ASBESTOS REMEDIATION	**									
WASTECLEANUP	2	135,000								
ADMINISTRATIVE COSTS		736,000								
ACQUISITION COST			5,337,500							
FAMILY UNITS	10		200,000							
BUSINESS MOVE EXPENSE	2	15,000								
BUSINESS RE-ESTAB. EXPENSE	2	20,000								
TOTAL BUSINESS			35,000							
ARM MOVE EXPENSE	0	0								
ARM RE-ESTAB. EXPENSE	0	0								
TOTAL FARMS			0							
NON-PROFIT MOVE EXPENSE	0	0								
NON-PROFIT RE-ESTAB.	0	0								
TOTAL NON-PROFIT			0							
MISCELLANEOUS MOVE	3		3,000							
GRAVE RELOCATIONS	0		0							
RELOCATION COST			238,000							
TOTAL PROJECT COST			5,575,500							

	ADMINISTRATIVE COST INCLUDES			PER RELOCATION	ADMINISTRATIVE COST INCLUDES	PER PARCEL +\$	PER RELOCATION
	\$	PER PARCEL +\$	PER RELOCATION				
WHAT ASSUMPTIONS WERE MADE IN PREPARING THIS ESTIMATE? (ATTACH ADDITIONAL SHEETS FOR CONTINUATION OF THE EXPLANATION.)	\$ 6,000	PER PARCEL +\$ 2,000	PER RELOCATION				
			ROUND TOTAL ESTIMATE TO \$5,600,000.00.				
ACCURATELY DESCRIBE THE PROJECT TERMINI UPON WHICH THIS ESTIMATE IS MADE. USE LANDMARK LOCATIONS AND STATION NUMBERS.	200 METERS WEST OF KY 1836 NEAR THE GRAVES/CALLOWAY COUNTY LINE TO US HIGHWAY 641 (THE PARENT PROJECT)						
DOES THIS DESCRIPTION AGREE WITH THE PRE-CON REPORT?	STA 0	TO 0	0	STA	TO		

YES  NO

YES  NO

YES  NO

CONTECH Construction Products Inc.  
7025 W. Highway 22, Box #2, Suite #5, Crestwood, KY 40014

Phone: (502) 241-5462

Fax: (502) 241-0216

### FAX TRANSMITTAL

This fax consists of 5 pages, including this transmittal form.

DATE: 4/29/99

TO: Tom Jobe

FAX NUMBER (502) 564-3324

FROM: Jason Garner, Sales Engineer/Judy Snyder

RE: /

Tom

I would not recommend a Pipe Arch in this situation  
because we have adequate headroom to put a round structure  
in place. With ~~plat~~ multi-plate pipe arches of this size we are  
limited to small cover heights no matter the gage. For the  
size you would need we are limited to 13' of cover. You have plenty  
of headroom to put a round pipe of 11' or 12' that will yield  
as much or more open area than what you have in place now



# QUOTATION

Quotation No.:

Sheet of:

## CONTECH CONSTRUCTION PRODUCTS INC.

Tom Jobe

DOT Dist. 4

E-town, Ky

Reply to:

Jason Garner

Phone No.

Area Code (602) 241-5462

Date

4/29/99

Project

Seller has based its quoted prices upon all of the (estimated, not guaranteed) quantities listed in this quotation. If Buyer elects to purchase from Seller only a portion of the material quoted, Seller shall have the right to adjust its prices to reflect the impact of all resulting cost.

Item No.	Approx. Quant.	Description	Unit	Unit Price
	200'	11' 10gauge Galv + Asphalt Coated	LF	193.00
	200'	11.5' 10gauge Galv + Asphalt Coated	LF	204.00
	200'	11' 8 gauge Galv + Asphalt Coated	LF	223.00
	200'	11.5' 8gauge Galv + Asphalt Coated *	LF	234.00
	200'	13'-3" x 9'4" 8gauge Galv + Asphalt Coated	LF	275.00
	200'	Assembly costs for 11' and 11.5' MP	LF	7800
		Minimum cover req. 24"		
		* Max. allowable cover for MP Arch is 13'		
		* See attached tables for max cover for MP round pipe.		

NOTES:

- Prices are F.O.B. origin with freight allowed to jobsite with unloading by others.
- Terms: 1/2%-10. NET 30 days from date of invoice, subject to credit approval.
- Sales tax is not included: add when applicable.

THIS QUOTATION CONTAINS THE PARTIES' ENTIRE AGREEMENT WITH RESPECT TO THE PURCHASE AND SALE OF THE PRODUCTS DESCRIBED ABOVE, AND SUPERSEDES ALL PREVIOUS COMMUNICATIONS. CONTECH'S OFFER TO SELL THE PRODUCTS DESCRIBED ABOVE IS EXPRESSLY CONDITIONAL UPON BUYER'S ASSENT TO THE CONDITIONS OF SALE (INCLUDING THOSE RELATING TO "WARRANTIES" AND "BUYER'S REMEDIES AND SELLER'S LIABILITY") THAT APPEAR ON THE REVERSE SIDE TO THIS FROM. BUYER'S SIGNATURE BELOW, OR ACCEPTANCE OF DELIVERY OF THE GOODS DESCRIBED ABOVE, SHALL BE DEEMED AN ACCEPTANCE OF THOSE CONDITIONS OF SALE. SELLER EXPRESSLY REJECTS ANY TERMS AND CONDITIONS THAT ARE DIFFERENT FROM OR IN ADDITION TO THE TERMS AND CONDITIONS SET FORTH ON THE FRONT SIDE AND REVERSE SIDE OF THIS QUOTATION.

The prices quoted above shall remain in effect for 30 days from the date of this Quotation. Seller reserves the right to adjust the prices after 30 days from the date of Quotation, but any such adjustment shall have no effect on the applicability of the Conditions of Sale set forth on the reverse side of this Quotation. Prices quoted apply only to the project specified herein.

### ACCEPTANCE

### CONTECH CONSTRUCTION PRODUCTS INC.

SUBJECT TO BEING AWARDED THIS CONTRACT, WE HEREBY ORDER THE MATERIAL DESCRIBED ABOVE, AT THE PRICES SPECIFIED, SUBJECT TO ALL TERMS AND CONDITIONS APPEARING ON THE FRONT AND REVERSE SIDE OF THIS QUOTATION.

Company \_\_\_\_\_

By \_\_\_\_\_

Title \_\_\_\_\_

Date \_\_\_\_\_

By \_\_\_\_\_

Title \_\_\_\_\_



Date 4/22/99

To \_\_\_\_\_

Copies \_\_\_\_\_

From \_\_\_\_\_

Subject \_\_\_\_\_

The following are the open areas for the multi-plate I just referenced:

11' - 96 ft<sup>2</sup>

11.5' - 104.7 ft<sup>2</sup>

12' - 114.2 ft<sup>2</sup>

Going to a round Multi-Plate is also going to save you on ~~so~~ material costs and erection costs, not to mention allow you to put alot more cover on the pipe.

Please give me a call if you have quotes.

Thanks



# Height-of-Cover limits<sup>(1)</sup> Pipe and Arches (in feet)

Table 20. H 20, HS 20, and HS 25 Live Load—Round Pipe and Arches

Span, Feet	Minimum Cover, Inches <sup>(2)</sup>	Maximum Cover, Feet						
		Specified Thickness, Inches <sup>(3)(4)</sup>						
		0.111 (12 Ga.)	0.140 (10 Ga.)	0.170 (8 Ga.)	0.188 (7 Ga.)	0.218 (5 Ga.)	0.249 (3 Ga.)	0.280 (1 Ga.)
5.0	12	81	120	157	176	205	234	264
5.5		74	110	143	159	186	213	240
6.0		68	101	131	146	171	195	220
6.5		62	92	121	135	157	180	203
7.0		58	86	112	125	146	168	188
7.5		54	80	105	117	137	156	176
8.0	12	51	75	98	111	128	146	165
8.5	24	48	71	92	103	120	137	155
9.0		45	67	87	97	114	130	146
9.5		43	63	82	92	108	123	139
10.0		40	60	78	87	102	117	132
10.5		39	57	74	83	97	112	126
11.0		37	54	71	79	93	106	120
11.5		35	52	68	76	89	102	114
12.0		34	50	65	73	85	97	110
12.5		32	48	63	70	82	93	106
13.0		31	46	60	67	79	90	101
13.5		30	44	58	65	76	87	98
14.0		29	43	56	62	73	83	94
14.5		28	41	54	60	70	80	91
15.0		27	40	52	58	68	78	88
15.5		26	39	50	56	66	75	85
16.0	24	25	37	49	54	64	73	82
16.5	36	[24] <sup>(4)</sup>	36	47	53	62	71	80
17.0		[24]	35	45	51	60	68	77
17.5		[23]	34	43	49	57	65	74
18.0		[23]	33	42	47	55	63	71
18.5		[21]	[32]	40	45	52	60	68
19.0		[18]	[31]	38	43	50	58	65
19.5			[30]	37	41	48	55	62
20.0			[28]	35	40	47	53	60
20.5			[27]	[34]	38	45	51	57
21.0			[27]	[32]	36	43	49	56
21.5			[25]	[31]	[35]	41	47	53
22.0			[21]	[31]	[33]	39	45	51
22.5				[28]	[32]	38	43	49
23.0				[27]	[31]	36	41	46
23.5	36			[22]	[29]	[34]	40	45
24.0	42			[21]	[28]	[33]	38	43
24.5	48			[20]	[23]	[32]	36	41
25.0					[22]	[31]	[35]	39
25.5					[21]	[25]	[33]	37
26.0	48					[24]	[32]	35

**General note**

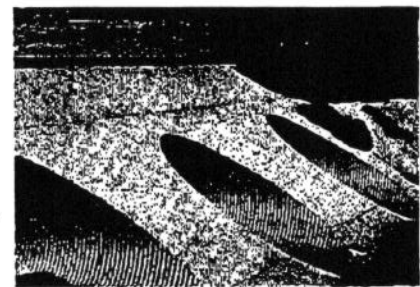
Height-of-Cover Tables 20 through 24 are presented for the designer's convenience for use in routine applications.

They are based on the design procedures presented herein, using the following values for the soil and steel parameters:

Unit weight of soil—120 Lbs./Ft.<sup>3</sup>

Relative density of compacted backfill—minimum 85% standard per AASHTO T 99

Yield point of steel—33,000 psi



Three 180-inch-diameter MULTI-PLATE structures were installed at Colorado's Lowry Field Airport in 1942. Full bevel ends required reinforced concrete end treatment to resist the hydraulic forces.

<sup>(1)</sup> Handbook of Steel Drainage and Highway Construction Products, American Iron and Steel Institute.

<sup>(2)</sup> Cover is measured from top of pipe to bottom of flexible pavement or top of rigid pavement.

<sup>(3)</sup> As cover levels approach the maximum, quality backfill materials and their compaction levels become increasingly important to performance.

<sup>(4)</sup> Bracketed values (i.e. [24]) must be arch structures only.

Higher allowable fill heights are possible if 0.3125-inch-thick or 0.375-inch-thick plate is used. However, maximum span is limited to 26 feet for standard design.

# Height-of-Cover limits<sup>(1)</sup> Pipe-Arches (in feet)

Table 22. Pipe-Arches

Size		H20 and H 25 Live Load <sup>(2)</sup>			E 80 Live Load <sup>(3)</sup>				
		Minimum Specified Thickness Required, Inches	Minimum Cover, Inches	Maximum Height-of-Cover over Pipe-Arch for Corner Bearing Pressures of 2 Tons per Ft. <sup>2</sup>	Minimum Specified Thickness Required, Inches	Minimum Cover, Inches	Maximum Height-of-Cover over Pipe-Arch for the Following Corner Bearing Pressures in Tons per Ft. <sup>2</sup>		
Span, Ft.-In.	Rise, Ft.-In.					2 Tons	3 Tons		
18" R <sub>c</sub> Corner Radius = 18"	6-1	0.111	12	19	0.111	24	19	—	
	6-4			18			15	—	
	6-9			17			15	—	
	7-0			16			13	—	
	7-3			16			12	—	
	7-8			15			12	—	
	7-11			14			11	—	
	8-2			14			10	—	
	8-7			13			6	—	
	8-10			13			5	—	
	9-4			12			—	17	
	9-6			12			—	16	
	9-9			12			24	16	
	10-3			10			30	15	
	10-8			8			—	13	
	10-11			8			—	13	
	11-5			9			—	12	
	11-7			9			0.111	—	
11-10	7	0.140	—						
12-4	6	—	—						
12-6	6	—	6						
12-8	6	—	6						
12-10	6	0.140	—	6					
31" R <sub>c</sub> Corner Radius = 31"	13-3	0.111	24	13 <sup>(4)</sup>	0.140	36	9 <sup>(4)</sup>	—	
	13-6			13			8	—	
	14-0			12			6	—	
	14-2			12			6	—	
	14-5			12			6	—	
	14-11			12			6	—	
	15-4			11			36	6	—
	15-7			11			42	6	—
	15-10			10			—	6	—
	16-3			10			—	6	—
	16-6			10			24	—	14
	17-0			10			30	—	14
	17-2			10			—	—	13
	17-5			10			—	—	13
	17-11			10			—	42	13
	18-1			9			—	48	11
	18-7			9			—	—	11
	18-9			9			—	—	11
	19-3			9			0.111	—	10
	19-6			9			0.140	—	10
19-8	9	—	0.170	10					
19-11	9	—	—	10					
20-5	8	30	—	10					
20-7	8	36	—	10					
	8	0.140	—	10					

**General note**

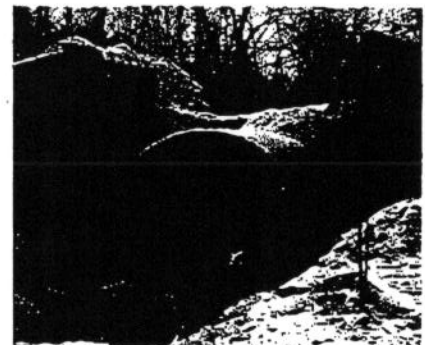
Height-of-Cover Tables 20 through 24 are presented for the designer's convenience for use in routine applications.

They are based on the design procedures presented herein, using the following values for the soil and steel parameters:

Unit weight of soil—120 Lbs./Ft.<sup>3</sup>

Relative density of compacted backfill—minimum 85% standard per AASHTO T 99

Yield point of steel—33,000 psi



MULTI-PLATE Pipe-Arch to replace a deteriorating bridge.

<sup>(1)</sup> Handbook of Steel Drainage and Highway Construction Products, American Iron and Steel Institute.

<sup>(2)</sup> H 20 and H 25 cover is measured from top of pipe to bottom of flexible pavement or top of rigid pavement.

<sup>(3)</sup> For E 80, cover is measured from top of pipe to bottom of railroad tie.

<sup>(4)</sup> Maximum cover increases due to R<sub>c</sub>/R.

As cover levels approach the maximum, quality backfill materials and their compaction levels become increasingly important to performance. Higher allowable fill heights are possible if 0.3125-inch-thick or 0.375-inch-thick plate is used. However, maximum span is limited to 26 feet for standard design.