VALUE ENGINEERING STUDY
OF
RECONSTRUCTION OF I-64/ KY 180 INTERCHANGE
Item Number: 9-60.00

Boyd County, Kentucky
October 17-21, 2005

Prepared by:
VENTRY ENGINEERING, L.L.C.

In Association With:
KENTUCKY TRANSPORTATION CABINET

VALUE ENGINEERING STUDY
TEAM LEADER

MALVIN J. TRICKEY, P.E., C.V.S.
C.V.S. Registration No. 950509

DATE

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I. EXECUTIVE SUMMARY

INTRODUCTION

This Value Engineering report summarizes the results of the Value Engineering Study performed by Ventry Engineering for the Kentucky Transportation Cabinet. The study was performed during the week of October 17-21, 2005.

The subject of the study was the I-64/KY 180 Interchange in Boyd County, Kentucky.

PROJECT DESCRIPTION

This project will replace the ramps connecting I-64 to KY180 and will also reconstruct the existing bridge superstructures of the I-64 Bridges over the West Fork of the Little Sandy River. KY 180 will be upgraded and widened from 2 lanes to 4 lanes throughout the interchange area and will also be reconstructed (south of the interchange) to the intersection of KY 3 in order to connect to the improved roadway section.

METHODOLOGY

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

This process included the following phases:

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

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

- Traffic Operations
- Construction Time
- Future Maintenance Cost
- Construction Cost

RESULTS – AREAS OF FOCUS

The following areas of focus were analyzed by the Value Engineering team and from these areas the following Value Engineering alternatives were developed and are recommended for implementation:

Recommendation Number 1: *GRADING-KY 180 PROFILE GRADES*

The Value Engineering Team recommends that *Value Engineering Alternative Number 1* be implemented. This alternative would modify the profile grade of KY 180 from station 15+00 to station 40+00.

If this recommendation can be implemented, there is a possible savings of **$268,147.**

Recommendation Number 2: *STRUCTURES-RAMPS A AND D*

The Value Engineering Team recommends that the *Value Engineering Alternative Number 3* be implemented. This alternative would modify the alignment of Ramps A and D into parallel ramps and combine the ramp bridges with the EB and WB I-64 bridges over the Little Sandy River into single structures.

If this recommendation can be implemented, there is a possible savings of **$1,533,224.**

Recommendation Number 3: *STRUCTURES-BRIDGES OVER KY 180*

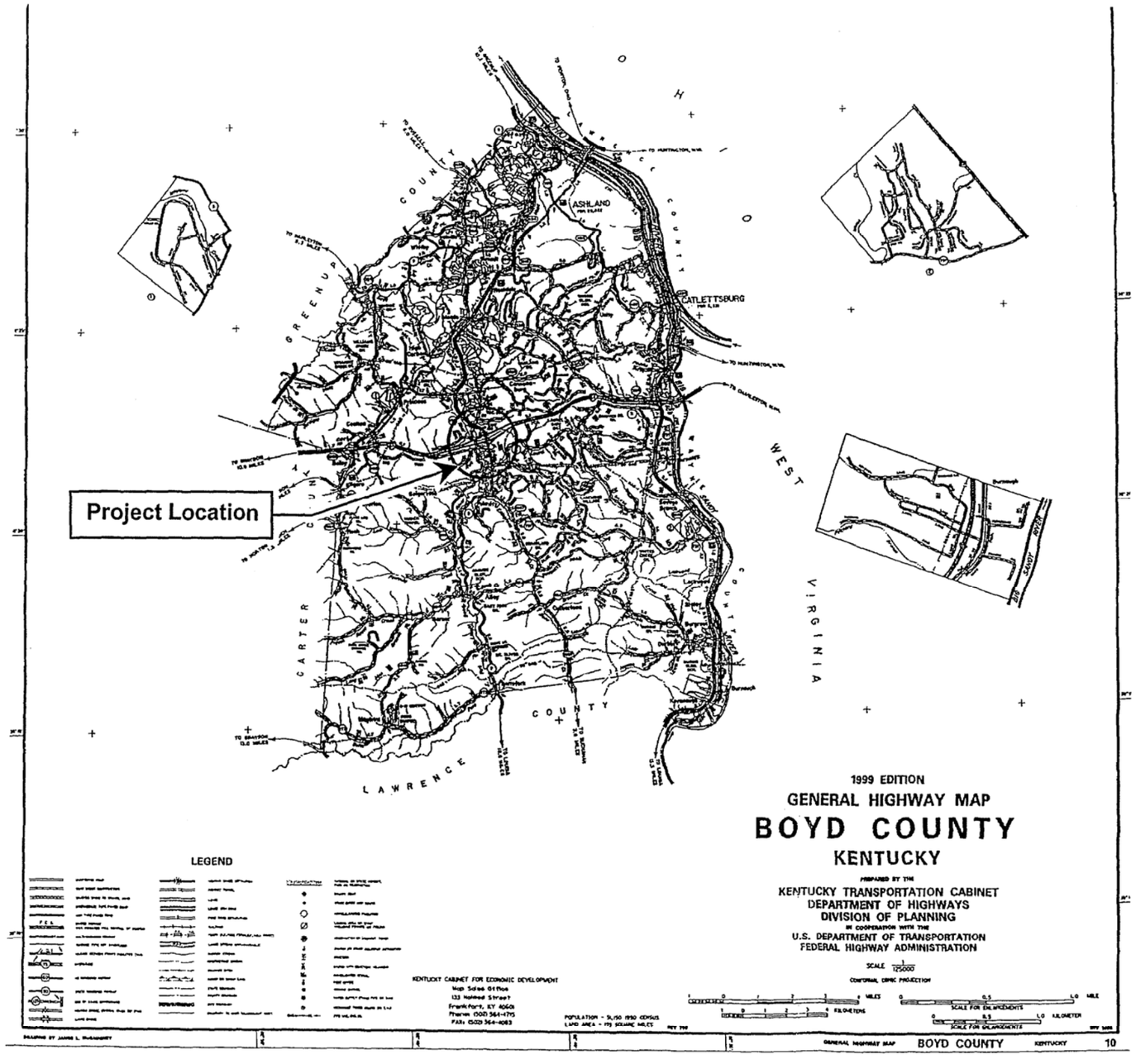
The Value Engineering Team recommends that the *Value Engineering Alternative Number 4* be implemented. This alternative would use vertical abutments with MSE walls on both the EB and WB I-64/KY 180 structures

If this recommendation can be implemented, there is a possible savings of **$354,411.**

Recommendation Number 4: *HIGHWAY LIGHTING*

The Value Engineering Team recommends that the *Value Engineering Alternative Number 5* be implemented. This alternative would utilize seventeen (17) 120 ft. high mast lights in lieu of the one hundred and sixty eight (168) 30 ft. and 40 ft. cobra head lights.

If this recommendation can be implemented, there is a possible savings of **$313,033.**



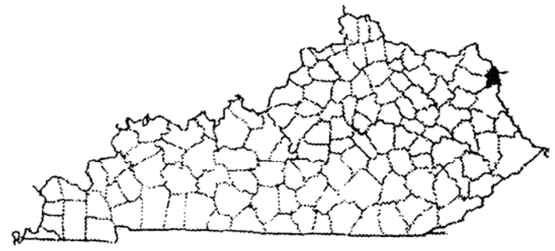


Exhibit 1
I-64/KY 180 Interchange Reconstruction
Boyd County, KY
Item No. 9-60.00
Project Location

III. TEAM MEMBERS AND PROJECT DESCRIPTION

TEAMMEMBERS

NAME	AFFILIATION	EXPERTISE	PHONE
M. Jack Trickey, P.E., C.V.S.	Ventry Engineering	Team Leader	850/627-3900
Duncan Silver, P.E.	Ventry Engineering	Geometrics/Interchange	850/627-3900
Richard Elliott, P.E.	Ventry Engineering	Structures	850/627-3900
Pete Picard	Ventry Engineering	Construction	850/627-3900
Robert Polcyn, P.E.	H. W. Lochner, Inc.	Roadway Design	859/224-4476
Chris L. Scott	KYTC, Glasgow Construction	Construction	270/651-2956

PROJECT DESCRIPTION

This project will reconstruct the interchange as a full diamond interchange with four new ramps varying in length from 2350 ft. to 3400 ft. Kentucky 180 will be slightly realigned to the west of the existing alignment and be reconstructed to a four-lane divided roadway with center turn lanes within the interchange area. Four new bridges will be required, one each on Ramp A and Ramp D over the East Fork of the Little Sandy River, and one each for the I-64 EB and I-64 WB mainlanes over KY 180. The two existing I-64 bridges over the East Fork of the Little Sandy River will be reconstructed to meet current design standards.

The September, 2005 estimated construction and right of way cost of this project are approximately $25,000,000 not including the cost of relocating the gas line. The major cost items in this estimate are:

Grading	$6,400,000
Pavement and Base	$5,200,000
Bridges	$4,625,000
Right-of-Way	$1,820,000
Water Line Restoration	$1,300,000
Lighting	$980,000
Maintenance of Traffic	$784,000

IV. INVESTIGATION PHASE

VALUE ENGINEERING STUDY BRIEFING

RECONSTRUCTION OF I-64/KY 180 INTERCHANGE October 17-21, 2005		
NAME	**AFFILIATION**	**PHONE**
M. Jack Trickey, P.E., C.V.S.	Ventry Engineering	850/627-3900
Duncan Silver, P.E.	Ventry Engineering	850/627-3900
Richard Elliott, P.E.	Ventry Engineering	850/627-3900
Pete Picard	Ventry Engineering	850/627-3900
Robert Polcyn, P.E.	H. W. Lochner, Inc.	859/224-4476
Chris L. Scott	KYTC, Glasgow Construction	270/651-2956
Robert Semones	KYTC, Value Engineering	502/564-3280
Siamak Shafaghi	KYTC, Design/VE	502/564-3280
Bill Helpinstine	Lochner, Project Manager	859/224-4476
Jim Wathen	KYTC, Professional Services	502/564-4555
Mary Wade	KYTC, Professional Services	502/564-4555

IV. INVESTIGATION PHASE

STUDY RESOURCES

RECONSTRUCTION OF I-64/KY 180 INTERCHANGE October 17-21, 2005		
NAME	**AFFILIATION**	**PHONE**
Ted Swansegar	KYTC, Lighting	502/564-3020
Steve Williams	KYTC, Design	502/564-3280
Jill Asher	KYTC, Design	502/564-3280
Jim Simpson	KYTC, Design	502/564-3280
Steve Halloren	KYTC, Construction	502/564-3280
John Faulkner	Lochner	859/224-8638

IV. INVESTIGATION PHASE

FUNCTIONAL ANALYSIS WORKSHEET

RECONSTRUCTION OF I-64/KY 180 INTERCHANGE
October 17-21, 2005

ITEM	FUNCT. VERB	FUNCT. NOUN	* TYPE	COST	WORTH	VALUE INDEX
Grading	Establish	Profile	B	$6,367,000	$5,000,000	1.27
Pavement & Base	Support	Vehicles	B	$5,200,000	$4,950,000	1.05
Right Of Way	Acquire	Property	B	$1,820,000	$1,820,000	1.00
Structures	Span Separate	River Traffic	B B	$4.625,000	$4,000,000	1.16
Water Line Relocation	Maintain	Service	B	$1,300,000	$1,300,000	1.00
Lighting	Enhance	Safety	B	$977,000	$600,000	1.63
Maintenance Of Traffic	Maintain	Access	B	$784,000	$784,000	1.00
Gas Line Relocation	Maintain	Access	B	UNKNOWN	NA	NA

***B – Basic S - Secondary**

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

IV. INVESTIGATION PHASE

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

A. GRADING

B. PAVEMENT AND BASE

C. STRUCTURES

D. HIGHWAY LIGHTING

V. SPECULATION PHASE

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

A. GRADING

- Modify the profile grade of KY 180 by raising the sag vertical at the entrance to Flying J Truck Stop and lowering the profile grade under I-64 EB structure.

- ~~Increase back slopes in rock cuts (steepen)~~. (A review of the soil information indicates that the rock quality is not good enough to allow steepening of the slopes.)

- ~~Construct temporary ramps to connect to WB I-64 for WB & EB construction~~. (A review of MOT phasing indicates that this is not necessary.)

- Modify the alignment of ramps B&C to make them parallel ramps.

- ~~Flatten fill slopes along ramps~~. (Look at cross sections of ramps to see if there are any areas where flattening would take additional material and minimize extensive haul from project.)

- ~~Utilize median area for disposal of waste~~. (Sense of the team was that KYTC was pretty much against this idea for various reasons.)

- ~~Use all available areas within R/W for disposal~~. (Discarded for same reason as previous idea)

- ~~Use property being acquired by the R/W for disposal sites~~. (The major property on south end of KY 180 (horse farm) is considered a flood plain site and would not be acceptable for waste area.)

B.1. PAVEMENT AND BASE

- ~~Eliminate rock roadbed excavation in cut areas~~. (This does not appear to be feasible. It was tried on a project on Cumberland Parkway with unsatisfactory results.)

V. SPECULATION PHASE (cont'd)

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

B.2. STRUCTURES

- ~~Reduce length of EB & WB I-64 structures over East Fork of Little Sandy River.~~

- Tighten radius of KY-180 to I-64 EB on-ramp (to reduce width of Ramp D structure.)

- Make Ramps A and D parallel ramps and combine the ramp bridges with the EB and WB I-64 bridges over the Little Sandy River into single structures.

- Use vertical abutments with MSE walls on both the EB and WB I-64/KY 180 structures.

- ~~Steepen the slope of east berm under spill-through abutments on I-64/KY 180 structures~~.

- ~~Reduce median width of KY 180~~. (Check out advisability of double left turn lane to Ramp B from SB KY 180 being LEFT ONLY-LEFT & THRU – THRU ONLY configuration.)

- ~~Use slope reinforcement or retaining wall to eliminate extension of Ramp D~~. (This would probably been a usable recommendation, but R/W purchase has been signed and completed – no chance of adoption.)

C. HIGHWAY LIGHTING

- Use high mast lighting in lieu of cobra heads.

VI. EVALUATION PHASE

A. ALTERNATIVES

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

A. GRADING-KY 180 PROFILE GRADES

Value Engineering Alternative Number 1: Modify the profile grade of KY 180 from station 15+00 to station 40+00. The alternative profile grade configuration consists of a grade of +7.2% ending at station 22+00 to a –4.0% grade ending at 34+00 to a + 1.0% grade which ties into a –3.38% grade.

GRADING-RAMPS B AND C

Value Engineering Alternative Number 2: Realign Ramps B and C into parallel ramps similar to an urban type design to reduce the amount of rock excavation required.

B.1. STRUCTURES-RAMPS A AND D

Value Engineering Alternative Number 3: Modify the alignment of Ramps A and D into parallel ramps and combine the ramp bridges with the EB and WB I-64 bridges over the Little Sandy River into single structures.

B.2. STRUCTURES-BRIDGES OVER KY 180

Value Engineering Alternative Number 4: Use vertical abutments with MSE walls on both the EB and WB I-64/KY 180 structures.

C. HIGHWAY LIGHTING

Value Engineering Alternative Number 5: Utilize100 ft. to 120 ft. high mast lighting in lieu of the 30 ft. and 40 ft. cobra head lighting.

VI. EVALUATION PHASE (cont'd)

B. ADVANTAGES AND DISADVANTAGES

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

A. GRADING-KY 180 PROFILE GRADE

"As Proposed": The "as proposed" profile grade configuration consists of a grade of +7.2% ending at station 22+23 to a –5.0% grade ending at 33+53 to a + 2.18% grade which ties into a –3.38% grade.

Advantages

- Minimizes the extensions to the RCBC
- May be easier to maintain traffic control during construction

Disadvantages

- Using steep grades along KY180
- Requires steep driveways connections at Flying J and Field Ave

Conclusion

Carry forward for further evaluation.

Value Engineering Alternative Number 1: *Modify the profile grade of KY 180 from station 15+00 to station 40+00. The alternative profile grade configuration consists of a grade of +7.2% ending at station 22+00 to a –4.0% grade ending at 34+00 to a + 1.0% grade which ties into a –3.38% grade.*

Advantages

- Reduces the amount of rock excavation required
- Increases the amount of embankment needed along KY180
- Improves (flattens) the grades along KY180, Flying J entrance, and Field Avenue
- Reduces the height of the retaining wall at the entrance to Flying J and Fannin

Disadvantages

- Requires an additional 8 ft. extension to the 4 ft. x 4 ft. RCBC
- Requires a 3 ft. extension of inlet at the 4 ft. x 4 ft. RCBC

Conclusion

Carry forward for further evaluation.

A. GRADING-RAMPS B AND C

"As Proposed": Construct Ramps B and C using a rural tight diamond design with tapered ramp terminals at the connection to the I-64 mainlanes.

Advantages

- Conforms to common practices of the KYTC design manual
- Easier to accommodate grade differences between the I-64 mainlanes, the ramps, and the crossroad
- Does not require any retaining walls
- Does not require any barrier walls along I-64

Disadvantages

- Increases the amount of rock cut that must be disposed of.

Conclusion

Carry forward for further evaluation.

Value Engineering Alternative Number 2: *Realign Ramps B and C into parallel ramps similar to an urban type design to reduce the amount of rock excavation required.*

Advantages

- Reduces the amount of rock excavation required between Sta. 13+00 and Sta. 18+00
- May improve the operational characteristics of the ramp

Disadvantages

- Intersection angle of KY 180 and Ramp B would violate AASHTO guidelines of minimum of 60 degree angle
- Super-elevation runoffs exceed length available along Ramp B
- Would require using the minimum 60 degree angle of intersection for Ramp C
- Would require using maximum 6% grade along Ramp C
- Would add retaining wall and barrier walls

Conclusion

DROP FROM FURTHER CONSIDERATION.

B. ADVANTAGES AND DISADVANTAGES (cont'd)

B.1. STRUCTURES-RAMPS A AND D

"As Proposed": Construct rural tight diamond Ramps A and D with separate one lane bridges spanning the Little Sandy River.

Advantages

- Easier to accommodate grade differences between the I-64 mainlanes, the ramps and the KY 180 crossroad
- Conforms to common practices in the KYTC design manual
- Allows for the use of higher design speeds

Disadvantages

- Requires the construction of two new single lane ramp bridges

Conclusion

Carry forward for further evaluation.

Value Engineering Alternative Number 3: *Modify the alignment of Ramps A and D into parallel ramps and combine the ramp bridges with the EB and WB I-64 bridges over the Little Sandy River into single structures.*

Advantages

- Reduces the amount of bridge structure required
- Reduces the amount of pavement and base required
- Reduces the amount of grading required
- Improves the profile grades of the ramps
- Reduces the environmental impacts to the river and adjacent area

Disadvantages

- Reduces the design speed for the SB to WB free right movement
- Requires staging the construction of the I-64 mainlane bridges

Conclusion

Carry forward for further evaluation.

B.2. STRUCTURES-BRIDGES OVER KY 180

As Proposed": Reconstruct the I-64 EB and WB bridges over KY 180 using two spans with 2:1 slope spill-thru abutments.

Advantages

- Provides the traditional design
- Provides a larger visual opening
- Does not place a vertical wall behind the shoulder of the road
- Reduces complexity of design of monolithic abutment

Disadvantages

- Increases the length of the bridges
- Increases the construction and maintenance requirements

Conclusion

Carry forward for further evaluation.

Value Engineering Alternative Number 4: *Use vertical abutments with MSE walls on both the EB and WB I-64/KY 180 structures.*

Advantages

- Reduces the length of the bridges
- Eliminates maintenance of the 2:1 slopes
- Increases the aesthetics of the structures

Disadvantages

- Increase the complexity of the design due to the monolithic abutment

Conclusion

Carry forward for further evaluation.

B. ADVANTAGES AND DISADVANTAGES (cont'd)

C. HIGHWAY LIGHTING

As Proposed": Install cobra head lighting throughout the interchange consisting of 168 light poles (71 @ 30' mounting height and 97 @ 40' mounting height) along with associated wiring and electrical hardware.

Advantages

- Provides more direct lighting to the roadway itself
- More aesthetic than high mast lighting

Disadvantages

- Very large interchange for this type lighting
- Significantly increases the future maintenance requirements
- May not illuminate deer and other animals along the outside of the shoulders

Conclusion

Carry forward for further evaluation.

Value Engineering Alternative Number 5: *Install 15-20 high mast lights throughout the interchange area in lieu of the cobra head lighting.*

Advantages

- Significantly reduces the amount of hardware required
- Reduces the number of obstacles along the roadways and ramps
- Eliminates the need for bridge mounted lighting
- Provides a more uniform lighting throughout the interchange area
- Easier to maintain
- Reduces the future maintenance requirements

Disadvantages

- May induce "light trespass" to some adjacent residences
- Increases access requirements to provide for construction and maintenance
- Increases overall power requirements

Conclusion

Carry forward for further evaluation.

VII. DEVELOPMENT PHASE

A. GRADING-KY 180 PROFILE GRADE

(1) AS PROPOSED
(2) VALUE ENGINEERING ALTERNATIVE NUMBER 1

B.1. STRUCTURES-RAMPS A AND D

(1) AS PROPOSED
(2) VALUE ENGINEERING ALTERNATIVE NUMBER 3

B.2. STRUCTURES-BRIDGES OVER KY 180

(1) AS PROPOSED
(2) VALUE ENGINEERING ALTERNATIVE NUMBER 4

C. HIGHWAY LIGHTING

(1) AS PROPOSED
(2) VALUE ENGINEERING ALTERNATIVE NUMBER 5

D. DESIGN COMMENTS

VII. DEVELOPMENT PHASE

A. GRADING

"As Proposed"

The KY 180 profile grade from station 15+00 to station 40+00 is the area of focus for this value engineering proposal. The "as proposed" profile grade configuration consists of a grade of +7.2% ending at station 22+23 to a –5.0% grade ending at 33+53 to a + 2.18% grade which ties into a –3.38% grade.

This area was selected to evaluate due to the 12 ft. of cut at the crest of the first vertical curve as well as the 5% profile grade on KY 180 at the signalized intersection to the Flying J Travel Plaza. The current profile grade of KY 180 results in no desirable profile grades for the entrance drives to Field Avenue and the Flying J.

The advantage of the "as proposed" is minimal extension requirements to existing drainage structures and no impact to the Boyd County Sanitation pump station at 28+50 Lt. The disadvantages include a steep profile grade of KY 180 at the signalized intersection to the Flying J, the steep profile grades for the entrances to the Flying J and Field Avenue, excessive excavation, and confined maintenance of traffic operations near the area of the 12 ft. cut during the phased construction.

NOTE: "As Proposed" drawings are shown with the Value Engineering Alternative drawings in the following section.

VII. DEVELOPMENT PHASE

A. GRADING-KY 180 PROFILE GRADES

Value Engineering Alternative Number 1

This Value Engineering alternative modifies the profile grade of KY 180 from station 15+00 to station 40+00. The alternative profile grade configuration consists of a grade of +7.2% ending at station 22+00 to a –4.0% grade ending at 34+00 to a + 1.0% grade which ties into a –3.38% grade.

The development of this alternative resulted in improvements to the profile grades of the entrance to the Flying J (from +6.36% to +5.0% and included increasing the length of the vertical sag curve on the entrance near KY 180), Field Avenue (from +11.8% to a constant +6.6%), Flying J detour (from +3.9% to +3.0%) and several other entrance drives. By modifying the entrance grade to the Flying J we were able to reduce the size of the proposed gravity retaining wall. Also, the gravity retaining wall on KY 180 at 26+00 was able to be reduced due to raising the KY 180 profile grade.

With the modification of the KY 180 profile grade the cut in the first crest curve was reduced by 5 ft. which eliminated approximately 25,000 cy of excavation. An additional benefit resulting from the grade change is in the sag vertical curve at station 34+00 which increased the embankment requirement allowing for additional use of excess excavation on this project.

The advantages of the Value Engineering alternative include the reduction in excavation of 25,000 CY; the addition of 13,100 CY of embankment; improvement (flattening) to vertical grade of KY 180 as well as the entrances to the Flying J, Field Avenue and several drives; reduction in the required height for the retaining walls to the flying J entrance and Fannin Lane.

The disadvantage of the Value Engineering alternative is the addition of approximately 8 ft. of extension to an existing 4 ft. x 4 ft. box culvert, a 3 ft. extension of the existing inlet at the box culvert entrance, a 3 ft. retaining wall to avoid impact to the Boyd County Sanitation pump station at 28+50 Lt.

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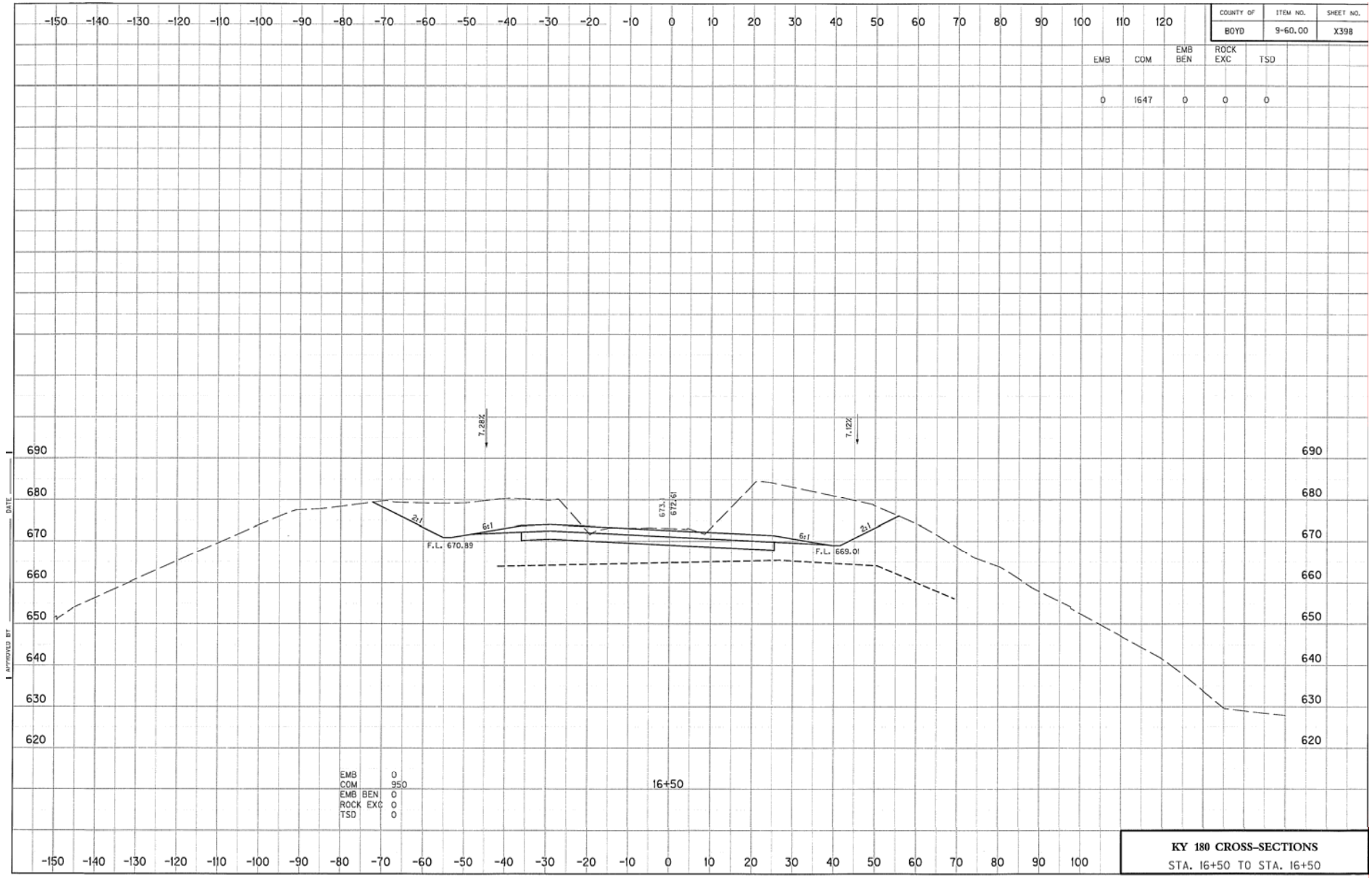
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ITEM NO.
9-60.00
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16+50
KY 180 CROSS-SECTIONS
STA. 16+50 TO STA. 16+50

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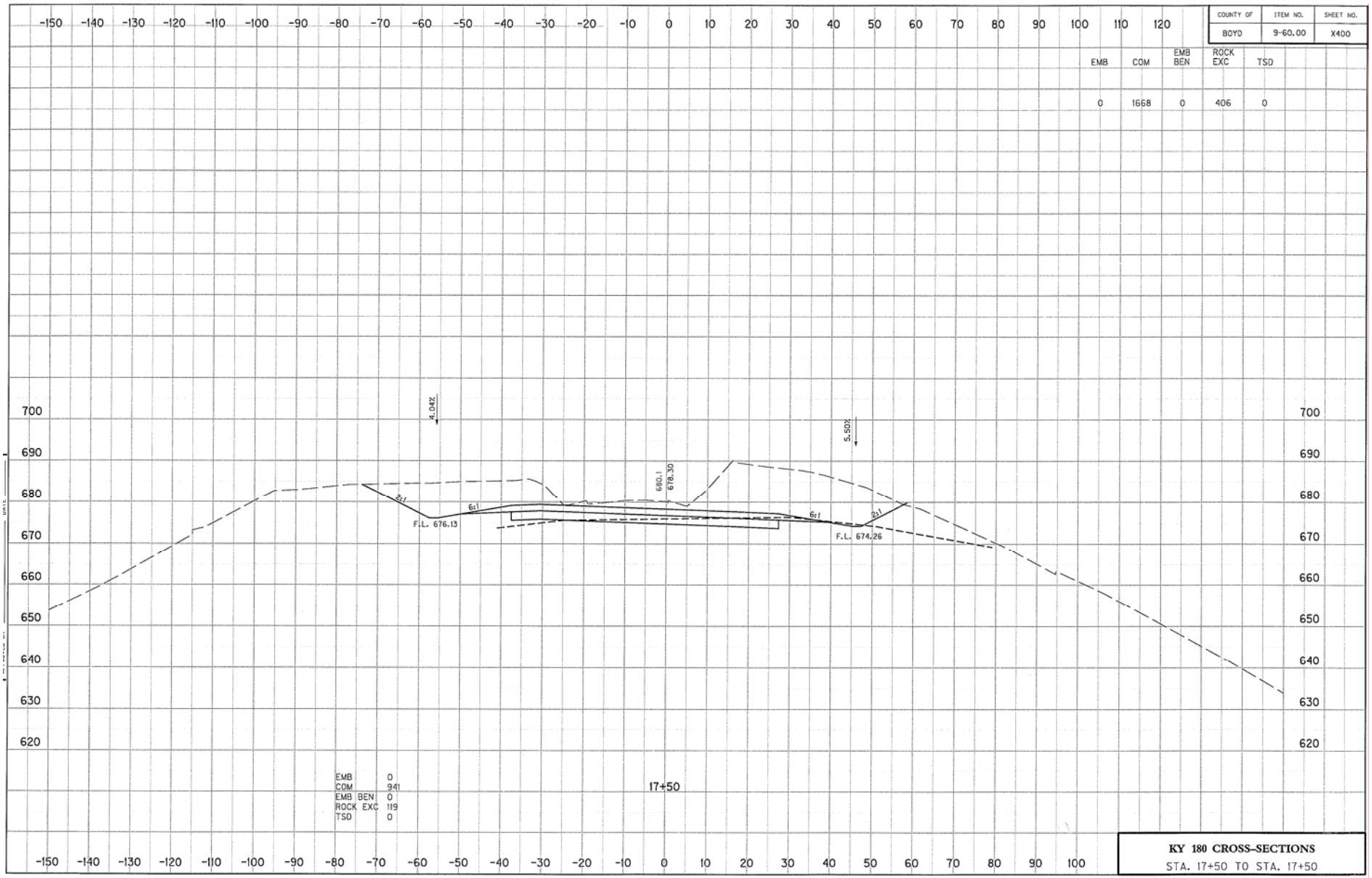
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KY 180 CROSS-SECTIONS
STA. 17+50 TO STA. 17+50

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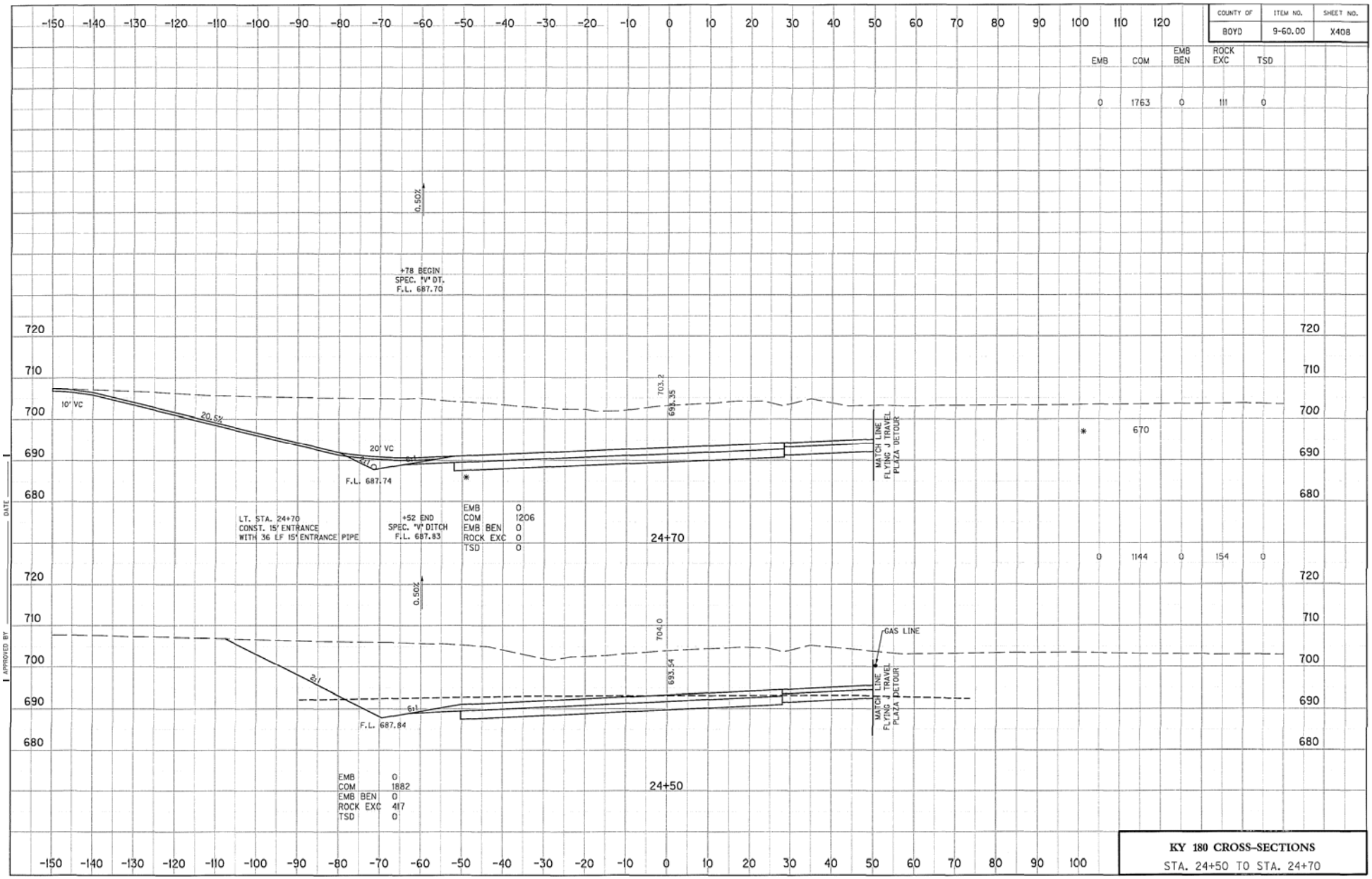
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+78 BEGIN
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F.L. 687.70
0.50%
10' VC
20.5%
20' VC
2:1
6:1
F.L. 687.74
703.2
693.35
MATCH LINE
FLYING J TRAVEL
PLAZA DETOUR
670
LT. STA. 24+70
CONST. 15' ENTRANCE
WITH 36 LF 15' ENTRANCE PIPE
+52 END
SPEC. 'V' DITCH
F.L. 687.83
EMB 0
COM 1206
EMB BEN 0
ROCK EXC 0
TSD 0
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154
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6:1
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EMB BEN 0
ROCK EXC 417
TSD 0
24+50
KY 180 CROSS-SECTIONS
STA. 24+50 TO STA. 24+70
DATE
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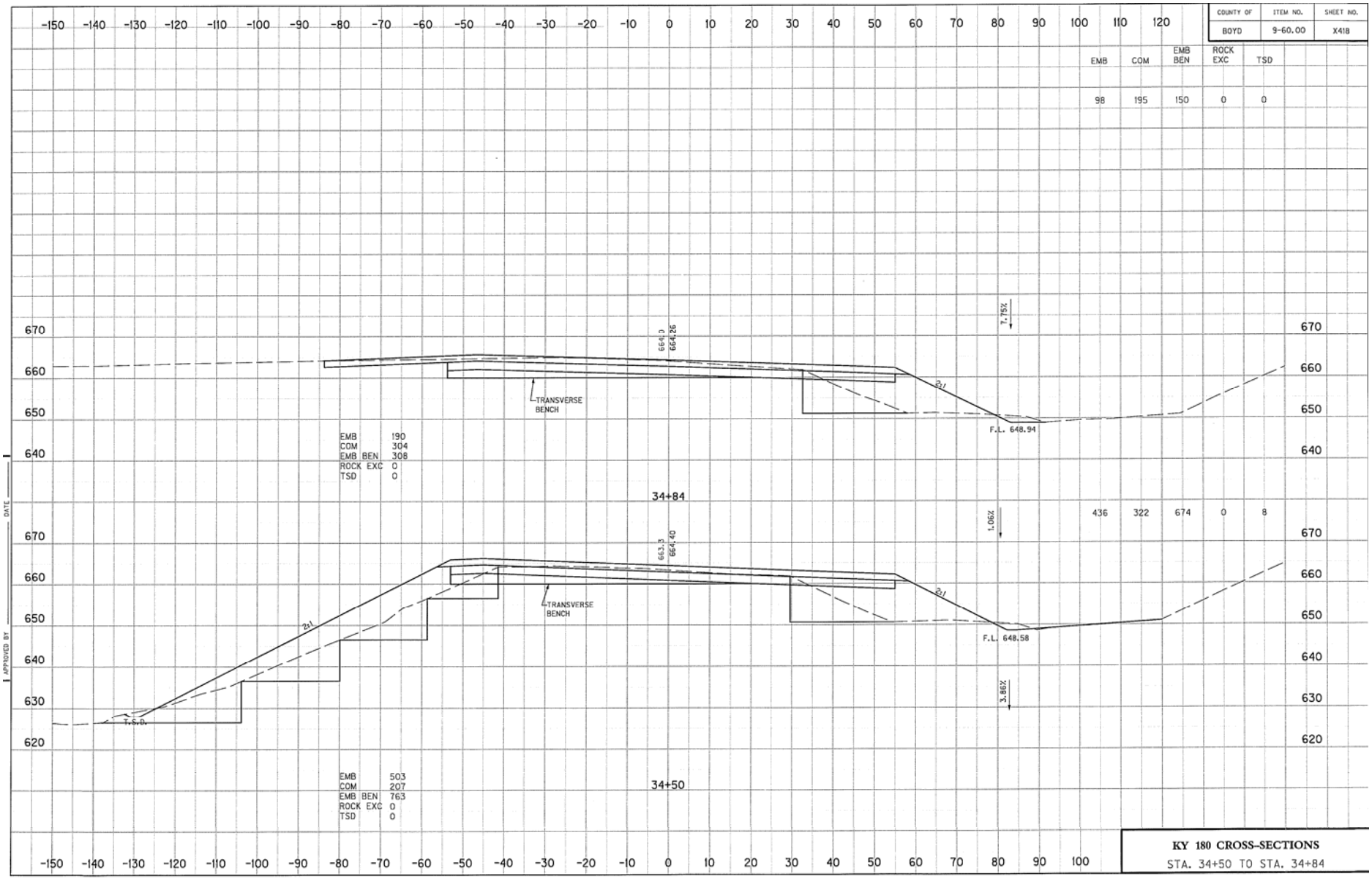
COUNTY OF
BOYD
ITEM NO.
9-60.00
SHEET NO.
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0
0
7.75%
664.0
664.26
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2:1
F.L. 648.94
EMB 190
COM 304
EMB BEN 308
ROCK EXC 0
TSD 0
34+84
436
322
674
0
8
1.06%
663.3
664.40
TRANSVERSE BENCH
2:1
F.L. 648.58
3.86%
T.S.D.
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COM 207
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ROCK EXC 0
TSD 0
34+50
KY 180 CROSS-SECTIONS
STA. 34+50 TO STA. 34+84
DATE
APPROVED BY

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GRADING-KY 180 PROFILE GRADES
VALUE ENGINEERING ALTERNATIVE NUMBER 1
COST COMPARISON SHEET

DESCRIPTION	UNITS	UNIT COST	PROP'D QTY.	PROP'D COST	V.E. QTY.	V.E. COST
Excavation	CY	**$9.25**			-25000.0	-$231,250
Retaining Walls @ Flying J & Fannin Lane	SF	$30.00			-600.0	-$18,000
4'x4' RCBC extension	LF	$160.00			8.0	$1,280
Retaining Wall @ Boyd County Sanitation Pump Station	SF	$30.00			120.0	$3,600
Raise Inlet @ 4'x4' RCBC entrance	LS	LS			1.0	$600.00
SUBTOTAL						**-$243,770**
ENGINEERING AND CONTINGENCY					10.0%	-$24,377
GRAND TOTAL						**-$268,147**

POSSIBLE SAVINGS: $268,147

VII. DEVELOPMENT PHASE

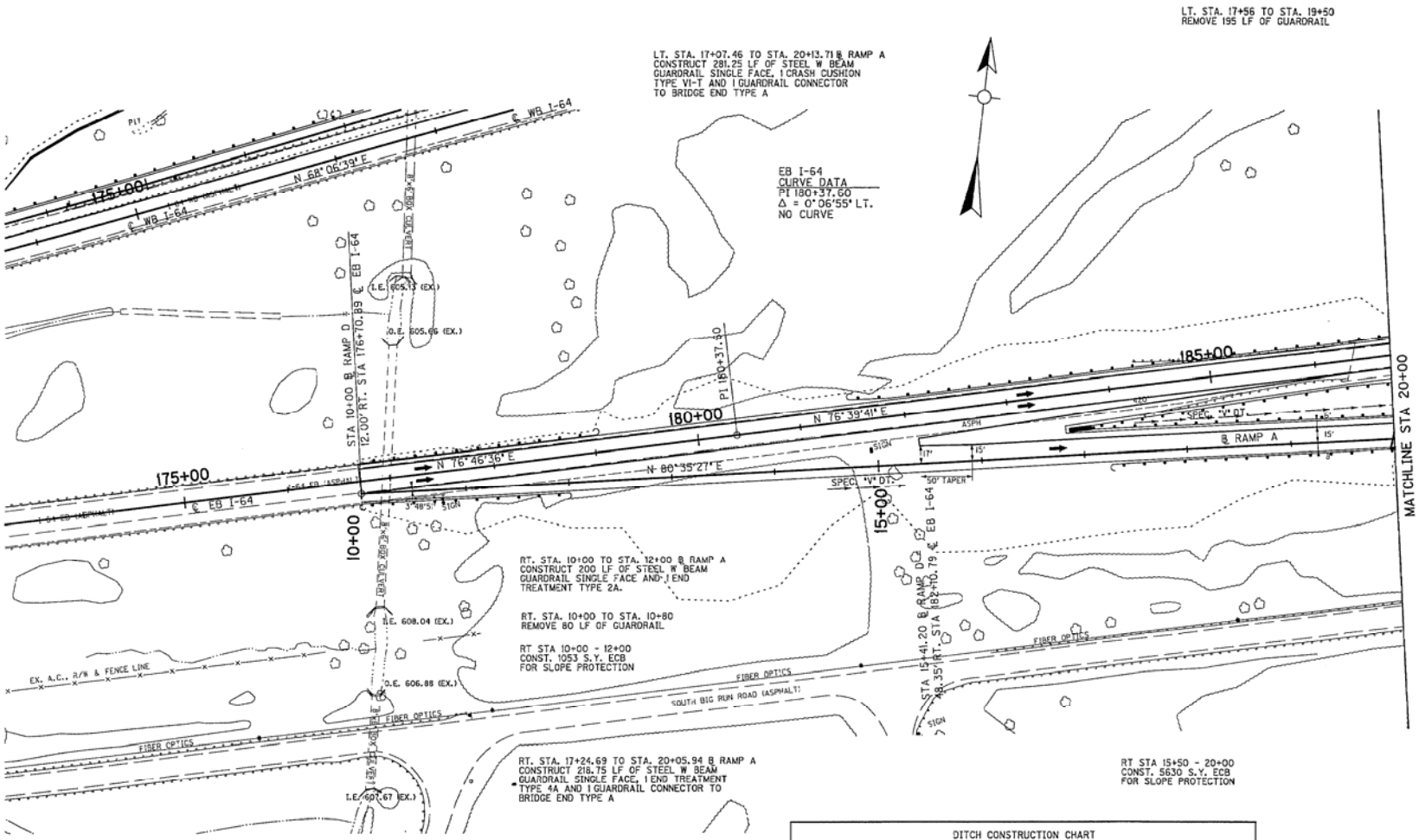
B.1. STRUCTURES-BRIDGES ON RAMPS A AND D

"As Proposed"

The As Proposed west-side ramps for the I-64/KY180 interchange are tapered ramps aligned in accordance with Kentucky's common practices interchange configuration in a rural area. The ramp alignments are separated from the mainline by 80 ft. at the East Fork Little Sandy River, thereby requiring two separate river crossing structures. The ramp river crossing structures are 30 ft. wide and 300 ft. long each.

The existing land use is rural, but commercial development is starting to take over the area. The interchange is a blend of rural and urban characteristics. The configuration of the interchange is a rural spread diamond. However, the projected traffic volumes require signalization of the crossroad and ramp intersection. This blending of urban and rural design elements causes conflicts with desirable design elements. The As Proposed design emphasizes the rural criteria. Therefore, the signalized intersections have less than desirable approach grades.

COUNTY OF	ITEM NO.	SHEET NO.
BOYD	9-60.00	R14



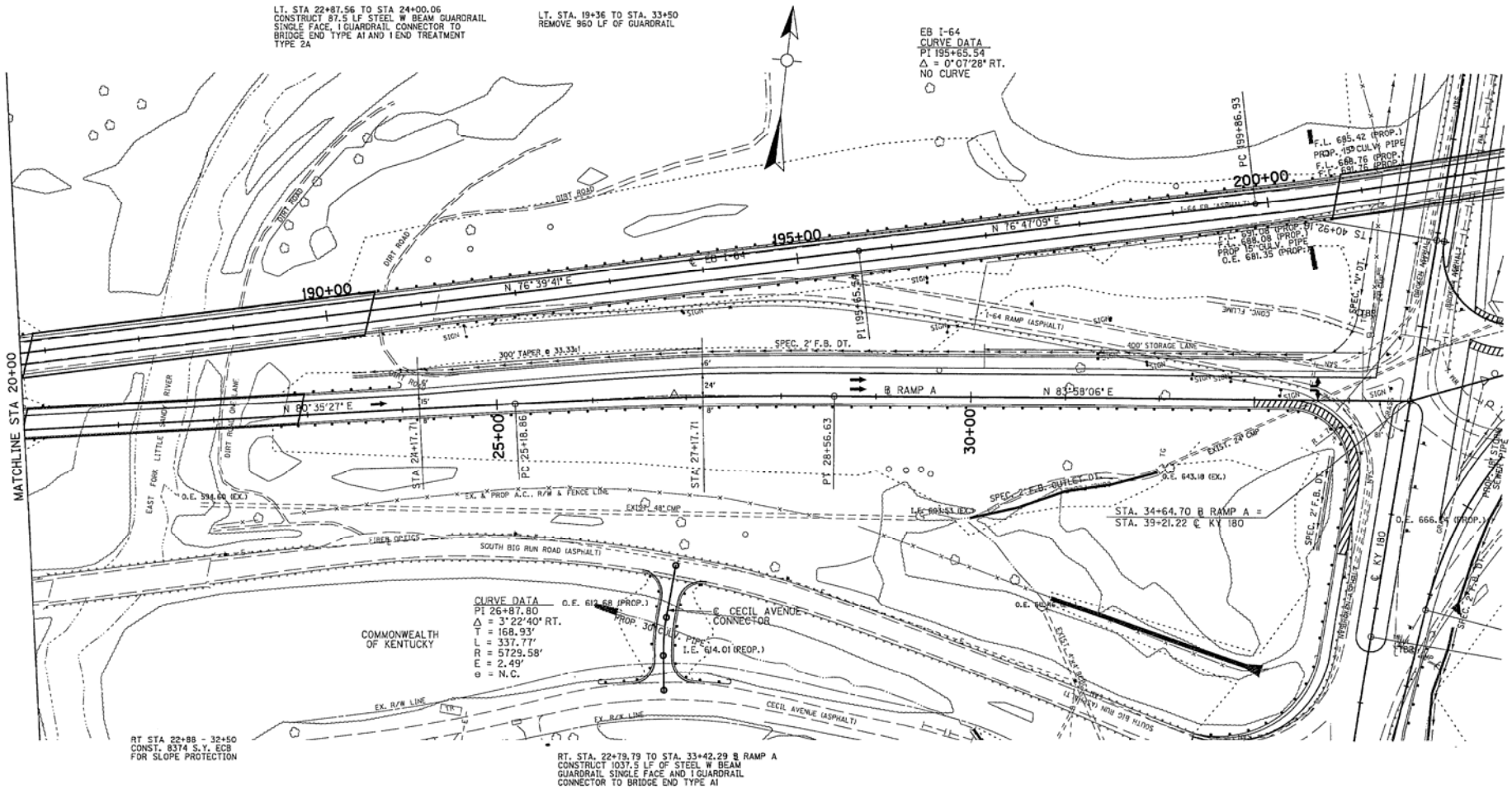
DITCH CONSTRUCTION CHART						
SIDE	STA TO STA	DESCRIPTION	LINING	QUANTITY	D	T
RT	12+00 TO 14+50	NORMAL RDWY. DT.	ECB	265 S.Y.	1.5'	-
RT	14+50 TO 15+24	SPECIAL "V" DT.	ECB	78 S.Y.	1.5'	-
LT	17+50 TO 20+00	SPECIAL "V" DT.	ECB	344 S.Y.	1.5'	-

SCALE 1" = 50'

AP

RAMP A PLAN
STA 10+00 TO STA 20+00

COUNTY OF	ITEM NO.	SHEET NO.
BOYD	9-60.00	R16



DITCH CONSTRUCTION CHART						
SIDE	STA TO STA	DESCRIPTION	LINING	QUANTITY	D	T
LT	23+50 TO 34+08	SPEC. 2' F.B. DT.	CL. II	662 TONS	1'	1.25'
RT	30+00 TO 32+00	OUTLET 2' F.B. DT.	CL. III	134 TONS	1'	2'

▨ SHOULDER STRENGTHENING FOR TRUCK OFF-TRACKING SEE RAMP TYPICAL SECTIONS

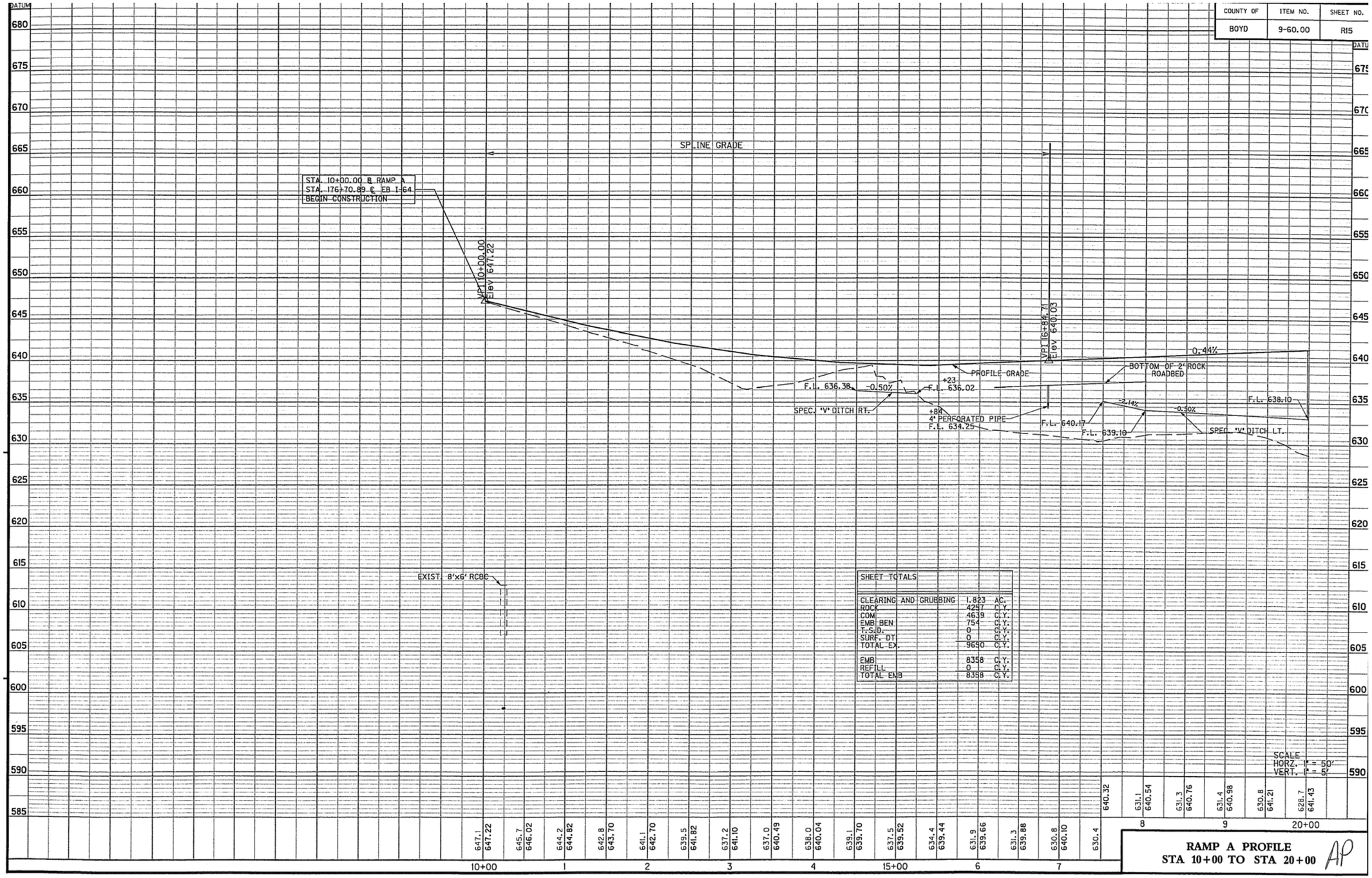
▩ TO BE REMOVED

SCALE 1" = 50'

AP

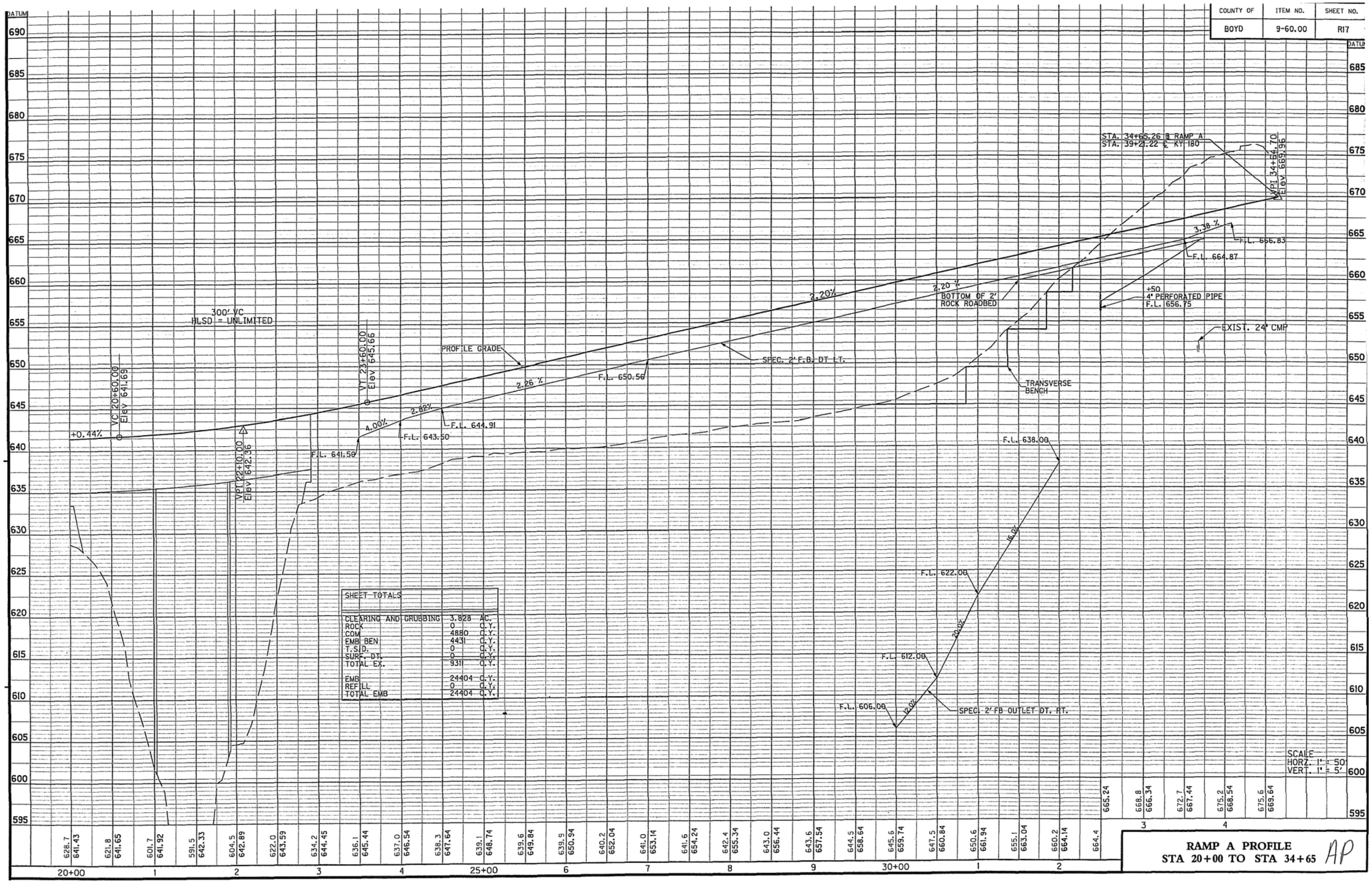
RAMP A PLAN
STA 20+00 TO STA 34+65

COUNTY OF	ITEM NO.	SHEET NO.
BOYD	9-60.00	R15



SHEET TOTALS		
CLEARING AND GRUBBING	1.823	AC.
ROCK	4257	C.Y.
COM.	4639	C.Y.
EMB. BEN	754	C.Y.
T.S.D.	0	C.Y.
SURF. DT	0	C.Y.
TOTAL EX.	9650	C.Y.
EMB.	8358	C.Y.
REFILL	0	C.Y.
TOTAL EMB	8358	C.Y.

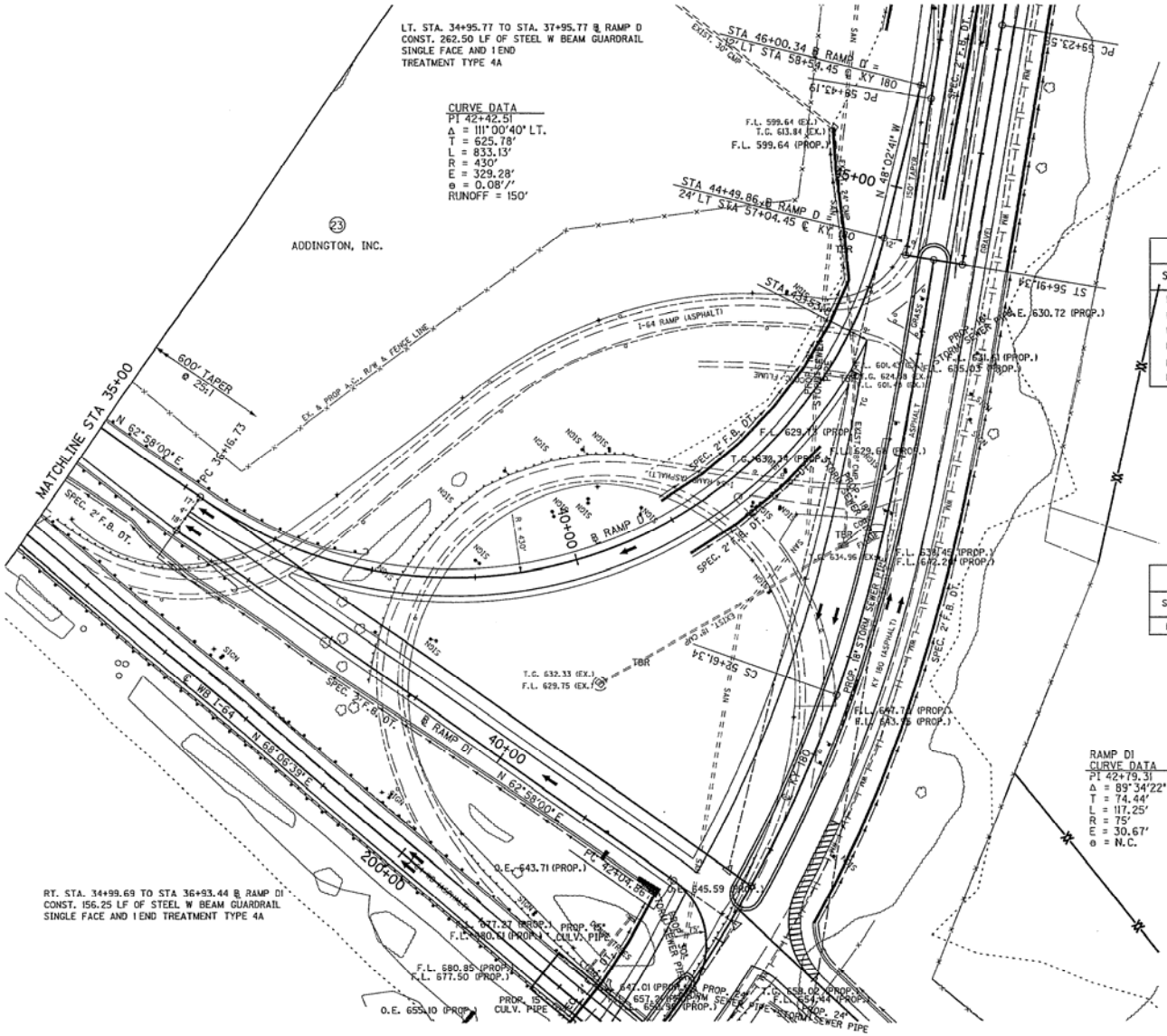
RAMP A PROFILE
STA 10+00 TO STA 20+00 AP



SHEET TOTALS

CLEARING AND GRUBBING	3.828	AC.
ROCK	0	C.Y.
COM	4880	C.Y.
EMB BEN	4431	C.Y.
T.S.D.	0	C.Y.
SURF. DT.	0	C.Y.
TOTAL EX.	9311	C.Y.
EMB	24404	C.Y.
REFILL	0	C.Y.
TOTAL EMB	24404	C.Y.

COUNTY OF	ITEM NO.	SHEET NO.
BOYD	9-60.00	R36



RAMP D
DITCH CONSTRUCTION CHART

SIDE	STA TO STA	DESCRIPTION	LINING	QUANTITY	D	T
LT	36+00 TO 41+00	NORMAL RDWY. DT.	ECB	530 S.Y.	1.5'	-
LT	41+00 TO 44+00	SPEC. 2' F.B. DT.	CL. II	167 TONS	1'	1.25'
LT	44+00 TO 45+40	SPEC. 2' F.B. DT.	CL. III	125 TONS	1'	2'
RT	35+00 TO 36+17	SPEC. 2' F.B. DT.	ECB	191 S.Y.	2'	-
RT	38+00 TO 41+00	NORMAL RDWY. DT.	ECB	364 S.Y.	1.5'	-
RT	41+00 TO 42+50	SPEC. 2' F.B. DT.	CL. II	83 TONS	1'	1.25'

RAMP DI
DITCH CONSTRUCTION CHART

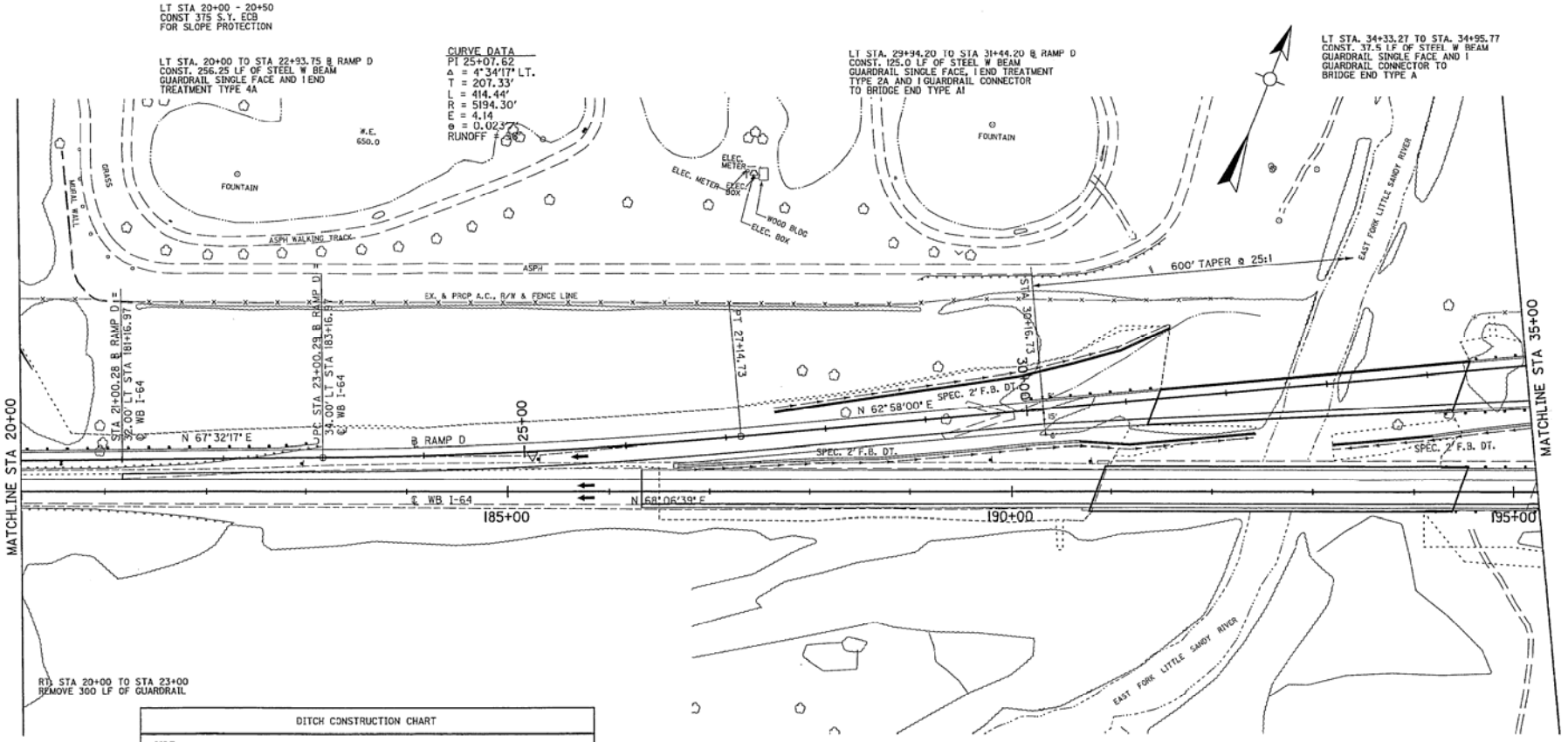
SIDE	STA TO STA	DESCRIPTION	LINING	QUANTITY	D	T
RT	36+17 TO 42+00	SPEC. 2' F.B. DT.	ECB	953 S.Y.	2'	-

SCALE 1" = 50'

AP

RAMP D PLAN
STA 35+00 TO STA 46+00

COUNTY OF	ITEM NO.	SHEET NO.
BOYD	9-60.00	R34



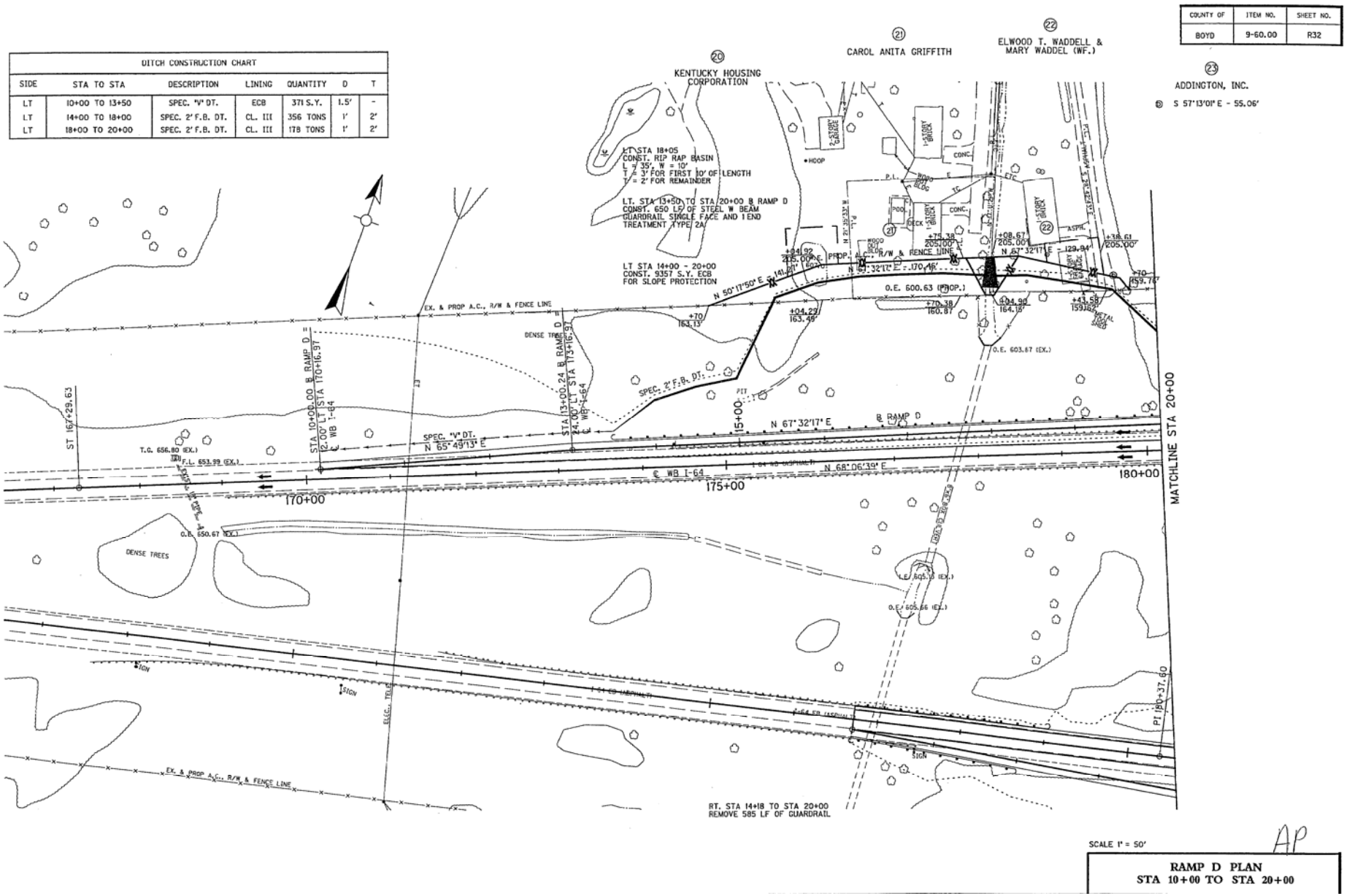
DITCH CONSTRUCTION CHART

SIDE	STA TO STA	DESCRIPTION	LINING	QUANTITY	D	T
LT	21+00 TO 27+50	NORMAL RDWY. DT.	ECB	689 S.Y.	1.5'	-
LT	27+50 TO 30+00	SPEC. 2' F.B. DT.	CL. II	139 TONS	1'	1.25'
LT	30+00 TO 31+50	SPEC. 2' F.B. DT.	CL. III	133 TONS	1'	2'
RT	26+50 TO 30+50	SPEC. 2' F.B. DT.	ECB	639 S.Y.	1.5'	-
RT	30+50 TO 32+25	SPEC. 2' F.B. DT.	CL. III	195 TONS	1'	2'
RT	33+00 TO 34+00	SPEC. 2' F.B. DT.	CL. III	67 TONS	1'	2'
RT	34+00 TO 35+00	SPEC. 2' F.B. DT.	ECB	164 S.Y.	2'	-

SCALE 1" = 50'

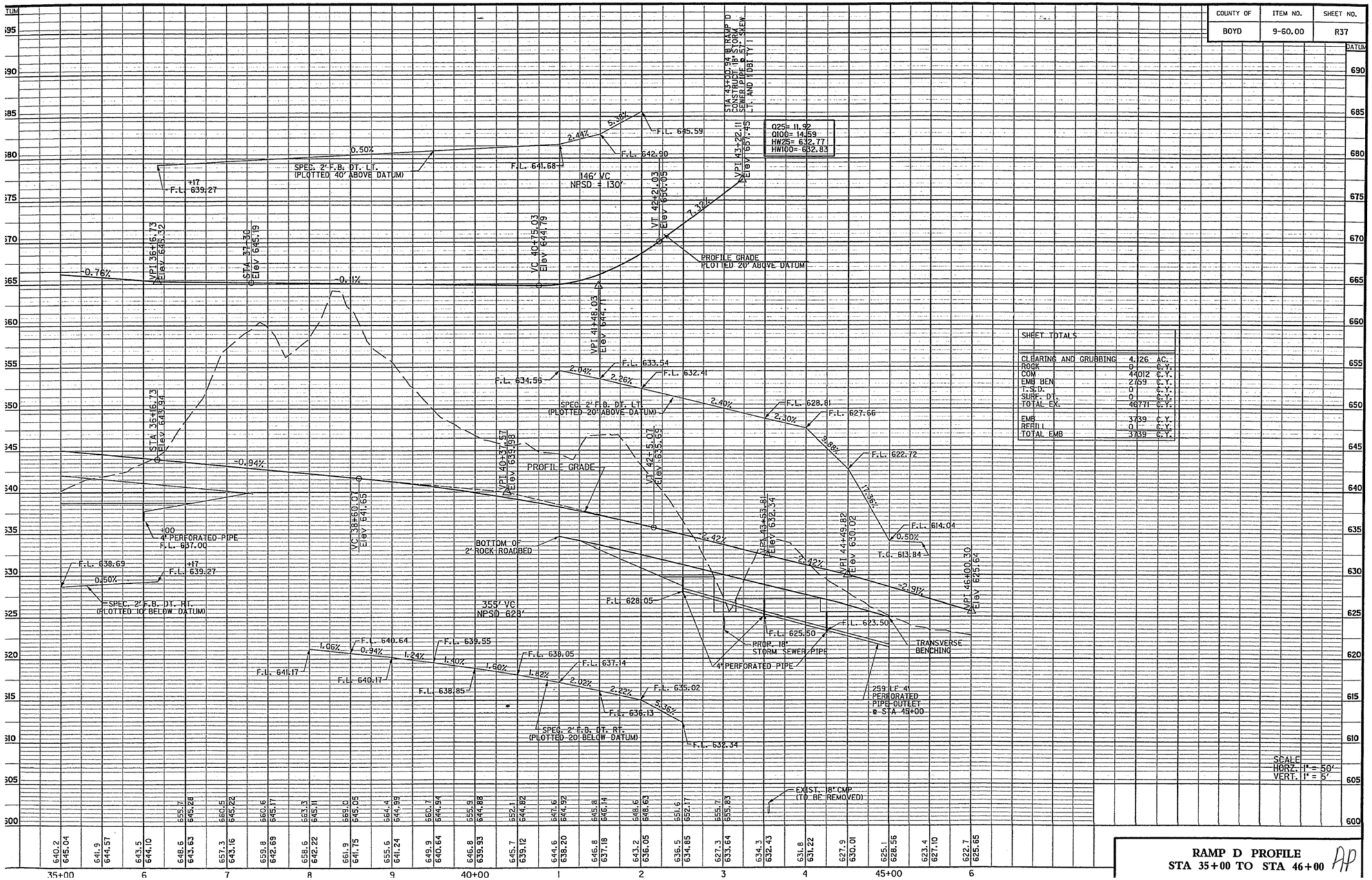
AP

RAMP D PLAN
STA 20+00 TO STA 35+00


DITCH CONSTRUCTION CHART
SIDE | STA TO STA | DESCRIPTION | LINING | QUANTITY | D | T
LT | 10+00 TO 13+50 | SPEC. "V" DT. | ECB | 371 S.Y. | 1.5' | -
LT | 14+00 TO 18+00 | SPEC. 2' F.B. DT. | CL. III | 356 TONS | 1' | 2'
LT | 18+00 TO 20+00 | SPEC. 2' F.B. DT. | CL. III | 178 TONS | 1' | 2'
COUNTY OF | ITEM NO. | SHEET NO.
BOYD | 9-60.00 | R32
20 KENTUCKY HOUSING CORPORATION
21 CAROL ANITA GRIFFITH
22 ELWOOD T. WADDELL & MARY WADDELL (WF.)
23 ADDINGTON, INC.
S 57°13'01" E - 55.06'
LT STA 18+05 CONST. RIP RAP BASIN L = 35', W = 10' T = 3' FOR FIRST 10' OF LENGTH T = 2' FOR REMAINDER
LT. STA 13+50 TO STA 20+00 @ RAMP D CONST. 650 L.F. OF STEEL W BEAM GUARDRAIL SINGLE FACE AND 1 END TREATMENT TYPE 2A
LT STA 14+00 - 20+00 CONST. 9357 S.Y. ECB FOR SLOPE PROTECTION
EX. & PROP A.C., R/W & FENCE LINE
DENSE TREES
STA 10+00.00 @ RAMP D = 12.00' LT STA 170+16.97 ℄ WB I-64
STA 13+00.24 @ RAMP D 24.00' LT STA 173+16.97 ℄ WB I-64
SPEC. "V" DT.
SPEC. 2' F.B. DT.
℄ WB I-64
@ RAMP D
N 67°32'17" E
N 65°49'13" E
N 68°06'39" E
T.C. 656.80 (EX.)
F.L. 653.99 (EX.)
O.E. 650.67 (EX.)
O.E. 600.63 (PROP.)
O.E. 603.67 (EX.)
170+00
175+00
180+00
MATCHLINE STA 20+00
ST 167+29.63
PT 180+37.60
RT. STA 14+18 TO STA 20+00 REMOVE 585 LF OF GUARDRAIL
SCALE 1" = 50'
RAMP D PLAN
STA 10+00 TO STA 20+00

AP

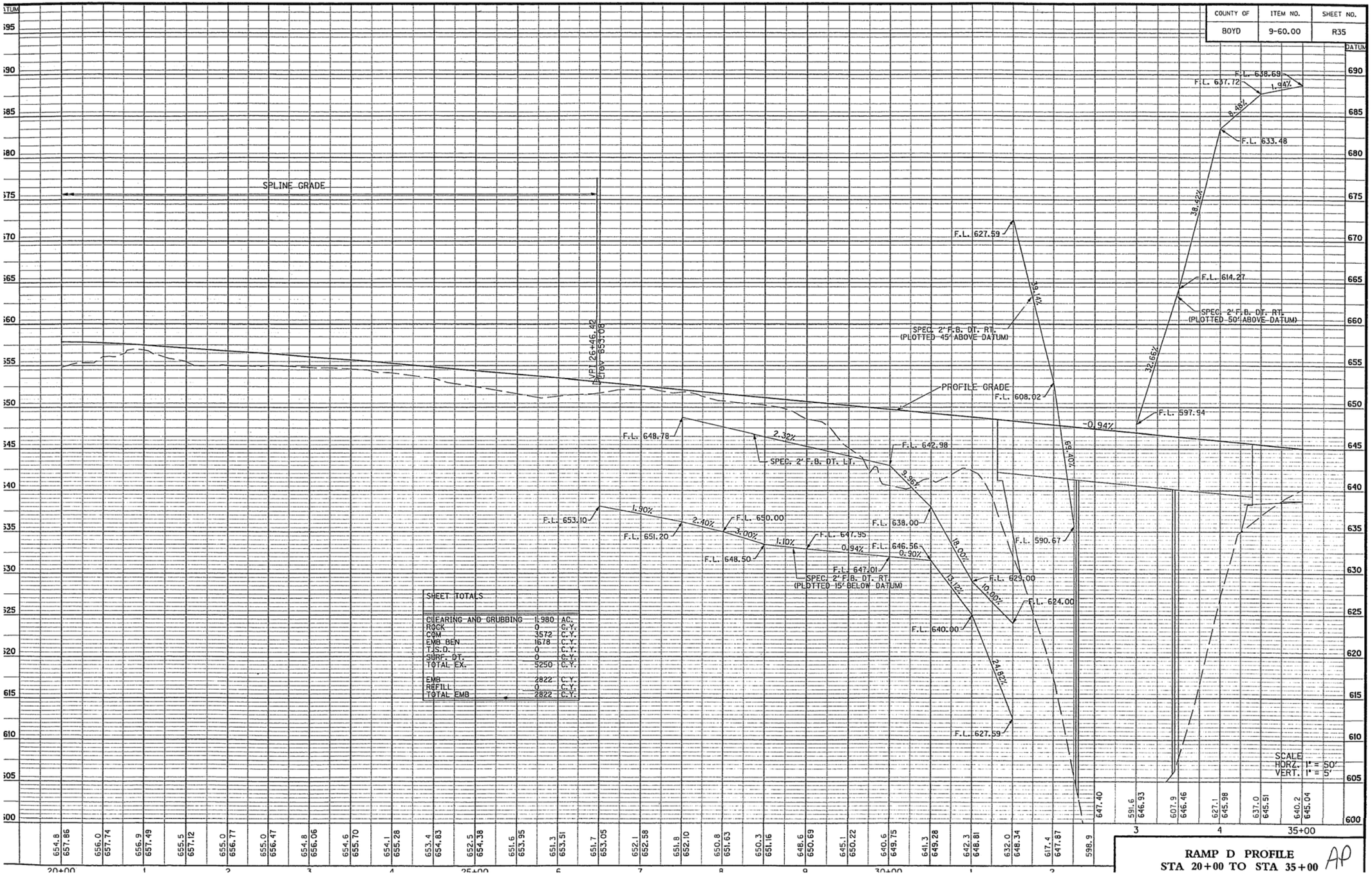
COUNTY OF	ITEM NO.	SHEET NO.
BOYD	9-60.00	R37



SHEET TOTALS		
CLEARING AND GRUBBING	4.126	AC.
ROCK	0	C.Y.
COM	44012	C.Y.
EMB BEN	2759	C.Y.
T.S.D.	0	C.Y.
SURF. DT.	0	C.Y.
TOTAL EX.	46771	C.Y.
EMB	3739	C.Y.
REFILL	0	C.Y.
TOTAL EMB	3739	C.Y.

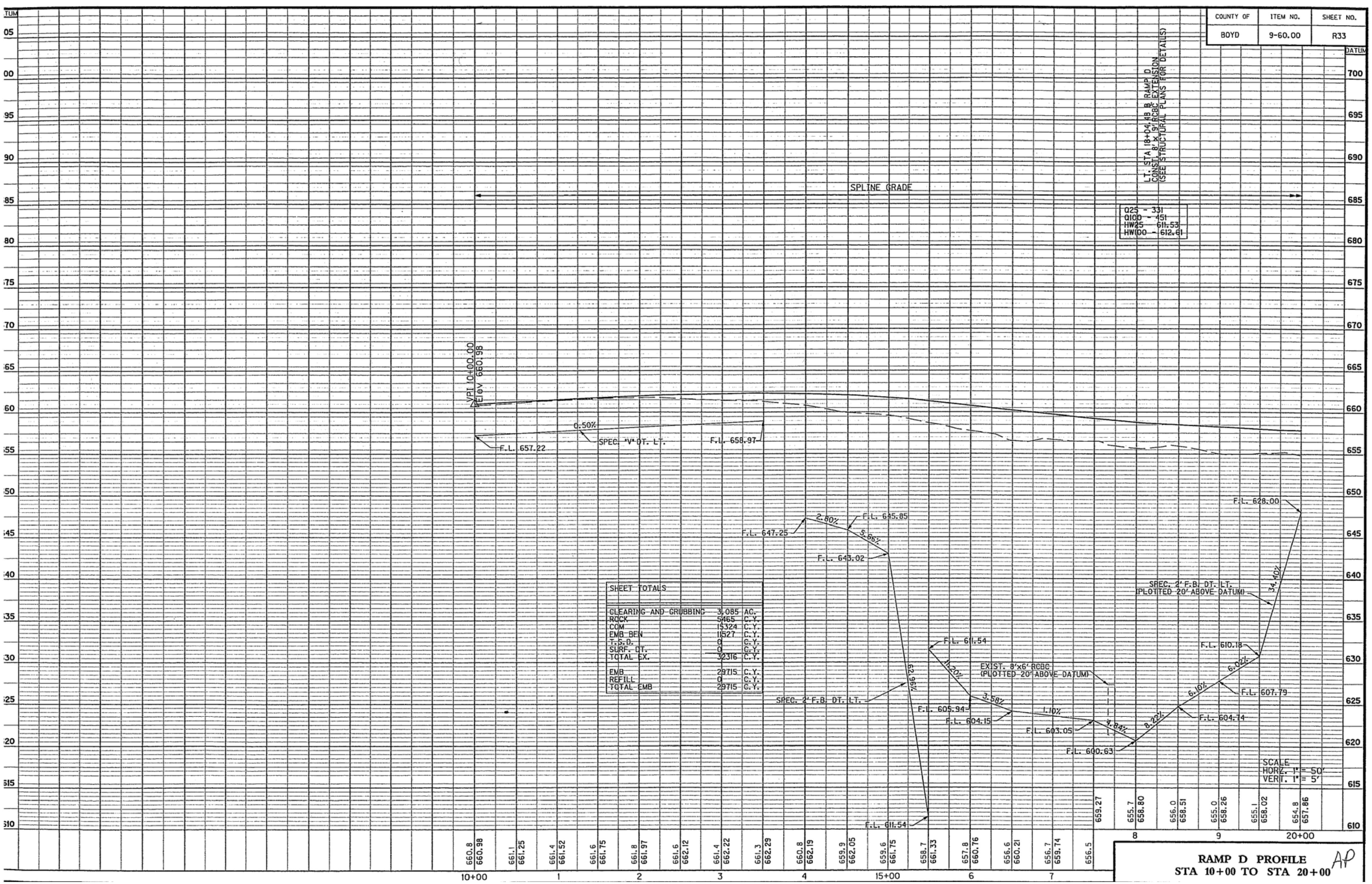
RAMP D PROFILE
STA 35+00 TO STA 46+00 AP

COUNTY OF	ITEM NO.	SHEET NO.
BOYD	9-60.00	R35



SHEET TOTALS		
CLEARING AND GRUBBING	1.980	AC.
ROCK	0	C.Y.
COM	3572	C.Y.
EMB BEN	1678	C.Y.
T.S.D.	0	C.Y.
SURF. DT.	0	C.Y.
TOTAL EX.	5250	C.Y.
EMB	2822	C.Y.
REFILL	0	C.Y.
TOTAL EMB	2822	C.Y.

RAMP D PROFILE
STA 20+00 TO STA 35+00 AP



COUNTY OF
BOYD
ITEM NO.
9-60.00
SHEET NO.
R33
DATUM
LT. STA 18+04.48 R RAMP D
CONST. 8' x 9' RCBC EXTENSION
(SEE STRUCTURAL PLANS FOR DETAILS)
SPLINE GRADE
Q25 - 331
Q100 - 451
HW25 - 611.53
HW100 - 612.61
VPI 10+00.00
Elev 660.98
0.50%
F.L. 657.22
SPEC. "V" DT. LT.
F.L. 658.97
F.L. 647.25
2.80%
F.L. 645.85
5.66%
F.L. 643.02
62.96%
SPEC. 2' F.B. DT. LT.
F.L. 611.54
F.L. 611.54
11.20%
F.L. 605.94
3.58%
F.L. 604.15
1.10%
F.L. 603.05
EXIST. 8'x6' RCBC
(PLOTTED 20' ABOVE DATUM)
4.84%
F.L. 600.63
8.22%
F.L. 604.74
6.10%
F.L. 607.79
6.02%
F.L. 610.18
34.40%
SPEC. 2' F.B. DT. LT.
(PLOTTED 20' ABOVE DATUM)
F.L. 628.00
SCALE
HORZ. 1" = 50'
VERT. 1" = 5'
SHEET TOTALS
CLEARING AND GRUBBING 3.085 AC.
ROCK 5465 C.Y.
COM 15324 C.Y.
EMB BEN 11527 C.Y.
T.S.D. 0 C.Y.
SURF. DT. 0 C.Y.
TOTAL EX. 32316 C.Y.
EMB 29715 C.Y.
REFILL 0 C.Y.
TOTAL EMB 29715 C.Y.
660.8 660.98 10+00
661.1 661.25
661.4 661.52 1
661.6 661.75
661.8 661.97 2
661.6 662.12
661.4 662.22 3
661.3 662.29
660.8 662.19 4
659.9 662.05
659.6 661.75 15+00
658.7 661.33
657.8 660.76 6
656.6 660.21
656.7 659.74 7
656.5
659.27
655.7 658.80 8
656.0 658.51
655.0 658.26 9
655.1 658.02
654.8 657.86 20+00
RAMP D PROFILE
STA 10+00 TO STA 20+00
AP

VII. DEVELOPMENT PHASE

B.1. STRUCTURES-BRIDGES ON RAMPS A AND D

Value Engineering Alternative Number 3

The Value Engineering team recommends that the interchange ramps be reconfigured using AASHTO parallel ramps in lieu of the tapered ramp configuration. The parallel ramps can be accommodated on widened mainline I-64 structures and eliminate the need for a separate ramp structure over the East Fork Little Sandy River. This will reduce the required structure width from 30 feet to 12 feet. The grading and paving for the ramp will also be reduced.

The VE team recommends that the intersection of the A and D ramps with KY180 be modified to provide a better operating intersection in closer conformity with Kentucky's desired intersection criteria. The VE team believes that desirable intersection criteria should control over open road criteria at a major signalized intersection.

The As Proposed intersection is located in a 1200 ft. radius curve on KY 180. The open road super-elevation for a 1200 ft. radius curve at 60 mph is 7.7%. This 7.7% cross slope on KY 180 requires an intersection approach leg to have an undesirable grade of 8%. Kentucky and AASHTO intersection design guides prefer a maximum intersection approach grade of 3% or less. Therefore, the VE team recommends that the super-elevation on KY 180 be changed to 4% in the intersection area and all approach grades be reduced to 4% or less. The 4% super-elevation for a 1200-foot radius curve allows for a 55-mph open road speed, which is the proposed posted speed limit on KY 180.

The Value Engineering alternative will require staged construction of the EB & WB bridges over the river. This will reduce the work area that the contractor needs to the long (130 ft.) and heavy prestressed girders adjacent to traffic. If spliced prestressed post tensioned girders were used the maximum length of beam could be reduced to about 98 ft.

HIGHWAY DESIGN	Chapter INTERSECTIONS
	Subject At-Grade Intersections

See 586 GB

Summary: The basic intersection configurations are the three-leg "T", the four-leg, and the multi-leg. At each specific location, the intersection type is determined by the number of intersecting legs, the topography of the area, the character of the intersecting highways, traffic volumes and movements, speeds and desired type of operation.

Horizontal and vertical alignment, cross-sectional elements, adequate sight distance and drainage issues are very important design elements in the layout of an at-grade intersection. These features contribute a great deal to the overall operation of the facility.

HORIZONTAL AND VERTICAL ALIGNMENT:

The horizontal alignment and vertical grades of an intersection should be designed to permit users to visually recognize the intersection, the other vehicles using it, and to readily perform the needed maneuvers to pass through the intersection safely. Generally the alignments should be as straight and the gradients as flat as feasible. Major grade changes should be avoided at intersections and adequate sight distance should be provided along both intersecting roads. Ideally grades exceeding 3 percent on the major road(s) should be avoided in the vicinity of the intersection. Where this is not feasible, grades greater than 6 percent should be avoided.

The designer/project team should review each intersection thoroughly and determine an acceptable solution. When designing an intersection, the mainline grades/cross-slopes generally are carried through the intersection and the approach roadways adjusted to match the mainline geometrics. However, there are times when intersection design may be controlled by constraints other than the crossing roadway geometry. The design may need to address such intersection characteristics as traffic volumes, type of design vehicles, design speed, functional characteristics, type of intersection control, and the topographic constraints of the location.

Each intersection should be adjusted at all intersecting legs, as necessary, to accommodate adequate sight distance requirements, driver comfort during maneuvers and any drainage concerns. This

might be accomplished by modification of the mainline/approach grade points, cross-slopes, etc. The goals for an intersection should include: smooth and continuous intersection elements, smooth transitions for vehicles changing directions, grades as level as practical, and sufficient sight distance to allow drivers to prepare for and avoid potential conflicts.

For safety and economic reasons, the intersecting roadways should meet at right angles when feasible. Although a 90-degree intersection is desired, some deviation from this is permissible. Generally intersection angles between 75 and 90-degrees are preferred. Intersection angles of at least 70-degrees should be provided.

TURNING ROADWAY ELEMENTS:

Turning roadways are created by high-type right-turn radius designs and corner traffic islands. They are typically used at high-speed and/or high volume intersections, and are associated with a high level of service for right-turn vehicles. It is important to provide a turning roadway design that is consistent with the speed and volume characteristics of the turn. The primary design elements of a turning roadway are 1) radius of turn, 2) development of superelevation, and 3) width of roadway.

The relationships between speed and curvature may be found on the exhibit titled "Minimum Radii for Intersection Curves" found in Chapter 3 of AASHTO's ***A Policy on Geometric Design of Highways and Streets***, current edition. Kentucky's common practice is to use a maximum superelevation of 8%. Note that the minimum radii indicated in this exhibit should be used as the inner edge of pavement for the turning roadway.

Three-centered compound curves may also be considered as an option when determining an intersection radius. Three-centered compound curves information may be found in the exhibit titled "Typical Design for Turning Roadways" found in Chapter 9 of AASHTO's ***A Policy on Geometric Design of Highways and Streets***, current edition.

The turning path of the design vehicle and angle of turn determines the widths of turning roadways. Chapter 2 of AASHTO's ***A Policy on Geometric Design of Highways and Streets***, current edition, details the various types of design vehicles with their dimensions and turning radii. Chapter 9 of AASHTO's ***A Policy on Geometric Design of Highways and Streets***, current edition, summarizes the minimum edge of traveled way values for various vehicles and turning angles.

or vehicles attempting to start slowly from a stopped position. One series of tests (**16**) found coefficients of friction for ice ranging from 0.050 to 0.200, depending on the condition of the ice (i.e., wet, dry, clean, smooth, or rough). Tests on loose or packed snow show coefficients of friction ranging from 0.200 to 0.400. Other tests (**21**) have corroborated these values. The lower extreme of this range of coefficients of friction probably occurs only under thin film "quick freeze" conditions at a temperature of about –1°C [30°F] in the presence of water on the pavement. Similar low friction values may occur with thin layers of mud on the pavement surface, with oil or flushed spots, and with high speeds and a sufficient depth of water on the pavement surface to permit hydroplaning. For these reasons some highway agencies have adopted a maximum superelevation rate of 8 percent. Such agencies believe that 8 percent represents a logical maximum superelevation rate, regardless of snow or ice conditions. Such a limit tends to reduce the likelihood that slow drivers will experience negative side friction, which can result in excessive steering effort and erratic operation.

Where traffic congestion or extensive marginal development acts to restrict top speeds, it is common practice to utilize a low maximum rate of superelevation, usually 4 to 6 percent. Similarly, either a low maximum rate of superelevation or no superelevation is employed within important intersection areas or where there is a tendency to drive slowly because of turning and crossing movements, warning devices, and signals. In these areas it is difficult to warp crossing pavements for drainage without providing negative superelevation for some turning movements.

In summary, it is recommended that (1) several rates, rather than a single rate, of maximum superelevation should be recognized in establishing design controls for highway curves, (2) a rate of 12 percent should not be exceeded, (3) a rate of 4 or 6 percent is applicable for urban design in areas with little or no constraints, and (4) superelevation may be omitted on low-speed urban streets where severe constraints are present. Accordingly, five maximum superelevation rates—4, 6, 8, 10, and 12 percent—are used below. For each of these rates the maximum curvature and actual superelevation rates for flatter curves are determined. In actual design practice, an agency will generally use different superelevation rates within the normal range of rates described above for different road systems.

Minimum Radius

The minimum radius is a limiting value of curvature for a given design speed and is determined from the maximum rate of superelevation and the maximum side friction factor selected for design (limiting value of f). Use of sharper curvature for that design speed would call for superelevation beyond the limit considered practical or for operation with tire friction and lateral acceleration beyond what is considered comfortable by many drivers, or both. Although based on a threshold of driver comfort, rather than safety, the minimum radius of curvature is a significant value in alignment design. The minimum radius of curvature is also an important control value for determination of superelevation rates for flatter curves.

The minimum radius of curvature, R_{min}, can be calculated directly from the simplified curve formula introduced above in the section on the "Side Friction Factor." This formula can be recast to determine R_{min} as follows:

US CUSTOMARY

	V_d = 15 mph			V_d = 20 mph			V_d = 25 mph			V_d = 30 mph			V_d = 35 mph			V_d = 40 mph			V_d = 45 mph			V_d = 50 mph			V_d = 55 mph			V_d = 60 mph			V_d = 65 mph			V_d = 70 mph			V_d = 75 mph			V_d = 80 mph		
		L (ft)			L (ft)			L (ft)			L (ft)			L (ft)			L (ft)			L (ft)			L (ft)			L (ft)			L (ft)			L (ft)			L (ft)			L (ft)		
R (ft)	e (%)	2 Lns	4 Lns	e (%)	2 Lns	4 Lns	e (%)	2 Lns	4 Lns	e (%)	2 Lns	4 Lns	e (%)	2 Lns	4 Lns	e (%)	2 Lns	4 Lns	e (%)	2 Lns	4 Lns	e (%)	2 Lns	4 Lns	e (%)	2 Lns	4 Lns	e (%)	2 Lns	4 Lns	e (%)	2 Lns	4 Lns	e (%)	2 Lns	4 Lns	e (%)	2 Lns	4 Lns
23000	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0
20000	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0
17000	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0
14000	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0	RC	60	90	RC	63	95	RC	69	103
12000	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0	RC	56	84	RC	60	90	RC	63	95	2.2	75	113
10000	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0	RC	53	80	RC	56	84	2.1	63	95	2.4	76	114	2.6	89	134
8000	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0	RC	51	77	2.1	56	84	2.4	67	100	2.6	78	117	2.9	92	137	3.3	113	170
6000	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0	RC	44	67	RC	48	72	2.4	61	92	2.7	72	108	3.1	87	130	3.4	102	153	3.8	120	180	4.3	147	221
5000	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0	RC	41	62	RC	44	67	2.4	58	86	2.8	71	107	3.2	85	128	3.6	100	151	4.1	123	184	4.5	142	213	5.1	175	262
4000	NC	0	0	NC	0	0	NC	0	0	NC	0	0	RC	39	58	RC	41	62	2.4	53	80	2.9	70	104	3.4	87	130	3.9	104	156	4.4	123	184	4.9	147	221	5.5	174	261	6.2	213	319
3500	NC	0	0	NC	0	0	NC	0	0	NC	0	0	RC	39	58	2.3	48	71	2.7	60	90	3.2	77	115	3.8	97	146	4.4	117	176	4.9	137	205	5.5	165	248	6.2	196	294	7.0	240	360
3000	NC	0	0	NC	0	0	NC	0	0	RC	36	55	2.1	41	61	2.6	54	81	3.1	69	103	3.7	89	133	4.3	110	165	5.0	133	200	5.6	156	234	6.3	189	283	7.0	221	332	7.8	267	401
2500	NC	0	0	NC	0	0	NC	0	0	RC	36	55	2.5	48	73	3.0	62	93	3.7	82	123	4.3	103	155	5.0	128	191	5.7	152	228	6.4	179	268	7.2	216	324	7.8	246	369	R_{min} = 2675		
2000	NC	0	0	NC	0	0	RC	34	51	2.4	44	65	3.0	58	87	3.7	77	115	4.4	98	147	5.1	122	184	5.9	151	226	6.6	176	264	7.4	207	310	7.9	237	356	R_{min} = 2215					
1800	NC	0	0	NC	0	0	RC	34	51	2.6	47	71	3.3	64	96	4.0	83	124	4.7	104	157	5.5	132	198	6.3	161	241	7.1	189	284	7.7	215	322	R_{min} = 1820								
1600	NC	0	0	RC	32	49	2.2	38	57	2.9	53	79	3.6	70	105	4.4	91	137	5.2	116	173	5.9	142	212	6.7	171	257	7.5	200	300	8.0	223	335									
1400	NC	0	0	RC	32	49	2.4	41	62	3.2	58	87	4.0	77	116	4.8	99	149	5.6	124	187	6.4	154	230	7.2	184	276	7.8	208	312	R_{min} = 1485										
1200	NC	0	0	RC	32	49	2.8	48	72	3.6	65	98	4.5	87	131	5.4	112	168	6.2	138	207	7.0	168	252	7.7	197	295	R_{min} = 1205													
1000	NC	0	0	2.4	39	58	3.3	57	85	4.2	76	115	5.1	99	148	6.0	124	186	6.8	151	227	7.6	182	274	8.0	204	306														
900	RC	31	46	2.6	42	63	3.5	60	90	4.5	82	123	5.5	106	160	6.4	132	199	7.2	160	240	7.8	187	281	R_{min} = 965																	
800	RC	31	46	2.9	47	71	3.9	67	100	4.9	89	134	5.9	114	171	6.8	141	211	7.6	169	253	8.0	192	288																		
700	RC	31	46	3.2	52	78	4.3	74	111	5.3	96	145	6.3	122	183	7.2	149	223	7.9	176	263	R_{min} = 760																				
600	2.2	34	51	3.6	58	88	4.8	82	123	5.8	105	158	6.8	132	197	7.6	157	236	8.0	178	267																					
500	2.6	40	60	4.1	66	100	5.3	91	136	6.4	116	175	7.4	143	215	8.0	166	248	R_{min} = 600																						
450	2.9	45	67	4.4	71	107	5.6	96	144	6.7	122	183	7.7	149	224	R_{min} = 465																										
400	3.2	49	74	4.8	78	117	6.0	103	154	7.1	129	194	7.9	153	229																											
350	3.5	54	81	5.2	84	126	6.4	110	165	7.5	136	205	8.0	155	232																											
300	3.9	60	90	5.6	91	136	6.8	117	176	7.8	142	213	R_{min} = 350																													
250	4.5	69	104	6.1	99	148	7.4	127	190	8.0	145	218																													
200	5.1	78	118	6.7	109	163	7.9	135	203	R_{min} = 250																															
150	5.9	91	136	7.5	122	182	R_{min} = 170																																		
100	7.0	108	162	R_{min} = 105																																					
75	7.7	118	178																																						
	R_{min} = 60																																								

e_{max}	=	8%
R	=	radius of curve
V_d	=	assumed design speed
e	=	rate of superelevation
L	=	minimum length of runoff (does not include tangent runout) as discussed in "Tangent-to-Curve Transition" section
NC	=	normal crown section
RC	=	remove adverse crown, superelevate at normal crown slope

Exhibit 3-23. Values for Design Elements Related to Design Speed and Horizontal Curvature (Continued)

US CUSTOMARY

	V_d = 15 mph			V_d = 20 mph			V_d = 25 mph			V_d = 30 mph			V_d = 35 mph			V_d = 40 mph			V_d = 45 mph			V_d = 50 mph			V_d = 55 mph			V_d = 60 mph		
		L (ft)			L (ft)			L (ft)			L (ft)			L (ft)			L (ft)			L (ft)			L (ft)			L (ft)			L (ft)	
R (ft)	e (%)	2 Lns	4 Lns	e (%)	2 Lns	4 Lns	e (%)	2 Lns	4 Lns	e (%)	2 Lns	4 Lns	e (%)	2 Lns	4 Lns	e (%)	2 Lns	4 Lns	e (%)	2 Lns	4 Lns	e (%)	2 Lns	4 Lns	e (%)	2 Lns	4 Lns	e (%)	2 Lns	4 Lns
23000	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0
20000	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0
17000	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0
14000	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0
12000	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0
10000	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0
8000	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0	RC	51	77	RC	53	80
6000	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0	RC	48	72	RC	51	77	2.3	61	92
5000	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0	RC	44	67	RC	48	72	2.3	59	88	2.5	67	100
4000	NC	0	0	NC	0	0	NC	0	0	NC	0	0	NC	0	0	RC	41	62	RC	44	67	2.3	55	83	2.6	68	100	2.8	75	112
3500	NC	0	0	NC	0	0	NC	0	0	NC	0	0	RC	39	58	RC	41	62	2.2	49	73	2.5	60	90	2.7	69	103	3.0	80	120
3000	NC	0	0	NC	0	0	NC	0	0	NC	0	0	RC	39	58	2.1	43	65	2.4	53	80	2.7	65	97	2.9	74	111	3.3	88	132
2500	NC	0	0	NC	0	0	NC	0	0	RC	36	55	RC	39	58	2.4	50	74	2.6	58	87	2.9	70	104	3.2	82	123	3.5	93	140
2000	NC	0	0	NC	0	0	RC	34	51	RC	36	55	2.3	45	67	2.6	54	81	2.9	64	97	3.2	77	115	3.5	89	134	3.8	101	152
1800	NC	0	0	NC	0	0	RC	34	51	2.1	38	57	2.4	46	70	2.7	56	84	3.0	67	100	3.3	79	119	3.7	94	142	3.9	104	156
1600	NC	0	0	NC	0	0	RC	34	51	2.2	40	60	2.6	50	75	2.9	60	90	3.2	71	107	3.5	84	126	3.8	97	146	4.0	107	160
1400	NC	0	0	NC	0	0	RC	34	51	2.4	44	65	2.7	52	78	3.0	62	93	3.4	76	113	3.7	89	133	3.9	100	149	R_{min} = 1505		
1200	NC	0	0	RC	32	49	2.2	38	57	2.5	45	68	2.9	56	84	3.2	66	99	3.6	80	120	3.9	94	140	4.0	102	153			
1000	NC	0	0	RC	32	49	2.4	41	62	2.7	49	74	3.1	60	90	3.5	72	108	3.8	84	127	4.0	96	144	R_{min} = 1190					
900	NC	0	0	2.1	34	51	2.5	43	64	2.9	53	79	3.2	62	93	3.6	74	112	3.9	87	130	R_{min} = 930								
800	NC	0	0	2.2	36	54	2.6	45	67	3.0	55	82	3.4	66	99	3.8	79	118	4.0	89	133									
700	RC	31	46	2.3	37	56	2.7	46	69	3.2	58	87	3.6	70	105	3.9	81	121	R_{min} = 730											
600	RC	31	46	2.5	41	61	2.9	50	75	3.4	62	93	3.8	74	110	4.0	83	124												
500	2.1	32	48	2.6	42	63	3.1	53	80	3.6	65	98	3.9	75	113	R_{min} = 565														
450	2.2	34	51	2.7	44	66	3.2	55	82	3.7	67	101	4.0	77	116															
400	2.3	35	53	2.9	47	71	3.4	58	87	3.8	69	104	R_{min} = 420																	
350	2.4	37	55	3.0	49	73	3.6	62	93	3.9	71	106																		
300	2.6	40	60	3.2	52	78	3.7	63	95	4.0	73	109																		
250	2.7	42	62	3.4	55	83	3.9	67	100	R_{min} = 300																				
200	3.0	46	69	3.7	60	90	R_{min} = 205																							
150	3.3	51	76	3.9	63	95																								
100	3.8	58	88	R_{min} = 125																										
75	4.0	62	92																											
	R_{min} = 70																													

e_{max} = 4%
R = radius of curve
V_d = assumed design speed
e = rate of superelevation
L = minimum length of runoff (does not include tangent runout) as discussed in "Tangent-to-Curve Transition" section
NC = normal crown section
RC = remove adverse crown, superelevate at normal crown slope

Use of e_{max} = 4% should be limited to urban conditions

Exhibit 3-21. Values for Design Elements Related to Design Speed and Horizontal Curvature (Continued)

COUNTY OF	ITEM NO.	SHEET NO.
BOYD	9-60.00	R85

CURVE DATA

RAMP A
PI 26+87.80
Δ = 3°22'40" RT.
T = 168.93'
L = 337.77'
R = 5729.58'
E = 2.49'
e = N.C.

RAMP D
PI 25+07.62
Δ = 4°34'17" LT.
T = 207.33'
L = 414.44'
R = 5194.30'
E = 4.14'
e = 0.023'/'
RUNOFF = 56'

RAMP D
PI 42+42.51
Δ = 111°00'40" LT.
T = 625.78'
L = 833.13'
R = 430.00'
E = 329.28'
e = 0.08'/'
RUNOFF = 150'

RAMP DI
PI 42+79.31
Δ = 89°34'22" RT.
T = 74.44'
L = 117.25'
R = 75'
E = 30.67'
e = N.C.

EB I-64
PI 180+37.60
Δ = 0°06'55" LT.
NO CURVE

EB I-64
PI 195+62.54
Δ = 0°07'28" RT.
NO CURVE

EB I-64
PI 207+13.32
Δ = 17°59'09" LT.
T = 725.39'
L = 1432.96'
R = 4583.66'
E = 56.34'
e = 0.044'/'
RUNOFF = 133'
RUNOUT = 60'

EB I-64
PI 251+10.97
Δ = 17°11'03" RT.
T = 1154.28'
L = 2291.22'
R = 7639.44'
E = 86.71'
e = N.C.

CURVE DATA

KY 180
PI 31+60.04
Δ = 10°08'32" RT.
Ts = 145.27'
Ls = 370.00'
Lc = 289.78'
Os = 6.41'
L.T. = 246.83'
S.T. = 123.48'
R = 1637.02'
Es = 6.43'
e = 0.066'/'
RUNOFF = 370'
RUNOUT = 115'

KY 180
PI 49+45.41
Δ = 35°06'41" LT.
Ts = 381.61'
Ls = 430.00'
Lc = 739.19'
Os = 56.18'
L.T. = 287.15'
S.T. = 143.77'
R = 1206.23'
Es = 58.93'
e = 0.077'/'
RUNOFF = 430'
RUNOUT = 112'

SB KY 180
PI = 60+94.16
Δ = 12°29'56" LT.
T = 250.98'
L = 499.96'
R = 2291.83'
E = 13.70'
e = 0.054'/'
RUNOFF = 138'
RUNOUT = 52'

NB KY 180
PI 61+58.72
Δ = 11°42'55" LT.
T = 235.13'
L = 468.61'
R = 2291.83'
E = 12.03'
E = 0.054'/'
RUNOFF = 138'
RUNOUT = 52'

RAMP C
PI 26+58.94
Δ = 0°43'42" RT.
T = 72.82'
L = 145.64'
R = 11459.16'
E = 0.23'
e = N.C.

RAMP B
PI 11+32.06
Δ = 60°12'00"RT.
T = 249.26'
L = 451.80'
R = 430.00'
E = 67.02'
e = 0.08'/'
RUNOFF = 150'

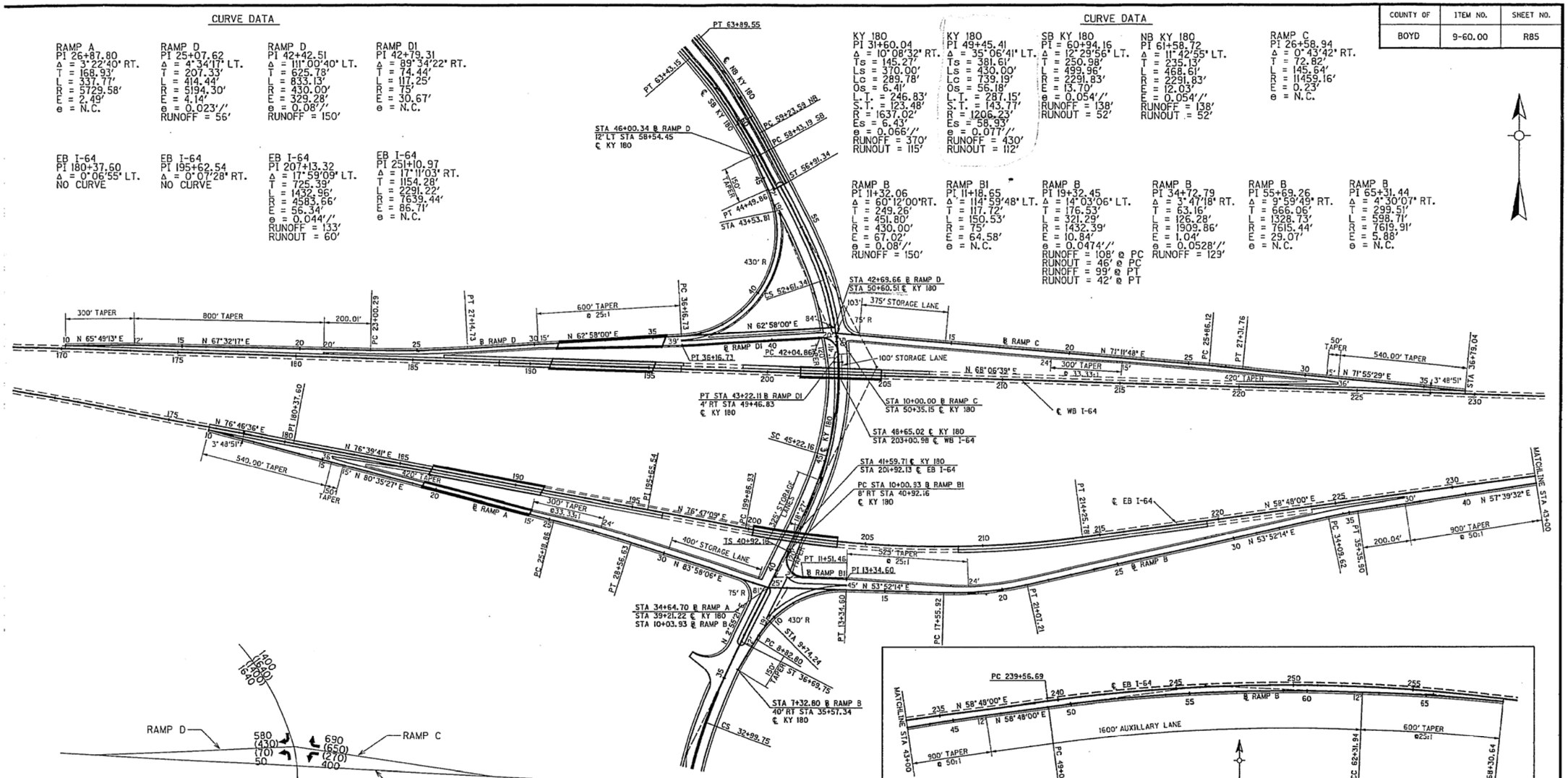
RAMP BI
PI 11+18.65
Δ = 114°59'48" LT.
T = 117.72'
L = 150.53'
R = 75'
E = 64.58'
e = N.C.

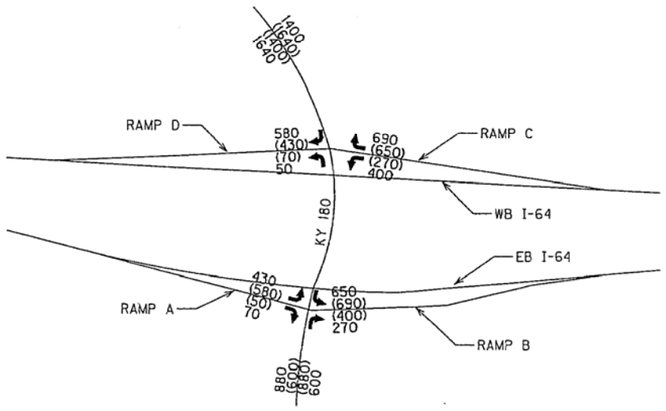
RAMP B
PI 19+32.45
Δ = 14°03'06" LT.
T = 176.53'
L = 321.29'
R = 1432.39'
E = 10.84'
e = 0.0474'/'
RUNOFF = 108' @ PC
RUNOUT = 46' @ PC
RUNOFF = 99' @ PT
RUNOUT = 42' @ PT

RAMP B
PI 34+72.79
Δ = 3°47'18" RT.
T = 63.16'
L = 126.28'
R = 1909.86'
E = 1.04'
e = 0.0528'/'
RUNOFF = 129'

RAMP B
PI 55+69.26
Δ = 9°59'49" RT.
T = 666.06'
L = 1328.73'
R = 7615.44'
E = 29.07'
e = N.C.

RAMP B
PI 65+31.44
Δ = 4°30'07" RT.
T = 299.51'
L = 598.71'
R = 7619.91'
E = 5.88'
e = N.C.





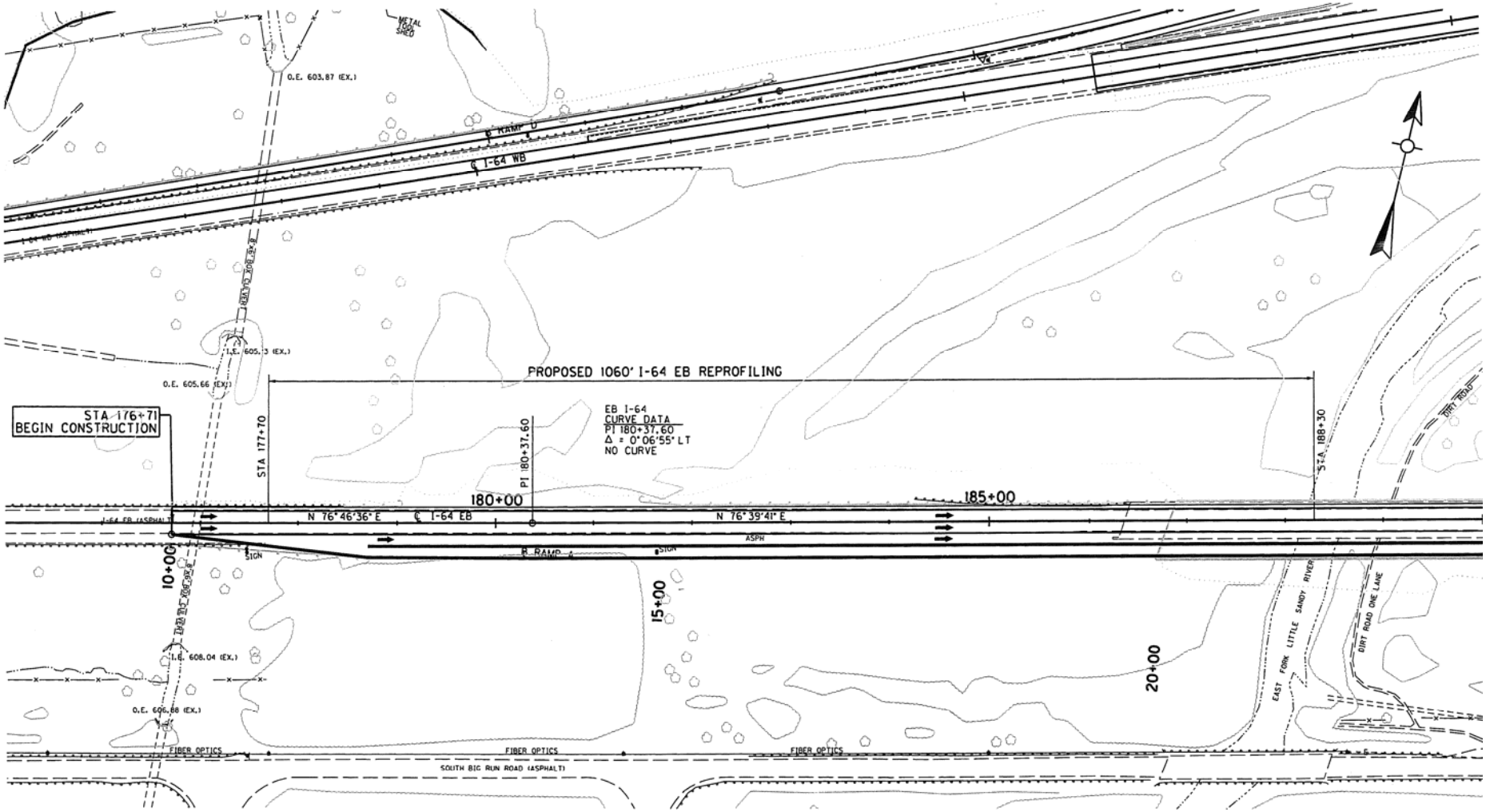
TRAFFIC SOURCE : KYTC
LEGEND (333) YEAR 2020 AM DHV
333 YEAR 2020 PM DHV

INTERCHANGE GEOMETRIC APPROVAL
I-64 - KY 180
INTERCHANGE
BOYD COUNTY

APPROVED

PREPARED & SUBMITTED BY
LOCHNER
CONSULTING ENGINEERS AND PLANNERS
BY: _____
DATE: _____
KY REGISTRATION NO.: _____

DATE _____ T.E.B.M. FOR PRE-CONST.
DATE _____ DIRECTOR OF DESIGN
DATE _____ DIRECTOR OF TRAFFIC
DATE _____ F.H.W.A

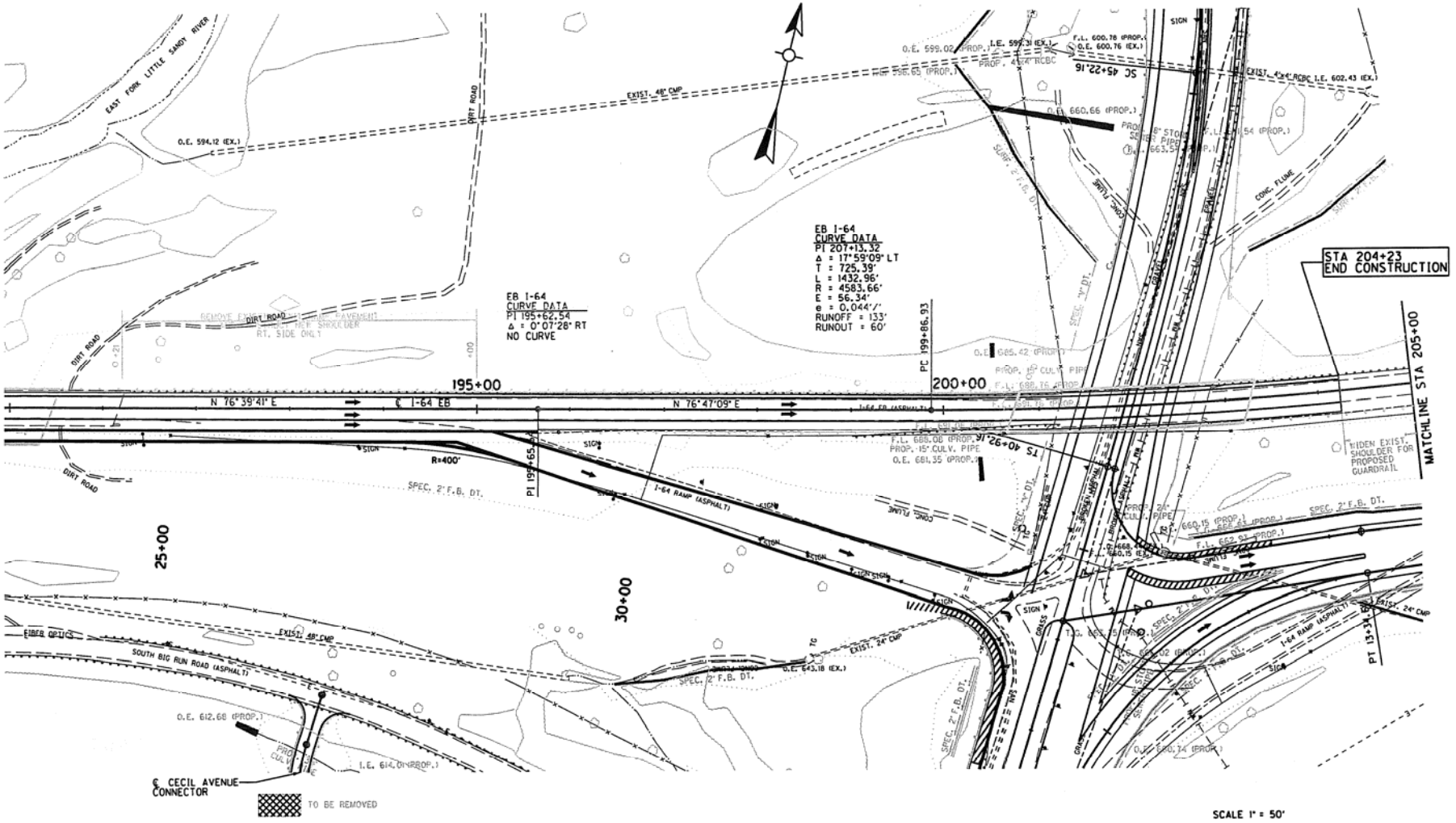


RT. STA 184+28 TO STA 186+22
REMOVE 199 LF OF GUARDRAIL

RT. STA 183+76.66 TO STA 186+84.91
CONSTRUCT 281.25 LF OF STEEL W BEAM
GUARDRAIL SINGLE FACE AND 1 GUARDRAIL
CONNECTOR TO BRIDGE END TYPE A

SCALE 1" = 50'

VE
RAMP A


EAST FORK LITTLE SANDY RIVER
DIRT ROAD
EXIST. 48" CMP
O.E. 594.12 (EX.)
REMOVE EXIST. ASPHALT PAVEMENT & DITCH RT. SIDE ONLY
EB I-64
CURVE DATA
PI 207+13.32
Δ = 17°59'09" LT
T = 725.39'
L = 1432.96'
R = 4583.66'
E = 56.34'
e = 0.044'/'
RUNOFF = 133'
RUNOUT = 60'
EB I-64
CURVE DATA
PI 195+62.54
Δ = 0°07'28" RT
NO CURVE
195+00
200+00
N 76°39'41" E
℄ I-64 EB
N 76°47'09" E
PC 199+86.93
PI 199+65.41
R=400'
SPEC. 2' F.B. DT.
I-64 RAMP (ASPHALT)
TS 40+92.16
SC 45+22.16
EXIST. 42"x4" RCBC I.E. 602.43 (EX.)
STA 204+23
END CONSTRUCTION
MATCHLINE STA 205+00
WIDEN EXIST. SHOULDER FOR PROPOSED GUARDRAIL
25+00
30+00
SOUTH BIG RUN ROAD (ASPHALT)
EXIST. 24" CMP
O.E. 612.68 (PROP.)
I.E. 614.01 (PROP.)
℄ CECIL AVENUE CONNECTOR
TO BE REMOVED
PT 13+34.
SCALE 1" = 50'

VE RAMP A

COUNTY OF	ITEM NO.	SHEET NO.
BOYD	9-60.00	R17

I-64 EB RAMP A PROFILE

0.78%

R=500' VC

I-64 EB RAMP A PROFILE

3.2%

300' VC
HLSD = UNLIMITED

2.20%

BOTTOM OF 2' ROCK ROADBED

EXIST. 24" CMP

TRANSVERSE BENCH

PROFILE GRADE

0.44%

VC 20+60.00
Elev 641.65

VPI 23+60.00
Elev 645.66

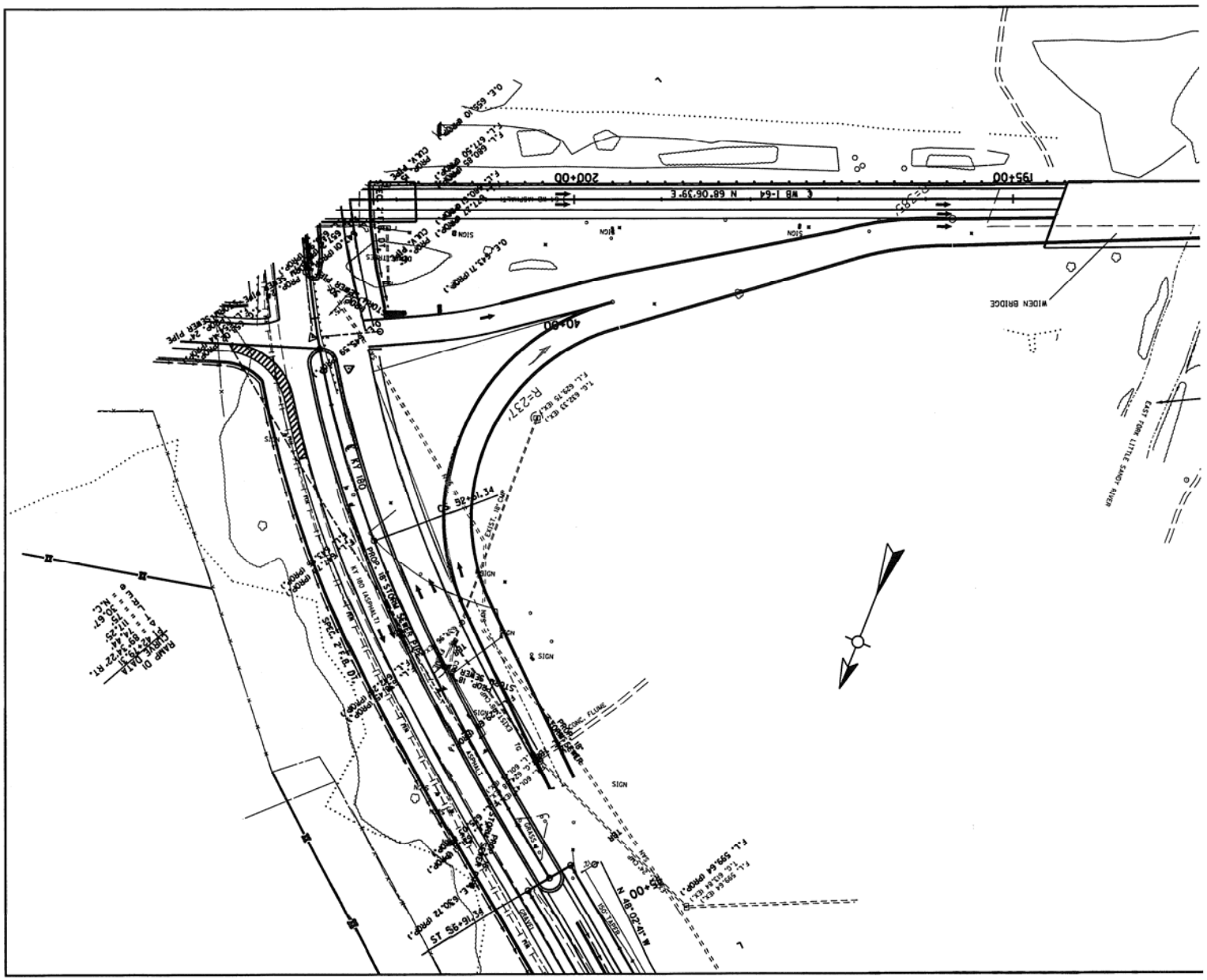
VPI 22+10.00
Elev 642.56

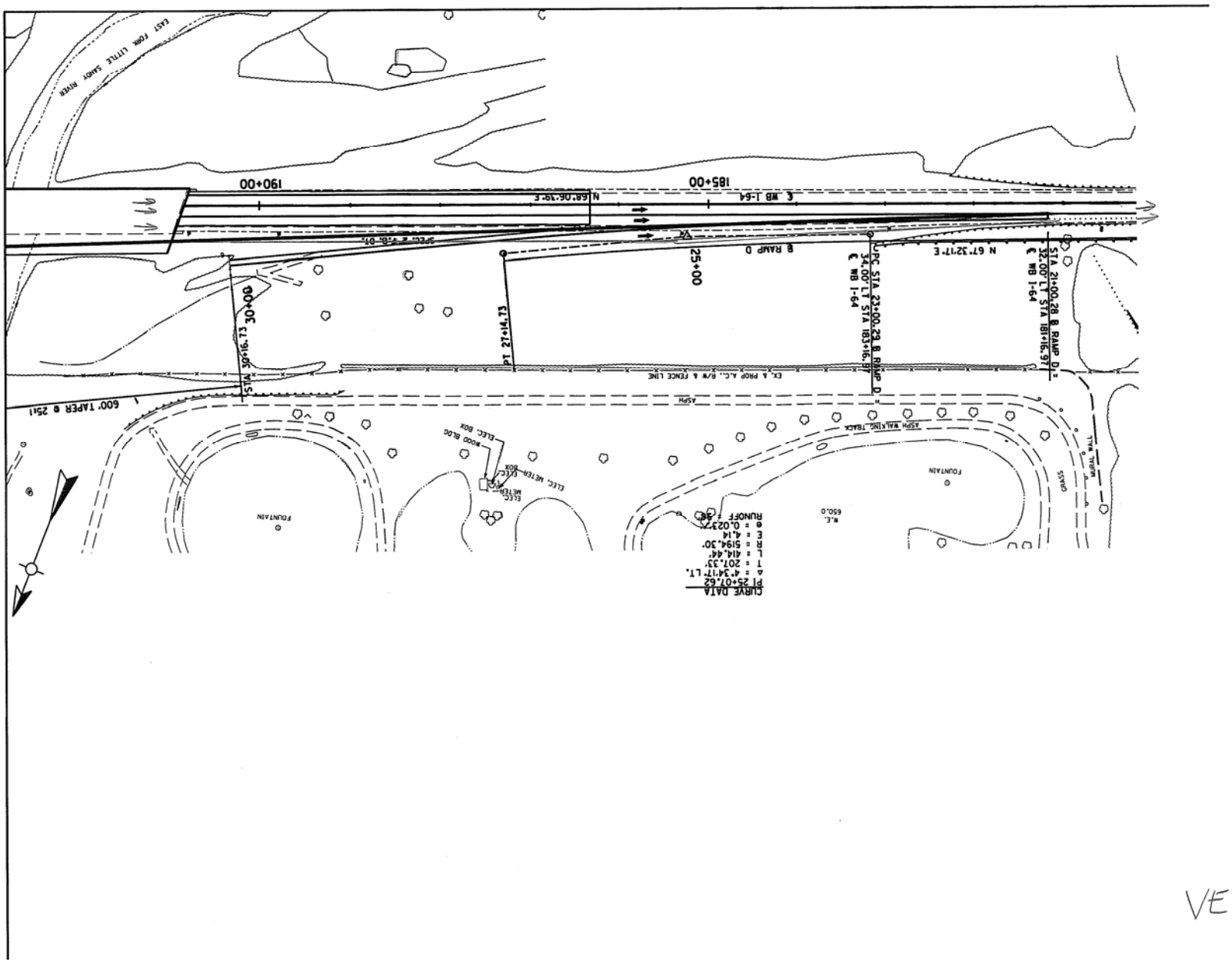
VPI 34+64.70
Elev 669.96

RAMP A PROFILE
STA 20+00 TO STA 34+65

VE

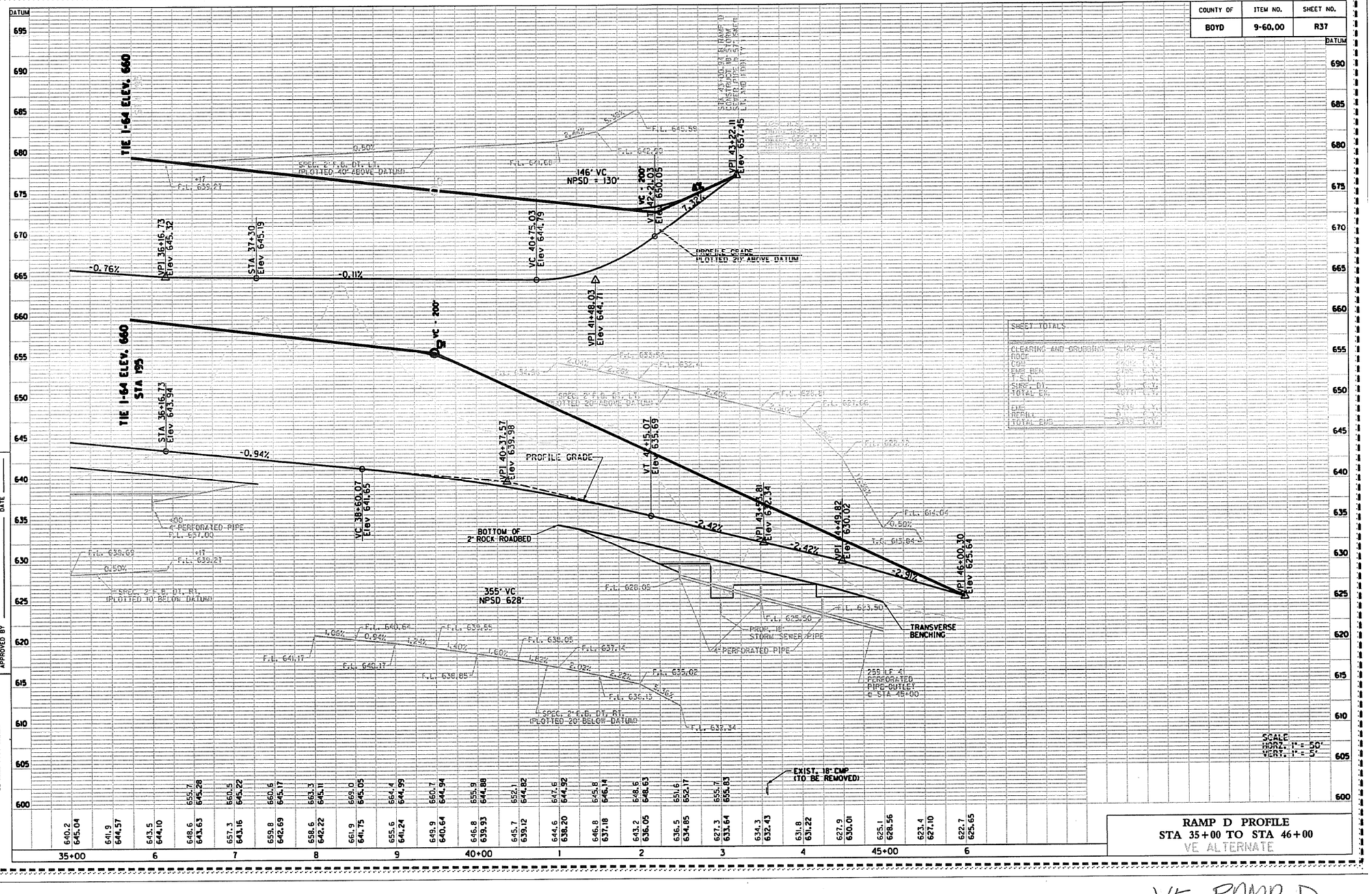
pr_rampA_2.valueengineering.dgn 10/21/2005 7:44:38 AM


VE RAMP
D


190+00
185+00
25+00
30+00
℄ WB I-64
B RAMP D
N 67°32'17" E
600' TAPER @ 25:1
FOUNTAIN
ASPH
GRASS

VE RAMP D

COUNTY OF	ITEM NO.	SHEET NO.
BOYD	9-60.00	R37



VE RAMP D

STRUCTURES-BRIDGES ON RAMPS A AND D
VALUE ENGINEERING ALTERNATIVE NUMBER 3
COST COMPARISON SHEET

DESCRIPTION	UNITS	UNIT COST	PROP'D QTY.	PROP'D COST	V.E. QTY.	V.E. COST
Excavation	CY	$9.25	103300	$955,525	76000	$703,000
Pavement	SY	$50.00	11000	$550,000	7700	$385,000
Structures I-64 EB	SF	$52.66	16425	$864,941	0	$0
Structures I-64 EB	SF	$63.19	0	$0	16425	$1,037,896
Structures I-64 WB	SF	$52.66	16401	$836,677	0	$0
Structures I-64 WB	SF	$63.19	0	$0	16401	$1,036,379
Structures I-64 EB Widening Only	SF	$100.00	0	$0	2916	$291,600
Structures I-64 WB Widening Only	SF	$100.00	0	$0	2920	$292,000
Structure Ramp A	SF	$83.00	9379	$778,457	0	$0
Structure Ramp D	SF	$86.00	13106	$1,127,116	0	$0
SUBTOTAL				**$5,139,715**		**$3,745,875**
Engineering & Contingency			10%	$513,972	10%	374,587
GRAND TOTAL				**$5,653,687**		**$4,120,642**

POSSIBLE SAVINGS: $ 1,533,224

VII. DEVELOPMENT PHASE

B.2. STRUCTURES-BRIDGES OVER KY 180

"As Proposed"

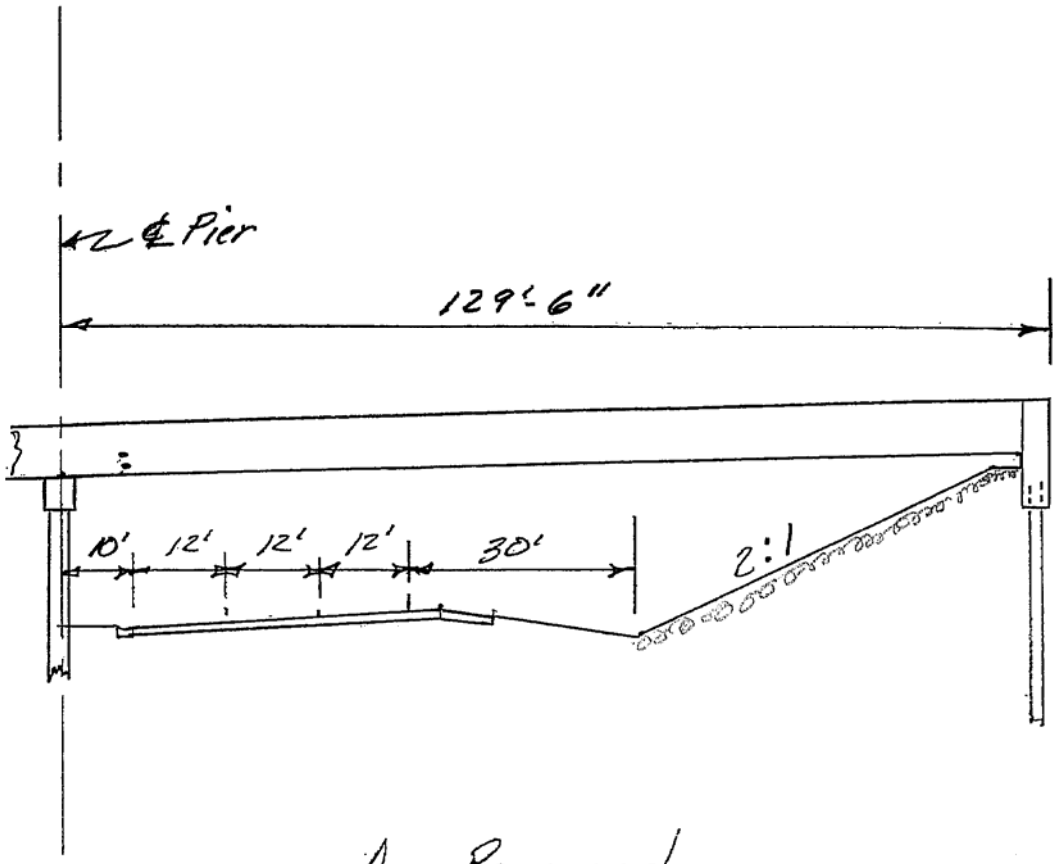
The as proposed uses two span prestressed girder bridges over KY 180 with conventional spill through abutments. The toe of the 2:1 berm slope is 30 ft. from the edge of the through-lane. This results in a 246 ft. long WB bridge and a 253.2 ft. long EB bridge. See attached sketch.

Advantages:

- Less complexity in the design monolithic abutments
- Provides a larger visual opening
- Less impacts on arrant vehicles outside the clear zone

Disadvantages:

- Requires longer bridge spans
- Requires more maintenance on the face of the bridge berms



As Proposed

B.2. STRUCTURES-BRIDGES OVER KY 180

Value Engineering Alternative Number 4

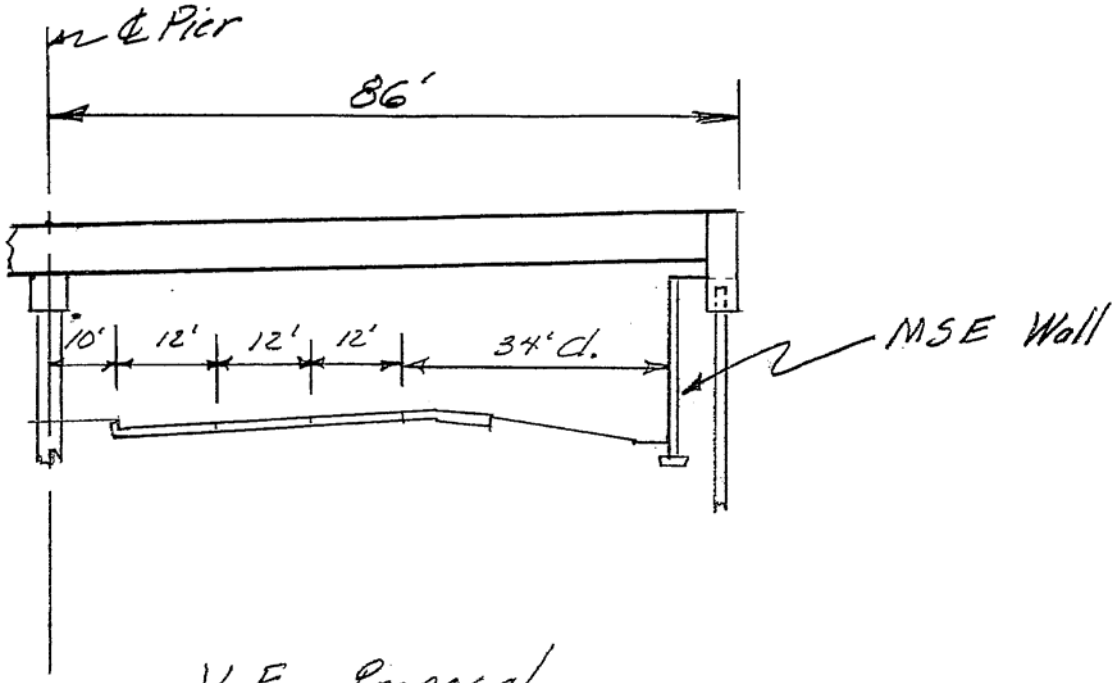
Use vertical MSE walls at the abutments. The face of the MSE wall is located 34 ft. from the edge of the through-lane. This provides a 30 ft. clear zone and 4 ft. flat area for ditch drainage and a platform for the base of the wall. This results in a 160 ft. long WB bridge and a 163 ft. long EB bridge. See attached sketch.

Advantages:

- Reduced bridge length
- Eliminates maintenance of the Crushed Aggregate Slope Protection
- Allows the possible use of a single span bridge
- More aesthetically pleasing

Disadvantages:

- More complex design for the monolithic abutments



VE Proposal

STRUCTURES-BRIDGES OVER KY 180
VALUE ENGINEERING ALTERNATIVE NUMBER 4
COST COMPARISON SHEET

DESCRIPTION	UNITS	UNIT COST	PROP'D QTY.	PROP'D COST	V.E. QTY.	V.E. COST
BRIDGE	A^2	$78.14	22,464	$1,755,337	14,535	$1,135,765
MSE WALLS	A^2	$28.60	0	$0	10,692	$305,791
CRUSHED SLOPE PROTECTION	TONS	$19.20	438	$8,411	0	$0
SUBTOTAL				**$1,763,748**		**$1,441,556**
ENGINEERING AND CONTINGENCY			10%	$176,375	10%	$144,156
GRAND TOTAL				**1,940,123**		**$1,585,712**

POSSIBLE SAVINGS: $354,411

VII. DEVELOPMENT PHASE

C. HIGHWAY LIGHTING

"As Proposed"

The lighting design as proposed for this project consists of continuous interchange lighting on the I-64 mainline throughout the interchange area. The chosen method of lighting consists of 168 light poles (71 @ 30 ft. mounting height and 97 @ 40 ft. mounting height) along with associated wiring and electrical hardware. The total estimated costs of the interchange lighting is $977,205, excluding engineering and contingencies.

The lighting installations are as follows:

EB mainline – Sta. 185+70 to Sta. 222+70 (total of 3,700 feet)

WB mainline – Sta. 189+10 to Sta. 221+40 (total of 3,230 feet)

Ramp A (EB exit ramp) – Sta. 9+40 to 33+00 (total of 2,360 feet)

Ramp B (EB entrance ramp) – Sta. 10+00 to 67+05 (total of 5,705 feet)

Ramp C (WB exit ramp) – Sta. 36+40 to 11+30 (total of 2,510 feet)

Ramp D (WB entrance ramp) – Sta. 45+00 to 10+80 (total of 3,420 feet)

Ramp D1 (WB entrance ramp) – Sta.38+20 to 41+50 (total of 330 feet)

KY 180 between interchange ramp terminals – Sta. 57+50 to 35+50 (2,200 feet)

The total extent of the lighting design covers 23,465 linear feet of roadways including the two mainline roadways, four entrance and exit ramps, and the KY 180 crossroad.

There are also plans included in the project plans for temporary lighting in MOT phases 1B, 2, 3, 4 and 5. The installations are not extensive and are designed to provide light during detour operations.

We reviewed the estimate for the temporary lighting units and could not find that the costs and prices or bid items were included for the temporary work. It must be part of the Maintenance of Traffic Lump Sum bid item, or will be added later. No specifications were provided with materials reviewed by the Value Engineering team.

COUNTY OF	ITEM NO.	SHEET NO.
BOYD	9-60.00	

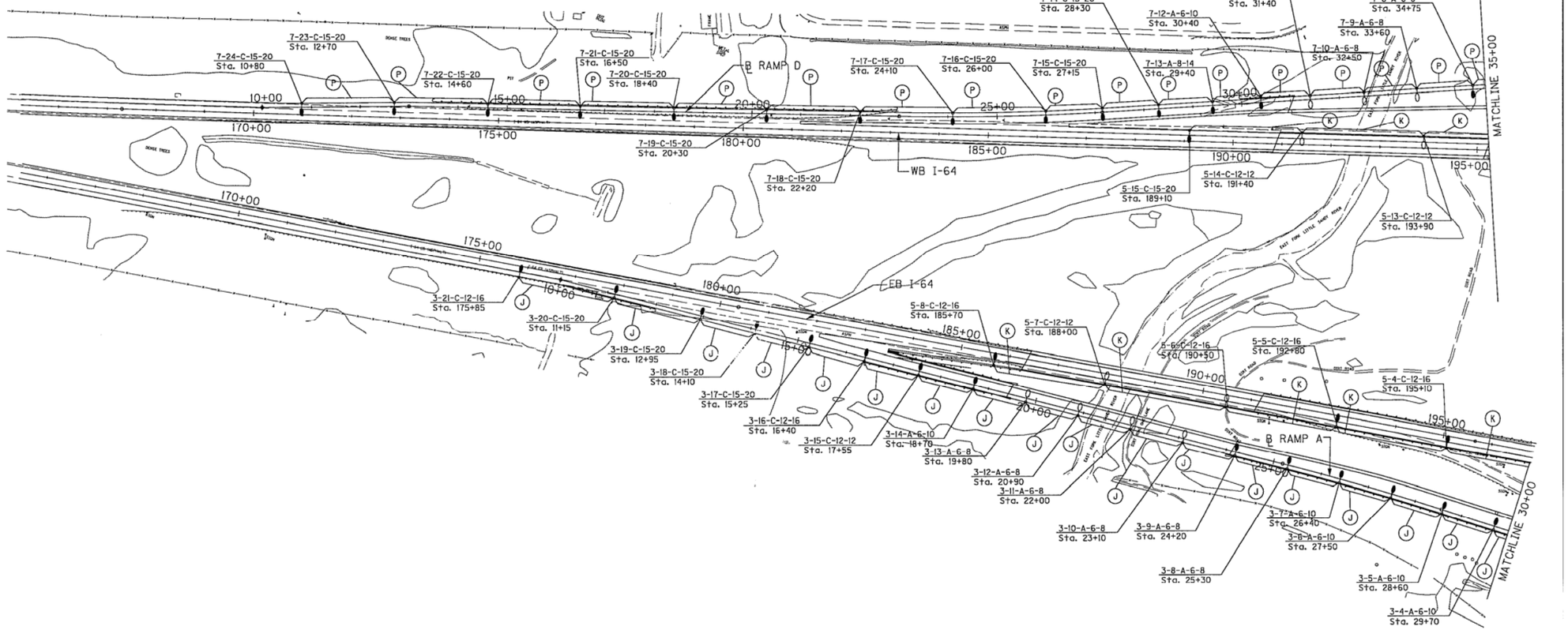
SYMBOL LEGEND

- SERVICE POINT
- EXISTING LUMINAIRE
- LUMINAIRE (HIGH PRESSURE SODIUM TYPE II BRIDGE MOUNTED)
- LUMINAIRE (HIGH PRESSURE SODIUM, TYPE II)
- JUNCTION BOX TYPE B
- 2" CONDUIT

CIRCUIT LEGEND

- (J) – CKT. 3-2-#8
- (K) – CKT. 5-2-#8
- (P) – CKT. 7-2-#4

SCALE 1" = 100'



ALL EXISTING LIGHT POLES ARE TO BE REMOVED UNLESS NOTED OTHERWISE

I-64/KY 180 INTERCHANGE LIGHTING PLAN

COUNTY OF	ITEM NO.	SHEET NO.
BOYD	9-60.00	

SYMBOL LEGEND

- SERVICE POINT
- EXISTING LUMINAIRE
- LUMINAIRE (HIGH PRESSURE SODIUM TYPE II BRIDGE MOUNTED)
- LUMINAIRE (HIGH PRESSURE SODIUM, TYPE II)
- JUNCTION BOX TYPE B
- 2" CONDUIT

CIRCUIT LEGEND

- (SP) — CKT. 1-2-#8, CKT. 2-2-#8, CKT. 3-2-#8, CKT. 4-2-#6, CKT. 5-2-#8, CKT. 6-2-#4, CKT. 7-2-#4, CKT. 8-2-#6, CKT. 9-2-#4
- (A) — CKT. 2-2-#8, CKT. 4-2-#6, CKT. 6-2-#4, CKT. 8-2-#6, CKT. 9-2-#4
- (B) — CKT. 4-2-#6, CKT. 6-2-#4
- (C) — CKT. 2-2-#8, CKT. 8-2-#6, CKT. 9-2-#4
- (E) — CKT. 2-2-#8, CKT. 9-2-#4
- (F) — CKT. 8-2-#6
- (G) — CKT. 2-2-#8
- (H) — CKT. 9-2-#4
- (I) — CKT. 1-2-#8, CKT. 3-2-#8, CKT. 5-2-#8, CKT. 7-2-#4
- (J) — CKT. 3-2-#8
- (K) — CKT. 5-2-#8
- (L) — CKT. 1-2-#8, CKT. 5-2-#8, CKT. 7-2-#4
- (M) — CKT. 1-2-#8, CKT. 7-2-#4
- (N) — CKT. 1-2-#8
- (P) — CKT. 7-2-#4

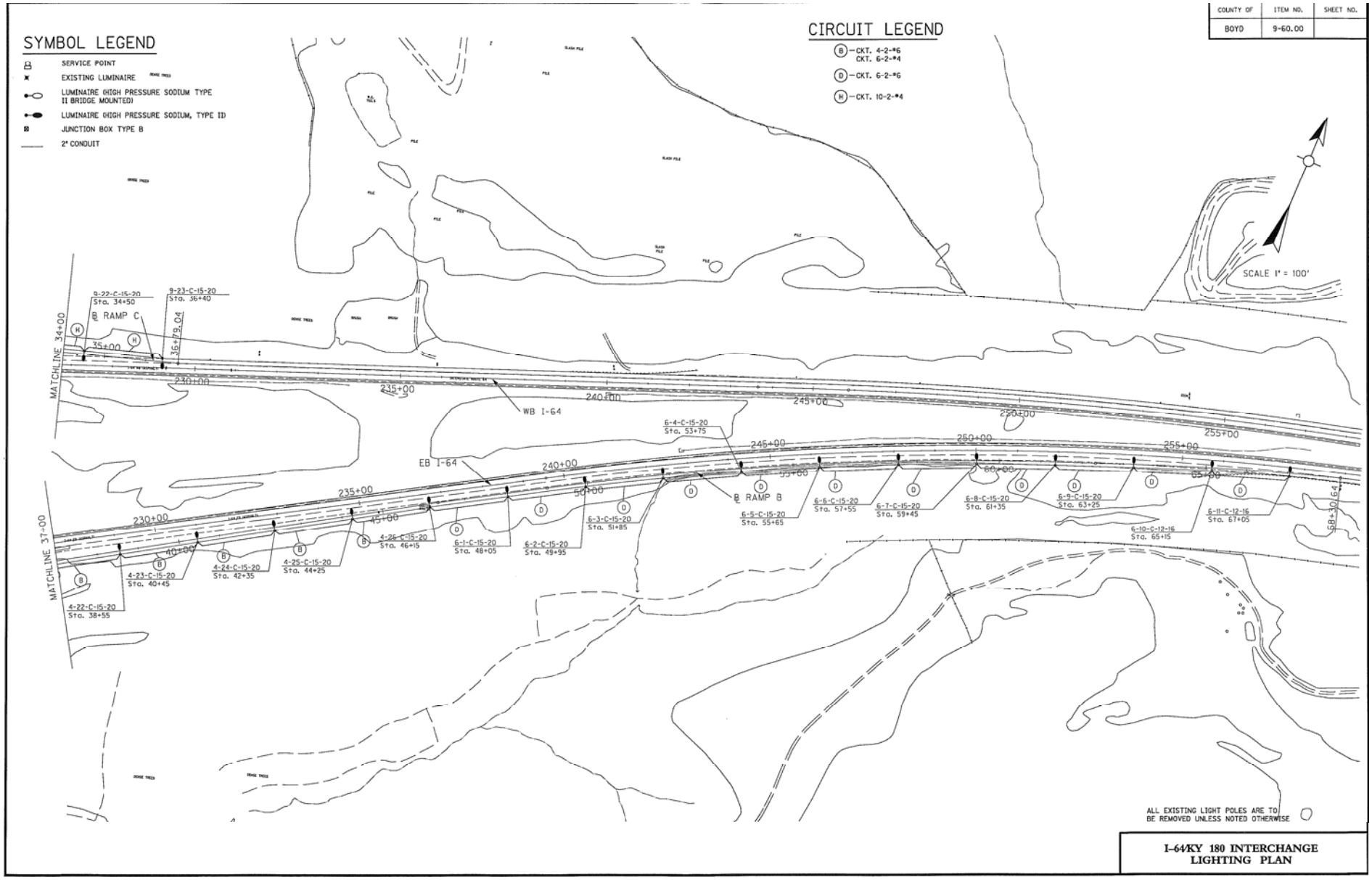
INSET A

INSET B

SCALE 1" = 100'

ALL EXISTING POLES ARE TO BE REMOVED UNLESS NOTED OTHERWISE

I-64/KY 180 INTERCHANGE LIGHTING PLAN


SYMBOL LEGEND
SERVICE POINT
EXISTING LUMINAIRE
LUMINAIRE (HIGH PRESSURE SODIUM TYPE II BRIDGE MOUNTED)
LUMINAIRE (HIGH PRESSURE SODIUM, TYPE II)
JUNCTION BOX TYPE B
2" CONDUIT
CIRCUIT LEGEND
(B) — CKT. 4-2-#6 CKT. 6-2-#4
(D) — CKT. 6-2-#6
(H) — CKT. 10-2-#4
COUNTY OF BOYD
ITEM NO. 9-60.00
SHEET NO.
SCALE 1" = 100'
MATCHLINE 34+00
MATCHLINE 37+00
℄ RAMP C
℄ RAMP B
WB I-64
EB I-64
9-22-C-15-20 Sta. 34+50
9-23-C-15-20 Sta. 36+40
35+79.04
4-22-C-15-20 Sta. 38+55
4-23-C-15-20 Sta. 40+45
4-24-C-15-20 Sta. 42+35
4-25-C-15-20 Sta. 44+25
4-26-C-15-20 Sta. 46+15
6-1-C-15-20 Sta. 48+05
6-2-C-15-20 Sta. 49+95
6-3-C-15-20 Sta. 51+85
6-4-C-15-20 Sta. 53+75
6-5-C-15-20 Sta. 55+65
6-6-C-15-20 Sta. 57+55
6-7-C-15-20 Sta. 59+45
6-8-C-15-20 Sta. 61+35
6-9-C-15-20 Sta. 63+25
6-10-C-12-16 Sta. 65+15
6-11-C-12-16 Sta. 67+05
68+30.64
ALL EXISTING LIGHT POLES ARE TO BE REMOVED UNLESS NOTED OTHERWISE
I-64/KY 180 INTERCHANGE
LIGHTING PLAN

COUNTY OF	ITEM NO.	SHEET NO.
BOYD	9-60.00	

CIRCUIT LEGEND

Ⓡ-CKT. E1-2-*8Ⓢ-CKT. E1-2-*8Ⓣ-CKT. E3-2-*8Ⓤ-CKT. E5-2-*8
CKT. E2-2-*8 CKT. E4-2-*8 CKT. E6-2-*8
CKT. E3-2-*8 CKT. E5-2-*8
CKT. E4-2-*8 CKT. E6-2-*8
CKT. E5-2-*8
CKT. E6-2-*8

SCALE 1" = 100'

MATCH LINE STA. 54+00

MATCH LINE STA. 187+50

MATCH LINE STA. 188+00

MATCH LINE STA. 216+00

MATCH LINE STA. 217+00

MATCH LINE STA. 34+25

℄ RAMP D

℄ RAMP C

℄ RAMP A

℄ RAMP B

℄ WB I-64

℄ EB I-64

WOOD POLE

TO BE REMOVED

WOOD POLE STA. 50+70

WOOD POLE STA. 46+75

WOOD POLE STA. 44+25

WOOD POLE STA. 38+80

WOOD POLE STA. 36+00

E5-6-E-0-32 STA. 12+00

E5-7-E-0-32 STA. 46+30

E3-5-E-0-32 STA. 49+45

E3-4-E-0-32 STA. 48+00

E3-3-E-0-32 STA. 45+50

E3-2-E-0-32 STA. 43+00

E1-3-E-0-32 STA. 37+10

E1-2-E-0-32 STA. 34+38

TIE INTO EXISTING CKTS. E3, E4, E5, E6 AT J-BOX

TIE INTO EXISTING CKTS. 5, 6 AT J-BOX

TIE INTO EXISTING CIRCUITS E2, E3, E4, ~~E5, E6~~ AT POLE 6-2-B-15.

TIE TO EXISTING CIRCUITS E2, E3, E4, E5, E6 AT POLE 6-3-A-12-16

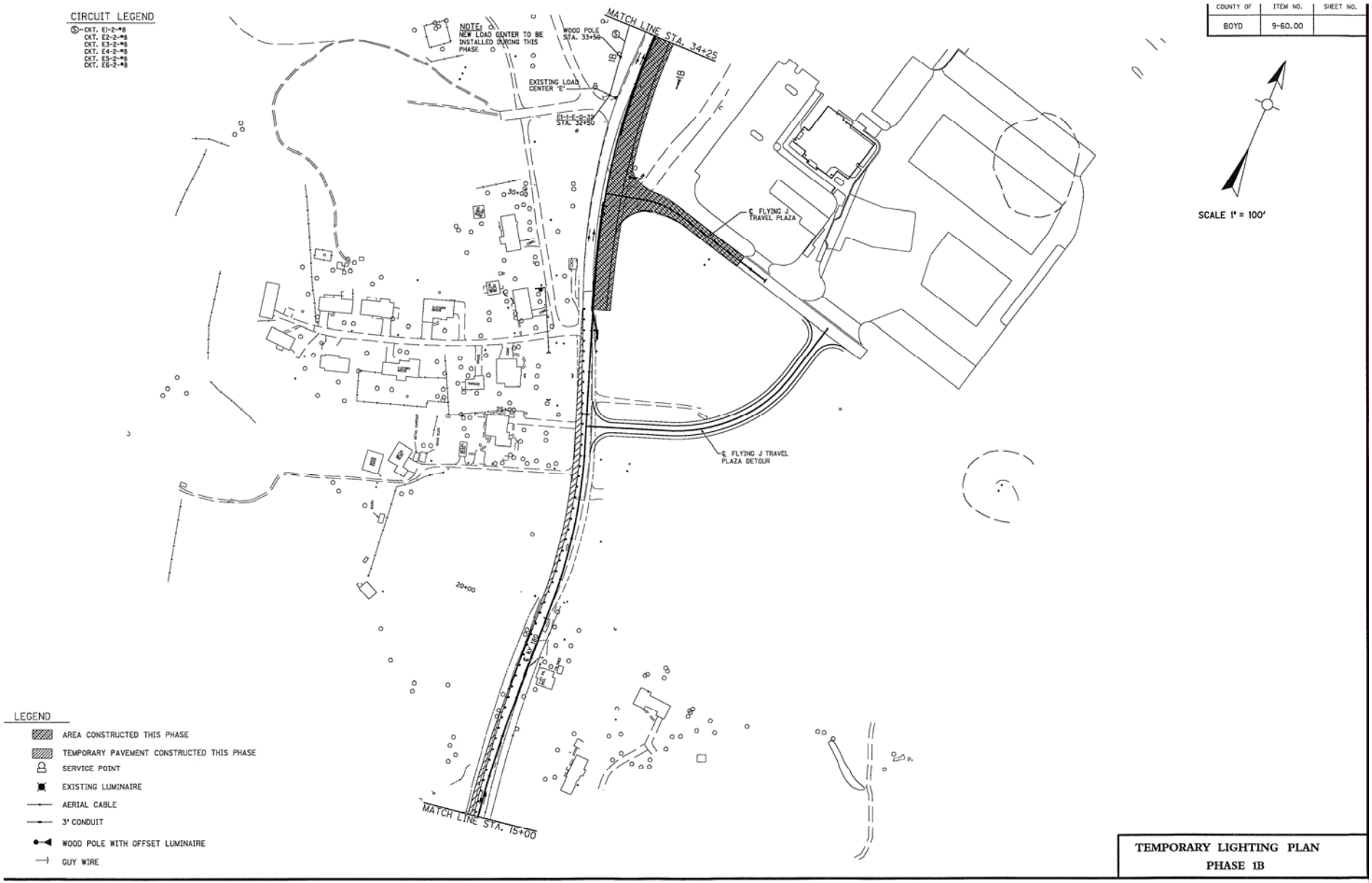
TIE TO EXISTING CIRCUIT E1 AT POLE

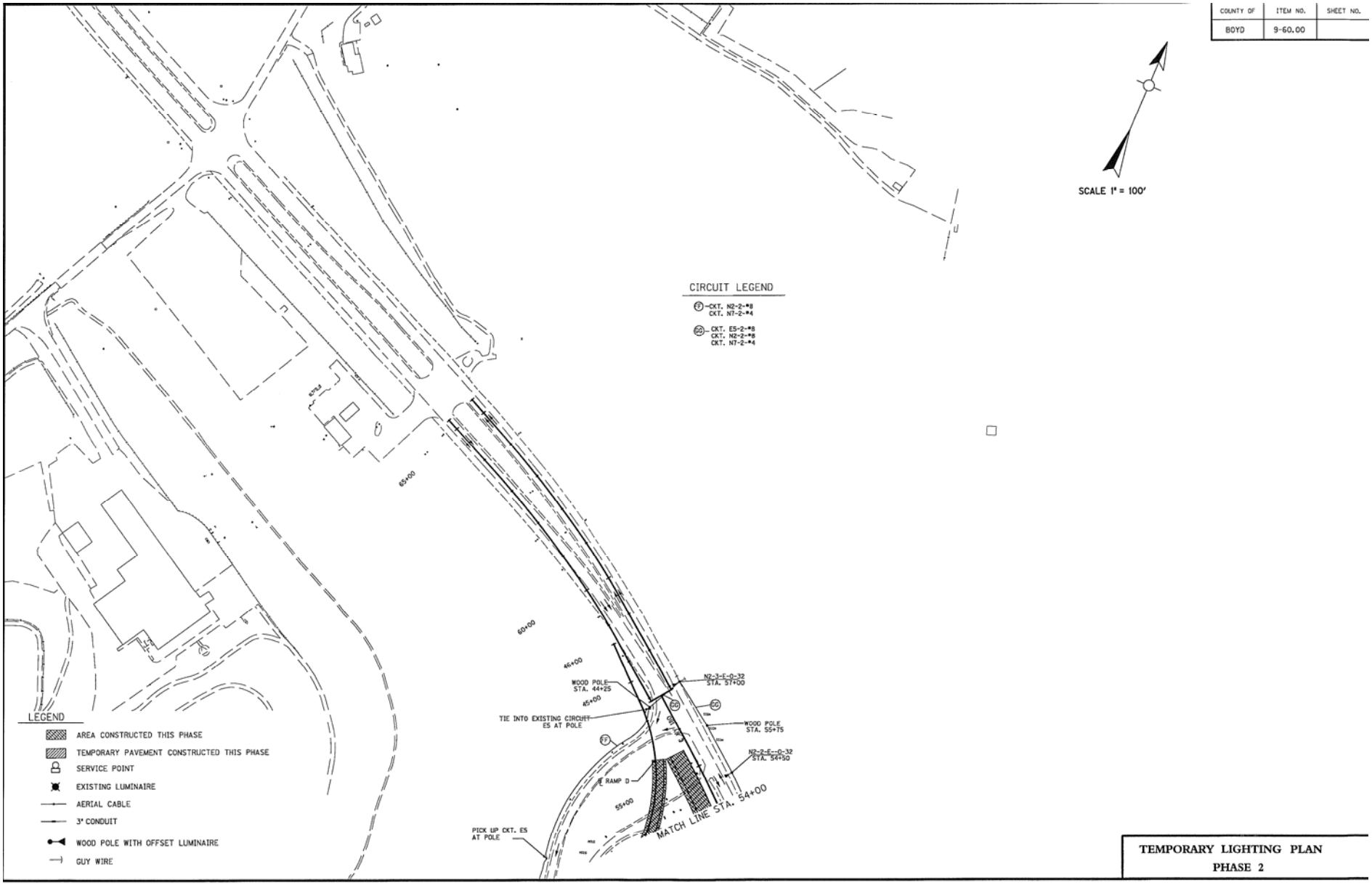
PICK UP CIRCUITS E3, E4, E5, E6, FROM REMOVED POLE

LEGEND

- AREA CONSTRUCTED THIS PHASE
- TEMPORARY PAVEMENT CONSTRUCTED THIS PHASE
- SERVICE POINT
- EXISTING LUMINAIRE
- AERIAL CABLE
- 3" CONDUIT
- WOOD POLE WITH OFFSET LUMINAIRE
- GUY WIRE

TEMPORARY LIGHTING PLAN
PHASE 1B


CIRCUIT LEGEND
Ⓢ-CKT. E1-2-*8
CKT. E2-2-*8
CKT. E3-2-*8
CKT. E4-2-*8
CKT. E5-2-*8
CKT. E6-2-*8
NOTE: 4
NEW LOAD CENTER TO BE INSTALLED DURING THIS PHASE
WOOD POLE STA. 33+50
EXISTING LOAD CENTER 'E'
E1-1-E-2-12 STA. 32+50
MATCH LINE STA. 34+25
1B
℄ FLYING J TRAVEL PLAZA
℄ FLYING J TRAVEL PLAZA DETOUR
30+00
25+00
20+00
MATCH LINE STA. 15+00
COUNTY OF
ITEM NO.
SHEET NO.
BOYD
9-60.00
SCALE 1" = 100'
LEGEND
AREA CONSTRUCTED THIS PHASE
TEMPORARY PAVEMENT CONSTRUCTED THIS PHASE
SERVICE POINT
EXISTING LUMINAIRE
AERIAL CABLE
3" CONDUIT
WOOD POLE WITH OFFSET LUMINAIRE
GUY WIRE
TEMPORARY LIGHTING PLAN
PHASE 1B


COUNTY OF
BOYD
ITEM NO.
9-60.00
SHEET NO.
SCALE 1" = 100'
CIRCUIT LEGEND
(F) -CKT. N2-2-#8
CKT. N7-2-#4
(G) CKT. E5-2-#8
CKT. N2-2-#8
CKT. N7-2-#4
LEGEND
AREA CONSTRUCTED THIS PHASE
TEMPORARY PAVEMENT CONSTRUCTED THIS PHASE
SERVICE POINT
EXISTING LUMINAIRE
AERIAL CABLE
3" CONDUIT
WOOD POLE WITH OFFSET LUMINAIRE
GUY WIRE
65+00
60+00
46+00
45+00
55+00
WOOD POLE
STA. 44+25
TIE INTO EXISTING CIRCUIT
E5 AT POLE
N2-3-E-0-32
STA. 57+00
WOOD POLE
STA. 55+75
N2-2-E-0-32
STA. 54+50
℄ RAMP D
MATCH LINE STA. 54+00
PICK UP CKT. E5
AT POLE
TEMPORARY LIGHTING PLAN
PHASE 2

COUNTY OF	ITEM NO.	SHEET NO.
BOYD	9-60.00	

CIRCUIT LEGEND

(D)-CKT. E5-2-*8 (W)-CKT. N2-2-*8 (Y)-CKT. N2-2-*8 (AA)-CKT. EI-2-*8 (EE)-CKT. E4-2-*8 (II)-CKT. N7-2-*4
(V)-CKT. N2-2-*8 CKT. N3-2-*8 CKT. N7-2-*4 CKT. N7-2-*4 CKT. N2-2-*8
CKT. N7-2-*4 CKT. N7-2-*4 CKT. N9-2-*4 CKT. N7-2-*4 (GG)-CKT. E5-2-*8
CKT. N9-2-*4 CKT. N9-2-*4 CKT. EI-2-*8 CKT. N9-2-*4 CKT. N2-2-*8
CKT. EI-2-*8 CKT. E1-2-*8 CKT. E3-2-*8 (BB)-CKT. N2-2-*8 CKT. N7-2-*4
CKT. E2-2-*8 CKT. E2-2-*8 CKT. E4-2-*8 CKT. N7-2-*4 (HH)-CKT. N2-2-*8
CKT. E3-2-*8 CKT. E3-2-*8 CKT. E5-2-*8 CKT. N9-2-*4 CKT. N7-2-*4
CKT. E4-2-*8 CKT. E4-2-*8 CKT. E6-2-*8 CKT. N9-2-*4
CKT. E5-2-*8 CKT. E5-2-*8 (CC)-CKT. E3-2-*8 CKT. E3-2-*8
CKT. E6-2-*8 CKT. E6-2-*8 (Z)-CKT. EI-2-*8 CKT. E4-2-*8 CKT. E4-2-*8
CKT. E5-2-*8 CKT. E5-2-*8
(X)-CKT. E2-2-*8 (DD)-CKT. N3-2-*8
CKT. E6-2-*8 (EE)-CKT. N9-2-*4

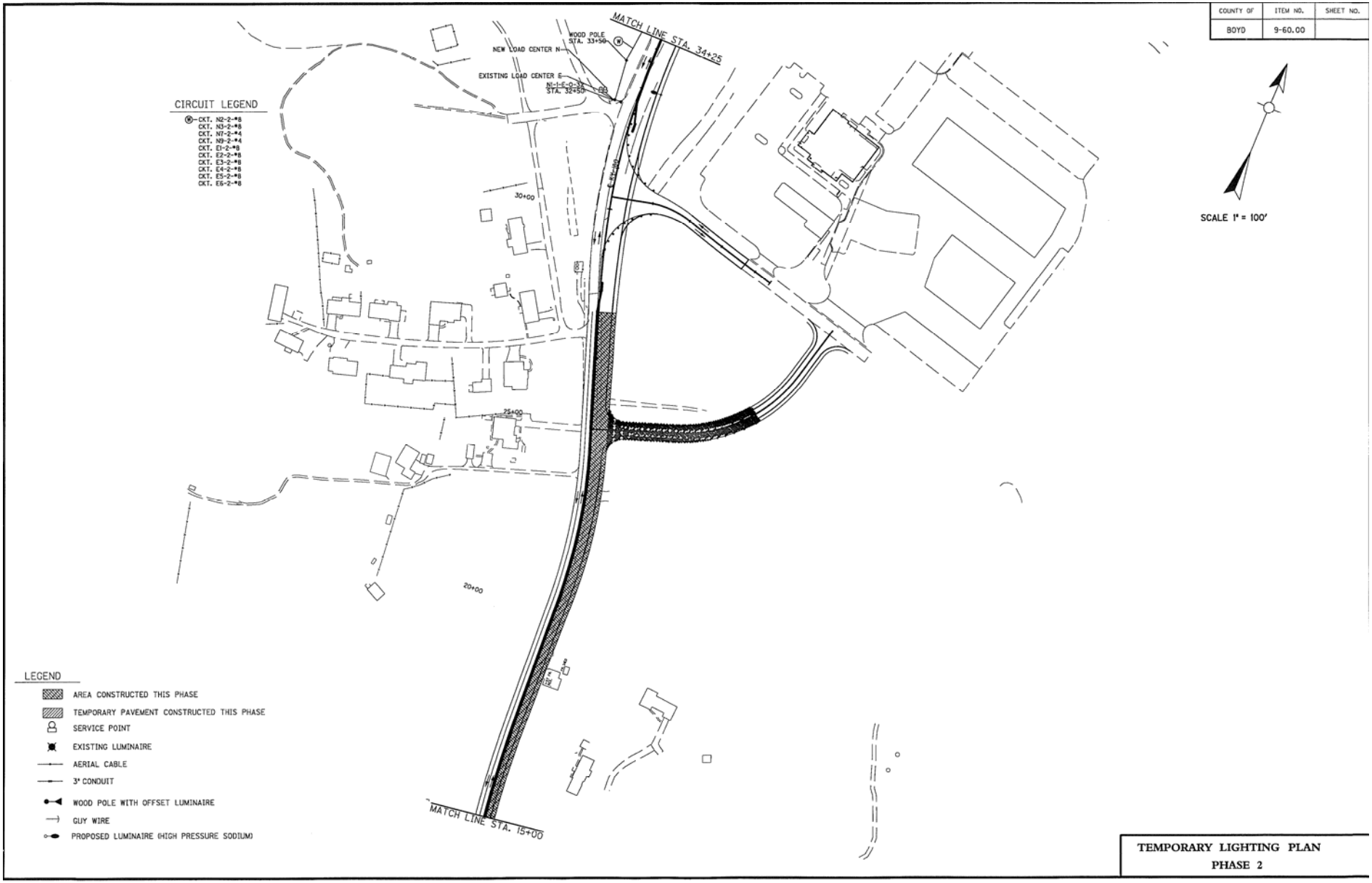
SCALE 1" = 100'

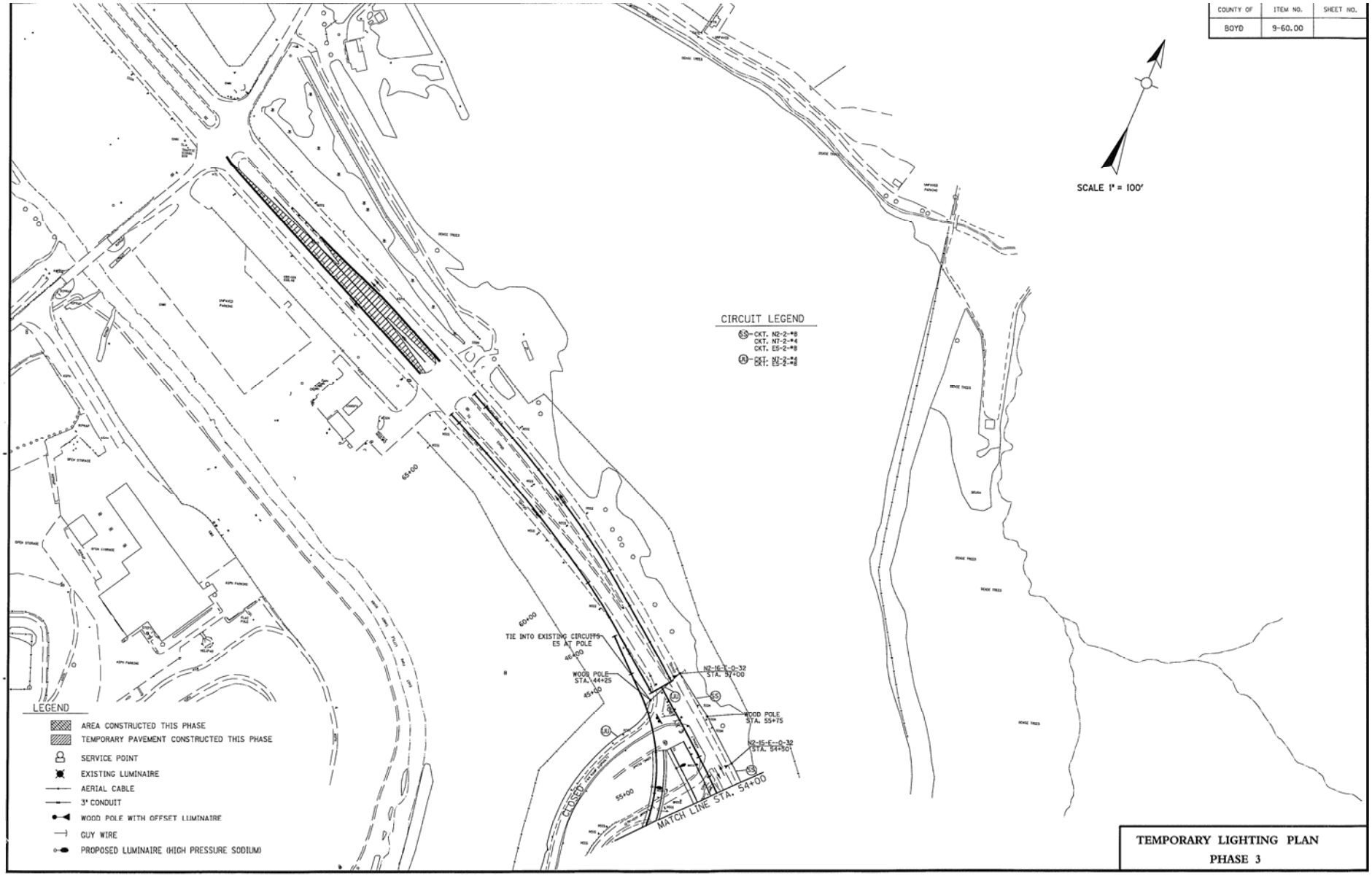
MATCH LINE STA. 187+50
MATCH LINE STA. 188+00
MATCH LINE STA. 54+00
MATCH LINE STA. 216+00
MATCH LINE STA. 217+00
MATCH LINE STA. 34+25

℄ RAMP D
℄ DETOUR D
TO BE REMOVED
TIE INTO NEW LIGHTING SYSTEM CKT. N7
N2-4-E-O-32 STA. 36+62
WOOD POLE STA. 45+36
TIE INTO EXISTING CKT. E5 AT EXISTING J-BOX
TIE POLE INTO CKT. E4
WOOD POLE STA. 53+25
N2-1-E-O-32 STA. 52+00
WOOD POLE STA. 50+70
TIE INTO NEW LIGHTING SYSTEM CKT. N9
℄ RAMP C
E3-5-E-O-32 STA. 49+45
TIE INTO EXISTING CIRCUIT E4 AT POLE
℄ EB I-64
E3-4-E-O-32 STA. 48+00
℄ RAMP 81
E3-3-E-O-32 STA. 45+50
WOOD POLE STA. 46+75
WOOD POLE STA. 44+25
E3-2-E-O-32 STA. 43+00
WOOD POLE STA. 42+80 PICK UP CIRCUITS E3,E4, E5
TO BE REMOVED LEAVE CONDUIT & WIRING IN PLACE
BARRICADE
TIE INTO EXISTING CIRCUITS E3, E4, E5, E6 AT POLE
WOOD POLE STA. 40+30
WOOD POLE STA. 33+50
TIE INTO EXISTING CIRCUITS E2, AND E6 AT POLE
TIE INTO NEW LIGHTING CKT. N3 AT POLE AT STA. 31+90
E6-2-E-O-32 STA. 33+00
E6-3-E-O-32 STA. 38+80
℄ DETOUR A
EI-3-E-O-32 STA. 37+10
WOOD POLE STA. 36+00
EI-2-E-O-32 STA. 34+50
EI-4-E-O-32 STA. 40+50
℄ RAMP B1
EI-5-E-O-32 STA. 12+14
℄ DETOUR B
EI-6-E-O-32 STA. 14+60
WOOD POLE STA. 15+80
WOOD POLE STA. 17+00
WOOD POLE STA. 14+50
TIE INTO EXISTING CIRCUIT EI AT POLE
TO BE REMOVED
℄ RAMP B
℄ EB I-64
35+00
34+39

LEGEND
- AREA CONSTRUCTED THIS PHASE
- TEMPORARY PAVEMENT CONSTRUCTED THIS PHASE
- SERVICE POINT
- EXISTING LUMINAIRE
- AERIAL CABLE
- 3" CONDUIT
- WOOD POLE WITH OFFSET LUMINAIRE
- GUY WIRE
- PROPOSED LUMINAIRE (HIGH PRESSURE SODIUM)

TEMPORARY LIGHTING PLAN
PHASE 2


COUNTY OF
BOYD
ITEM NO.
9-60.00
SHEET NO.
MATCH LINE STA. 34+25
WOOD POLE
STA. 33+50
NEW LOAD CENTER N-
EXISTING LOAD CENTER E-
STA. 32+50
CIRCUIT LEGEND
CKT. N2-2-#8
CKT. N3-2-#6
CKT. N7-2-#4
CKT. N9-2-#4
CKT. E1-2-#8
CKT. E2-2-#8
CKT. E3-2-#8
CKT. E4-2-#8
CKT. E5-2-#8
CKT. E6-2-#8
30+00
25+00
20+00
SCALE 1" = 100'
LEGEND
AREA CONSTRUCTED THIS PHASE
TEMPORARY PAVEMENT CONSTRUCTED THIS PHASE
SERVICE POINT
EXISTING LUMINAIRE
AERIAL CABLE
3" CONDUIT
WOOD POLE WITH OFFSET LUMINAIRE
GUY WIRE
PROPOSED LUMINAIRE (HIGH PRESSURE SODIUM)
MATCH LINE STA. 15+00
TEMPORARY LIGHTING PLAN
PHASE 2


COUNTY OF
ITEM NO.
SHEET NO.
BOYD
9-60.00
SCALE 1" = 100'
CIRCUIT LEGEND
CKT. N2-2-*B
CKT. N1-2-*A
CKT. E5-2-*B
CKT. N2-2-*A
CKT. E5-2-*B
LEGEND
AREA CONSTRUCTED THIS PHASE
TEMPORARY PAVEMENT CONSTRUCTED THIS PHASE
SERVICE POINT
EXISTING LUMINAIRE
AERIAL CABLE
3" CONDUIT
WOOD POLE WITH OFFSET LUMINAIRE
GUY WIRE
PROPOSED LUMINAIRE (HIGH PRESSURE SODIUM)
TIE INTO EXISTING CIRCUITS E5 AT POLE
WOOD POLE STA. 44+25
N2-16-E-0-32 STA. 37+00
WOOD POLE STA. 55+75
N2-15-E-0-32 STA. 54+50
MATCH LINE STA. 54+00
CLOSED
TEMPORARY LIGHTING PLAN
PHASE 3

COUNTY OF	ITEM NO.	SHEET NO.
BOYD	9-60.00	

CIRCUIT LEGEND

(LL) CKT. N1-2-#8	(PP) CKT. N1-2-#8	(SS) CKT. N2-2-#8	(aa) CKT. N1-2-#8
CKT. N3-2-#8	CKT. N2-2-#8	CKT. N7-2-#4	CKT. E4-2-#8
CKT. N7-2-#4	CKT. N7-2-#4	CKT. E5-2-#8	
CKT. E4-2-#8	CKT. N9-2-#4		
CKT. E5-2-#8	CKT. E4-2-#8	(TT) CKT. N9-2-#4	(FF) CKT. E4-2-#8
	CKT. E5-2-#8	(UU) CKT. N7-2-#4	
(MM) CKT. N3-2-#8			
(NN) CKT. N1-2-#8	(RR) CKT. N2-2-#8	CKT. N2-2-#8	CKT. E5-2-#8
CKT. N7-2-#4	CKT. N7-2-#4		
CKT. E4-2-#8	CKT. N9-2-#4	(VV) CKT. E5-2-#8	
CKT. E5-2-#8	CKT. E5-2-#8	(WW) CKT. N7-2-#4	

SCALE 1" = 100'

MATCH LINE STA. 54+00

WOOD POLE STA. 53+25

N2-14-E-0-32 STA. 52+00

WOOD POLE STA. 50+70

TIE INTO NEW LIGHTING SYSTEM CKT. N9

TIE INTO NEW CIRCUIT N1 AT POLE 1-8-C-15-20 STA. 50+00.

WOOD POLE STA. 36+62

TIE INTO NEW CIRCUIT N1 AT POLE 7-5-A-6-10, STA. 37+75.

WOOD POLE STA. 49+90

WOOD POLE STA. 45+36

N2-13-E-0-32 STA. 49+45

TIE INTO EXISTING CKT. E5 AT EXISTING J-BOX

TIE INTO EXISTING CIRCUIT E4 AT POLE

N2-12-E-0-32 STA. 48+00

WOOD POLE STA. 46+75

N2-11-E-0-32 STA. 45+50

WOOD POLE STA. 44+25

N2-10-E-0-32 STA. 43+00

N1-1-E-0-32 STA. 33+50

WOOD POLE STA. 40+30

N2-9-E-0-32 STA. 40+50 O

PICK UP CKT. N2, #9 FROM NEW POLE 2-8-A-8-14

TIE INTO NEW LIGHTING CKT. N3 AT POLE AT STA. 31+90

WOOD POLE STA. 33+00

WOOD POLE STA. 37+10

WOOD POLE STA. 36+00

WOOD POLE STA. 34+50

MATCH LINE STA. 34+25

MATCH LINE STA. 187+50

MATCH LINE STA. 188+00

MATCH LINE STA. 216+00

MATCH LINE STA. 217+00

℄ RAMP A

℄ RAMP B

℄ RAMP B1

℄ RAMP C

℄ RAMP D

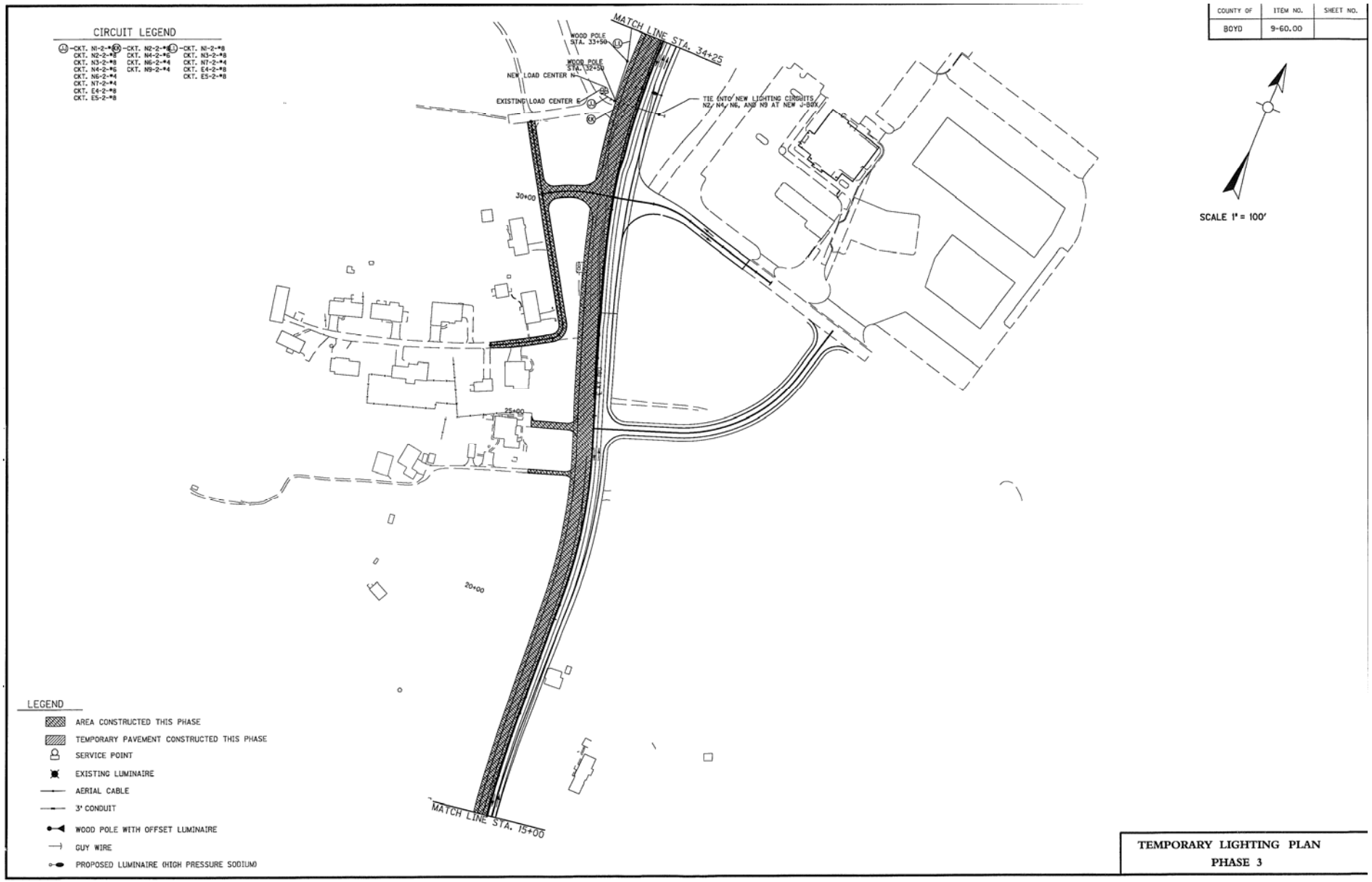
℄ WB I-64

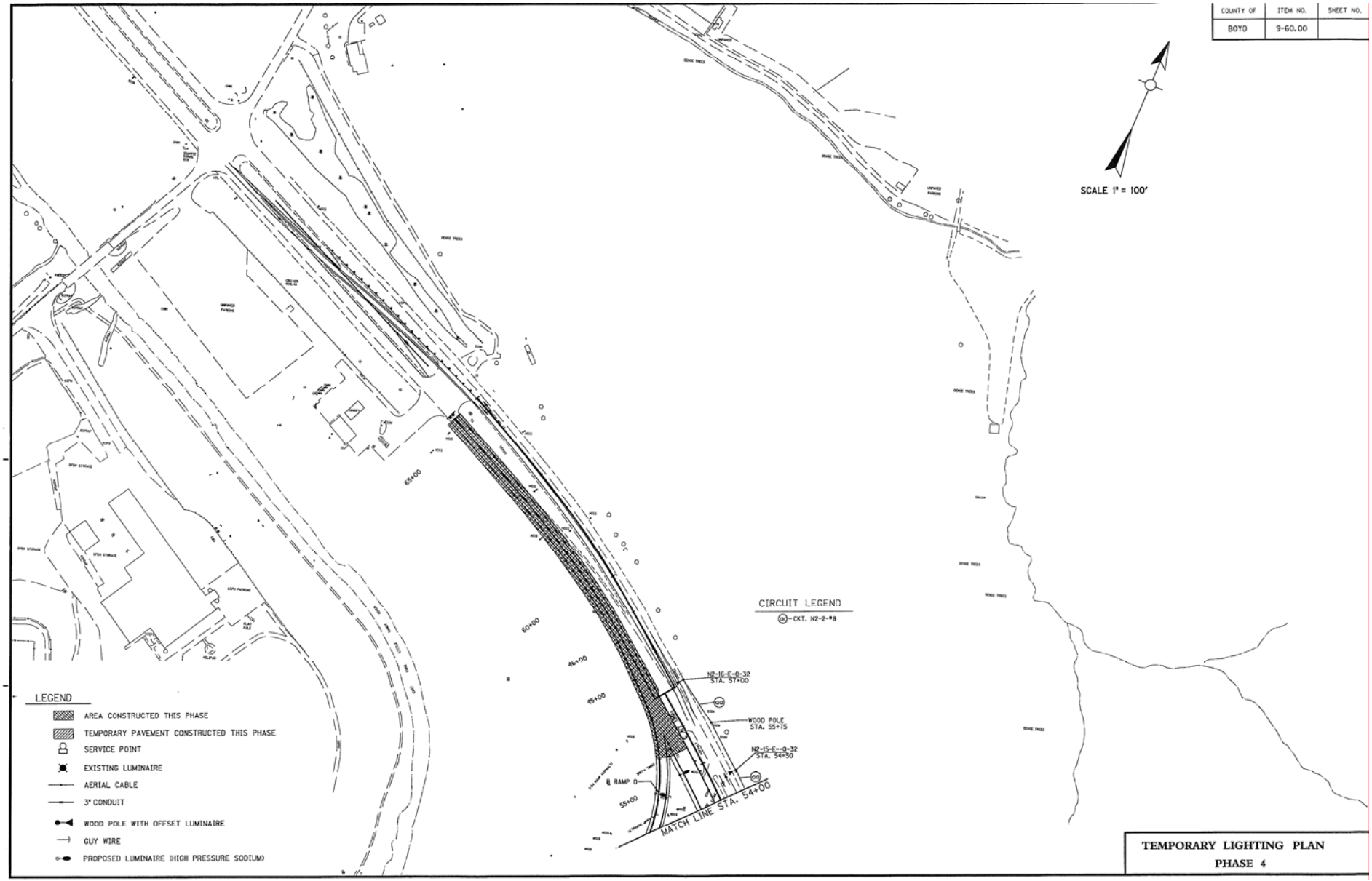
℄ EB I-64

LEGEND

- AREA CONSTRUCTED THIS PHASE
- TEMPORARY PAVEMENT CONSTRUCTED THIS PHASE
- SERVICE POINT
- EXISTING LUMINAIRE
- AERIAL CABLE
- 3" CONDUIT
- WOOD POLE WITH OFFSET LUMINAIRE
- GUY WIRE
- PROPOSED LUMINAIRE (HIGH PRESSURE SODIUM)

TEMPORARY LIGHTING PLAN
PHASE 3


CIRCUIT LEGEND
CKT. N1-2-#8
CKT. N2-2-#8
CKT. N3-2-#8
CKT. N4-2-#6
CKT. N6-2-#4
CKT. N7-2-#4
CKT. E4-2-#8
CKT. E5-2-#8
CKT. N2-2-#6
CKT. N4-2-#6
CKT. N6-2-#4
CKT. N9-2-#4
CKT. N1-2-#8
CKT. N3-2-#8
CKT. N7-2-#4
CKT. E4-2-#8
CKT. E5-2-#8
MATCH LINE STA. 34+25
WOOD POLE STA. 33+50
WOOD POLE STA. 32+50
NEW LOAD CENTER N
EXISTING LOAD CENTER E
TIE INTO NEW LIGHTING CIRCUITS N2, N4, N6, AND N9 AT NEW J-BOX
30+00
25+00
20+00
MATCH LINE STA. 15+00
LEGEND
AREA CONSTRUCTED THIS PHASE
TEMPORARY PAVEMENT CONSTRUCTED THIS PHASE
SERVICE POINT
EXISTING LUMINAIRE
AERIAL CABLE
3" CONDUIT
WOOD POLE WITH OFFSET LUMINAIRE
GUY WIRE
PROPOSED LUMINAIRE (HIGH PRESSURE SODIUM)
COUNTY OF
ITEM NO.
SHEET NO.
BOYD
9-60.00
SCALE 1" = 100'
TEMPORARY LIGHTING PLAN
PHASE 3


COUNTY OF
BOYD
ITEM NO.
9-60.00
SHEET NO.
SCALE 1" = 100'
CIRCUIT LEGEND
CKT. N2-2-#8
LEGEND
AREA CONSTRUCTED THIS PHASE
TEMPORARY PAVEMENT CONSTRUCTED THIS PHASE
SERVICE POINT
EXISTING LUMINAIRE
AERIAL CABLE
3" CONDUIT
WOOD POLE WITH OFFSET LUMINAIRE
GUY WIRE
PROPOSED LUMINAIRE (HIGH PRESSURE SODIUM)
N2-16-E-0-32
STA. 57+00
WOOD POLE
STA. 55+75
N2-15-E-0-32
STA. 54+50
℄ RAMP D
MATCH LINE STA. 54+00
65+00
60+00
46+00
45+00
55+00
TEMPORARY LIGHTING PLAN
PHASE 4

COUNTY OF	ITEM NO.	SHEET NO.
BOYD	9-60.00	

CIRCUIT LEGEND

- (QZ)—CKT. N2-2-*8 (Y)—CKT. N1-2-*8 CKT. N7-2-*4
- (QQ)—CKT. N2-2-*8 (ZZ)—CKT. N1-2-*8 CKT. N9-2-*4 CKT. N2-2-*8 CKT. N7-2-*4 CKT. N9-2-*4
- (TT)—CKT. N9-2-*4
- (XX)—CKT. N2-2-*8 CKT. N8-2-*6 CKT. N9-2-*4

SCALE 1" = 100'

MATCH LINE STA. 187+50

MATCH LINE STA. 188+00

MATCH LINE STA. 34+25

MATCH LINE STA. 54+00

MATCH LINE STA. 216+00

MATCH LINE STA. 217+00

℄ RAMP D

℄ RAMP A

℄ RAMP C

℄ RAMP B1

℄ RAMP B

C-KB-1-64

WOOD POLE STA. 53+25

N2-14-E-0-32 STA. 52+00

WOOD POLE STA. 50+70

TIE INTO NEW LIGHTING SYSTEM CKT. N9

TIE INTO NEW SYSTEM CKT. N1 AND N7 AT POLE 1-8-C-15-20 STA. 50+00.

WOOD POLE 50+00 STA. 49+90

N2-13-E-0-32 STA. 49+45

WOOD POLE STA. 48+05

N2-12-E-0-32 STA. 48+00

PICK UP CIRCUITS N1, N7 FROM POLE 1-7-C-15-20 AT STA. 48+00

WOOD POLE STA. 46+75

N2-11-E-0-32 STA. 45+50

WOOD POLE STA. 44+25

N2-10-E-0-32 STA. 43+00

TIE INTO CIRCUIT N8 AT NEW J-BOX

N2-9-E-0-32 STA. 40+50

PICK UP CKT. QN2, N8, AND N9 FROM POLE 2-8-A-8-14 AT STA. 11+50

LEGEND

- AREA CONSTRUCTED THIS PHASE
- TEMPORARY PAVEMENT CONSTRUCTED THIS PHASE
- SERVICE POINT
- EXISTING LUMINAIRE
- AERIAL CABLE
- 3" CONDUIT
- WOOD POLE WITH OFFSET LUMINAIRE
- GUY WIRE
- PROPOSED LUMINAIRE (HIGH PRESSURE SODIUM)

TEMPORARY LIGHTING PLAN
PHASE 4


COUNTY OF
BOYD
ITEM NO.
9-60.00
SHEET NO.
MATCH LINE STA. 34+25
NEW LOAD CENTER N
REMOVE EXISTING LOAD CENTER DURING THIS PHASE.
NOTE:
NEW LIGHTING SYSTEM CONSTRUCTED IN PRIOR PHASES SHALL BE IN PLACE AND FUNCTIONING.
30+00
25+00
20+00
MATCH LINE STA. 15+00
SCALE 1" = 100'
LEGEND
AREA CONSTRUCTED THIS PHASE
TEMPORARY PAVEMENT CONSTRUCTED THIS PHASE
SERVICE POINT
EXISTING LUMINAIRE
AERIAL CABLE
3" CONDUIT
WOOD POLE WITH OFFSET LUMINAIRE
GUY WIRE
PROPOSED LUMINAIRE (HIGH PRESSURE SODIUM)
TEMPORARY LIGHTING PLAN
PHASE 4


COUNTY OF
ITEM NO.
SHEET NO.
BOYD
9-60.00
SCALE 1" = 100'
LEGEND
AREA CONSTRUCTED THIS PHASE
TEMPORARY PAVEMENT CONSTRUCTED THIS PHASE
SERVICE POINT
EXISTING LUMINAIRE
AERIAL CABLE
3" CONDUIT
WOOD POLE WITH OFFSET LUMINAIRE
GUY WIRE
PROPOSED LUMINAIRE (HIGH PRESSURE SODIUM)
65+00
60+00
55+00
MATCH LINE STA. 54+00
TEMPORARY LIGHTING PLAN
PHASE 5

COUNTY OF	ITEM NO.	SHEET NO.
BOYD	9-60.00	

CIRCUIT LEGEND

(CC) –CKT. N8-2-#6
CKT. N9-2-#4

(dd) –CKT. N9-2-#4

NOTE:
NEW LIGHTING SYSTEM CONSTRUCTED IN PRIOR PHASES SHALL BE IN PLACE AND FUNCTIONING.

SCALE 1" = 100'

MATCH LINE STA. 54+00

MATCH LINE STA. 187+50

MATCH LINE STA. 188+00

MATCH LINE STA. 34+25

MATCH LINE STA. 216+00

MATCH LINE STA. 217+00

℄ RAMP D

℄ RAMP C

℄ RAMP A

℄ RAMP B1

℄ RAMP B

℄ KY 1-64

℄ EB 1-64

WOOD POLE STA. 50+70

TIE INTO NEW CKT. N9 AT POLE 9-1-A-8-14 AT STA. 11+30

WOOD POLE STA. 49+45

TIE INTO NEW CKT. N8 AT J-BOX

WOOD POLE STA. 48+00

WOOD POLE STA. 46+75

WOOD POLE STA. 45+50

WOOD POLE STA. 44+25

WOOD POLE STA. 43+00

TIE INTO NEW CKT. N8 AT NEW J-BOX

PICK UP CIRCUITS N8, AND N9 FROM POLE N2-8-A-8-14 AT STA. 11+50

LEGEND

- AREA CONSTRUCTED THIS PHASE
- TEMPORARY PAVEMENT CONSTRUCTED THIS PHASE
- SERVICE POINT
- EXISTING LUMINAIRE
- AERIAL CABLE
- 3" CONDUIT
- WOOD POLE WITH OFFSET LUMINAIRE
- GUY WIRE
- PROPOSED LUMINAIRE (HIGH PRESSURE SODIUM)

TEMPORARY LIGHTING PLAN
PHASE 5

VII. DEVELOPMENT PHASE

C. HIGHWAY LIGHTING

Value Engineering Alternative Number 5

Change the permanent lighting design to 100 ft. and 120 ft. high mast lighting. There is no change proposed to the temporary lighting plan, except where the designer intends that the permanent lighting be installed early to provide lighting during maintenance of traffic operations.

We are unsure whether the designer intended that the permanent lighting units be installed during progress of the MOT phases. If so, we believe this is impractical and not typical of electrical subcontractor operations. Generally, they expect to perform the work in essentially one visit to the project – move in – complete the required work – move out on completion. We believe that additional phasing of the lighting units beyond the small quantities of temporary wood pole mounted lights would cost more than estimated in the current estimate.

The huge extent of this interchange footprint pointed the Value Engineering team towards investigating the feasibility and economics of high mast tower lighting for this interchange. The length of the interchange along the mainline is approximately 9,800 feet and its width is about 2,200 ft. along the KY 180 crossroad. This project needs to light a large portion of approximately 490 acres.

The Value Engineering team consulted with Mr. Ted Swansegar of the KYTC Traffic Division, Lighting Branch, regarding this project and consulted with Mr. Bill Helphinstine, Project Manager, H.W. Lochner, the lead project designer. Mr. Swansegar indicated that this project would be very appropriate application of tower lighting and that KYTC has no prohibition or current policy which dissuades the designer from using tower lighting in appropriate situations.

Mr. Helphinstine had originally proposed tower lighting as the recommended method of lighting for this project and had been instructed to use the lower level luminaire units for the project. He was not given additional information regarding the reasoning behind this decision and preceded with the current lighting design of 30 ft. and 40 ft. mounting heights.

In the initial consultation with Mr. Swansegar, he indicated that use of tower high mast lighting units was preferred in areas where the shorter luminaire units could be hit by straying vehicles. He said that in the design of high mast tower lighting locations, particular attention needed to be paid to placing the towers behind guardrails and at other protected locations.

The Value Engineering team received assistance from KYTC staff in preparing this recommendation, and is most grateful for their assistance.

1 VE insert

HIGHWAY LIGHTING
VALUE ENGINEERING ALTERNATIVE NUMBER 5
COST COMPARISON SHEET

DESCRIPTION	UNITS	UNIT COST	PROP'D QTY.	PROP'D COST	V.E. QTY.	V.E. COST
Poles and Bases	EA	$31,000	168	$372,665	17	$527,000
Luminaires	EA	$650	168	$94,000	93	$60,450
Control Equipment	EA	$7,000	1	$8,500	1	$7,000
Conduit	LF	$25.00	24638	$492,760	2580	$64,500
Marker	EA	$100	0	$0	18	$16,800
Junction Box	EA	$800	20	$9,937	21	$159,936
Cable	LF	VARIOUS	142449	$129,704	43,920	$31,000
Other Items	LS	VARIOUS		$48,743	1	$101,800
Trench and Backfill	LF	$4.00	24638	$98,552	25450	$970,286
SUBTOTAL				**$1,254,861**		**$970,286**
Engineering and Contingency			10%	$125,486	10%	$97,029
GRAND TOTAL				**$1,380,347**		**$1,067,314**

POSSIBLE SAVINGS: $313,033

Item	Description	Qty	Unit	Unit Price	Total	Adj. UP		
	Interchange Lighting							
4700	POLE 30' MTG HT	71	EA	1,053.68	74,811.28	1,100.00	78,100.00	
4701	POLE 40' MTG HT	97	EA	2,500.00	242,500.00	1,500.00	145,500.00	
4721	BRACKET 6'	24	EA	150.00		150.00	3,600.00	**
4722	BRACKET 8'	19	EA	175.00		175.00	3,325.00	**
4723	BRACKET 10'	48	EA	200.00		200.00	9,600.00	**
4724	BRACKET 12'	23	EA	225.00		225.00	5,175.00	**
4725	BRACKET 15'	54	EA	250.00		250.00	13,500.00	**
4740	POLE BASE	168	EA	587.29	98,664.72	587.29	98,664.72	
4750	TRANSFORMER BASE	168	EA	250.00	42,000.00	300.00	50,400.00	
4760	POLE w/SECONDARY CONTROL EQUIPMENT	1	EA	8,500.00	8,500.00	8,700.00	8,700.00	
4770	HPS LUMINAIRE	168	EA	500.00	84,000.00	350.00	58,800.00	
4780	FUSED CONNECTOR KIT	336	EA	50.12	16,840.32	55.00	18,480.00	
4797	CONDUIT - 3 IN	24638	LF	7.60	187,248.80	20.00	492,760.00	
4811	JUNCTION BOX TY B	20	EA	496.86	9,937.20	500.00	10,000.00	
4820	TRENCHING AND BACKFILLING	24638	LF	3.99	98,305.62	4.00	98,552.00	
4832	WIRE- No. 12	13440	LF	0.50		0.50	6,720.00	**
4833	WIRE - No. 8	12491	LF	0.85	10,617.35	0.60	7,494.60	
4834	WIRE - No. 6	16737	LF	1.12	18,745.44	0.75	12,552.75	
4835	WIRE - No. 4	62255	LF	0.50	31,127.50	0.90	56,029.50	
4836	WIRE - No. 2	37526	LF	1.25	46,907.50	1.25	46,907.50	
4940	REMOVE LIGHTING	1	LS	7,000.00	7,000.00	30,000.00	30,000.00	
	SUB-TOTAL LIGHTING				$ 977,205.73		$ 1,254,861.07	
							$ 277,655.34	

** Items apparently missing from original estimate required for completion of lighting work. (Prices furnished by KyTC Traffic Div.)

6,570	Annual Power Cost @ $0.06 /kWHr (As Proposed)
20,367	Annual Power Cost @ $0.06 /kWHr (VE Alternative)
(13,797)	Increase in Power Cost Annually

Item	Description	Qty	Unit	Unit Price	Total
	Interchange Lighting "VE Proposal"				
4714	POLE 120 FT MTG HT HIGH MAST	17	EA	26,000.00	442,000.00
4742	POLE BASE-HIGH MAST	17	EA	5,000.00	85,000.00
4761	LIGHTING CONTROL EQUIPMENT	1	EA	7,000.00	7,000.00
4773	HPS LUMINAIRE HIGH MAST	93	EA	650.00	60,450.00
4798	CONDUIT 3 1/2 IN	2580	LF	25.00	64,500.00
4800	MARKER	18	EA	100.00	1,800.00
20392ES835	JUNCTION BOX TY B	21	EA	800.00	16,800.00
4820	TRENCHING AND BACKFILLING	25450	LF	4.00	101,800.00
4860	CABLE-NO. 8/3C DUCTED	400	LF	2.00	800.00
4861	CABLE-NO. 6/3C DUCTED	2320	LF	2.65	6,148.00
4862	CABLE-NO. 4/3C DUCTED	15750	LF	3.25	51,187.50
4863	CABLE-NO. 2/3C DUCTED	25450	LF	4.00	101,800.00
4873	POLE 45' WOODEN	1	EA	1,000.00	1,000.00
4940	REMOVE LIGHTING	1	LS	30,000.00	30,000.00
	SUB-TOTAL LIGHTING				970,285.50

VII. DEVELOPMENT PHASE

D. DESIGN COMMENTS

Consider extending the South Big Run frontage road farther to the south to utilize the signalized intersection at the entrance to the Flying J truck stop.

Consider completing the entrance to the Flying J truck stop in Phase I and eliminating the need for the detour into the Flying J from Phase II.

Check the unit bid price for roadway excavation. The adjacent project on I-64 was recently bid at $11.12 C.Y.

Check the width of the double left turn lane to Ramp B to ensure large truck off-tracking is accommodated.

Consider using the stockpiled barrier wall located 4000 ft. south of the interchange in this project.

VIII. SUMMARY OF RECOMMENDATIONS

It is the recommendation of the Value Engineering Team that the following Value Engineering Alternatives be carried into the Project Development process for further development.

Recommendation Number 1: *GRADING-KY 180 PROFILE GRADES*

The Value Engineering Team recommends that *Value Engineering Alternative Number 1* be implemented. This alternative would modify the profile grade of KY 180 from station 15+00 to station 40+00.

If this recommendation can be implemented, there is a possible savings of **$268,147.**

Recommendation Number 2: *STRUCTURES-RAMPS A AND D*

The Value Engineering Team recommends that the *Value Engineering Alternative Number 3* be implemented. This alternative would modify the alignment of Ramps A and D into parallel ramps and combine the ramp bridges with the EB and WB I-64 bridges over the Little Sandy River into single structures.

If this recommendation can be implemented, there is a possible savings of **$1,533,224.**

Recommendation Number 3: *STRUCTURES-BRIDGES OVER KY 180*

The Value Engineering Team recommends that the *Value Engineering Alternative Number 4* be implemented. This alternative would use vertical abutments with MSE walls on both the EB and WB I-64/KY 180 structures

If this recommendation can be implemented, there is a possible savings of **$354,411.**

Recommendation Number 4: *HIGHWAY LIGHTING*

The Value Engineering Team recommends that the *Value Engineering Alternative Number 5* be implemented. This alternative would utilize seventeen (17) 120 ft. high mast lights in lieu of the one hundred and sixty eight (168) 30 ft. and 40 ft. cobra head lights.

If this recommendation can be implemented, there is a possible savings of **$313,033.**

RECONSTRUCTION OF I-64/KY 180 INTERCHANGE
VALUE ENGINEERING STUDY PRESENTATION
October 17-21, 2005

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