

MEMORANDUM

TO: Stuart Payton, P.E.
TEBM PD&P I, District 3

cc: Lucas Gilliam, P.E.
Brad Hall, P.E.
Matthew Holder, P.E.

FROM: Adam Ross, P.E.
TEBM
Geotechnical Services Branch

BY: Aaron Wallace, P.E.
Geotechnical Support and Review Branch

DATE: October 13, 2025

SUBJECT: Butler County
KY 185 MP 0.44
Item # 3-9021.00
MARS# 1074901D
Geotechnical Landslide Recommendation

At the request of the District, the Geotechnical Services Branch conducted an evaluation of a landslide in Butler County on KY 185 at mile point 0.44 (N 37.15772, E -86.41226) on August 6, 2025. The affected area encompasses approximately 150 feet of the northbound shoulder and lane. Additional sounding locations were planned outside the slide area for potential shoulder widening for guardrail to occur in the area.

This project is part of an HSIP safety improvement project, stations throughout this report are referenced to stationing for item #3-9021.00. Drilling and recommendations are for landslide repair and guardrail widening that is to occur as part of the project.

On October 8, 2025 a KYTC Geotechnical Branch Drill Crew was on site to conduct rock line soundings at five locations. Resulting depths and offsets are as follows:

Station	Offset from centerline	Depth to refusal
19+00	6.0 feet right	6.5 feet
19+50	6.0 feet right	6.2 feet
20+00	6.0 feet right	19.5 feet
21+00	6.0 feet right	10.7 feet
22+00	6.0 feet right	11.9 feet

Embankment widening

Soil Embankment

Due to refusal depths around station 20+00 widening of the existing slope is recommend for the entire length of need for this project. Embankment constructed from soil should be no steeper than a finished 2:1 slope at any point throughout. Desired shoulder widening for guardrail should be considered when designing embankment slopes. Right of way is

potentially an issue on this site, if slopes need to be steeper than 2:1 consider rock embankment outlined below.

Rock Embankment

If necessary, embankments can be constructed from quarried rock in this location. If rock embankments are used it is recommended to shape benched foundation soils on approximately 20:1 cross slope. Foundation soils need to maintain positive drainage away from roadway, toward the base of finished slope. After foundations soils have been graded line excavation with a layer of Fabric – Geotextile Class 1, as separation and stabilizer between foundation soils and rock embankment. Crushed Aggregate #23 is recommended as the embankment type, the finished slope of the embankment should not exceed 1.5:1.

Railroad steel wall

Overhead utilities are present through the location and could become an issue if utilizing a recycled rail repair, especially in areas requiring 40’ rails for repair. Due to these issues embankment widening in recommended as the repair in this area. If recycled rail wall is still desired use information below for construction of the repair wall.

Refusal depths to rock varied from 6.2’ to 19.5’ from Sta 19+00 to 22+00. The table below is to be used for estimation of rail quantities based on results of soundings. Rails installed should follow standard drawing BGX-027 (attached) to ensure 1/3 of rail length is in rock socket throughout the entire project.

Begin Sta	End Sta	Refusal Depth	Length of Rails	Spacing between Rails	Number of rows
19+00	19+75	6.5’	20’*	4’	1
19+75	20+75	19.5’	40’	3’	2
20+75	22+00	11.9’	20’	3’	1

*Length used to ensure minimum embedment achieved

Recommendation:

1) Install a **single or double** row of recycled railroad rails below the roadway grade based on chart above. Rail spacing should be approximately **3 feet or 4 feet** center to center based on the chart above. Installation of the rails from center line will be determined by the Engineer. **Use a minimum length of 20-foot rails, assure at least 1/3 of the rail is embedded into bedrock, and verified by district personnel.**

2) Install Recycled Drilled-In (Used) Railroad Rails classified with a nominal weight of **130 Lbs/yd. or greater**. Use only visibly straight Recycled Railroad Rails with no splices. The Engineer will verify rail nominal weights (Manufacturer’s Stamp with lbs yd., date, etc.). Provide certification for nominal weight if the Manufacturer’s Stamp is unidentifiable. Install the flanges of the rails positioned parallel to the centerline of the roadway.

Immediately after installing Railroad Rails below grade, backfill the drilled socket with materials other than auger tailings including one of the following materials: concrete (high slump 8”-9”); gravel; cement grout; flowable fill; or coarse

aggregates (#67, #68, #78, #8 & #9 only). Shovel backfill material into drilled socket to prevent voids from forming around the rails. Proper backfilling is critical to the performance of the rails.

3) Rails should be installed to a height of 1 foot below the roadway level or as instructed by the Engineer. It is also critical rails be installed with the long axis 90 degrees to the road flush with the wide flange against cribbing.

4) Install lagging a minimum of 10 feet, extending to an elevation of 12 feet below groundline or to bedrock. Lagging could consist of concrete panels or recycled (used) steel "W" beam guardrail. Use Kentucky Coarse Aggregate Nos. 2's, 3's, or 23's meeting the requirements of Sections 703 and 805 of the Standard Specifications for Road and Bridge Construction (Current Edition) for backfill behind the lagging. Positive drainage must be maintained behind the lagging. Place Geotextile Fabric Class I, in accordance with Section 214 & 843 of the Standard Specifications for Road and Bridge Construction, current edition, between the aggregate and soil interface.

5) In conjunction with installing rail the Geotechnical Branch recommends maintaining positive drainage in these areas by cleaning out existing pipes and ditches to help eliminate future failures.

Soil Nail Wall

An estimate by GSI has been prepared for this location and is attached to this report. A soil nail is an appropriate fix in this area, however, will likely be the more costly repair. If selected, please use quantities from option #2: Shotcrete Wall. With the potential right of way issues for embankment and overhead utilities for rail walls, should a soil nail wall be needed, the attached report can aid in quantities and costs for such as repair. Please note the GSI attached recommendation starts at approximately project Sta 19+40 and extend to Sta 21+23. Should soil nail wall be used and shoulder widening desired throughout the entire project the quantities from the estimate will need to be updated.

Attachments:

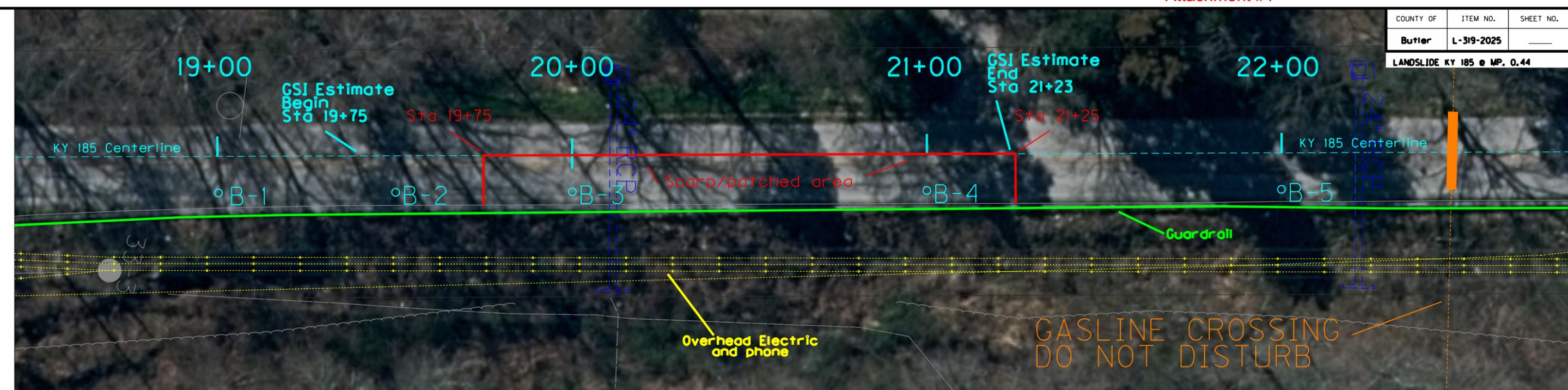
Location layout

Drillers Logs

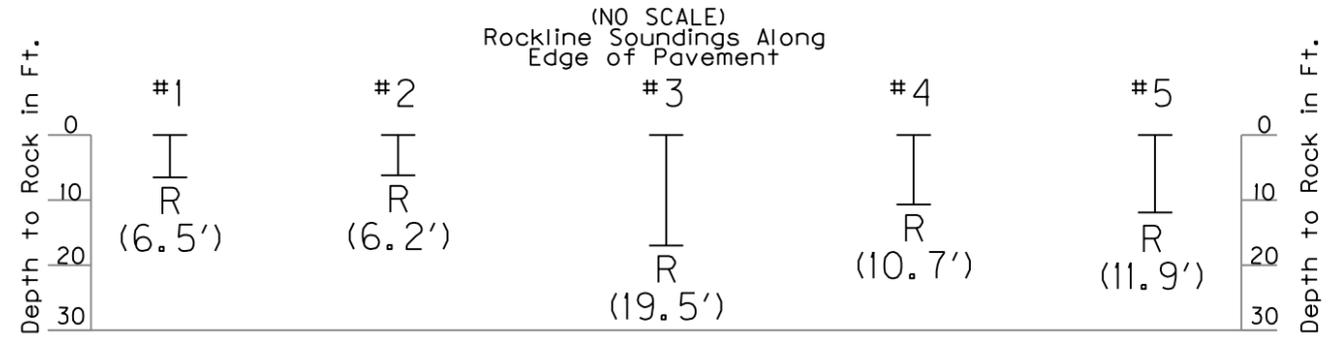
Standard Drawing BGX-027

GSI Repair Estimate

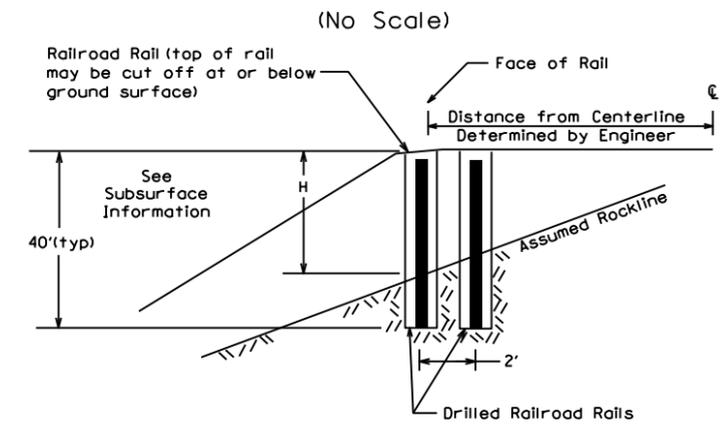
COUNTY OF	ITEM NO.	SHEET NO.
Butler	L-319-2025	
LANDSLIDE KY 185 @ MP. 0.44		



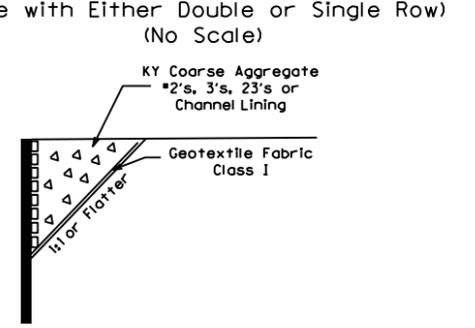
SUBSURFACE INFORMATION



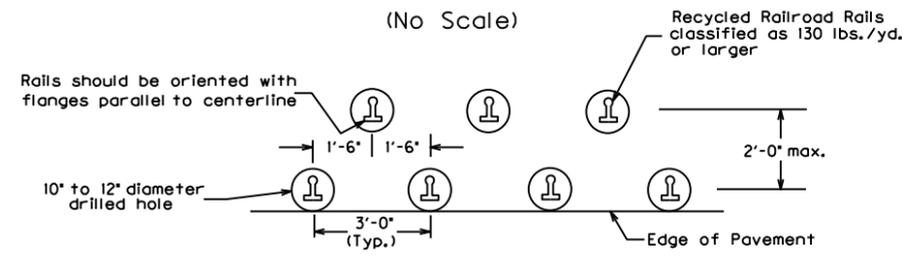
TYPICAL CROSS SECTION DETAIL - DOUBLE ROW



TYPICAL CROSS SECTION WITH BACKFILL



TYPICAL SPACING DETAIL - DOUBLE ROW



Drawings are for Sta 19+75 to 20+75. For repairs outside this area refer to Standard Drawing BGX-027 and landslide report L-319-2025

FILE NAME: _____
USER: _____ DATE PLOTTED: _____
E-SHEET NAME: _____

			Kentucky Single Zone		NAD 83 Lat./Long.	
Location	Sta	Offset	Northing	Easting	Northing	Easting
Sta 19+00	19+00	N/A	3581575.92	4728262.65	37.157391	-86.412192
B-1	19+00	6' RT	3581578.38	4728272.66	37.157398	-86.412192
B-2	19+50	6' RT	3581627.19	4728261.82	37.157532	-86.412230
B-3	20+00	6' RT	3581675.82	4728251.03	37.157665	-86.412269
B-4	21+00	6' RT	3581773.44	4728229.35	37.157933	-86.412345
B-5	22+00	6' RT	3581871.07	4728207.67	37.158201	-86.412422

DESIGNED BY: _____
DATE SUBMITTED: _____

DEPARTMENT OF HIGHWAYS
COUNTY OF
Butler County

PROJECT NUMBERS: _____

LANDSLIDE KY 185 @ MP. 0.44

DRILLER'S SUBSURFACE LOG

Project ID: <u>L-319-2025</u>	<u>Butler - KY-185 MP 2.4-</u>	Project Type: <u>Landslide Landslide Memo</u>	
Item Number: <u>03-00000.</u>		Project Manager: <u>Aaron Wallace</u>	
Hole Number <u>1</u>	Immediate Water Depth <u>NA</u>	Start Date <u>10/08/2025</u>	Hole Type <u>sounding</u>
Surface Elevation <u>'</u>	Static Water Depth <u>NA</u>	End Date <u>10/08/2025</u>	Rig Number <u>320-0104</u>
Total Depth <u>7.0'</u>	Driller <u>Joshua Smallwood</u>	Latitude(83) <u>__</u>	
Location <u>19+00.00 6.0' Rt.</u>		Longitude(83) <u>__</u>	

Lithology		Description	Overburden	Sample No.	Depth (ft)	Rec. (ft)	SPT Blows	Sample Type	Remarks
Elevation	Depth		Rock Core	Std/Ky RQD	Run (ft)	Rec (ft)	Rec (%)	SDI (JS)	
	0.6		Blacktop.						
	1.0		DGA.						
			Medium soft, red, moist, sandy clay.						
	6.5		(Refusal)						
	7.0		Brown sandstone.						
			(Bottom of Hole 7.0') (Refusal @ 6.5)						

DRILLER'S SUBSURFACE LOG

Project ID: <u>L-319-2025</u>	<u>Butler - KY-185 MP 2.4-</u>	Project Type: <u>Landslide Landslide Memo</u>		
Item Number: <u>03-00000.</u>		Project Manager: <u>Aaron Wallace</u>		
Hole Number <u>2</u>	Immediate Water Depth <u>NA</u>	Start Date <u>10/08/2025</u>	Hole Type <u>sounding</u>	
Surface Elevation <u>'</u>	Static Water Depth <u>NA</u>	End Date <u>10/08/2025</u>	Rig Number <u>320-0104</u>	
Total Depth <u>6.7'</u>	Driller <u>Joshua Smallwood</u>	Latitude(83) <u>__</u>		
Location <u>19+50.00 6.0' Rt.</u>		Longitude(83) <u>__</u>		

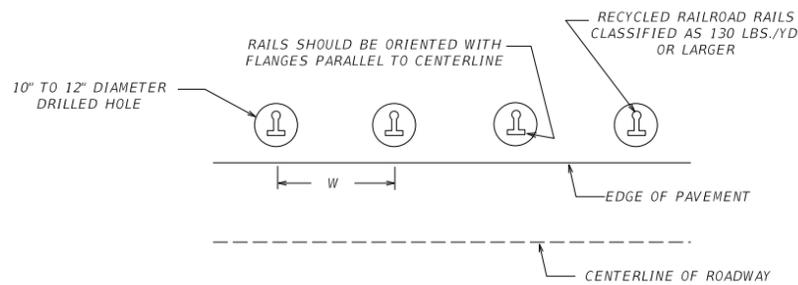
Lithology		Description	Overburden	Sample No.	Depth (ft)	Rec. (ft)	SPT Blows	Sample Type	Remarks
Elevation	Depth		Rock Core	Std/Ky RQD	Run (ft)	Rec (ft)	Rec (%)	SDI (JS)	
	0.7	Blacktop.							
	1.0	DGA.							
	6.2	Medium stiff, red, moist, sandy clay.							
	6.7	(Refusal)							
	6.7	Brown sandstone.							
		(Bottom of Hole 6.7') (Refusal @ 6.2)							

DRILLER'S SUBSURFACE LOG

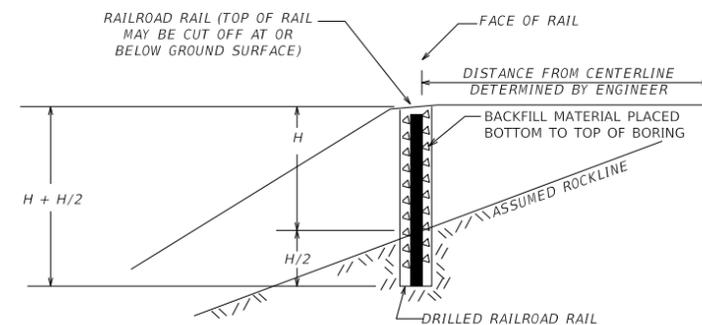
Project ID: <u>L-319-2025</u>		<u>Butler - KY-185 MP 2.4-</u>				Project Type: <u>Landslide Landslide Memo</u>			
Item Number: <u>03-00000.</u>		Project Manager: <u>Aaron Wallace</u>							
Hole Number <u>5</u>		Immediate Water Depth <u>NA</u>		Start Date <u>10/08/2025</u>		Hole Type <u>sounding</u>			
Surface Elevation <u>'</u>		Static Water Depth <u>NA</u>		End Date <u>10/08/2025</u>		Rig Number <u>320-0104</u>			
Total Depth <u>11.9'</u>		Driller <u>Joshua Smallwood</u>		Latitude(83) <u>__</u>					
Location <u>22+00.00 7.0' Rt.</u>				Longitude(83) <u>__</u>					
Lithology		Overburden		Sample No.	Depth (ft)	Rec. (ft)	SPT Blows	Sample Type	Remarks
Elevation	Depth	Description		Std/Ky RQD	Run (ft)	Rec (ft)	Rec (%)	SDI (JS)	
	0.6	Blacktop.							
	1.0	DGA.							
5		Medium soft, red, moist, sandy clay.							5
10	11.9								
		(Refusal)							
15		Brown sandstone.							15
		(Bottom of Hole 11.9') (Refusal @ 11.9)							
20									20
25									25
30									30
35									35
40									40
45									45
50									50

Recommend 3' spacing due to depth to rock. 40' rails

TYPICAL SPACING DETAIL - SINGLE ROW
(NO SCALE)



TYPICAL CROSS SECTION DETAIL - SINGLE ROW
(NO SCALE)

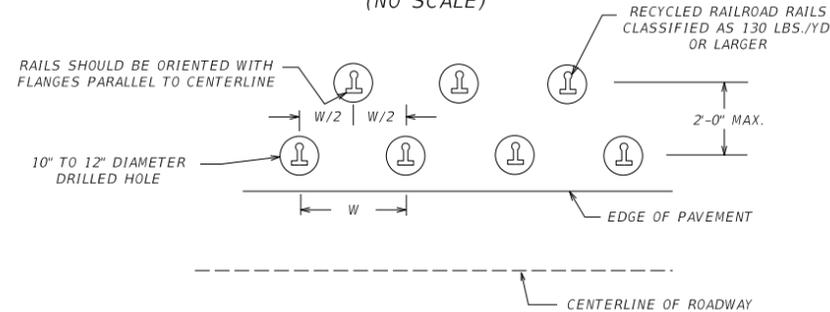


DEPTH TO ROCKLINE (H)	RAIL SPACING (W)	
	SINGLE ROW	DOUBLE ROW
<8 FT	4 FT	NA
8 - 12 FT	3 FT	NA
12 - 15 FT	2-3 FT*	3 FT
15 - 21 FT	NA	2-3 FT*
>21 FT	SPECIAL DESIGN REQUIREMENTS	

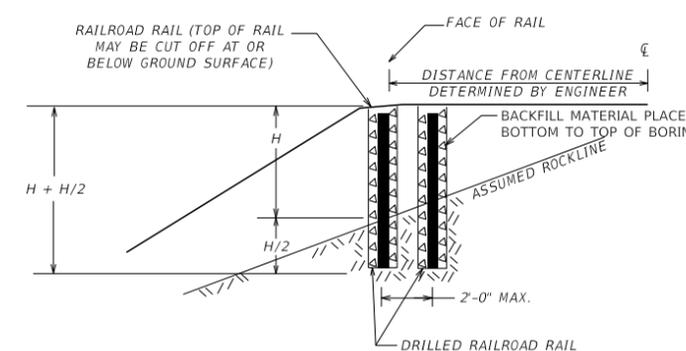
* 2 FEET SPACING PREFERRED - CAN EXTEND UP TO 3 FEET PROVIDED DEEPER RAILS (UP TO 40 FEET LONG) ARE USED

Sta 19+00 to Sta 19+75
Sta 20+75 to Sta 22+00
Sta 19+75 to Sta 20+75

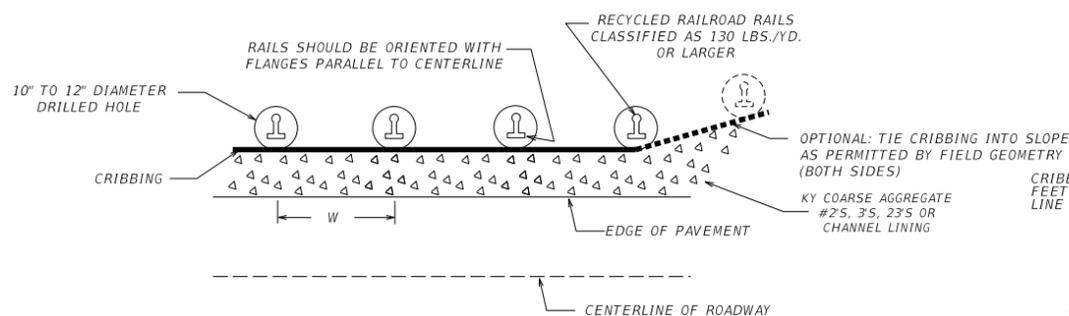
TYPICAL SPACING DETAIL - DOUBLE ROW
(NO SCALE)



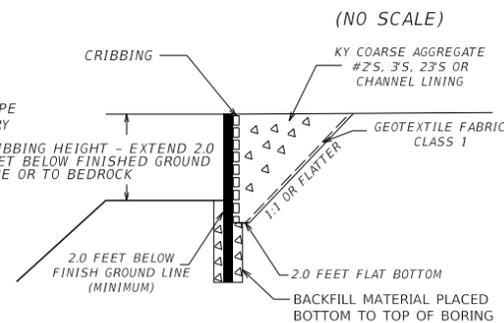
TYPICAL CROSS SECTION DETAIL - DOUBLE ROW
(NO SCALE)



TYPICAL SPACING DETAIL - SINGLE ROW W/ CRIBBING
(NO SCALE)



TYPICAL CROSS SECTION WITH BACKFILL
(USE WITH SINGLE OR DOUBLE ROW)



GEOTECHNICAL NOTES

- (1) H IS THE HEIGHT OF MATERIAL FROM ROCKLINE TO ROADWAY GRADE
- (2) MINIMUM EMBEDMENT INTO BEDROCK IS H/2 OR 1/3 OF TOTAL LENGTH OF THE INSTALLED RAIL. THESE LENGTHS MAY BE EXCEEDED AT THE FIELD ENGINEER'S DISCRETION DUE TO FIELD OR MATERIAL CONSIDERATIONS BUT SHALL NOT BE REDUCED.
- (3) BACKFILL IS TO BE PEAGRAVEL, NO. 8 OR 9 CRUSHED STONE, CONCRETE, FLOWABLE FILL, OR GROUT. BACKFILL OF BORINGS SHALL NOT BE OMITTED BY CONTRACTOR/ENGINEER AND SHALL NOT BE SOIL CUTTINGS FROM THE BORING.
- (4) BACKFILL SHALL BE PLACED FROM THE BOTTOM TO THE TOP OF THE BORING
- (5) BACKFILL (GRAVEL OR CRUSHED STONE) IS TO BE SHOVELED INTO BORE HOLE TO THE TOP OF THE BORING TO PREVENT VOIDS
- (6) RAIL IS TO BE INSTALLED PERPENDICULAR TO THE ROADWAY WITH WIDE FLANGE FACING ROADWAY
- (7) SPACING BETWEEN ROWS IS TO BE 2.0 FEET
- (8) CRIBBING SHALL BE MINIMUM 2.0 FEET BELOW FINISHED GROUND LINE OR TO BEDROCK BASED ON LOCAL CONDITIONS
- (9) BACKFILL BEHIND THE WALL IS TO BE 2'S, 23'S, 3'S, OR CHANNEL LINING
- (10) ALL RAILS SHALL BE MINIMUM OF 130 LB/YD UNIT WEIGHT
- (11) CRIBBING SHALL CONSIST OF USED W BEAM GUARDRAIL SECTIONS, CONCRETE PANELS, OR OTHER MATERIALS SPECIFIED BY THE ENGINEER
- (12) RAILS 40.0 FEET IN LENGTH MAY BE REQUIRED WHEN LOCAL CONDITIONS WARRANT SUCH AS WHEN SPACING BETWEEN RAILS HAS TO BE WIDENED MORE THAN RECOMMENDED OR WHEN LOCALIZED, SMALL SECTIONS OF THE REPAIR EXCEED 21.0 FEET DEPTH TO BEDROCK.
- (13) OPTIONAL: TIE CRIBBING INTO EMBANKMENT SLOPE OR HILLSIDE AS PERMITTED BY FIELD GEOMETRY (BOTH SIDES)

L-319-2025
Butler County
KY 185 MP 0.44

DATE: 08/11/2025
NUMBER: 0
RR
SUBMITTED: 08-11-2021
DATE: 08-11-2021
APPROVED: 08-11-2021
DATE: 08-11-2021

GENERAL



Dylan Jones, MS, PE
Project Development Engineer
dylan.jones@gsi.us | 859.248.2985

August 6, 2025

Mr. Lucas Gilliam, PE
Mr. Keith Embry
Kentucky Transportation Cabinet
Department of Highways, District Three
1205 Nashville St.
Russellville, KY 42276

Subject: Estimate for Roadway Slope Stabilization on KY 185, MP 0.41 in
Butler County, Kentucky

Dear Sirs:

Project Notes

Our stabilization proposal addresses a slide area that has created a scarp in the outboard lane of KY 185, MP 0.41 in Butler County, Kentucky. The site is 183 LF in total in length. The GPS coordinates for the site are **N37.15786, W86.41238**. This proposal is only for the work noted.

View of KY 185, MP 0.41



Slide Repair

GSI is proposing two repair options for this site. The first option is to install soil nails and pinned mesh to stabilize the roadway platform only. While on site, shoulder loss was observed around the guardrail posts. The second option is to install a soil nail and shotcrete wall with “Y-Wall” shoulder buildout to restore the shoulder. Costs for both options are presented below.

Option 1: Pinned Mesh

Work on this site will begin by KYTC forces clearing and grubbing and performing minor reshaping of the slope where necessary to create a uniform slope prior to GSI’s arrival.

Our forces will then install up to 30-ft drilled soil nails through slope. The nails will be left protruding out of the ground. We will then install an 11-ft band of high strength pinned mesh. Galvanized plates and nuts will be attached to the nails to secure the pinned mesh to the ground. This will stabilize the roadway platform.

Option 2: Shotcrete Wall

Once on site, our forces will begin by excavating 1-foot behind the existing guardrail, approximately 10 feet down the slope to achieve a 0.5H:1V slope. The excavation will be day-lighted out on the bottom for positive drainage. The excavated material will be hauled from the site.

Our forces will then install up to 30-ft Drilled Soil Nails into the sloped face. We are proposing a 10-ft tall wall for the 183 LF of proposed repair. This 10-ft tall by 183-ft long section will receive an 8-in reinforced shotcrete surface treatment. Also, we will install up to 20-ft soil nails on 10-ft centers to be used as drains.

We are proposing an “Alternate Shoulder Buildup”, a “Y” Wall, where metal lath is installed on top of the soil nail wall creating a void between the asphalt pavement and the top of the soil nail wall. This open space will be filled with lightweight backfill material by our forces. This area will provide sufficient width to re-establish the shoulder.

One lane of this road will need to be closed for our proposed work for both options. We are proposing to accomplish this with temporary traffic signals.

Items Furnished by Client

Our contract calls for us to do our specialty work and your forces to perform all other items, as applicable, such as clearing/grubbing, excavation, paving, striping, guard rail work, etc. We request that KYTC assist in locating a dump site for excavated material if Option 2 is chosen.

Cost – Based on LF Estimated

Option 1: Pinned Mesh

LF	QTY	Unit	Line #	Item	Unit Price	Price	Notes
	1	EA	2.26	Mobilization	\$ 900.00	\$ 900.00	Mobe
138	106	EA	2.1	20 FT Drilled or Launched Soil Nail	\$ 585.00	\$ 62,010.00	Soil Nails Sta. 10+00 to 10+80 & Sta. 11+25 to 11+83
45	34	EA	2.2	30 FT Drilled or Launched Soil Nail	\$ 885.00	\$ 30,090.00	Soil Nails Sta. 10+80 to 11+25
183	2013	SQFT	2.15	Wire Mesh Surface Treatment	\$ 26.50	\$ 53,344.50	Surface Treatment
	2	WK	2.32	Traffic Control - Portable Traffic Signal	\$ 3,371.00	\$ 6,742.00	Traffic Control
				TOTAL		\$ 153,086.50	

Option 2: Shotcrete Wall

LF	QTY	Unit	Line #	Item	Unit Price	Price	Notes
	1	EA	2.26	Mobilization	\$ 900.00	\$ 900.00	Mobe
138	83	EA	2.1	20 FT Drilled or Launched Soil Nail	\$ 585.00	\$ 48,555.00	Soil Nails Sta. 10+00 to 10+80 & Sta. 11+25 to 11+83
45	27	EA	2.2	30 FT Drilled or Launched Soil Nail	\$ 885.00	\$ 23,895.00	Soil Nails Sta. 10+80 to 11+25
183	1830	SQFT	2.18	8 in Shotcrete	\$ 47.25	\$ 86,467.50	Surface Treatment
183	360	LNFT	2.3	Horizontal Drains	\$ 29.25	\$ 10,530.00	Drains
183	31	CY	2.23	Lightweight Backfill	\$ 293.00	\$ 9,083.00	Lightweight Backfill
183	1830	SF	2.25	Excavation	\$ 13.35	\$ 24,430.50	Excavation
	2	WK	2.32	Traffic Control - Portable Traffic Signal	\$ 3,371.00	\$ 6,742.00	Traffic Control
				TOTAL		\$ 210,603.00	

Please note the quantities and project limits are based on the surface information gathered and the information provided during our recent site visit. Pricing may need to be adjusted for changes to project limits over time.

Additional details will be provided in a P.E. stamped proposal and drawings once a Delivery Order is issued, per our Master Agreement MA 605 2200000368.

Per our Master Agreement, our work is based on a 75-year design life and includes a 5-year warranty for the soil nail wall located below the road.

Schedule

Barring unforeseen delays, this site will take approximately 2 weeks to complete.

Please let me know if you have any questions or comments on this proposal.

GeoStabilization International

Dylan Jones

Dylan Jones, MS, PE

dylan.jones@gsi.us | M: 859.248.2985

Robert Chandler

Robert Chandler, EI, MBA

robert.chandler@gsi.us | M: 615.969.6925