District 11-0 Landslides and Remediation Techniques

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PENNDOT Dist. 11-0

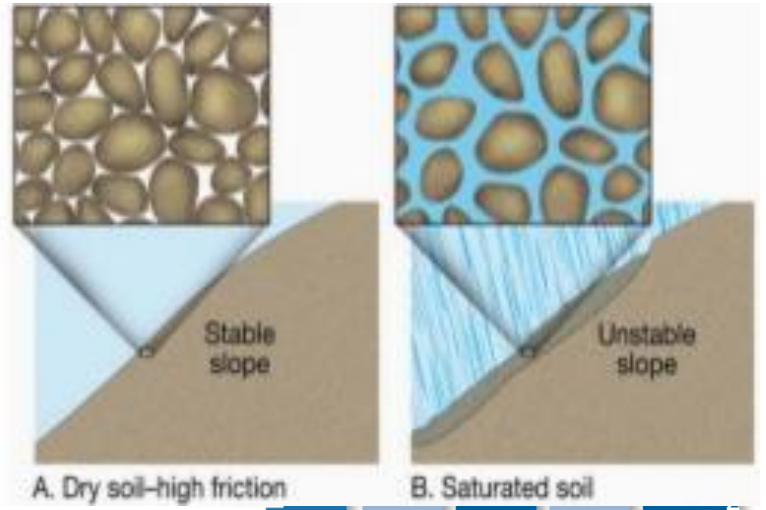
LANDSLIDE CAUSES

Landslides are the result of several contributing factors:

- Slope steepness
- Relatively weak soil and/or underlying rock
- Human alteration of a site
- Change in moisture conditions

Fully saturated soil

- Becomes buoyant, its ability to resist the weight of material above is reduced
- Material above is also heavier when it is wet
- Result -> material that is weaker trying to hold up more weight.
- The result is a landslide until the soil reaches equilibrium, typically at the bottom of the slope



LANDSLIDE CAUSES (CONT'D)

- Changing water content and weathered rock are the most frequent triggers for landslides.
- Water content changes over time. The clay-rich soils and weathered rocks common in the greater Pittsburgh area readily absorb moisture and soften.
- Landslides may move as a solid block of soil sliding on a weak layer or as a very thick fluid, flowing like wet concrete or oatmeal, deforming as it flows. Increased soil moisture can soften the key material and has been shown to either initiate or accelerate movement.
- The Pittsburgh Red Beds (as well as other red bed layers) are a layer of claystone rock that deteriorate when exposed to water. When deteriorated, this layer can act like a lubricated plane for all material above to slide.

TYPES OF SLOPE FAILURES

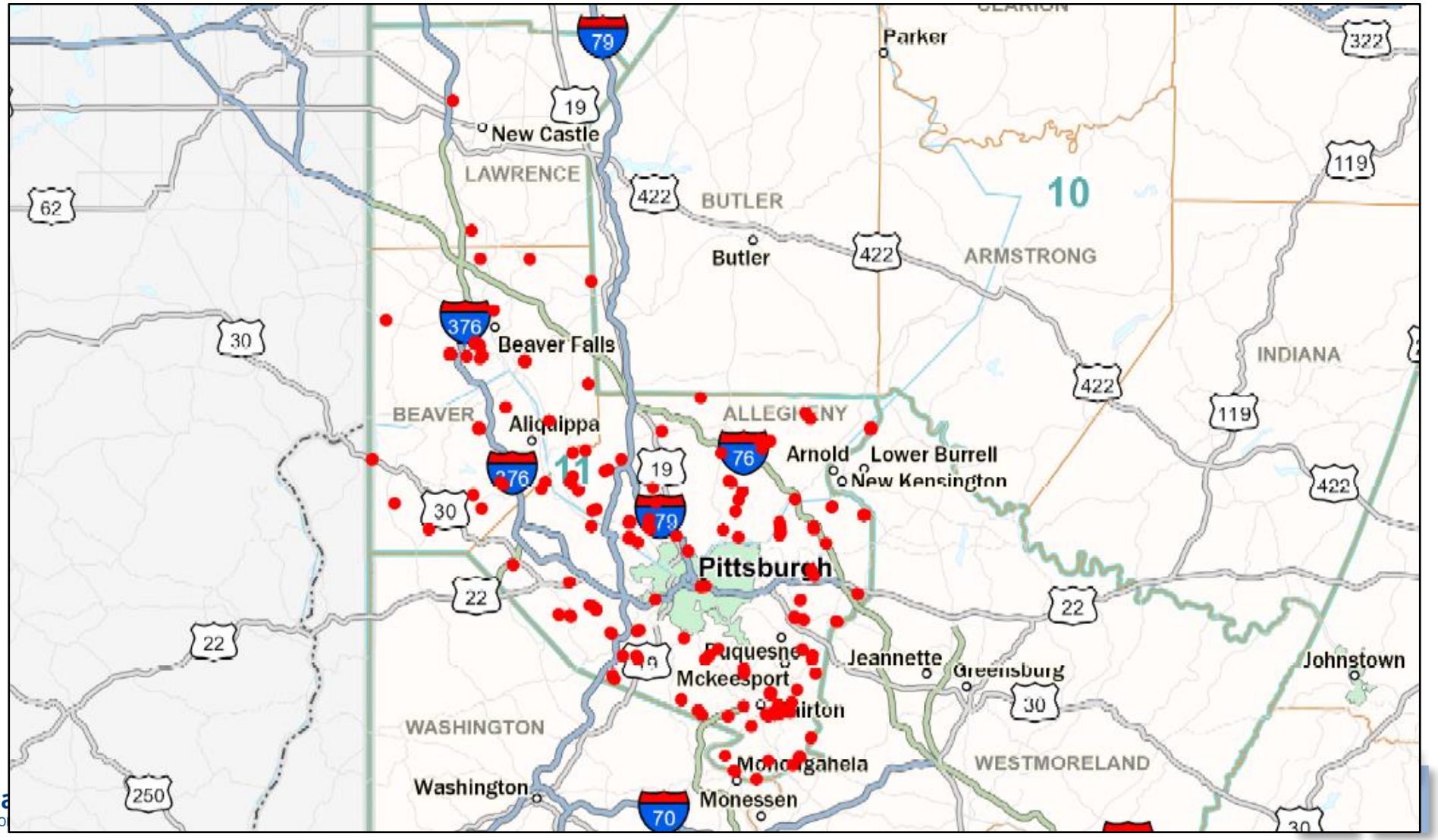

Pipe Failure


True Landslide


Stream Scour

Sheet Flow

DIST. 11-0 LANDSLIDE LOCATIONS



DIST. 11-0 GEOHAZARD INVENTORY & RATING SYSTEM

PENNDOT DISTRICT 11-0 GEOHAZARD INVENTORY AND RATING SYSTEM

Number of Outstanding High Priority Geohazards =	35 Sites
Number of Outstanding Medium Priority Geohazards =	49 Sites
Number of Outstanding Low Priority Geohazards =	33 Sites
Total Number of Outstanding Geohazards[1] =	117 Sites

LOCATION								GEOHAZARD CATEGORY RATINGS							
STATE ROUTE [2]	SECTION	COUNTY	BEGIN SEGMENT	BEGIN OFFSET	END SEGMENT	END OFFSET	LOCAL ROAD NAME	ADT RATING	CAUSE OF GEOHAZARD RATING	LENGTH OF ROADWAY IMPACTED RATING	HEIGHT OF FAILURE RATING	DEPTH TO VOID / MINED SEAM RATING	ROADWAY LIMITS IMPACT RATING	SURROUNDING AREA IMPACTS RATING	TOTAL GEOHAZARD RATING
4022		Allegheny	0130	1835	0130	1930	Reis Run Rd	9	81	3	9		243	81	426
2023	A03	Allegheny	0010	3081	0010	3646	Harrison Hollow Rd	3	81	27	9		243	3	366
0028	A60	Allegheny	0160	1795	160	1985	Allegheny Valley Ex	81	81	9	27		9	81	288
2026		Allegheny	0030	0900	0030	1200	Kline Av	9	27	27	27		81	81	252
1001	A59	Allegheny	0170		0180		Freeport Rd	27	81	81	27		3	3	222
2001		Allegheny	0010	2726	0020	0528	Pucala River Rd	3	81	27	27		81	3	222

Geohazard Inventory | REF Drop Down | REF Functional Class | REF ADT

GEOHAZARD RATING CRITERIA

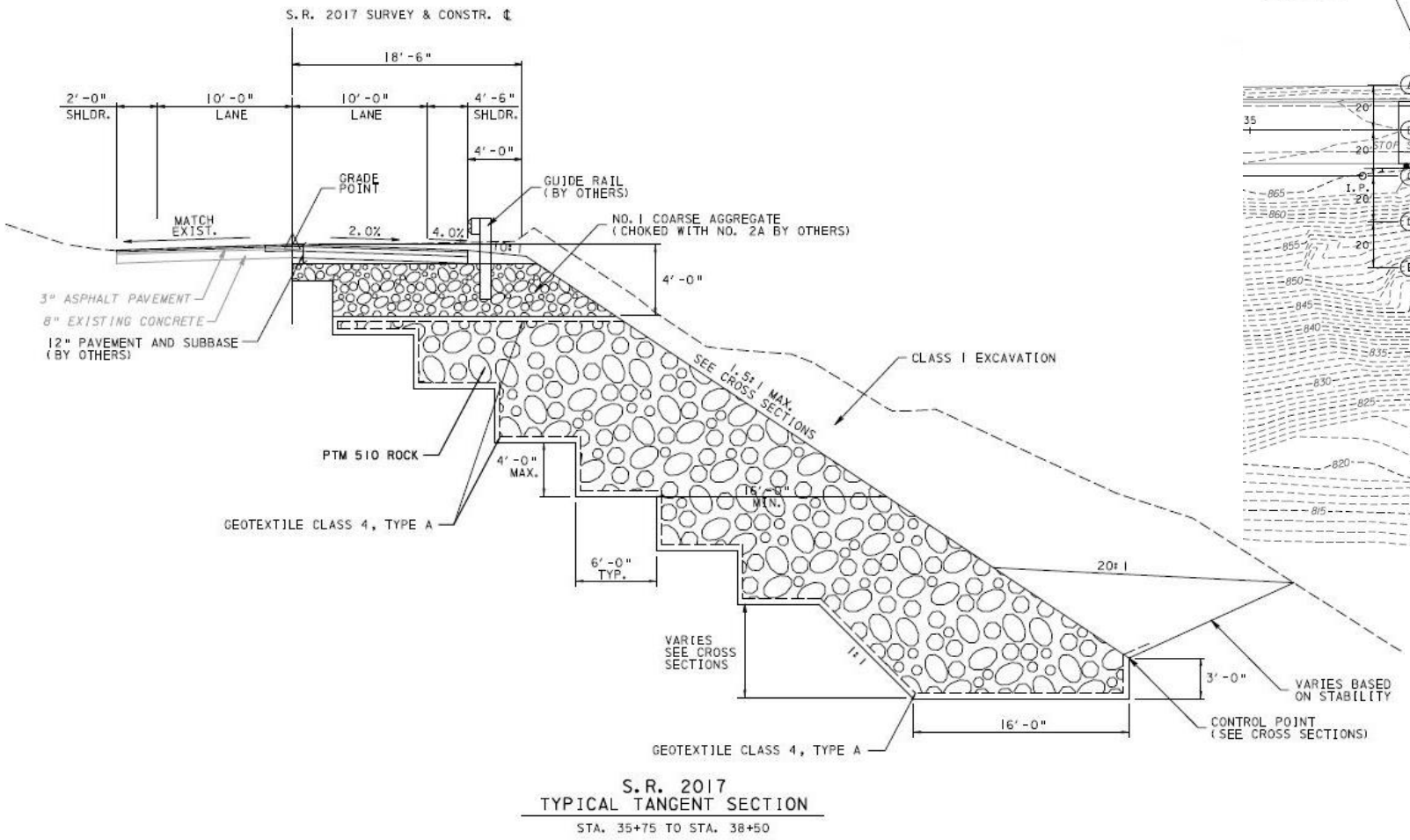
ADT		TYPE_OF_GEOHAZARD		LENGTH_OF_ROADWAY_IMPACTED		HEIGHT_OF_FAILURE_RELATIVE_TO_ROADWAY	
THRESHOLD	VALUE	THRESHOLD	VALUE	THRESHOLD	VALUE	THRESHOLD	VALUE
1	3	Creep Failure	27	1	3	1	3
1000	9	Landslide (Redbeds/Colluvium)	81	99	9	10	9
5000	27	Other		249	27	50	27
10000	81	Pipe Outlet Erosion	9	500	81	100	81
		Rockfall with Drop Zone	9				
		Rockfall with Fence	3				
		Rockfall with Jersey Barrier	27				
		Rockfall with No Protection	81				
		Sheet Flow	3				
		Stream Scour	27				
		Subsidence	27				

DEPTH_TO_VOID_MINED_SEAM		ROADWAY_LIMITS_IMPACT		SURROUNDING_AREA_IMPACT	
THRESHOLD	VALUE	THRESHOLD	VALUE	THRESHOLD	VALUE
1	81	Both Lanes	243	Frequent Maintenance	9
50	27	Debris in Both Lanes	243	Maintenance Costs of Closure	81
100	3	Debris in Drop Zone	3	Other	0
		Debris in Lane	81	Periodic Maintenance	9
		Debris in Shoulder	9	Political Implications	81
		Dip in Road	27	Rural Road with Low ADT	3
		Into Lane	81	School, EMS, Police, and/or Fire Impacts	27
		Lane Distress	9		
		Lane Undermined	27		
		One Lane and Shoulder	81		
		Other			
		Shoulder Backup Failing	3		
		Shoulder Failing	9		
		To White Line	27		

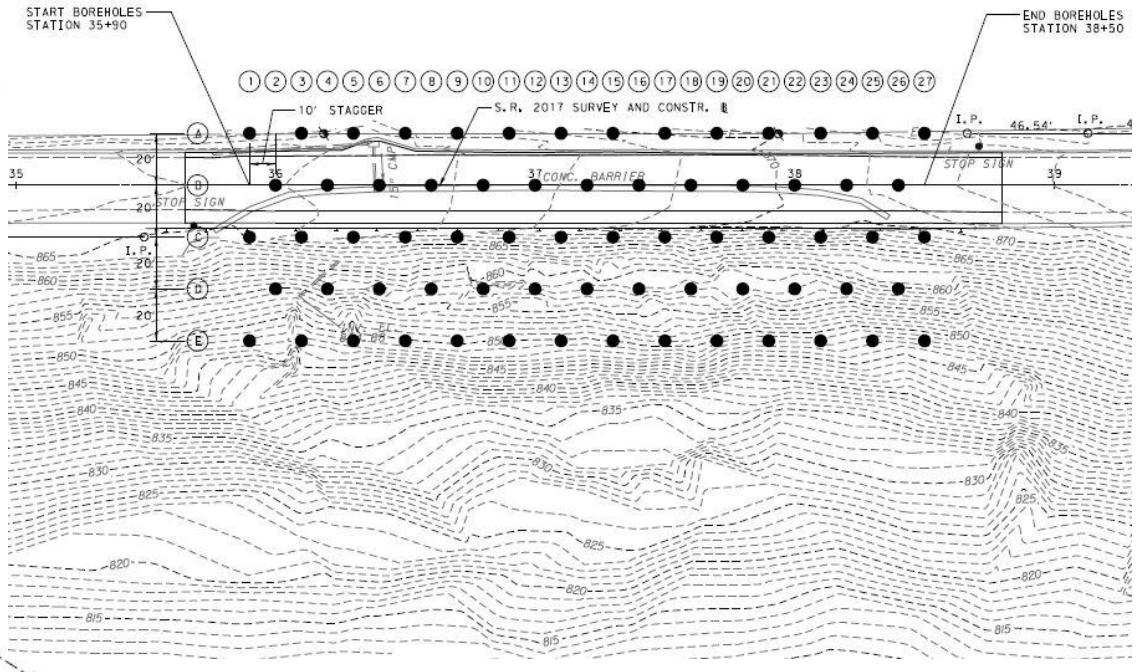
Revised Rating Ranges
Low Priority
18 - 70
Medium Priority
71 - 149
High Priority
150 - 648

SR 2017-A07 BLYTHEDALE ROAD
(ROCK EMBANKMENT & MINE GROUTING TREATMENT)

SR 2017-A07 BLYTHEDALE ROAD
(ROCK EMBANKMENT & MINE GROUTING TREATMENT)



S.R. 2017
TYPICAL TANGENT SECTION
STA. 35+75 TO STA. 38+50



SR 2017-A07 BLYTHEDALE ROAD
(ROCK EMBANKMENT & MINE GROUTING TREATMENT)

SR 4070-A18 WILDWOOD ROAD - SOIL NAILS

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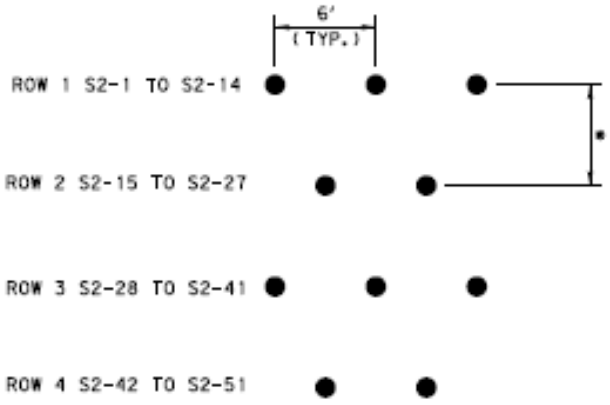
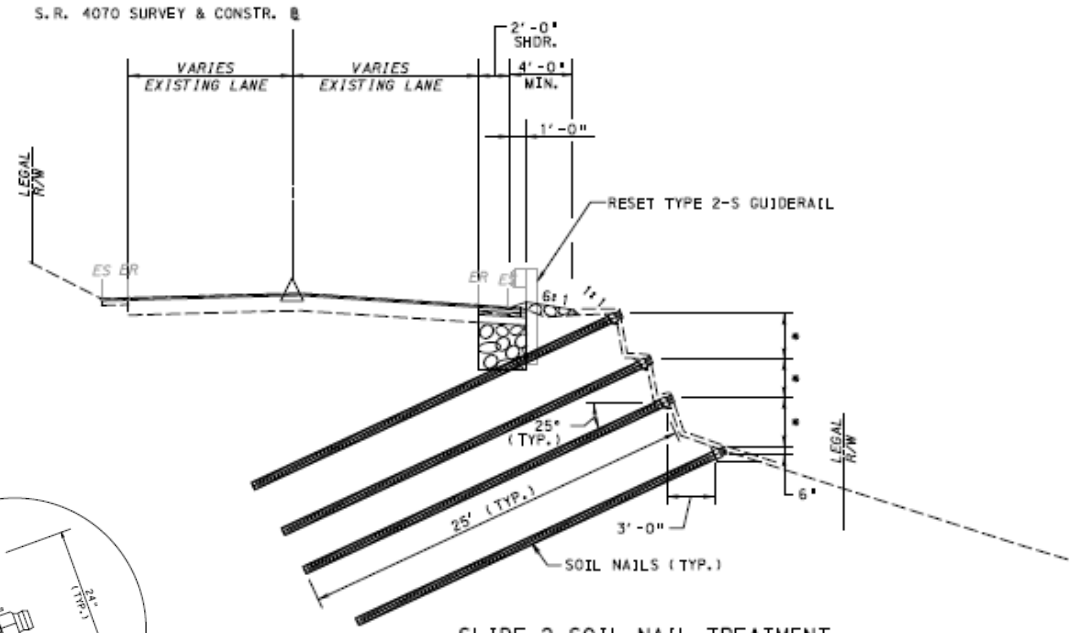
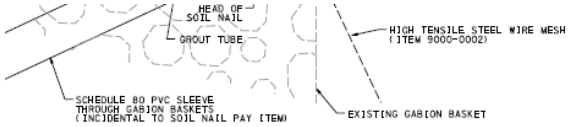


FOR SOIL NAIL COORDINATES, SEE SHEET 12.



SLIDE 2 SOIL NAIL TREATMENT
TYPICAL SECTION

NTS
STA. 120+98.00 TO STA. 121+80.00



NAIL HEAD IN GABION DETAIL
NTS

TYPICAL SOIL NAIL DETAIL
NTS

NOTES

1. HIGH-TENSILE STEEL WIRE MESH REINFORCEMENT SYSTEM INCLUDING STEEL WIRE MESH REINFORCEMENT, SPIKE PLATES, CONNECTION CLIPS, AND OTHER FACING HARDWARE PER MANUFACTURER.
2. SOIL NAILS ANGLE FROM HORIZONTAL VARIES (SEE DETAIL SHEETS), TOTAL LENGTH 25.0 FEET.

SR 4070-A18 WILDWOOD ROAD - SOIL NAILS

SR 3054-A07 EWING ROAD GRS
(GEOSYNTHETIC REINFORCED SLOPE)

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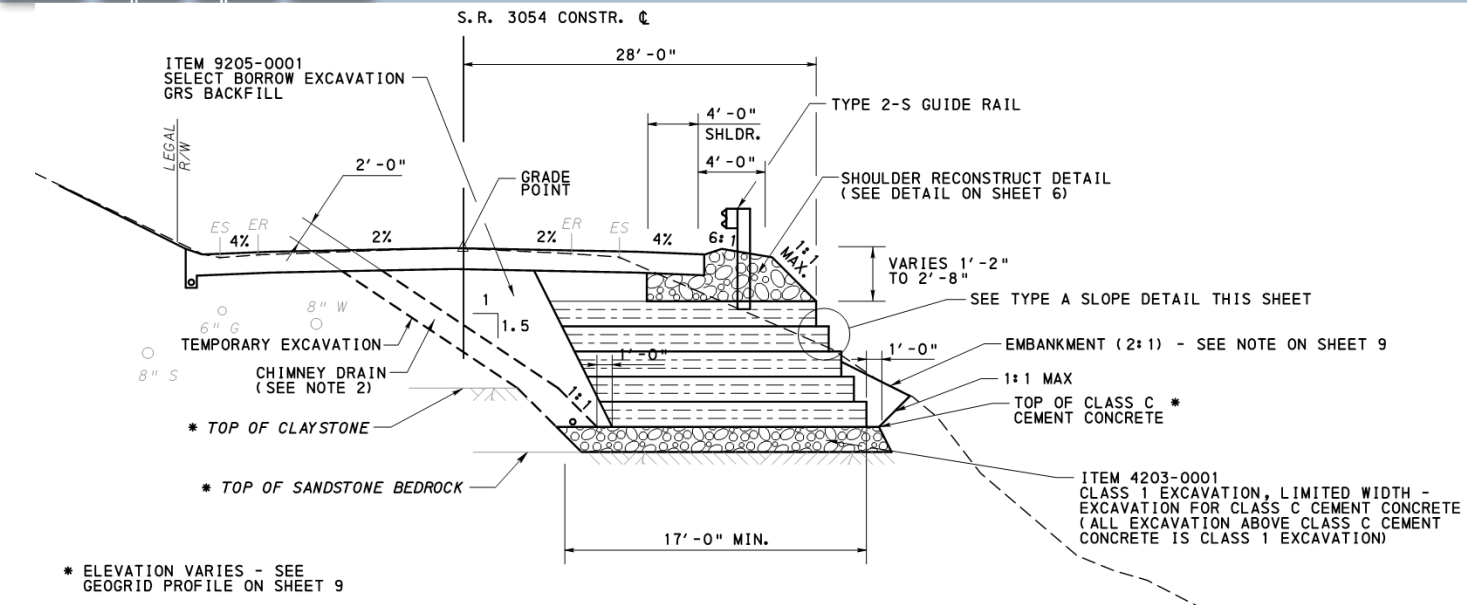

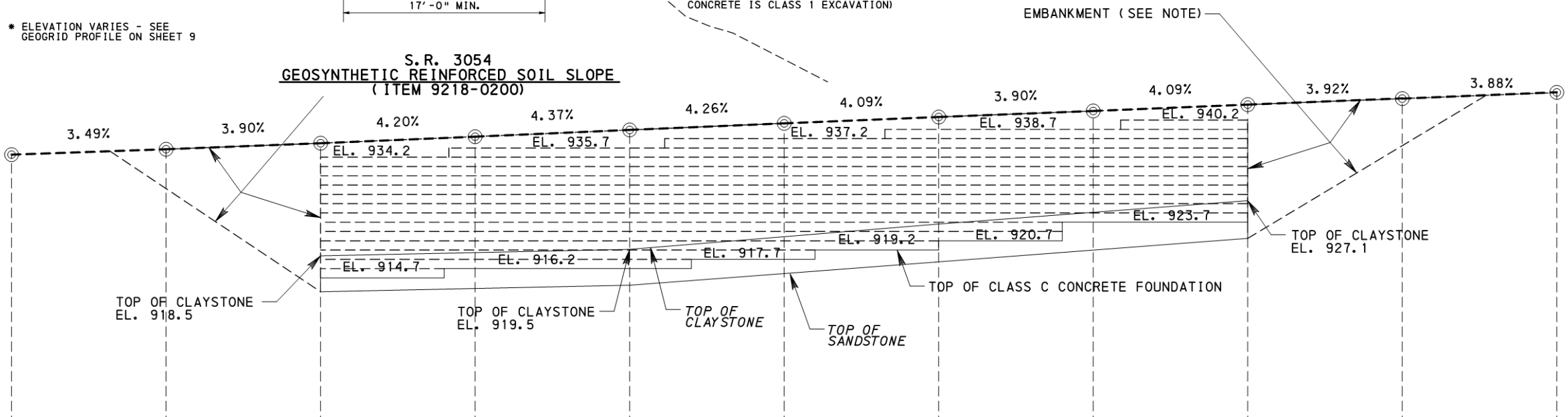

SR 3054-A07 EWING ROAD GRS
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SR 4063-A05 PEARCE MILL ROAD – CAISSON/GEOFOAM TREATMENT

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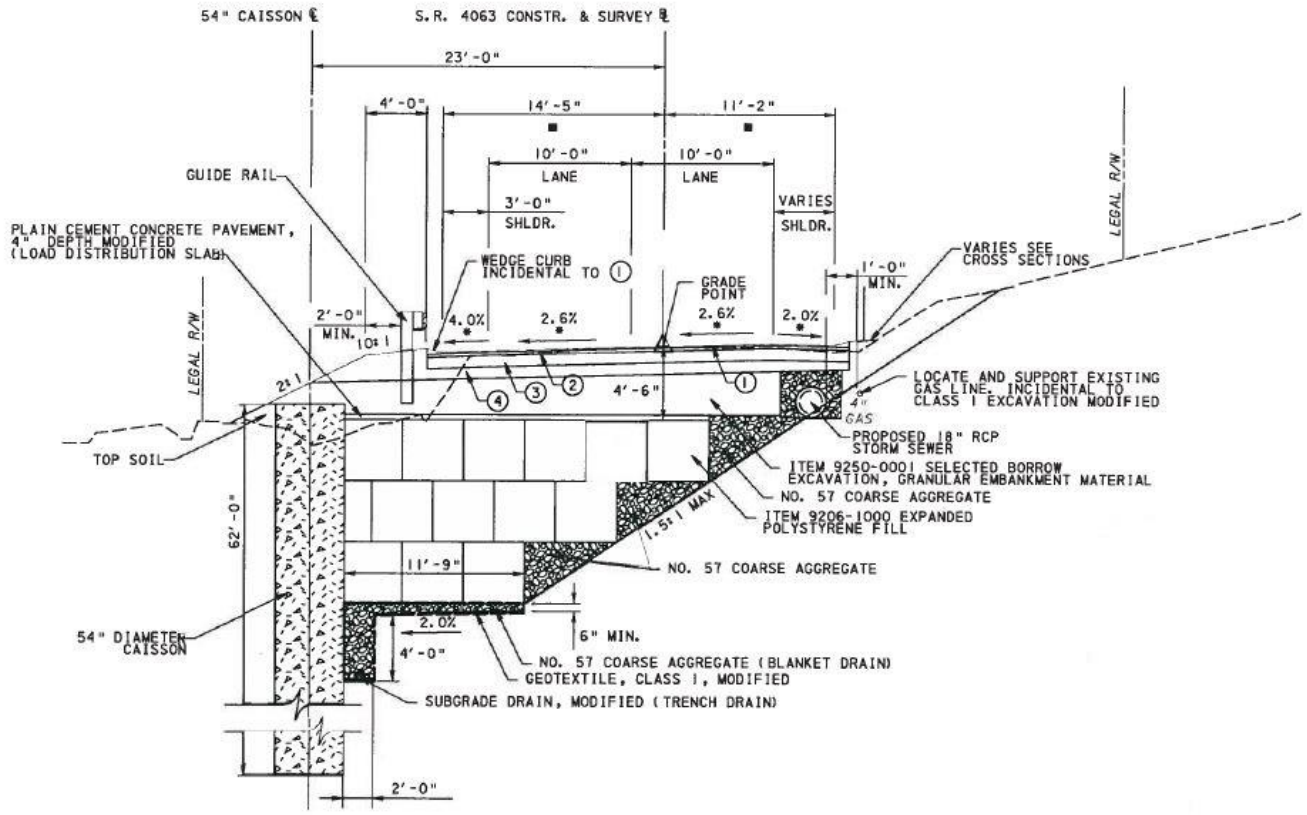

S.R. 4063 TYPICAL SECTION

STA. 41+50.00 TO STA. 46+00.00

SR 4063-A05 PEARCE MILL ROAD – CAISSON/GEOFOAM TREATMENT

SR 4063-A05 PEARCE MILL ROAD – GEOFOAM INSTALLATION

SR 2001-A18 BUNOLA RIVER ROAD WALL
(CANTILEVER AND ANCHORED SOLDIER PILE & LAGGING WALL)

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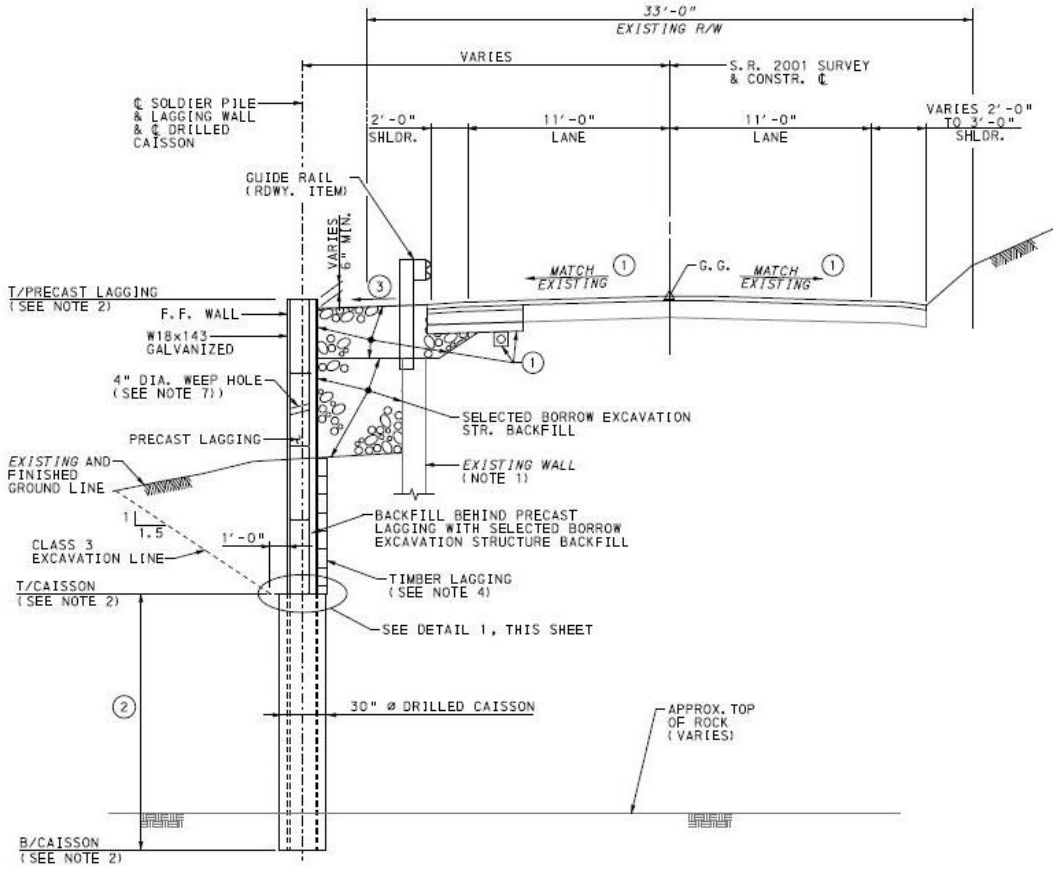
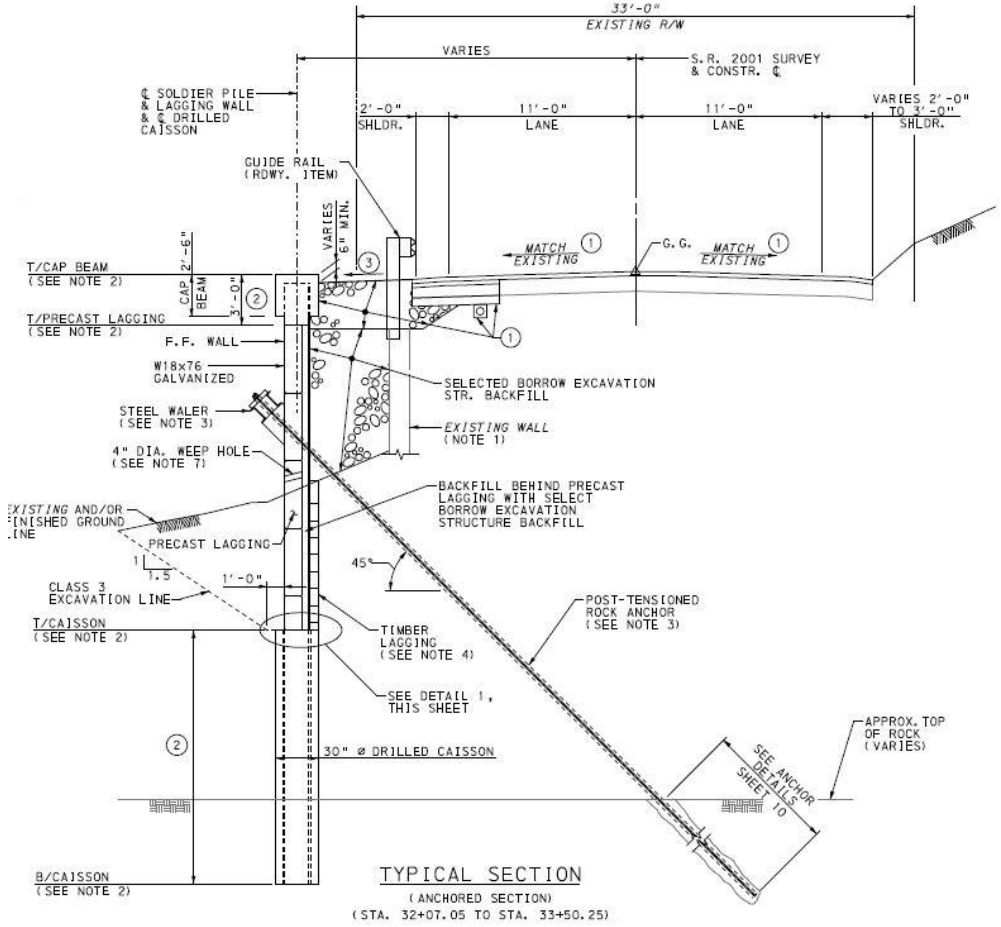
(CANTILEVER AND ANCHORED SOLDIER PILE & LAGGING WALL)



TYPICAL SECTION
(CANTILEVER SECTION)
(STA. 28+44.75 TO STA. 32+07.05)



TYPICAL SECTION
(ANCHORED SECTION)
(STA. 32+07.05 TO STA. 33+50.25)

pennsylvania DEPARTMENT OF TRANSPORTATION

U.S. Department of Transportation
Federal Highway Administration

SR 2001-A18 BUNOLA RIVER ROAD WALL
(CANTILEVER AND ANCHORED SOLDIER PILE & LAGGING WALL)

Questions/Feedback