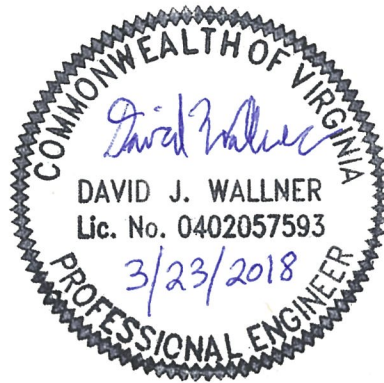


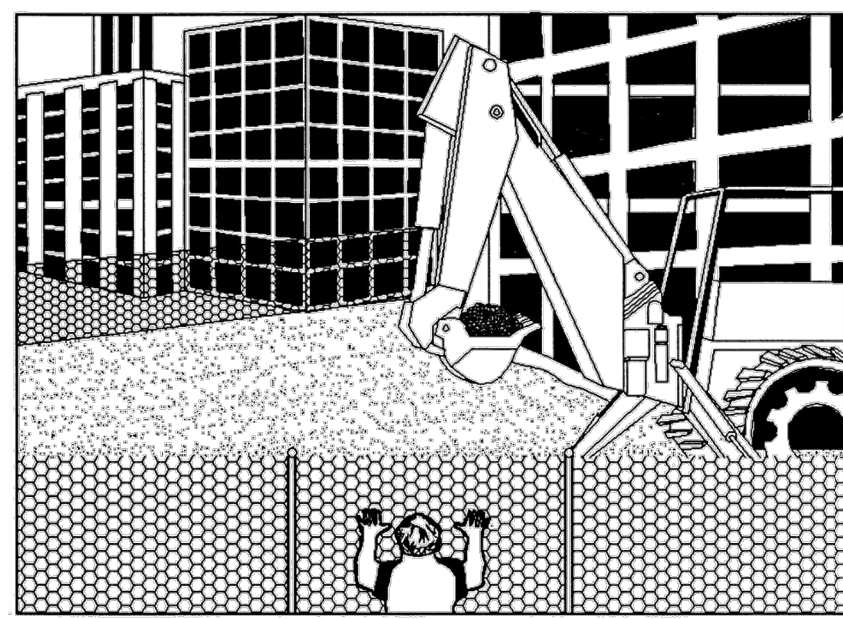
By virtue of this seal and signature, all supporting documents included in this package are accurate and support the design presented herein.



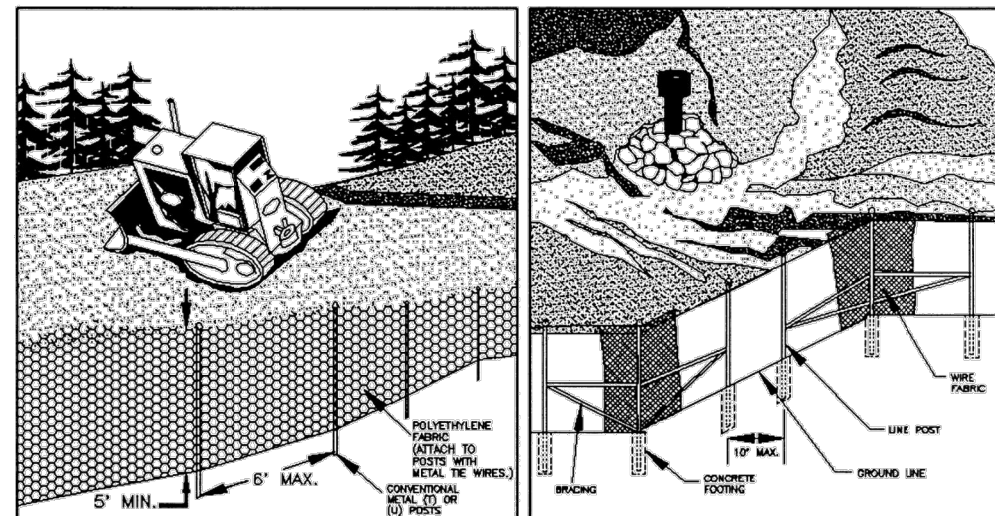
1992

3.01

SAFETY FENCE



PERSPECTIVE VIEW



PERSPECTIVE VIEW
PLASTIC FENCE

PERSPECTIVE VIEW
METAL FENCE

Source: Adapted from Conwed Plastics and
VDOT Road and Bridge Standards

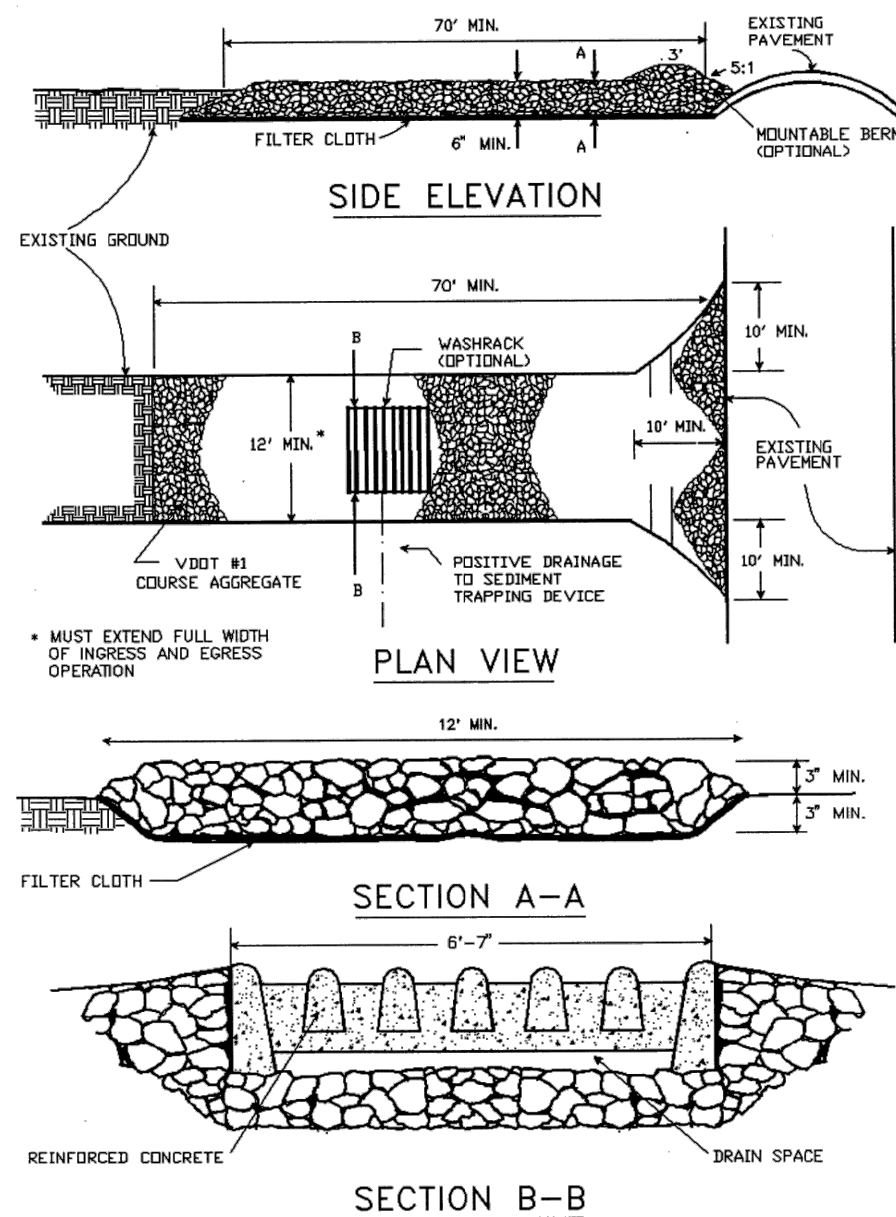
Plate 3.01-1

SAFETY FENCE
TAKEN FROM VADEQ 1992 MANUAL

1992

3.02

STONE CONSTRUCTION ENTRANCE



Source: Adapted from 1983 Maryland Standards for Soil
Erosion and Sediment Control, and Va. DSWC

Plate 3.02-1

STONE CONSTRUCTION ENTRANCE
TAKEN FROM VADEQ 1992 MANUAL

WASH RACK SHALL BE 20 FEET (MIN.) WIDE OR TOTAL WIDTH OF ACCESS.

WASH RACK SHALL BE DESIGNED AND CONSTRUCTED TO ACCOMMODATE
ANTICIPATED CONSTRUCTION VEHICULAR TRAFFIC.

A WATER SUPPLY SHALL BE MADE AVAILABLE TO WASH THE WHEELS OF ALL
VEHICLES EXITING THE SITE.

MAINTENANCE: ROCK CONSTRUCTION ENTRANCE THICKNESS SHALL BE CONSTANTLY
MAINTAINED TO THE SPECIFIED DIMENSIONS BY ADDING ROCK. A STOCKPILE OF ROCK
MATERIAL SHALL BE MAINTAINED ON SITE FOR THIS PURPOSE. DRAIN SPACE UNDER
WASH RACK SHALL BE KEPT OPEN AT ALL TIMES. DAMAGE TO THE WASH RACK SHALL
BE REPAIRED PRIOR TO FURTHER USE OF THE RACK. ALL SEDIMENT DEPOSITED ON
ROADWAYS SHALL BE REMOVED AND RETURNED TO THE CONSTRUCTION SITE
IMMEDIATELY. WASHING THE ROADWAY OR SWEEPING THE DEPOSITS INTO ROADWAY
DITCHES, SEWERS, CULVERTS, OR OTHER DRAINAGE COURSES IS NOT ACCEPTABLE.

AT A MINIMUM, ROCK CONSTRUCTION ENTRANCES WITH WASH RACKS SHOULD BE
CONSTRUCTED TO THE LENGTH, WIDTH, AND THICKNESS DIMENSIONS SHOWN ON
STANDARD CONSTRUCTION DETAIL #3-2. A METAL WASH RACK OR LIVESTOCK GRATE
IS AN ACCEPTABLE ALTERNATIVE TO THE REINFORCED CONCRETE ONE SHOWN IN THE
STANDARD DETAIL. APPROACHES TO THE WASH RACK SHOULD BE LINED WITH
AASHTO #1 AT A MINIMUM OF 25' ON BOTH SIDES. THE WASH RACK SHOULD
DISCHARGE TO A SEDIMENT REMOVAL FACILITY, SUCH AS A CHANNEL LEADING TO A
SEDIMENT REMOVAL DEVICE (E.G. A SEDIMENT TRAP OR SEDIMENT BASIN). ROCK
CONSTRUCTION ENTRANCES WITH WASH RACKS SHOULD BE MAINTAINED TO THE
SPECIFIED DIMENSIONS BY ADDING ROCK WHEN NECESSARY AT THE END OF EACH
WORKDAY. A STOCKPILE OF ROCK MATERIAL SHOULD BE MAINTAINED ON SITE FOR
THIS PURPOSE.

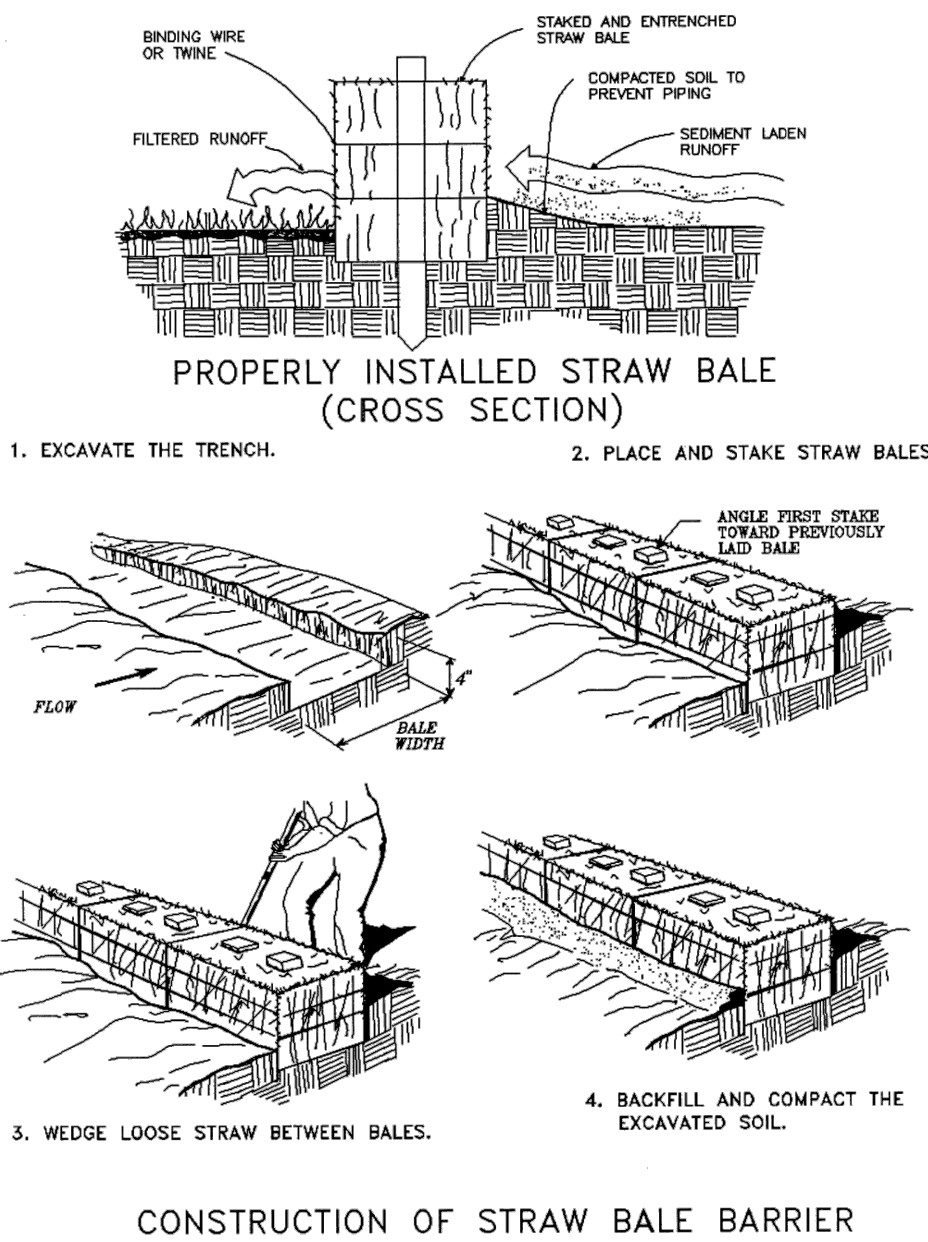
SEDIMENT DEPOSITED ON PAVED ROADWAYS SHOULD BE REMOVED AND RETURNED
TO THE CONSTRUCTION SITE.

NOTE: WASHING THE ROADWAY OR SWEEPING THE DEPOSITS INTO ROADWAY
DITCHES, SEWERS, CULVERTS, OR OTHER DRAINAGE COURSES IS NOT ACCEPTABLE.
DAMAGED WASH RACKS SHOULD BE REPAIRED AS NECESSARY TO MAINTAIN THEIR
EFFECTIVENESS.

1992

3.04

STRAW BALE BARRIER



Source: Va. DSWC

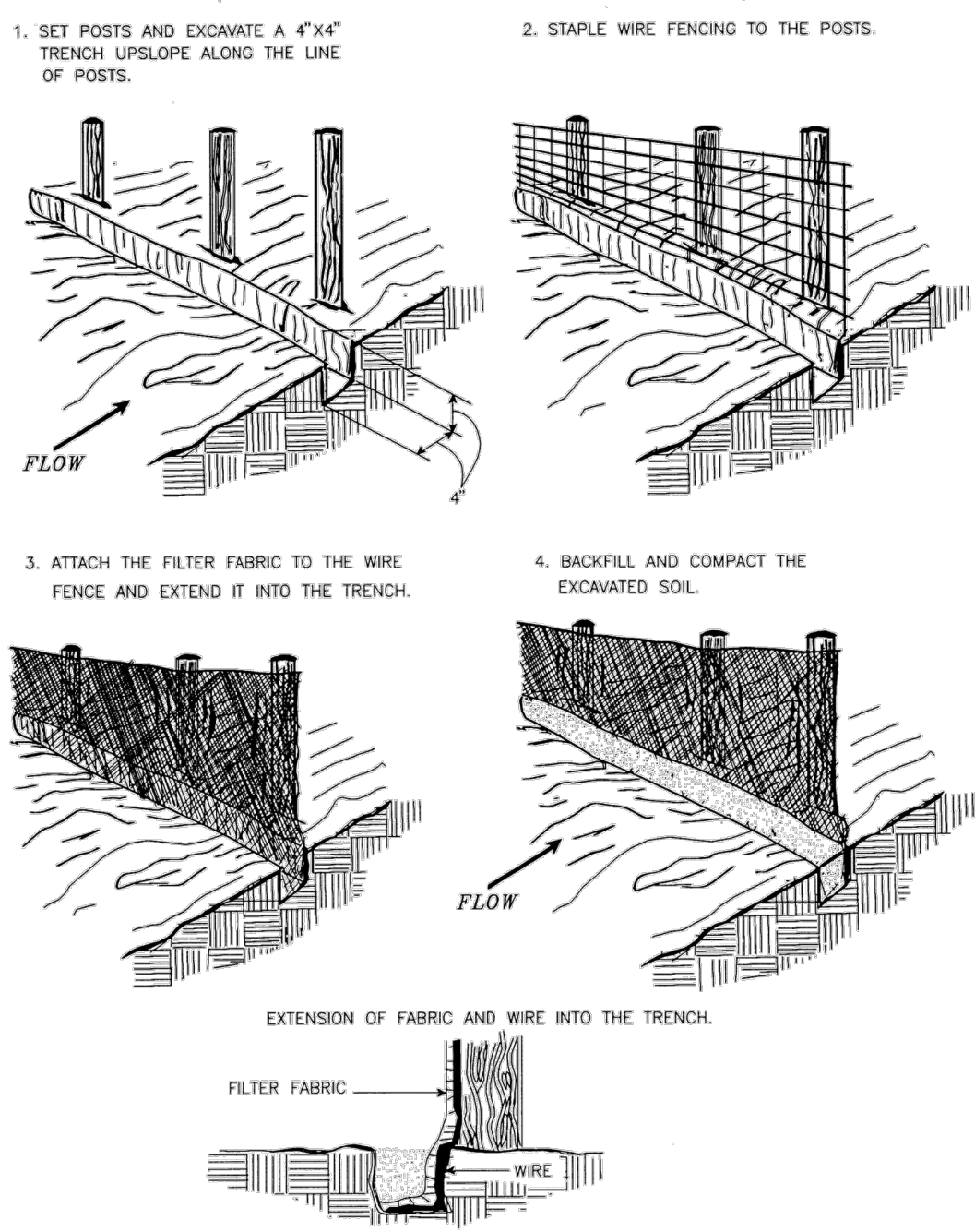
Plate 3.04-1

STRAW BALE BARRIER
TAKEN FROM VADEQ 1992 MANUAL

1992

3.05

CONSTRUCTION OF A SILT FENCE (WITH WIRE SUPPORT)



Source: Adapted from Installation of Straw and Fabric Filter
Barriers for Sediment Control, Sherwood and Wyant

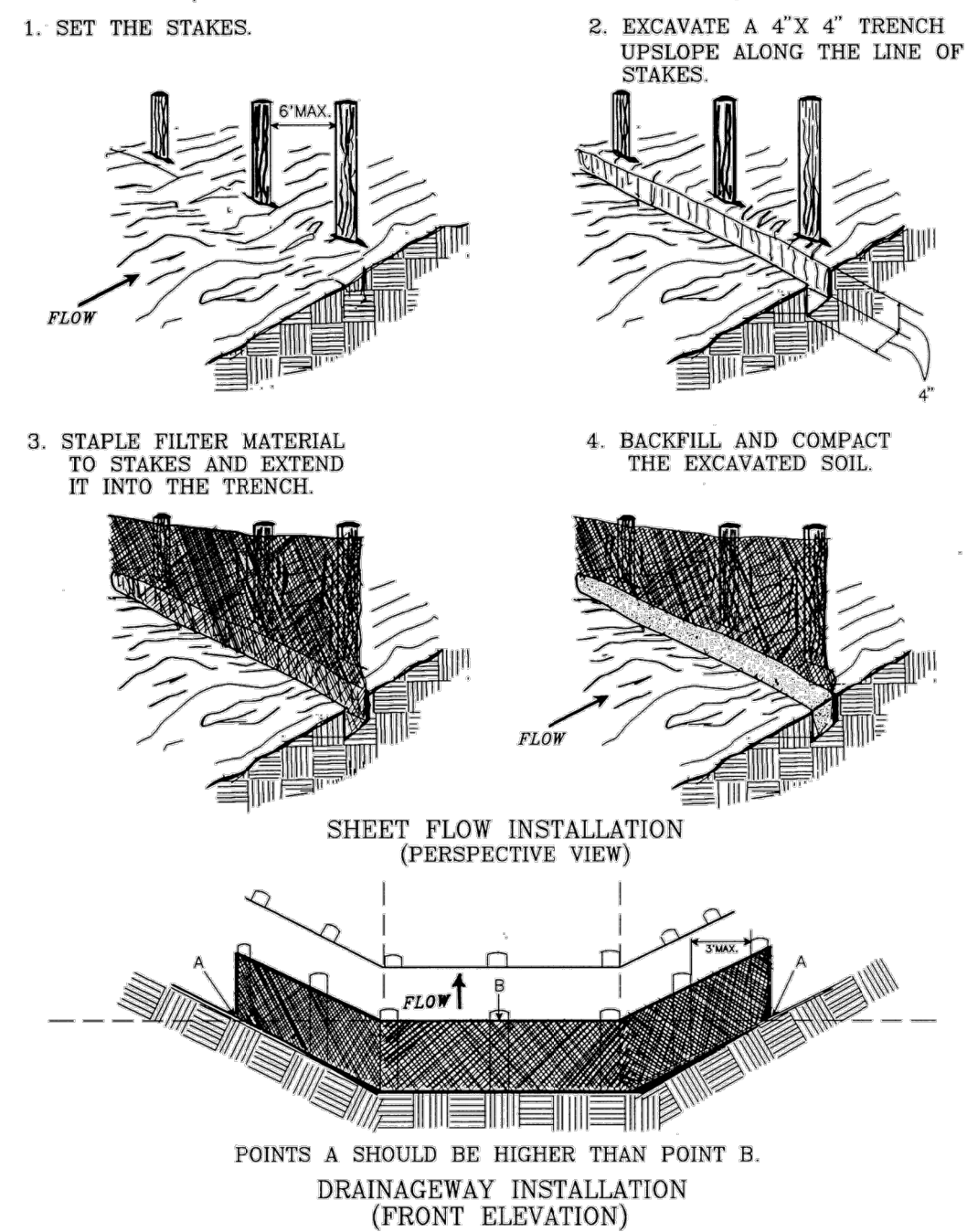
Plate 3.05-1

CONSTRUCTION OF SILT FENCE
(WITH WIRE SUPPORT)
TAKEN FROM VADEQ 1992 MANUAL

1992

3.05

CONSTRUCTION OF A SILT FENCE (WITHOUT WIRE SUPPORT)



Source: Adapted from Installation of Straw and Fabric Filter
Barriers for Sediment Control, Sherwood and Wyant

Plate 3.05-2

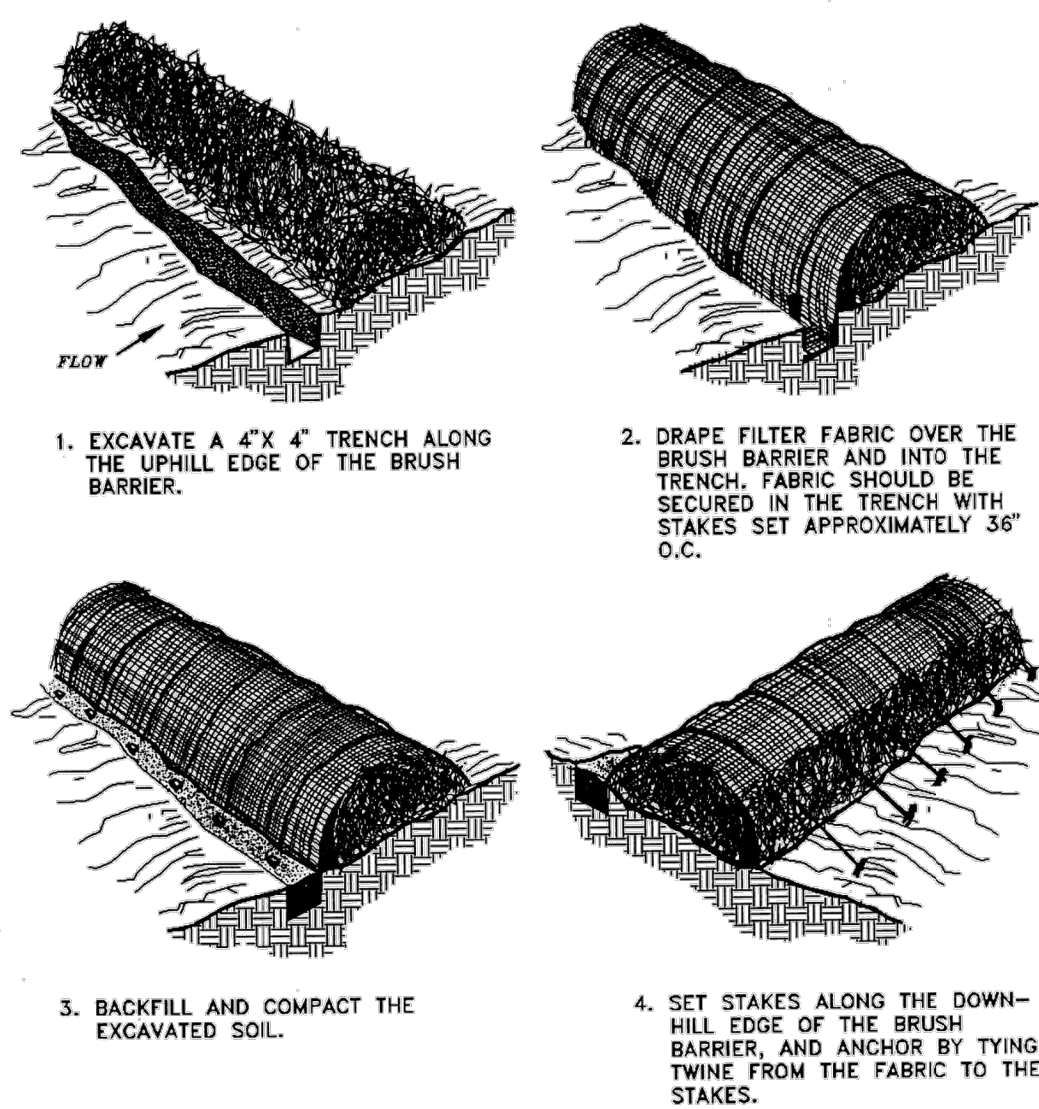
CONSTRUCTION OF SILT FENCE
(WITHOUT WIRE SUPPORT)
TAKEN FROM VADEQ 1992 MANUAL

1992

3.06

CONSTRUCTION OF A BRUSH BARRIER COVERED BY FILTER FABRIC

(TREE/RESIDUAL MATERIAL
WITH DIAMETER > 6")



Source: Va. DSWC

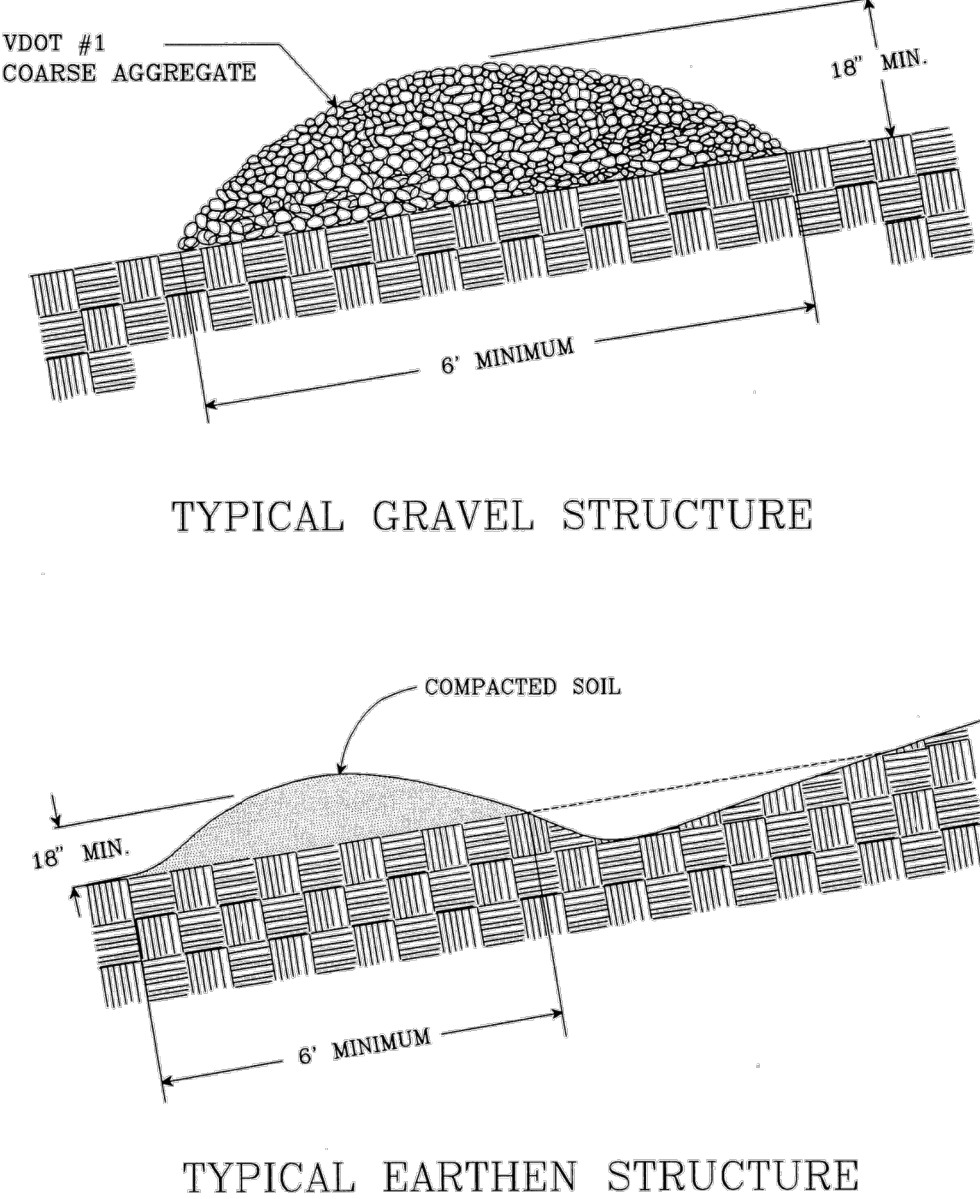
Plate 3.06-1

CONSTRUCTION OF A BRUSH BARRIER
TAKEN FROM VADEQ 1992 MANUAL

1992

3.11




TEMPORARY RIGHT-OF-WAY DIVERSIONS

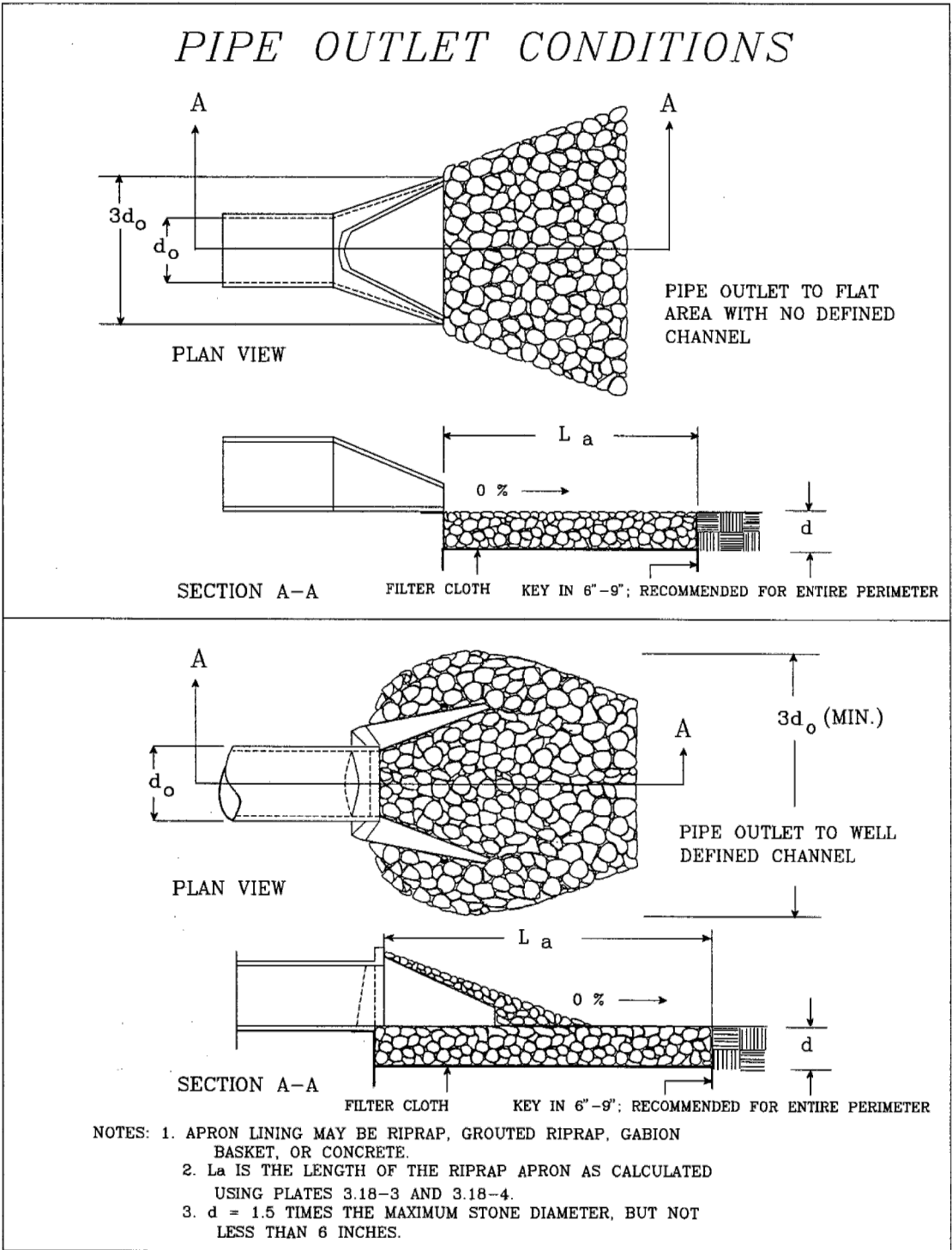


Source: Va. DSWC

Plate 3.11-1

TEMPORARY RIGHT-OF-WAY DIVERSION
DEVELOPED FROM VADEQ 1992 MANUAL

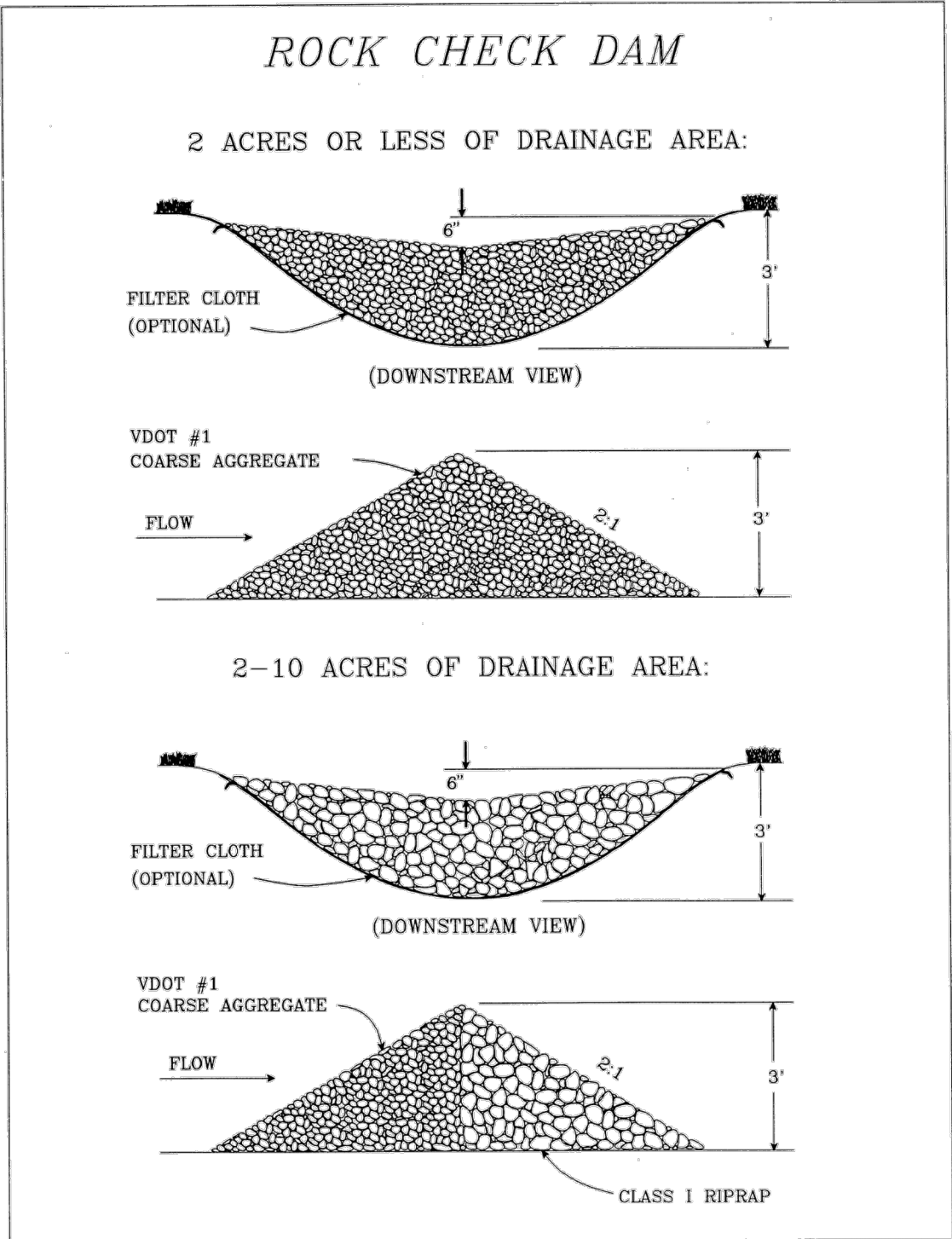
<div><div>Mountain Valley PIPELINE</div><div>EROSION AND SEDIMENT CONTROL PLANS</div><div>MOUNTAIN VALLEY PIPELINE PROJECT – H600 LINE</div></div>										<div><div>NO.</div><div>DATE:</div><div>DWN.:</div><div>CHD.:</div><div>APPD.:</div><div>DESCRIPTION:</div></div>										REVISIONS:									
7	01/31/18	KAL	RE	DW	ADDED DETAILS FOR ROADS AND PADS																								
6	01/28/18	KAL	RE	DW	ADDRESS VADEQ COMMENTS																								
5	01/08/18	KAL	RE	DW	ADDRESS VADEQ COMMENTS																								
4	11/28/17	KAL	RE	DW	ADDRESS VADEQ COMMENTS																								
3	11/01/17	KAL	RE	DW	ADDRESS VADEQ COMMENTS																								
2	08/18/17	KAL	RE	DW	ADDRESS VADEQ COMMENTS																								
<div><div>TETRA TECH</div><div>complex world CLEAR SOLUTIONS™</div><div>661 ANDERSEN DRIVE FOSTER PLAZA 7 PITTSBURGH, PA 15220</div></div>										<div><div>GENERAL DETAILS SET</div><div><div></div><div><div>DRAWN BY:</div><div>KAL</div></div><div><div>CHECKED BY:</div><div>HT</div></div><div><div>APPROVED BY:</div><div>RE</div></div><div><div>DATE:</div><div>11/28/2017</div></div><div><div>SCALE:</div><div>AS SHOWN</div></div><div><div>SHT. NO.</div><div>0.01</div><div>OF</div><div>0.23</div></div></div></div>										<div><div>REVISION</div><div>REVISION:</div></div>									
<div><div>MOUNTAIN VALLEY PIPELINE, LLC</div><div>555 SOUTHPOINTE BOULEVARD, SUITE 200</div><div>CANONSBURG, PA 15317</div></div>																													



Source: Va. DSWC

Plate 3.18-1

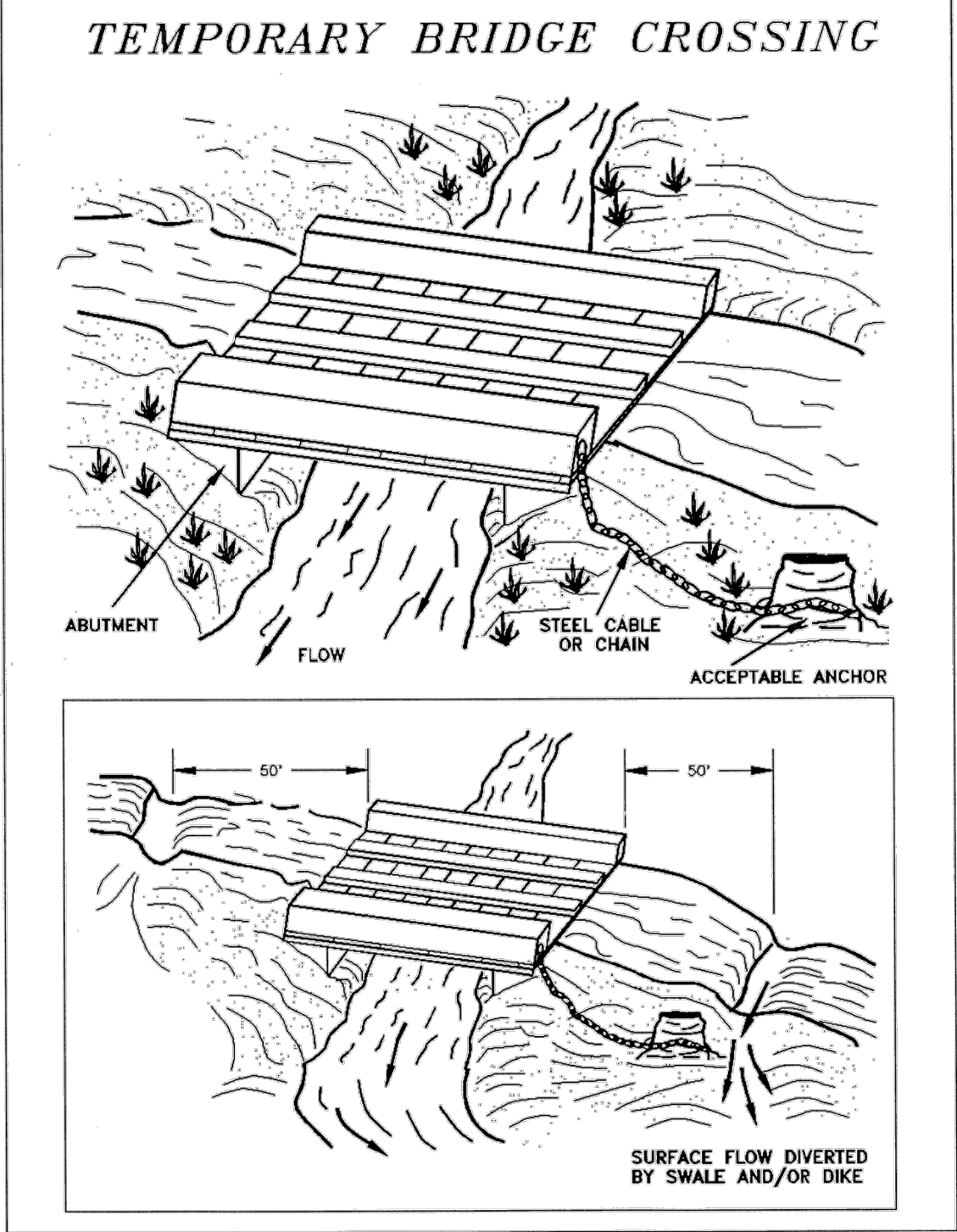
PIPE OUTLET CONDITIONS
TAKEN FROM VADEQ 1992 MANUAL



Source: Va. DSWC

Plate 3.20-1

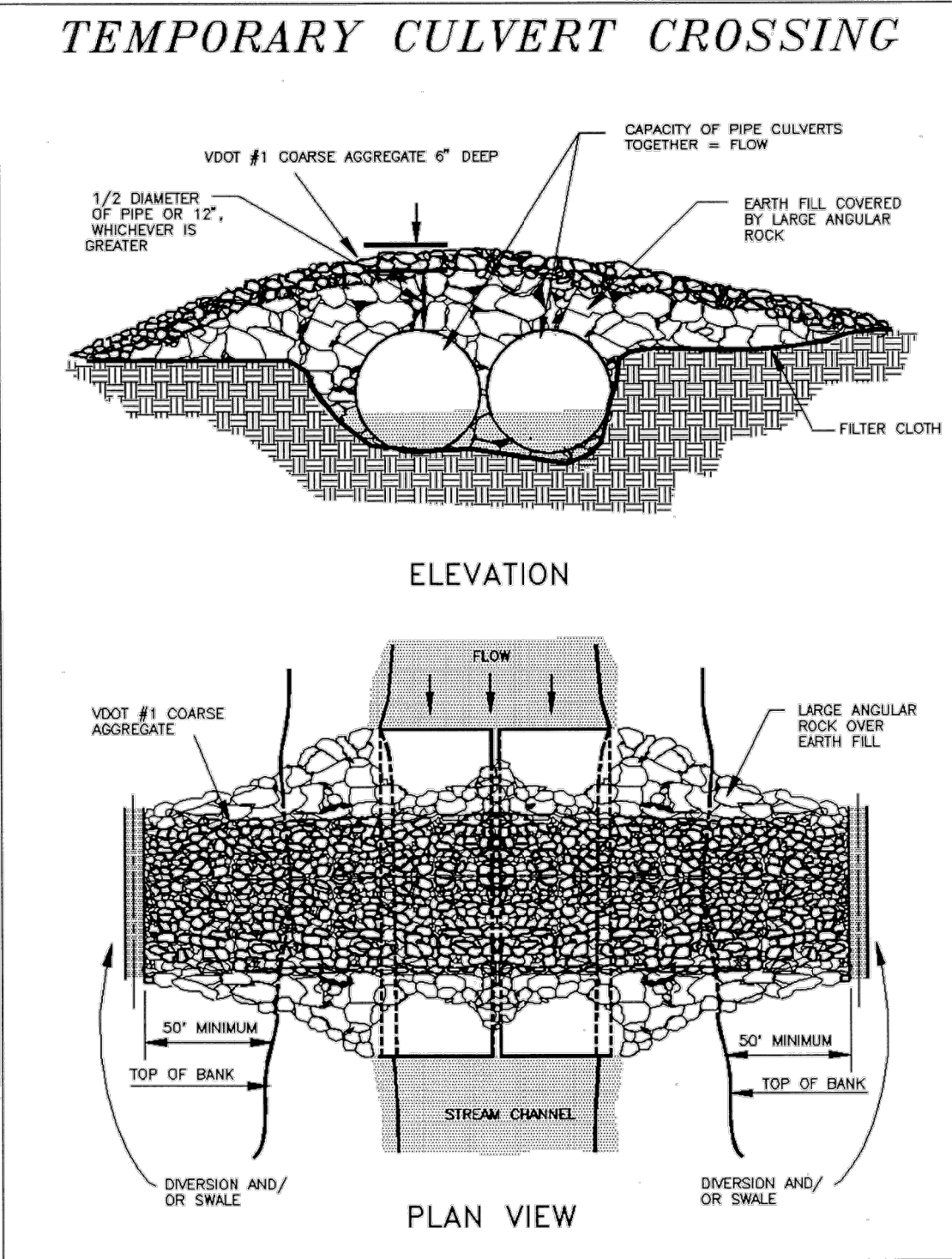
ROCK CHECK DAM
DEVELOPED FROM VADEQ 1992 MANUAL



Source: 1983 Maryland Standards and Specifications
for Soil Erosion and Sediment Control

Plate 3.24-1

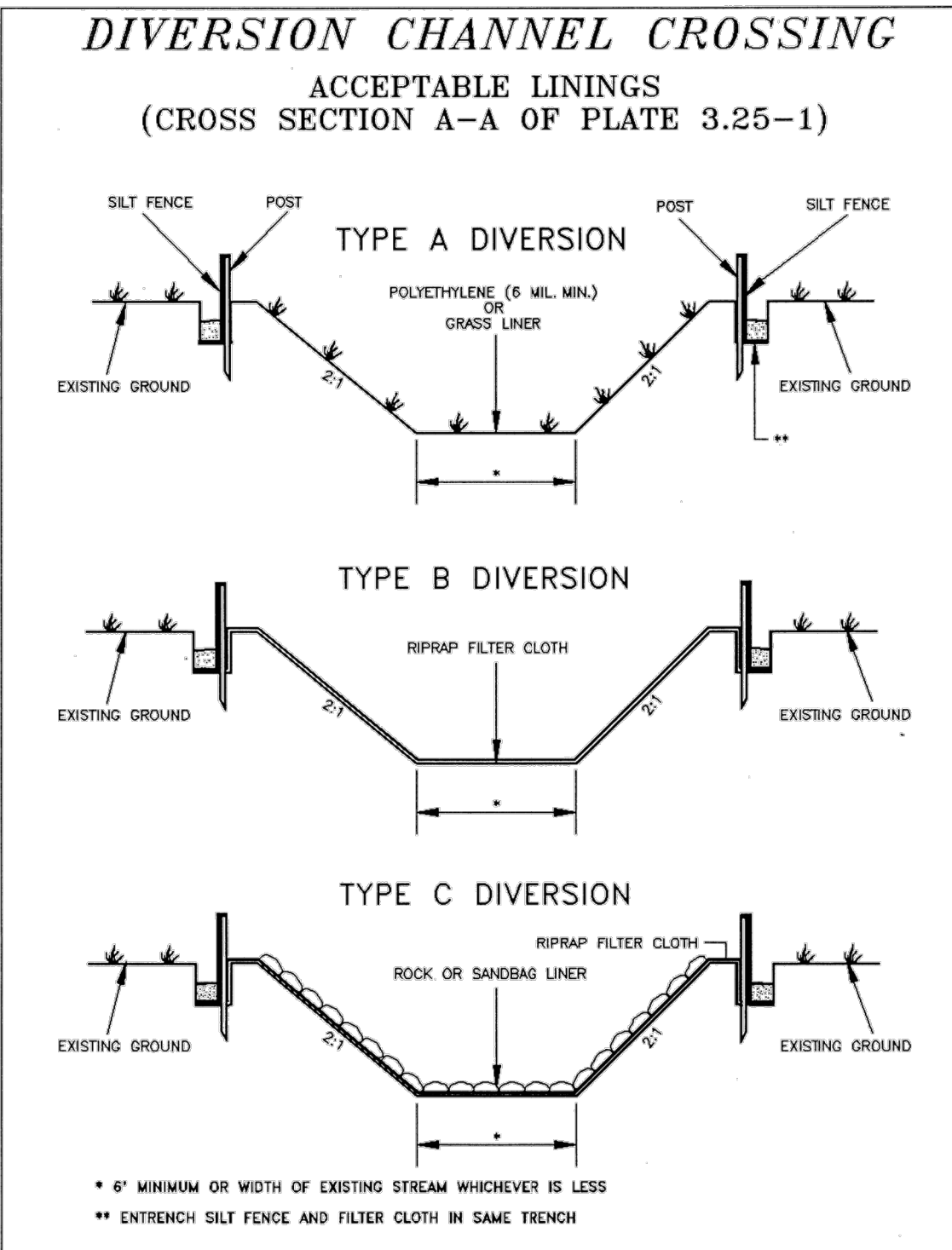
TEMPORARY BRIDGE CROSSING
DEVELOPED FROM VADEQ 1992 MANUAL



Source: Va. DSWC

Plate 3.24-2

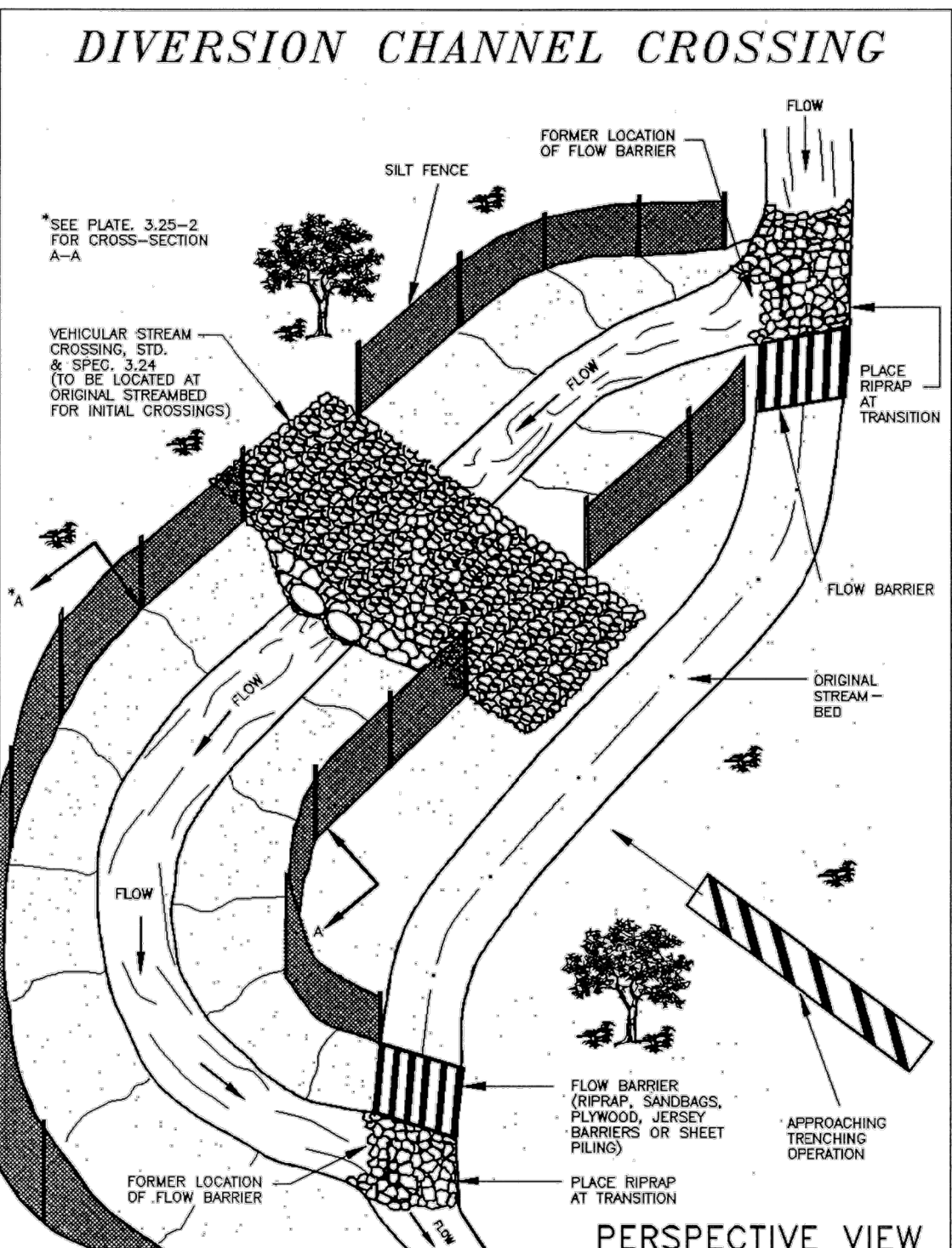
TEMPORARY CULVERT CROSSING
TAKEN FROM VADEQ 1992 MANUAL



Source: Adapted from VDOT Standard Sheets

Plate 3.25-2

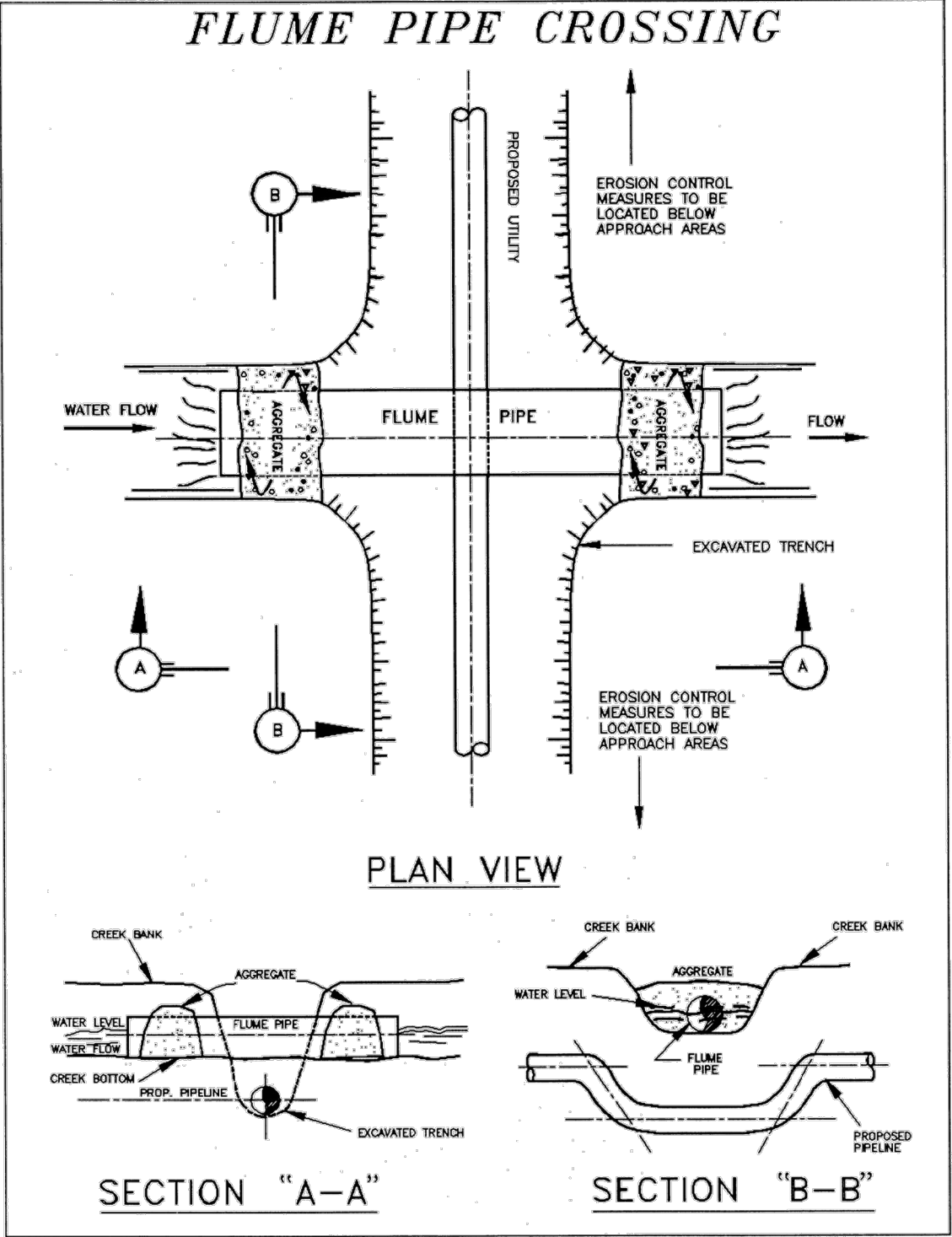
DIVERSION CHANNEL CROSSING
DEVELOPED FROM VADEQ 1992 MANUAL



Source: Va. DSWC

Plate 3.25-1

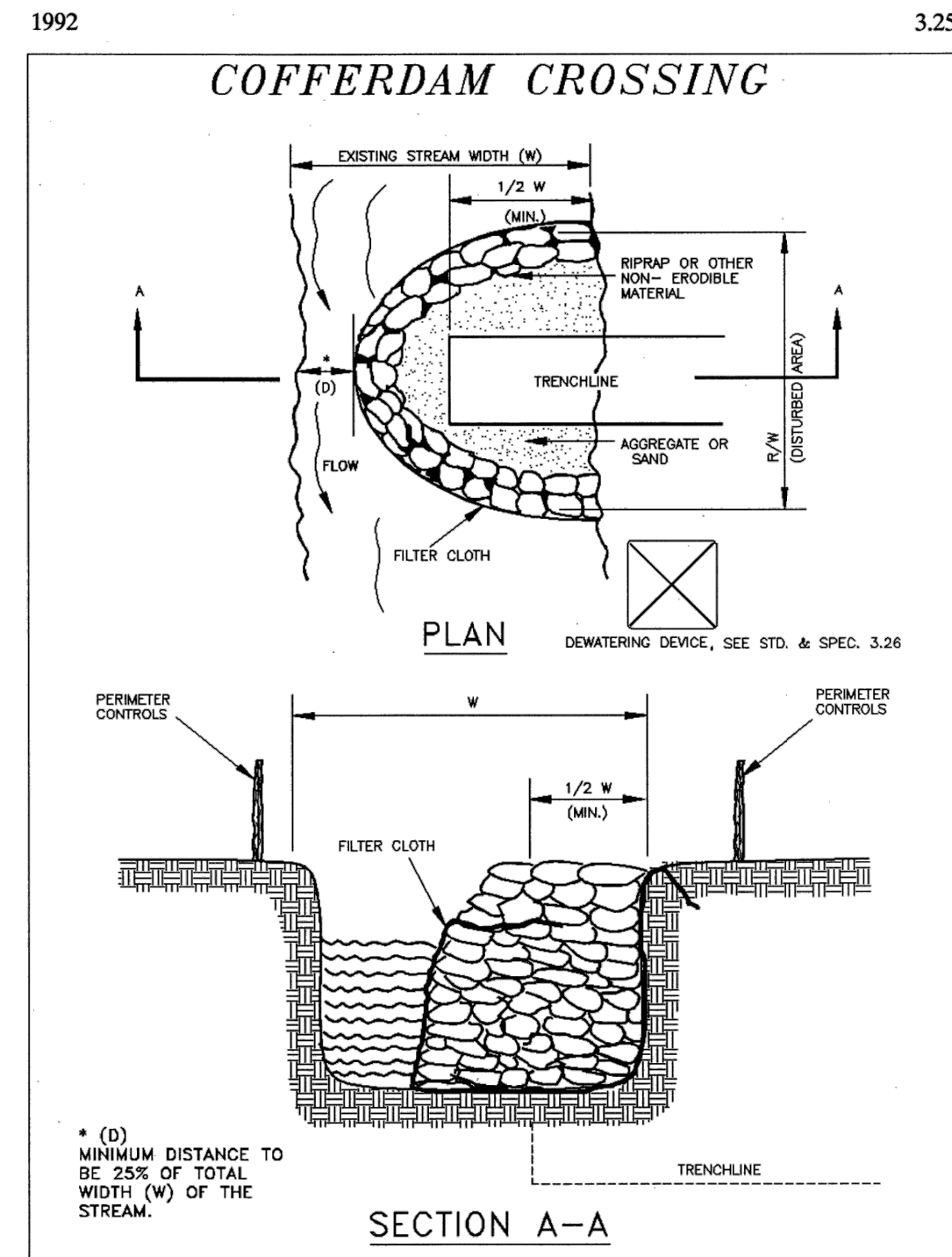
DIVERSION CHANNEL CROSSING
DEVELOPED FROM VADEQ 1992 MANUAL



Source: Va. DSWC

Plate 3.25-3

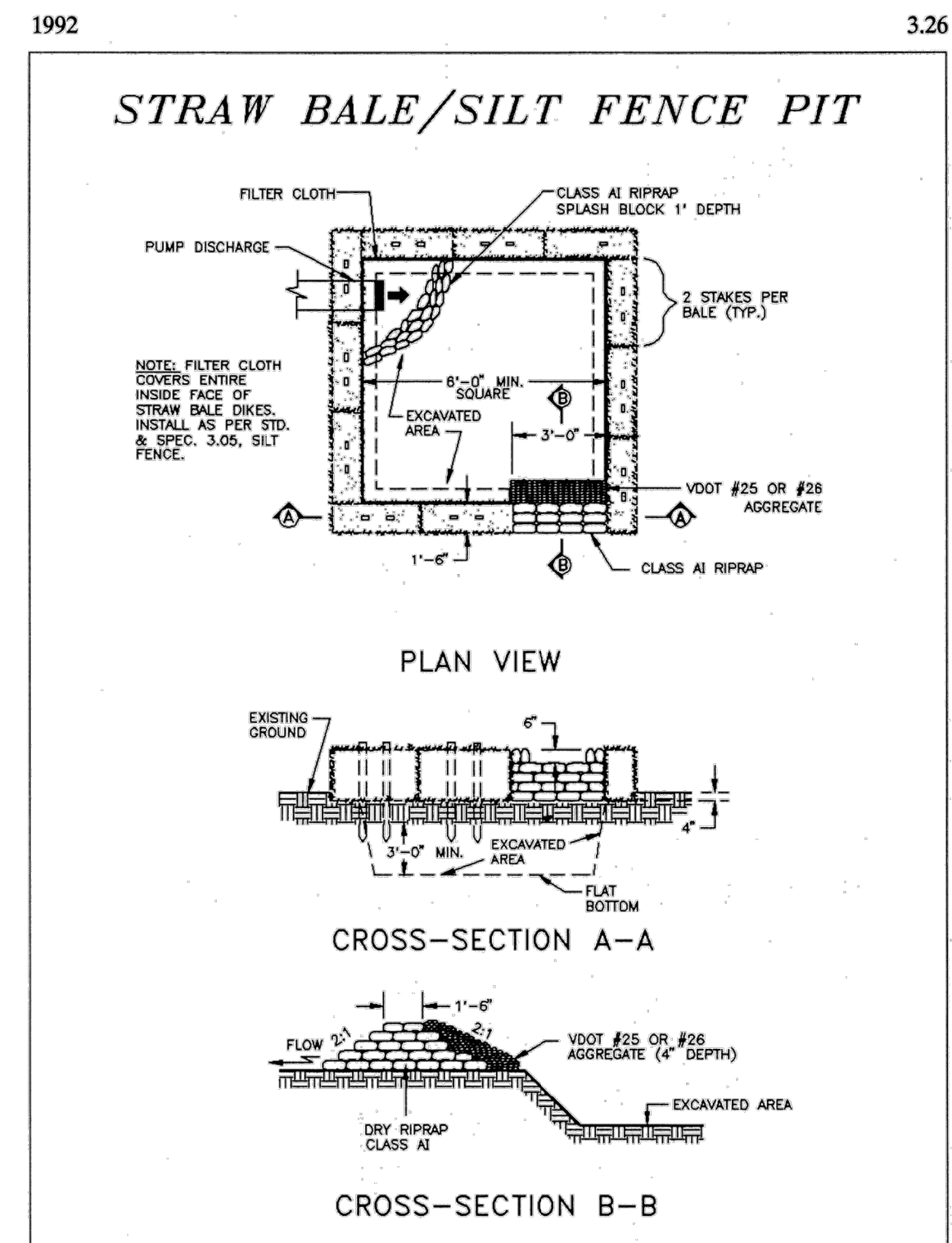
FLUME PIPE CROSSING
DEVELOPED FROM VADEQ 1992 MANUAL



Source: Va. DSWC

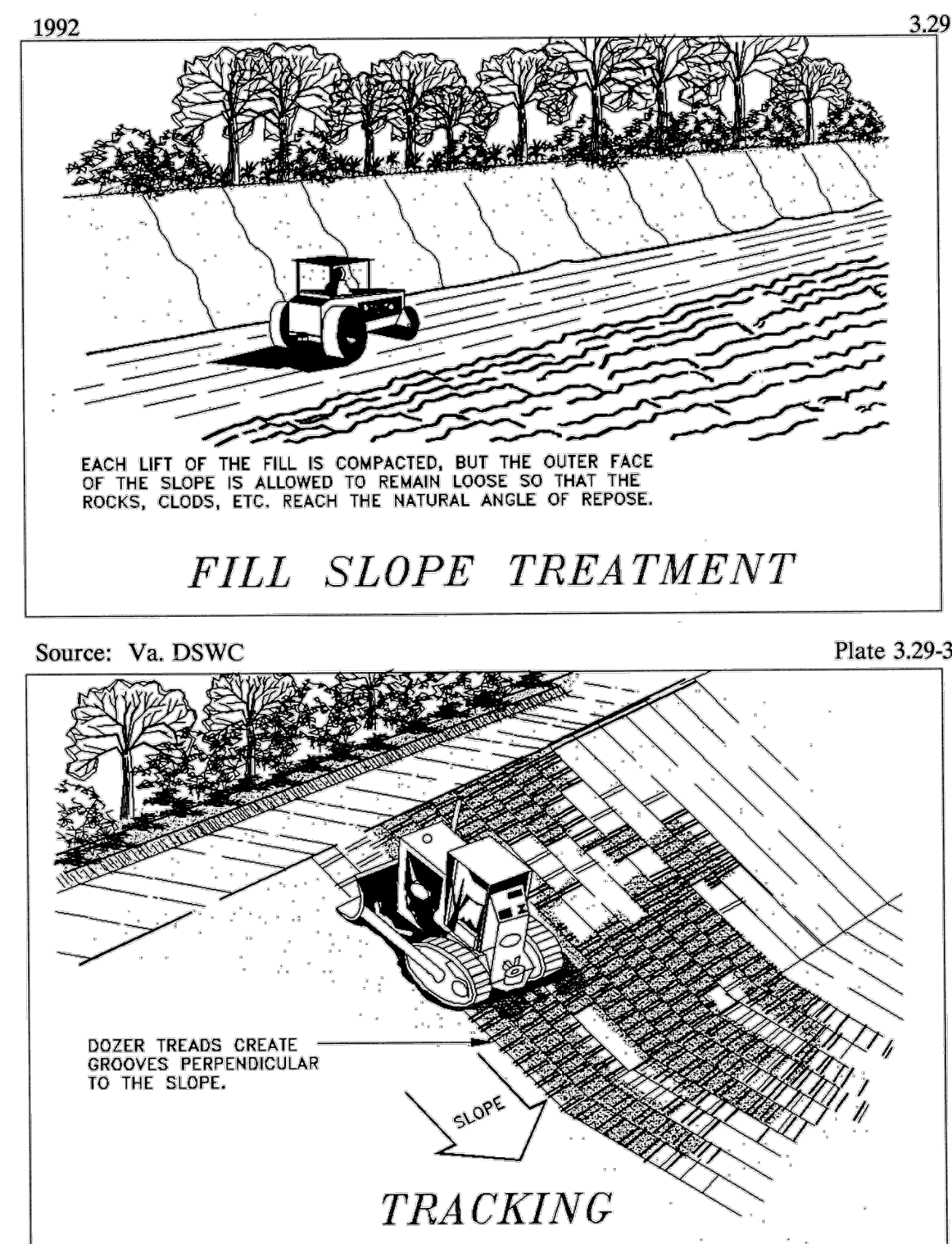
Plate 3.25-4

COFFERDAM STREAM CROSSING
TAKEN FROM VADEQ 1992 MANUAL

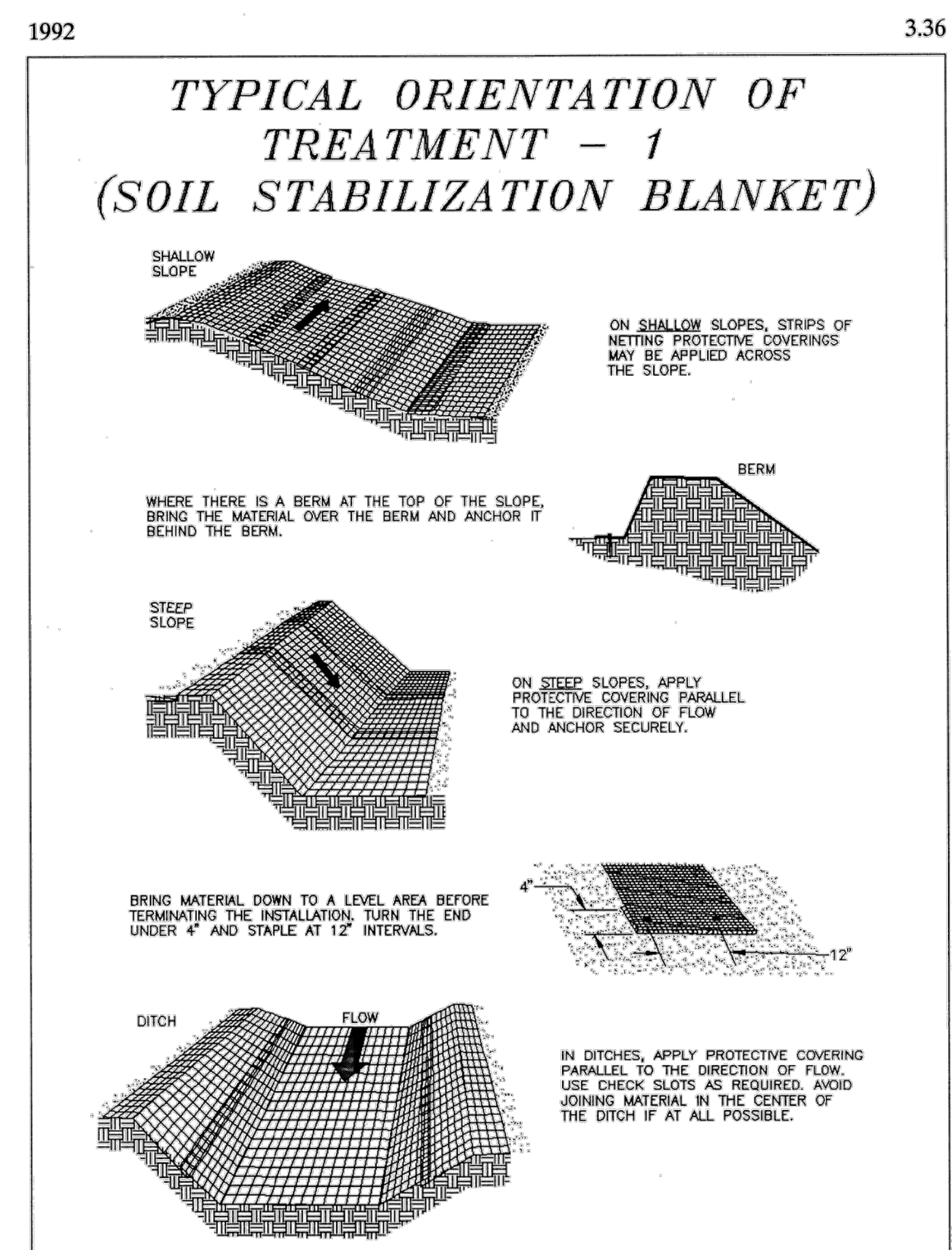


Source: Va. DSWC Plate 3.26-3

STRAW BALE/SILT FENCE PIT
DEVELOPED FROM VADEQ 1992 MANUAL



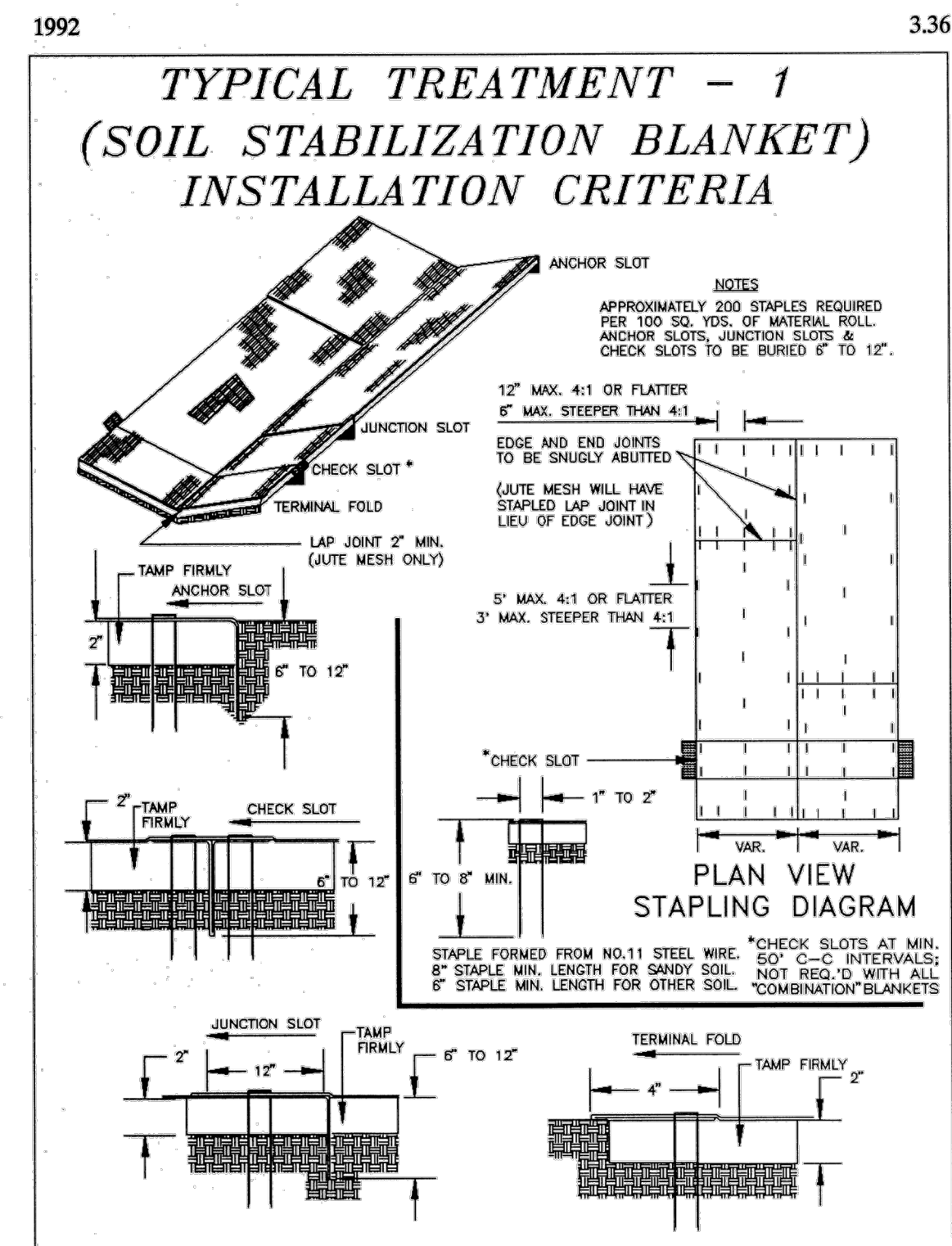
Source: Michigan Soil Erosion and Sedimentation Guide Plate 3.29-
FILL SLOPE TREATMENT & TRACKING
 TAKEN FROM VADEQ 1992 MANUAL



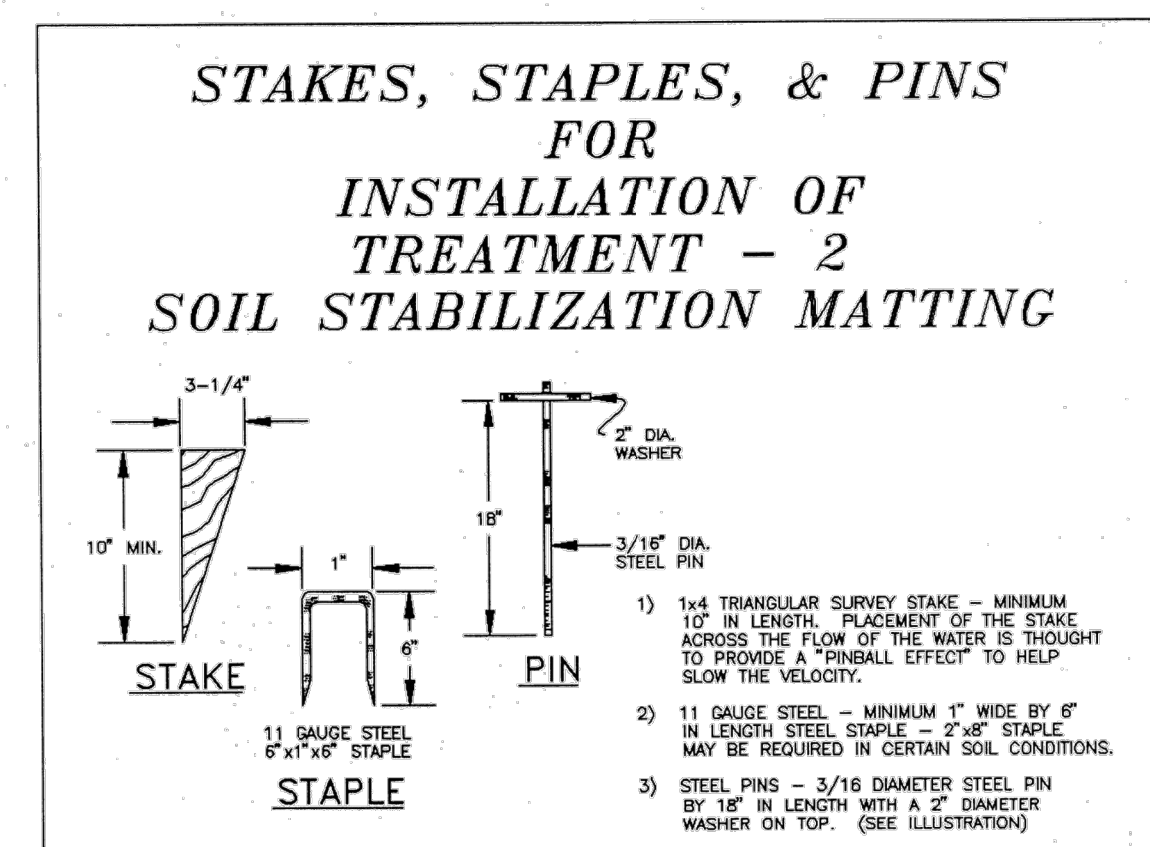
Source: Adapted from Ludlow Products Brochure

Plate 3.36-1

TYPICAL ORIENTATION OF TREATMENT
SOIL STABILIZATION BLANKET
DEVELOPED FROM VADEQ 1992 MANUAL



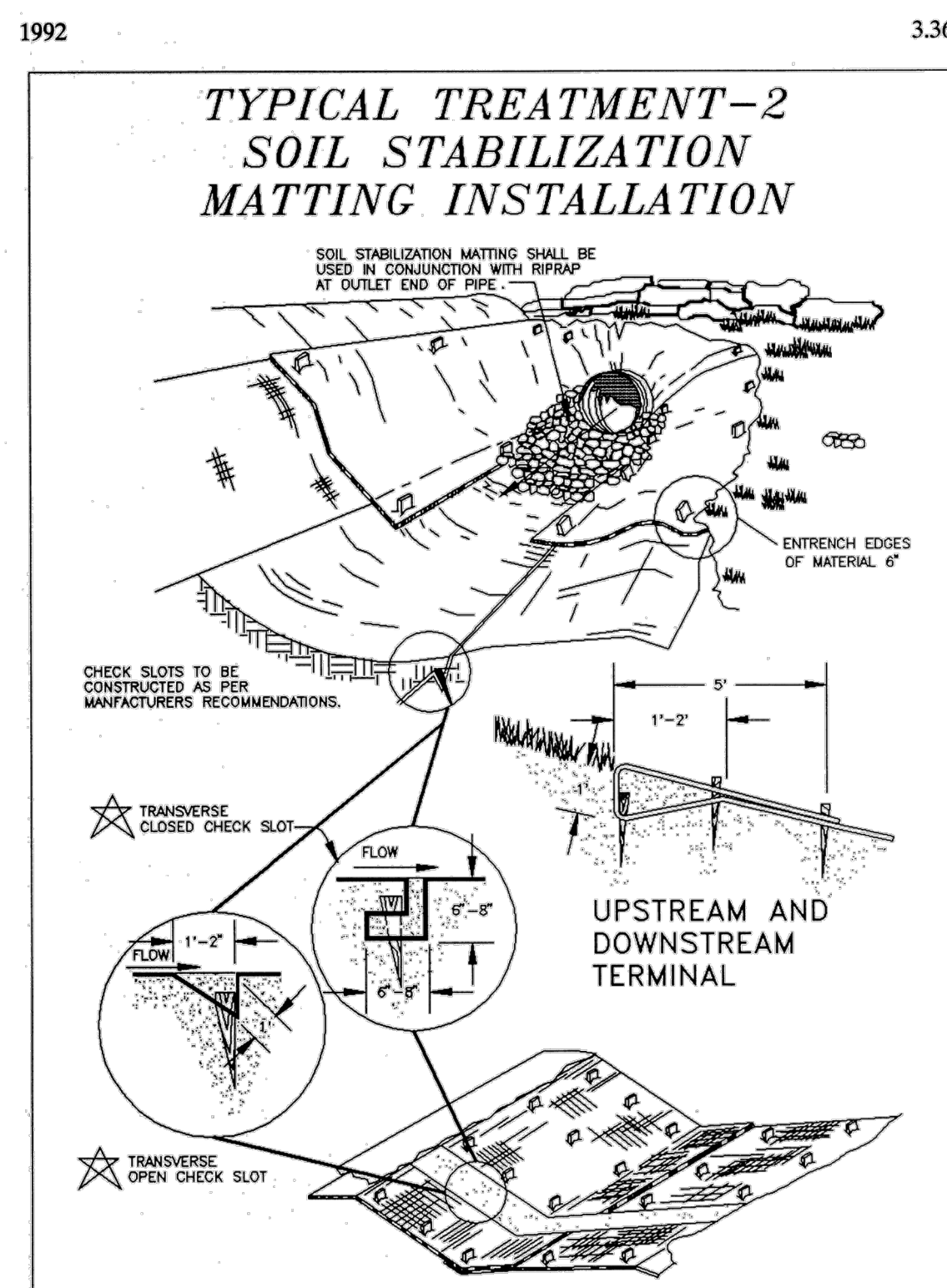
Source: VDOT Road and Bridge Standards Plate 3.36-2



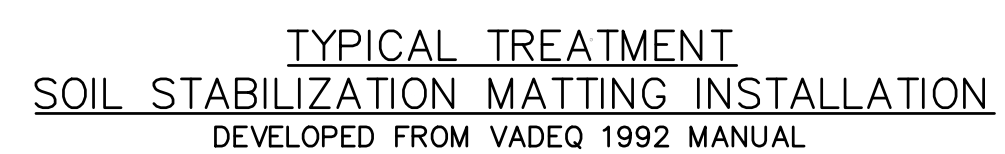
Source: Product literature from Greenstreak, Inc. Plate 3.36-3

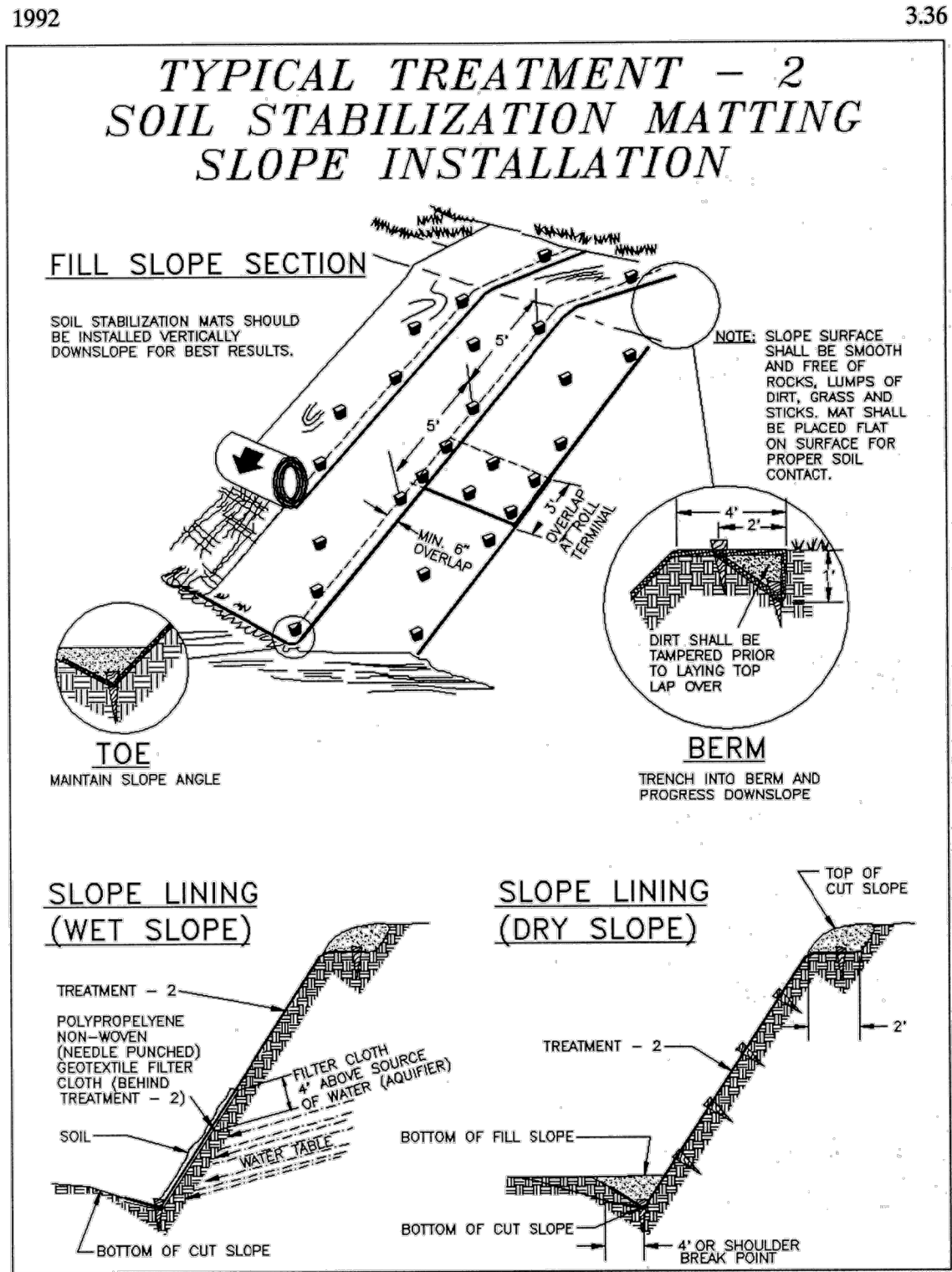
Installation Requirements

Site Preparation - After site has been shaped and graded to approved design, prepare a friable seedbed relatively free from clods and rocks more than 1 inch in diameter, and any foreign material that will prevent contact of the soil stabilization mat with the soil surface. If necessary, redirect any runoff away from the ditch or slope during installation.



Source: VDOT Road and Bridge Standards





Source: VDOT Road and Bridge Standards

Plate 3.36-5

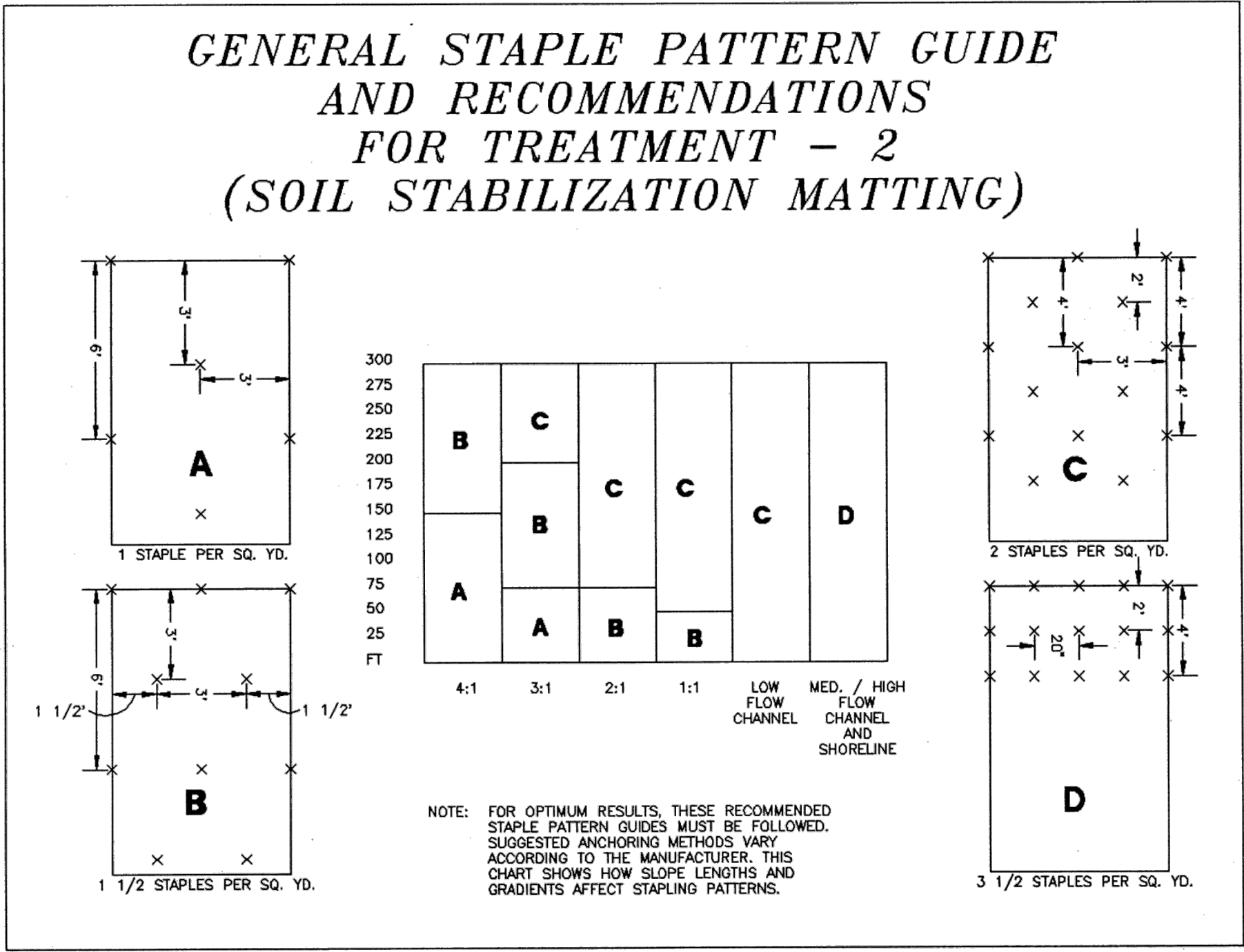
SOIL STABILIZATION MATTING SLOPE

NOTE:
FOR LANDS ON THE JEFFERSON NATIONAL FOREST, IF THE USE OF STABILIZATION NETTING IS REQUIRED/PERMITTED, WILDLIFE FRIENDLY GEOTEXTILES MUST BE USED. THESE PRODUCTS MUST EITHER NOT CONTAIN NETTING, OR NETTING MUST BE MADE OF 100% BIODEGRADABLE NON-PLASTIC MATERIALS SUCH AS JUTE, SISAL, OR COIR FIBER. PLASTIC NETTING (SUCH AS POLYPROPYLENE, NYLON, POLYETHYLENE, AND POLYESTER), EVEN IF ADVERTISED AS BIODEGRADABLE, IS NOT ACCEPTED ALTERNATIVE. ANY NETTING USED MUST ALSO HAVE A LOOSE-WEAVE DESIGN WITH MOVABLE JOINTS BETWEEN HORIZONTAL AND VERTICAL TWINES TO REDUCE THE CHANCE FOR WILDLIFE ENTANGLEMENT, INJURY, OR DEATH. (CA COASTAL COMMISSION, 2012)

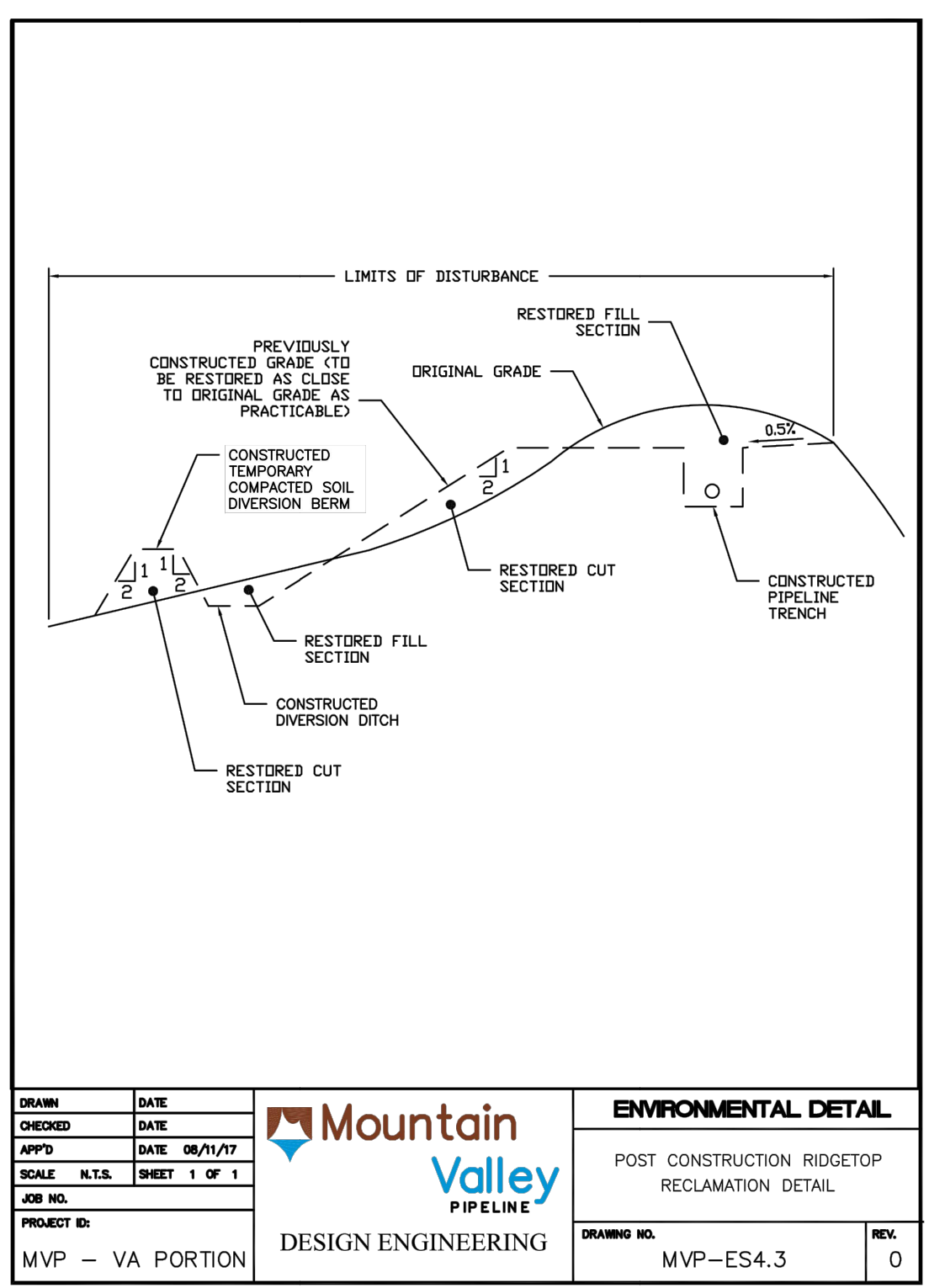
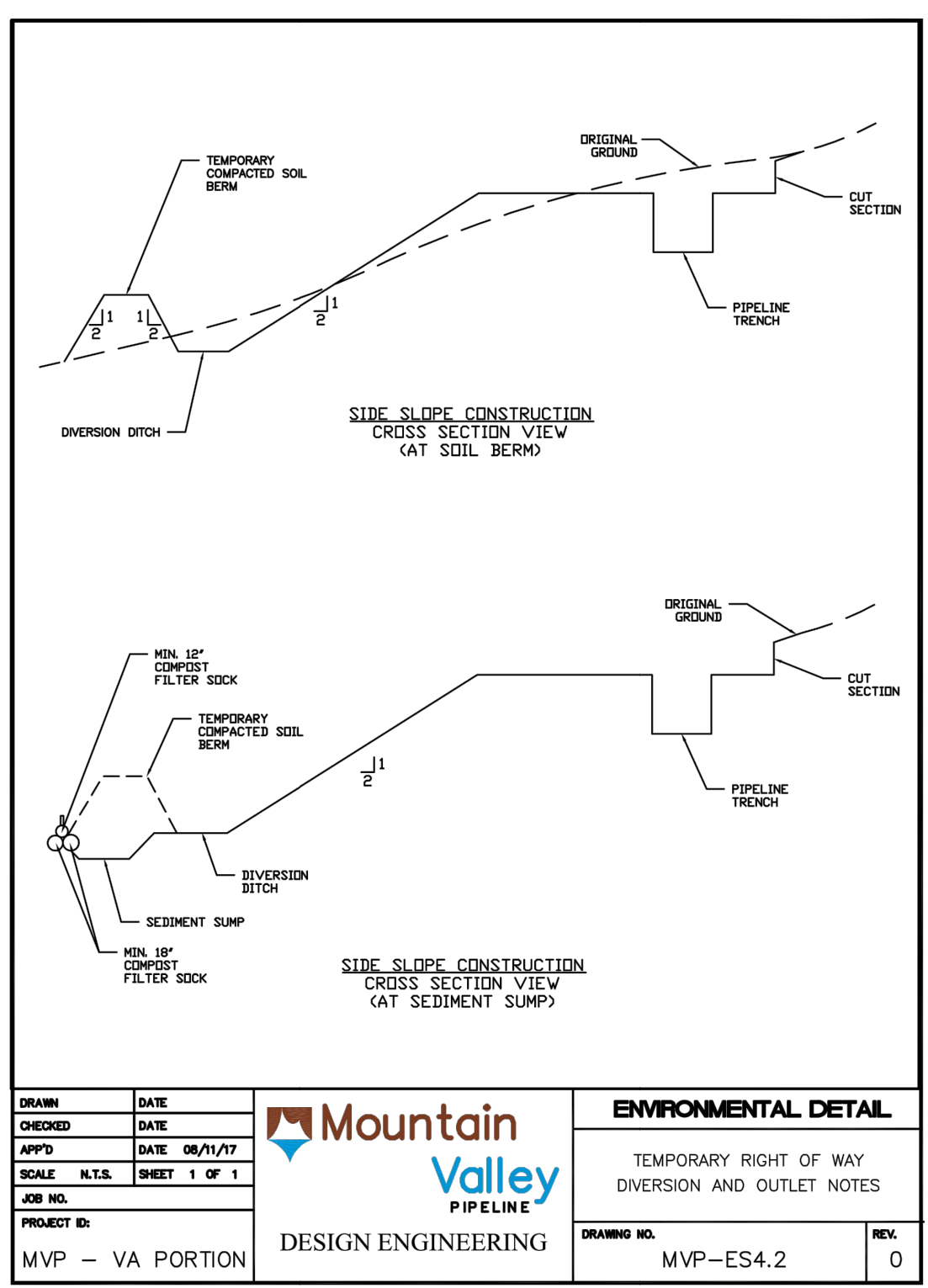
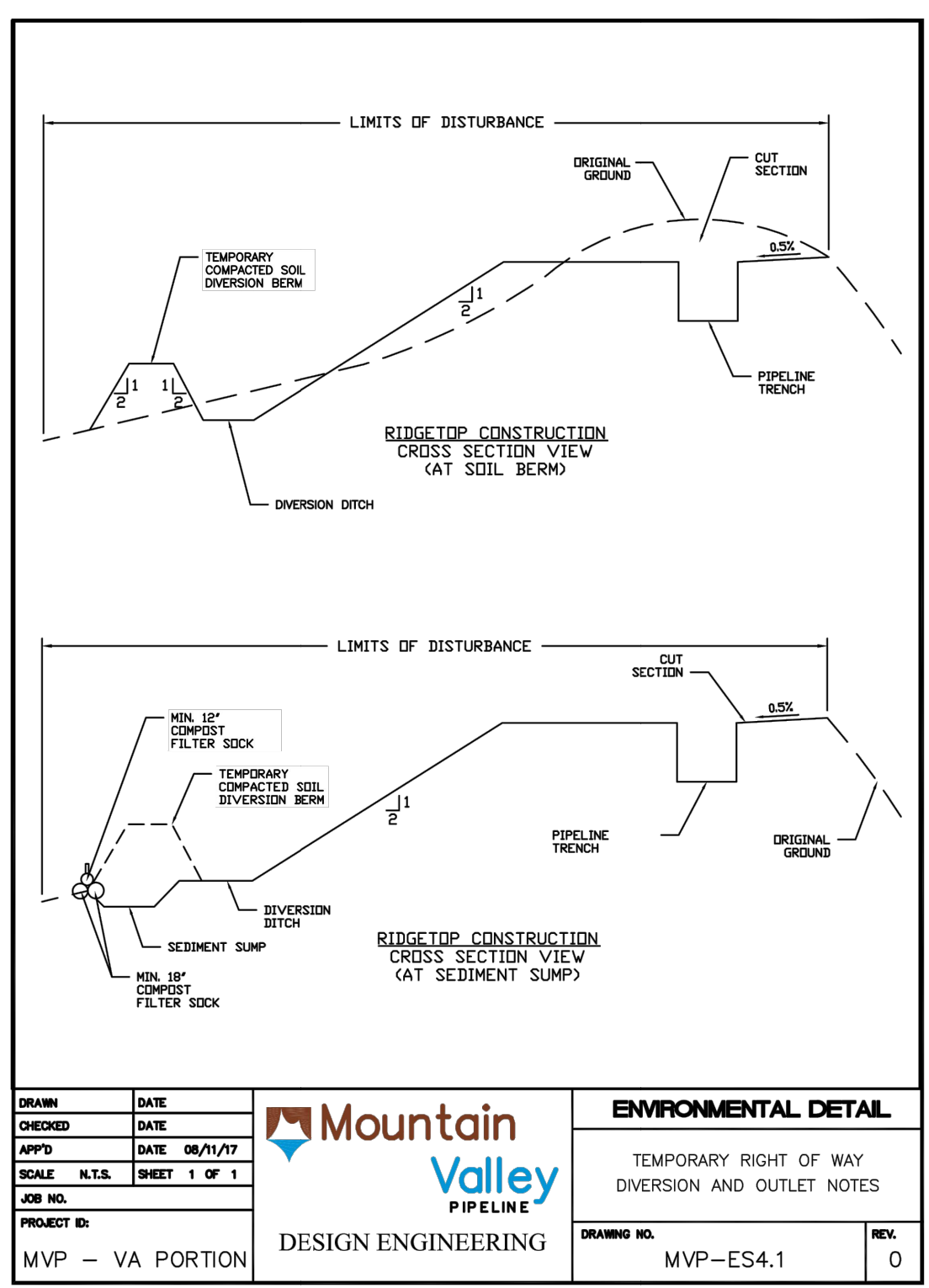
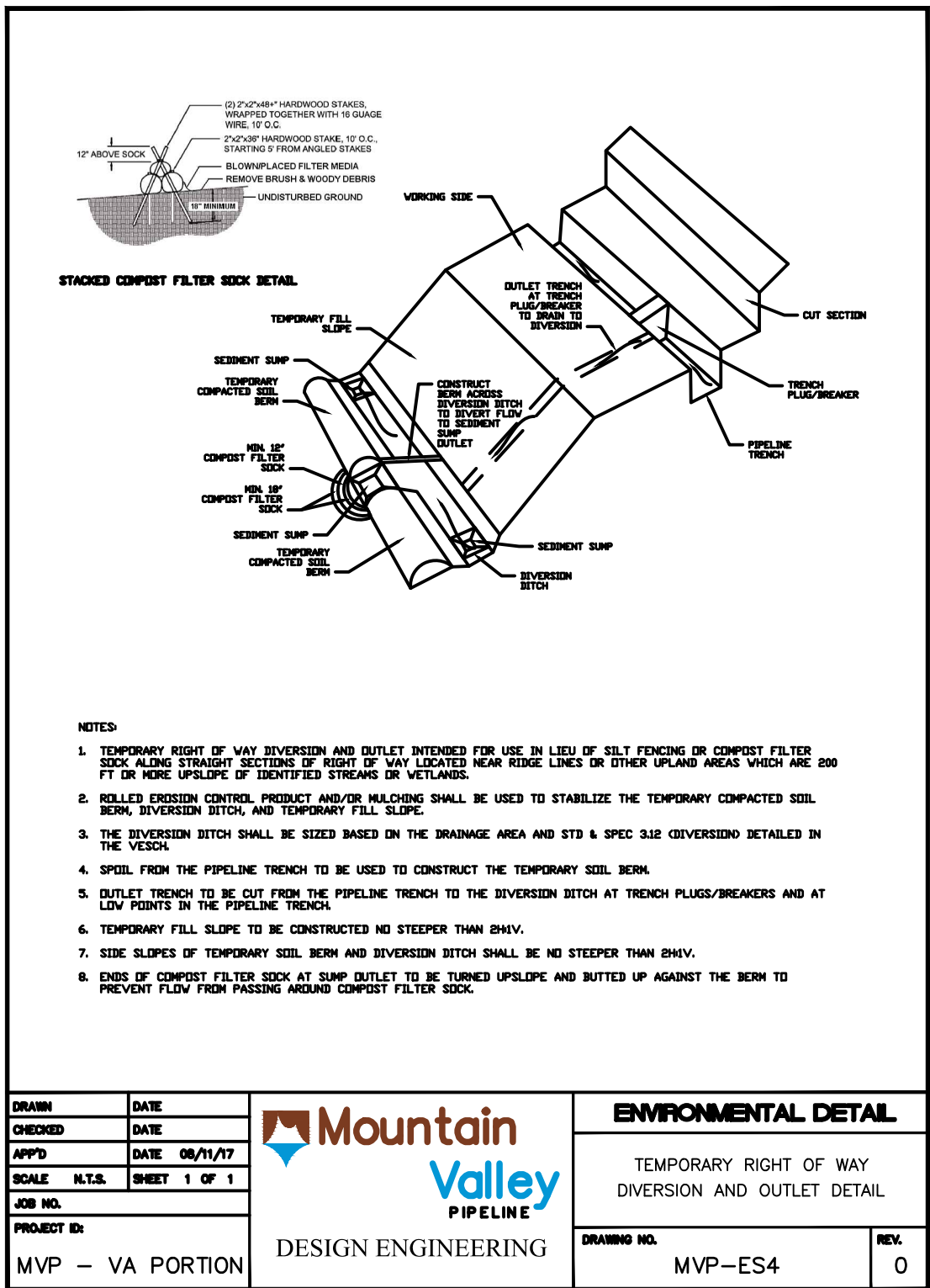
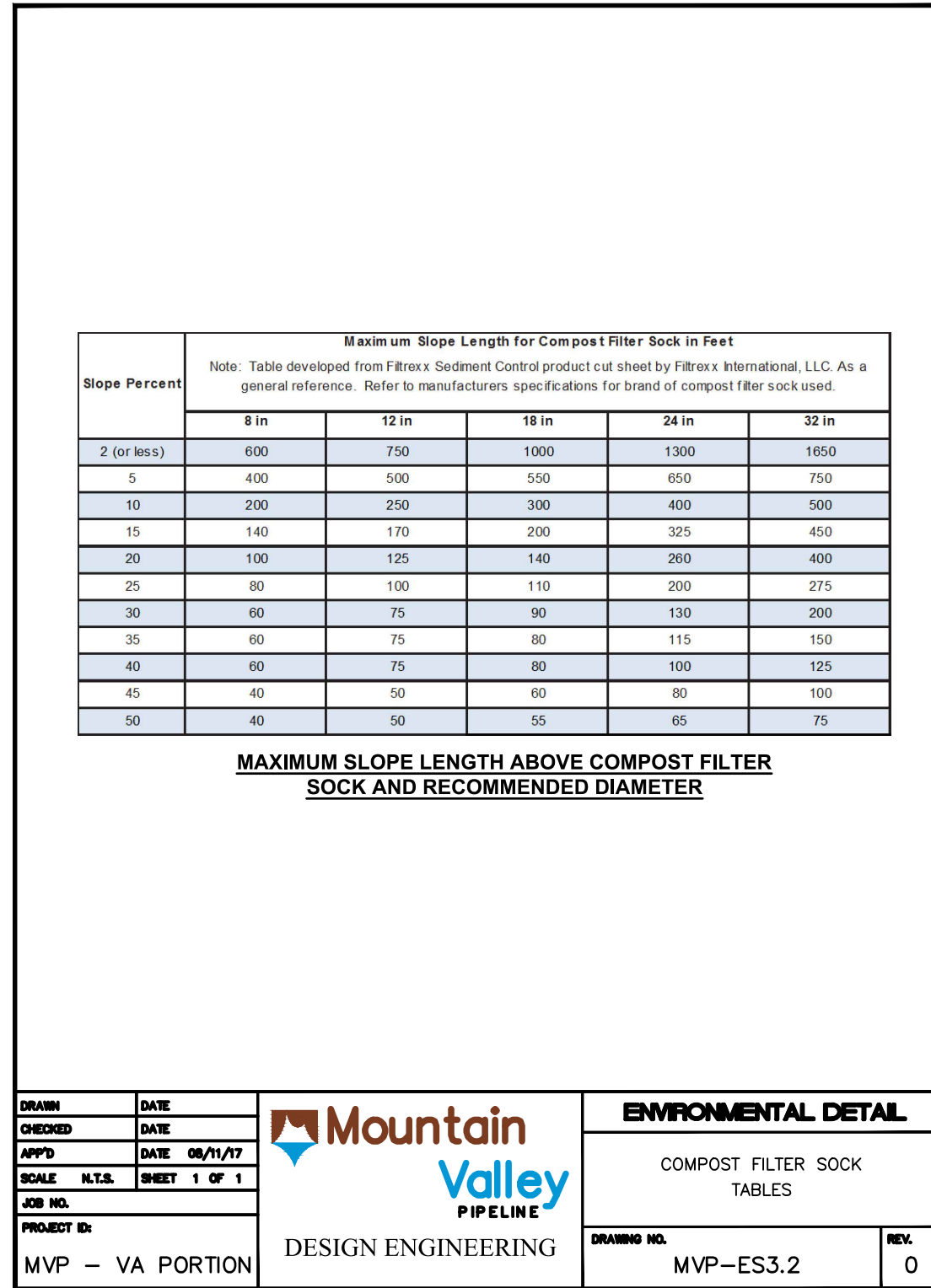
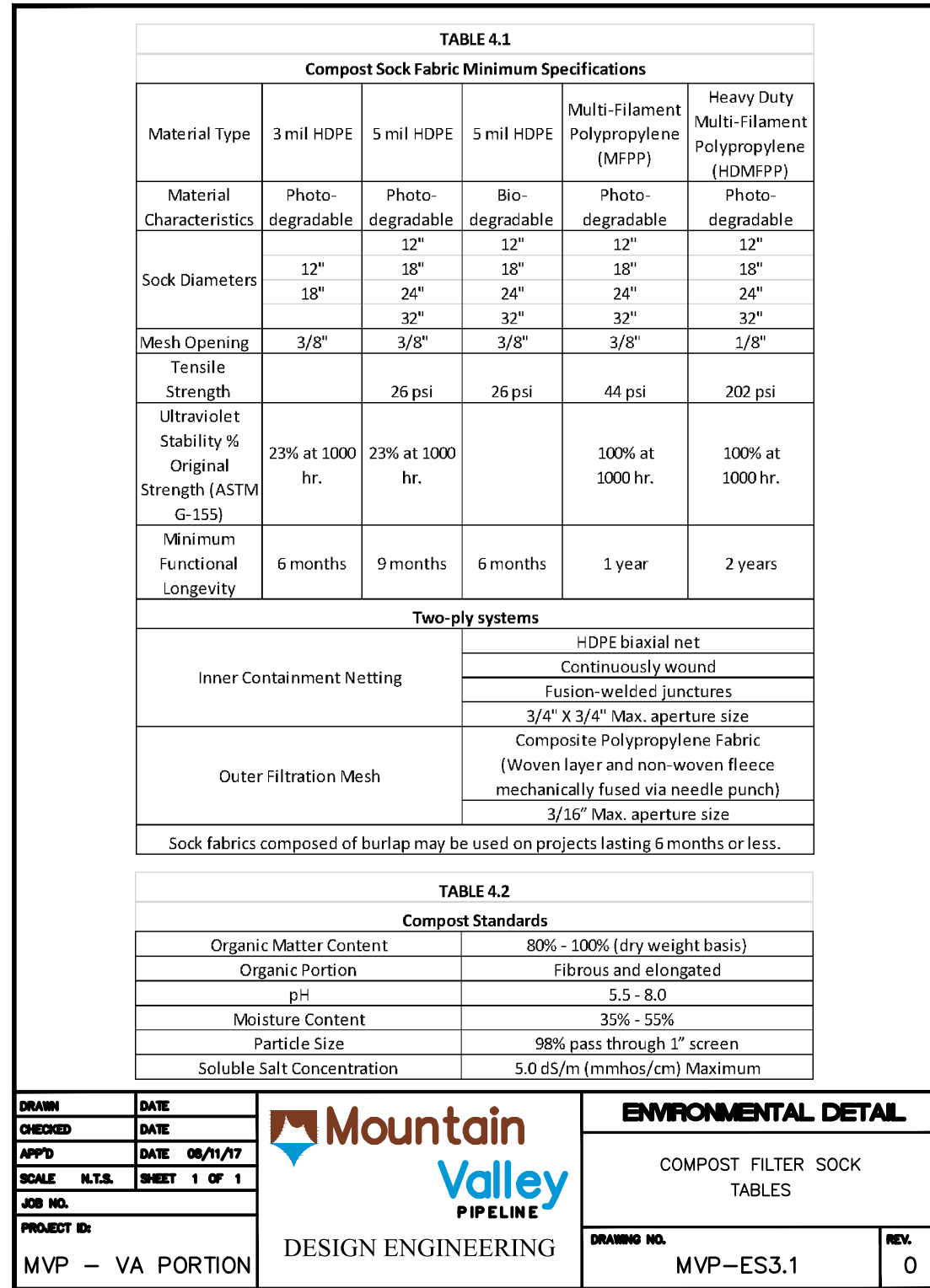
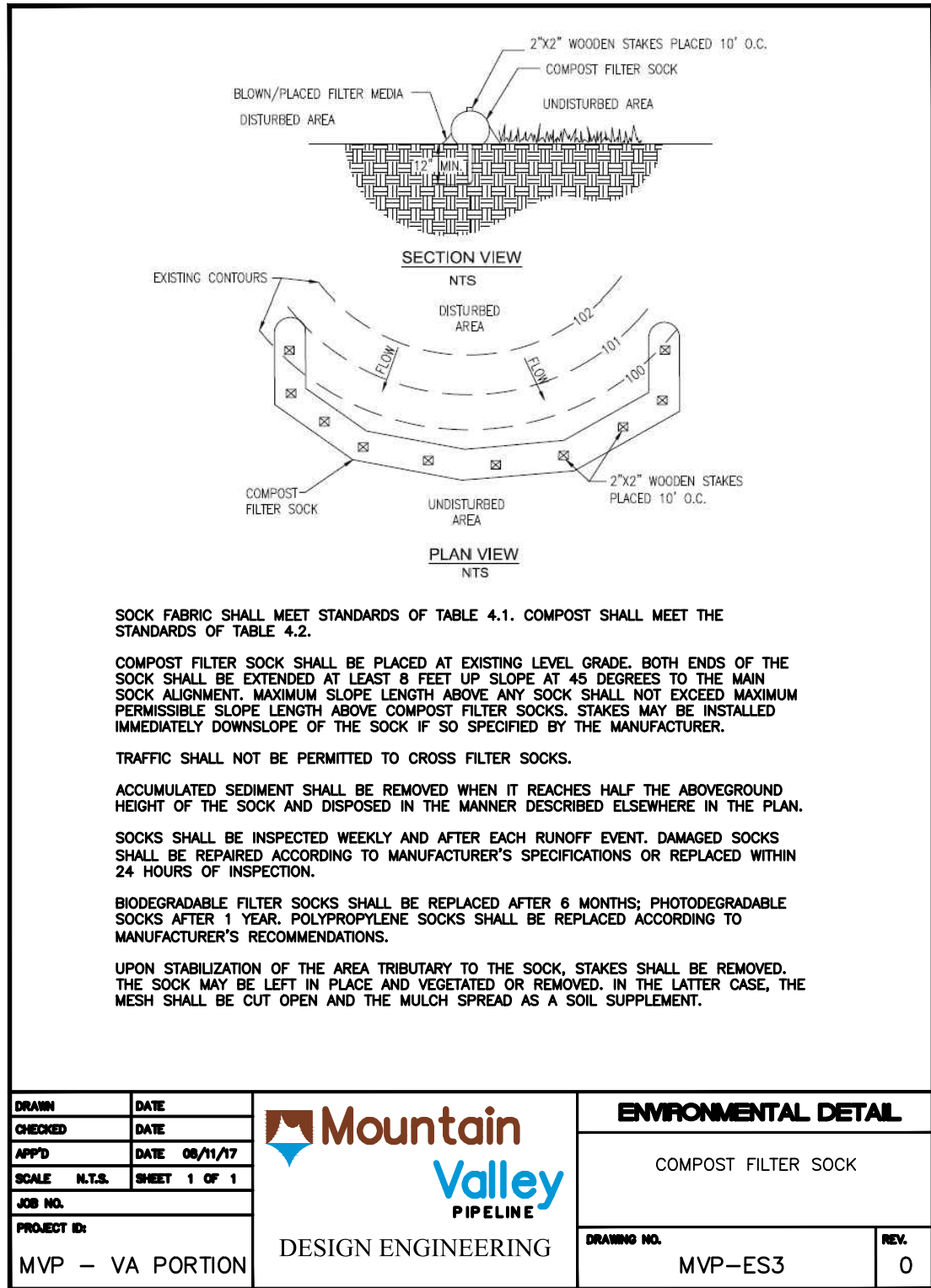
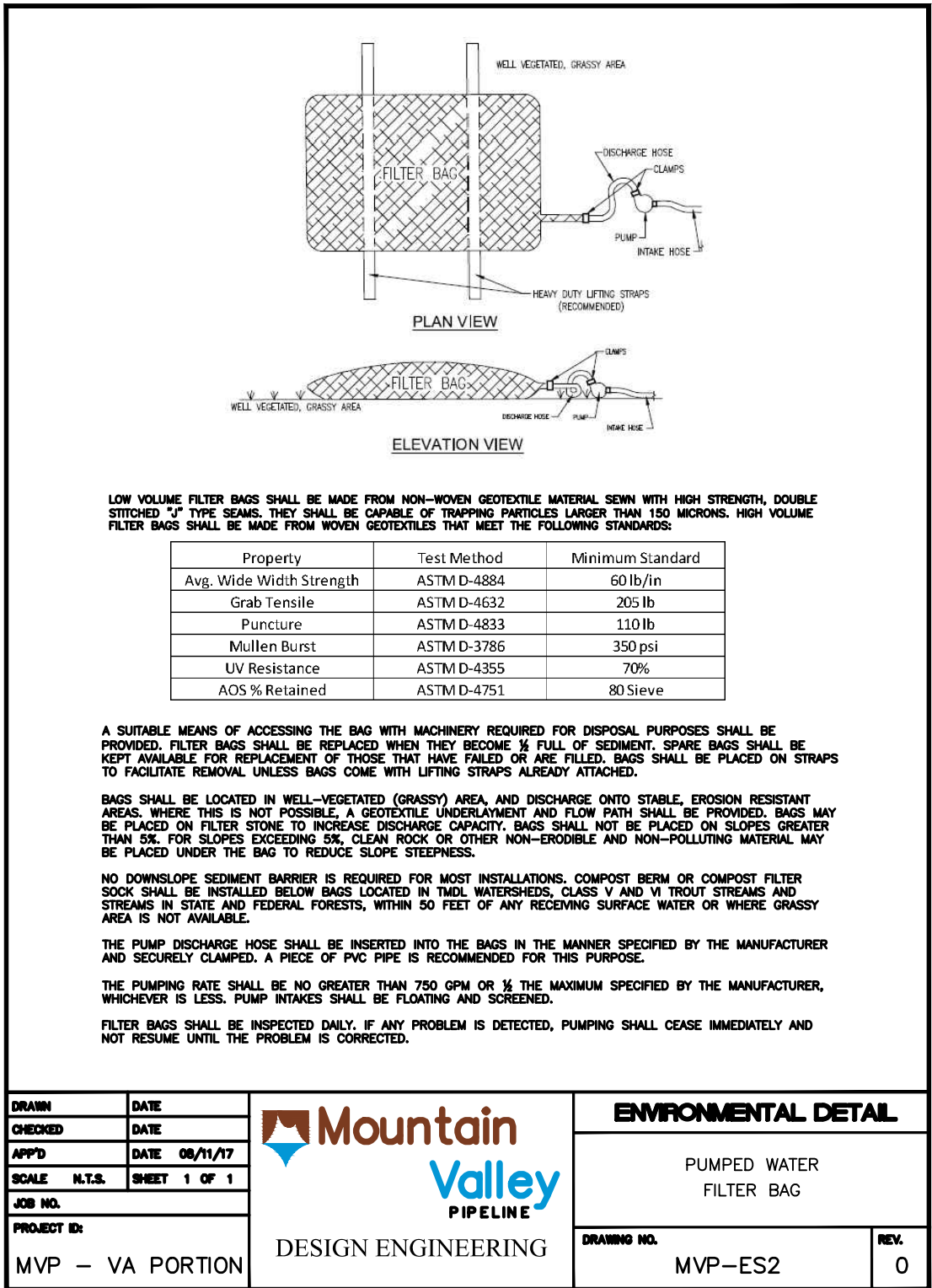
III - 368

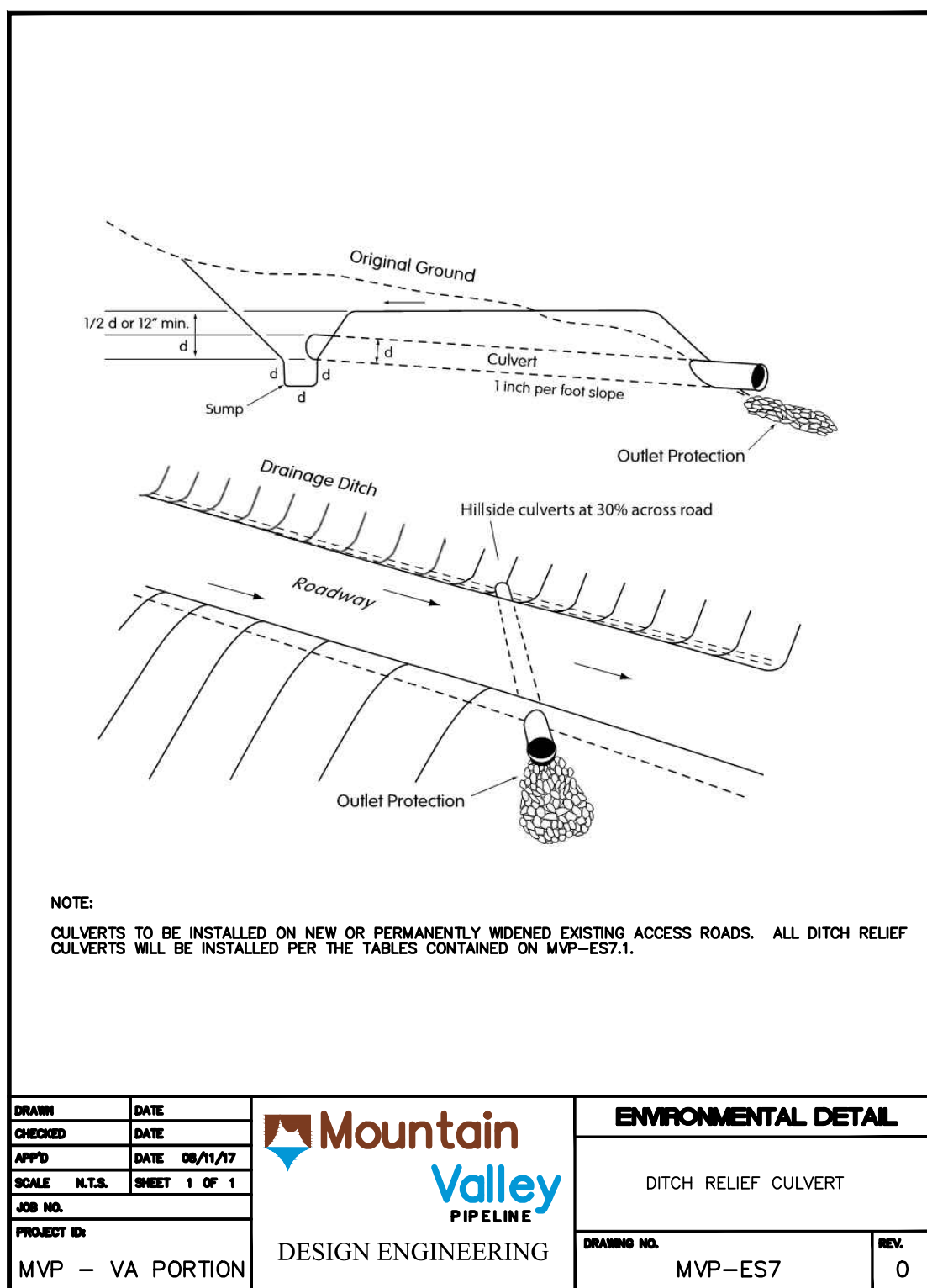
Source: Product literature from North American Green

Plate 3.36-6



**GENERAL STAPLE PATTERN GUIDE
& RECOMMENDATIONS FOR TREATMENT
DEVELOPED FROM VADEQ 1992 MANUAL**



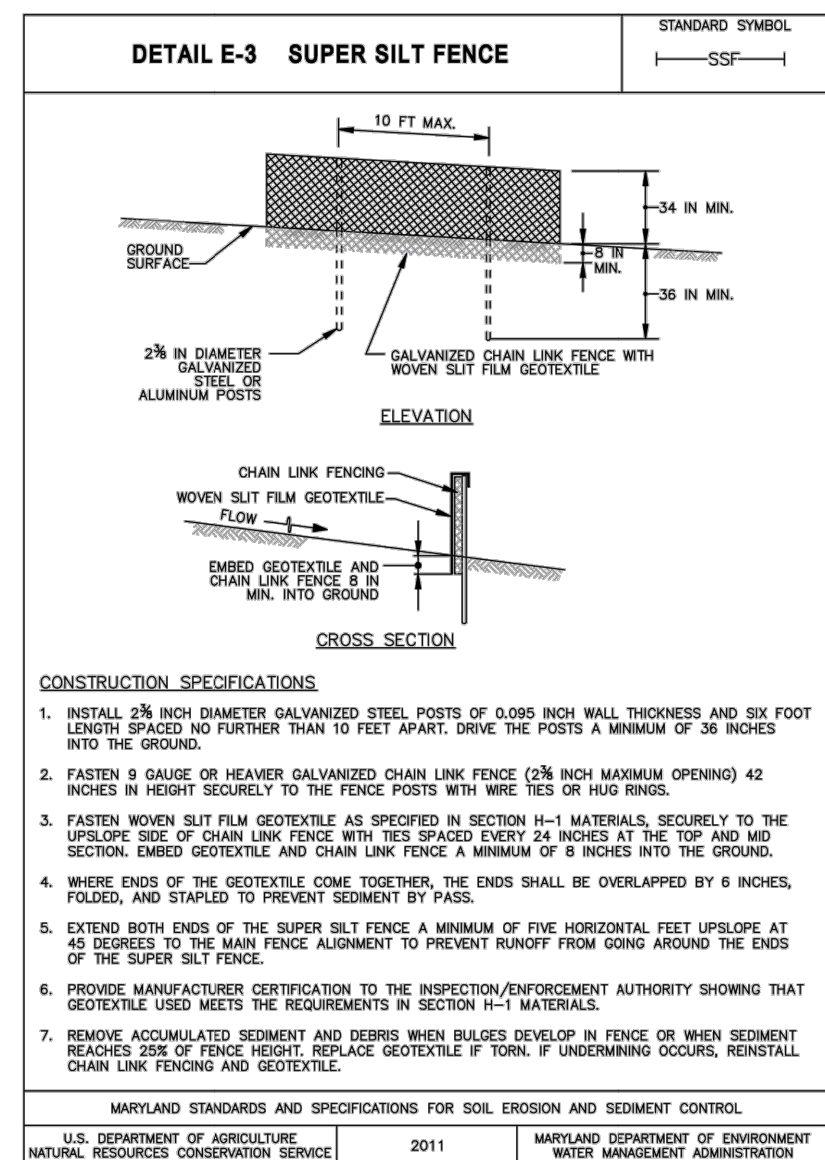
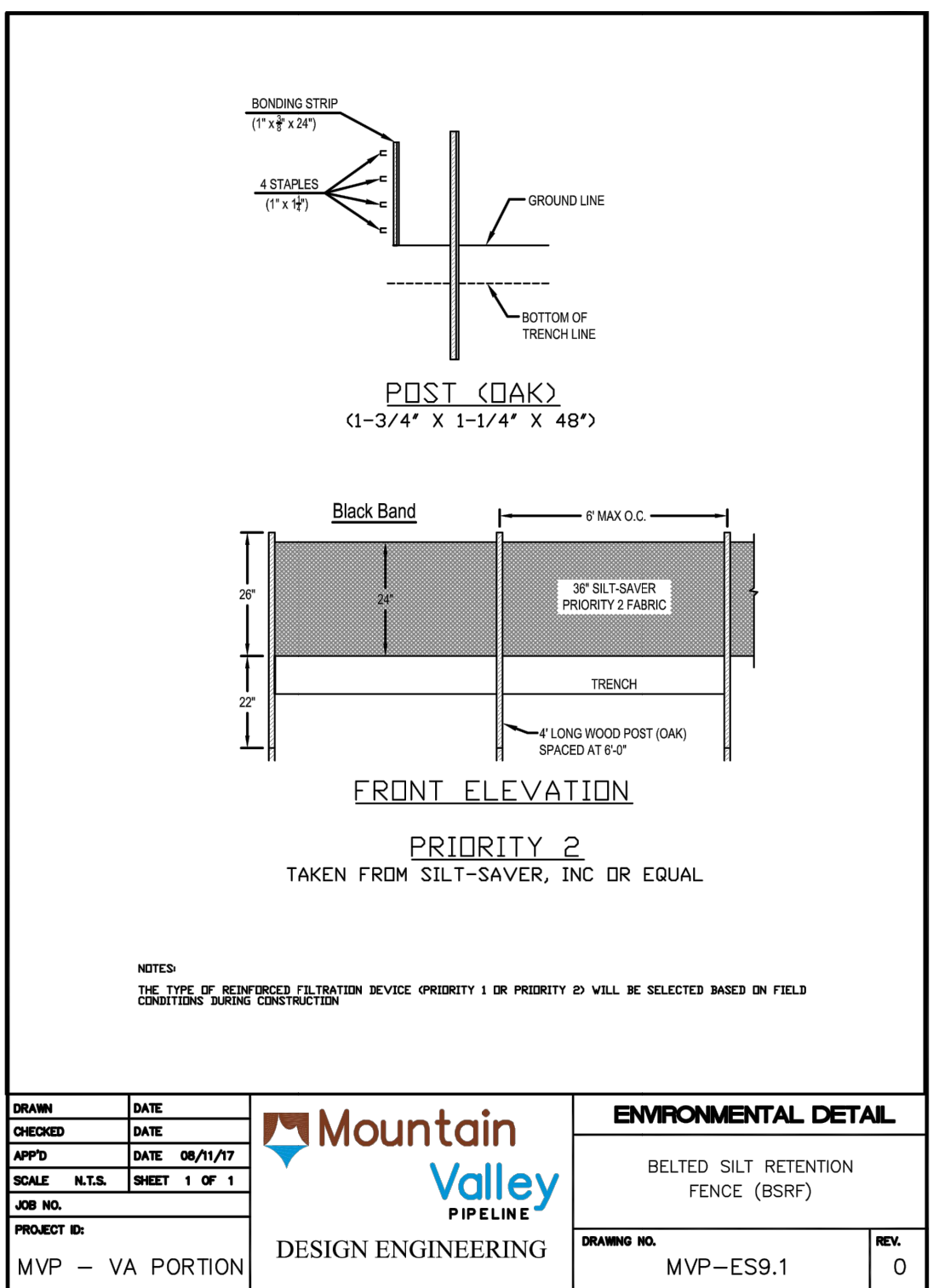
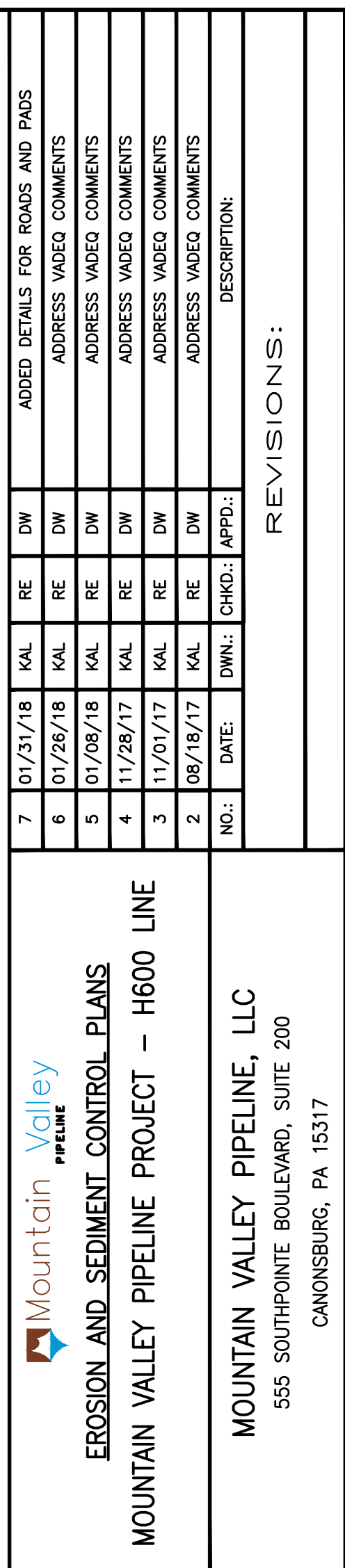


Road Grade (%)	Culvert Spacing* (ft)	Length of Upslope Drainage (ft)				
		<300	300-400	400-500	500-600	>600
		Minimum Culvert Size (in)				
2	300	12	15	15	15	18
3	235	12	15	15	15	18
4	200	12	15	15	15	18
5	180	12	12	15	15	15
6	165	12	12	12	15	15
7	155	12	12	12	12	15
8	150	12	12	12	12	15
9	145	12	12	12	12	15
10	140	12	12	12	12	15
12	135	12	12	12	12	15

*Culvert spacing may be adjusted slightly to take advantage of natural drainage courses

Road Grade Percent	Soil Type in Ditch				
	Gravel, Sandy Gravels, Aggregate Surfacing	Silty Gravels, Clay Gravels	Plastic and Nonplastic Inorganic Clays	Inorganic Silt, or Clayey Sands	Sands, Silty Sands, and Gravelly Sands
	Culvert Spacing Feet*				
2	990	315	245	170	95
4	335	275	210	145	85
6	285	230	180	125	75
8	240	195	150	105	65
10	200	160	125	90	55
12	160	130	105	75	45
14	135	110	85	60	35

*Culvert spacing may be adjusted slightly to take advantage of natural drainage courses



Average Slope Steepness	Maximum Slope Length	Maximum Super Silt Fence Length
Flatter than 10:1 (0 - <10%)	Unlimited	Unlimited
10:1 to 5:1 (10 - 20%)	200 feet	1,500 feet
<5:1 to 3:1 (>20 - 33%)	150 feet	1,000 feet
<3:1 to 2:1 (>33 - 50%)	100 feet	500 feet
Steeper than 2:1 (>50%)	50 feet	250 feet

1. Super silt fence should be placed on the contour. No section of super silt fence is to exceed a grade of 5% for a distance of more than 50 feet.
2. Super silt fence should be used with caution in areas where rocky soils may prevent trenching.
3. The use of super silt fence must conform to the design constraints listed in Table E.3 above.
4. Extend both ends of the silt fence a minimum five (5) feet horizontally upslope at 45 degrees to the maximum alignment to prevent runoff from going around the ends of the silt fence.

Maintenance

Accumulated sediment and debris must be removed when bulges develop in the fence or when sediment reaches 25 percent of the fence height. The geotextile must be replaced if torn. If undermining occurs, reinstall chain link fencing and geotextile.

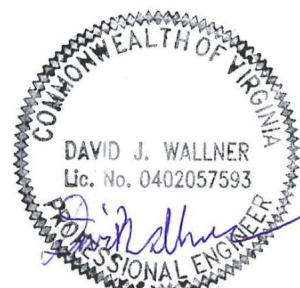
Table H.1: Geotextile Fabrics


PROPERTY	TEST METHOD	MINIMUM AVERAGE ROLL VALUE ¹									
		WOMEN SLIT FILM GEOTEKILE				WOMEN MONOMERALE GEOTEKILE				NONWOMEN GEOTEKILE	
		MD	CD	MD	CD	MD	CD	MD	CD		
Grab Tensile Strength	ASTM D-4632	200 lb	200 lb	370 lb	250 lb	200 lb	200 lb				
Grab Tensile Elongation	ASTM D-4632	15%	15%	10%	10%	10%	10%				
Trapped Tear Tensile Strength	ASTM D-4353	75 lb	75 lb	100 lb	60 lb	60 lb	80 lb				
Puncture Strength	ASTM D-6241	450 lb		900 lb		450 lb					
Apparent Opening Size ²	ASTM D-4751	U.S. Sieve 30 (0.59 mm)		U.S. Sieve 70 (0.21 mm)		U.S. Sieve 70 (0.21 mm)					
Permeability	ASTM D-4941	0.05 sec ³		0.28 sec ³		1.1 sec ³					
Ultraviolet Resistance Retained at 800 hours	ASTM D-4355	70% strength		70% strength		70% strength					

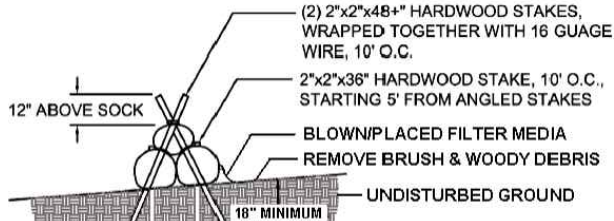
¹ All numeric values except apparent opening size (AOS) represent minimum average roll values (MARV). MARV is calculated as the typical minus two standard deviations. MD is machine direction; CD is cross

² Values for AOS represent the average maximum opening.


GENERAL DETAILS SET



DRAWN BY:		KAL
CHECKED BY:		HT
APPROVED BY:		RE
DATE:	11/28/2017	 REVISION
SCALE:	AS SHOWN	
SHT. NO.	0.06	OF 0.23



NOTES:
THE TYPE OF REINFORSED FILTRATION DEVICE PRIORITY 1 OR PRIORITY 2 WILL BE SELECTED BASED ON FIELD
OBTAINING PRIORITY CONSTRUCTION


DRAWN	DATE		ENVIRONMENTAL DETAIL	
CHECKED	DATE			
APPROVED	DATE 06/11/17			
SCALE	N.T.S. SHEET 1 OF 1			
JOB NO.				
PROJECT ID:		DESIGN ENGINEERING	DRAWING NO. MVP-ES9.3	REV. 0
MVP - VA PORTION				

Forest Regeneration Woody Seed Mix and Application Rates.

Species	Common Name	Seeding Rate (lbs/acre)
Oak-Hickory Forest a		
Fagus grandifolia	American Beech	0.3
Liriodendron tulipifera	Tulip Poplar	0.3
Pinus strobus	White Pine	0.3
Pinus virginiana	Virginia Pine	0.3
Prunus serotina	Black Cherry	0.3
Amelanchier canadensis	Canadian Serviceberry	0.3
Cercis canadensis	Eastern Redbud	0.3
Cornus florida	Flowering Dogwood	0.3
Diostyros virginiana	Periwinkle	0.3
Ilex opaca	American Holly	0.3
Nyssa sylvatica	Black Gum	0.3
Sassafras albidum	Sassafras	0.3
Hamelis virginiana	Wild Hazel	0.3
Lindera benzoin	Spicebush	0.3
Vaccinium angustifolium	Lowbush Blueberry	0.3
Viburnum acerifolium	Mapleleaf Viburnum	0.3
Vitis aestivalis	Grape	0.3

a) Oak and hickory species to be planted as bare root seedlings in addition to this mix. Refer to Section 5.9 Bare Root Seedling Planting for more information. At minimum, 3 of the 5 overstory, 4 of the 7 understory, and 2 of the 4 shrub species will comprise the woody seed mix for Oak-Hickory Forests.

NOTE:
WOODY SEED MIX TO BE USED IN COMBINATION WITH MVP-ES11.2 UPLAND MEADOW SEED MIX.

DRAWN	DATE		ENVIRONMENTAL DETAIL	
CHECKED	DATE			
APPROVED	DATE 06/11/17			
SCALE	N.T.S. SHEET 1 OF 1			
JOB NO.				
PROJECT ID:		DESIGN ENGINEERING	DRAWING NO. MVP-ES11.1	REV. 0
MVP - VA PORTION				

Upland Meadow Seed Mix and Application Rates in Virginia.

Species	Common Name	Seeding Rate (lbs/acre)	pH	Bloom Period (if applicable)
Elymus virginicus	Virginia Wildrye	4.00	5.0 - 7.4	June to October
Schizanthus scoparium	Little Bluestem	11.68	6.0 - 8.4	July to October
Sorghastrum nutans	Indiangrass	1.00	5.0 - 7.8	August to October
Asclepias syriaca	Common Milkweed	0.10		June to August
Asclepias tuberosa	Butterfly Milkweed	0.10	4.8 - 6.8	June to August
Chamaecrista fasciculata	Partridge Pea	0.80	5.5 - 7.5	July to September
Sensitiva Partridge Pea		0.06		June to October
Coneopsis lanceolata	Lanceleaf Coneopsis	0.44	6.0 - 7.0	April to July
Eupatorium coelestinum	Mistflower	0.04	5.5 - 7.5	July to October
Helopsis helianthoides	Oxeye Sunflower	0.40		July to August
Lespedeza virginica	Slender Bushclover	0.10		July to September
Liatris graminifolia	Grassleaf Liatris	0.10	5.8 - 6.8	August to October
Monarda fistulosa	Wild Bergamot	0.10	6.0 - 8.0	June to September
Penstemon laevigatus	Appalachian Beardtongue	0.10		late May to late August
Pycnanthemum incanum	Hoary Mountainmint	0.20		May to June
Rudbeckia fulgida var. fulgida	Orange Coneflower	0.02	< 6.8	summer
Rudbeckia hirta	Black-eyed Susan	0.04		July to October

Species	Common Name	Seeding Rate (lbs/acre)	pH	Bloom Period (if applicable)
Senna hebecarpa	Wild Senna	0.00	6.0 - 7.0	May to July
Solidago juncea	Early Goldenrod	0.10		July to August
Solidago nemoralis	Gray Goldenrod	0.04		June to July
Tradescantia ohioensis	Ohio Spiderwort	0.04	6.5 - 7.5	August to September
Tradescantia virginiana	Virginia Spiderwort	0.10		late April to mid-July


TEMPORARY SEED MIX:
9/1 - 2/15: 50/50 MIX ANNUAL RYEGRASS (LOLIUM MULTI-FLORUM) AND WINTER RYE (SECALE CEREALE) (50-100 LBS/AC)
2/16 - 4/30: ANNUAL RYEGRASS (LOLIUM MULTI-FLORUM) (60-100 LBS/AC)
5/1 - 8/31: GERMAN MILLET (SETARIA ITALICA) (50 LBS/AC)

DRAWN	DATE		ENVIRONMENTAL DETAIL	
CHECKED	DATE			
APPROVED	DATE 06/11/17			
SCALE	N.T.S. SHEET 1 OF 1			
JOB NO.				
PROJECT ID:		DESIGN ENGINEERING	DRAWING NO. MVP-ES11.2	REV. 0
MVP - VA PORTION				

Upland Steep Slope Seed Mix and Application Rates in Virginia.

Species	Common Name	Seeding Rate (lbs/acre)	pH	Bloom Period (if applicable)
Agrostis perennans	Autumn Bentgrass	3.15	5.5 - 7.5	Midsummer
Elymus virginicus	Virginia Wildrye	9.05	5.0 - 7.4	June to October
Panicum clandestinum	Dactyloctenium	4.50	4.0 - 7.5	May to September
Schizanthus scoparium	Little Bluestem	11.26	5.0 - 7.4	July to October
Sorghastrum nutans	Indiangrass	14.40	5.0 - 7.8	August to October
Asclepias syriaca	Common Milkweed	0.09		June to August
Aster pilosus	Heath Aster	0.05	5.4 - 7.0	After fall frost
Chamaecrista fasciculata	Partridge Pea	0.45	5.5 - 7.5	July to September
Coneopsis lanceolata	Lanceleaf Coneopsis	0.45	6.0 - 7.0	April to July
Eupatorium coelestinum	Mistflower	0.05	5.5 - 7.5	July to October
Helopsis helianthoides	Oxeye Sunflower	0.45		July to August
Liatris graminifolia	Grassleaf Liatris	0.09	5.8 - 6.8	August to October
Monarda fistulosa	Wild Bergamot	0.23	6.0 - 8.0	June to September
Pycnanthemum incanum	Hoary Mountainmint	0.05	< 6.8	summer
Rudbeckia hirta	Black-eyed Susan	0.45	6.0 - 7.0	May to July
Senna hebecarpa	Wild Senna	0.23		July to August
Solidago nemoralis	Gray Goldenrod	0.05	6.5 - 7.5	August to September
Tradescantia ohioensis	Ohio Spiderwort	0.05		late April to mid-July

45.90

DRAWN	DATE		ENVIRONMENTAL DETAIL	
CHECKED	DATE			
APPROVED	DATE 06/11/17			
SCALE	N.T.S. SHEET 1 OF 1			
JOB NO.				
PROJECT ID:		DESIGN ENGINEERING	DRAWING NO. MVP-ES11.3	REV. 0
MVP - VA PORTION				

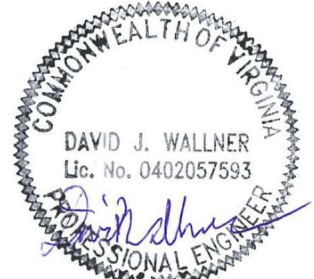
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DESCRIPTION:	CHD:	APPD:	
NO:	DATE:	DWN:	
REVISIONS:			

EROSION AND SEDIMENT CONTROL PLANS
MOUNTAIN VALLEY PIPELINE PROJECT - H600 LINE

MOUNTAIN VALLEY PIPELINE, LLC
555 SOUTHPOINTE BOULEVARD, SUITE 200
CANONSBURG, PA 15317

TETRA TECH
complex world | CLEAR SOLUTIONS™
661 ANDERSEN DRIVE
FOSTER PLAZA 7
PITTSBURGH, PA 15220

GENERAL DETAILS SET



DRAWN BY:	KAL
CHECKED BY:	HT
APPROVED BY:	RE
DATE:	11/28/2017
SCALE:	AS SHOWN
SHT. NO.	0.07 OF 0.23

Wetlands Seed Mix and Application Rates in Virginia.

Species	Common Name	Seeding Rate (lbs/acre)	pH	Bloom Period (if applicable)
0.04				
Alisma subcordatum	Mud Plantain	0.10	5.0 - 7.0	Midsummer
Carex gymandra	Fringed Sedge	1.00	6.2 - 7.0	May to June
Carex lupulina	Hop Sedge	3.00	6.2 - 7.0	June to October
Carex lurida	Shallow Sedge	1.00	4.9 - 6.8	June to July
Carex scoparia	Burnt Brown Sedge	6.90	4.6 - 6.9	July to August
Carex vulpinoidea	Fox Sedge	0.40	6.8 - 8.9	June to August
Cinna arundinacea	Wood Reedgrass	4.00	4.0 - 8.5	August to September
Elymus virginicus	Virginia Wildrye	0.60	5.0 - 7.4	June to October
Juncus effusus	Soft Rush	0.20	5.5 - 7.0	May to June
Oxycodon sessilis	Sensitive Fern	0.20		June to October
Scirpus cyperinus	Woolgrass	0.20		June to October

Species	Common Name	Seeding Rate (lbs/acre)	pH	Bloom Period (if applicable)
Scirpus polyphyllus	Many Leaved Bulrush	0.20	4.8 - 7.2	July to September
Asclepias incarnata	Swamp Milkweed	0.40		July to August
Eupatorium coelestinum	Mistflower	0.10	5.0 - 8.0	June to July
Eupatorium fistulosum	Joe Pye Weed	0.14	5.5 - 7.5	July to October
Eupatorium perfoliatum	Boneset	0.20	4.5 - 7.0	July to September
Helianthus autumnale	Common Sneezeweed	0.10		July to October
Helopsis helianthoides	Oxeye Sunflower	0.40	4.0 - 7.5	August to September
Ludwigia alternifolia	Seedbox	0.10		August to September
Mimulus ringens	Square Stemmed Monkeyflower	0.10		August to September
Verbena hastata	Blue Vervain	0.72		June to September
Vernonia noveboracensis	New York Ironweed	0.10		June to October

NOTE:
1. ANNUAL RYEGRASS WILL BE USED AT A RATE OF 40 LBS/AC FOR STABILIZATION OF WETLANDS DISTURBED BY THE PROJECT.
2. FOLLOWING RESTORATION AND TEMPORARY STABILIZATION WITH ANNUAL RYEGRASS, SHOULD THE NATIVE SEED MIX PRESENT IN THE TOPSOIL NOT REESTABLISH THE WETLAND, MVP WILL APPLY THIS SEED MIX TO SUPPLEMENT AND PERMANENTLY STABILIZE THE WETLAND.

DRAWN	DATE		ENVIRONMENTAL DETAIL	
CHECKED	DATE			
APPROVED	DATE 06/11/17			
SCALE	N.T.S. SHEET 1 OF 1			
JOB NO.				
PROJECT ID:		DESIGN ENGINEERING	DRAWING NO. MVP-ES11.4	REV. 0
MVP - VA PORTION				

Riparian Seed Mix and Application Rates in Virginia.

Species	Common Name	Seeding Rate (lbs/acre)	pH	Bloom Period (if applicable)
0.04				
Agrostis perennans	Autumn Bentgrass	0.10	5.0 - 7.0	Midsummer
Andropogon gerardi	Big Bluestem	1.00	6.2 - 7.0	June to October
Elymus virginicus	Virginia Wildrye	3.00	4.9 - 6.8	June to July
Juncus effusus	Soft Rush	1.00	4.8 - 6.9	June to August
Panicum clandestinum	Dactyloctenium	6.90	6.8 - 8.9	June to August
Sorghastrum nutans	Indiangrass	0.40	4.0 - 8.5	August to September
Asclepias incarnata	Swamp Milkweed	4.00	5.0 - 7.4	June to October
Chamaecrista fasciculata	Partridge Pea	0.80	5.5 - 7.0	May to June
Eupatorium coelestinum	Mistflower	0.20		June to October
Eupatorium fistulosum	Joe Pye Weed	0.20	4.8 - 7.2	July to September
Eupatorium perfoliatum	Boneset	0.20		July to August
Geum canadense	White Avena	0.40	5.0 - 8.0	June to July
Helianthus autumnale	Common Sneezeweed	0.10	5.5 - 7.5	July to October
Helopsis helianthoides	Oxeye Sunflower	0.14	4.5 - 7.0	July to September
Monarda fistulosa	Wild Bergamot	0.20		July to October
Pycnanthemum tenuifolium	Slender Mountainmint	0.10	4.0 - 7.5	August to September
Rudbeckia hirta	Black-eyed Susan	0.40		July to August
Senna hebecarpa	Wild Senna	0.10		August to September
Verbena hastata	Blue Vervain	0.72		June to September
Vernonia noveboracensis	New York Ironweed	0.20		June to October

TEMPORARY SEED MIX:
9/1 - 2/15: 50/50 MIX ANNUAL RYEGRASS (LOLIUM MULTI-FLORUM) AND WINTER RYE (SECALE CEREALE) (50-100 LBS/AC)
2/16 - 4/30: ANNUAL RYEGRASS (LOLIUM MULTI-FLORUM) (60-100 LBS/AC)
5/1 - 8/31: GERMAN MILLET (SETARIA ITALICA) (50 LBS/AC)

Revised 1/24/18

DRAWN	DATE		ENVIRONMENTAL DETAIL	
CHECKED	DATE			
APPROVED	DATE 06/11/17			
SCALE	N.T.S. SHEET 1 OF 1			
JOB NO.				
PROJECT ID:		DESIGN ENGINEERING	DRAWING NO. MVP-ES11.5	REV. 0
MVP - VA PORTION				

Native tree and shrub species for bare root plantings within riparian areas and forested wetlands.

Species	Common Name	Indicator Status	Riparian Planting ¹	Forested Wetland Planting ²
Native Trees				
Acer rubrum	Red Maple	FACW	X	X
Acer saccharinum	Silver Maple	FACW	X	X
Betula nigra	River Birch	FACW	X	X
Carpinus caroliniana	American Hornbeam	FACW	X	X
Carya glabra	Pignut Hickory	FACU	X	
Carya ovata	Shagbark Hickory	FACU	X	
Chionanthus virginicus	White Fringe Tree	FAC+	X	
Diostyros virginiana	Common Periwinkle	FAC-	X	
Native Shrubs				
Alnus serrulata	Brook-side Alder	OBL		X
Amelanchier canadensis	Canada Serviceberry	FAC	X	
Aspen atrovirens	Red Chokeberry	FACW	X	X
Baccharis halimifolia	Groundsel Bush	FACW-	X	X
Cephalanthus occidentalis	Butterbush	OBL	X	X
Cornus amomum	Silky Dogwood	FACW	X	X
Cornus stolonifera	Red-osier Dogwood	FAC	X	X
Hamelis virginiana	American Witchhazel	FAC-	X	
Ilex verticillata	Common Winterberry	FACW+	X	X
Ilex virginica	Virginia Willow	OBL	X	X
Iva frutescens	Marsh Elder	FACW+	X	X
Leucothoe racemosa	Fetter-bush	FACW	X	X
Lindera benzoin	Spicebush	FACW-	X	X
Lycia ligustrina	Maiberry	FACW	X	X
Magnolia virginiana	Sweetbay Magnolia	FACW+	X	X
Physocarpus opulifolius	Eastern Ninebark	FACW-	X	X
Sambucus canadensis	American Elder	FACW-	X	X
Vaccinium corymbosum	Highbush Blueberry	FACW-	X	X
Viburnum dentatum	Arrow-wood	FAC	X	
Viburnum prunifolium	Black-haw	FACU	X	

NOTE:
1. REFER TO MVP-ES11.8 AND MVP-ES11.9 FOR LOCATIONS OF BARE ROOT PLANTINGS.

DRAWN	DATE		ENVIRONMENTAL DETAIL	
CHECKED	DATE			
APPROVED	DATE 06/11/17			
SCALE	N.T.S. SHEET 1 OF 1			
JOB NO.				
PROJECT ID:		DESIGN ENGINEERING	DRAWING NO. MVP-ES11.6	REV. 0
MVP - VA PORTION				


DRAWN	DATE		ENVIRONMENTAL DETAIL	
CHECKED	DATE			
APPROVED	DATE 06/11/17			
SCALE	N.T.S. SHEET 1 OF 1			
JOB NO.				
PROJECT ID:		DESIGN ENGINEERING	DRAWING NO. MVP-ES11.7	REV. 0
MVP - VA PORTION				

Species for Hydroseed mixes within the Jefferson National Forest.			
Scientific Name	Common Name	Growth Habit	pH Preference
Non-native Species for Temporary Erosion Control			
<i>Lolium perenne</i> subsp. <i>multiflorum</i>	Italian ryegrass; Annual ryegrass	Graminoid	5.0 – 7.9
<i>Urochloa ramosa</i> (<i>Panicum ramosum</i>)	Browntop millet	Graminoid	5.5 – 6.9
<i>Sescale cereale</i>	Cereal rye	Graminoid	5.2 – 8.0
<i>Setaria italica</i>	Foxtail millet	Graminoid	5.3 – 6.9
Native – Highly Preferred			
<i>Sorghastrum nutans</i>	Indiangrass	Graminoid	5.0 – 7.5
<i>Tridens flavus</i>	Purpletop	Graminoid	4.5 – 6.5
Native – Preferred			
<i>Agrostis perennans</i>	Autumn bentgrass; Upland bentgrass	Graminoid	5.5 – 7.5
<i>Dichanthelium clandestinum</i>	Deerfongue	Graminoid	4.0 – 7.5
<i>Elymus canadensis</i>	Canada wildrye	Graminoid	5.0 – 7.9
<i>Desmodium canadense</i>	Showy ticktrefoil	Forb	wide tolerance
<i>Helipopsis hellanroides</i>	Oxeye sunflower; Smooth oxeye	Forb	unknown
<i>Lespedeza virginica</i>	Slender bushclover; Slender lespedeza	Forb	acid tolerant
<i>Liabris spicata</i>	Dense blazing star; Spiked gayfeather	Forb	5.6 – 7.5
<i>Senna hebecarpa</i>	Wild senna; American senna	Forb	unknown
Native – Moderately Preferred			
<i>Panicum virgatum</i>	Switchgrass	Graminoid	4.5 – 8.0
<i>Chamaecrista fasciculata</i>	Partridge pea	Forb	5.5 – 7.5
<i>Rudbeckia hirta</i>	Blackeyed Susan	Forb	6.0 – 7.0

Name	Ph preference	Wetland Indicator Status
Annual Ryegrass (<i>Lolium Multiflorum</i> (L. perenne var. <i>Italicum</i>))	5.0–7.9	NI/moderate
German/Foxtail Millet (<i>Setaria Italica</i>)	5.3–6.9	FACU
Cereal Rye (<i>Secale cereale</i>)	5.2–8.0	NI/damp
Browntop Millet (<i>Panicum ramosum</i>) (introduced in VA & south; possibly ok for WV?)	5.5–6.9	FACU

NOTES:

- 1): A MINIMUM OF (2) OF THE ABOVE LISTED SPECIES SHALL BE UTILIZED
- 2): APPLY WHENEVER EROSION CONTROL IS NEEDED OUTSIDE OF NORMAL (PERMANENT) SEEDING SEASONS
- 3): APPLY CONCURRENT WITH PERMANENT EROSION CONTROL
- 4): APPLY PRIOR TO PERMANENT SEEDING WITH WILDLIFE MIXES

DRAWN	DATE		ENVIRONMENTAL DETAIL US FOREST SERVICE (NATIONAL FOREST) LANDS TEMPORARY EROSION CONTROL SPECIFICATIONS
CHECKED	DATE		
APP'D	DATE 06/11/77		
SCALE N.T.S.	SHEET 1 OF 1		
PROJECT ID:		DESIGN ENGINEERING	DRAWING NO. MVP-ES12.4 REV.
MVP – VA PORTION			

MVP-ES13 Cofferdam Stream Crossing Method

STREAM

TEMPORARY COFFERDAM*

BRIDGE ABUTMENT, STREAMBANK REHAB, ETC.

PA DEP

* Sandbags (Standard Construction Detail #3-15), Jersey barriers (Figure 3.13) or other non-errosive material, no earth fill.

DRAWN	DATE	 DESIGN ENGINEERING	ENVIRONMENTAL DETAIL
CHECKED	DATE 06/11/17		COFFERDAM STREAM CROSSING METHOD
APP'D	DATE		
SCALE	N.T.S.		
JOB NO.	SHEET 1 OF 1		
PROJECT ID:		DRAWING NO.	REV.
MVP - VA PORTION		MVP-ES13.1	


FIGURE 3.13
Jersey Barrier Cofferdam - End View

NOTES: AT NO TIME, SHOULD MORE THE 60% OF THE STREAM CHANNEL WIDTH BE DIVERTED DURING PIPELINE INSTALLATION.

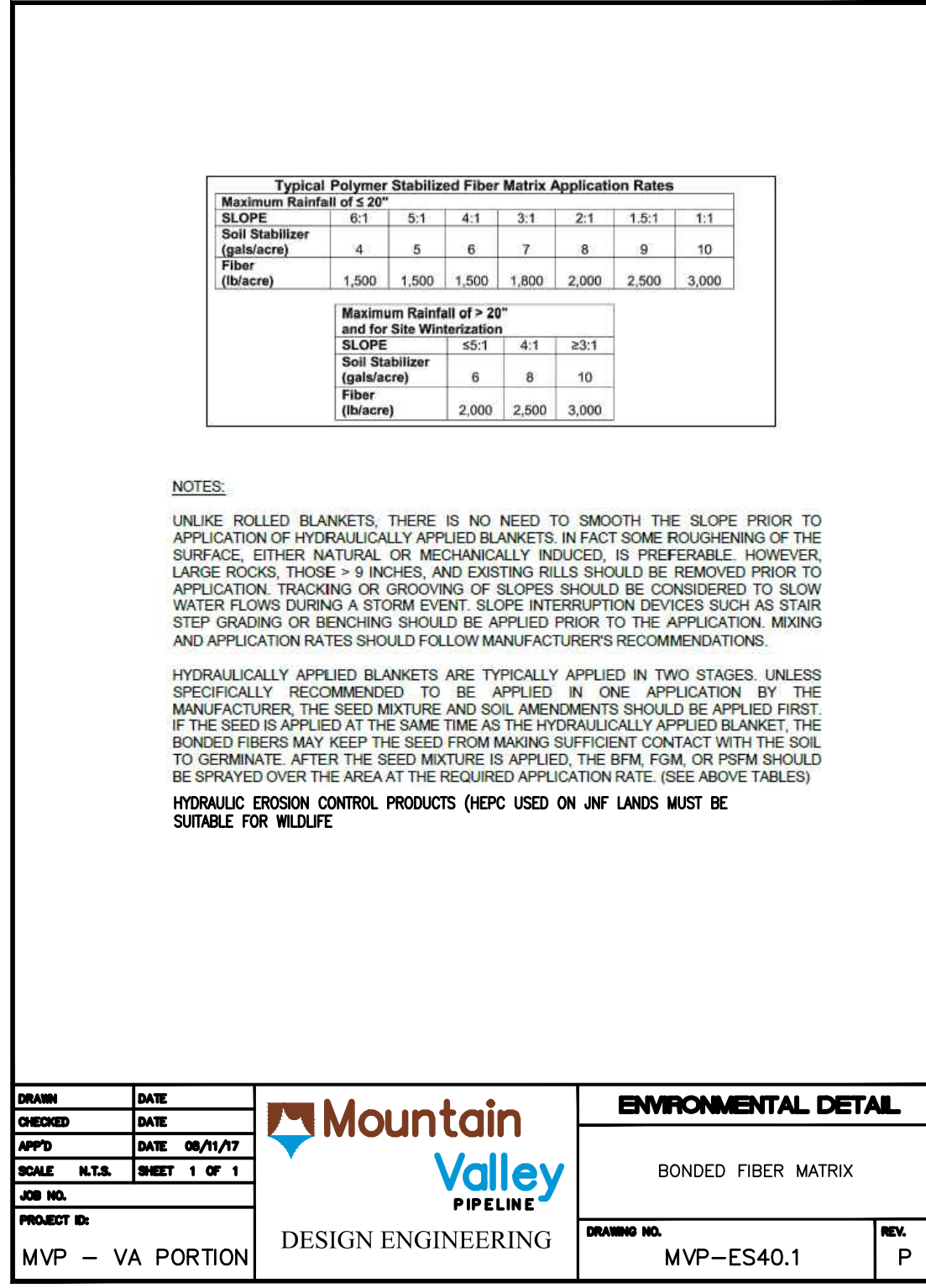
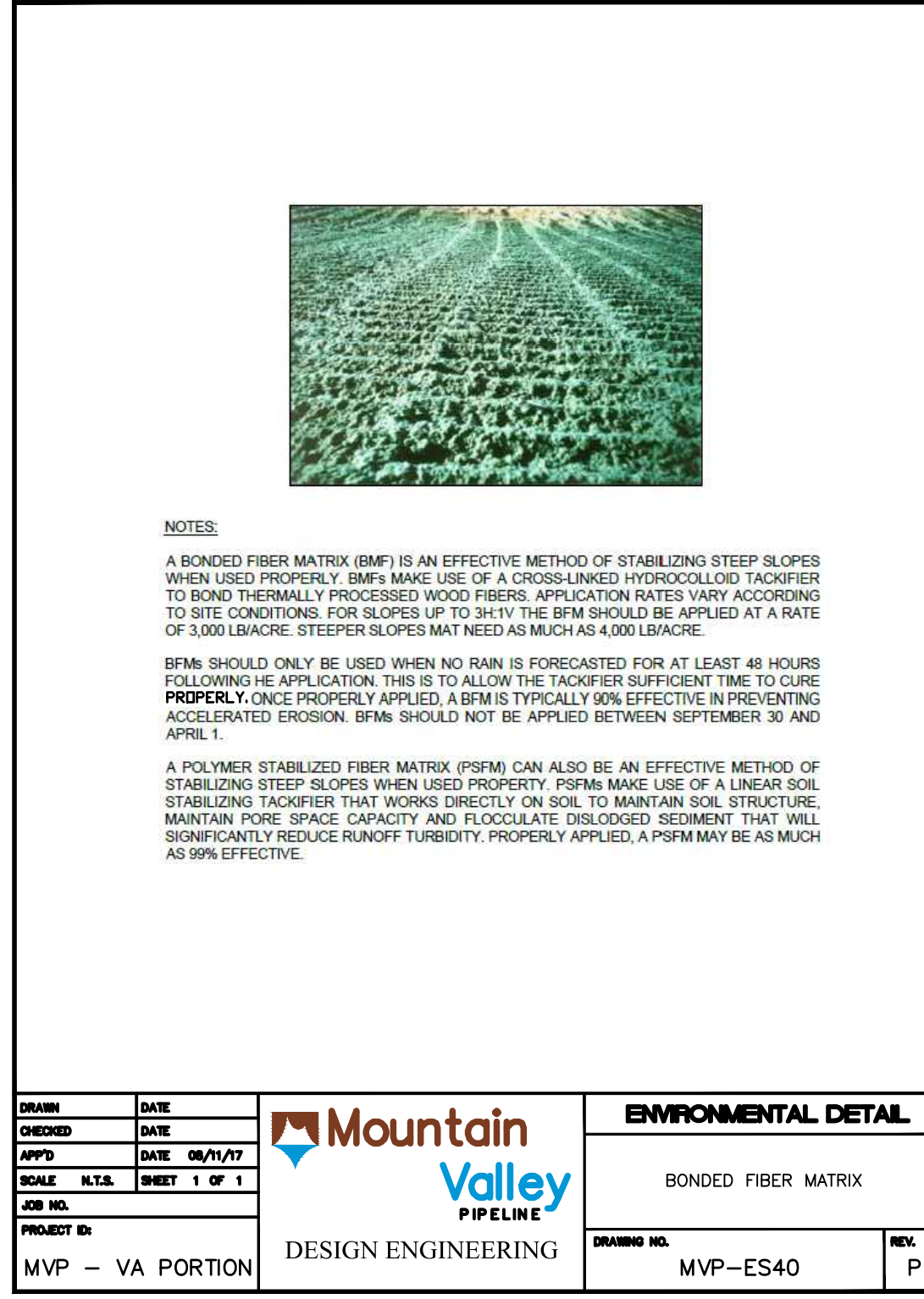
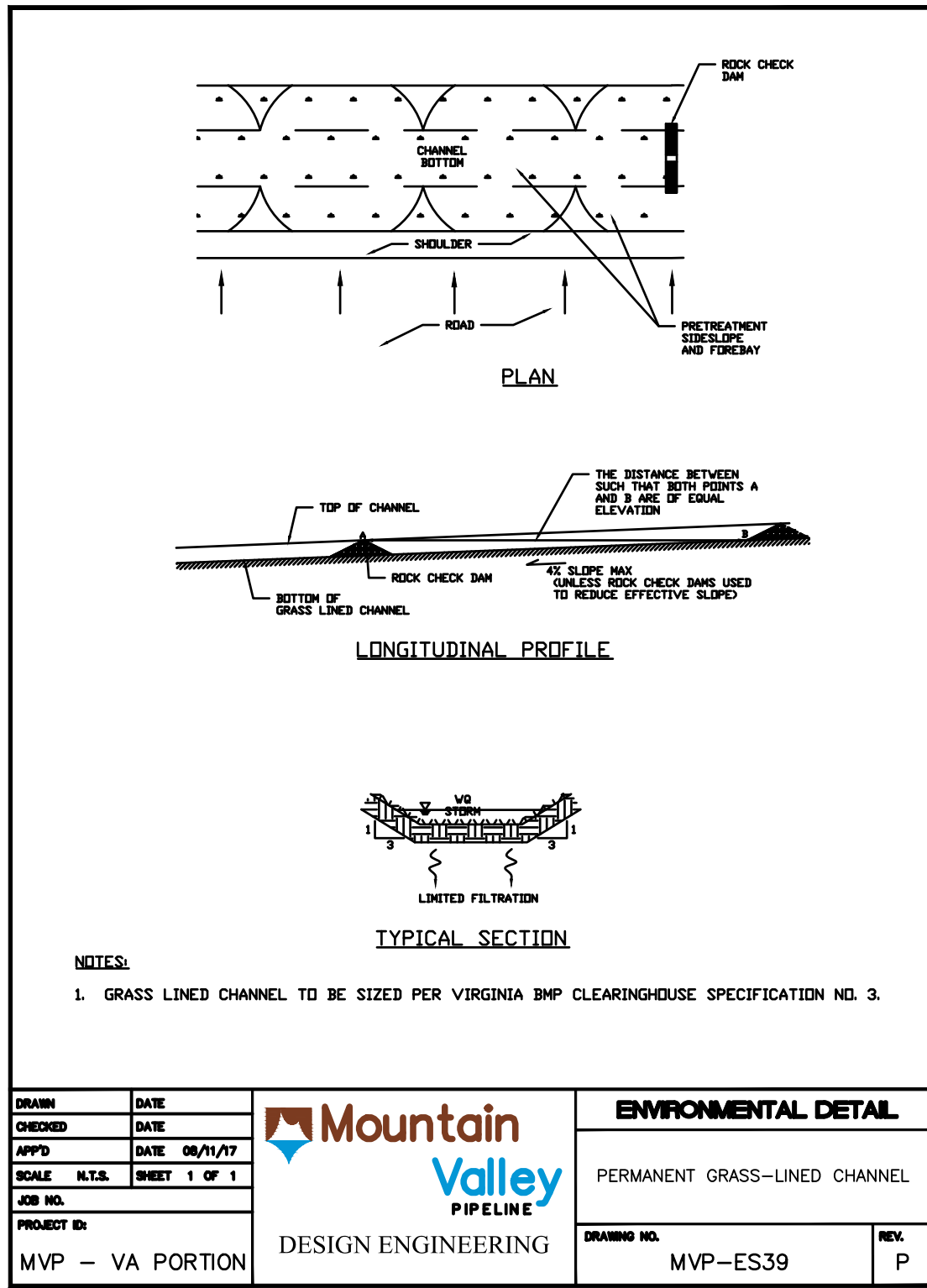
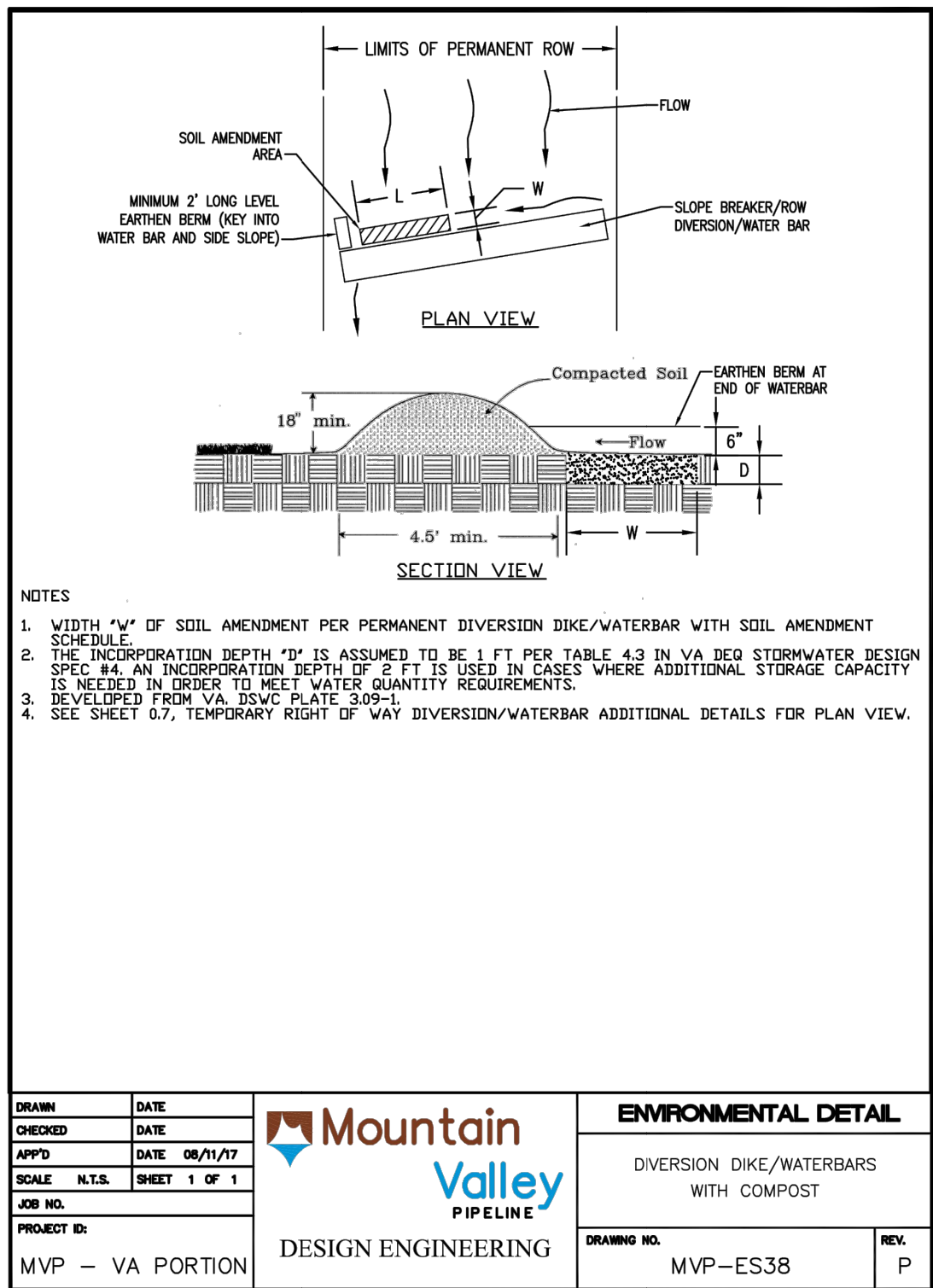
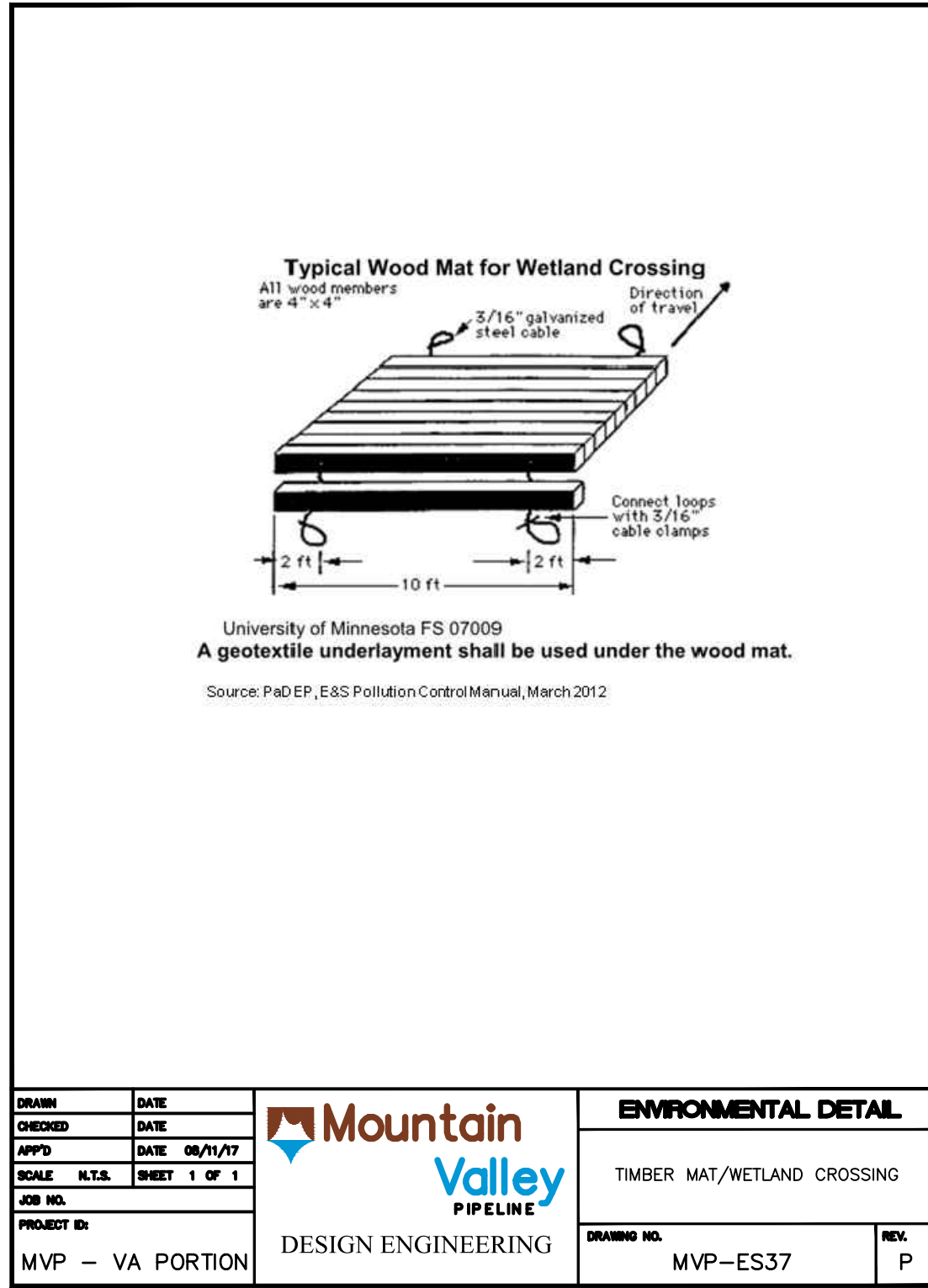
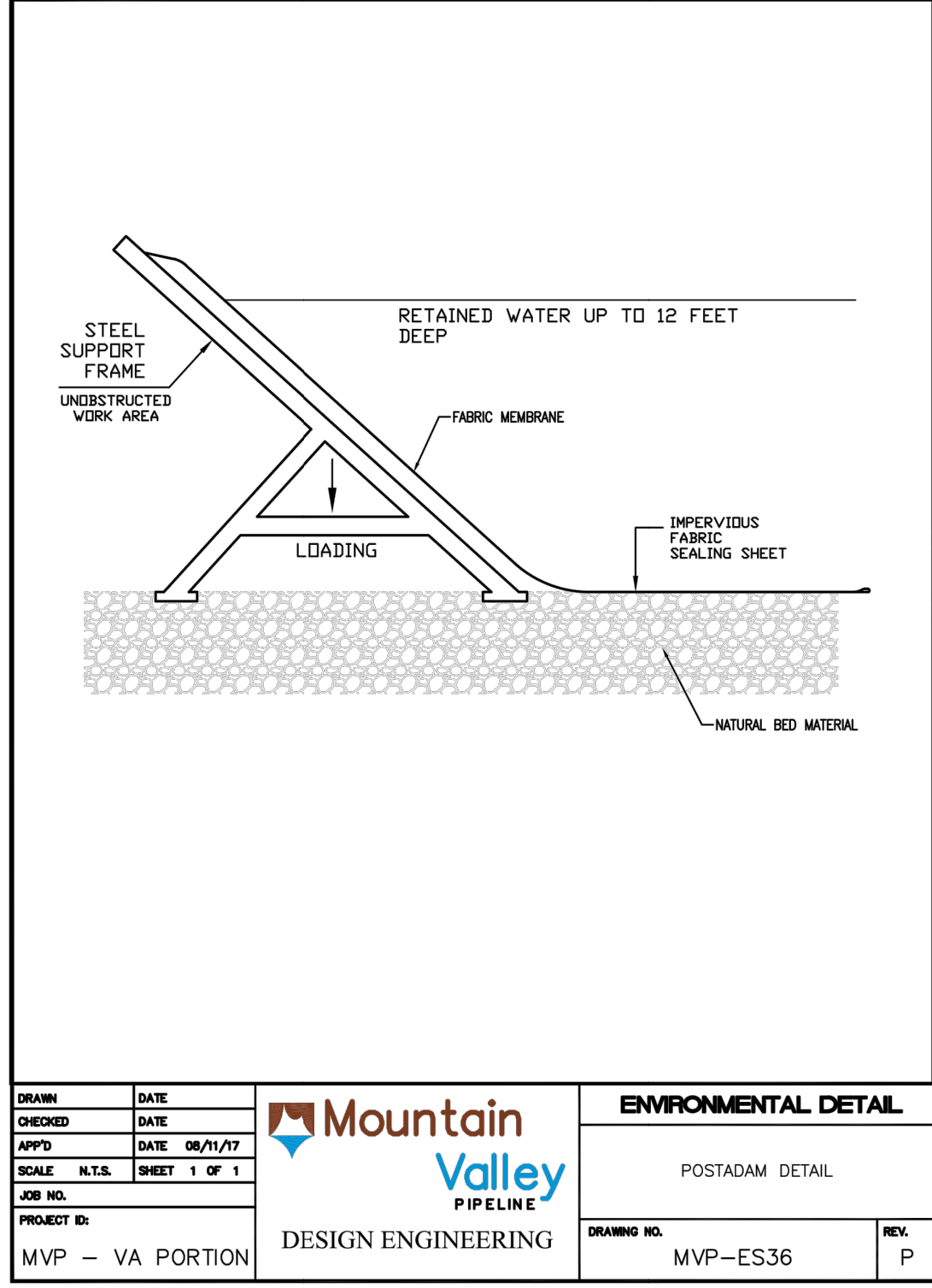
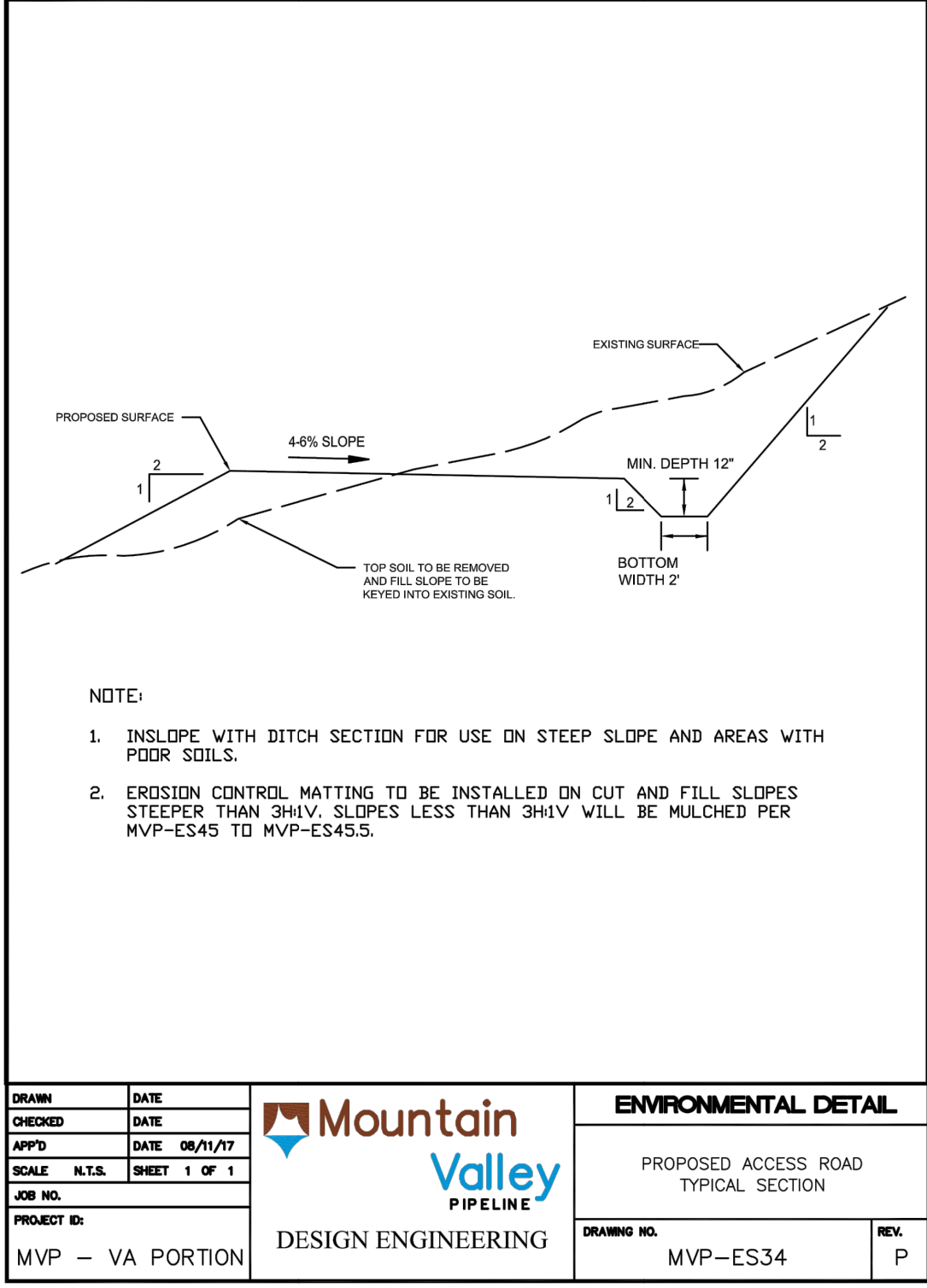
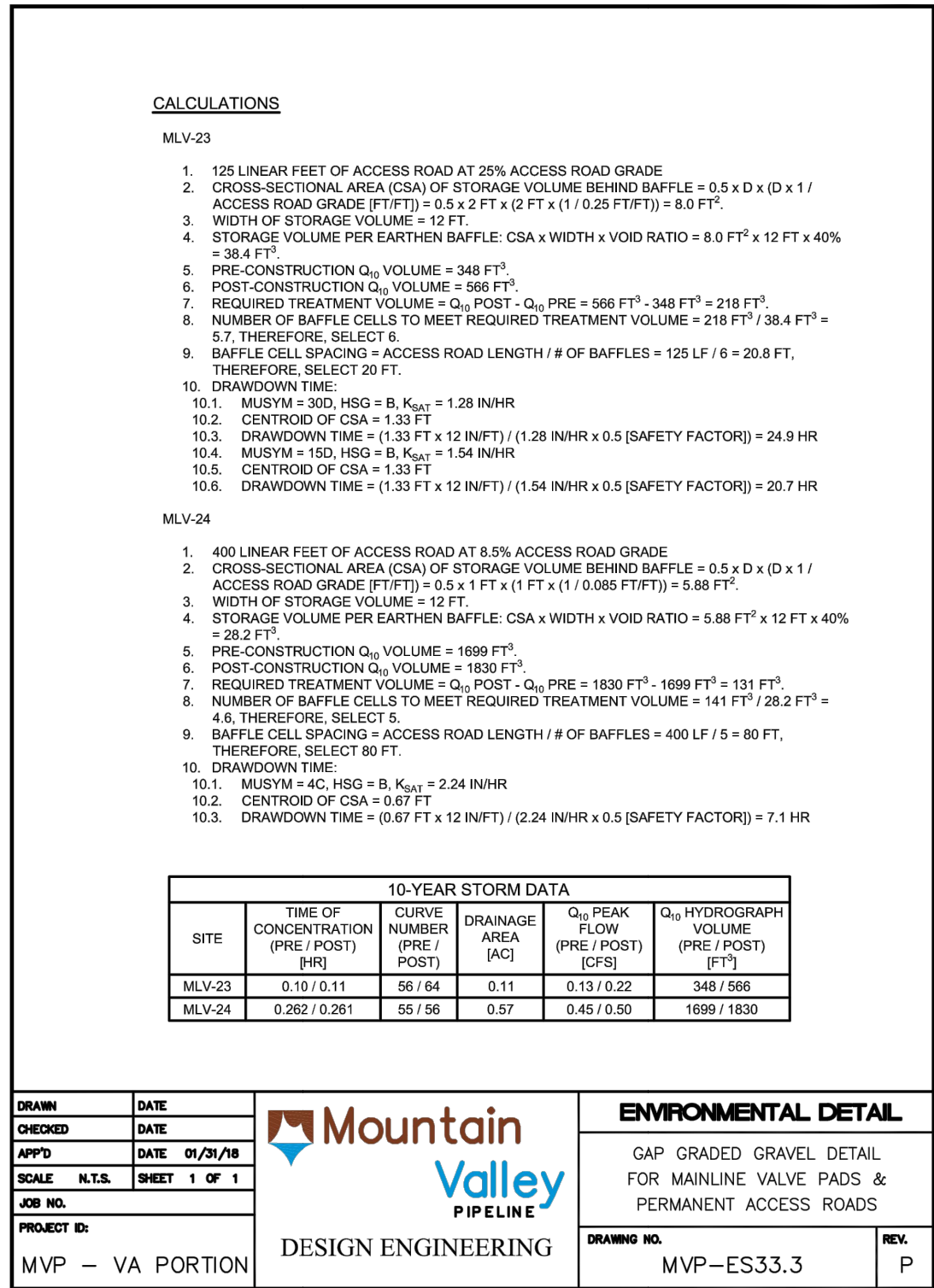
GRUBBING SHALL NOT TAKE PLACE WITHIN 50 FEET OF TOP-OF-BANK UNTIL ALL MATERIALS REQUIRED TO COMPLETE CROSSING ARE ON SITE AND PIPE IS READY FOR INSTALLATION. TRENCH BREAKERS SHALL BE INSTALLED WITHIN THE TRENCH ON BOTH SIDES OF THE STREAM CHANNEL. (MVP TYPICAL DETAIL MVP-20). WATER ACCUMULATING WITHIN THE WORK AREA SHALL BE PUMPED TO A PUMPED WATER FILTER BAG OR SEDIMENT TRAP PRIOR TO DISCHARGING INTO ANY RECEIVING SURFACE WATER.

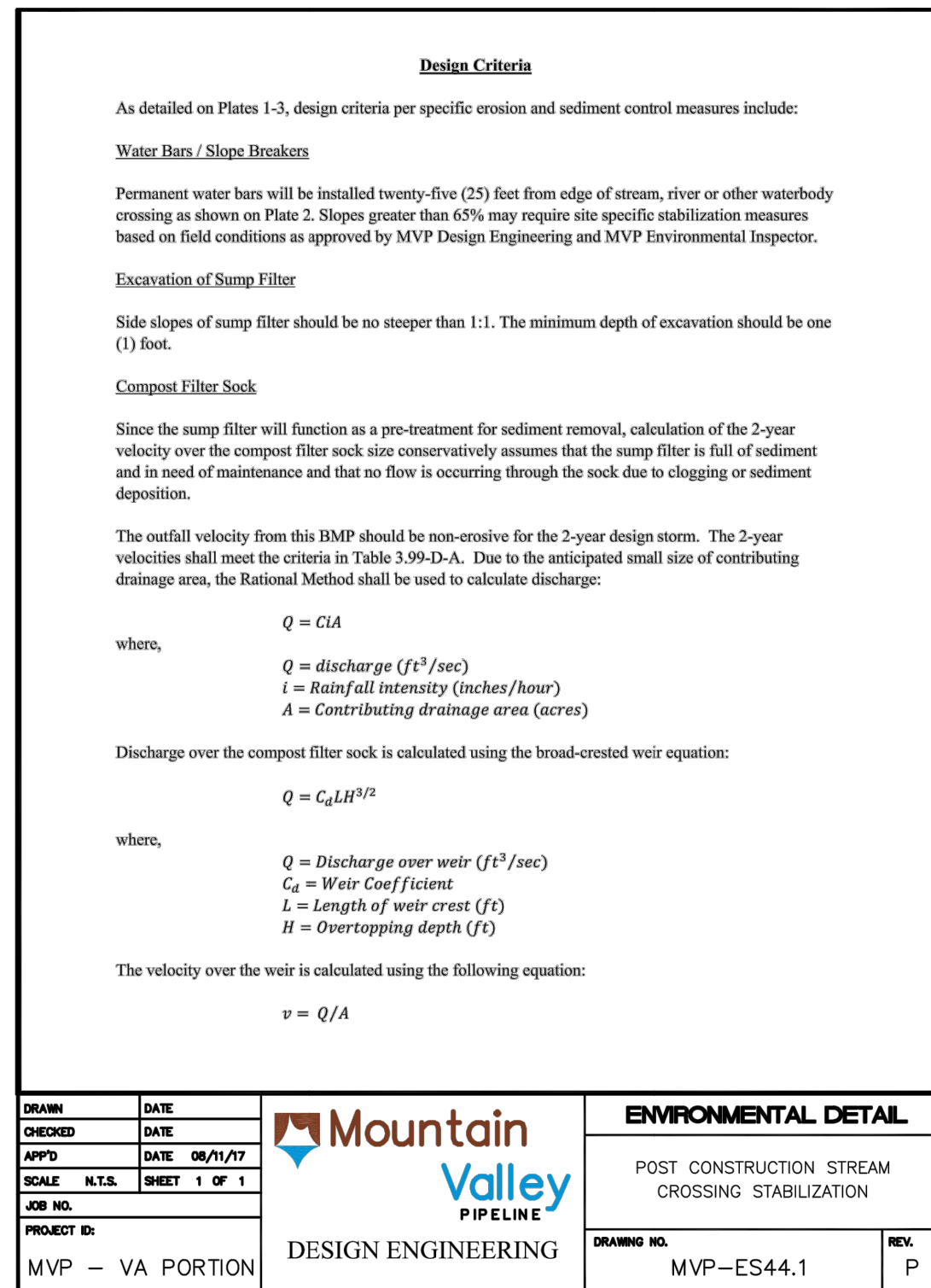
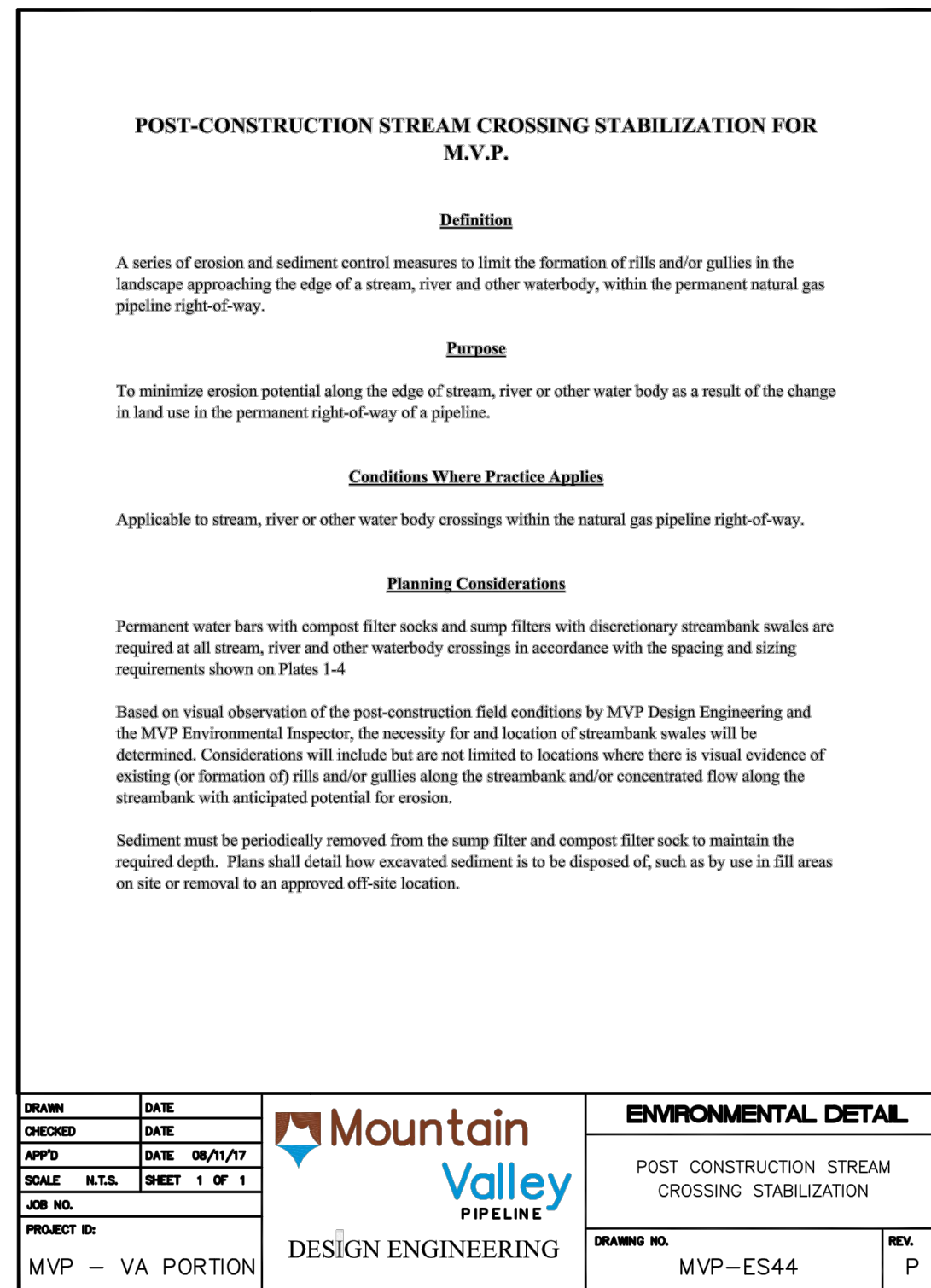
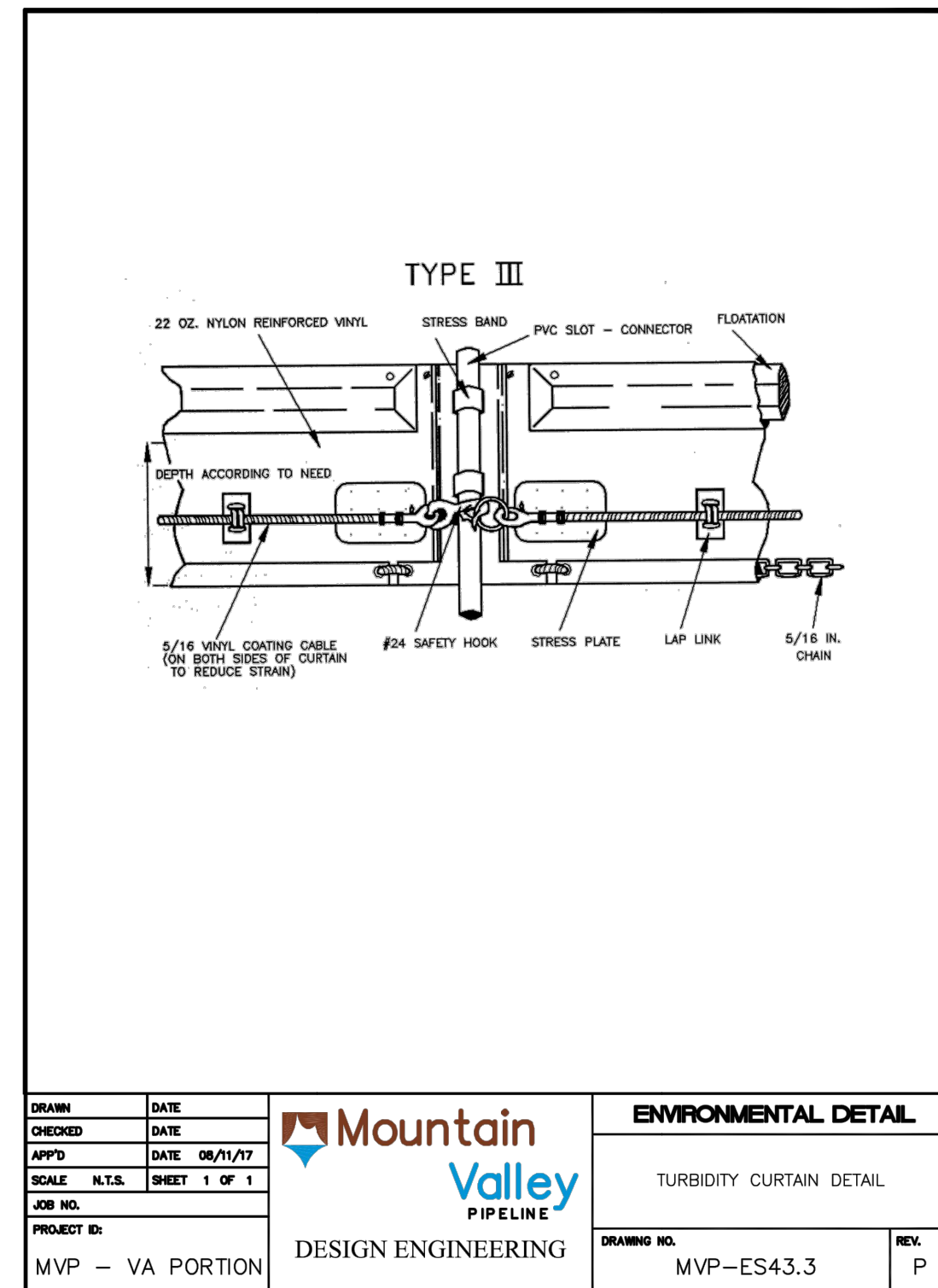
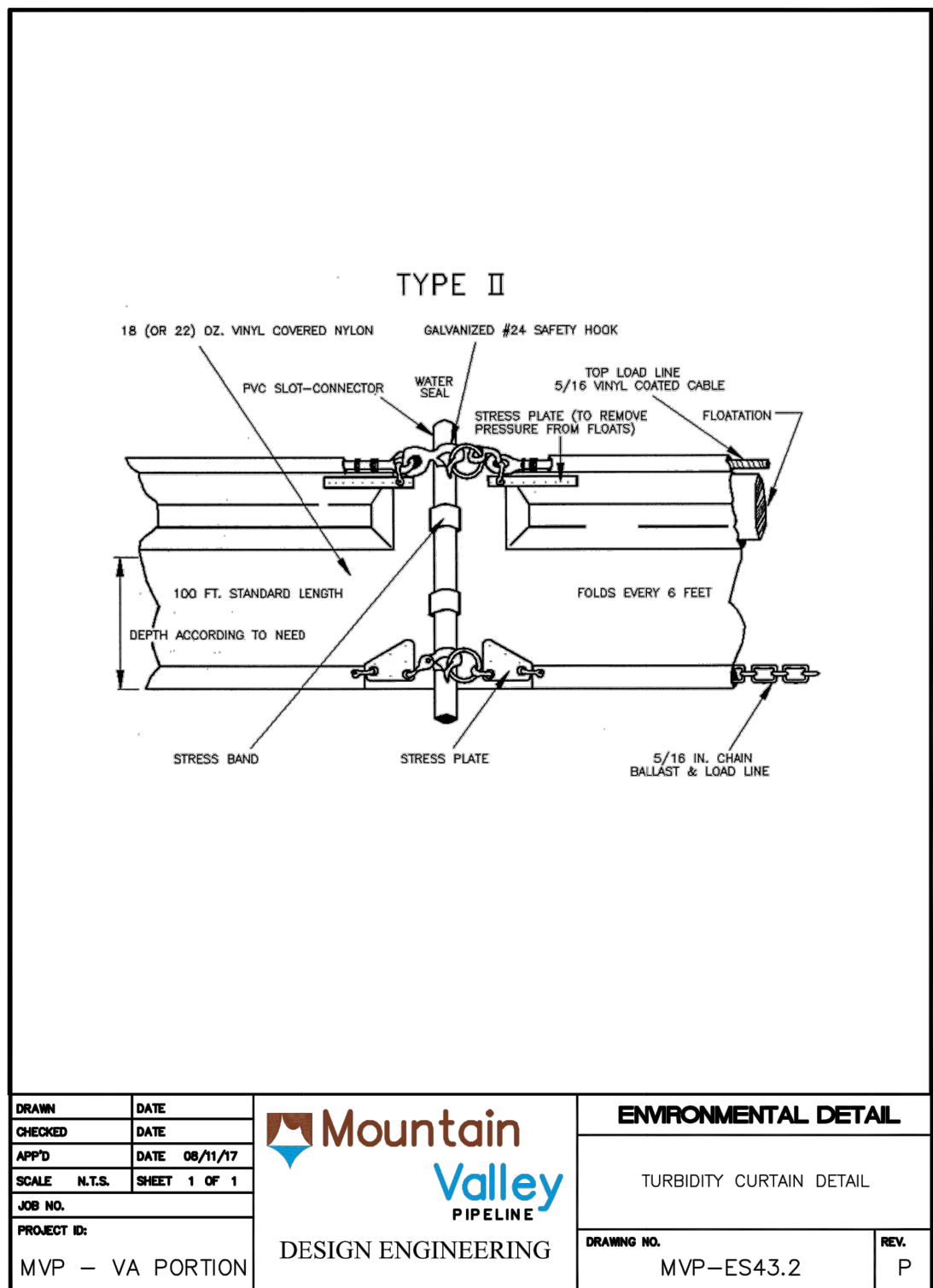
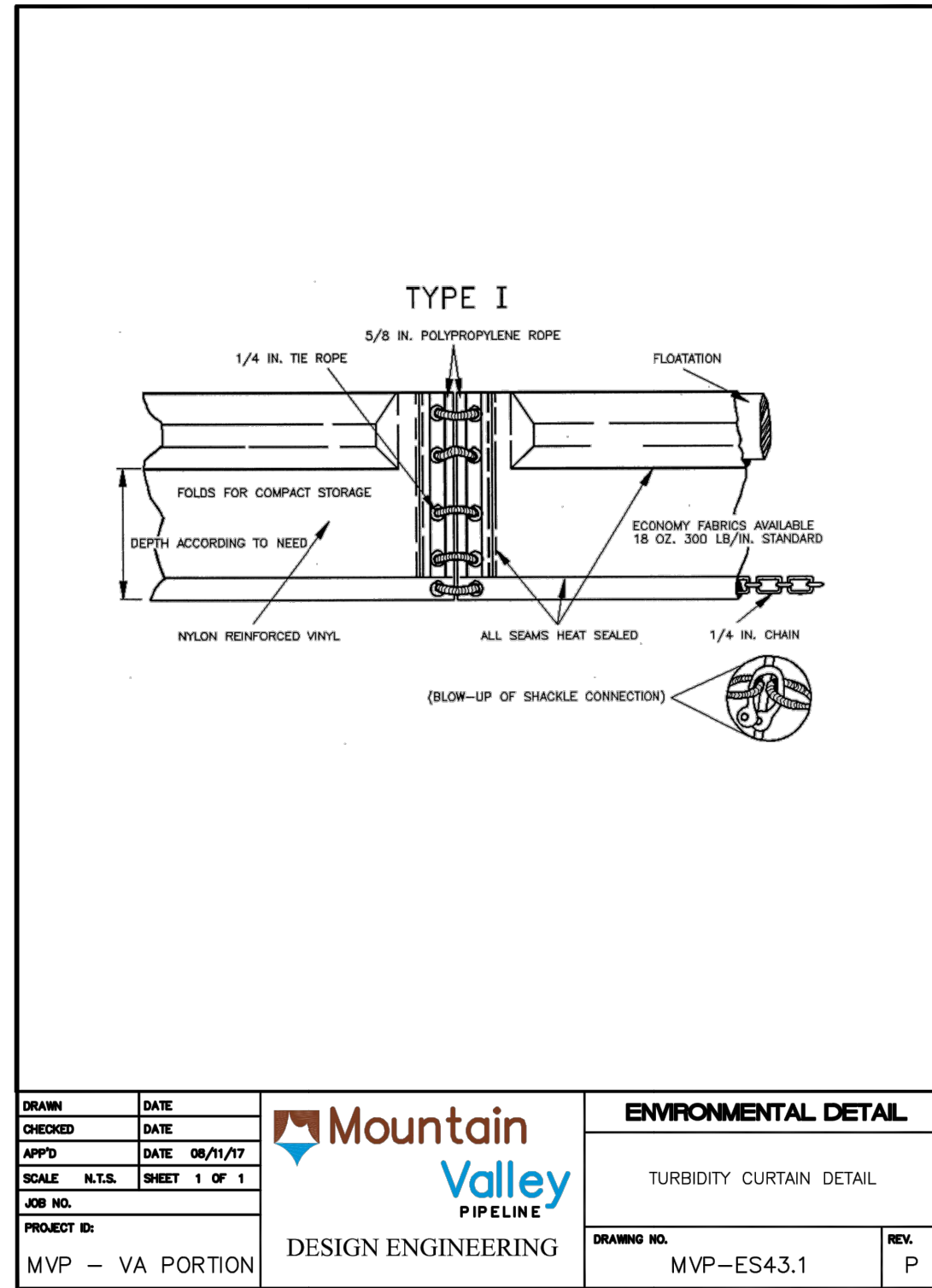
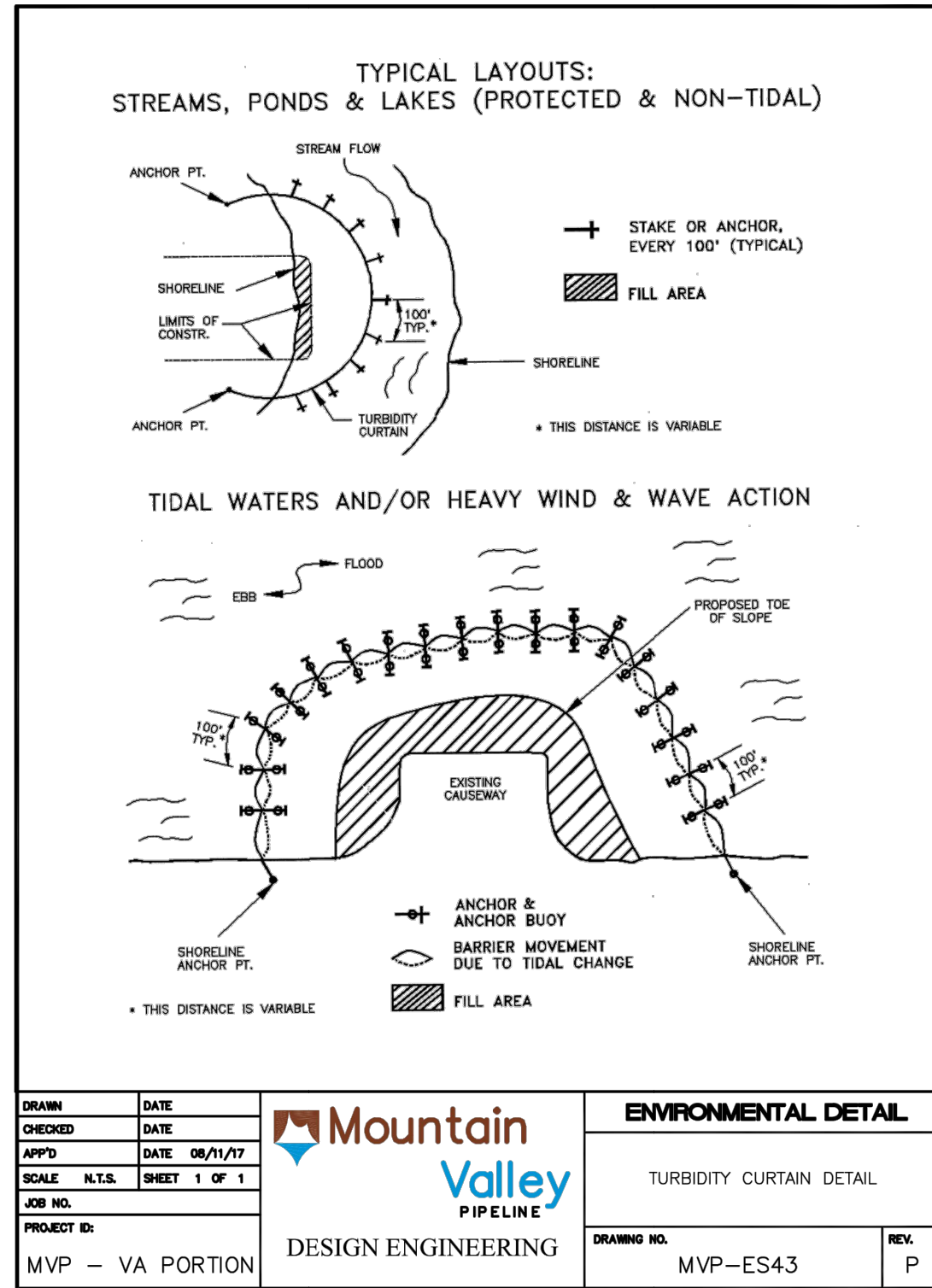
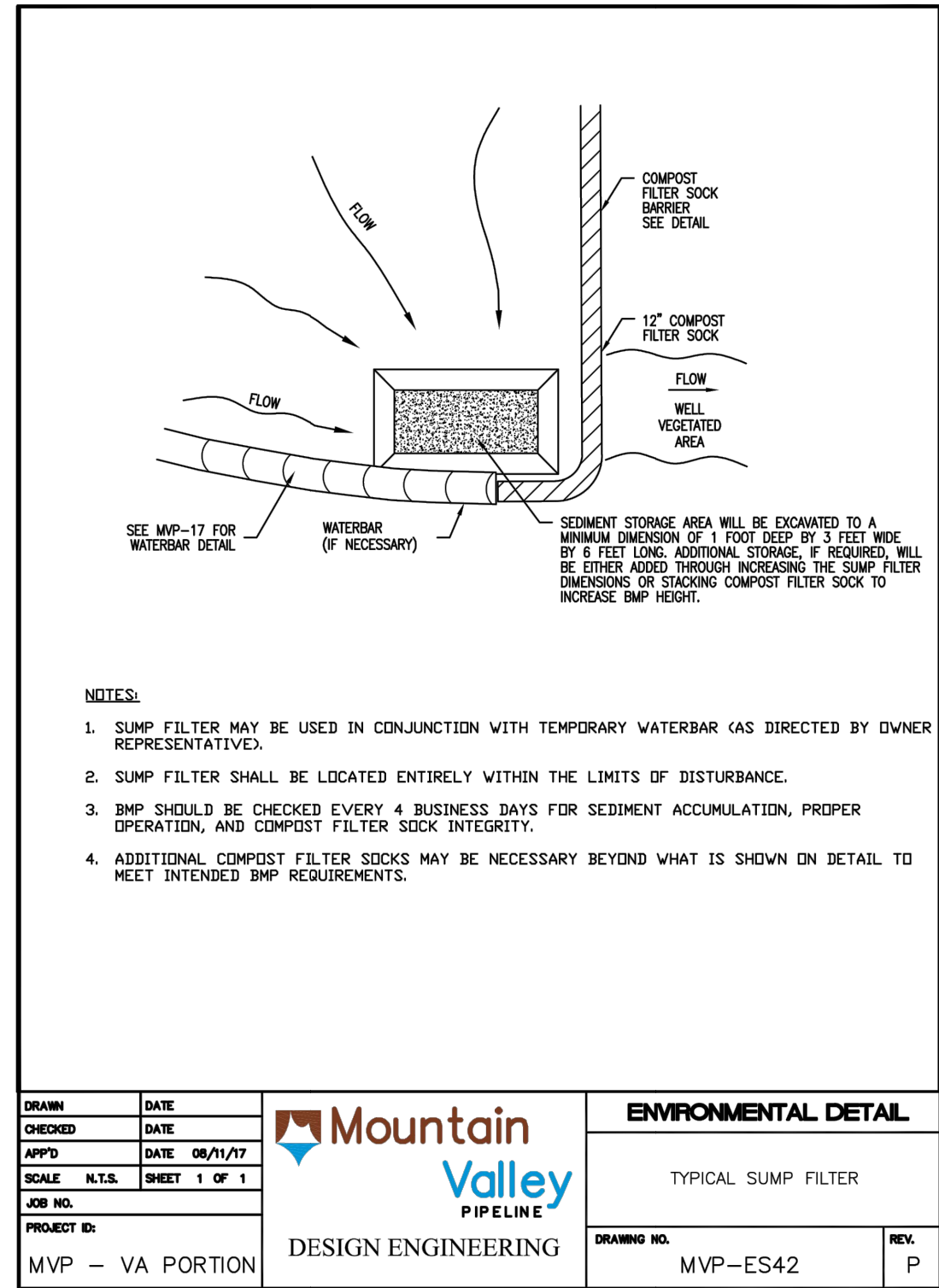
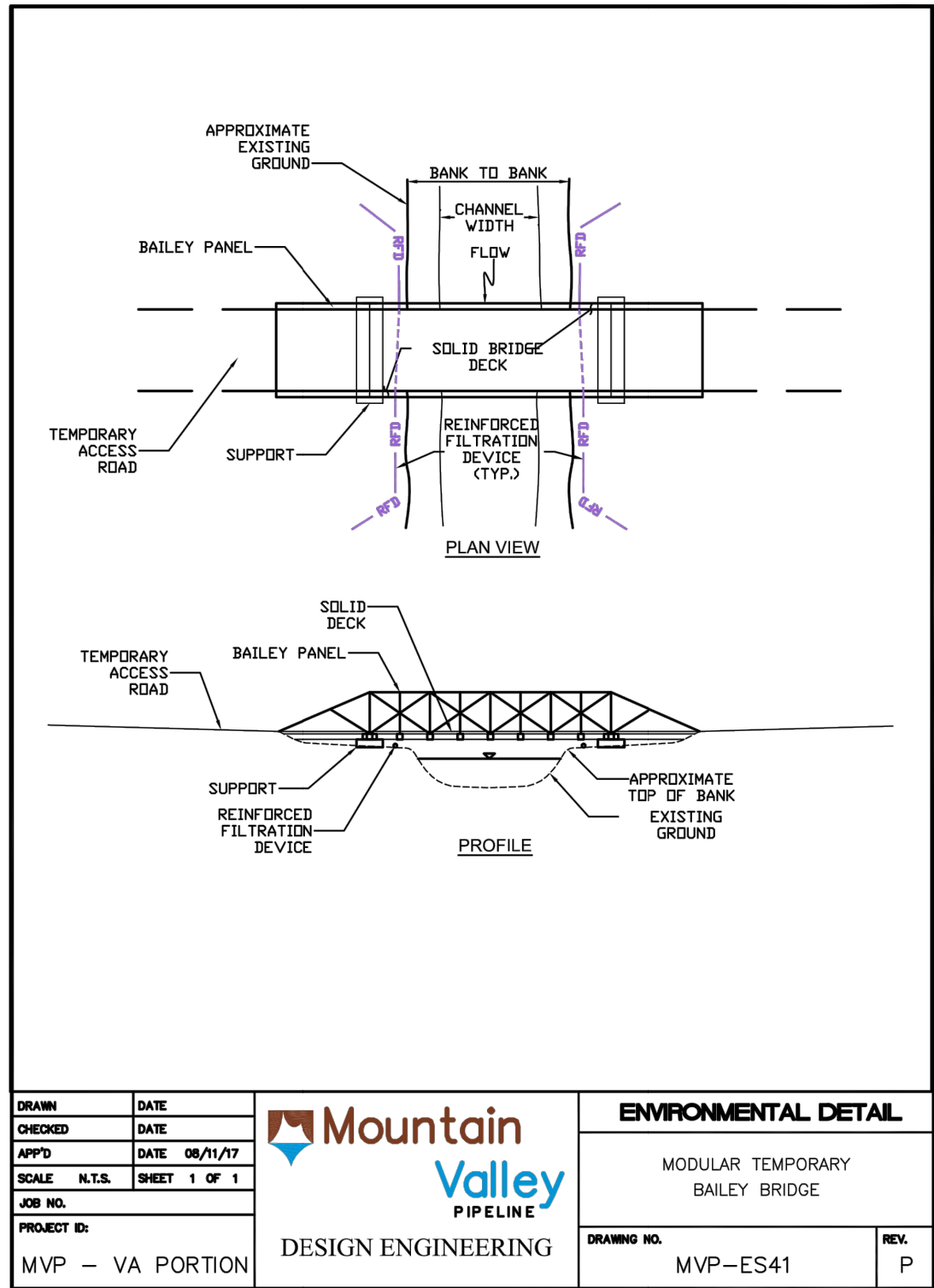
HAZARDOUS OR POLLUTANT MATERIAL STORAGE AREAS SHALL BE LOCATED AT LEAST 100 FEET BACK FROM THE TOP OF STREAMBANK. ALL EXCESS EXCAVATED MATERIAL SHALL BE IMMEDIATELY REMOVED FROM THE STREAM CROSSING AREA.





ALL DISTURBED AREAS WITHIN 50 FEET OF TOP-OF-BANK SHALL BE BLANKETED OR MATTED WITHIN 24 HOURS OF INITIAL DISTURBANCE FOR MINOR STREAMS OR 48 HOURS OF INITIAL DISTURBANCE FOR MAJOR STREAMS UNLESS OTHERWISE AUTHORIZED.

DRAWN	DATE	 Mountain Valley PIPELINE	ENVIRONMENTAL DETAIL COFFERDAM STREAM CROSSING METHOD
CHECKED	DATE		
APP'D	DATE 06/11/17		
SCALE N.T.S.	SHEET 1 OF 1		
PROJECT ID:		DESIGN ENGINEERING	DRAWING NO. MVP-ES13.2
MVP - VA PORTION			RE

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<div><div></div><div><div>EROSION AND SEDIMENT CONTROL PLANS</div><div>MOUNTAIN VALLEY PIPELINE PROJECT – H600 LINE</div></div></div>										<div><div><div>7</div><div>01/31/18</div><div>KAL</div><div>RE</div><div>DW</div></div><div><div>6</div><div>01/26/18</div><div>KAL</div><div>RE</div><div>DW</div></div><div><div>5</div><div>01/08/18</div><div>KAL</div><div>RE</div><div>DW</div></div><div><div>4</div><div>11/28/17</div><div>KAL</div><div>RE</div><div>DW</div></div><div><div>3</div><div>11/01/17</div><div>KAL</div><div>RE</div><div>DW</div></div><div><div>2</div><div>08/18/17</div><div>KAL</div><div>RE</div><div>DW</div></div></div> <div><div>NO.:</div><div>DATE:</div><div>DWN.:</div><div>CHKD.:</div><div>APPD.:</div></div> <div>DESCRIPTION:</div>									
<div><div></div><div><div>TETRA TECH</div><div>complex world CLEAR SOLUTIONS™</div></div><div><div>661 ANDERSEN DRIVE</div><div>FOSTER PLAZA 7</div><div>PITTSBURGH, PA 15220</div></div></div>										<div><div>MOUNTAIN VALLEY PIPELINE, LLC</div><div>555 SOUTHPOINTE BOULEVARD, SUITE 200</div><div>CANONSBURG, PA 15317</div></div>									
<div><div>GENERAL DETAILS SET</div></div>																			
<div><div><div><div>COMMONWEALTH OF VIRGINIA</div><div>DAVID J. WALLNER</div><div>Lic. No. 0402057593</div><div></div><div>PROFESSIONAL ENGINEER</div></div></div></div>																			
DRAWN BY:										KAL									
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where,

$v = \text{Velocity (ft/sec)}$
 $Q = \text{Discharge over weir (ft}^3\text{/sec)}$
 $A = \text{Flow area over weir (ft}^2\text{)}$


Soil Types	Corrected Permissible Velocities (ft/sec.)
Fine Sand (noncolloidal)	2.0
Sandy Loam (noncolloidal)	2.0
Silt Loam (noncolloidal)	2.4
Ordinary Firm Loam	2.8
Fine Gravel	4.0
Stiff Clay (very colloidal)	4.0
Graded, Loam to Cobbles (noncolloidal)	4.0
Graded, Silt to Cobbles (colloidal)	4.4
Alluvial Silts (noncolloidal)	4.4
Alluvial Silts (colloidal)	4.0
Coarse Gravel (noncolloidal)	4.8
Cobbles and Shingles	4.4
Shales and Hard Pans	4.8

NOTE: Correction factor value = 0.8 for flow depths less than one foot has been applied to original table.
Source: Chapter 5, Engineering Calculations: Table 5-22 and Plate 5-39, *Virginia Erosion and Sediment Control Handbook*, 3rd Ed., 1992.

Example
Given: A one-acre drainage area in Giles County, an 18-inch diameter compost filter sock with an effective level weir length of 8 feet, in a Sandy Loam soil installed per details in Plate 2.

Solution:

- Calculate the discharge:
 $Q = C/A = 0.9 \times 4.07 \text{ inches/hour} \times 1 \text{ acre} = 3.66 \text{ ft}^3/\text{sec}$
- Rearranging the weir equation to solve for overtopping depth:
 $H = (Q/(C_p \times L))^{2/3} = (3.66 \text{ ft}^3/\text{sec} / (2.99 \times 8 \text{ ft}))^{2/3} = 0.29 \text{ ft}$
- Calculate the velocity over the compost filter sock:


DRAWN	DATE		ENVIRONMENTAL DETAIL	
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SCALE N.T.S.	SHEET 1 OF 1			
JOB NO.		DESIGN ENGINEERING	DRAWING NO. MVP-ES44.2	REV. P
PROJECT ID: MVP - VA PORTION				

$v = Q/A = 3.66 \text{ ft}^3/\text{sec} / (0.29 \text{ ft} \times 8 \text{ ft}) = 1.60 \text{ ft/sec}$

4. Verify that the velocity is non-erosive in Table 3.99-D-A for Sandy Loam soil.
 $1.60 \text{ ft/sec} < 2.0 \text{ ft/sec}$

Streambank Swale
Minimum thickness (T, as shown on Streambank Swale Typical Cross Section on Plate 3) shall be two (2) times the D₅₀. For drainage areas one (1) acre or less, rock shall have a minimum D₅₀ = 6" and T = 12 inches for stream banks with a slope of 1:1 or flatter (i.e. S_w = 1.0 ft/ft). If the contributing drainage area is greater than one (1) acre or if the swale is steeper than 1:1 (1.0 ft/ft), the plans shall provide calculations to determine an appropriate size stone and minimum thickness. Rock may be salvaged on-site materials and may contain topsoil, fines, sand, gravel in a mix with at least 60% rock with a D₅₀ of at least 6".

Calculations (from VDOT Drainage Manual Appendix 7B-5)
Given: A one-acre drainage area in Giles County from previous example.
Solution:
CHANNEL DATA
 $Q = 3.66 \text{ (cfs)}$ $P = 3.02 \text{ (ft)}$ $n = 0.069$
 $S_w = 1.00 \text{ (ft/ft)}$ $R = 0.18 \text{ (ft)}$
 $d_s = 0.37 \text{ (ft)}$ $V_s = 6.81 \text{ (fps)}$
 $A = 0.54 \text{ (ft}^2\text{)}$ Side Slope = 4:1
ASSUMED ROCK SIZE - D50 = 0.5 ft
VERIFY ASSUMED ROCK SIZE
 $\phi = 41.2^\circ$ (Appendix 7B-1)
Side Slope = 4:1 $\phi = 14^\circ$
 $K_1 = [1 - (\sin^2 \phi / \sin^2 \phi)^{1.5}]$
 $K_1 = [1 - (\sin^2 14^\circ / \sin^2 41.5^\circ)^{1.5}]^{0.5} = 0.93$
For Specific Gravity = 2.65 and Stability Factor = 1.2
 $D50 = 0.001 \times V_s^2 / (d_m^{0.5} \times K_1^{1.5})$
 $D50 = 0.001 \times 6.81^2 / (0.5^{0.5} \times 0.93^{1.5}) = 0.45 \text{ ft}$
 $D50 \text{ Computed } (0.45) < D50 \text{ Assumed } (0.5)$
Therefore, assumed D50 is appropriate.

DRAWN	DATE		ENVIRONMENTAL DETAIL	
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SCALE N.T.S.	SHEET 1 OF 1			
JOB NO.		DESIGN ENGINEERING	DRAWING NO. MVP-ES44.3	REV. P
PROJECT ID: MVP - VA PORTION				

Construction Specifications

General

- All trees, brush, stumps, roots, obstructions and other unsuitable material shall be removed and disposed of properly.
- Disturbed areas will be returned to pre-construction contours. Topsoil shall be replaced in accordance with the Mountain Valley Pipeline Project Specific Standards and Specifications.
- Existing suitable stream substrate shall be salvaged and replaced to streambed at pre-construction contours.
- The swale shall be excavated or shaped to the proper grade and cross-section.
- Any excess soil shall be removed and disposed of properly.

Water Bars / Slope Breakers

- Water bars / slope breakers shall be installed in accordance with WATER BAR, TYPICAL SLOPE BREAKER (SB), Std. & Spec. MVP-17 and MVP-18.
- Permanent water bars are required at all stream, river and other waterbody crossings, as well as upslope from roadway and roadbed cut slopes.
- Construct permanent water bars with compost filter sock after completion of grading in accordance with the water bar spacing and sizing requirements shown on plan and in table on Plate 3.
- Water bar closest to stream top of bank shall be located twenty-five (25) feet maximum upslope from top of bank.
- Water bars shall have a slope of one to four percent.
- Water bars on retired roadways, skidtrails, and right-of-ways shall be left in place after permanent stabilization has been achieved.


Compost Filter Socks

- Compost filter socks shall be installed in accordance with COMPOST FILTER SOCK, Std. & Spec. MVP ES-3.
- Compost filter socks shall extend at least ten feet upslope from the uppermost limit of the sump filter.

Sump Filters

- Sump filters to be installed at end of water bars. Refer to sump filter detail on Plate 2.
- Sump filter shall be located entirely within the permanent right-of-way.
- Sediment storage area shall be excavated to a minimum dimension of one-foot-deep by three-feet-wide by six-feet-long. Additional storage, if required due to a larger contributing drainage area, will either be added through increasing the sump filter dimension or stacking compost filter sock to increase BMP height.

Streambank Swales
Streambank swales shall be installed at locations determined by MVP Design Engineering and the MVP Environmental Inspector based on their visual observation of the post-construction field conditions.

DRAWN	DATE		ENVIRONMENTAL DETAIL	
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SCALE N.T.S.	SHEET 1 OF 1			
JOB NO.		DESIGN ENGINEERING	DRAWING NO. MVP-ES44.4	REV. P
PROJECT ID: MVP - VA PORTION				


Locations shall include but are not limited to locations where there is visual evidence of formation of rills and/or gullies along the streambank and/or evidence of concentrated flow along the streambank with anticipated potential for erosion.

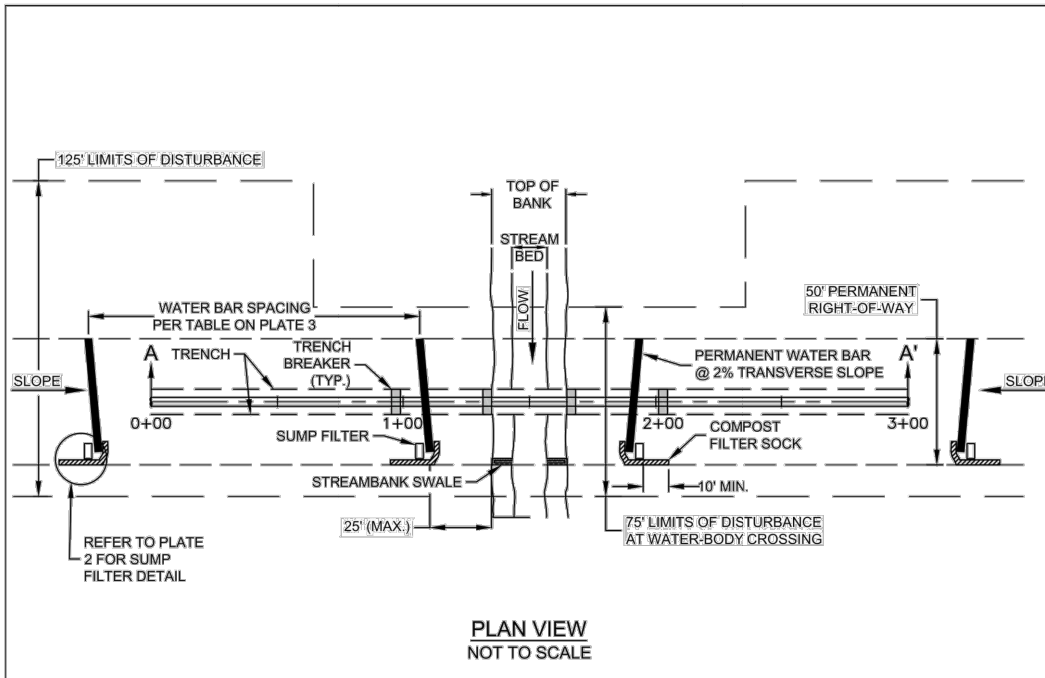
- On-site salvaged rock and/or riprap, if on-site rock is not salvageable, shall be installed in accordance with RIPRAP, Std. & Spec. 3.19.
- Erosion control fabric shall be installed along the edges of the riprap-lined channel as shown on Plate 3 in accordance with SOIL STABILIZATION BLANKETS AND MATTING, Std. & Spec. 3.36.

Inspections and Maintenance


- Inspections shall be conducted at a frequency of (i) at least once every four business days or (ii) at least once every five business days and no later than 48-hours following a measurable storm event.
- Damaged or eroded water bars shall be restored to original dimensions within 24-hours of inspection.
- Compost filter sock shall be inspected for sediment accumulation, integrity, and maintained as necessary. Accumulated sediment shall be removed when it reaches no more than half the aboveground height of the sock and disposed in the manner described elsewhere in the plan. Damaged socks shall be repaired according to manufacturer's specifications or replaced within 24 hours of inspection.
- Sump filter shall be inspected for sediment accumulation and proper operation. Sediment shall be removed and the sump filter restored to original dimensions when sediment has accumulated to half the design depth. Sediment removal from the sump shall be deposited in a suitable area and in such a manner that it will not erode and cause sedimentation problems.
- Streambank swales shall be inspected for integrity and proper operation. Damaged or eroded streambank swales shall be restored to original dimension within 24-hours of inspection.
- If during inspection, additional rills and/or gullies are observed, streambank swales shall be installed in accordance with the construction specifications herein at these locations within 24-hours of inspection.
- Maintenance of water bars, compost filter socks and sump filters shall be provided until roadway, skidtrail, or right-of-way has achieved permanent stabilization.

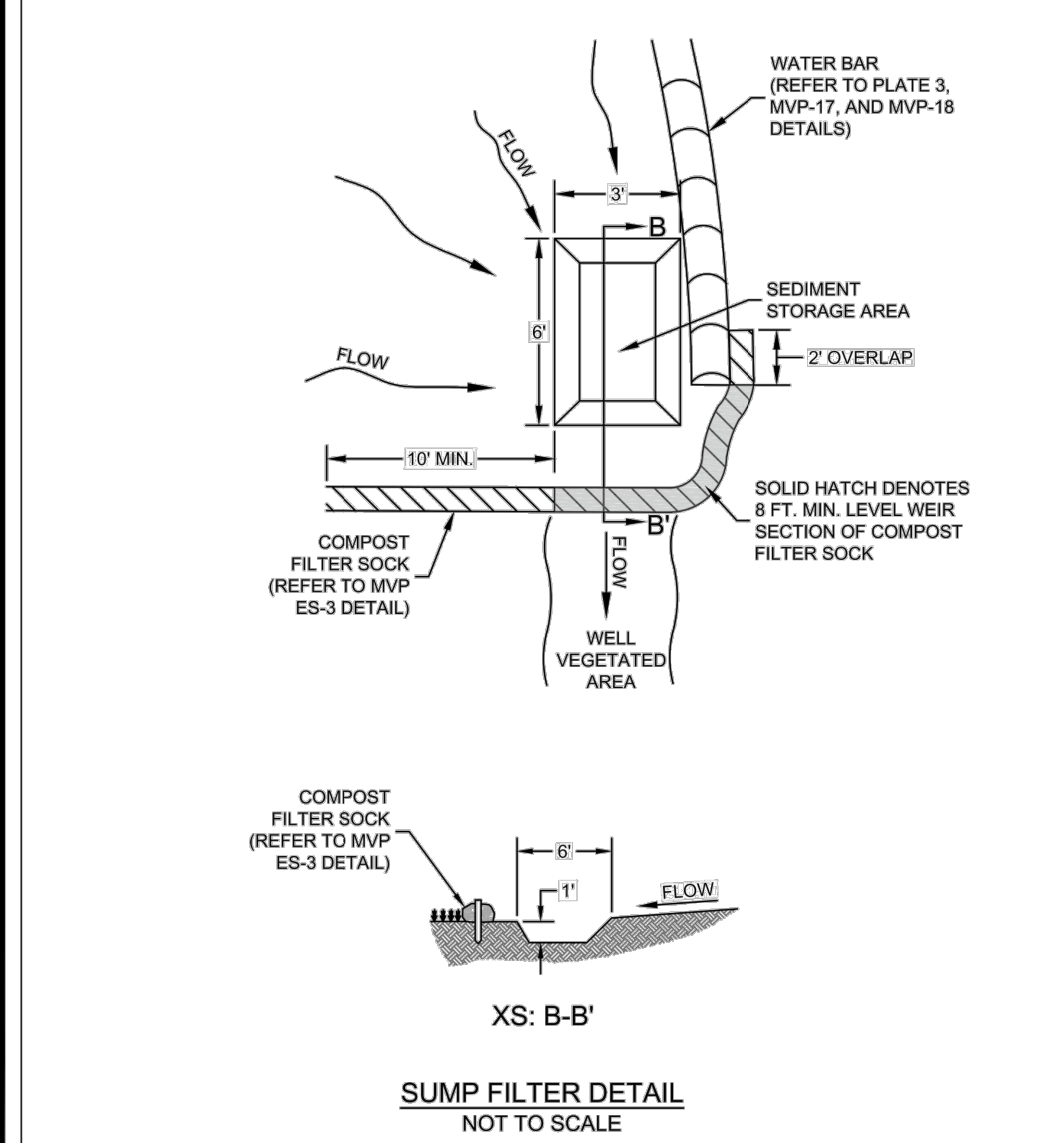
Post Stabilization
Once permanent stabilization has been achieved, sediment storage should be seeded with permanent seed mix in accordance with the Mountain Valley Pipeline Project Specific Standards and Specifications. Compost filter socks shall remain to decompose in place and streambank swales shall remain in place.

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JOB NO.		DESIGN ENGINEERING	DRAWING NO. MVP-ES44.5	REV. P
PROJECT ID: MVP - VA PORTION				




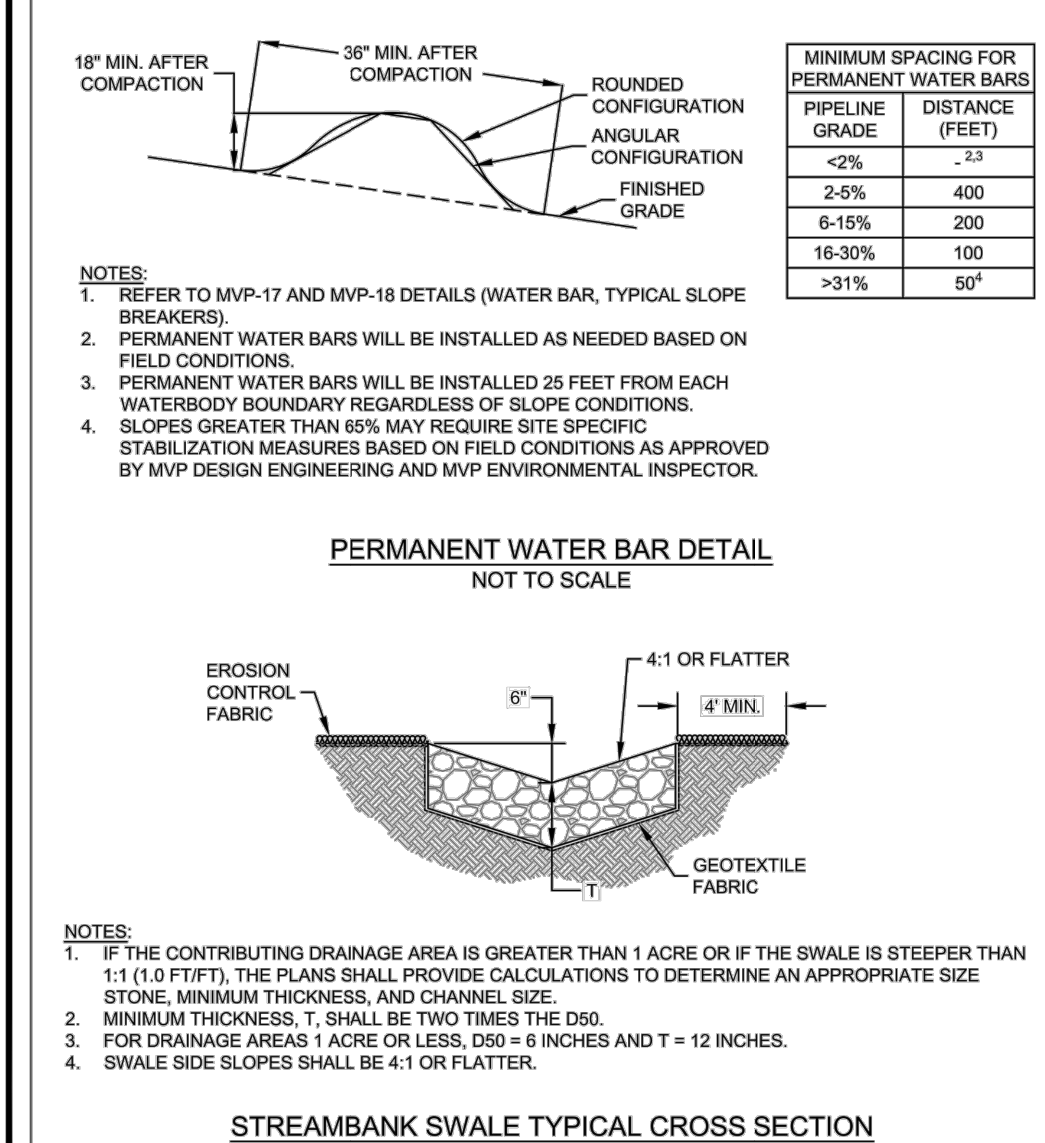
PLAN VIEW
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JOB NO.		DESIGN ENGINEERING	DRAWING NO. MVP-ES44.6	REV. P
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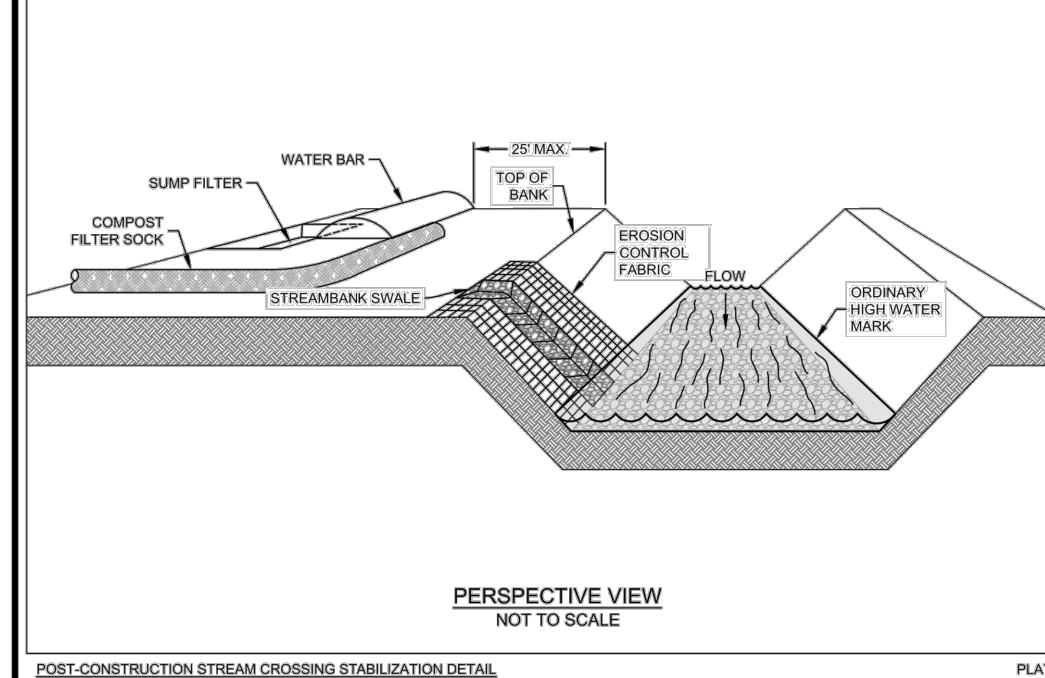
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PROJECT ID: MVP - VA PORTION				




PERMANENT WATER BAR DETAIL
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STREAMBANK SWALE TYPICAL CROSS SECTION
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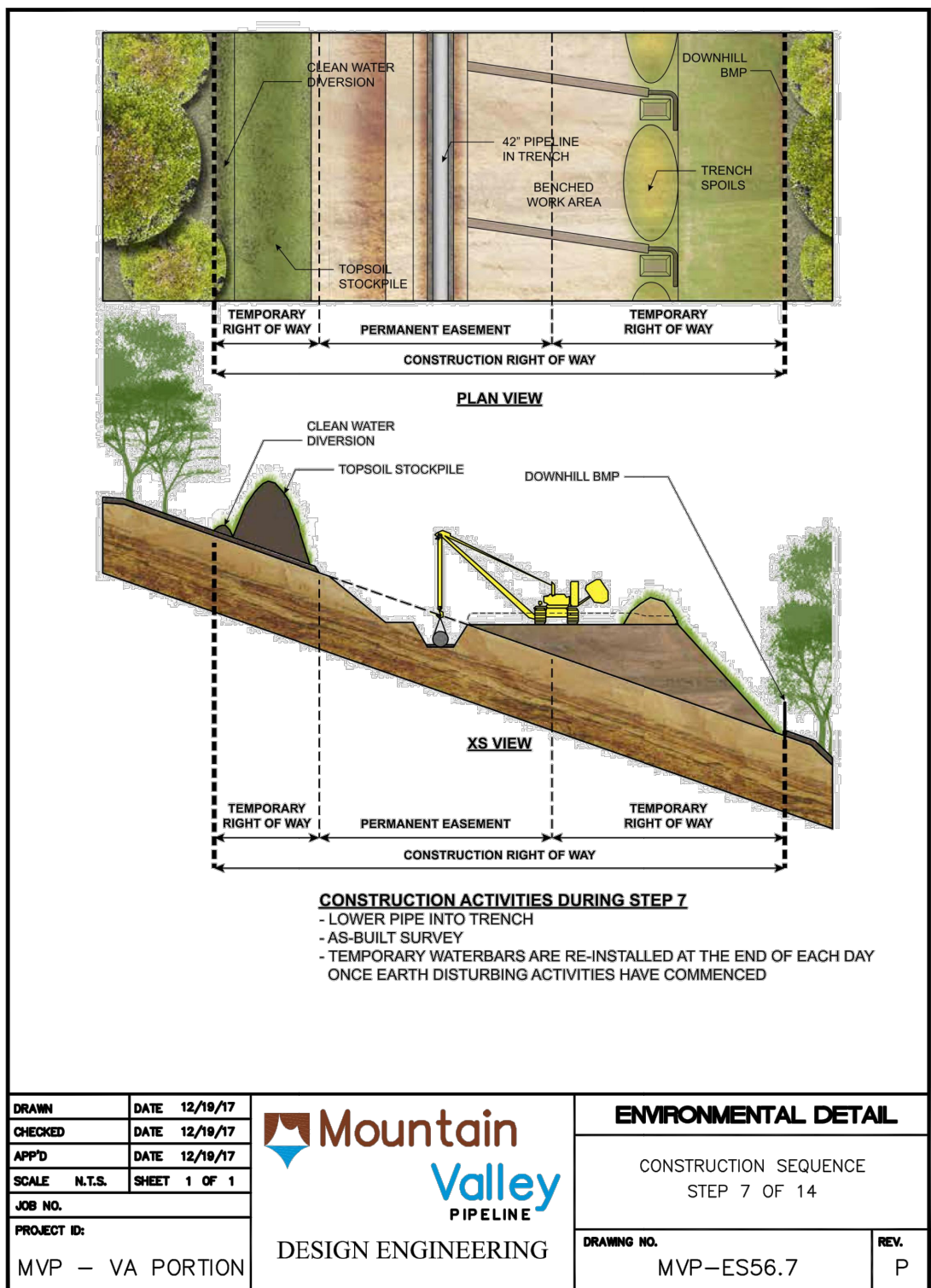
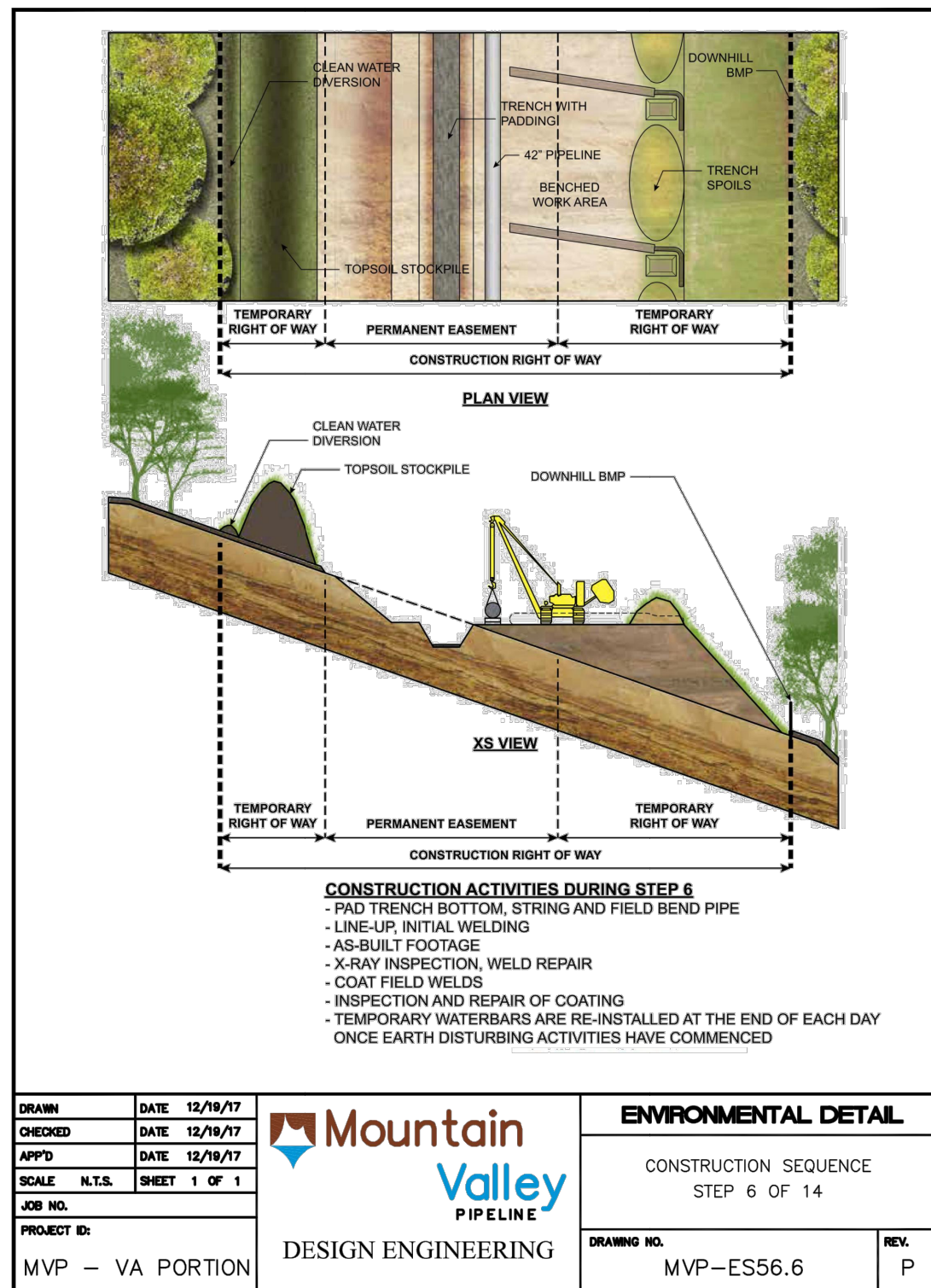
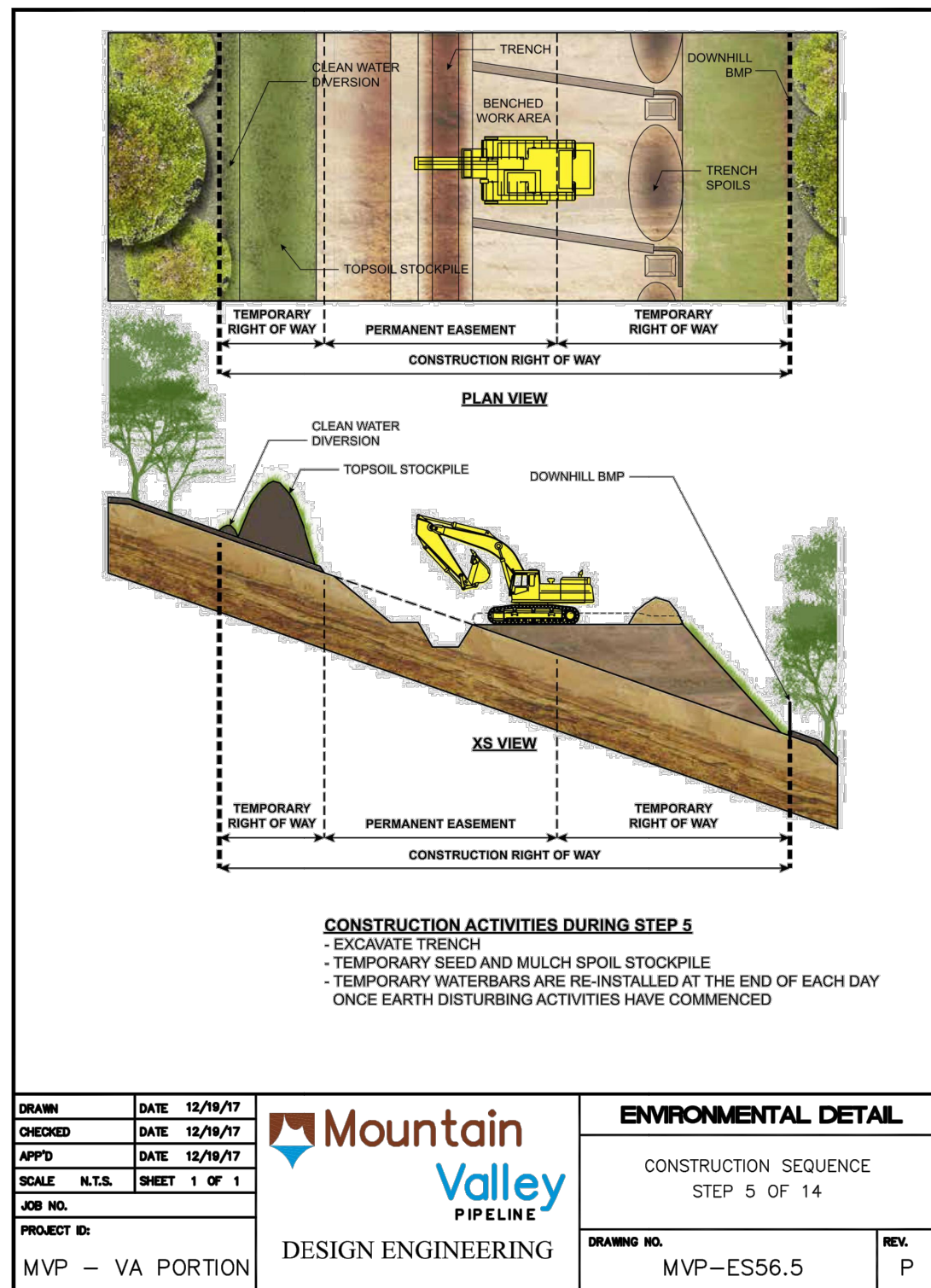
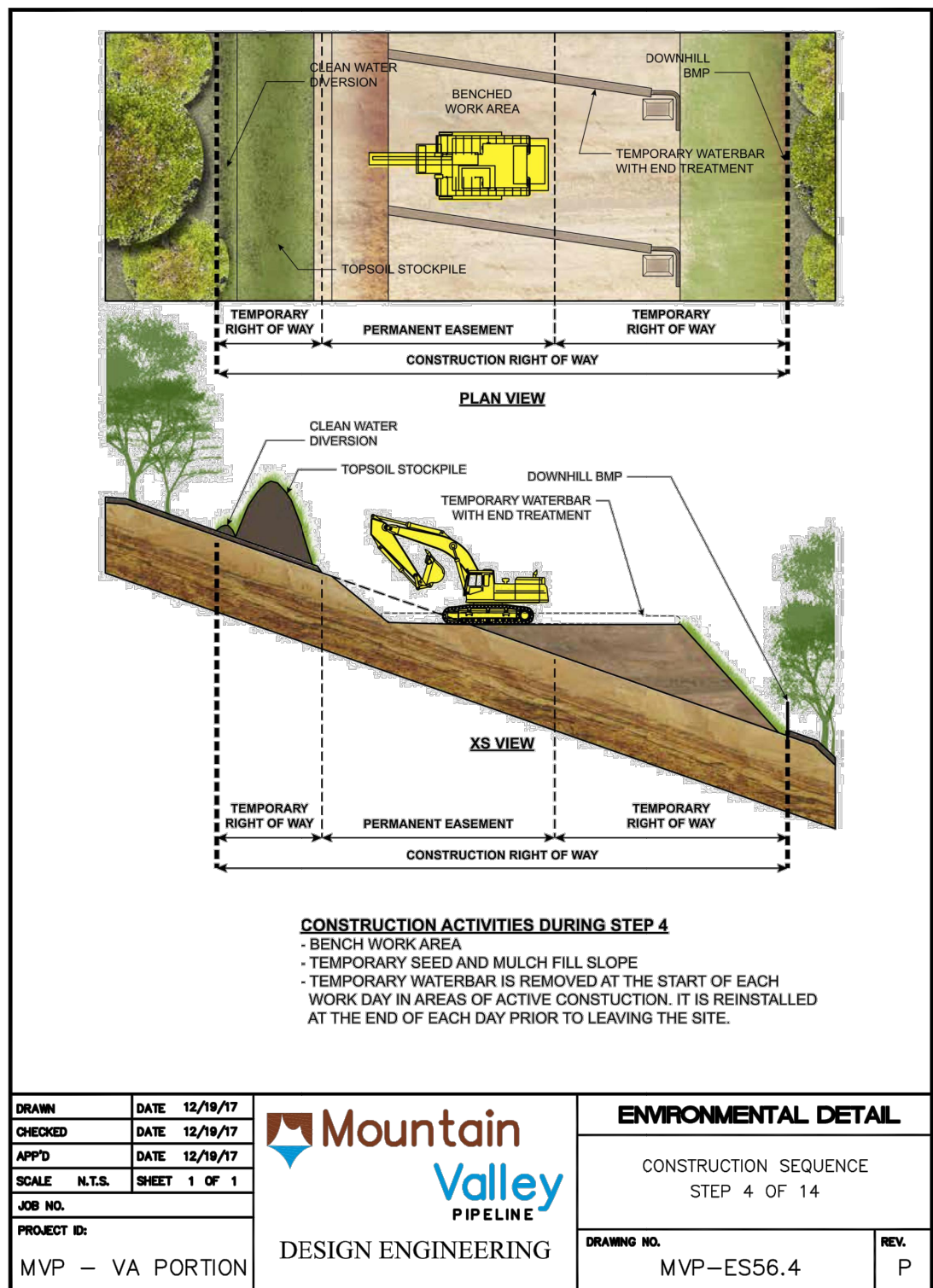
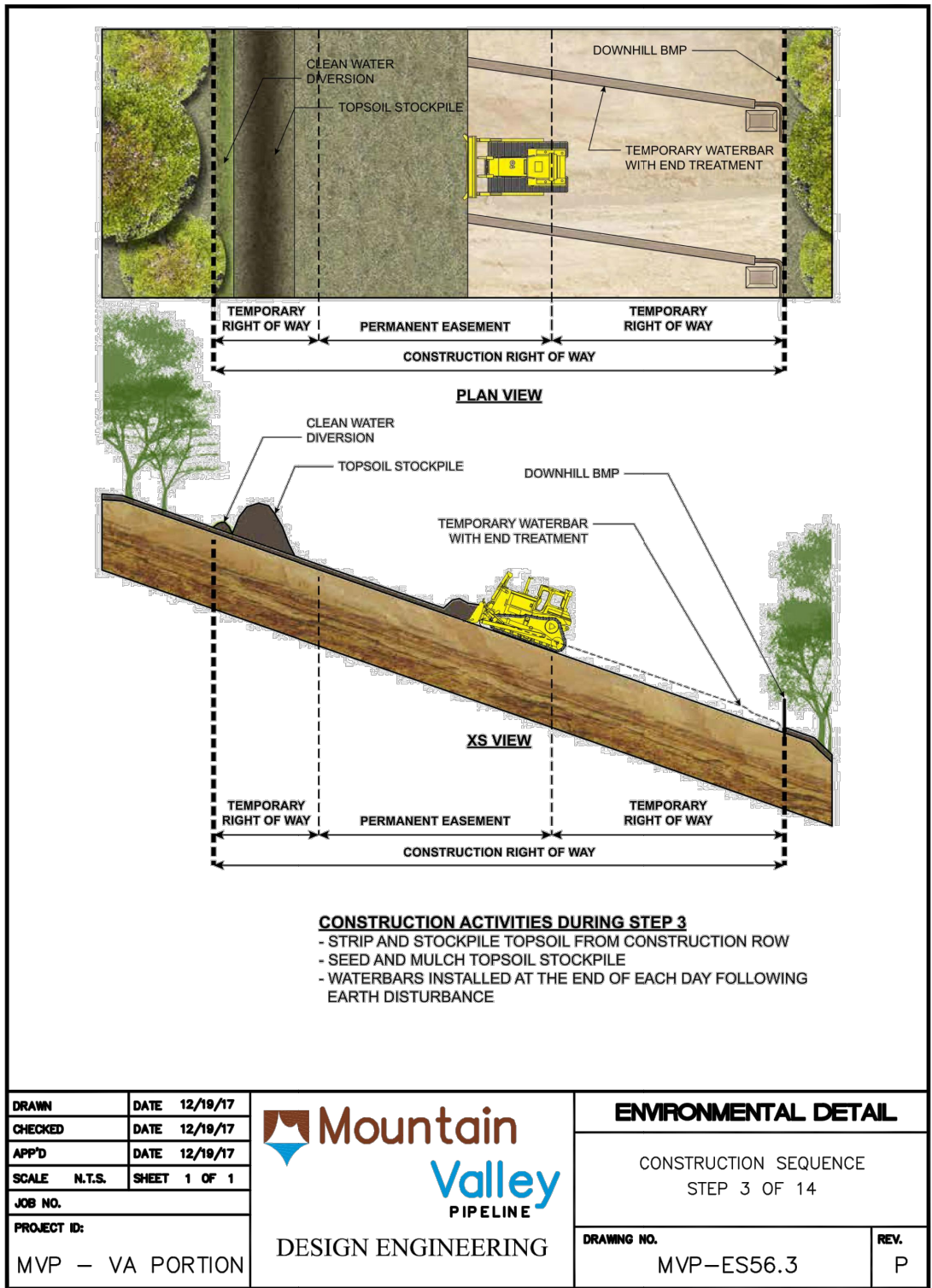
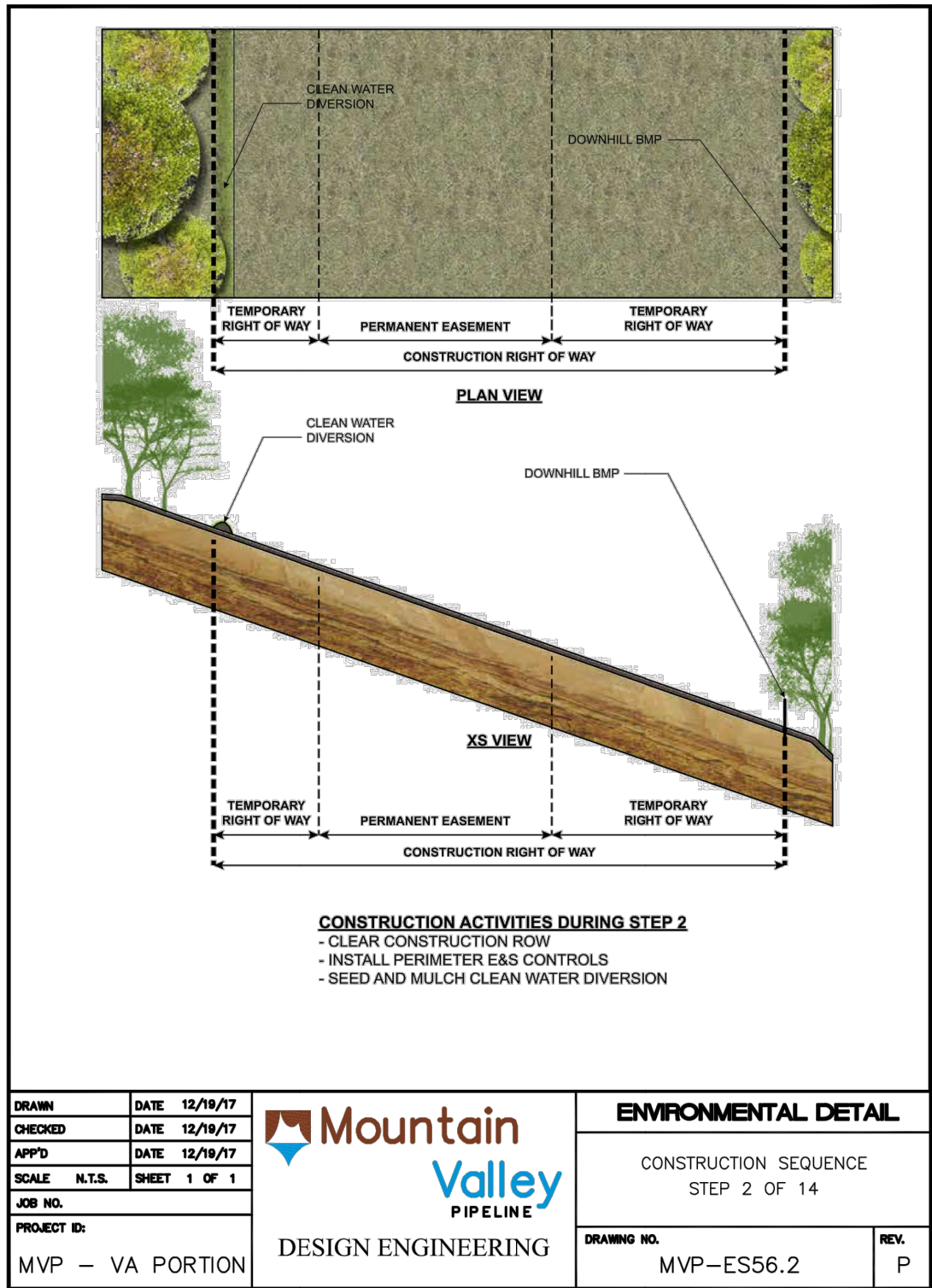
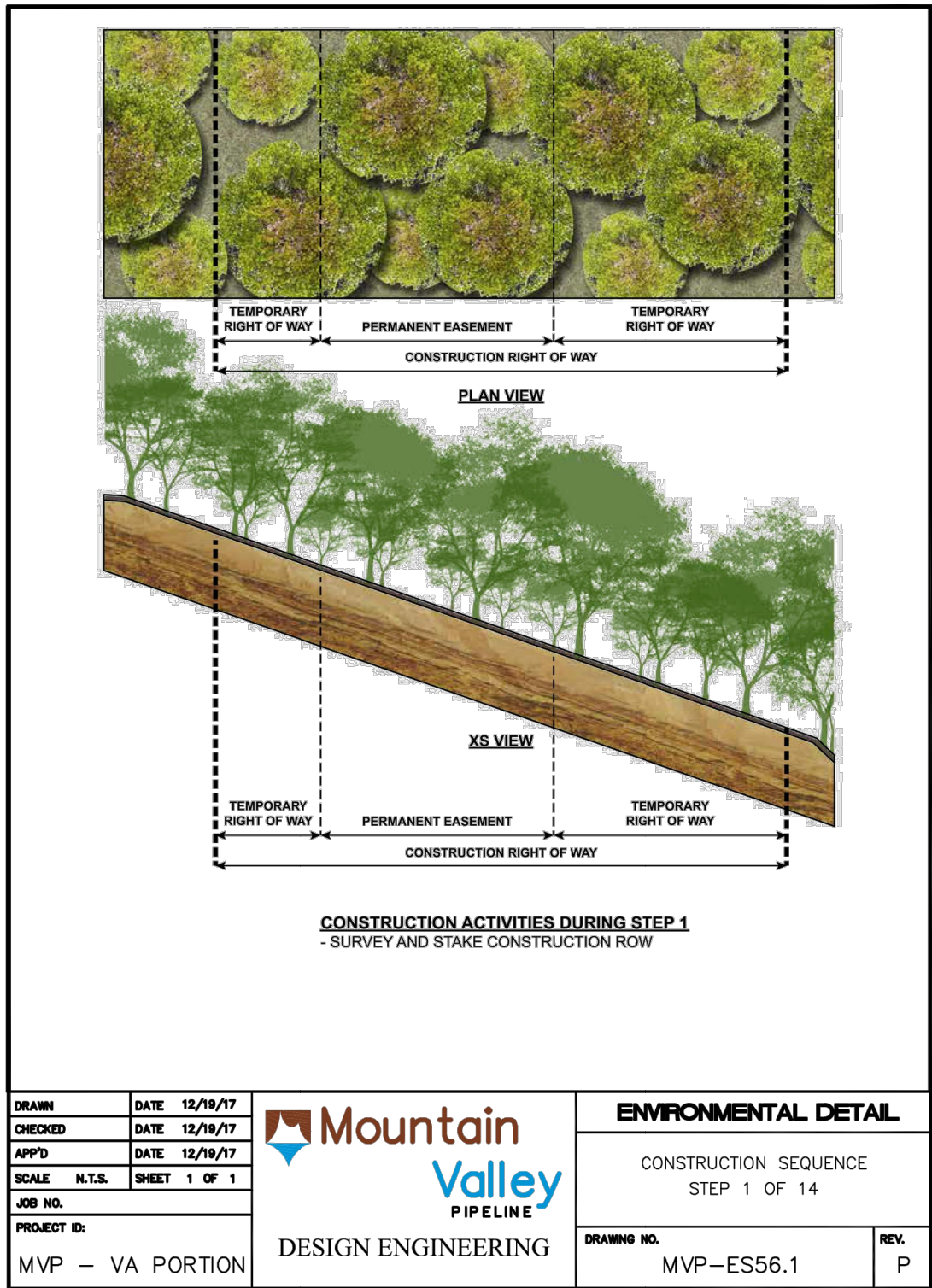
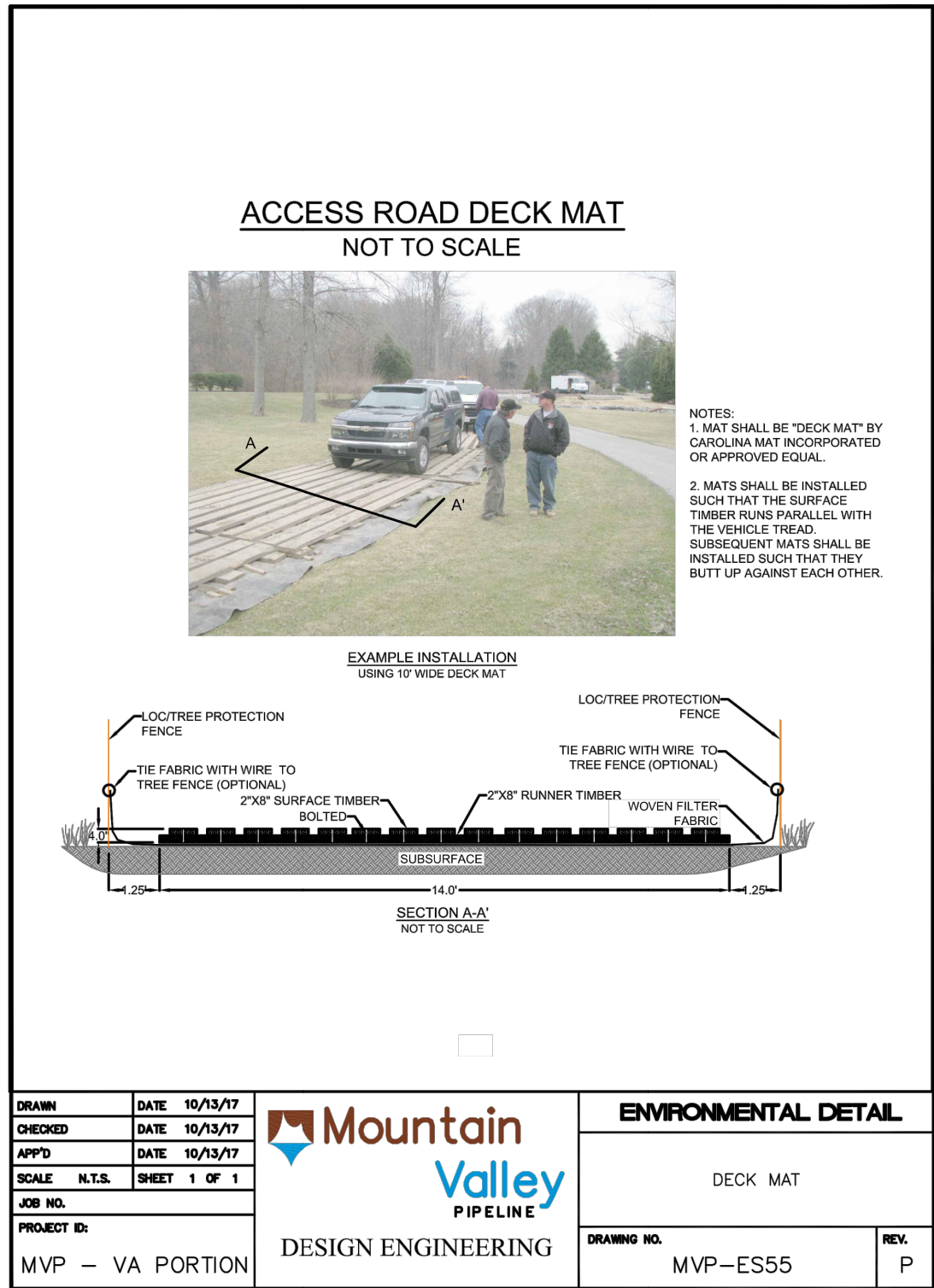
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PERSPECTIVE VIEW
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SCALE N.T.S.	SHEET 1 OF 1			
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PROJECT ID: MVP - VA PORTION				

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2	08/18/17	KAL	RE	DW	RE	DW	RE	DW	RE	DW	RE	CHD	APPO
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MOUNTAIN VALLEY PIPELINE, LLC 555 SOUTHPOINTE BOULEVARD, SUITE 200 CANONSBURG, PA 15317													
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Mountain Valley Pipeline
EROSION AND SEDIMENT CONTROL PLANS
MOUNTAIN VALLEY PIPELINE PROJECT - H600 LINE

MOUNTAIN VALLEY PIPELINE, LLC
555 SOUTHPOINTE BOULEVARD, SUITE 200
CANONSBURG, PA 15317

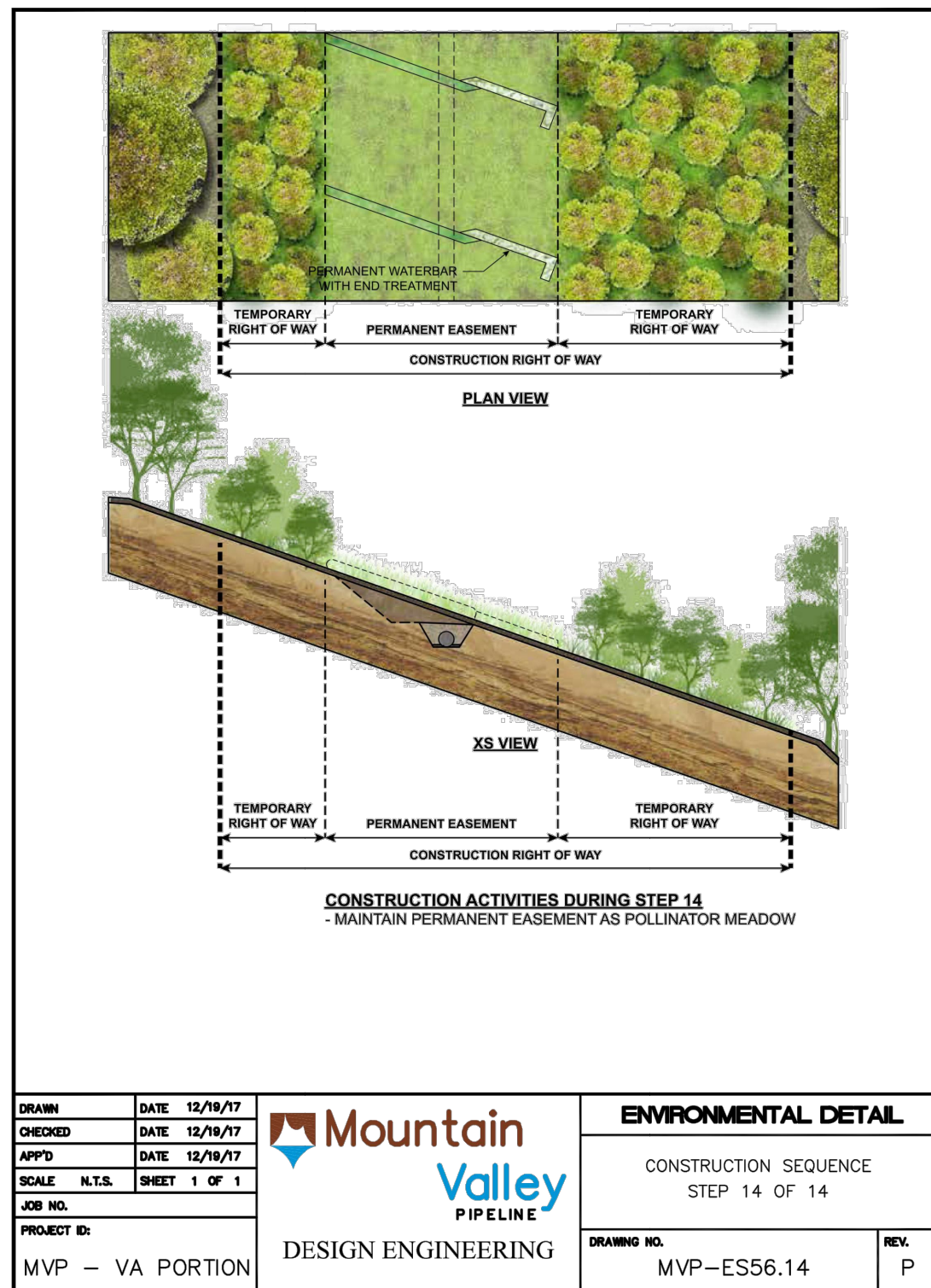
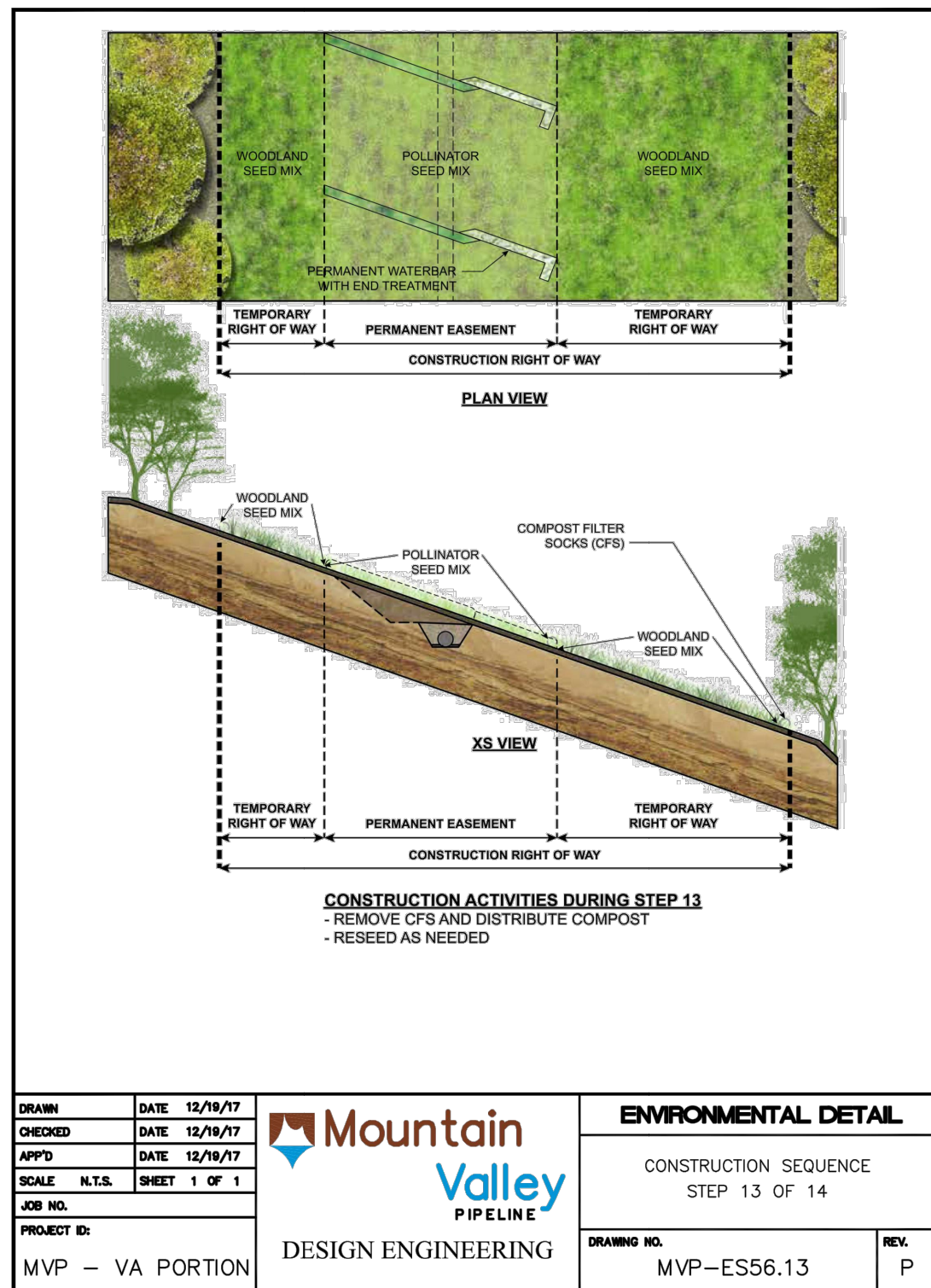
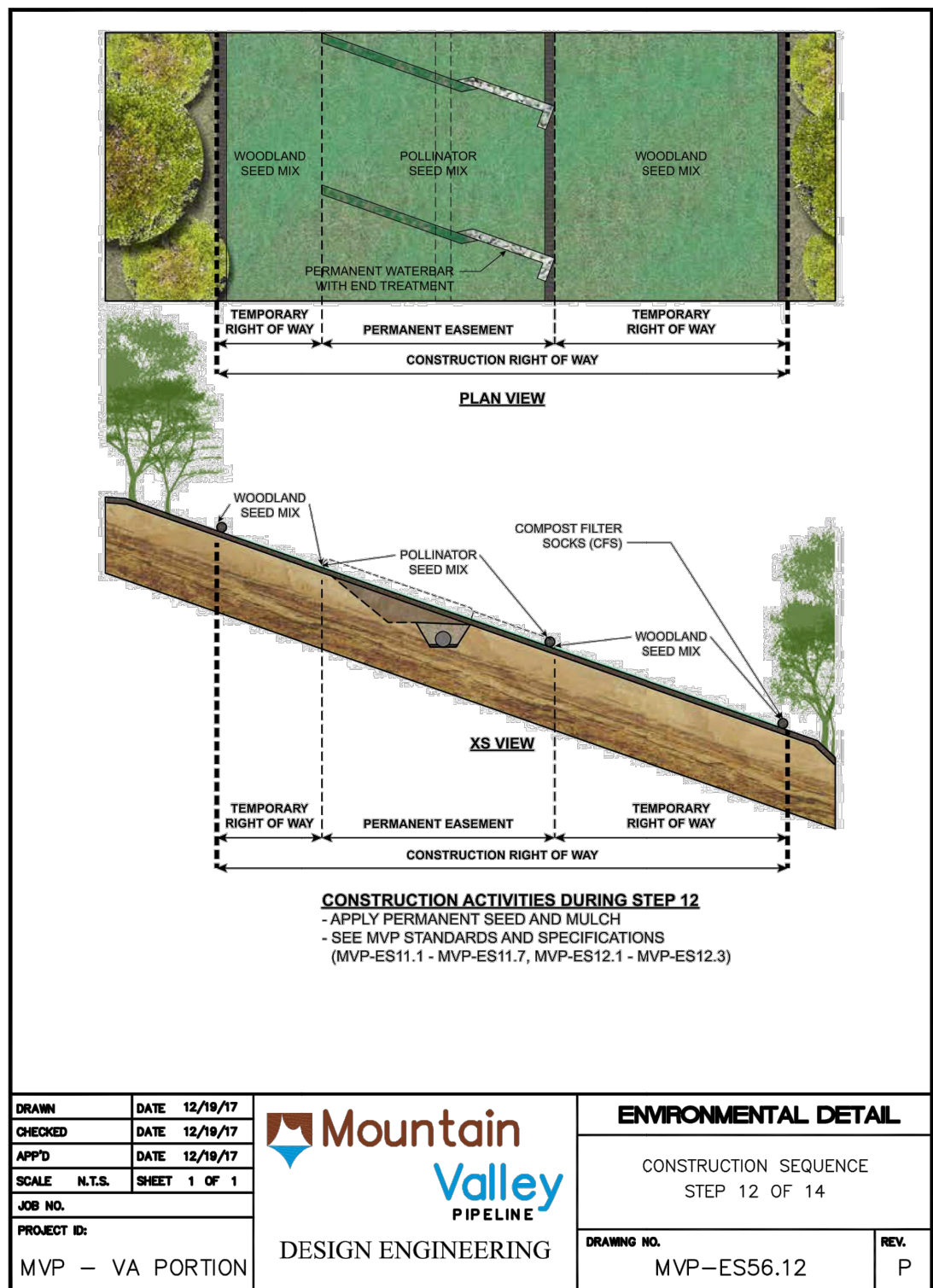
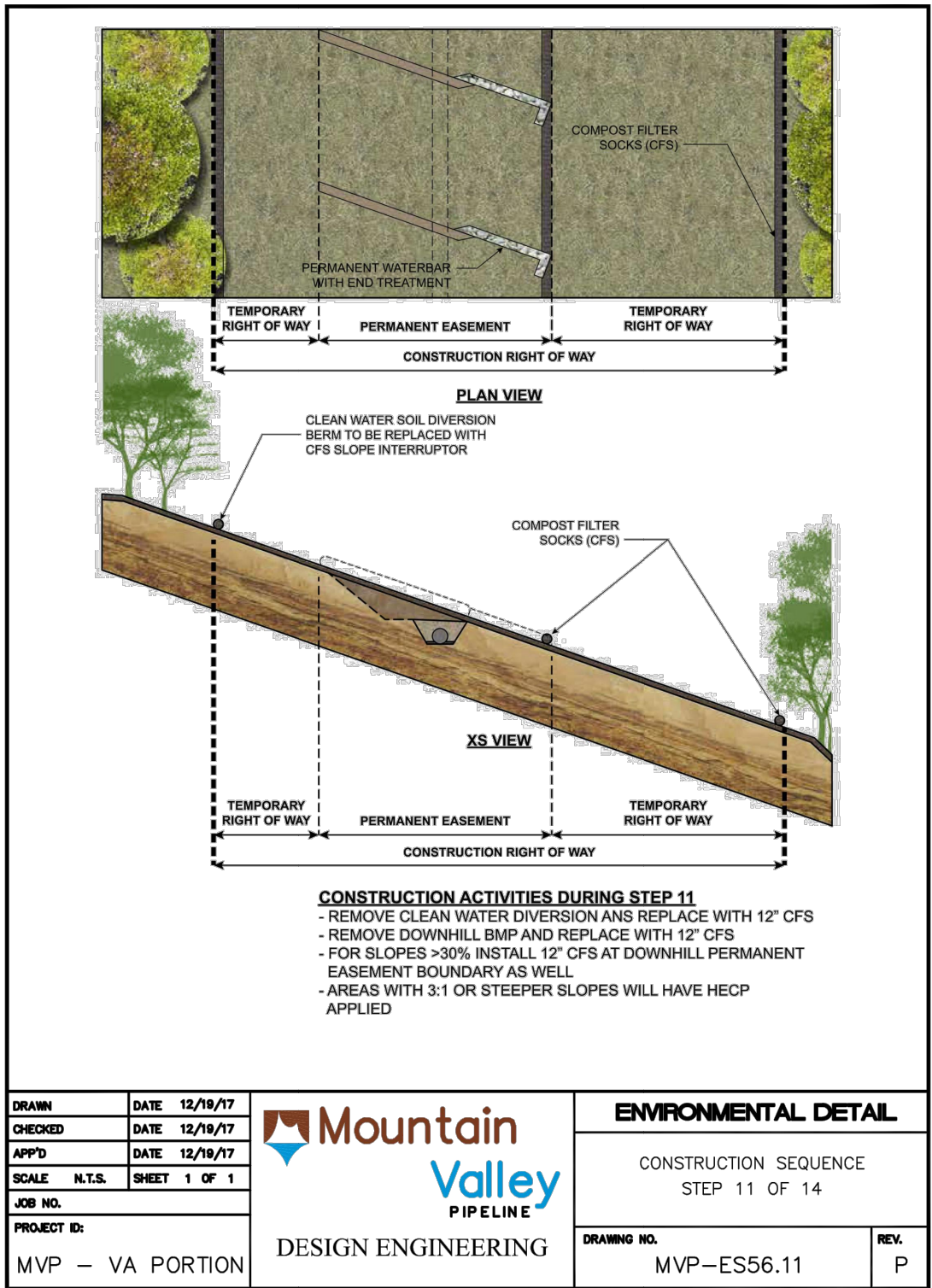
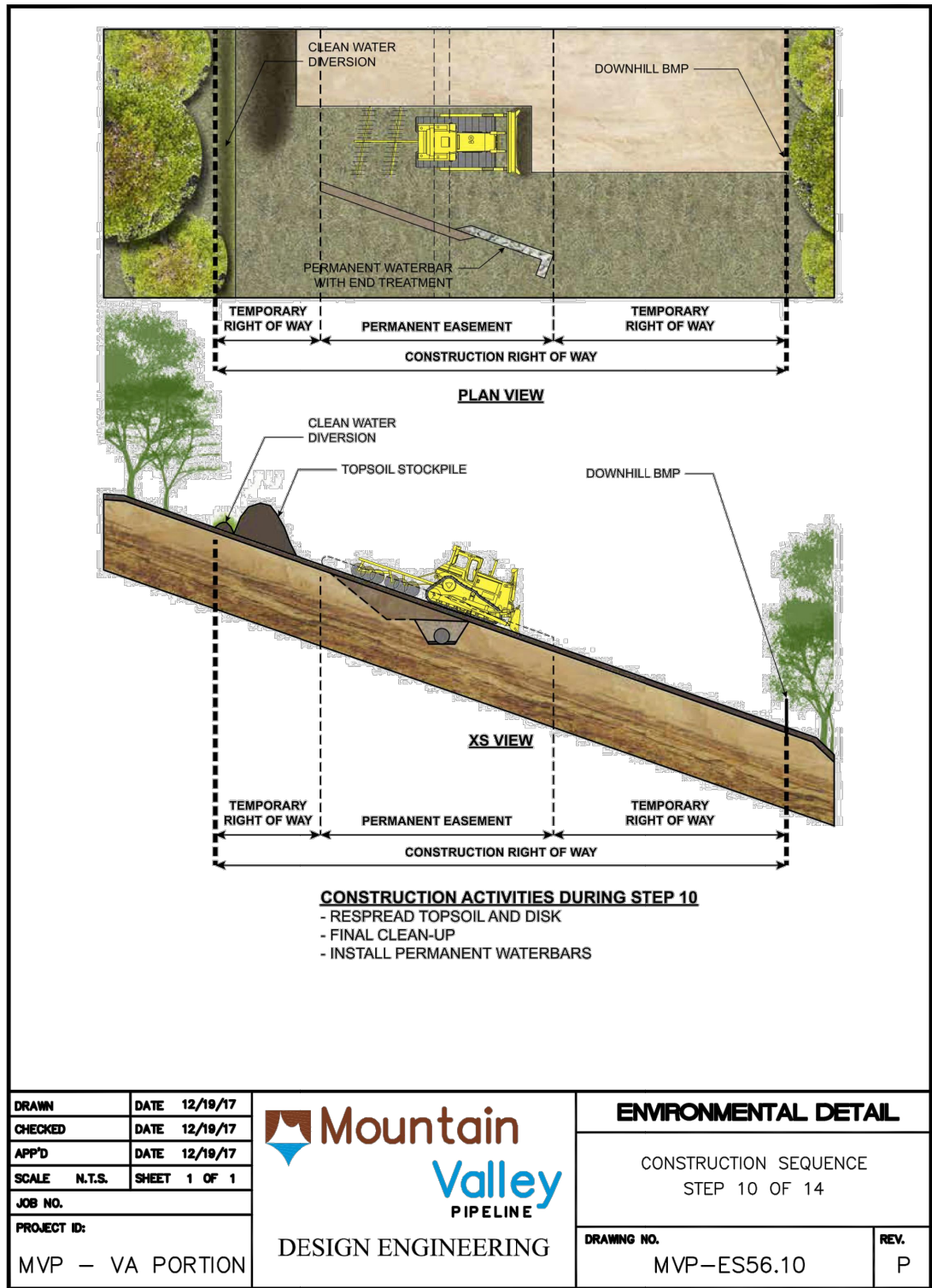
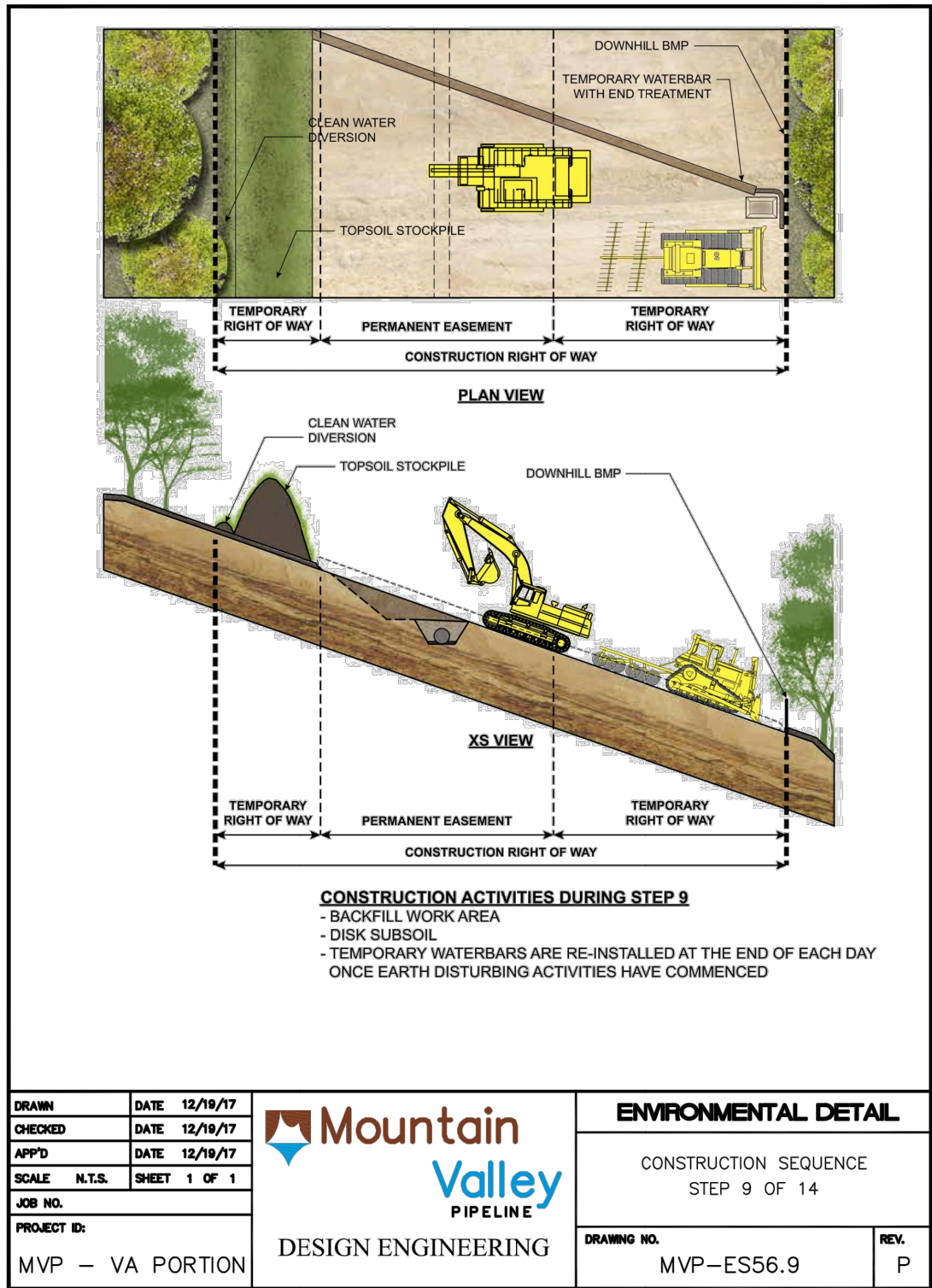
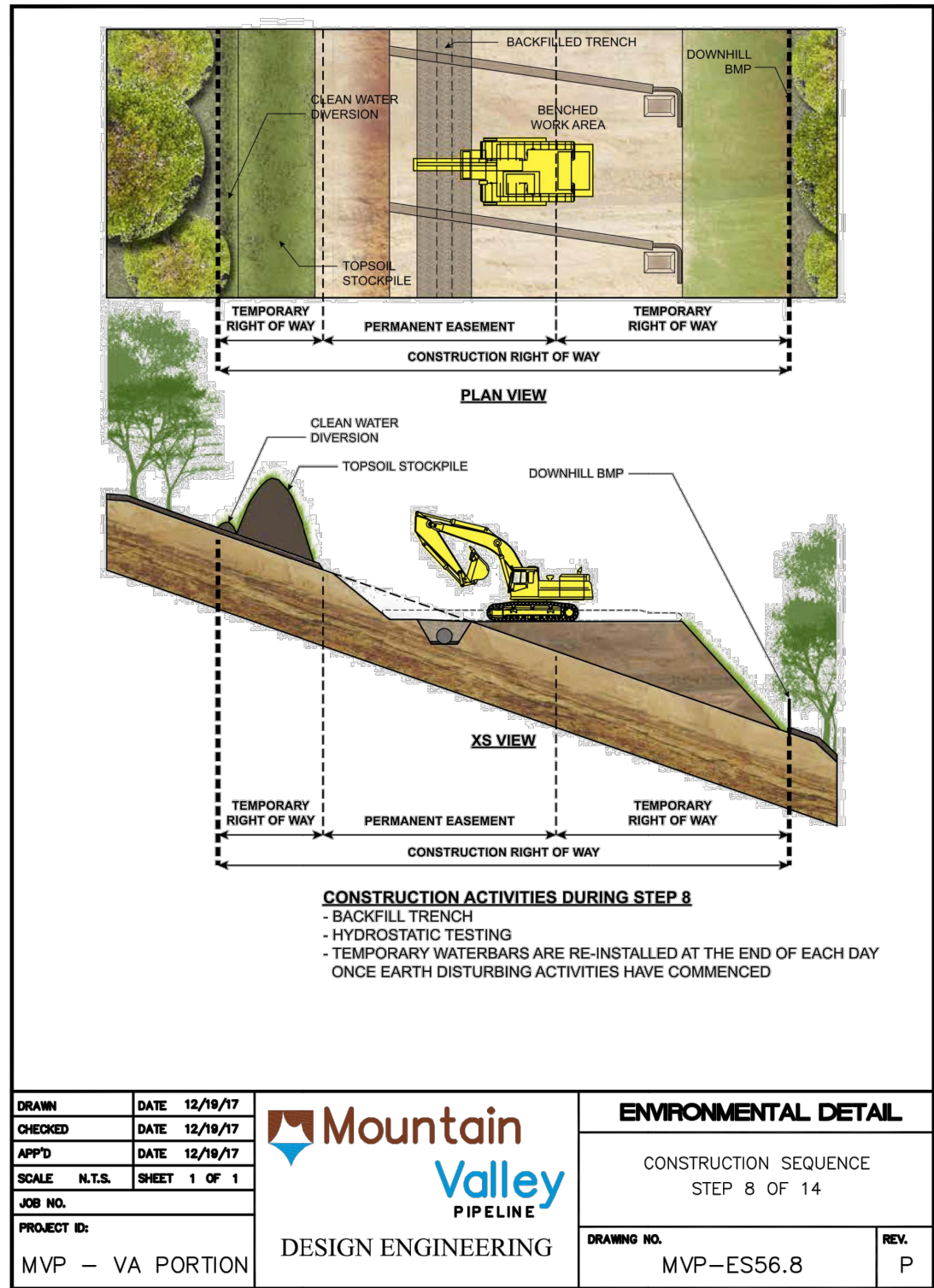
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GENERAL DETAILS SET

DAVID J. WALLNER
Lic. No. 0402057593
Professional Engineer
Commonwealth of Pennsylvania

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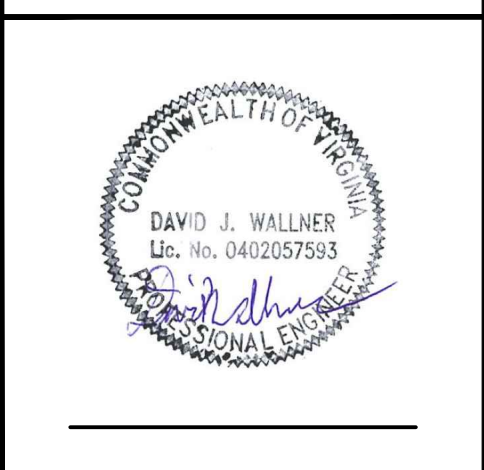
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EROSION AND SEDIMENT CONTROL PLANS		MOUNTAIN VALLEY PIPELINE PROJECT - H600 LINE	
MOUNTAIN VALLEY PIPELINE, LLC		555 SOUTHPOINTE BOULEVARD, SUITE 200	
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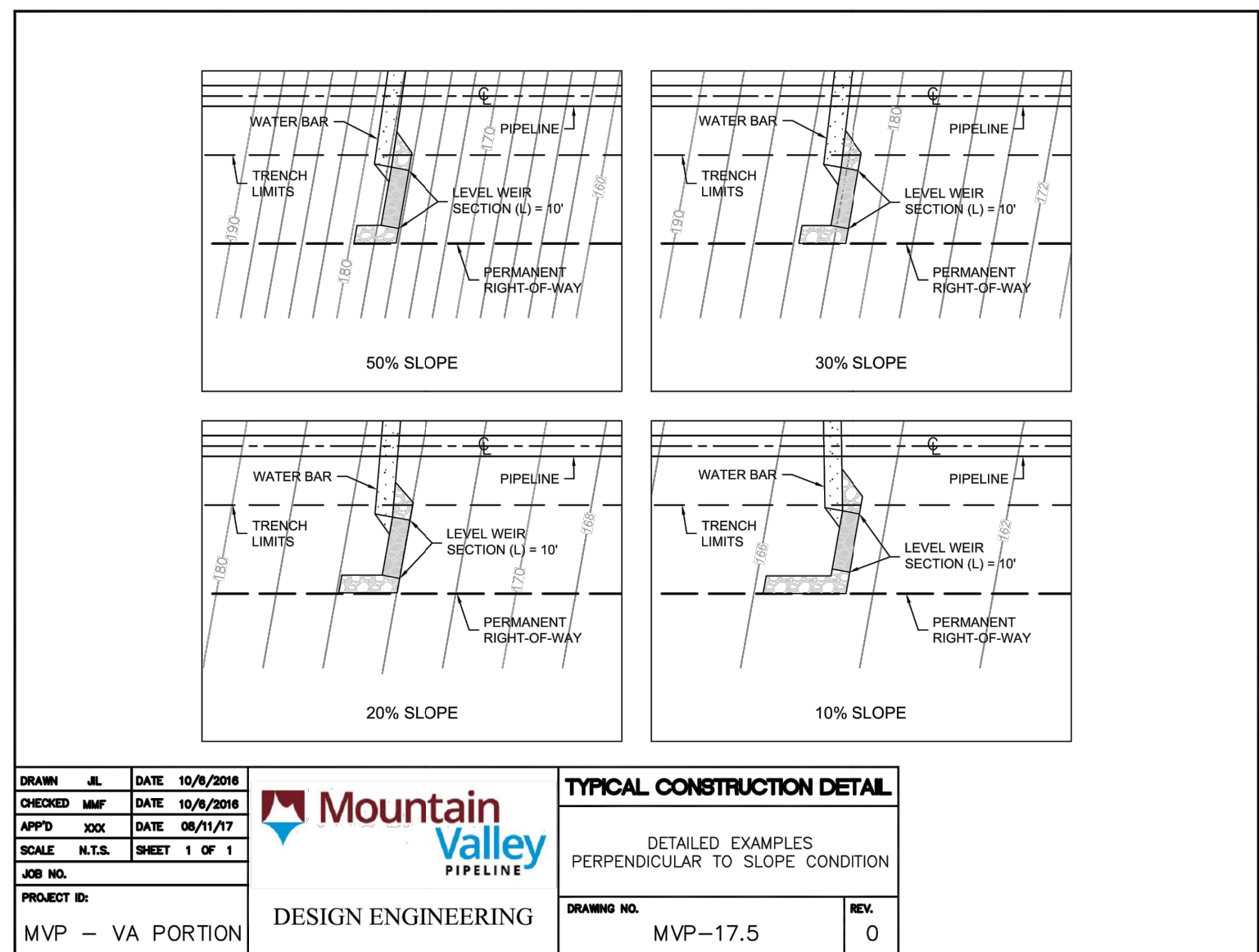
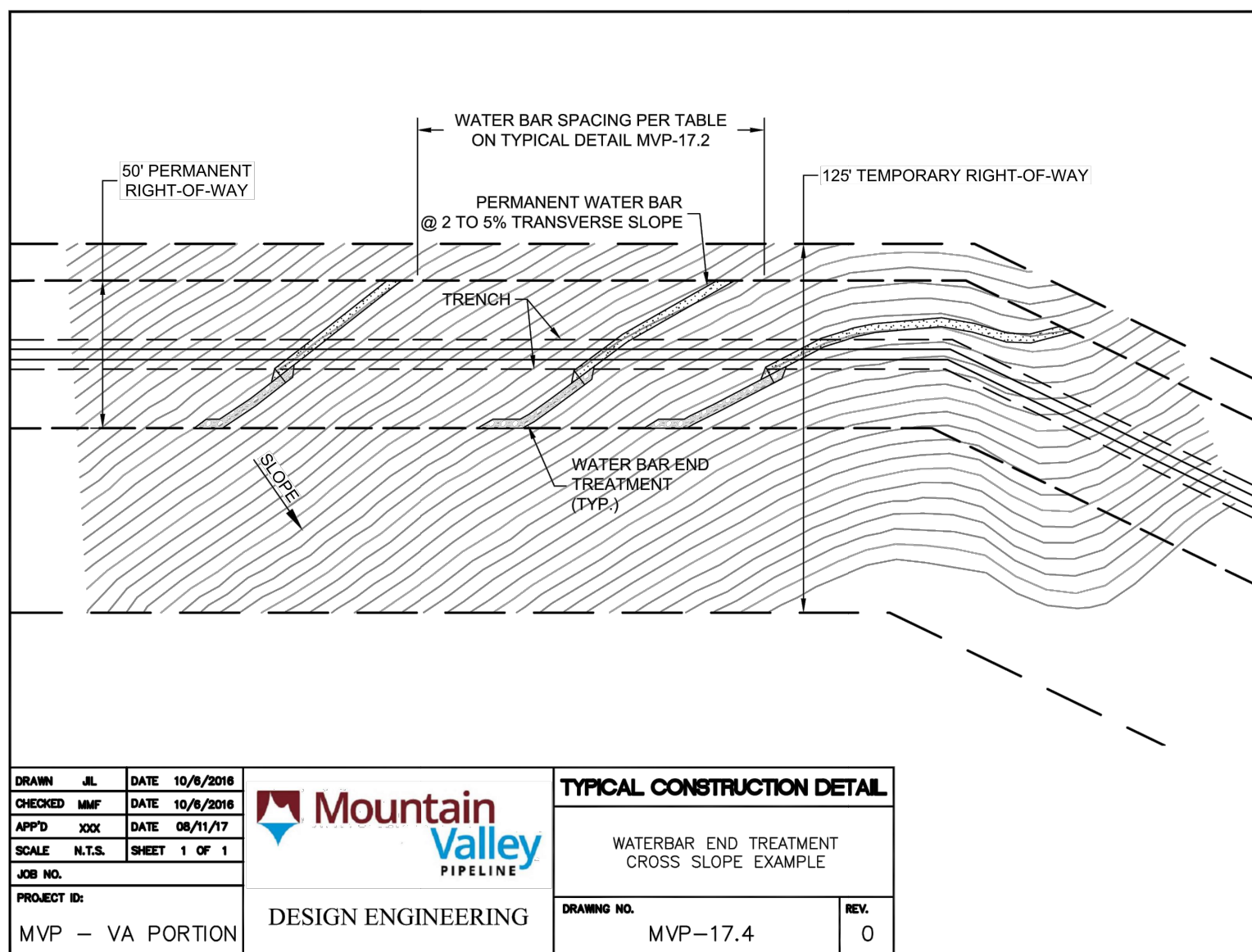
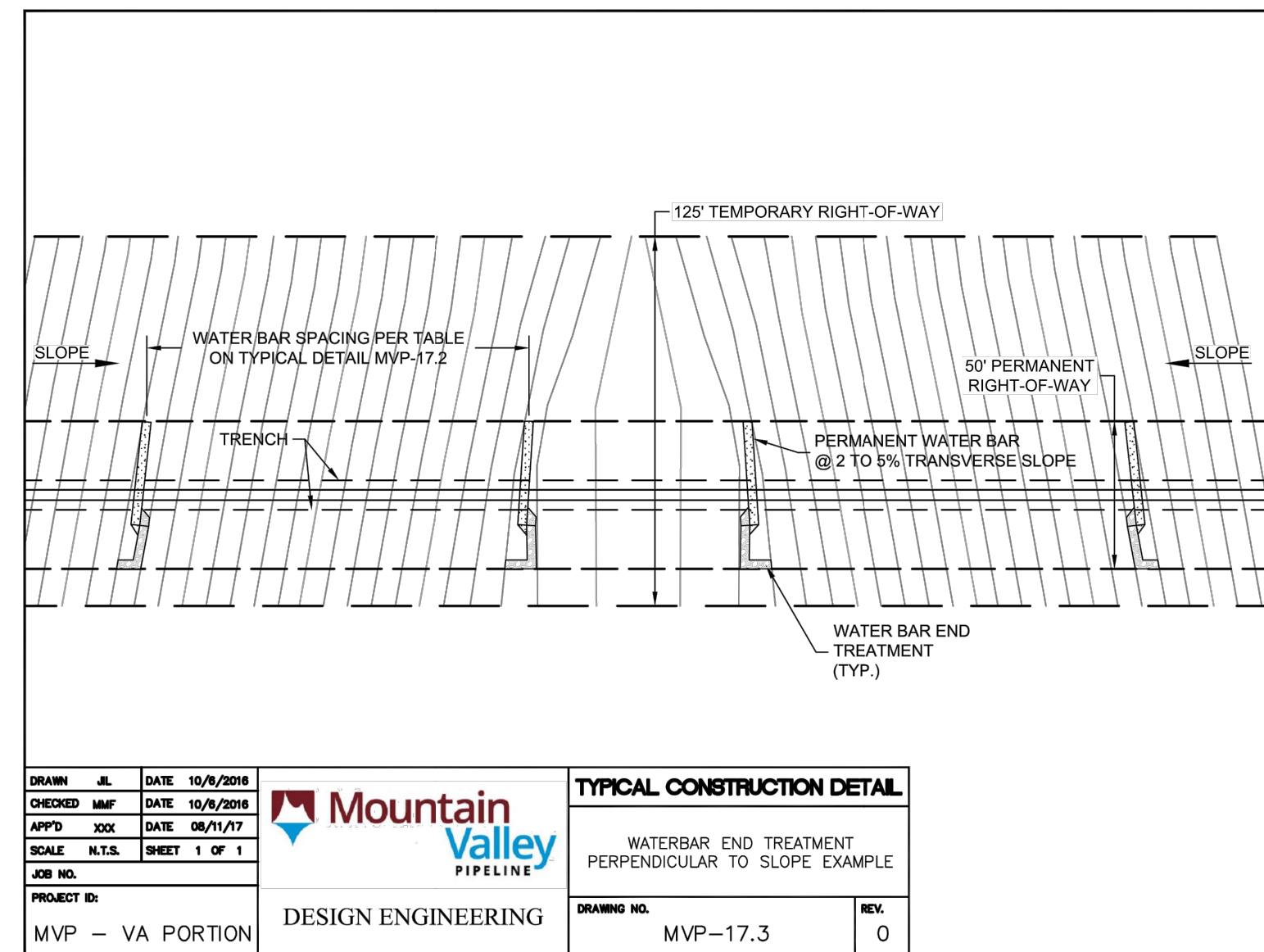
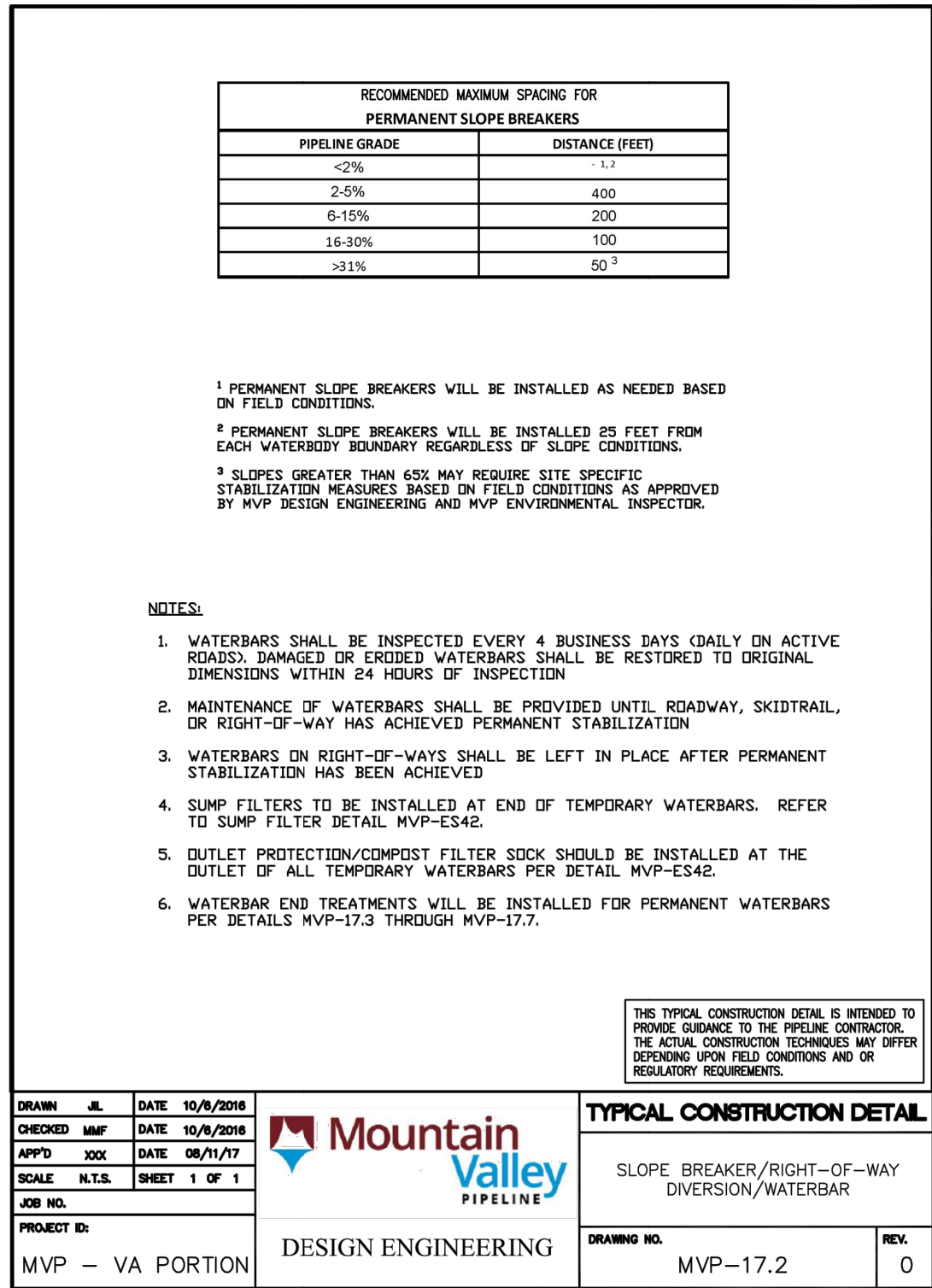
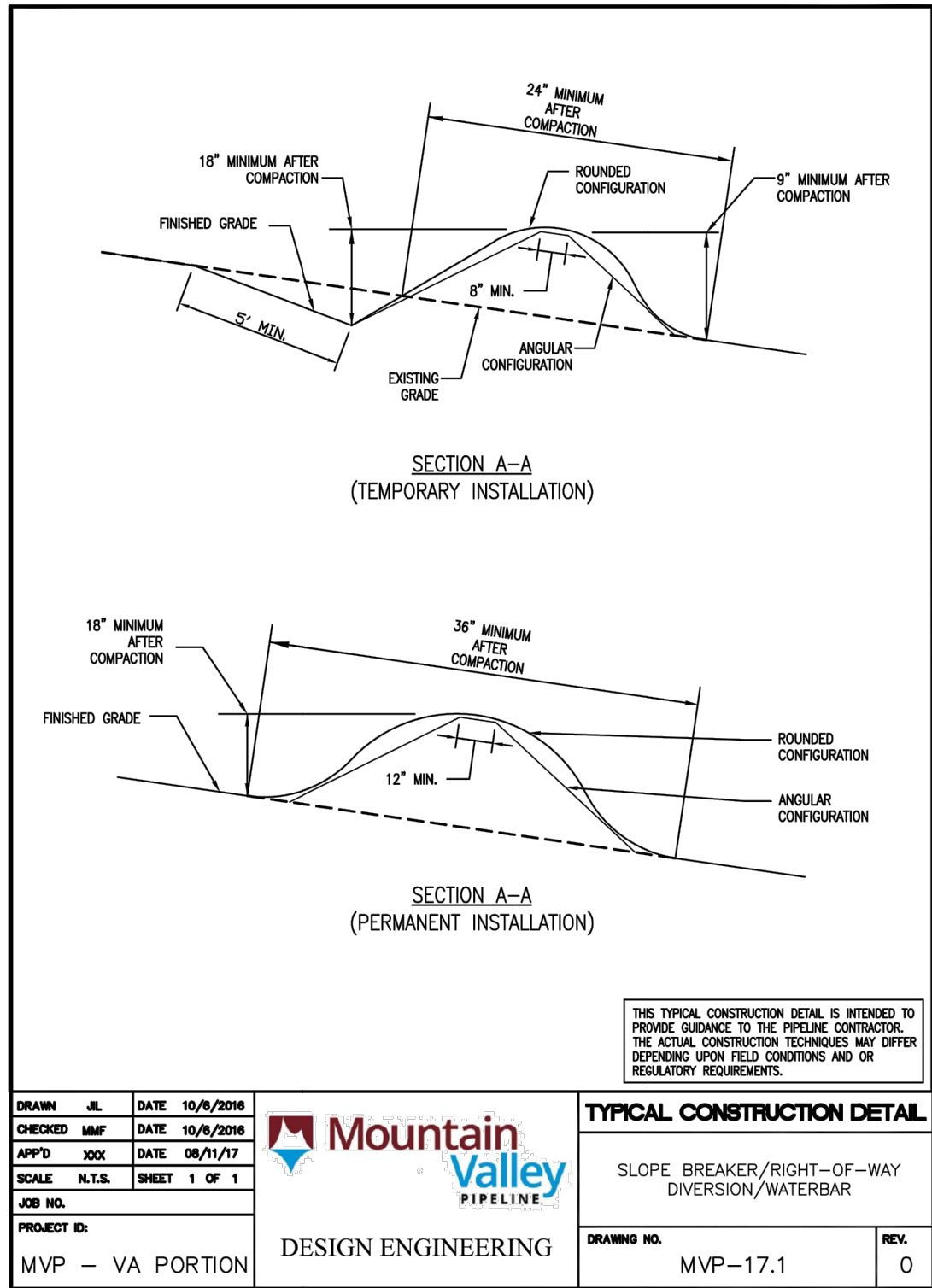
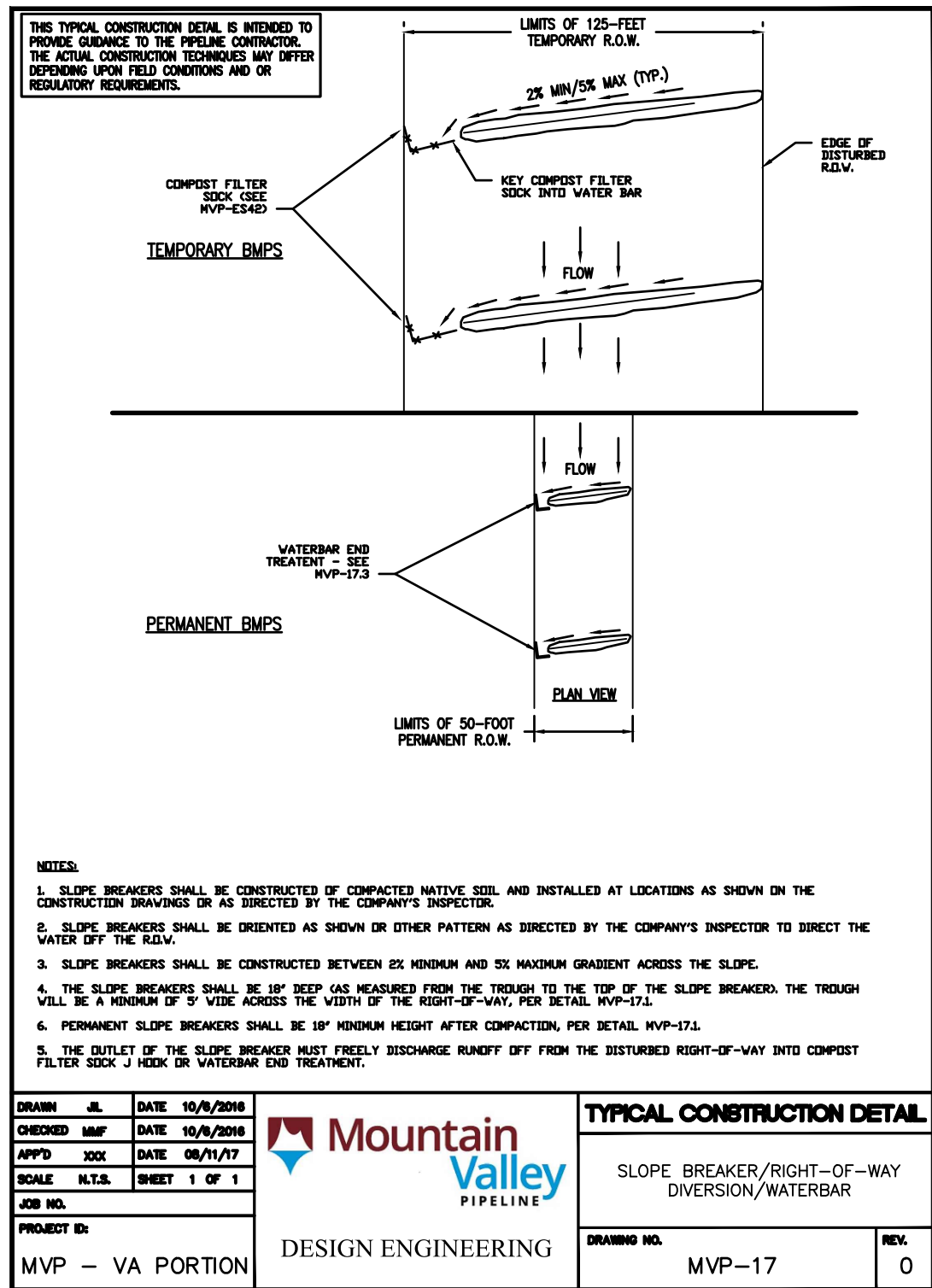
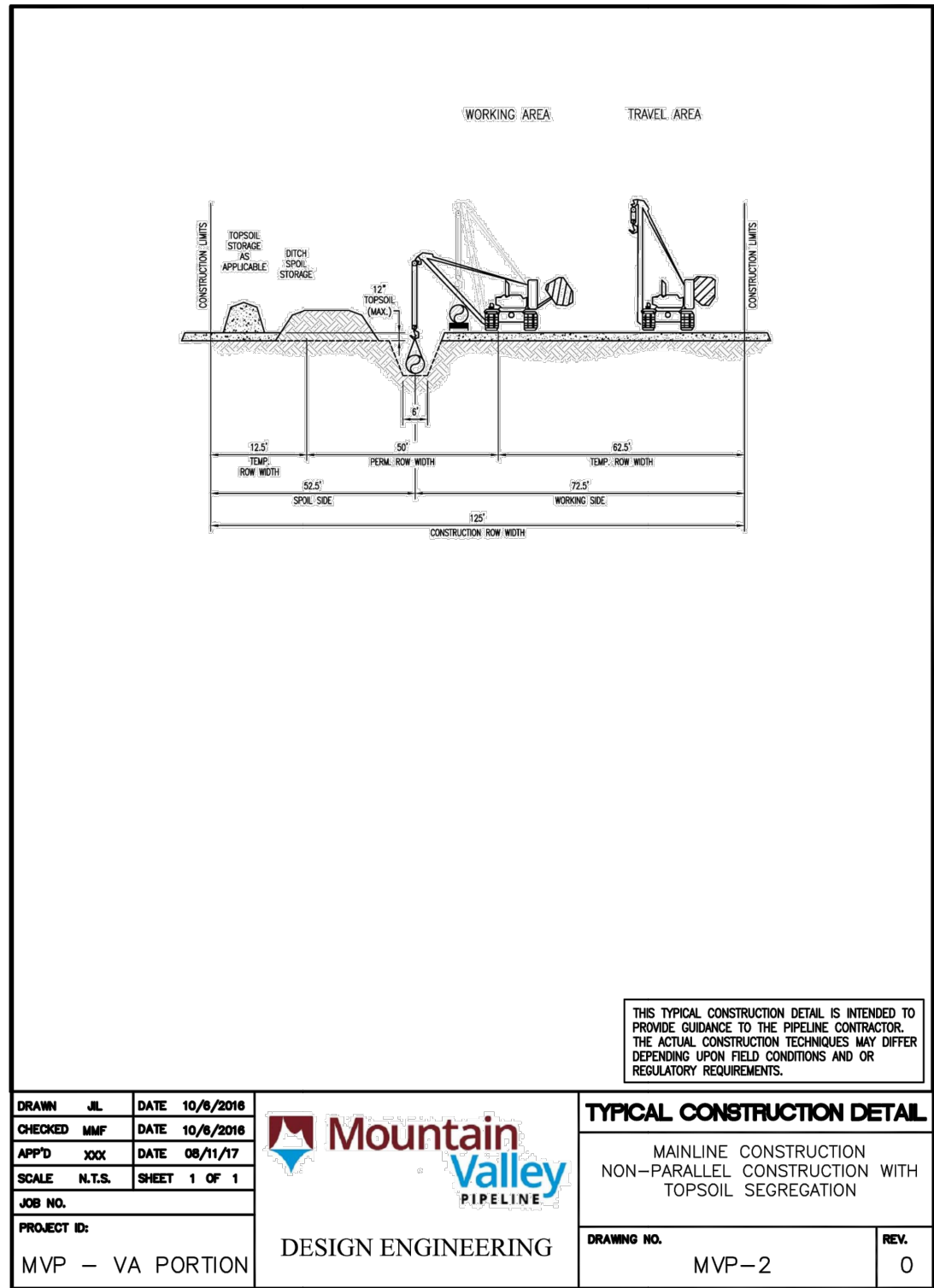


661 ANDERSEN DRIVE
FOSTER PLAZA 7
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Mountain Valley Pipeline
EROSION AND SEDIMENT CONTROL PLANS
MOUNTAIN VALLEY PIPELINE PROJECT - H600 LINE

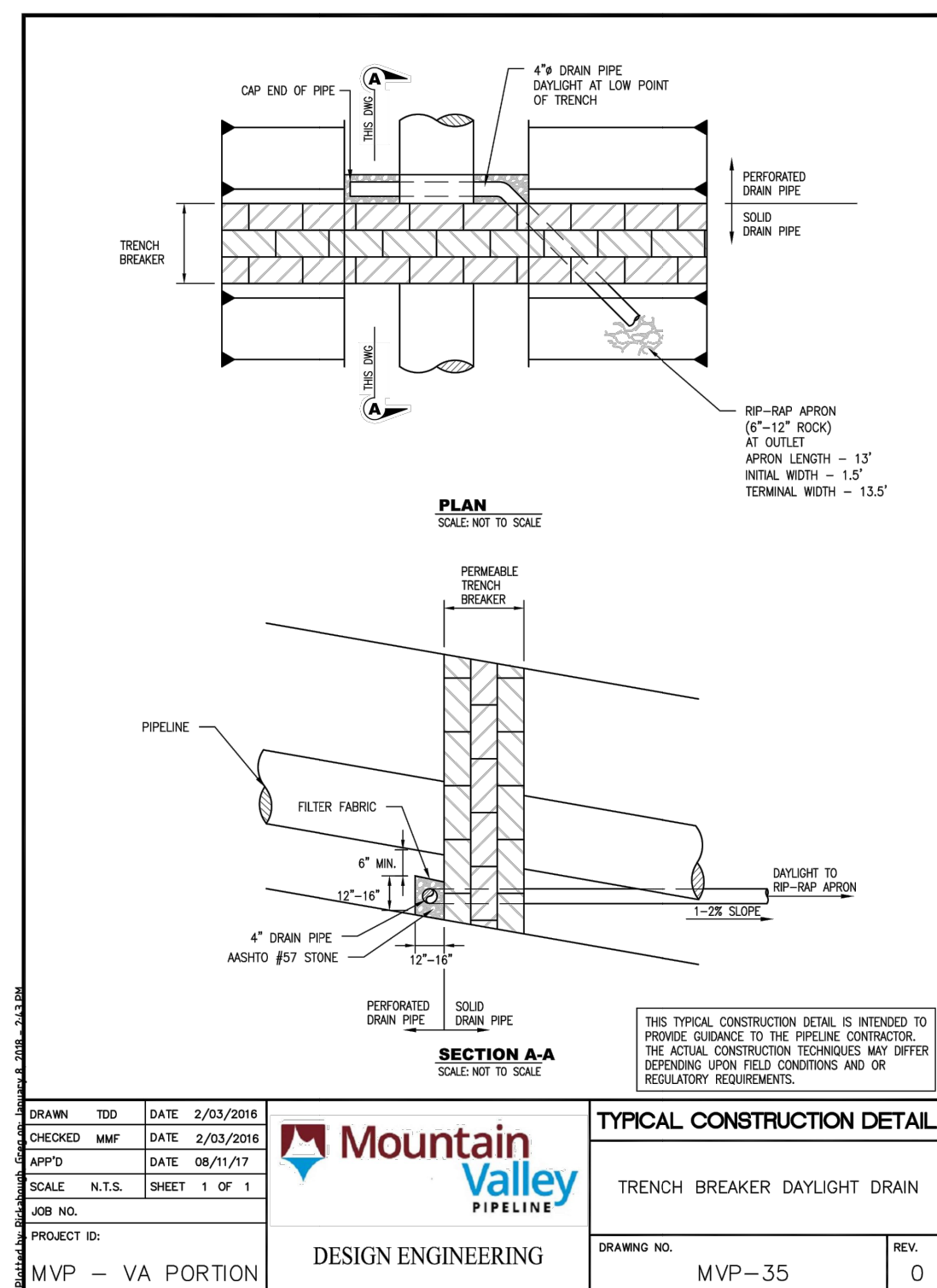
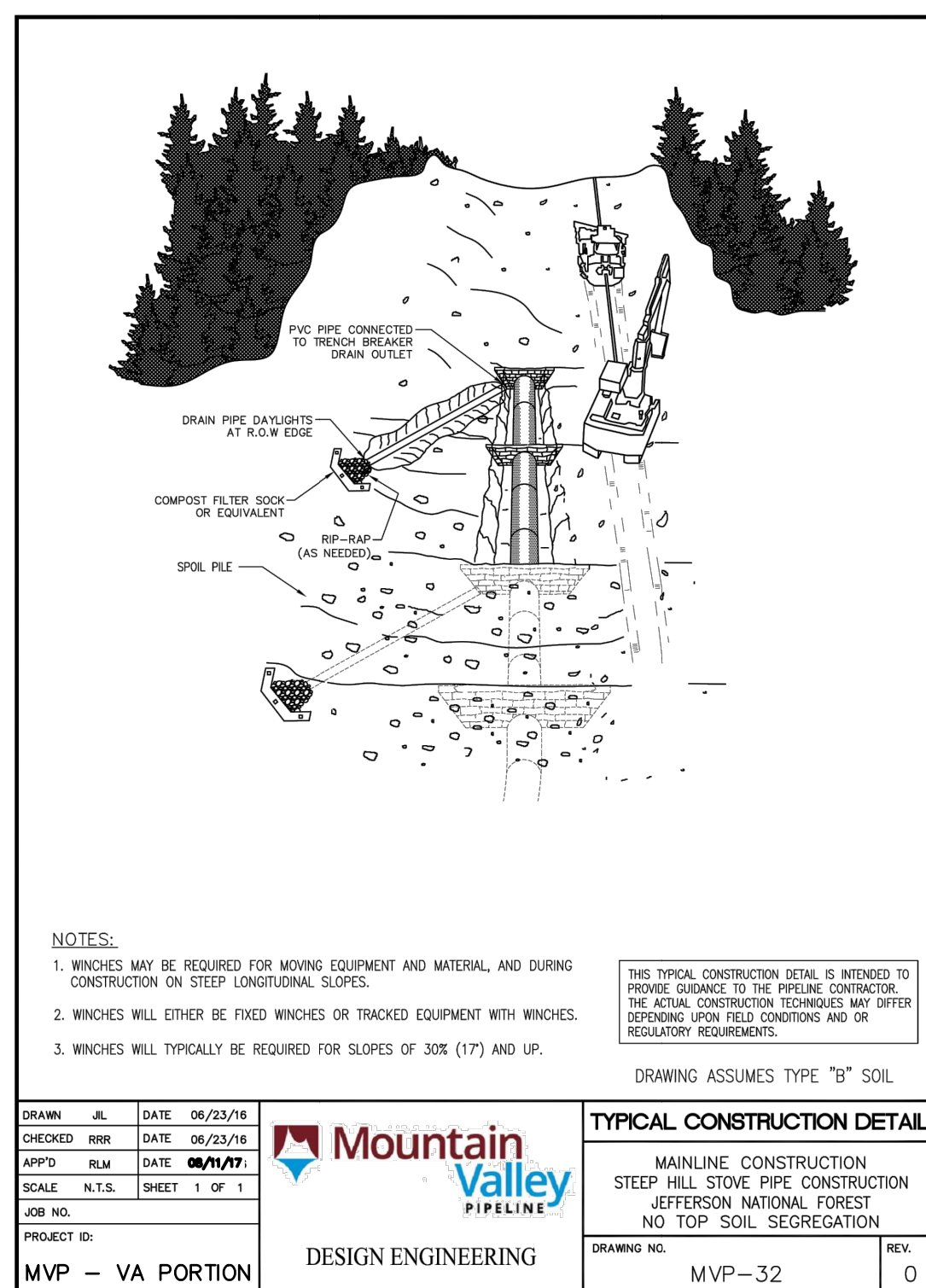
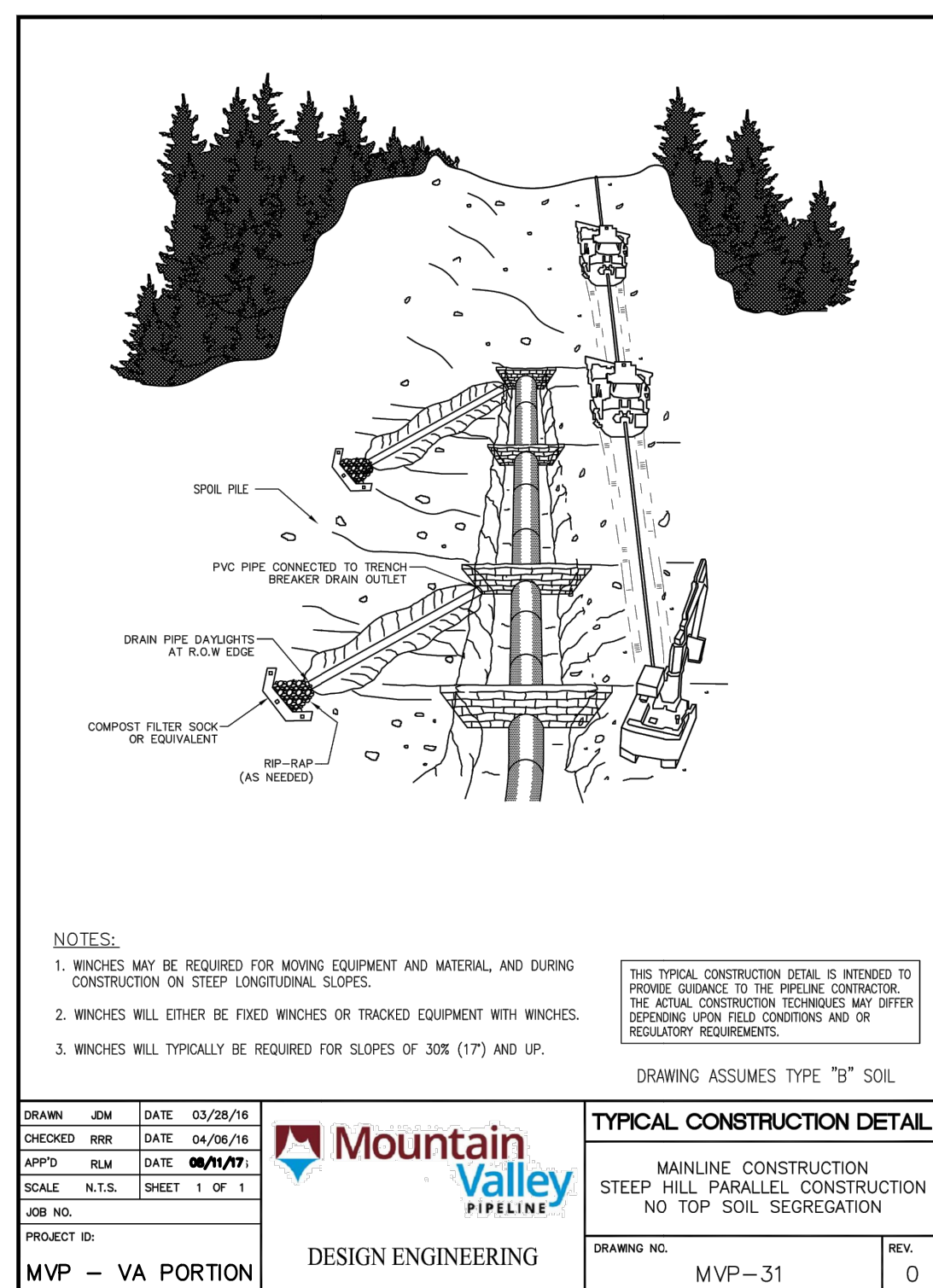
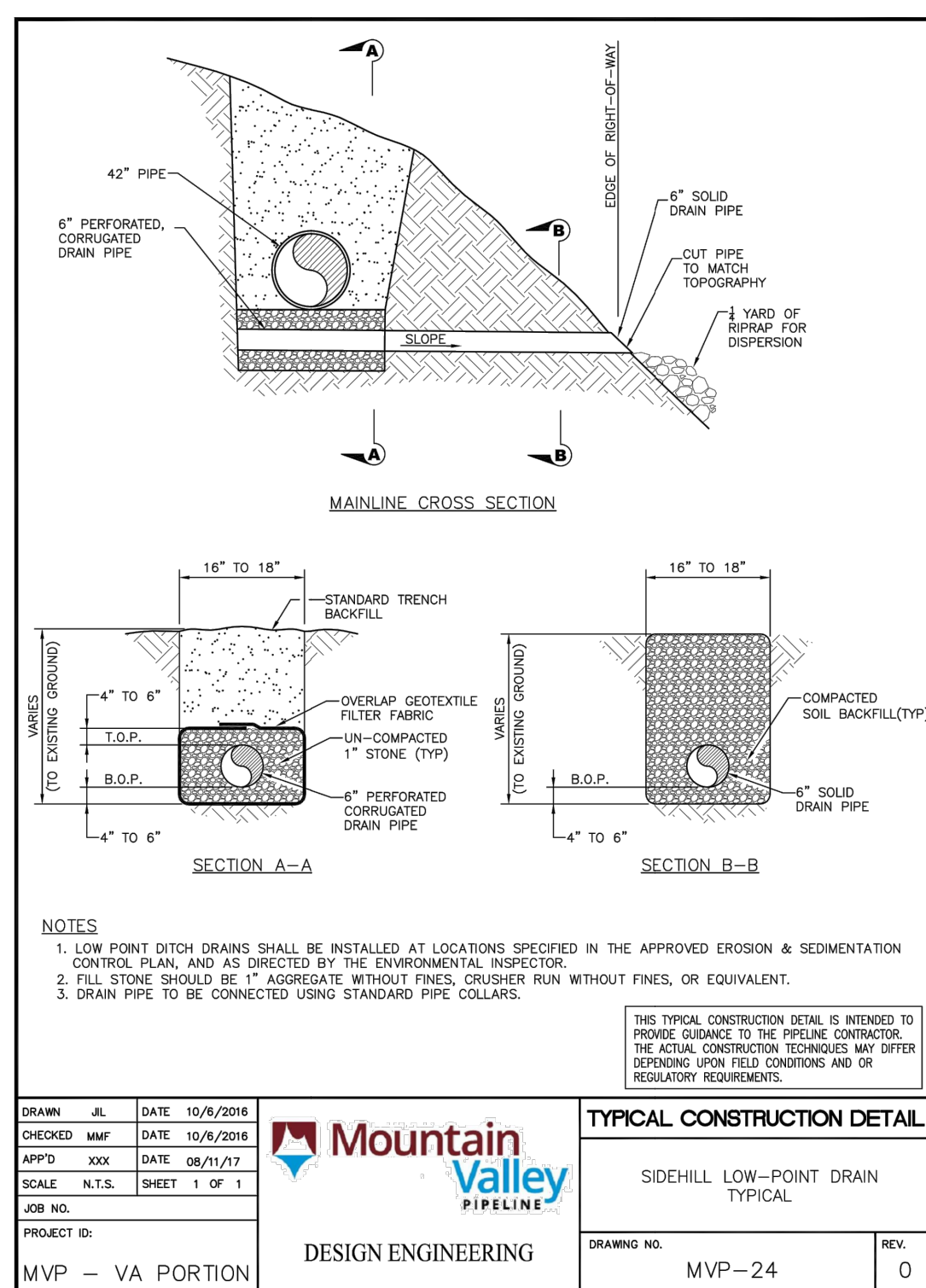
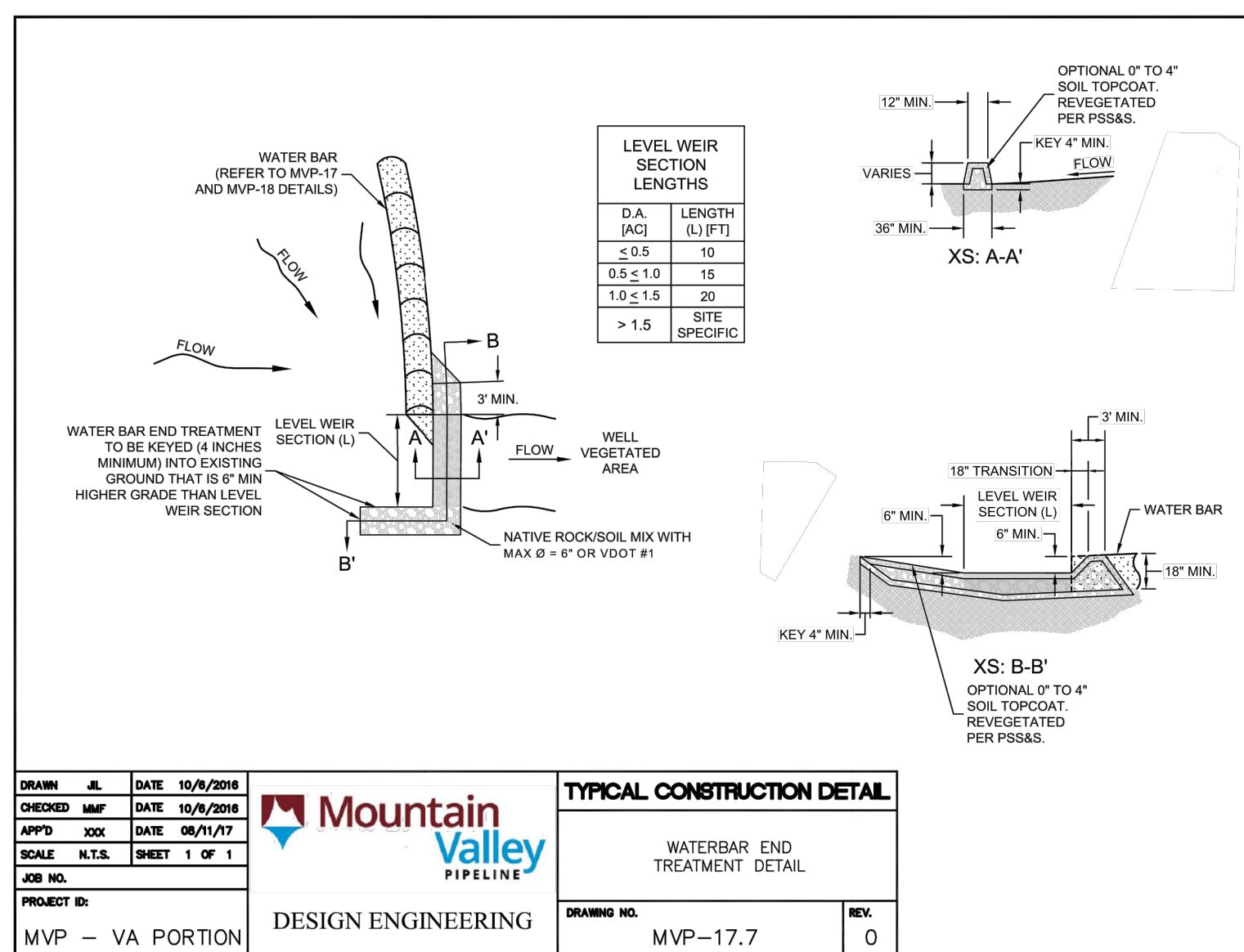
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555 SOUTHPOINTE BOULEVARD, SUITE 200
CANONSBURG, PA 15317

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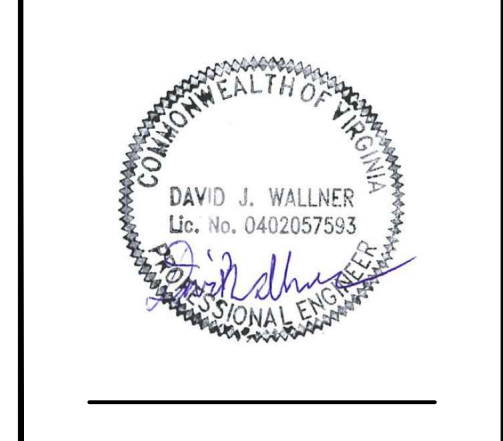
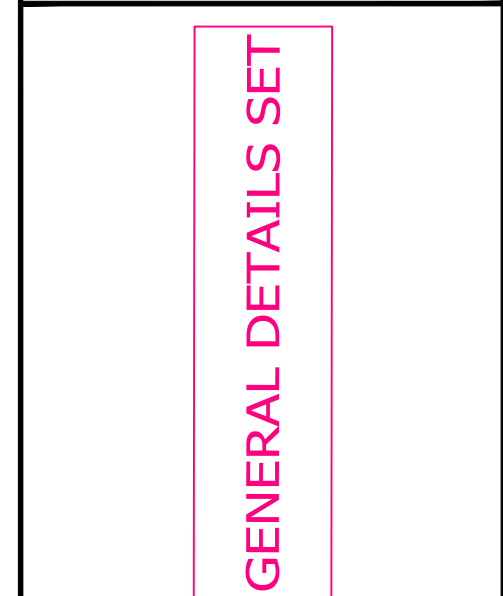
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DAVID J. WALLNER
Lic. No. 0402057593
Professional Engineer

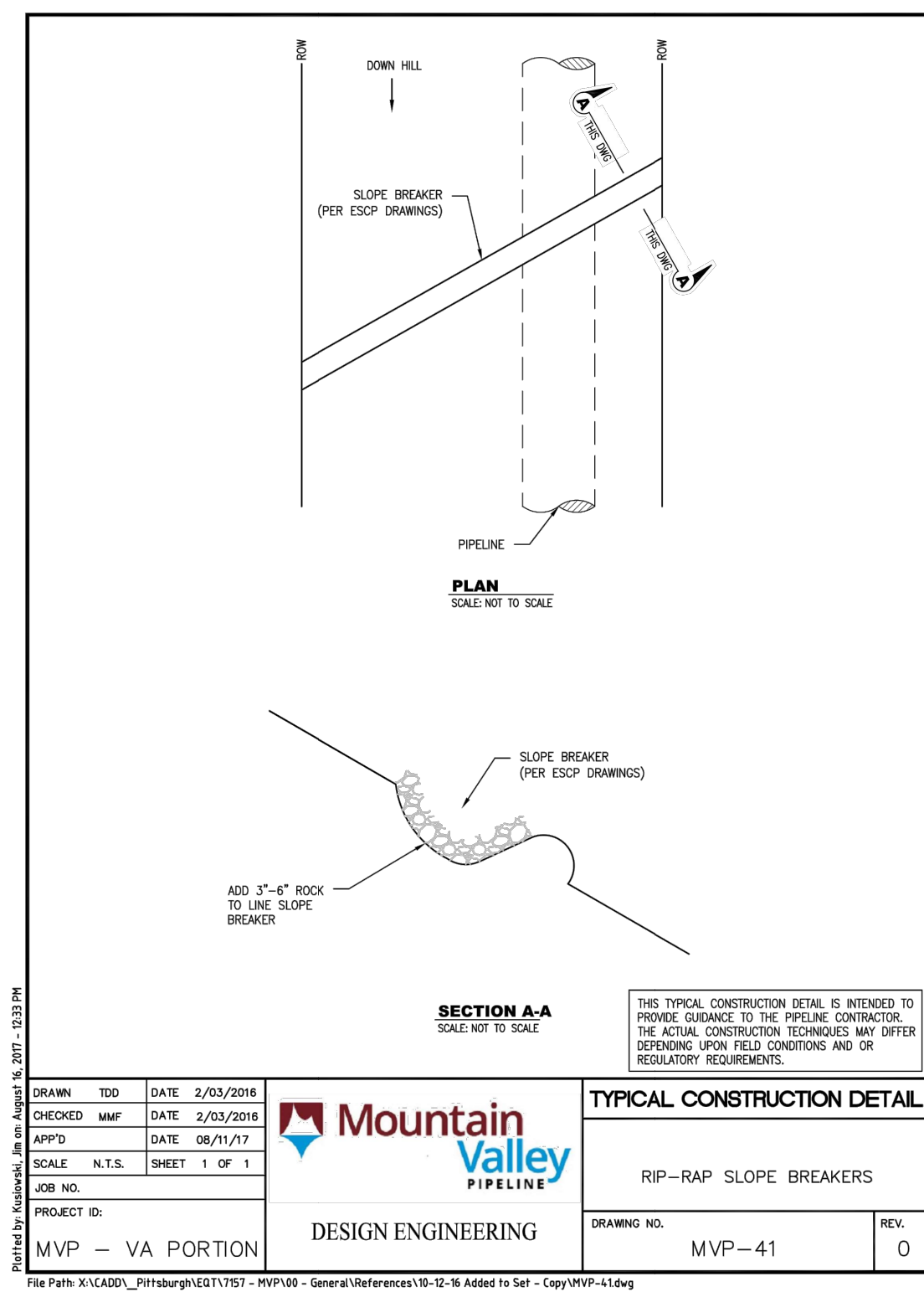
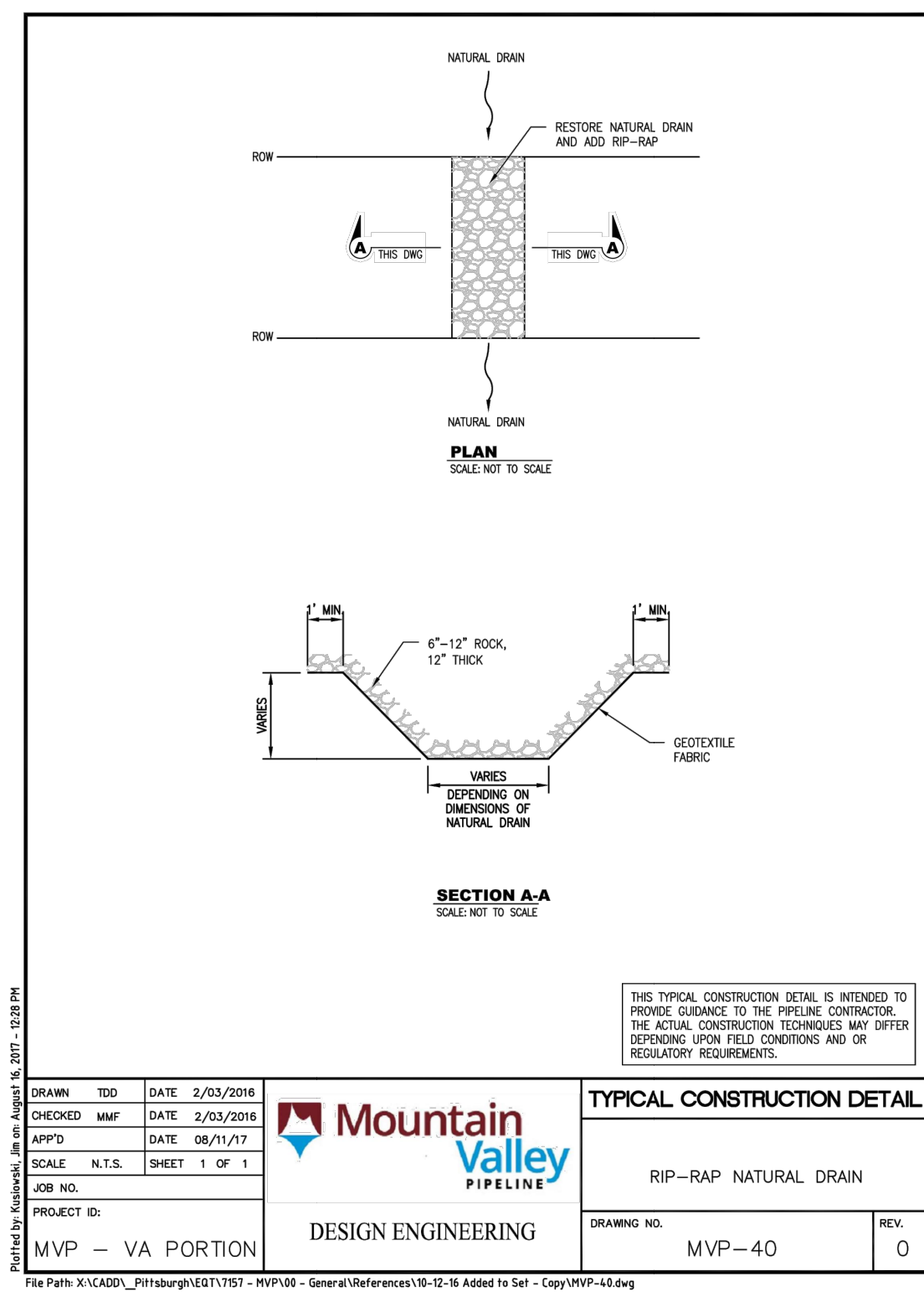
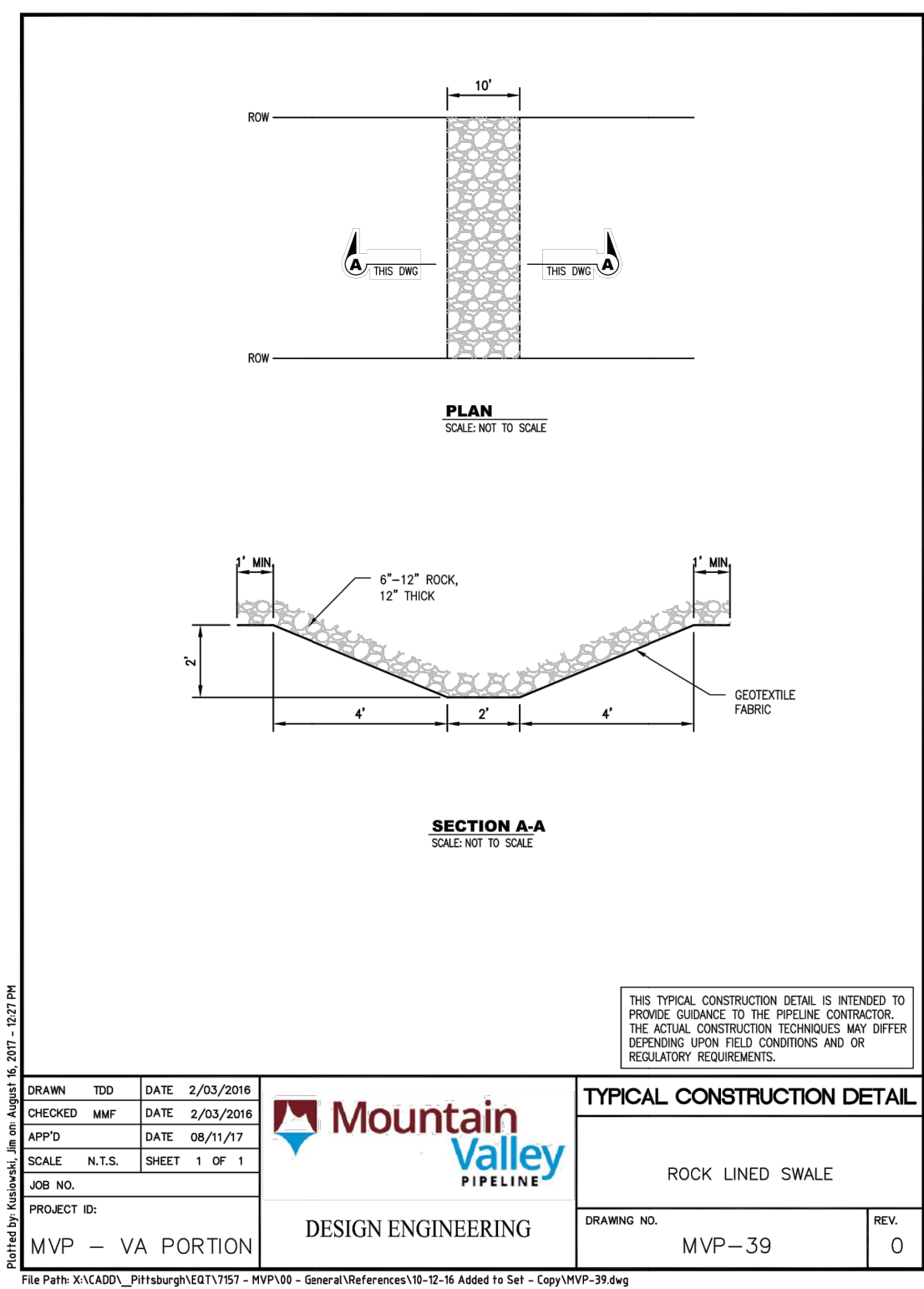
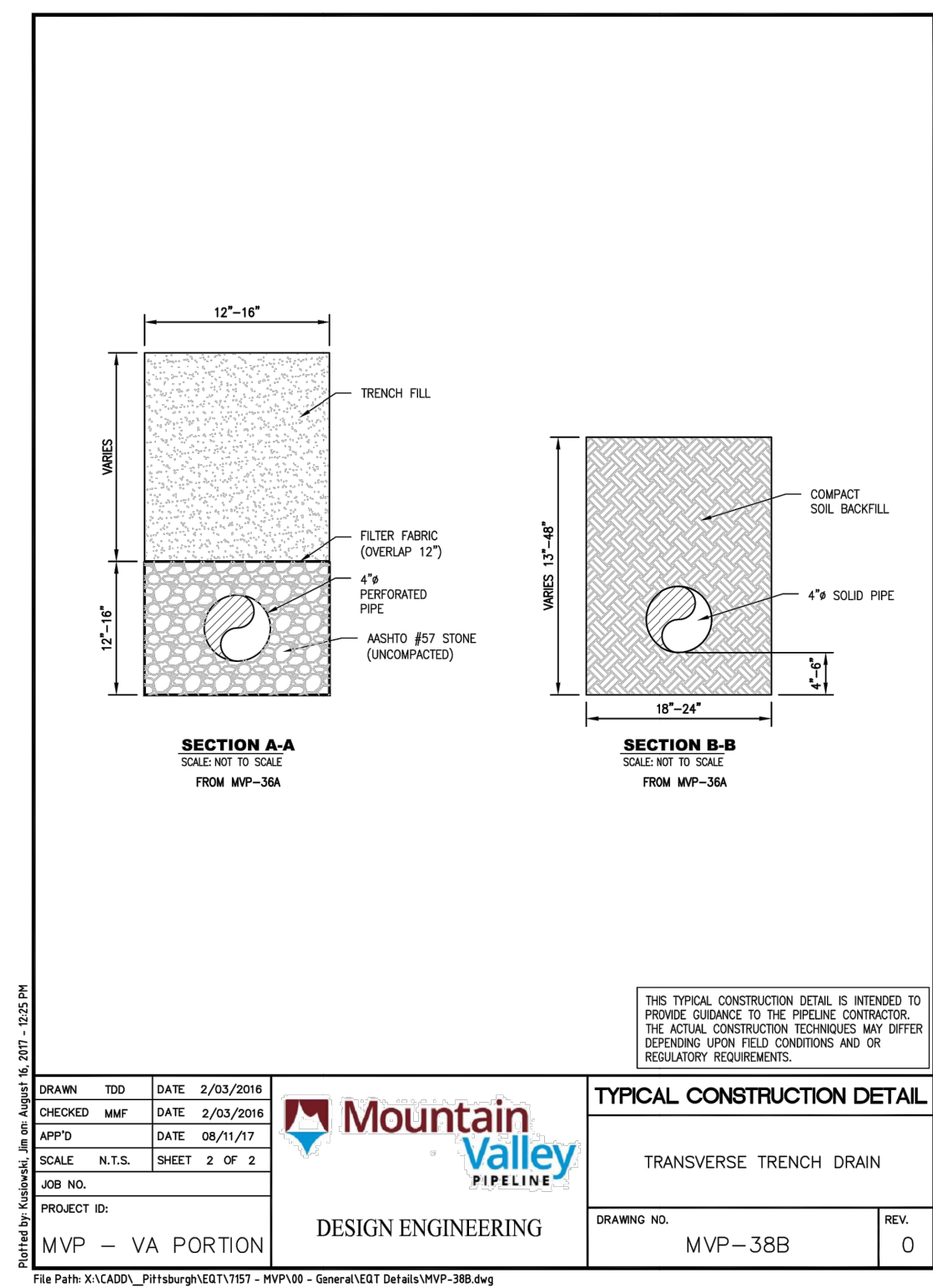
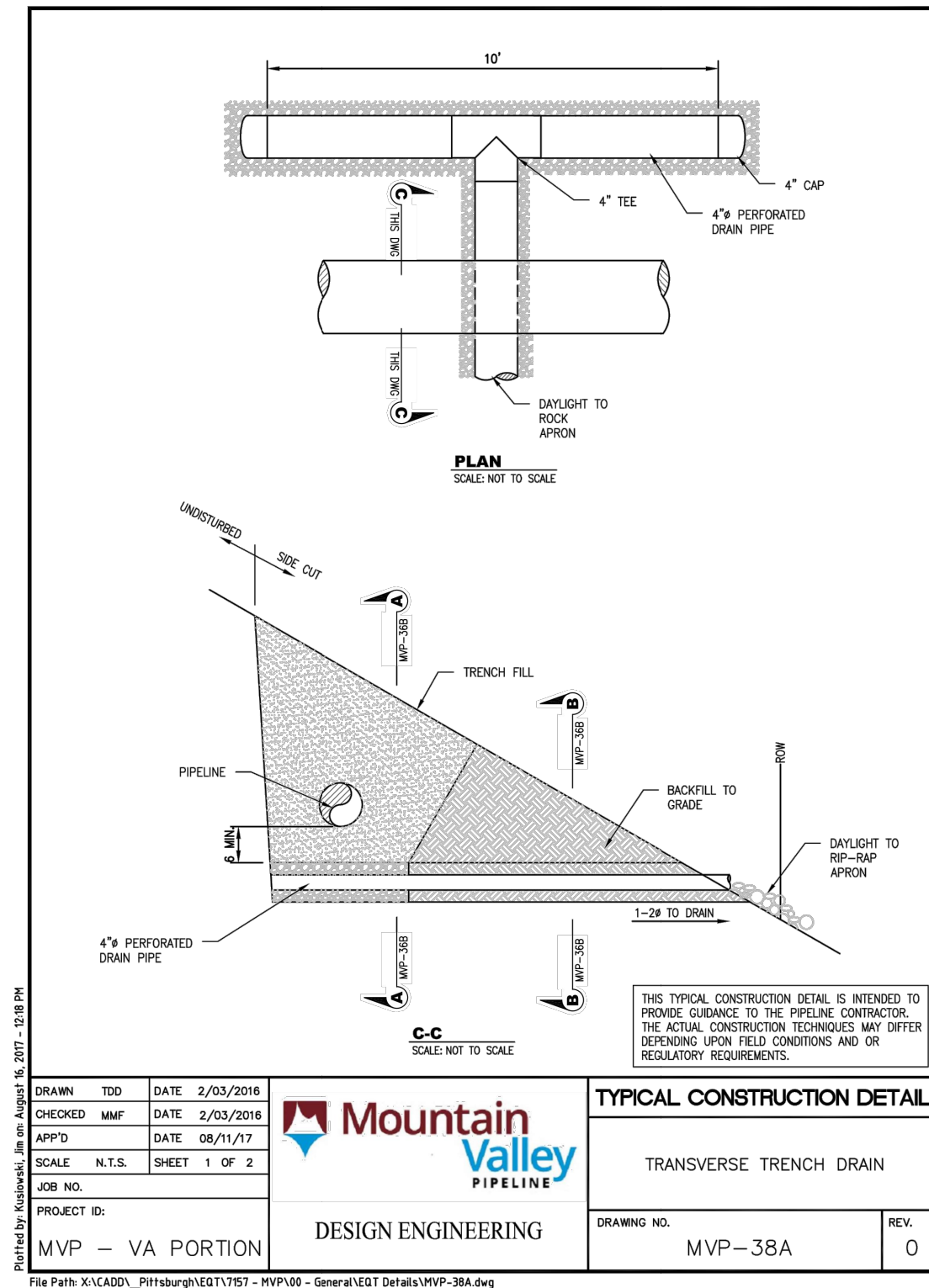
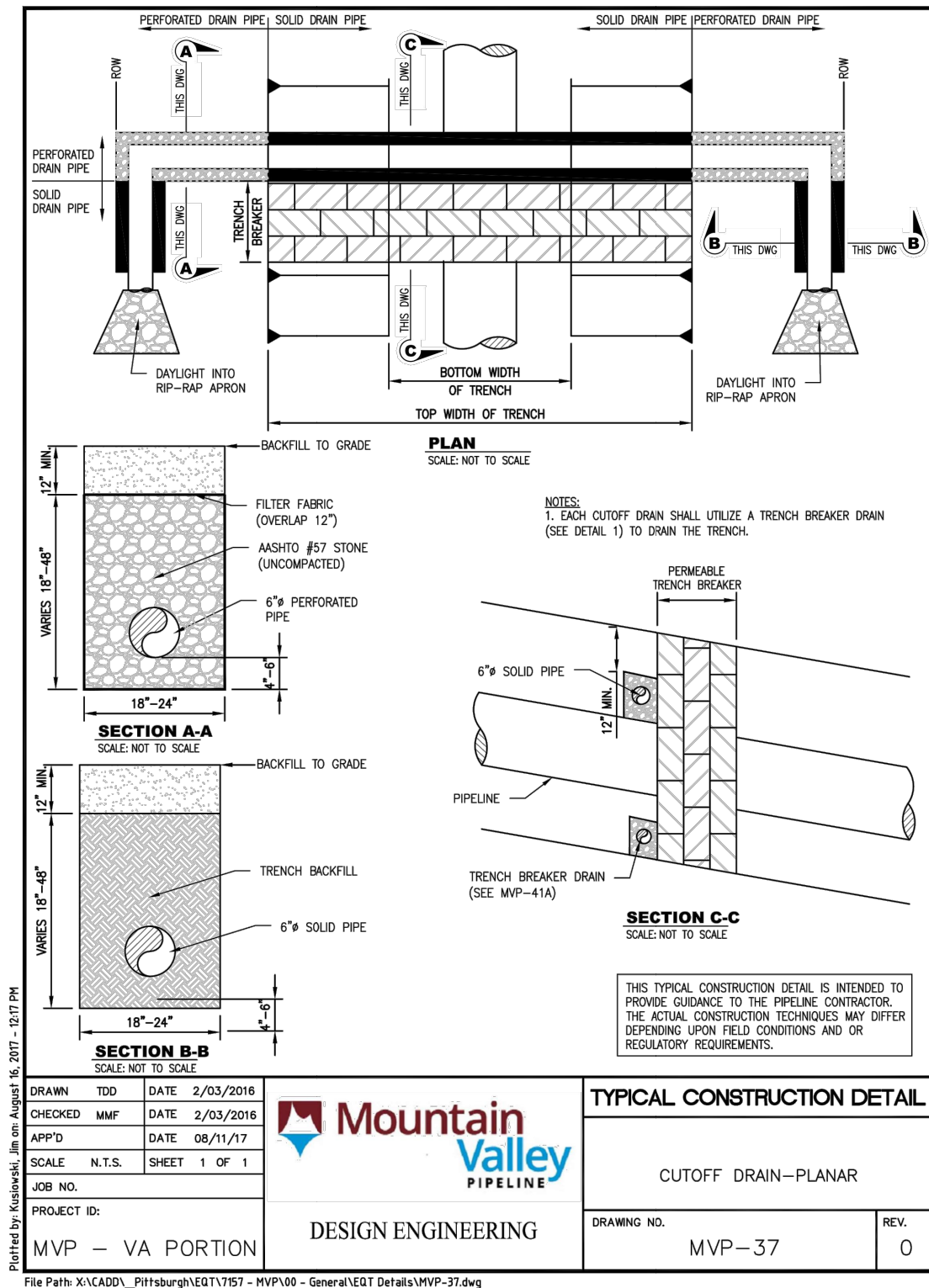
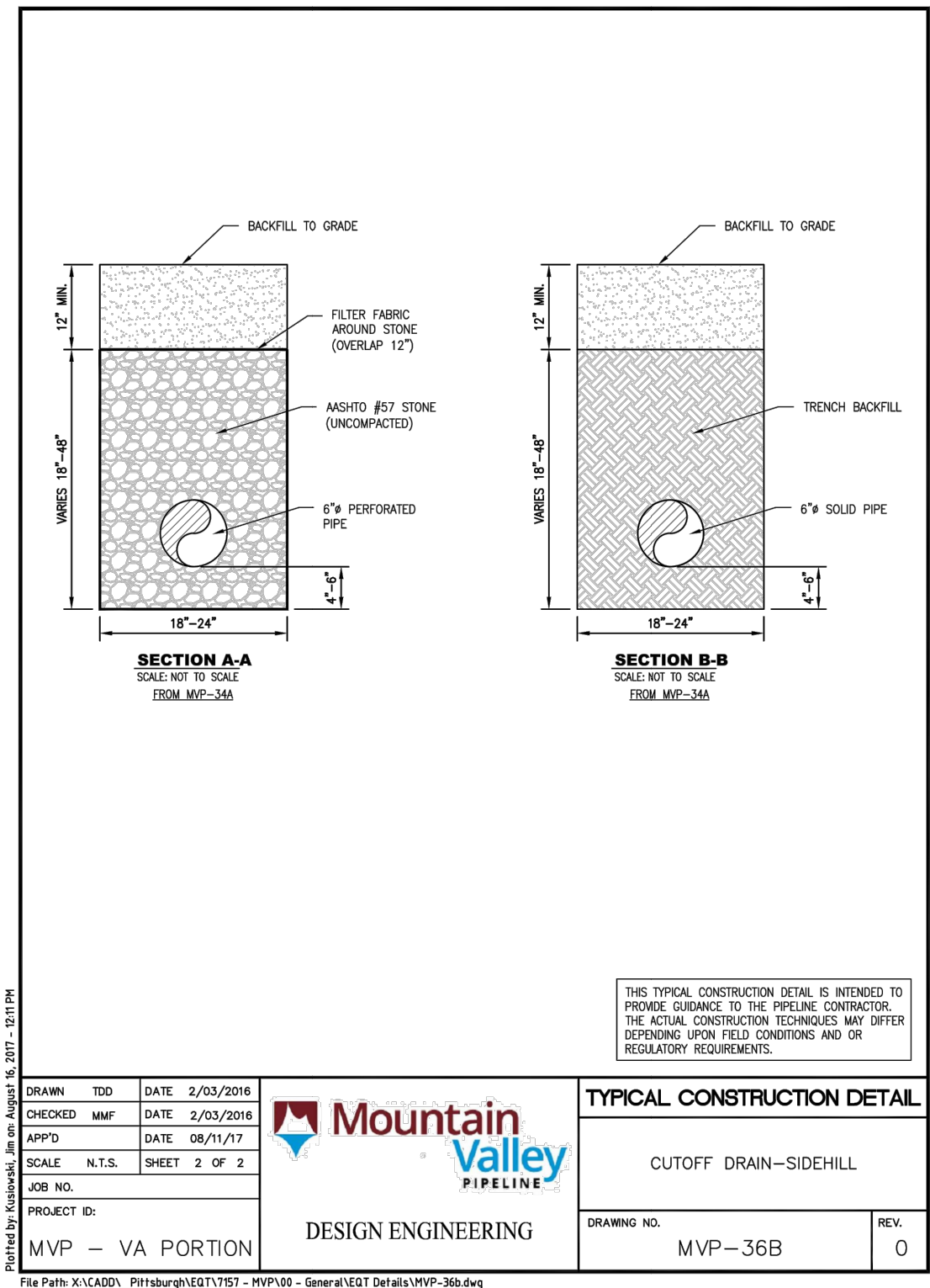
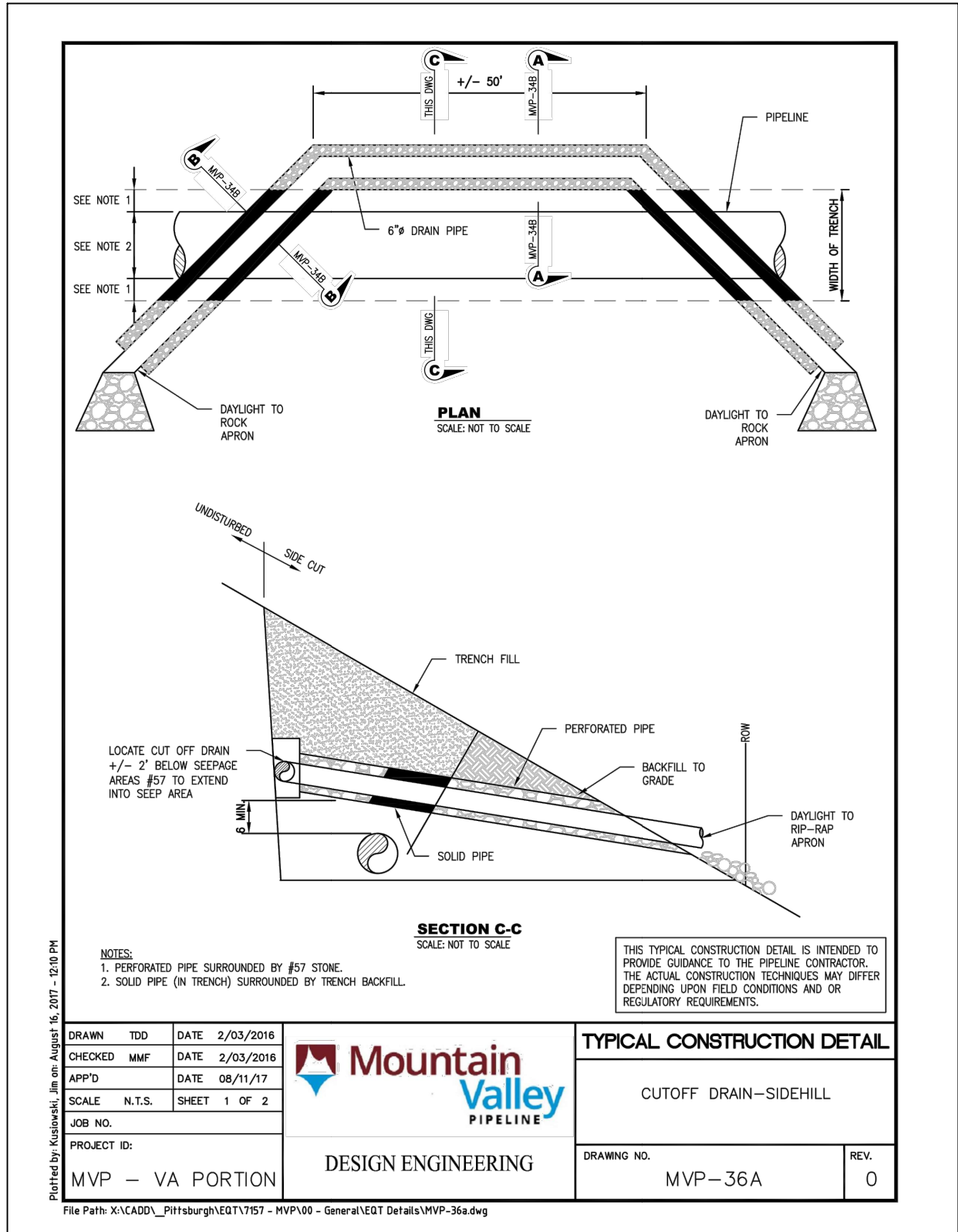
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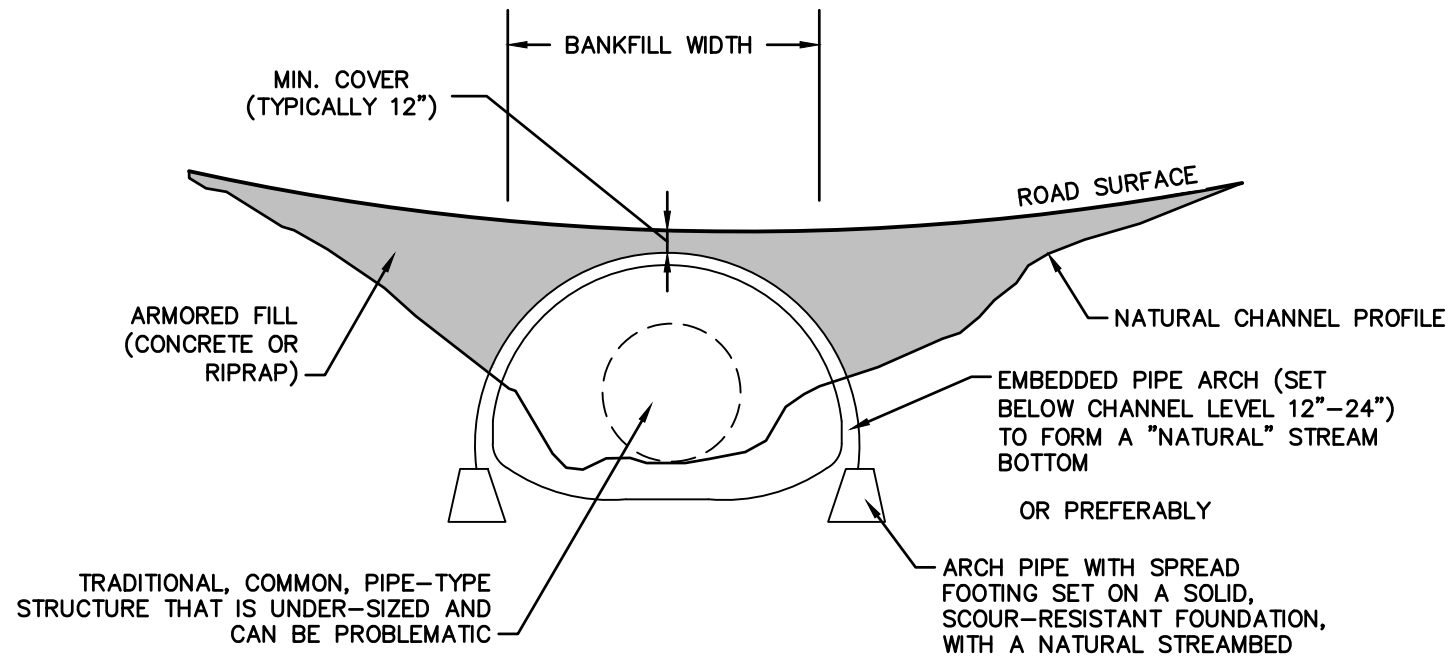
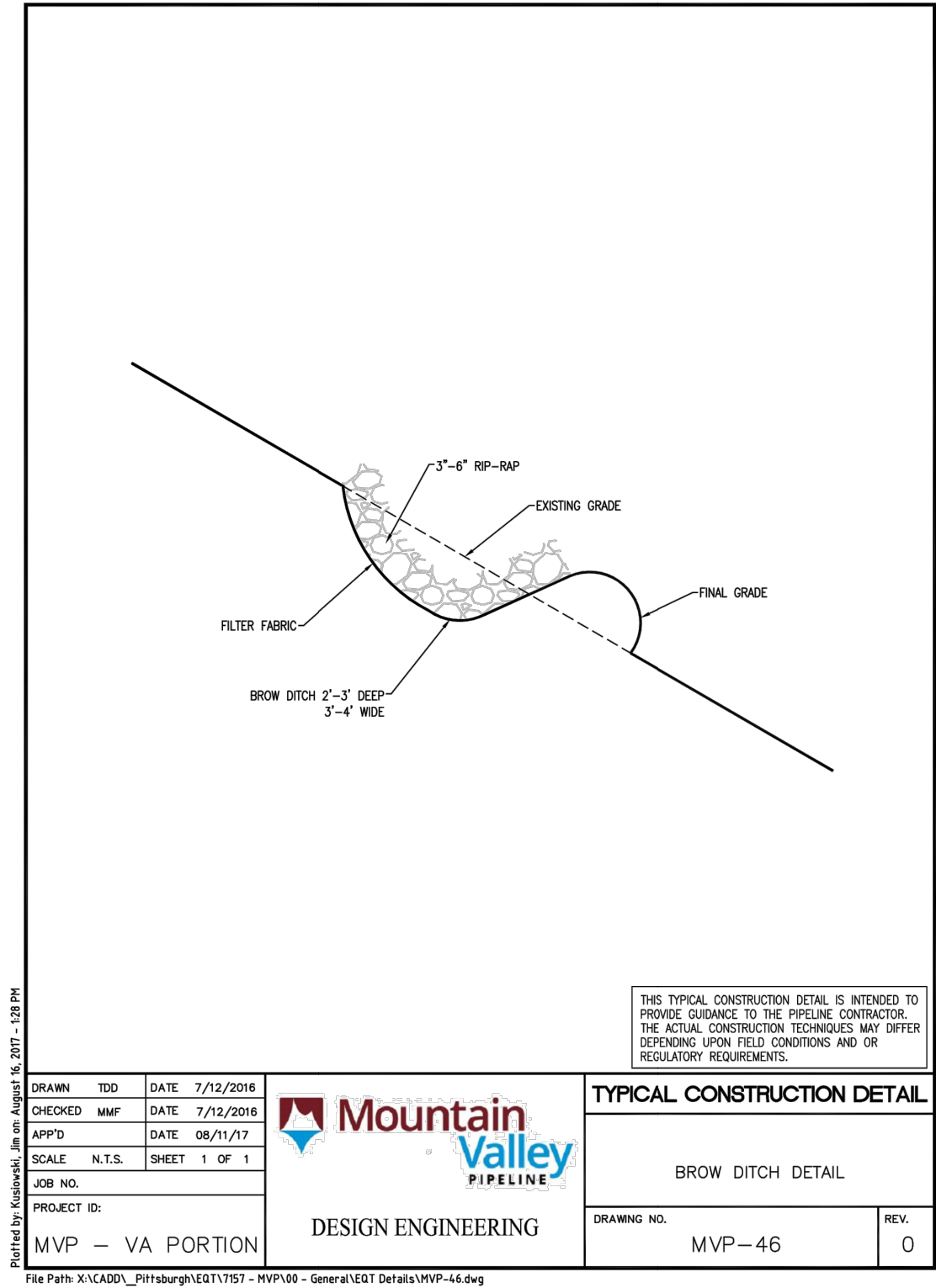
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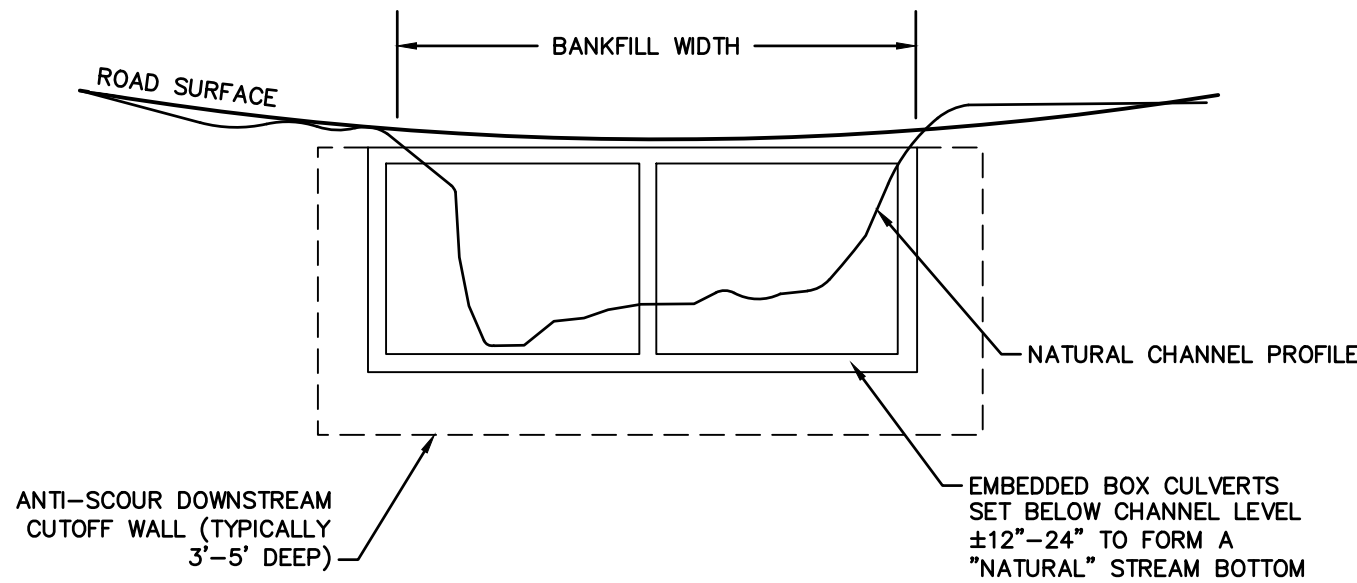
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"STREAM SIMULATION" EMBEDDED ARCH OR PIPE-ARCH CULVERTS



FISH PASSABLE EMBEDDED BOX CULVERT

"FISH FRIENDLY" CULVERT STRUCTURES
NOT TO SCALE

NOTE:
LOW-WATER CROSSINGS THAT PROVIDE PASSAGE FOR FISH AND OTHER AQUATIC SPECIES. THE EMBEDDED CULVERTS WOULD HAVE A LAYER OF STREAMBED MATERIAL AT LEAST 1- TO 2-FOOT THICK COVERING THE CULVERT FLOOR.

Stream ID	Pocahontas Road Station	Drainage Area (ac)	25-Year Design Flow (cfs)	Culvert Length (ft)	Inlet Cover (ft)	Outlet Cover (ft)	Lidar Elevation at Inlet (ft)*	Lidar Elevation at Outlet (ft)	Invert Elevation at Inlet (ft)**	Invert Elevation at Outlet(ft)**	Culvert Slope	Replacement Culvert Type	Replacement Culvert Material	Culvert Dimensions (Span/Rise)	Embedment Depth (in)	Scour Protection
S-SS2	3+20	159.66	26.72	13.72	6.5	12	2146.7	2149.6	2140.2	2137.6	19.0%	Arch - Open Bottom	Corrugated Aluminum	6/1.79'	0	R-6 Riprap
S-HH12	13+42	1.05	0.38	45.44	2.5	7	2100	2089	2097.5	2082	34.1%	Box Culvert	Precast Concrete	3/3'	16.5	R-3 Riprap
S-HH13	13+70	209.45	137.31	29.72	4.5	7.5	2080.5	2078.8	2076	2071.3	15.8%	Arch - Open Bottom	Corrugated Aluminum	8/3.33'	0	Grouted Riprap or Equivalent
S-HH14	51+63	21.34	2.59	27.67	2	3	2279.9	2279	2277.9	2276	6.9%	Box Culvert	Precast Concrete	3/3'	22.5	R-3 Riprap
S-HH15	53+15	2.08	2.172	18.29	3.5	5	2276	2275.6	2272.5	2270.6	10.4%	Arch - Open Bottom	Corrugated Aluminum	6/1.79'	0	R-3 Riprap
S-MN20	78+62	73.04	0.603	39.95	2	4	2413.9	2407	2411.9	2403	22.3%	Box Culvert	Precast Concrete	3/3'	22.5	R-3 Riprap
S-UU9	129+95	77.54	64.2	26.33	2	5	2776.3	2774.3	2774.3	2769.3	19.0%	Box Culvert	Precast Concrete	12/2.98' ***	24	Grouted Riprap or Equivalent
S-PP19	152+50	62.21	38.36	21.67	2	4	2926.7	2926	2924.7	2922	12.5%	Box Culvert	Precast Concrete	8/3.021' ***	24	Grouted Riprap or Equivalent
S-PP18	178+54	86.24	74.59	38.8	2.5	5	3103.9	3100.3	3101.4	3095.3	15.7%	Box Culvert	Precast Concrete	9/3.521' ***	24	Grouted Riprap or Equivalent
S-PP17	222+68	7.24	5.03	38.7	2	4.5	2979.9	2976	2977.9	2971.5	16.5%	Box Culvert	Precast Concrete	3/3'	22.5	R-6 Riprap
S-PP14	264+25	187.91	116.48	52.8	2.5	5	2812	2814.2	2809.5	2809.2	0.6%	Box Culvert	Precast Concrete	10/3.5' ***	24	R-3 Riprap
S-PP15	277+95	201.23	130.37	50.23	2.5	5	2803.6	2801.5	2801.1	2796.5	9.2%	Box Culvert	Precast Concrete	10/3.5' ***	24	Grouted Riprap or Equivalent

*Design basis for Roadway Crest Elevation in all cases except S-PP14 and S-PP15.
** Calculated culvert invert based on Lidar elevations adjusted for field-measured cover depths.
*** Non-standard culvert dimensions.

NO.	DATE	DWN.	CHKD.	APPD.	DESCRIPTION
7	01/31/18	KAL	RE	DW	ADDED DETAILS FOR ROADS AND PADS
6	01/26/18	KAL	RE	DW	ADDRESS VADEO COMMENTS
5	01/08/18	KAL	RE	DW	ADDRESS VADEO COMMENTS
4	11/28/17	KAL	RE	DW	ADDRESS VADEO COMMENTS
3	11/01/17	KAL	RE	DW	ADDRESS VADEO COMMENTS
2	08/18/17	KAL	RE	DW	ADDRESS VADEO COMMENTS



Mountain Valley Pipeline

EROSION AND SEDIMENT CONTROL PLANS

MOUNTAIN VALLEY PIPELINE PROJECT – H600 LINE

MOUNTAIN VALLEY PIPELINE, LLC

555 SOUTHPOINTE BOULEVARD, SUITE 200

CANONSBURG, PA 15317



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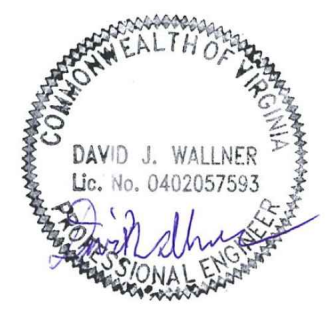
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FOSTER PLAZA 7

PITTSBURGH, PA 15220

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GENERAL CONSTRUCTION SEQUENCE

THE FOLLOWING IS A GENERAL SEQUENCE FOR EARTHMOVING ACTIVITIES ASSOCIATED WITH CONSTRUCTION OF THE PIPELINE:

1.

INSTALL TEMPORARY EROSION AND SEDIMENT CONTROLS PRIOR TO EARTH DISTURBANCE. REFER TO BEST MANAGEMENT PRACTICES (BMP) INSTALLATION AND REMOVAL NOTES. APPROPRIATE BMPS SHOULD BE PLACED AROUND SENSITIVE AREAS PRIOR TO EARTH DISTURBANCE. STONE CONSTRUCTION ENTRANCES (SCE) ARE TO BE PROVIDED AT ALL LOCATIONS WHERE ACCESS ROADS AND PIPELINES WILL BE ACCESSING OR CROSSING A PUBLIC ROADWAY. NOTE THAT SILT FENCE, COMPOST FILTER SOCK AND SUPER SILT FENCE IS BEING INSTALLED AS PART OF A "SYSTEM" OF EROSION CONTROL BMPS INCLUDING CLEAN WATER DIVERSIONS, WATERBARS AND BONDED FIBER MATRIX. THIS BMP SYSTEM APPROACH ALLOWS MVP TO MANAGE SLOPE LENGTH LIMITATIONS OF SUPER SILT BY INTRODUCING SLOPE BREAKS AND ADDITIONAL SURFACE EROSION PROTECTION.
2.

INSTALL TEMPORARY E&S CONTROLS FOR STREAM CROSSINGS AT LOCATIONS SHOWN ON THE E&S PLAN SHEETS. NO EARTH DISTURBANCE ACTIVITIES WITHIN 50 FEET OF STREAM CHANNELS WILL BE PERFORMED UNTIL MATERIALS NEEDED TO COMPLETE THE CROSSING ARE AT THE NEAREST AVAILABLE LOCATION.
3.

GENERAL CLEARING AND GRUBBING OF THE TREES AND BRUSH ALONG THE RIGHT-OF-WAY (ROW) FOR PIPELINE TRENCHING MAY COMMENCE TO THE WIDTH SPECIFIED IN THE ROW AGREEMENTS OR CONSTRUCTION ALIGNMENT SHEETS, WHICHEVER IS LESS. SMALLER DEBRIS, SUCH AS SHRUBS OR LIMBS, ARE TO BE CHIPPED AND UTILIZED ON-SITE AS PART OF THE SOIL STABILIZATION. WHERE CHIPPED MATERIAL IS USED AS MULCH, SPREAD AT A RATE NOT TO EXCEED 1 TON/ACRE. UNLESS OTHERWISE DIRECTED BY THE LANDOWNER, LOGS WILL EITHER BE HAULED OFF-SITE OR GIVEN TO THE LANDOWNER UPON THEIR REQUEST; STUMPS AND/OR LOGS WILL BE GROUND, CHIPPED, WINDROWED, OR HAULED OFF-SITE.
4.

INSTALL CLEAN WATER DIVERSIONS AND CLEAN WATER DIVERSION PIPES IN ACCORDANCE WITH VESCH STD & SPEC 3.09 AND MVP-ES50 AND MCP-ESS0.1. IN ADDITION, INSTALL OUTLET STRUCTURES FOR CLEAN WATER PIPES IN ACCORDANCE WITH MVP-ES51 AND MVP-ESS1.1. FOLLOWING INSTALLATION OF CLEAN WATER DIVERSION BERMS STABILIZE THE UPHILL SIDE OF THE BERM USING TEMPORARY SEED, EROSION CONTROL MATTING OR BONDED FIBER MATRIX. FINALLY INSTALL ROCK CHECK DAMS IN ACCORDANCE WITH VESCH STD & SPEC 3.20 EXCEPT THAT COMPOST FILTER SOCK OR NATIVE ROCK (SIZED APPROPRIATELY PER VESCH STD & SPEC 3.20) EXCAVATED DURING GRADING WILL BE USED FOR CONSTRUCTION.
5.

INSTALL TEMPORARY AND PERMANENT RIGHT-OF-WAY DIVERSIONS/WATERBARS IMMEDIATELY AFTER INITIAL DISTURBANCE OF THE SOIL IN ACCORDANCE WITH THE WATERBAR SPACING AND SIZING REQUIREMENTS SHOWN ON THE PLAN AND DETAIL SHEETS (SEE DETAILS VADEQ STD & SPEC 3.11 AND MVP-17). RIGHT-OF-WAY DIVERSIONS/WATERBARS WILL BE CONSTRUCTED OF SOIL, AND USED TO REDUCE RUNOFF VELOCITY AND DIVERT WATER OFF THE PIPELINE ROW. WATERBARS WILL BE INSTALLED WITH SUMP FILTERS (DETAIL MVP-ES42) AT THE DISCHARGE END.
6.

EXCAVATE PIPELINE TRENCH AND BEGIN GRADING OF PROPOSED METER AND RECTIFIER ANODE BED SITES. THE PROPOSED CONSTRUCTION ROW AND EXTRA WORKSPACES ARE TO BE USED AS A WORK AREA FOR TRENCH EXCAVATION, EQUIPMENT MOVEMENT AND THE TEMPORARY STORAGE OF SOIL STOCKPILES, AS NEEDED. EQUIPMENT, SOIL STOCKPILES, AND OTHER MATERIALS ARE TO REMAIN UPSLOPE OF BMPS DURING CONSTRUCTION ACTIVITIES. REFER TO BMP INSTALLATION AND REMOVAL SEQUENCE FOR THE BMPS TO BE USED FOR PROTECTION DURING TRENCH EXCAVATION AND AROUND TEMPORARY SOIL STOCKPILES. STOCKPILES AND NON-WORK AREA SLOPES WILL BE STABILIZED THROUGH AN APPLICATION OF EITHER MULCH (ORGANIC, EROSION CONTROL BLANKET OR BONDED FIBER MATRIX) OR TEMPORARY SEED. SEGREGATION OF TOPSOIL AND SUBSOIL WILL BE PERFORMED WHERE TRENCH EXCAVATION TAKES PLACE IN AN AGRICULTURAL, WETLAND, OR RESIDENTIAL AREA.
7.

PIPELINE SECTIONS WILL BE TRANSPORTED TO THE WORK AREA AND STRUNG ALONG THE WORKING SIDE OF THE ROW PARALLEL TO THE TRENCH LINE. WELDING CAN OCCUR IN OR OUT OF THE TRENCH. THE PIPELINE WILL BE BENT TO CONFORM TO THE TRENCH CONTOUR, ALIGNED WELDED AND PLACED ON TEMPORARY SUPPORTS ALONGSIDE THE TRENCH. WELDS WILL BE VISUALLY AND RADIO-GRAPHICALLY INSPECTED AND REPAIRED AS NECESSARY. THE PIPE SECTION WILL BE LOWERED INTO THE TRENCH AND PLACED ON PADDING PER MVP CONSTRUCTION STANDARDS. ANY WETNESS ENCOUNTERED DURING CONSTRUCTION WORK WILL BE DEWATERED BY USING PUMPS, HOSES, AND PUMPED BAGS (DETAIL MVP-ES2), AND WILL BE DISCHARGED TO A WELL VEGETATED, UPLAND AREA.
8.

STREAM PIPELINE CROSSING CONSTRUCTION METHODS WILL BE INSTALLED AT LOCATIONS SHOWN ON THE E&S PLAN SHEETS AND AS SPECIFIED ON DETAIL SHEET. STREAM BANK STABILIZATION WILL BE INSTALLED IMMEDIATELY FOLLOWING COMPLETION OF PIPELINE INSTALLATION AS SHOWN ON THE DETAIL SHEET.
9.

INSTALL TRENCH BREAKERS AT LOCATIONS SHOWN ON THE DRAWINGS OR AS DIRECTED BY MVP AND AS SPECIFIED ON THE DETAIL SHEET (DETAIL MVP-20).
10.

THE TRENCH WILL SUBSEQUENTLY BE BACKFILLED WITH SUITABLE EXCAVATED MATERIAL. THE BACKFILL MATERIAL WILL BE SLIGHTLY CROWNED IN UPLAND AREAS TO ALLOW FOR SETTLEMENT THAT MAY OCCUR. CROWNING THE SOIL SLIGHTLY OVER THE PIPELINE WILL HELP PREVENT FUTURE STORM WATER-RELATED PROBLEMS FROM SETTLING OF THE BACKFILLED AREA. NO CROWNING OF SOILS WILL TAKE PLACE IN WETLANDS, STREAMS, OR FLOOD PLAINS. IN AREAS WHERE TOPSOIL HAS BEEN SEGREGATED, THE SUBSOIL WILL BE REPLACED FIRST, AND THEN THE TOPSOIL WILL BE SPREAD OVER THE AREA FROM WHICH IT WAS REMOVED. DISTURBED AREAS WILL BE RESTORED TO THEIR APPROXIMATE ORIGINAL TOPOGRAPHIC CONTOURS.
11.

STABILIZE EXPOSED AND UNWORKED SOILS BY APPLICATION OF EFFECTIVE BMPS THAT PROTECT THE SOIL FROM THE EROSIIVE FORCES OF RAINDROPS, FLOWING WATER, AND WIND. PERMANENT OR TEMPORARY SOIL STABILIZATION SHALL BE APPLIED TO DENUDED AREAS WITHIN SEVEN DAYS AFTER FINAL GRADE IS REACHED ON ANY PORTION OF THE SITE. WHERE A DENUDED AREA WILL REMAIN IDLE FOR MORE THAN 7 CALENDAR DAYS, TEMPORARY SEEDING (VA STD & SPEC 3.31, TABLE 3.31-B) WILL BE APPLIED TO THE ROUGH GRADED AREA. PERMANENT STABILIZATION SHALL BE APPLIED TO AREAS THAT ARE TO BE LEFT DORMANT FOR MORE THAN ONE YEAR.
12.

IN THE UNLIKELY EVENT THAT THERE ARE EXCESS EXCAVATED MATERIALS REMAINING AFTER THE TRENCH HAS BEEN BACKFILLED, THE MATERIAL IS TO BE DISPOSED OF WITHIN THE EXISTING ROW IN AN UPLAND AREA OUTSIDE OF THE 100-YEAR FLOOD PLAIN. MATERIAL WILL BE SPREAD IN A THIN LAYER AND TIED INTO EXISTING CONTOURS TO CREATE POSITIVE DRAINAGE FOR STORMWATER RUNOFF.
13.

CONSTRUCT PERMANENT RIGHT-OF-WAY DIVERSION/WATERBARS AFTER COMPLETION OF GRADING IN ACCORDANCE WITH THE WATERBAR SPACING AND SIZING REQUIREMENTS SHOWN ON PLAN AND DETAIL SHEETS (DETAIL MVP-17).
14.

PRIOR TO SEEDING MVP WILL DISC AREAS TO A DEPTH OF 4-6" TO FACILITATE REVEGETATION. DISCING WILL BE PERFORMED ON SUBSOILS TO A DEPTH OF 4-6" AND AGAIN FOLLOWING TOPSOILING.
15.

REVEGETATE DISTURBED AREA PER THE TABLES ON DETAILS MVP-ES11.1 TO 11.9 AND MVP-12.1 TO 12.4 OR PER LANDOWNER REQUEST. FOR 3:1 OR STEEPER SLOPES THE DISTURBED AREA WILL HAVE EROSION CONTROL FABRIC (BLANKETING, HYDROSEEDING, FLEXTERRA, OR APPROVED EQUAL) INSTALLED AS SHOWN ON DETAIL SHEET (DETAILS VA STD & SPEC 3.36, MVP-ES40 AND MVP ES-40.1).
16.

RE-ESTABLISH APPROPRIATE DRAINAGE IN EXISTING ROAD CHANNELS PRIOR TO SEEDING AND MULCHING.
17.

CONDUCTING INSPECTIONS OF TEMPORARY ESC CONTROLS AND SWM BMPS ON AT LEAST THE FOLLOWING FREQUENCIES:

A.

IN NON-TMDL WATERSHEDS

•

AT LEAST ONCE EVERY FIVE BUSINESS DAYS, OR

•

AT LEAST ONCE EVERY 10 BUSINESS DAYS AND NO LATER THAN 48 HOURS FOLLOWING A MEASURABLE STORM EVENT (OR ON THE NEXT BUSINESS DAY IF THE STORM EVENT OCCURS WHEN THERE ARE MORE THAN 48 HOURS BETWEEN BUSINESS DAYS.

B.

TMDL WATERSHEDS:

•

AT LEAST ONCE EVERY FOUR BUSINESS DAYS, OR

•

AT LEAST ONCE EVERY 5 BUSINESS DAYS AND NO LATER THAN 48 HOURS FOLLOWING A MEASURABLE STORM EVENT (OR ON THE NEXT BUSINESS DAY IF THE STORM EVENT OCCURS WHEN THERE ARE MORE THAN 48 HOURS BETWEEN BUSINESS DAYS.

TEMPORARY BMP'S WILL BE REMOVED UPON ACHIEVING VEGETATIVE STABILIZATION, WHICH IS DEFINED AS "A GROUND COVER IS ACHIEVED THAT IS UNIFORM, MATURE ENOUGH TO SURVIVE AND WILL INHIBIT EROSION". DISTURBED AREAS NOT ATTAINING AN ACCEPTABLE VEGETATIVE COVER SHALL BE RESEEDDED AS NEEDED UNTIL THE ENDPOINT IS ACHIEVED.

18.

ALL POLLUTANTS, INCLUDING WASTE MATERIALS AND DEMOLITION DEBRIS THAT OCCUR ON SITE DURING CONSTRUCTION SHALL BE HANDLED AND LEGALLY DISPOSED OF IN A MANNER THAT DOES NOT CAUSE CONTAMINATION OF SURFACE WATERS. WOODY DEBRIS MAY BE CHIPPED AND SPREAD ON-SITE.

FOR STREAM CROSSINGS, REFER TO THE FOLLOWING STEPS:

1.

INSTALL TEMPORARY EQUIPMENT BRIDGE, BYPASS HOSE, FLUME, PUMP, OR COFFERDAM AS DESCRIBED IN STREAM CROSSING DETAILS AROUND THE WORK AREA.

2.

DEWATER WORK AREA UTILIZING PUMP WATER FILTER BAGS. WHERE POSSIBLE, EXCAVATION WILL BE FROM THE TOP OF THE STREAM BANK.

3.

INSTALL TRENCH PLUGS, PIPE, AND BACKFILL.

4.

STABILIZE CHANNEL EXCAVATION AND STREAM BANKS PRIOR TO REDIRECTING STREAM FLOW.

5.

REMOVE BYPASS HOSE, FLUME, PUMP, AND TEMPORARY DAM AS NEEDED.

IF WORKING WITHIN A WETLAND AREA, FOLLOW THE GENERALIZED CONSTRUCTION SEQUENCE BELOW:

1.

INSTALL EITHER SUPER SILT FENCE, ORANGE CONSTRUCTION FENCE, OR COMPOST FILTER SOCKS ALONG THE PERIMETERS OF THE SITE AS SHOWN ON THE CONSTRUCTION DRAWINGS.

2.

MATS, PADS, OR SIMILAR DEVICES WILL BE USED DURING THE CROSSINGS OF WETLANDS. ORIGINAL GRADES THROUGH WETLANDS MUST BE RESTORED AFTER TRENCHING AND BACKFILLING. ANY EXCESS FILL MATERIALS MUST BE REMOVED FROM THE WETLAND AND NOT SPREAD WITHIN WETLANDS.

3.

SOIL EXCAVATED FROM WETLAND AREAS WILL BE CAREFULLY REMOVED WITH THE ROOTS INTACT. THIS SOIL WILL BE PLACED IN A SEPARATE STOCKPILE TO BE REUSED DURING THE WETLAND SURFACE RESTITUTION.

4.

DEWATER WORK AREA UTILIZING PUMPED WATER FILTER BAGS.

5.

INSTALL PIPE.

6.

INSTALL TRENCH PLUGS IN WETLAND AREAS TO PREVENT THE TRENCH FROM DRAINING THE WETLAND OR CHANGING ITS HYDROLOGY.

7.

BACKFILL PIPE TRENCH. BACKFILL THE TOP 12-INCHES OF THE EXCAVATED TRENCH WITH THE STOCKPILED WETLAND SOIL TO MATCH ORIGINAL SURFACE GRADES.

8.

COMPACT BACKFILL AND GRADE THE SURFACE OF THE TRENCH AREA TO ALLOW FOR POSITIVE DRAINAGE TO SOIL E&SCS AND TO PREPARE DISTURBED AREAS FOR PERMANENT TRENCH RESTORATION.

9.

MAINTAIN ALL E&SCS DEVICES UNTIL SITE WORK IS COMPLETE AND A GROUND COVER IS ACHIEVED THAT IS UNIFORM AND MATURE ENOUGH TO SURVIVE AND INHIBIT EROSION.

10.

REMOVE ALL SOIL AND E&SC MEASURES UPON ESTABLISHMENT OF A GROUND COVER THAT IS UNIFORM AND MATURE ENOUGH TO SURVIVE AND INHIBIT EROSION. RE-GRADE AND REVEGETATE AREAS DISTURBED DURING THE REMOVAL OF THE SOIL E&SCS.

BMP MAINTENANCE

•

TEMPORARY AND PERMANENT EROSION AND SEDIMENT CONTROL BMPS SHALL BE MAINTAINED AND REPAIRED AS NEEDED TO ASSURE CONTINUED PERFORMANCE OF THEIR INTENDED FUNCTION. MAINTENANCE AND REPAIR SHALL BE CONDUCTED IN ACCORDANCE WITH THE APPROVED STANDARDS AND SPECIFICATIONS.

•

IN NON-AGRICULTURAL AREAS THE VISUAL SURVEY SHALL BE COMPARED TO THE DENSITY AND COVER OF ADJACENT UNDISTURBED LANDS. IN AGRICULTURAL AREAS, THE VISUAL SURVEY SHALL BE COMPARED TO THE ADJACENT UNDISTURBED PORTIONS OF THE SAME FIELD, UNLESS THE EASEMENT AGREEMENT SPECIFIES OTHERWISE.

•

WETLANDS ALONG THE PROPOSED PIPELINE ARE EXPECTED TO EXHIBIT VARYING DEGREES OF SATURATION AND WATER ELEVATION, REQUIRING A VARIETY OF PLANT SPECIES TO BE RE-ESTABLISHED. IN UNSATURATED WETLANDS, MOST VEGETATION WILL BE REPLACED BY SEEDING. SATURATED WETLANDS WILL TYPICALLY BE ALLOWED TO RE-VEGETATE NATURALLY. WETLAND REVEGETATION WILL BE CONSIDERED SUCCESSFUL WHEN THE COVER OF HERBACEOUS AND/OR WOODY SPECIES IS AT LEAST 80 PERCENT OF THE TYPE, DENSITY, AND DISTRIBUTION OF THE VEGETATION IN ADJACENT WETLAND AREAS THAT WERE NOT DISTURBED BY CONSTRUCTION. REVEGETATION EFFORTS WILL CONTINUE UNTIL WETLAND REVEGETATION IS SUCCESSFUL.

•

CONDUCTING INSPECTIONS OF TEMPORARY ESC CONTROLS AND SWM BMPS AT LEAST ONCE EVERY FOUR BUSINESS DAYS.

•

TEMPORARY EROSION AND SEDIMENT CONTROL BMPS SHOULD BE REMOVED WITHIN 30 DAYS AFTER FINAL SITE STABILIZATION IS ACHIEVED OR AFTER THE TEMPORARY BMPS ARE NO LONGER NEEDED. TRAPPED SEDIMENT SHALL BE REMOVED OR STABILIZED ON SITE. DISTURBED SOIL RESULTING FROM REMOVAL OF BMPS OR VEGETATION SHALL BE PERMANENTLY STABILIZED.

RESTORATION BMP PHASING

THE FOLLOWING IS THE SEQUENCE OF EROSION AND SEDIMENT CONTROL BEST MANAGEMENT PRACTICE REMOVAL AND INSTALLATION RELATED TO RESTORATION ACTIVITIES. THIS WORK WILL OCCUR BETWEEN RESTORATION OF PIPELINE LIMIT OF DISTURBANCE TO PRE-CONSTRUCTION GRADES AND FINAL CLOSURE OF THE PROJECT DEFINED AS "ACHIEVING VEGETATIVE STABILIZATION". THE SEQUENCE IS:

1)

REMOVE AND GRADE OUT THE CLEAN WATER DIVERSION DIKE.

2)

REMOVE DOWNSLOPE BMPS UTILIZED DURING CONSTRUCTION AND IMMEDIATELY REPLACE WITH 12-IN COMPOST FILTER SOCK. ON SLOPES GREATER THAN 30%, AN ADDITIONAL INTERMEDIATE 12-IN COMPOST FILTER SOCKS WILL BE PLACED PER THE SLOPE SPACING (MVP-ES3.2) TO ATTENUATE THE VELOCITY OF RUNOFF IN THE RECLAIMED AREA.

3)

APPLY SPECIALTY SEEDS AS REQUIRED THAT WILL NOT BE INCLUDED IN THE MULCH PHASE (STEP 4), SEED THE AREA USING THE SEED MIXES AND RATES SPECIFIED IN MVP-ES11.1 TO MVP-ES11.9 AND MVP-ES12.1 TO MVP-ES12.4.

4)

APPLY MULCH IN THE FORM OF ORGANIC MULCH (PER MVP-ES45), SOIL STABILIZATION MATTING (PER VADEQ STD & SPEC 3.36), OR HYDRAULIC EROSION CONTROL PRODUCT (PER MVP-ES40).

5)

FOLLOWING A DETERMINATION THAT THE SITE HAS ACHIEVED VEGETATIVE STABILIZATION, THE COMPOST FILTER SOCK WILL BE "OPENED" AND THE MULCH CONTAINED WITHIN WILL BE SPREAD WITHIN THE LIMITS OF DISTURBANCE.

ADDED DETAILS FOR ROADS AND PADS		DW	RE	01/31/18	KAL
ADDRESS VADEQ COMMENTS		DW	RE	01/26/18	KAL
ADDRESS VADEQ COMMENTS		DW	RE	01/08/18	KAL
ADDRESS VADEQ COMMENTS		DW	RE	11/28/17	KAL
ADDRESS VADEQ COMMENTS		DW	RE	11/01/17	KAL
ADDRESS VADEQ COMMENTS		DW	RE	08/18/17	KAL
DESCRIPTION:		CHGD.:	APPD.:	NO.:	DATE:
REVISIONS:					

Mountain Valley Pipeline

EROSION AND SEDIMENT CONTROL PLANS

MOUNTAIN VALLEY PIPELINE PROJECT – H600 LINE

MOUNTAIN VALLEY PIPELINE, LLC

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CANONSBURG, PA 15317

TETRA TECH

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COMMONWEALTH OF PENNSYLVANIA

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DRAWN BY:

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CHECKED BY:

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APPROVED BY:

RE

DATE:

11/28/2017

SCALE:

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BEST MANAGEMENT PRACTICES (BMP) INSTALLATION & REMOVAL NOTES

TEMPORARY AND PERMANENT BMPs WILL BE USED DURING CONSTRUCTION ACTIVITIES TO AVOID AND/OR MINIMIZE ADVERSE ENVIRONMENTAL EFFECTS OF CONSTRUCTION ACTIVITIES.

THE FOLLOWING ARE GENERAL BMP INSTALLATION NOTES FOR PIPELINE CONSTRUCTION ACTIVITIES.

- A STONE CONSTRUCTION ENTRANCE, PER VESCH STD & SPEC 3.02 AND MVP-ES20, SHALL BE PROVIDED AT ALL LOCATIONS WHERE CONSTRUCTION TRAFFIC WILL BE ACCESSING A PAVED ROAD DIRECTLY FROM A DISTURBED AREA.
- TEMPORARY SEDIMENT BARRIERS, INCLUDING APPROPRIATELY SIZED COMPOST FILTER SOCK, SILT FENCE OR SILT FENCE WILL BE PLACED AROUND SOIL STOCKPILES, AS NEEDED.
- COMPOST FILTER SOCK WILL BE PLACED AROUND WETLANDS AND WATERBODIES IN AND ADJACENT TO THE WORK AREA PRIOR TO ANY TRENCHING ACTIVITIES. COMPOST FILTER SOCK HAS BEEN SIZED PER MVP-ES3 AND THE SIZE IS SPECIFIED ON THE PLAN SETS UTILIZING THE LINE TYPES CONTAINED IN THE LEGEND ON EACH SHEET.
- STOCKPILE SLOPES WILL BE 2:1 OR FLATTER, AND STOCKPILES WILL NOT EXCEED 35 FEET IN HEIGHT.
- TEMPORARY STREAM CROSSINGS SHALL BE INSTALLED AS INDICATED ON THE E&S PLAN SHEETS AND AS PER THE E&S DETAIL SHEETS.
- WATERBARS WILL BE INSTALLED IMMEDIATELY AFTER INITIAL DISTURBANCE OF THE SOIL IN ACCORDANCE WITH THE SPACING AND SIZING REQUIREMENTS SHOWN ON PLAN AND DETAIL SHEET. WATERBARS WILL BE CONSTRUCTED OF SOIL TO REDUCE RUNOFF VELOCITY AND DIVERT WATER OFF THE PIPELINE ROW.
- EXCAVATED TRENCH SPOIL MATERIAL WILL BE USED FOR TEMPORARY RIGHT OF WAY DIVERSIONS AS SHOWN IN THE DETAIL AT THE LOCATIONS INDICATED ON THE PLAN SHEETS.
- TRENCH DEWATERING, IF NEEDED, WILL BE CONDUCTED USING A PUMP AND HOSE. WATER WILL BE RELEASED INTO A FILTER BAG THAT WILL BE LOCATED IN A WELL-VEGETATED UPLAND AREA.
- TRENCH BREAKERS WILL BE INSTALLED ON SLOPES ADJACENT TO STREAMS, WETLANDS, AND ROAD CROSSINGS TO PREVENT SUBSURFACE EROSION. TRENCH BREAKERS WILL BE INSTALLED AS SHOWN ON THE DETAILS.
- THE WORK AREA WILL BE BACKFILLED FOLLOWING PIPELINE INSTALLATION OR OTHER EXCAVATION WORK. IN AREAS WHERE TOPSOIL HAS BEEN SEGREGATED, THE SUBSOIL WILL BE REPLACED FIRST, AND THEN THE TOPSOIL WILL BE SPREAD OVER THE AREA FROM WHICH IT WAS REMOVED. DISTURBED AREAS WILL BE RESTORED TO THEIR ORIGINAL TOPOGRAPHIC CONTOURS.
- PERMANENT WATERBARS, WILL BE CONSTRUCTED WITH A TWO PERCENT (TYPICAL) OUTSLOPE TO DIVERT SURFACE FLOW TO A WELL VEGETATED STABLE AREA.
- IMMEDIATELY FOLLOWING BACKFILLING ALL DISTURBED AREAS WILL BE GRADED IN PREPARATION FOR SEEDING AND MULCHING. PRIOR TO SEEDING MVP WILL DISC AREAS TO A DEPTH OF 4-6" TO FACILITATE REVEGETATION. DISCING WILL BE PERFORMED ON SUBSOILS TO A DEPTH OF 4-6" AND AGAIN FOLLOWING TOPSOILING. THE CONSTRUCTION SITE SHOULD BE STABILIZED AS SOON AS POSSIBLE AFTER COMPLETION. ESTABLISHMENT OF FINAL COVER MUST BE INITIATED NO LATER THAN 7 DAYS AFTER REACHING FINAL GRADE. REFER TO TABLES ON THIS SHEET FOR TEMPORARY AND PERMANENT SEEDING SPECIFICATIONS.
- FOR 3:1 OR STEEPER SLOPES THE DISTURBED AREA WILL HAVE EROSION CONTROL BLANKETING INSTALLED AS INDICATED ON DETAIL SHEET.
- TEMPORARY SEDIMENT BARRIERS WILL BE MAINTAINED UNTIL VEGETATION HAS BECOME ESTABLISHED WITH A GROUND COVER THAT IS UNIFORM, MATURE ENOUGH TO SURVIVE AND WILL INHIBIT EROSION. ONCE THIS COVERAGE HAS BEEN OBTAINED, APPROPRIATE CONTROLS WILL BE REMOVED FROM THE WORK AREA. AREAS DISTURBED DURING THE REMOVAL OF THE EROSION CONTROLS WILL BE STABILIZED IMMEDIATELY.
- ALL WASTE MATERIAL WILL BE TRANSPORTED OFFSITE FOR RECYCLING AND/OR DISPOSAL AT A FACILITY APPROVED TO RECEIVE THE MATERIAL.
- IN NON-AGRICULTURAL AREAS THE VISUAL SURVEY SHALL BE COMPARED TO THE DENSITY AND COVER OF ADJACENT UNDISTURBED LANDS. IN AGRICULTURAL AREAS, THE VISUAL SURVEY SHALL BE COMPARED TO THE ADJACENT UNDISTURBED PORTIONS OF THE SAME FIELD, UNLESS THE EASEMENT AGREEMENT SPECIFIES OTHERWISE.
- WETLANDS ALONG THE PROPOSED PIPELINE ARE EXPECTED TO EXHIBIT VARYING DEGREES OF SATURATION AND WATER ELEVATION, REQUIRING A VARIETY OF PLANT SPECIES TO BE RE-ESTABLISHED. IN UNSATURATED WETLANDS, MOST VEGETATION WILL BE REPLACED BY SEEDING. SATURATED WETLANDS WILL TYPICALLY BE ALLOWED TO RE-VEGETATE NATURALLY. WETLAND REVEGETATION WILL BE CONSIDERED SUCCESSFUL WHEN THE COVER OF HERBACEOUS AND/OR WOODY SPECIES IS AT LEAST 80 PERCENT OF THE TYPE, DENSITY, AND DISTRIBUTION OF THE VEGETATION IN ADJACENT WETLAND AREAS THAT WERE NOT DISTURBED BY CONSTRUCTION. REVEGETATION EFFORTS WILL CONTINUE UNTIL WETLAND REVEGETATION IS SUCCESSFUL.

STREAM CROSSING PROCEDURES

GENERAL: PROCEDURES THAT WILL BE FOLLOWED AT STREAM CROSSING LOCATIONS INCLUDE THE FOLLOWING:

- MINIMIZE CLEARING AND GRUBBING OF VEGETATION UP TO STREAMS, AS POSSIBLE, UNTIL THE TIME OF THE PIPELINE INSTALLATION;
- ONLY THAT AREA WHICH IS REQUIRED FOR PIPELINE INSTALLATION SHALL BE DISTURBED WITHIN THE PROPOSED LIMIT OF DISTURBANCE OR RIGHT-OF-WAY AT STREAM CROSSINGS; LOCATING STAGING AREAS 50 FEET AWAY FROM THE STREAM, WHERE POSSIBLE;
- STORING CHEMICALS, STORING EQUIPMENT, WASHING EQUIPMENT, OR REFUELING EQUIPMENT MUST BE DONE IN AREAS THAT ARE GREATER THAN 100 FEET AWAY FROM THE STREAM;
- SPOIL PILE PLACEMENT AND BMPs WILL BE MONITORED AT ALL TIMES DURING STREAM CROSSING PROCEDURES; ONCE WORK WITHIN A STREAM AREA IS STARTED, IT WILL BE CONDUCTED CONTINUOUSLY TO COMPLETION; EMPHASIS WILL BE PLACED ON MINIMIZING TIME OF DISTURBANCE;
- SPOILS FROM STREAM CROSSINGS MUST BE PLACED AT LEAST 10 FEET FROM THE WATER'S EDGE; AND
- CONSTRUCTION EQUIPMENT WILL NOT BE ALLOWED IN THE STREAM CHANNEL WHEN EXCAVATION CAN BE DONE FROM EITHER SIDE OR A TEMPORARY CROSSING WHILE WORKING AT THE STREAM CROSSING.
- ESC BMPs WILL BE MONITORED/MAINTAINED AT ALL TIMES FOLLOWING INITIAL EARTH DISTURBANCE AND WILL CONTINUE UNTIL RESTORATION IS DEEMED COMPLETE.

THE FOLLOWING SECTIONS DESCRIBE STREAM CROSSING TECHNIQUES THAT MAY BE USED DURING PIPELINE RELOCATION/INSTALLATION ACTIVITIES. REFER TO THE DETAIL SHEETS AND APPROVED STANDARDS AND SPECIFICATIONS FOR ADDITIONAL INFORMATION.

DRY CROSSING TECHNIQUES: THESE TECHNIQUES WILL BE USED TO PERFORM PIPELINE WORK IN A RELATIVELY DRY WORKING CONDITION OR AROUND THE OPEN EXCAVATION. THESE TECHNIQUES INCLUDE PUMP AROUND AND FLUME PIPE CROSSING METHODS. THE LIMITING FACTORS FOR THESE TECHNIQUES ARE USUALLY STREAM SIZE, FLOW, AND WATER DEPTH.

DIRECTIONAL BORING IS ALSO A TECHNIQUE THAT CAN BE UTILIZED AS IT WILL LESSEN THE IMPACTS ON THE WATERBODIES.

E&S CONTROL MEASURES WILL BE INSTALLED PRIOR TO ANY EARTH DISTURBANCE AND MONITORED/MAINTAINED UNTIL CONSTRUCTION AND RESTORATION THROUGH THE WATER-BODY IS COMPLETE.

FLUME PIPE METHOD: PLEASE SEE DETAIL SHEETS AND SWPPP FOR MORE INFORMATION ON THE FLUME PIPE METHOD. THIS PROCEDURE INVOLVES CONSTRUCTING TWO BULKHEADS, EITHER SANDBAGS OR PLASTIC DAMS, TO DIRECT THE STREAM FLOW THROUGH A FLUME PIPE PLACED OVER THE TRENCH PRIOR TO EXCAVATION. THE FLUME SHALL BE ALIGNED AS TO PREVENT BANK EROSION AND BED SCOUR. THE FLUME WILL NOT BE REMOVED DURING TRENCHING, PIPE LAYING OR BACKFILLING.

PUMP AROUND METHOD: PLEASE SEE THE DETAIL SHEETS AND APPROVED STANDARDS AND SPECIFICATIONS FOR MORE INFORMATION ON THE PUMP AROUND METHOD. THIS PROCEDURE INVOLVES CONSTRUCTING TWO BULKHEADS, EITHER SANDBAGS OR PLASTIC DAMS. THE UPSTREAM DAM WILL CAUSE THE WATER TO POND WHERE IT CAN BE PUMPED AROUND THE WORK AREA AND BE DISCHARGED BEHIND THE DOWNSTREAM BULKHEAD. PUMPS OF SUFFICIENT SIZE TO TRANSMIT THE FLOW DOWNSTREAM WILL BE USED. BACKUP PUMPS MUST BE ON-SITE. PUMP INTAKES MUST BE SCREENED. PUMP DISCHARGES MUST NOT CAUSE SCOUR.

TEMPORARY ROAD CROSSINGS: TEMPORARY ROAD CROSSINGS, CONSISTING OF BRIDGES OF TIMBER MATS OR CLEAN ROCK FILL AND FLUME(S), WILL BE INSTALLED TO CROSS MINOR OR INTERMEDIATE STREAMS. TIMBER MATS SHALL BE USED TO CROSS SMALLER STREAMS WHERE THE SPAN OF THE MAT WILL STRETCH FROM BANK TO BANK. CLEAN ROCK FILL AND FLUMED CROSSINGS WILL BE UTILIZED WHERE IT IS NOT FEASIBLE TO UTILIZE TIMBER MATS. AS AN ALTERNATIVE, PORTABLE BRIDGES MAY BE USED INSTEAD FOR SMALL CROSSINGS. EQUIPMENT WILL NOT BE ALLOWED TO FORD FLOWING STREAMS DURING CONSTRUCTION ACTIVITIES. TEMPORARY ROAD CROSSINGS OF STREAMS MUST MAINTAIN FOR ADEQUATE FLOW DOWNSTREAM.

STREAM BANK STABILIZATION: PERMANENT STABILIZATION SHALL OCCUR IMMEDIATELY UPON INSTALLATION, BACKFILLING, AND GRADING AT EACH STREAM CROSSING.

LEGEND

- CLEAN WATER DIVERSION DIKE (SEE DETAIL MVP-ES50 AND MVP-ES51)
- STREAM
- US FOREST SERVICE (NATIONAL FOREST) LANDS
- ANST ANST APPALACHIAN NATIONAL SCENIC TRAIL
- EXISTING ROAD/TRAIL
- EXISTING PROPERTY LINE
- EXISTING STATE LINE
- EXISTING COUNTY LINE
- POND
- WETLAND
- AFM AFM ACID FORMING MATERIAL
- AGRI AGRI AGRICULTURAL LAND USE BOUNDARY
- DCMNI PROPOSED LIMIT OF DISTURBANCE
- DOARR DOARR PROPOSED ACCESS ROAD CENTERLINE
- PROPOSED PIPELINE
- PROPOSED SILT FENCE
- PROPOSED SUPER SILT FENCE (SEE DETAIL MVP-ES9.2)
- RFD RFD PROPOSED REINFORCED FILTRATION DEVICE (SEE DETAILS MVP-ES9, 9.1, 9.2, 9.3)
- EOT ORANGE CONSTRUCTION SAFETY FENCE
- 12-12-12-12-12-12 PROPOSED 12" COMPOST FILTER SOCK (SEE DETAILS MVP-ES3, 3.1, 3.2)
- 18-18-18-18-18-18 PROPOSED 18" COMPOST FILTER SOCK (SEE DETAILS MVP-ES3, 3.1, 3.2)
- 24-24-24-24-24-24 PROPOSED 24" COMPOST FILTER SOCK (SEE DETAILS MVP-ES3, 3.1, 3.2)
- COL GRASS-LINED CHANNEL (SEE DETAIL MVP-ES39)
- CLEAN WATER DIVERSION PIPE
- TIMBER MAT (SEE DETAIL MVP-ES37)
- STEEP SLOPE EROSION CONTROL (SEE NOTE 2)
- STEEP SLOPE AREAS (SEE NOTE 4)
- PROPOSED ROCK CONSTRUCTION ENTRANCE
- PROPOSED TRENCH BREAKER (SEE DETAIL MVP-20)
- TEMPORARY ROW DIVERSION/WATER BAR (VADEQ STD & SPEC 3.11)
- PERMANENT SLOPE BREAKER/ROW DIVERSION/WATER BAR (SEE DETAILS MVP-17, ES38, AND SCHEDULE)

NOTES:

- TOPSOIL SEGREGATION WILL BE PERFORMED IN ALL-CONSTRUCTION AREAS OF THE PROJECT IN ACCORDANCE WITH DETAIL MVP-ES46.1 THROUGH MVP-ES46.3.
- FLEX TERRA, EARTHGUARD OR EQUIVALENT MAY BE USED AS A SUBSTITUTE TO EROSION CONTROL BLANKET AS DIRECTED BY MVP.
- CONTRACTOR IS RESPONSIBLE TO IDENTIFY ALL UTILITIES. THE UTILITY LINES SHOWN ON THE PLAN ARE FOR INFORMATIONAL PURPOSES ONLY AND DO NOT REPRESENT SURVEYED LINE INFORMATION.
- SLOPES OF 30' OR GREATER EXIST. CONSTRUCTION FOR STEEP SLOPES TO BE PERFORMED USING STEEP SLOPE TECHNIQUES IDENTIFIED IN THE DETAIL SHEETS. ALSO REFER TO THE SITE-SPECIFIC DESIGN OF STABILIZATION MEASURES IN SELECTED HIGH-HAZARD PORTIONS OF THE ROUTE OF THE PROPOSED MOUNTAIN VALLEY PIPELINE PROJECT.
- WHERE CONSTRUCTION CONDITIONS PRECLUDE THE USE OF DIVERSION DITCHES DUE TO SITE CONDITIONS THE CONTRACTOR WILL INSTALL SILT FENCE AT THE DIRECTION OF MVP.
- IMPROVEMENTS TO PERMANENT AND TEMPORARY ACCESS ROADS WILL BE PERFORMED PER THE SITE SPECIFIC ACCESS ROAD DETAILS.
- TEMPORARY ACCESS ROAD CROSSING OF STREAMS AND WETLANDS WILL UTILIZE TIMBERMATS. ANY PERMANENT ROAD CROSSINGS WILL BE CONDUCTED VIA CULVERTS.
- ALL NON VMRC STREAM CROSSINGS WILL BE PERFORMED AS DESCRIBED IN THE STREAM CROSSING TABLE INCLUDED IN THIS PACKAGE.