MOUNTAIN VALLEY PIPELINE - TRANSCO INTERCONNECT PROJECT VARIANCE AND DEVIATION REQUESTS

PURSUANT OF VIRGINIA CODE 9VAC25-840-40 ET SEQ. MVP RESPECTFULLY REQUESTS VARIANCES AS OUTLINED BELOW:

THESE VARIANCE REQUESTS HAVE BEEN PREPARED IN ACCORDANCE WITH VADEQ AND VIRGINIA DEPARTMENT OF CONSERVATION AND RECREATION (VADCR) GUIDANCE DOCUMENTS. INFORMATION INCLUDED IN THESE VARIANCE REQUESTS IS INTENDED TO SUPPLY VADEQ WITH PROJECT INFORMATION, PERTINENT TO ESC, INCLUDING BUT NOT LIMITED TO: SITE CHARACTERIZATION, SOIL TYPES, CRITICAL AREAS, SOIL ERODIBILITY, AND WATERBODY/WETLAND IDENTIFICATION.

MVP IS REQUESTING THESE VARIANCES DUE TO THE LENGTH OF THE PROJECT, THE DIAMETER OF THE PIPE INVOLVED, THE EQUIPMENT REQUIRED, CONSTRUCTION TECHNIQUES UTILIZED AND THE DESIRE TO CREATE SAFE WORKING CONDITIONS FOR ALL EMPLOYEES INVOLVED IN THE PROJECT. THE VARIANCES RELATED TO THE LENGTH OF TRENCH OPEN DURING PIPELINE INSTALLATION AND THE USE OF SILT FENCE TO PREVENT "RUN-ON" OF STORMWATER FROM UPGRADIENT UNDISTURBED AREAS WHERE STEEP SIDE SLOPES ARE PRESENT AND ARE DESCRIBED BELOW.

IN ORDER TO ENSURE ALL VARIANCE STIPULATIONS ARE MET, MVP WILL HAVE ONE VADEQ CERTIFIED ESC INSPECTOR PER SPREAD (TOTAL OF FOUR) ON DUTY DURING DAYS OF ACTIVE CONSTRUCTION. ALL OTHER MVP ENVIRONMENTAL INSPECTORS WILL HAVE A VADEQ RESPONSIBLE LAND DISTURBER (RLD) CERTIFICATION.

MVP ENVIRONMENTAL INSPECTORS WILL SUBMIT REPORTS DOCUMENTING ESC-RELATED ACTIVITIES ON A WEEKLY BASIS VIA VADEQ'S E-REPORTING SYSTEM. EDUCATING CONTRACTORS ON VARIANCE AND OTHER PERMIT REQUIREMENTS WILL BE ACCOMPLISHED BY ASSIMILATING ALL RELEVANT INFORMATION INTO MVP'S PRE-CONSTRUCTION WORKER ENVIRONMENTAL AWARENESS PROGRAM (WEAP) TRAINING.

THE DESIGNATION OF MVP'S VADEQ-CERTIFIED INSPECTORS FOR THE PROJECT IS PENDING, AND WILL BE PROVIDED TO VADEQ WHEN AVAILABLE. MVP WILL BE UTILIZING TWO FERC 3RD PARTY MONITORS DURING CONSTRUCTION IN ADDITION TO THE VADEO CERTIFIED INSPECTORS AND RLDS.

VARIANCE REQUEST MS-16-A LENGTH OF TRENCH

THIS VARIANCE IS REQUESTED DUE TO THE LENGTH OF THE PROJECT, THE DIAMETER OF THE PIPE INVOLVED, THE EQUIPMENT REQUIRED TO FACILITATE INSTALLATION, CONSTRUCTION TECHNIQUES UTILIZED AND THE DESIRE TO CREATE SAFE WORKING CONDITIONS FOR ALL EMPLOYEES INVOLVED IN THE PROJECT. A PROJECT OF THIS TYPE REQUIRES MULTIPLE OVERLAPPING AND SEQUENTIAL ACTIVITIES SUCH AS TREE FELLING, CLEARING, INSTALLATION OF ESC DEVICES, GRUBBING, GRADING, TRENCH EXCAVATION, PIPE STRINGING, PIPE BENDING, PIPE WELDING, PIPE INSPECTION, PIPE INSTALLATION IN THE TRENCH, TRENCH BREAKER INSTALLATION, BACKFILLING OF THE TRENCH, HYDROSTATIC TESTING OF THE PIPELINE AND RECLAMATION/FINAL CLEANUP. SINCE ALL OF THESE TASKS ARE DEPENDENT ON THE TASK BEFORE IT, A SIGNIFICANT LENGTH OF WORK AREA IS REQUIRED TO ELIMINATE THE CONFLICTS THAT OCCUR WITH WORKING IN CLOSE PROXIMITY IN ORDER TO ENSURE THE SAFE AND TIMELY COMPLETION OF THE WORK.

THE PHASE OF CONSTRUCTION THAT BEGINS THE HEART OF THE CONSTRUCTION ACTIVITIES IS THE TRENCHING PHASE. IN ORDER TO MAINTAIN THE PRODUCTION LEVELS NECESSARY TO COMPLETE THE PROJECT IN A SAFE AND TIMELY MANNER, TRENCHING NEEDS TO BE A NON-STOP ACTIVITY. ONCE TRENCHING STARTS, THE CONTRACTOR WILL FOLLOW DIRECTLY BEHIND THE EXCAVATIONS TO BEGIN THE STRINGING AND BENDING (ENGINEERING) THE PIPE. THE NEXT PHASE, WELDING, IS THE KEY COMPONENT TO THE ENTIRE CONSTRUCTION PROCESS TO MEET TIMELY COMPLETION OF THE PROJECT. THE CONTRACTORS CAN WELD UP TO 1800 FEET PER DAY, THEREFORE, IT IS NECESSARY TO HAVE ENOUGH TRENCH OPEN TO BE ABLE TO CONTINUE TO STRING, BEND AND WELD PIPE WITHOUT ANY DELAYS OR DOWN TIME TO FACILITATE IMPLEMENTATION OF THE PROJECT IN AN EFFICIENT AND SAFE MANNER. MVP PROPOSES TO HAVE A MAXIMUM OF FIVE MILES OF TRENCH OPEN AT ANY TIME DURING SPREAD 8 CONSTRUCTION. MVP WOULD ALIGN THE TRENCH EXCAVATION TO MEET THE CONDITIONS OUTLINED BELOW. THIS WILL NOT INCLUDE AREAS OF ROW PREPARATION INCLUDING CLEARING, GRUBBING, TOP-SOILING, STRINGING OF PIPE, BACKFILLING OR OTHER RESTORATION ACTIVITIES THAT ARE ONGOING ONCE THE PIPE HAS BEEN PLACED IN THE TRENCH.

SPECIALIZED CONSTRUCTION ACTIVITIES / CREWS WILL BE UTILIZED TO INSTALL THE PIPELINE AT SPECIFIC LOCATIONS SUCH AS WATERBODIES AND WETLANDS, PUBLIC ROADS, RAILROADS AND STEEP SLOPE AREAS (I.E. TYPICALLY INCLUDES SLOPES APPROACHING 30 DEGREES OR MORE AND WOULD REQUIRE WINCH TRACTORS). INSTALLATION OF THE PIPELINE AT THESE SPECIFIC LOCATIONS WILL BE CONDUCTED AS A SEPARATE AND COMPLETE CROSSING ACTIVITY AND ARE NOT INCLUDED AS PART OF THE CONSTRUCTION DISCUSSED ABOVE. THIS IS NECESSARY TO FACILITATE USE OF SPECIALIZED CONSTRUCTION METHODS REQUIRED TO COMPLETE INSTALLATION AT THESE LOCATIONS OR TO COMPLY WITH PERMITTING RESTRICTIONS THAT APPLY TO THESE CROSSINGS (I.E. TIMING RESTRICTIONS, ETC.).

MVP PROPOSES A TOTAL LENGTH OF TRENCH OPEN AT ANY ONE TIME FOR SPREAD 8 WOULD BE FIVE (5) MILES (CUMULATIVE) FOR MAINLINE CONSTRUCTION AND ONE (1) ADDITIONAL MILE (CUMULATIVE) OF TRENCH OPEN ASSOCIATED WITH AREAS OF SPECIALIZED CONSTRUCTION ACTIVITIES. AREAS OF SPECIALIZED CONSTRUCTION ACTIVITIES INCLUDE:

- ROAD CROSSINGS CONVENTIONAL BORE METHODS,
- STREAM/WETLAND CROSSINGS
- EXISTING BURIED UTILITY CROSSINGS
- STEEP SLOPE (WINCH HILL) CONSTRUCTION
- OTHER AREAS DETERMINED BY MVP AS REQUIRING SPECIALIZED CONSTRUCTION ACTIVITIES (BIOLOGICAL OR CULTURAL RESOURCE MONITORS, ETC.)

IN ADDITION, MVP PROPOSES TO IMPLEMENT THIS VARIANCE REQUEST BASED ON A TIERED APPROACH THAT WILL LIMIT CONTIGUOUS TRENCH LENGTH BASED ON SLOPE CONDITIONS. MVP PROPOSES TO LIMIT THE CONTIGUOUS LENGTH OF TRENCH OPEN WITHIN THE CUMULATIVE 5 MILE SPREAD LIMIT BASED ON A THREE-TIER SYSTEM, SO THAT AS THE STEEPNESS OF THE SLOPE INCREASES, THE ALLOWABLE LENGTH OF CONTINUOUS TRENCH OPEN DECREASES. MVP PROPOSES THE FOLLOWING:

MVP Proposed	Slope Conditions ¹	Continuous
Tier Structure		trench length not
		to exceed (ft) ^{2,3}
Tier I	0 to <10%	7,000
Tier II	10% to <33%	5,000
Ti III	> 220/	2 500

- Tier III >33% 1. SLOPE PERCENT IS DETERMINED BASED ON THE PRE-EXISTING SITE CONDITIONS.
- 2. Any break in continuous trench length will constitute reset of the continuous trench footage.
- 3. CONTINUOUS TRENCH LENGTH MAY BE EXCEEDED WHERE SAFETY CONCERNS ARE IDENTIFIED FOLLOWING
- CONSULTATION WITH THE ONSITE DEQ, FERC AND MVP (ENVIRONMENTAL AND SAFETY) INSPECTORS.

ACTIVITIES THAT WILL BE CONSIDERED AS A BREAK IN CONTINUOUS TRENCH LENGTH INCLUDE BUT NOT LIMITED TO THE FOLLOWING:

- ROAD CROSSINGS (CONVENTIONAL BORE METHODS)
- STREAM AND/OR WETLAND CROSSINGS
- STOVEPIPE CONSTRUCTION ACTIVITIES
- NATIVE (UNDISTURBED) SOIL PLUG TO REMAIN IN PLACE UNTIL IMMEDIATELY BEFORE PIPE INSTALLATION
- EXISTING UTILITY LINE CROSSINGS THAT WILL UTILIZE SPECIALIZED CONSTRUCTION CREW OR BE CONDUCTED SEPARATE FROM THE MAIN CONSTRUCTION EFFORT
- WINCH HILL CONSTRUCTION (I.E. WHERE EQUIPMENT IS REQUIRED TO BE ANCHORED TO ANOTHER STATIONARY OBJECT DUE TO STEEPNESS OF SLOPE)
- BREAK IN SLOPE CATEGORIES IDENTIFIED IN THIS REQUEST
- TRANSITION OF TRENCH LINE ACROSS RIDGELINES BREAKING THE DIRECTION OF CONTINUOUS FLOW

MVP WILL ADHERE TO THE TIERS IDENTIFIED ABOVE. IN THE EVENT DURING CONSTRUCTION SAFETY CONCERNS ARISE DUE TO SITE CONDITIONS (SLOPE, ADJACENT RESOURCES OR OTHER UTILITY INFRASTRUCTURE) THAT WOULD BE ALLEVIATED BY A MINOR EXCEEDANCE OF THE TRENCH LIMITATIONS, MVP WOULD COORDINATE ANY EXCEEDANCE WITH THE APPLICABLE AGENCY REPRESENTATIVES. INSTANCES WHERE THIS CONDITION MAY APPLY WOULD BE BUT NOT

- AREAS OF WINCH HILL CONSTRUCTION
- AREAS THAT WOULD REQUIRE PIPELINE TO BE DEAD MANNED (ANCHORED) DURING WELDING OF PIPE SEGMENTS ON STEEP SLOPE AREAS PRIOR TO BACKFILLING OF THE TRENCH. EXCEEDING THE TRENCH LENGTH IN THESE CONDITIONS WOULD ALLEVIATE THE NEED FOR PERSONNEL TO BE WORKING IN THE DITCH AND RESULT IN REDUCED SAFETY CONCERN FOR WORKERS.

EXCEEDANCE OF THE TRENCH LENGTH IN THESE CONDITIONS WILL BE DISCUSSED WITH APPROPRIATE ONSITE REPRESENTATIVES FROM DEQ, FERC AND MVP (I.E. CONSTRUCTION, ENVIRONMENTAL AND SAFETY STAFF) PRIOR TO IMPLEMENTING ANY INCREASE IN THE TIER TO THE TRENCH LENGTH. EACH INSTANCE WILL BE REVIEWED ON A CASE BY CASE BASIS AND REPORTED IN THE WEEKLY INSPECTION REPORT.

FOLLOWING INSTALLATION OF THE PIPELINE WITHIN THE TRENCH AND ONCE PERSONNEL CAN SAFELY ENTER THE TRENCH, MVP CONTRACTORS WILL INSTALL PERMANENT TRENCH BREAKERS IN ACCORDANCE WITH MVP TYPICAL CONSTRUCTION DETAIL MVP-20 (TYPICAL TRENCH BREAKER DETAIL). FOLLOWING INSTALLATION OF THE PERMANENT TRENCH BREAKERS, A SEPARATE CONSTRUCTION CREW WILL BEGIN PADDING AND BACKFILLING OF THE PIPELINE. TRENCH EXCAVATION WILL CONTINUE AS BACKFILLING ACTIVITIES PROGRESS. AT NO TIME, SHALL TOTAL TRENCH EXCAVATION EXCEED 5 CUMULATIVE MILES FOR MAIN CONSTRUCTION ACTIVITIES ON SPREAD 8.

DEVIATION REQUEST 24-IN SLOPE DRAIN PIPE SIZE FOR CLEAN WATER DIVERSIONS

THIS DEVIATION REQUEST IS REQUIRED FOR THE USE OF 24-INCH CLEAN WATER DIVERSION PIPE FOR DRAINAGE AREAS UP TO 5 ACRES WHERE TABLE 3.15-A IN VESCH STD & SPEC 3.15 SPECIFIES A 30-INCH DIAMETER. MVP COMPLETED PEAK FLOW CALCULATIONS FOR THE 10-YEAR EVENT USING THE RATIONAL METHOD ASSUMING A DRAINAGE AREA OF 5-ACRES (I.E., THE MAXIMUM ALLOWABLE DRAINAGE AREA FOR TEMPORARY DIVERSION DIKES PER VESCH STD & SPEC 3.09) AND A CONSERVATIVE RUNOFF COEFFICIENT (C=0.35 FOR 'LAWNS, HILLY" LAND USE CONDITION). RAINFALL INTENSITIES CORRESPONDING TO TRAVEL TIMES FOR SLOPES RANGING FROM 10-40% WERE USED TO CALCULATE A RANGE OF PEAK FLOWS REPRESENTATIVE OF THE VARIABLE SLOPES ACROSS THE PIPELINE. TO DETERMINE THE MOST CONSERVATIVE RANGE OF PEAK FLOWS, THE I-D-F CURVE FOR PITTSYLVANIA COUNTY WHICH HAS THE HIGEST RAINFALL INTENSITY ACROSS THE PROJECT FROM THE VA SWM HANDBOOK VOLUME II HAS BEEN APPLIED ACROSS THE PROJECT. PIPE FLOW CAPACITY WAS THEN EVALUATED FOR THE SAME RANGE OF SLOPES. ASSUMING A PIPE FLOW CAPACITY OF 0.5 TIMES THE CAPACITY CALCULATED WHEN FLOWING HALF-FULL, TO ENSURE NO BUILDUP OF WATER BEHIND THE DIVERSION DIKE, IT WAS DETERMINED THAT ONE (1) 24-IN DIAMETER PIPE COULD PASS THE 10-YEAR PEAK FLOW FOR THE SLOPE CONDITIONS. THE SUMMARY TABLE SPECIFYING NUMBER OF SIZED PIPES REQUIRED TO PASS THE DESIGN STORM PER 5 ACRE AREA IS INCLUDED BELOW.

	12" PIPE	18" PIPE	24" PIPE
10%	4	2	1
20%	3	1	1
30%	3	1	1
40%	2	1	1

- ¹ MAXIMUM ALLOWABLE DRAINAGE AREA OF 5-ACRES ASSUMED FOR SIZING PURPOSES PER VESCH STD & SPEC 3.15 TEMPORARY SLOPE DRAIN.
- ² TEMPORARY SLOPE DRAINS DESIGNED FOR THE 10-YR STORM USING THE RATIONAL METHOD IN LIEU OF THE VESCH STD & SPEC 3.15 SLOPE DRAIN SIZING TABLE (TABLE 3.15-A).
- ³ PIPE FLOW CAPACITY TAKEN AS 1/2 OF THE CAPACITY WHEN FLOWING HALF FULL TO ENSURE NO BUILDUP OF WATER WITHIN DIVERSION DIKE.

DEVIATION REQUEST CLEAN WATER PIPE PLUNGE POOL OUTLET DESIGN

THIS DEVIATION REQUEST IS TO REQUEST USE OF COMBINED TECHNIQUES TO PROVIDE ADEQUATE ENERGY MANAGEMENT OF STORMWATER EXITING THE CLEAN WATER DIVERSION. THIS DEVIATION REQUEST IS PRESENTED DUE TO THE LIMITED AREA AVAILABLE AND STEEP SLOPE CONDITIONS AT THE OUTLET THAT INHIBIT THE ABILITY TO UTILIZE TYPICAL TECHNIQUES (I.E. RIPRAP OUTLET PROTECTION). MVP CALCULATED THE MAXIMUM 10-YEAR PEAK FLOW DURING DESIGN OF THE CLEAN WATER PIPES, USING THE METHODS DESCRIBED IN THE SLOPE DRAIN PIPE SIZE FOR CLEAN WATER DIVERSIONS DEVIATION REQUEST. AND ASSUMED A CONSERVATIVE PIPE SIZE OF 24-IN. USING THESE PARAMETERS. A STANDARD PLUNGE POOL OUTLET WAS DESIGNED IN ACCORDANCE WITH NRCS DESIGN GUIDE MD #6. A STANDARD SPREADSHEET DEVELOPED BY THE NRCS THAT IS AVAILABLE FOR DOWNLOAD ONLINE (HTTPS: //WWW.NRCS.USDA.GOV/INTERNET/FSE_DOCUMENTS/NRCS142P2_007673.XLS) WAS USED TO SIZE THE PLUNGE POOL APPROPRIATELY BASED ON THE DESIGN DISCHARGE (I.E., THE MAXIMUM 10-YEAR PEAK FLOW), PIPE DIAMETER (24-IN), AND SLOPE OF THE PIPE OUTLET (AGAIN, SLOPES RANGING FROM 10-40% WERE EVALUATED). ADDITIONAL CALCULATIONS WERE ALSO COMPLETED TO SUPPORT THAT DISCHARGE FROM THE PLUNGE POOL WEIR OUTLET IS NON-EROSIVE WITH A 0.1-FOOT HEAD ON THE WEIR AT THE OUTLET OF THE PLUNGE POOL. MVP PLANS TO UTILIZE THE SINGLE PLUNGE POOL OUTLET DESIGN FOR ALL PIPE SIZES, WHICH IS DESIGNED FOR THE CONSERVATIVE CONDITIONS OF 40% SLOPE, MAXIMUM OF 5 ACRES AND 24-INCH CLEAN WATER DIVERSION PIPE DIAMETER. THE PLUNGE POOL OUTLET DIMENSIONS ARE SHOWN ON GENERAL DETAILS MVP-ES51 AND MVP-ES51.1.

DEVIATION REQUEST STD & SPEC 3.11 TEMPORARY RIGHT-OF-WAY DIVERSIONS

MVP PROPOSES TO UTILIZE BOTH TEMPORARY AND PERMANENT RIGHT-OF-WAY DIVERSIONS (ROW DIVERSIONS) ON THIS PROJECT. AS THE VESCH DOES NOT HAVE A STANDARD FOR PERMANENT RIGHT-OF-WAY DIVERSIONS (ROW DIVERSIONS), MVP REQUESTS APPROVAL TO IMPLEMENT THE MVP STANDARD SPECIFICATIONS FOR BOTH TEMPORARY AND PERMANENT ROW DIVERSIONS INSTALLATIONS. MVP DEVELOPED THE DIVERSION SPECIFICATIONS (PRESENTED ON MVP TYPICAL CONSTRUCTION DETAIL MVP-17 INCLUDED IN APPENDIX B OF THE PSS&S) BASED ON EXPERIENCE FROM CONSTRUCTING AND OPERATING PROJECTS IN SIMILAR TERRAIN IN NEIGHBORING STATES IN THE APPALACHIAN MOUNTAINS REGION. WHILE THE SPACING AND SLOPE REQUIREMENTS DIFFER FROM THE VESCH STANDARD 3.11, TEMPORARY ROW DIVERSIONS WILL BE SUPPLEMENTED WITH ADDITIONAL BMPS (I.E. TEMPORARY DIVERSION DIKES, TEMPORARY CLEAN WATER SLOPE DRAINS, ETC.) DURING CONSTRUCTION IN ORDER TO INCREASE SEDIMENT REMOVAL EFFICIENCY, ROW DIVERSIONS WILL BE CONSTRUCTED WITH A MAXIMUM CROSS-SLOPE NOT TO EXCEED 5% TO MINIMIZE POTENTIAL FOR EROSIVE VELOCITIES AS RUNOFF LEAVES THE ROW. DURING TRENCH EXCAVATION, TOPSOIL AND SUBSOIL SPOIL PILES WILL BE LOCATED ALONG THE ROW TO SLOW RUNOFF VELOCITY FROM ADJACENT AREAS. SPOIL PILES WILL BE TEMPORARILY SEEDED AND MULCHED IN ACCORDANCE WITH MS-1. TRENCH BREAKERS WILL BE INSTALLED TO SLOW RUNOFF FROM THE TRENCH. PERIMETER (DOWNSLOPE) ESC MEASURES (I.E. TEMPORARY SEED AND MULCH, SILT FENCE, SUPER SILT FENCE, COMPOST FILTER SOCK, BELTED SILT RETENTION FENCE, ETC.,) WILL BE INSTALLED TO COLLECT AND FILTER RUNOFF AS NECESSARY. THE MVP SPACING WILL FUNCTION AS INTENDED BY VESCH STANDARD 3.11 AND WILL PROVIDE ADEQUATE PROTECTION TO ADJACENT AREAS DURING CONSTRUCTION. MVP WILL MONITOR THE INSTALLATION OF ALL ESC BMPS IN ACCORDANCE WITH MVP'S APPROVED PSS&S INSPECTION FREQUENCIES FOR NON-TMDL AND TMDL WATERSHEDS.

IF DURING CONSTRUCTION MVP'S LEI/EI OR AN AGENCY REPRESENTATIVE DETERMINES THE TEMPORARY ROW DIVERSION SPACING IS NOT FUNCTIONING AS INTENDED AT A SPECIFIC LOCATION, INSTALLATIONS WILL BE FIELD ADJUSTED AS NECESSARY TO ADDRESS SITE-SPECIFIC CONDITIONS AND CONCERNS. ALL CHANGES WILL BE NOTED ON THE SPREAD 8 RED-LINE ESC PLAN SET AND ASSOCIATED RED-LINE LOG DESCRIBED IN THE PSS&S (PAGE 6).

RECOMMENDED MINIMUM SPACING FOR PERMANENT SLOPE BREAKERS					
PIPELINE GRADE	DISTANCE (FEET)				
<2%	- 1,2				
2-5%	400				
6-15%	200				
16-30%	100				
>31%	50 ³				

- 1 PERMANENT SLOPE BREAKERS WILL BE INSTALLED AS NEEDED BASED ON FIELD CONDITIONS.
- ² PERMANENT SLOPE BREAKERS WILL BE INSTALLED 25 FEET FROM EACH WATERBODY BOUNDARY
- REGARDLESS OF SLOPE CONDITIONS.
- ³ SLOPES GREATER THAN 65% MAY REQUIRE SITE SPECIFIC STABILIZATION MEASURES BASED ON FIELD CONDITIONS AS APPROVED BY MVP DESIGN ENGINEERING AND MVP ENVIRONMENTAL INSPECTOR.

AS NOTED ABOVE, ALL OTHER SPECIFICATIONS FOR STD & SPEC 3.11 WILL BE IMPLEMENTED IN ACCORDANCE WITH THIS VADEQ STANDARD.

DEVIATION TO STD AND SPEC 3.31 TEMPORARY SEEDING AND 3.32 PERMANENT SEEDING

THIS DEVIATION IS NECESSARY TO COMPLY WITH PROJECT MITIGATION ACTIVITIES THAT ARE BEING PREPARED IN COORDINATION WITH THE US FISH AND WILDLIFE SERVICE, US FOREST SERVICE AND WILDLIFE HABITAT COUNCIL, TO MINIMIZE PROJECT IMPACTS TO SENSITIVE SPECIES. THIS WILL INCLUDE USE OF POLLINATOR SEED MIXES FOR THE PERMANENT ROW AREAS AND WOODLAND HABITAT SEED MIXES / PLANTINGS IN DESIGNATED AREAS. MVP WILL IMPLEMENT THE SEED MIXES SPECIFIED IN THE USFWS MITIGATION PLAN FOR ALL AREAS OF THE PROJECT UNLESS OTHER REQUIREMENTS ARE SPECIFIED BY THE AFFECTED LANDOWNER. MVP REQUESTS A DEVIATION IN REGARD TO STD & SPEC 3.31 (TEMPORARY SEEDING) AND 3.32 (PERMANENT SEEDING) TO ALIGN THESE REQUIREMENTS WITH THE PROJECT'S VEGETATION AND HABITAT MITIGATION PLAN.

AS NOTED IN THE APPROVED PSS&S, MVP DEVELOPED THE PROJECT-SPECIFIC SEED MIXES IN COORDINATION WITH THE US FISH AND WILDLIFE SERVICE (USFWS), US FOREST SERVICE, VA DEPARTMENT OF CONSERVATION AND RECREATION, WILDLIFE HABITAT COUNCIL AND MVP'S THREATENED AND ENDANGERED SPECIES CONSULTANT. MVP DEVELOPED SEED MIXES PROPOSED FOR PERMANENT STABILIZATION TO INCLUDE NATIVE SPECIES. SEED MIXES ARE PRESENTED IN THE PSS&S APPENDIX B, MVP TYPICAL CONSTRUCTION DETAILS MVP—ES11.1 THROUGH MVP-ES11.9. MVP REVIEWED THE DCR'S VIRGINIA INVASIVE PLANT SPECIES LIST DURING DEVELOPMENT OF THE PROJECT SPECIFIC PERMANENT STABILIZATION SEED MIXES. NO SPECIES LISTED ON THE DCR'S VIRGINIA INVASIVE PLANT SPECIES LIST ARE INCLUDED IN MVP'S PROPOSED PERMANENT STABILIZATION MIXES TO BE USED DURING PROJECT ACTIVITIES IN VIRGINIA.

MVP ALSO REVIEWED THE DCR'S NATIVE PLANTS FOR CONSERVATION, RESTORATION AND LANDSCAPING BROCHURES (MOUNTAIN NATIVE PLANTS AND RIPARIAN NATIVE PLANTS) DURING DEVELOPMENT OF THE PERMANENT STABILIZATION MIXES. MVP INCORPORATED MANY OF THE SPECIES INCLUDED IN THE DCR BROCHURES NOTED ABOVE TO THE PROJECT SPECIFIC PERMANENT STABILIZATION SEED MIXES.

FOR PROJECT ACTIVITIES ON JNF LANDS. THE USFS DEVELOPED SPECIFIC SEED MIXES FOR ACTIVITIES OCCURRING ON JNF AND GEORGE WASHINGTON NATIONAL FOREST LANDS. THESE MIXES ARE PRESENTED IN THE PSS&S APPENDIX B, MVP TYPICAL CONSTRUCTION DETAIL MVP-ES12.1 THROUGH ES12.4 AND INCLUDES THE TEMPORARY AND PERMANENT SEED MIXES SPECIFIED BY THE USFS GUIDANCE.

MVP PROPOSES TO UTILIZE THE VESCH STANDARD 3.31 TEMPORARY SEEDING MIX DURING PROJECT ACTIVITIES WITH THE ADDITION OF BROWNTOP MILLET (PANICUM RAMOSUM) TO MATCH THE TEMPORARY SEED MIX REQUIRED BY THE USFS FOR USE ON JEFFERSON NATIONAL FOREST LANDS. WHILE THESE ARE NON-NATIVE ANNUAL SPECIES, THEY ARE NOT LISTED ON THE DCR'S INVASIVE SPECIES LIST REFERENCED ABOVE. MVP PROPOSES TO UTILIZE NON-NATIVE, NON-INVASIVE SPECIES FOR TEMPORARY EROSION CONTROL BASED ON RECOMMENDATIONS OF THE USFS AND DEQ PROVIDED IN VARIOUS GUIDANCE DOCUMENTS. NATIVE PLANTS THAT PROVIDE DIVERSE WILDLIFE BENEFITS AND STRUCTURAL DIVERSITY ON THE LANDSCAPE OFTEN DO NOT GERMINATE OR GROW FAST ENOUGH TO PROVIDE INITIAL EROSION CONTROL. THEREFORE, FAST-GERMINATING, NON-INVASIVE, ANNUAL COVER CROPS ARE RECOMMENDED FOR THE FIRST ROUND OF SEEDING TO STABILIZE EXPOSED SOIL. THE TEMPORARY SEEDING PROPOSED FOR USE ON THE PROJECT ARE PRESENTED IN PSS&S APPENDIX B, MVP TYPICAL CONSTRUCTION DETAIL MVP-ES11.10 AND PROVIDED ON THE GENERAL DETAIL PLAN DRAWINGS INCLUDED WITH THE SPREAD 8 SUBMISSION.

DEVIATION REQUEST STD AND SPEC 3.05 SILT FENCE

DUE TO THE NATURE OF CONSTRUCTION AND THE STEEP SLOPES EXPECTED ON THE PROJECT, MVP IS REQUESTING A VARIANCE TO INCLUDE SUPER SILT FENCE AS A BEST MANAGEMENT PRACTICE FOR EROSION AND SEDIMENT CONTROL. FOLLOWING DISCUSSIONS WITH THE VADEQ, MVP PROPOSES TO ADOPT THE E-3 STANDARDS AND SPECIFICATIONS FOR SUPER SILT FENCE INCLUDED IN THE 2011 MARYLAND STANDARDS AND SPECIFICATIONS FOR SOIL EROSION AND SEDIMENT CONTROL. THE MATERIAL SPECIFICATIONS AND CONSTRUCTION SEQUENCE FROM THIS SPECIFICATION HAS BEEN INCLUDED IN THE SPREAD 8 GENERAL DETAILS AS DETAIL MVP-ES9.2 AND MVP-ES9.2A.

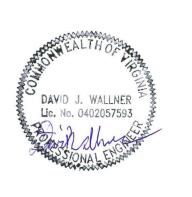
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STEEP SLOPE EROSION CONTROL PRODUCTS

FOLLOWING RESTORATION OF THE ROW TO PRE-EXISTING CONTOURS AND CONDITIONS, MVP WILL UTILIZE SOIL STABILIZATION BLANKETS (OR THEIR EQUIVALENT) TO STABILIZE SLOPES EXCEEDING 33% TO PREVENT EROSION OF THE DISTURBED SOILS. THERE ARE SEVERAL VARIATIONS OF THESE PRODUCTS INCLUDING: ROLLED EROSION CONTROL BLANKET, AND HYDRAULICALLY APPLIED EROSION CONTROL PRODUCT.

ROLLED EROSION CONTROL BLANKET

ROLLED EROSION CONTROL BLANKET (ECB) IS A WOVEN MAT CONSISTING OF A MONOFILAMENT NETTING (OR SIMILAR) BACKED STRAW MAT THAT IS MECHANICALLY ANCHORED TO THE SOIL. PRIOR TO INSTALLATION, THE SOIL IS SCARIFIED AND SMOOTHED PRIOR TO APPLICATION OF SEEDING AND SOIL AMENDMENTS. ROLLED ECB IS THEN INSTALLED BY HAND OVER THE SEEDING/SOIL AMENDMENTS AND MECHANICALLY ANCHORED TO THE SOIL USING DEGRADABLE METAL ANCHORS.

BONDED FIBER MATRIX

BONDED FIBER MATRIX (BFM) IS A HYDRAULICALLY APPLIED SOIL STABILIZER THAT IS EFFECTIVE IN STABILIZING STEEP SLOPES. AS PER MANUFACTURER SPECIFICATIONS, BFM APPLICATION RATES VARY DEPENDING ON SLOPE AND SOIL CONDITIONS, BUT APPLICATION RATES ARE TYPICALLY BETWEEN 1,500 TO 4,000 LBS/ACRE. SOME MANUFACTURERS OFFER BFM PRODUCTS IN PELLETIZED FORM FOR APPLICATION VIA BROADCAST SPREADER AND INTENDED FOR USE IN REMOTE AREAS WHERE WATER SUPPLIES ARE LIMITED, WHERE ACCESS VIA HYDROSEEDER IS DIFFICULT OR WHERE SMALL AREA COVERAGE IS NECESSARY. ONCE APPLIED, THE PELLETIZED BFM IS ACTIVATED BY PRECIPITATION EVENT FOLLOWING APPLICATION. BFM SHOULD NOT BE APPLIED WHEN RAIN IS FORECAST WITHIN 24 - 48 HOURS OF APPLICATION. APPLICATION OF BFM IS TYPICALLY 90% EFFECTIVE IN PREVENTING ACCELERATED EROSION FROM OCCURRING WITHIN THE AREA OF APPLICATION. WHEN APPLICATION OF THESE PRODUCTS INCLUDES A POLYMER (ANIONIC) STABILIZER, BFM CAN BE UP TO 99% EFFECTIVE IN REDUCING TURBIDITY AND SEDIMENT RUNOFF FROM DISTURBED AREAS. INFORMATION ON THE USE OF BFM IS PROVIDED UNDER TYPICAL CONSTRUCTION DETAIL MVP-ES40 (BONDED FIBER MATRIX).

HYDRAULIC EROSION CONTROL PRODUCTS

HYDRAULIC EROSION CONTROL PRODUCTS (HECP) ARE TYPICALLY INSTALLED USING A HYDROSEEDER TO APPLY A LIQUID SOLUTION OF SEED, SOIL AMENDMENTS, MULCH (WOOD FIBER, WOOD CHIPS OR SIMILAR WOOD MATERIALS OR NEWSPRINT) AND MULCH TACKIFIER TO STABILIZE THE SOIL. UNLIKE ROLLED ECB PRODUCTS, HECP MAKES SOLID CONTACT WITH THE SOIL REGARDLESS OF SOIL SURFACE CONDITIONS AND A ROUGHENED SURFACE IS PREFERRED. REMOVAL OF LARGE ROCKS AND EXISTING RILLS SHOULD BE UNDERTAKEN PRIOR TO APPLICATION. TRACKING OF SLOPES SHOULD BE CONSIDERED TO SLOW RUNOFF DURING A STORM EVENT.

HECP TYPE 4 IS A PRODUCT APPROVED BY THE VIRGINIA DEPARTMENT OF TRANSPORTATION (VDOT) ROAD BRIDGE SPECIFICATIONS FOR USE ON SEVERE SLOPES UP TO 100% (1V:1H), AND MEETS THE CRITERIA SPECIFIED BY IN TABLE II-22A BELOW. MVP WILL UTILIZE HECP TYPE 4 IN AREAS OF SIDE HILL CONSTRUCTION THAT EXCEED 33% CROSS SLOPE DURING PROJECT RESTORATION ACTIVITIES. THE SPECIFIC MANUFACTURER AND PRODUCT HAVE NOT BEEN DETERMINED AT THIS TIME, BUT MVP INTENDS TO USE PRODUCTS CONTAINED IN THE VDOT MATERIALS DIVISION APPROVED MATERIALS LIST, LIST NO. 79, (79) MULCHES (HECP TYPES 1—4) — (MAINTENANCE DIVISION), (OR THEIR EQUIVALENT) THAT MEET THE MINIMUM REQUIREMENTS DEFINED IN TABLE II-22A AND THE VDOT SPECIAL PROVISION FOR ROADSIDE DEVELOPMENT AND SOIL STABILIZATION, DATED JULY 12, 2016, AND UPDATED JUNE 1, 2017, PERTAINING TO WOOD CELLULOSE FIBER MULCH FOR HYDRAULIC SEEDING MANUFACTURER CERTIFICATIONS.

THE HECP WILL BE APPLIED TO DISTURBED AREAS WHERE UPSLOPE FLOW LENGTH HAS POTENTIAL TO RESULT IN CHANNELIZED EROSION. WHEN APPLIED TO SLOPES OF GREATER THAN 33%, PROFILE PRODUCTS (THE MANUFACTURER OF FLEXTERRA HP-FGM WHICH IS ON LIST 79 AS AN APPROVED MANUFACTURER OF HECP TYPE IV) RECOMMENDED A MAXIMUM SLOPE LENGTH OF 125-FEET WHICH IS EQUAL THE LIMIT OF DISTURBANCE TO BE RECLAIMED ALONG THE PIPELINE RIGHT-OF-WAY. IN LOCATIONS WHERE EXPANDED WORKSPACE AREAS, OR DIAGONAL CROSS SLOPES RESULT IN FLOW LENGTHS EXCEEDING 125-FEET OF DISTURBED AREA, MVP WILL INSTALL AN ADDITIONAL TEMPORARY MEASURE (I.E. COMPOST FILTER SOCK) TO SERVE AS A SLOPE BREAK. COMPOST FILTER SOCK INSTALLATIONS WILL BE IMPLEMENTED IN ACCORDANCE WITH THE MANUFACTURER SPECIFICATIONS.SIZING WILL BE IN ACCORDANCE WITH THE FLOW LENGTHS OCCURRING WITHIN THE LIMIT OF DISTURBANCE.

FOLLOWING TREATMENT OF DISTURBED STEEP SLOPE SIDE HILL AREAS WITH TYPE 4 HECP, THE DISTURBED AREA WOULD BE CONSIDERED STABILIZED. UPGRADIENT CLEAN WATER DIVERSIONS MAY BE REMOVED IMMEDIATELY PRIOR TO HECP TYPE IV APPLICATION OR LEFT IN PLACE AT THE DISCRETION OF THE MVP LEI/EI DETERMINED ON A CASE BY CASE BASIS. MONITORING AND INSPECTION ACTIVITIES WILL CONTINUE UNTIL THE AREAS ARE PERMANENTLY STABILIZED WITH VEGETATION AS OUTLINED IN THE PROJECT SPECIFIC STANDARDS AND SPECIFICATIONS (APPROVED JUNE 20, 2017).

HECP PROPERTY	TEST METHOD ¹	HECP TYPE 1	HECP TYPE 2	HECP TYPE 3	HECP TYPE 4
PHYSICAL	REQUIREMENT				
COLOR	VISUALLY OBSERVED			PON APPLICATION, S TE OR PAINTED SURI	
ORGANIC MATTER	ASTM D2974		90% MT	NIM UM	
WATER HOLDING CAPACITY	ASTM D7367	400% MINIMUM	500% MINIMUM	600% MINIMUM	700% MINIMUM
ACUTE TOXICITY	ASTM 7101 EPA 2021.0-1		TOXIC		
ENDURANCE		REQUIREMENT			
FUNCTIONAL LONGEVITY	VDOT APPROVED TESTING METHODS ³	UP TO 2 MONTHS	UP TO 3 MONTHS	UP TO 6 MONTHS	UP TO 12 MONTHS
PERFORMANCE			REQUIREMENT	<u> </u>	
MAXIMUM SLOPE APPLICATION	OBSERVED	4.0 H:1V	3.0 H:1V	2.0 H:1V	1.0 H:1V
RAINFALL EVENT (R- FACTOR)	ASTM D6459 ²	N/A	75 < R	140 < R	175 < R
COVER FACTOR	ASTM D6459 ²	C ≤ 0.50	C <0.10	C <0.05	C<0.01
VEGETATION ESTABLISHMENT	ASTM D7322 ²	200% MINIMUM	300% MINIMUM	400% MINIMUM	500% MINIMUM

1 ALL PRODUCTS MUST MEET THE REQUIREMENTS OF THIS SPECIFICATION TO BE LISTED ON THE MATERIALS DIVISION'S APPROVED LIST FOR HECPS. 2 ASTM TEST METHODS DEVELOPED FOR ROLLED EROSION CONTROL PRODUCTS (RECPS) THAT HAVE BEEN MODIFIED TO ACCOMMODATE HYDRAULIC EROSION CONTROL PRODUCTS (HECPS). 3 FUNCTIONAL LONGEVITY PERFORMED AT A VDOT TEST FACILITY OR TEST FACILITY APPROVED BY VDOT.

WOOD CELLULOSE FIBER MULCH FOR HYDRAULIC SEEDING MANUFACTURER'S CERTIFICATIONS

PROPERTY	VALUE
FIBER OR PARTICLE SIZE	
LENGTH	TO APPROXIMATELY 0.39 INCH (10 MM)
THICKNESS OR DIAMETER	APPROXIMATELY 0.04 INCH (1 MM)
NET DRY WEIGHT CONTENT (VTM-47)	MINIMUM STATED ON BAG
PH RANGE (TAPPI T509 OR ASTM D 778)	4.0 TO 8.5
ASH CONTENT (TAPPI T413 OR ASTM D 586)	MAXIMUM 7.0%
WATER-HOLDING CAPACITY (VTM-46)	MINIMUM 90%

DEVIATION REQUEST FOR MS-19 WATER QUANTITY EVALUATION OF TRANSCO SEDIMENT TRAPS 3&4

DUE TO THE FLAT TOPOGRAPHY IN THE NORTHERN PORTION OF THE TRANSCO INTERCONNECT SITE THAT RESTRICTS THE AREA AVAILABLE FOR CONSTRUCTION AND THE ABILITY TO SITE A BMP THAT PROVIDES ADEQUATE STORMWATER QUANTITY CONTROL PER MS-19, MVP REQUESTS A DEVIATION TO APPLY THE CALCULATED WET STORAGE VOLUME AS PART OF THE AVAILABLE TOTAL STORAGE WHEN EVALUATING PROPOSED SEDIMENT TRAPS 3&4 (ST-3 AND ST-4) IN THIS PORTION OF THE SITE. MVP WILL MAINTAIN ST-3 AND ST-4 BY REMOVING WATER FROM EACH SEDIMENT TRAP WITHIN 24-HOURS FOLLOWING ANY RAINFALL EVENT THAT LEAVES WATER IN THE TRAP, AND BY REMOVING ANY ACCUMULATED SEDIMENT TO ENSURE THAT DESIGN STORAGE VOLUMES ARE MAINTAINED. ALL WATER REMOVED FROM THE TRAPS WILL BE FILTERED THROUGH FILTER BAGS LOCATED IN AN UNDISTURBED AREA PROTECTED WITH A FILTERING BMP (I.E. SILT FENCE, COMPOST FILTER SOCK) LOCATED IMMEDIATELY DOWN GRADIENT OF THE FILTER BAG.

ADDRESS VADEQ COMMENTS	DESCRIPTION:						
MQ	MQ	Mra	Mra	Mra	Mra	APPD.:	
Ħ	ТН	ΤН	ΤН	ΤН	тн	DWN.: CHKD.: APPD.:	
MJP	JWK	KAL	KAL	KAL	KAL	:.WM	
11/21/17 MJP	02/28/18	04/10/18	05/11/18	05/23/18	06/04/18	DATE:	
2	3	4	2	9		NO.:	
	CT						



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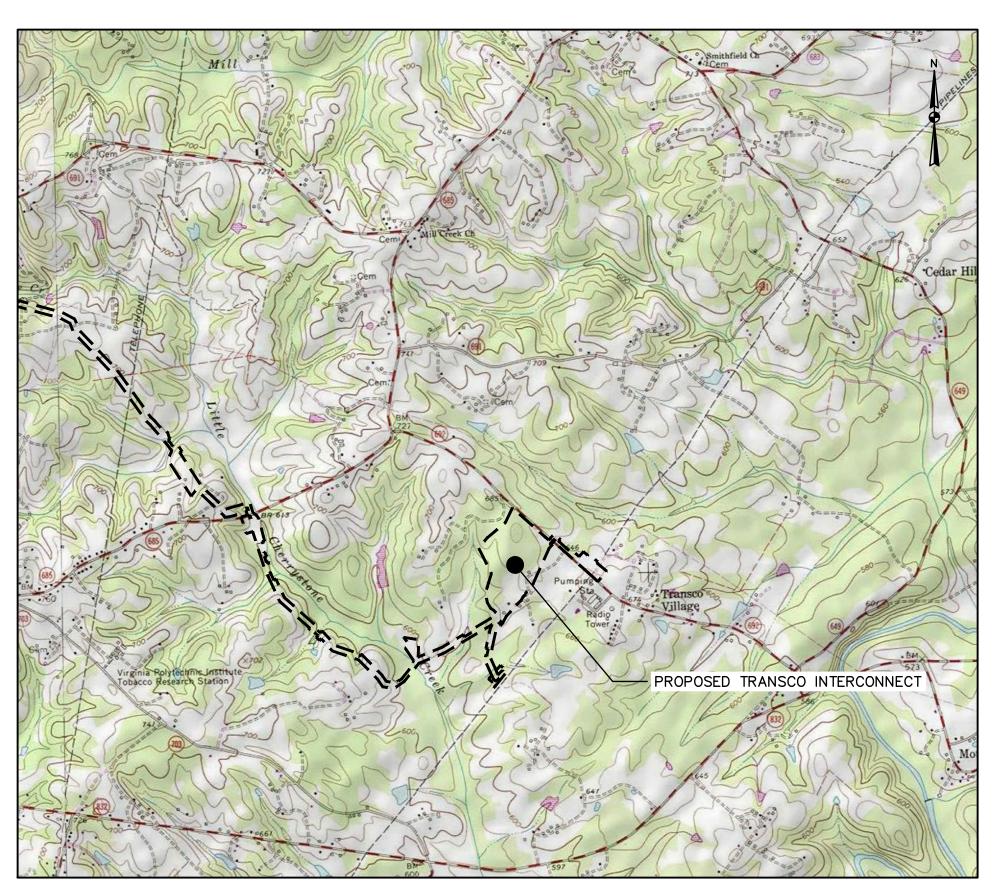
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CHECKED BY:	HT		
APPROVED BY		DJW	
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MOUNTAIN VALLEY PIPELINE

CONSTRUCTION PLANS

MOUNTAIN VALLEY PIPELINE - TRANSCO INTERCONNECT PROJECT

JUNE 2018



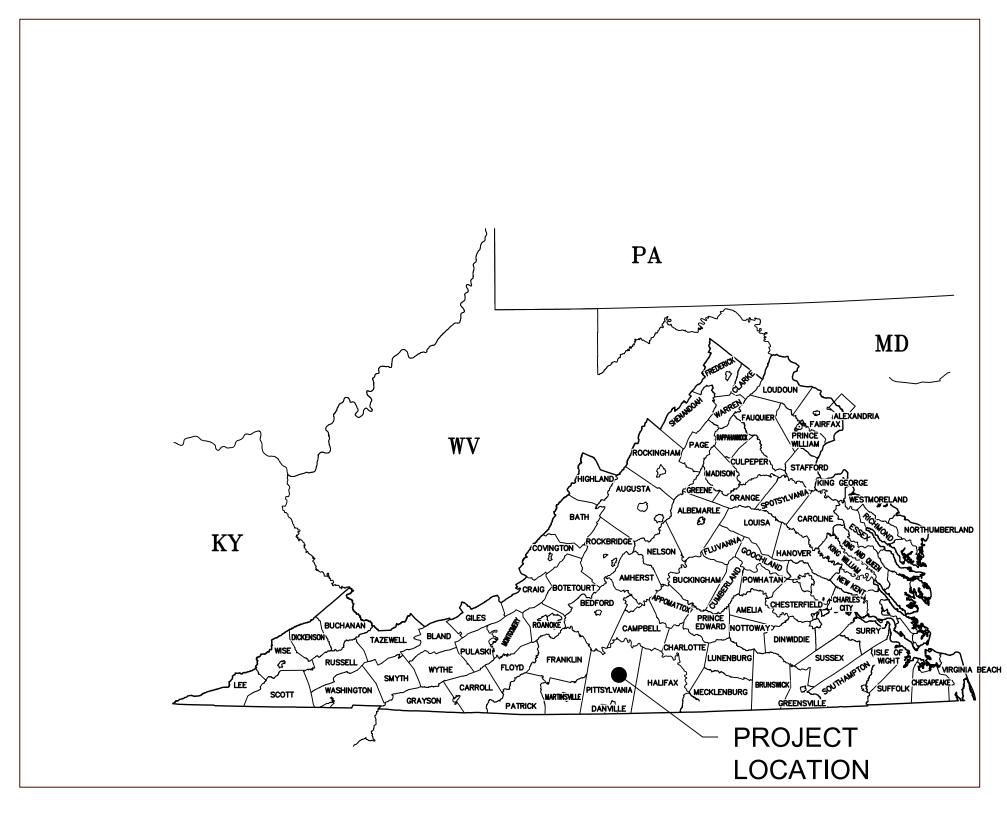
	DRAWING INDEX
SHEET No.	DRAWING TITLE
TRA-1	COVER SHEET
TRA-2	EROSION AND SEDIMENT CONTROL DETAILS
TRA-3	EROSION AND SEDIMENT CONTROL DETAILS
TRA-4	EROSION AND SEDIMENT CONTROL DETAILS
TRA-5	EROSION AND SEDIMENT CONTROL DETAILS
TRA-6	EROSION AND SEDIMENT CONTROL DETAILS
TRA-7	EROSION AND SEDIMENT CONTROL DETAILS
TRA-8	EROSION AND SEDIMENT CONTROL DETAILS
TRA-9	EROSION AND SEDIMENT CONTROL DETAILS
TRA-10	CONSTRUCTION DETAILS
TRA-10A	CONSTRUCTION DETAILS
TRA-11	SITE RESTORATION DETAILS
TRA-12	SITE RESTORATION DETAILS
TRA-13	SITE RESTORATION DETAILS
TRA-14	ESC NARRATIVE
TRA-15	ESC NARRATIVE
TRA-16	ESC NARRATIVE
TRA-17	SWM NARRATIVE
TRA-18	EXISTING CONDITIONS PLAN
TRA-19	EROSION AND SEDIMENT CONTROL PLAN
TRA-20	ACCESS ROAD PROFILES AND PERMANENT PAD SECTIONS
TRA-21	ACCESS ROAD SECTIONS
TRA-22	TEMPORARY PAD AND SEDIMENT TRAP SECTIONS
TRA-23	SEDIMENT BASIN SECTIONS
TRA-24	FINAL SITE RESTORATION PLAN
TRA-25	PERMANENT STORMWATER POND SECTIONS



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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.



VICINITY MAP

NOT TO SCALE

RESPONSIBLE LAND DISTURBER CERTIFICATION/INFORMATION	_
CERTIFICATE/ LICENSE HOLDER NAME:	
ADDRESS:	
TYPE OF CERTIFICATE:	
APPLICANT/AGENT SIGNATURE:	

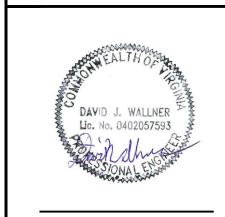
RESPONSIBLE LAND DISTURBER NOTE:
FOLLOWING THE EXECUTION OF A CONTRACT WITH THE SITE CONTRACTOR FOR THIS
PROJECT AND PRIOR TO THE INITIATION OF ANY LAND DISTURBANCE, A NEW
RESPONSIBLE LAND DISTURBER CERTIFICATION SHALL BE SUBMITTED TO THE COUNTY
BY THE CONTRACTOR NAMING A CERTIFIED INDIVIDUAL EMPLOYED BY THE
CONTRACTOR AS THE DESIGNATED RESPONSIBLE LAND DISTURBER FOR THE PROJECT
TO REPLACE THE INDIVIDUAL NAMED IN THE ABOVE CERTIFICATE.

2 11/21/17 MJP HT DW ADDRESS VADEQ COMMENTS	3 02/28/18 JWK HT DW ADDRESS VADEQ COMMENTS	4 04/10/18 KAL HT DJW ADDRESS VADEQ COMMENTS	5 05/11/18 KAL HT DJW ADDRESS VADEQ COMMENTS	6 05/23/18 KAL HT DJW ADDRESS VADEQ COMMENTS	7 06/04/18 KAL HT DJW ADDRESS VADEQ COMMENTS	NO.: DATE: DWN.: CHKD.: APPD.: DESCRIPTION:	REVISIONS:	
	PIPELINE	COVER SHEET	STANDOSCIPLIA COSTAGE ESTINACIÓN ESTA ESTANDADA	MOUNIAIN VALLEI FIFELINE FROJECI - IRANJOCO INTERCONNECT	PITTSYLVANIA COUNTY, VIRGINIA	OII JINI JOIG AJI IVA INIVITALIANI OM	S55 SOUTHPOINTE BLVD, SUITE 200	CANONSBURG, PA 15317
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CONSTRUCTION PLANS



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06/04/2018

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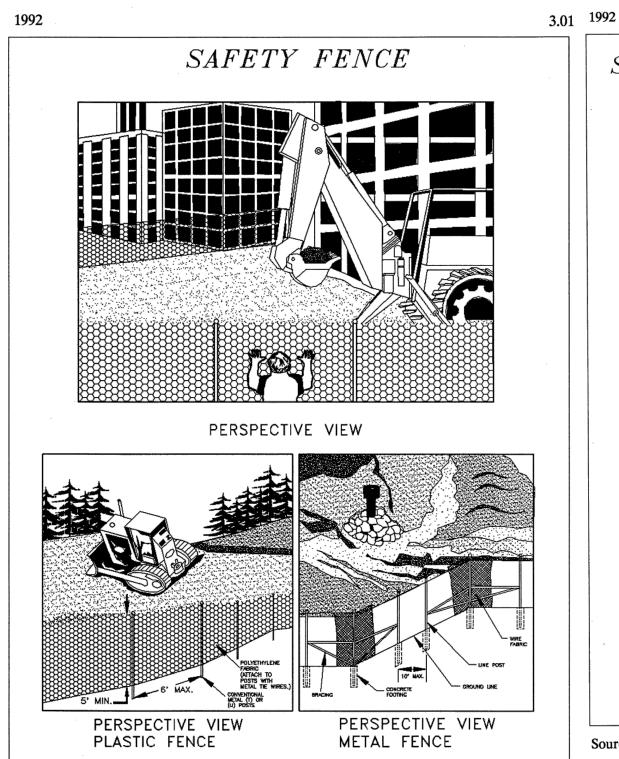
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OCATION MAP



SIDE ELEVATION EXISTING GROUND PLAN VIEW FILTER CLOTH -SECTION A-A SECTION B-B Source: Adapted from 1983 Maryland Standards for Soil Plate 3.02-1 Erosion and Sediment Control, and Va. DSWC

STONE CONSTRUCTION ENTRANCE

3.04 1992 3.02 1992 STRAW BALE BARRIER PROPERLY INSTALLED STRAW BALE (CROSS SECTION) 2. PLACE AND STAKE STRAW BALES. 1. EXCAVATE THE TRENCH. 4. BACKFILL AND COMPACT THE EXCAVATED SOIL. 3. WEDGE LOOSE STRAW BETWEEN BALES. CONSTRUCTION OF STRAW BALE BARRIER Source: Va. DSWC Plate 3.04-1

CONSTRUCTION OF A SILT FENCE (WITH WIRE SUPPORT) 1. SET POSTS AND EXCAVATE A 4"X4" TRENCH UPSLOPE ALONG THE LINE 2. STAPLE WIRE FENCING TO THE POSTS. 3. ATTACH THE FILTER FABRIC TO THE WIRE 4. BACKFILL AND COMPACT THE FENCE AND EXTEND IT INTO THE TRENCH. EXCAVATED SOIL. Source: Adapted from <u>Installation of Straw and Fabric Filter</u>
Barriers for Sediment Control, Sherwood and Wyant Plate 3.05-1

CONSTRUCTION OF A SILT FENCE (WITHOUT WIRE SUPPORT) 2. EXCAVATE A 4"X 4" TRENCH 1. SET THE STAKES. 4. BACKFILL AND COMPACT THE EXCAVATED SOIL. 3. STAPLE FILTER MATERIAL TO STAKES AND EXTEND SHEET FLOW INSTALLATION (PERSPECTIVE VIEW) POINTS A SHOULD BE HIGHER THAN POINT B. DRAINAGEWAY INSTALLATION (FRONT ELEVATION) Source: Adapted from Installation of Straw and Fabric Filter

Barriers for Sediment Control, Sherwood and Wyant

3.05 1992

Plate 3.05-2

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

SAFETY FENCE TAKEN FROM VADEQ 1992 MANUAL

Adapted from Conwed Plastics and

VDOT Road and Bridge Standards

Plate 3.01-1

STONE CONSTRUCTION ENTRANCE TAKEN FROM VADEQ 1992 MANUAL

STRAW BALE BARRIER TAKEN FROM VADEQ 1992 MANUAL

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

CONSTRUCTION OF A BRUSH BARRIER COVERED BY FILTER FABRIC (TREE/RESIDUAL MATERIAL WITH DIAMETER > 6")2. DRAPE FILTER FABRIC OVER THE BRUSH BARRIER AND INTO THE TRENCH. FABRIC SHOULD BE SECURED IN THE TRENCH WITH STAKES SET APPROXIMATELY 36" 1. EXCAVATE A 4"X 4" TRENCH ALONG THE UPHILL EDGE OF THE BRUSH SET STAKES ALONG THE DOWN-HILL EDGE OF THE BRUSH 3. BACKFILL AND COMPACT THE EXCAVATED SOIL. BARRIER, AND ANCHOR BY TYING TWINE FROM THE FABRIC TO THE STAKES. Source: Va. DSWC

Plate 3.06-1 CONSTRUCTION OF A BRUSH BARRIER

TAKEN FROM VADEQ 1992 MANUAL

3.18 PIPE OUTLET CONDITIONS PIPE OUTLET TO FLAT AREA WITH NO DEFINED CHANNEL PLAN VIEW FILTER CLOTH KEY IN 6"-9"; RECOMMENDED FOR ENTIRE PERIMETER 3d₀ (MIN.) PIPE OUTLET TO WELL DEFINED CHANNEL PLAN VIEW FILTER CLOTH KEY IN 6"-9"; RECOMMENDED FOR ENTIRE PERIMETER NOTES: 1. APRON LINING MAY BE RIPRAP, GROUTED RIPRAP, GABION 2. La IS THE LENGTH OF THE RIPRAP APRON AS CALCULATED USING PLATES 3.18-3 AND 3.18-4. 3. d = 1.5 TIMES THE MAXIMUM STONE DIAMETER, BUT NOT LESS THAN 6 INCHES.

Source: Va. DSWC

PIPE OUTLET CONDITIONS TAKEN FROM VADEQ 1992 MANUAL

Plate 3.18-1

²Dimensions adapted from VESCH Std & Spec 3.18 assuming minimum tailwater condition (T_w < 0.5d_o). Initial Apron Width to match channel width at depth associated with design storm.

³Oultet CC-3 will follow the channel taper

⁵ In addition to the riprap apron, a plunge pool section and a spreader weir section are also proposed at Outlet SB-1. See detail on sheet TRA-8.

TAKEN FROM VADEQ 1992 MANUAL

REFERENCES:
VIRGINIA EROSION AND SEDIMENT CONTROL HANDBOOK, DATED 1992

	С	ulvert Design				¹Riprap A	pron Outlet Protection Desig	gn		
Outlet No.	Culvert Diameter, d _o (in)	Pipe Slope (ft/ft)	Q (cfs)	d ₅₀ Riprap Size, d ₅₀ (in)	AASHTO Riprap Class	Placement Thickness per NSA Riprap Gradation, d (in)	Placement Thickness per AASHTO Riprap Gradation, d (in)	Apron Length, L _a (ft)	Apron Initial Width, W _i (ft)	Apron Terminal Width, W (ft)
⁴ Outlet CC-1	24	0.0077	5.747	6	А	18	23.4	10	6	10
Outlet CC-2	18	0.0099	3.290	6	Α	18	23.4	6	11.2	11.2
³ Outlet CC-3	18	0.0241	1.440	6	Α	18	23.4	16.4	8	11
Outlet CC-4 (Temporary)	18	0.0212	4.730	6	А	18	23.4	9	4.5	10.5
Outlet CC-5	18	0.0170	1.170	6	А	18	23.4	6	4.5	7.5
² Outlet CH-H	N/A	0.0352	4.730	6	А	18	23.4	9	11.0	20.0
Outlet CH-A	N/A	N/A	7.180	6	А	18	23.4	9	2	12.0
⁵ Outlet SB-1	18	2.5000	1.564	6	А	18	23.4	10	4.5	14.5
Outlet SB-2	18	2.5000	7.470	6	А	18	23.4	10	4.5	14.5
Outlet CC-6	18 0.0064 1.708 6 A 18		23.4	10	4.5	14.5				

¹Designed in accordance with VESCH Std & Spec 3.18 assuming minimum tailwater condition ($T_w < 0.5d_o$).

⁴Designed in accordance with VESCH Std & Spec 3.18 assuming maximum tailwater condition (Tw \geq 0.5d_o).

OUTLET PROTECTION SCHEDULE

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661 ANDERSEN DRIVE FOSTER PLAZA 7 PITTSBURGH, PA 15220 Source: Va. DSWC

ROCK CHECK DAM

DEVELOPED FROM VADEQ 1992 MANUAL

1992

POCK CHECK DAM

DEVELOPED FROM VADEQ 1992 MANUAL

NOTES:

NO FORMAL DESIGN IS REQUIRED FOR A CHECK DAM, HOWEVER THE FOLLOWING CRITERIA SHOULD BE

I. THE DRAINAGE AREA OF THE DITCH OR SWALE BEING PROTECTED SHALL NOT EXCEED 2 ACRES WHEN VDOT #1 COARSE AGGREGATE IS USED ALONE AND SHALL NOT EXCEED 10 ACRES WHEN A COMBINATION OF CLASS I RIPRAP (ADDED FOR STABILITY) AND VDOT #1 COARSE AGGREGATE IS USED.

ADHERED TO WHEN SPECIFYING CHECK DAMS:

- THE MAXIMUM HEIGHT OF THE DAM SHALL BE 12 INCHES.
- 3. THE CENTER OF THE CHECK DAM MUST BE AT LEAST 6 INCHES LOWER THAN THE OUTER EDGES. FIELD EXPERIENCE HAS SHOWN THAT MANY DAMS ARE NOT CONSTRUCTED TO PROMOTE THIS "WEIR" EFFECT. STORMWATER FLOWS ARE THEN FORCED TO THE STONE-SOIL INTERFACE, THEREBY PROMOTING SCOUR AT THE POINT AND SUBSEQUENT FAILURE OF THE STRUCTURE TO PERFORM ITS INTENDED FUNCTION.
- 4. FOR ADDED STABILITY, THE BASE OF THE CHECK DAM CAN BE KEYED INTO THE SOIL APPROXIMATELY 6 INCHES.

 5. THE MAXIMUM SPACING BETWEEN THE DAMAS SHOULD BE SUCH THAT THE TOP OF THE UNDERSOME DAMAS AT THE SAME.
- THAT THE TOE OF THE UPSTREAM DAM IS AT THE SAME ELEVATION AS THE TOP OF THE DOWNSTREAM DAM.

 6. HAND OR MECHANICAL PLACEMENT WILL BE NECESSARY TO ACHIEVE COMPLETE COVERAGE OF THE DITCH OR SWALE AND TO INSURE THAT THE CENTER OF THE DAM IS LOWER THAN THE
- 7. FILTER CLOTH MAY BE USED UNDER THE STONE TO PROVIDE A STABLE FOUNDATION AND TO FACILITATE THE REMOVAL OF THE STONE

Plate 3.20-1

3.24

	Av	erage Slope	of Watersl	ned		
Drainage Area (Acres)	1%	4%	8%	16%		
1 - 25	24	24	30	30		
	1550	T 22				
26 - 50	24	30	36	36		
51 - 100	30	36	42	48		
101 - 150	30	42	48	48		
151 - 200	36	42	48	54		
301 - 350	42	48	60	60		
351 - 400	42	54	60	60		
451 - 500	42	54	60	72		
501 - 550	48	60	60	72		
551 - 600	48	60	60	72		
601 - 640	48	60	72	72		

Note: Table is based on USDA-SCS Graphical Peak Discharge Method for 2-year frequency storm event, CN = 65; Rainfall depth = 3.5 inches (average for Virginia).

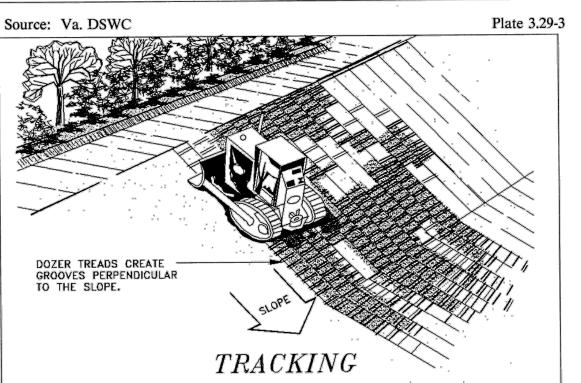
PIPE DIAMETER CHART

TAKEN FROM VADEQ 1992 MANUAL

Source: Va. DSWC

EACH LIFT OF THE FILL IS COMPACTED, BUT THE OUTER FACE OF THE SLOPE IS ALLOWED TO REMAIN LOOSE SO THAT THE ROCKS, CLODS, ETC. REACH THE NATURAL ANGLE OF REPOSE.

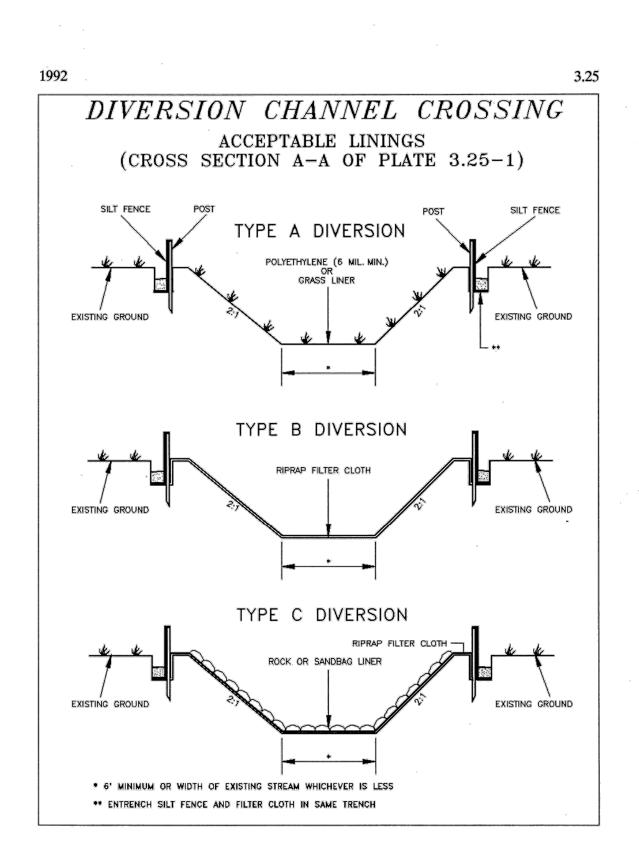
FILL SLOPE TREATMENT



Source: Michigan Soil Erosion and Sedimentation Guide

Plate 3.29-4

FILL SLOPE TREATMENT & TRACKING
TAKEN FROM VADEQ 1992 MANUAL



Source: Adapted from VDOT Standard Sheets Plate 3.25-2

DIVERSION CHANNEL CROSSING

DEVELOPED FROM VADEQ 1992 MANUAL

FILTER CLOTH

PUMP DISCHARGE

PUMP DISCHARGE

PUMP DISCHARGE

PUMP DISCHARGE

PUMP DISCHARGE

PUMP DISCHARGE

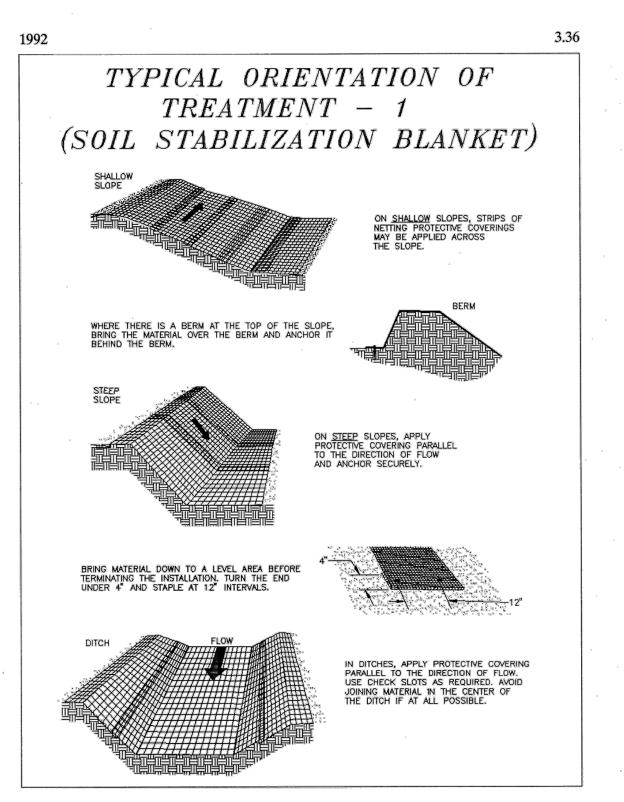
SOLUTION

SOLUTI

Source: Va. DSWC Plate 3.26-3

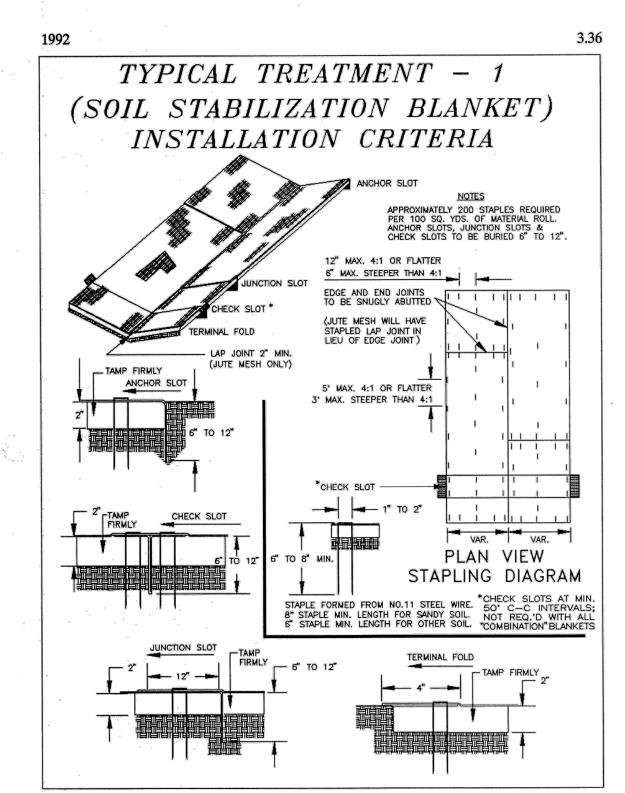
STRAW BALE/SILT FENCE PIT

DEVELOPED FROM VADEQ 1992 MANUAL



Source: Adapted from Ludlow Products Brochure

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

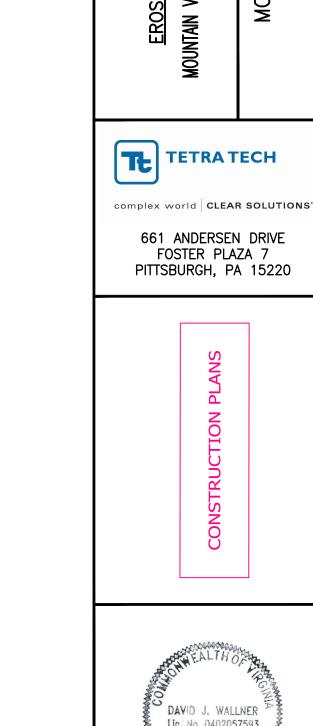


Source: VDOT Road and Bridge Standards

Plate 3.36-1

SOIL STABILIZATION BLANKET
INSTALLATION CRITERIA
DEVELOPED FROM VADEQ 1992 MANUAL

Plate 3.36-2



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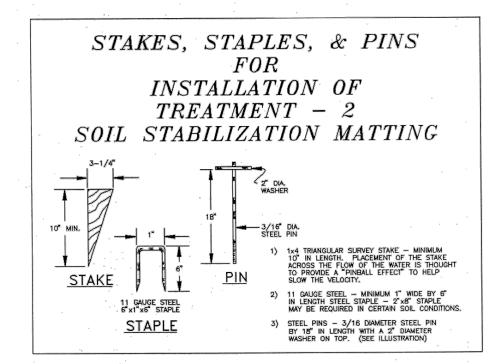
06/04/2018

AS SHOWN

SHT. NO. TRA-3 OF 25

evaluation of performance data to ensure proper selection of a soil stabilization matting are also essential. Although many manufacturers claim their products may inhibit erosion associated with channel velocities of up to 20 ft./sec., it is recommended that any velocities that exceed 10 ft./sec. be properly protected with some form of structural lining (see Std. & Spec. 3.17, STORMWATER CONVEYANCE CHANNEL).

<u>Staples</u> - Staples or anchoring methods and recommendations vary by manufacturers. The expectation of high velocities should dictate the use of more substantial anchoring. Some of the typically recommended stakes, staples and pins are depicted in Plate 3.36-3

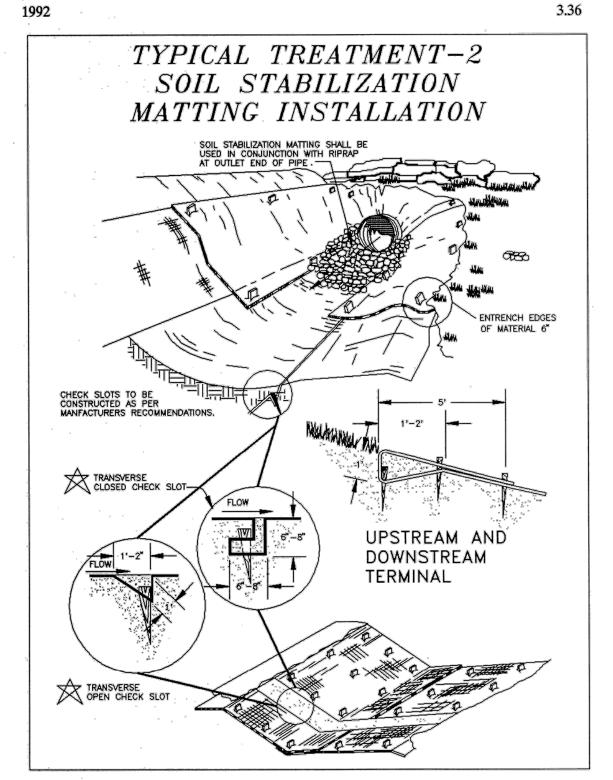


Source: Product literature from Greenstreak, Inc.

Plate 3.36-3

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.

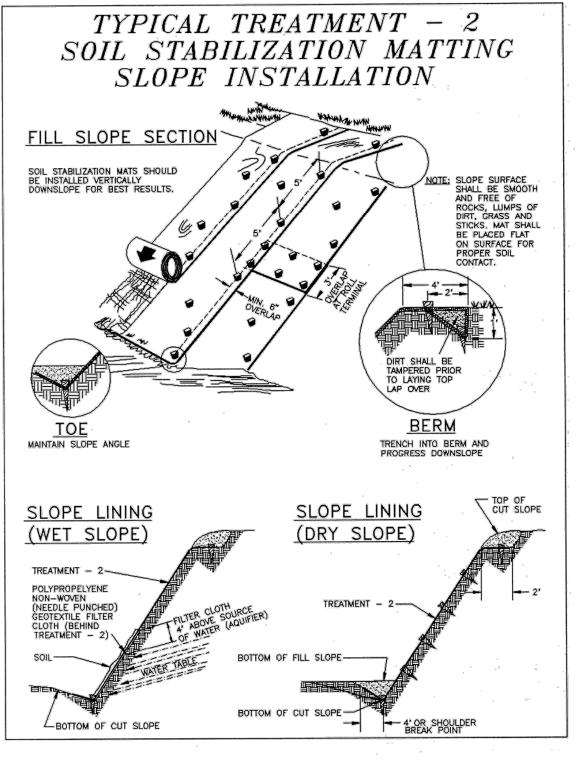
STAKES, STAPLES, & PINS FOR INSTALLATION OF SOIL STABILIZATION MATTING DEVELOPED FROM VADEQ 1992 MANUAL



Source: VDOT Road and Bridge Standards

Plate 3.36-4

TYPICAL TREATMENT SOIL STABILIZATION MATTING INSTALLATION DEVELOPED FROM VADEQ 1992 MANUAL

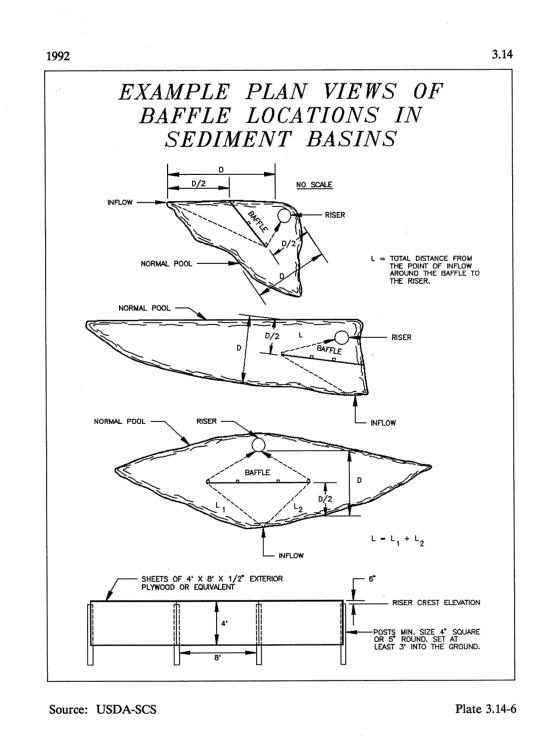


Source: VDOT Road and Bridge Standards

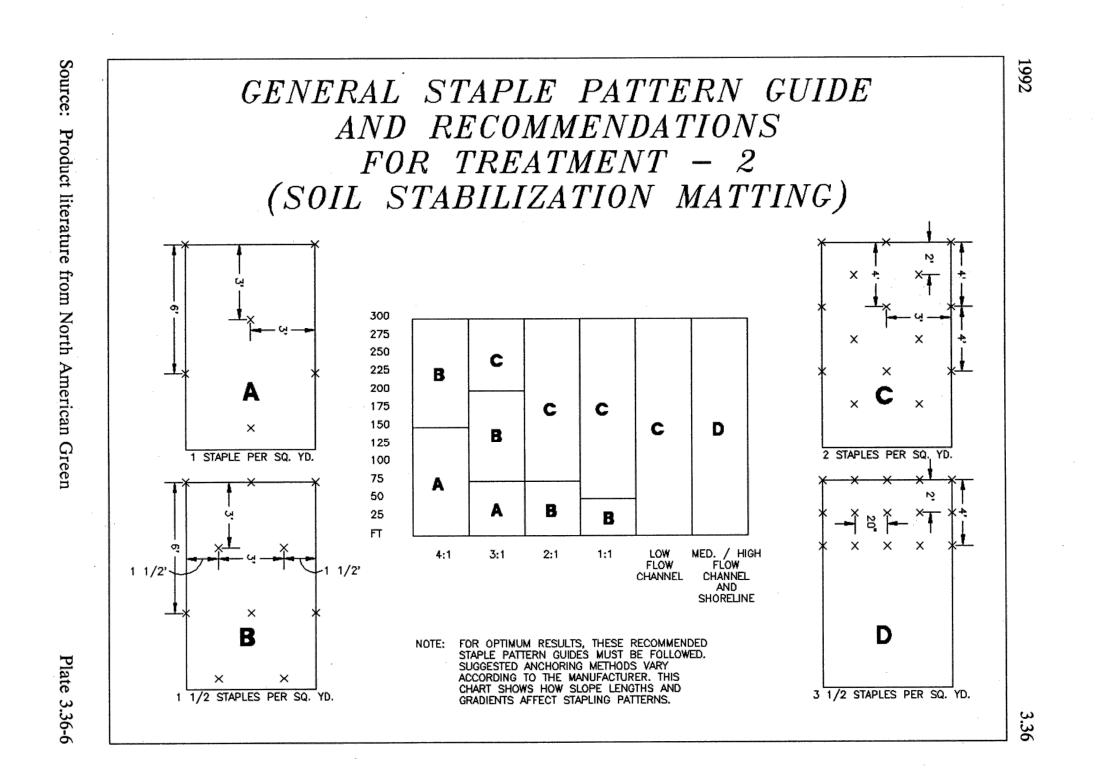
Plate 3.36-5

3.36

SOIL STABILIZATION MATTING SLOPE **INSTALLATION** DEVELOPED FROM VADEQ 1992 MANUAL



BAFFLE DETAIL



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

TAKEN FROM VADEQ 1992 MANUAL

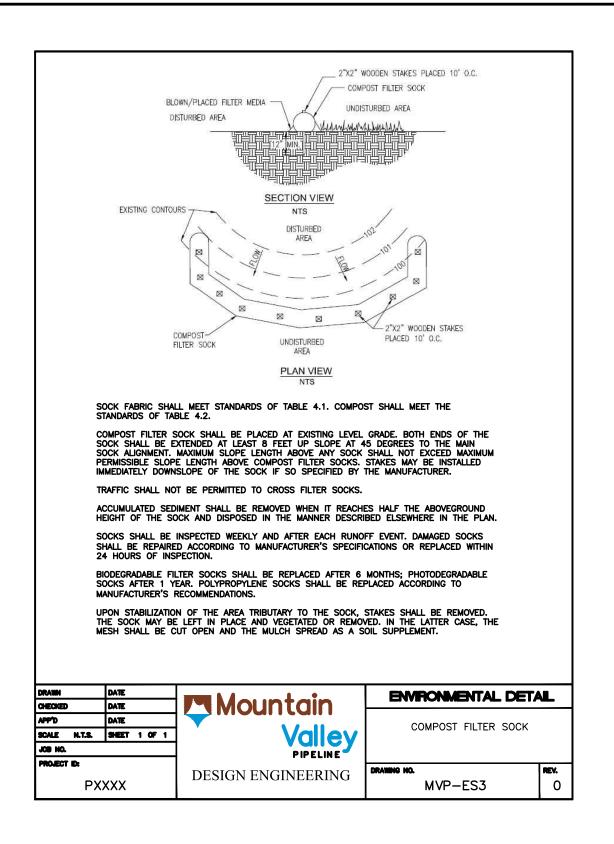
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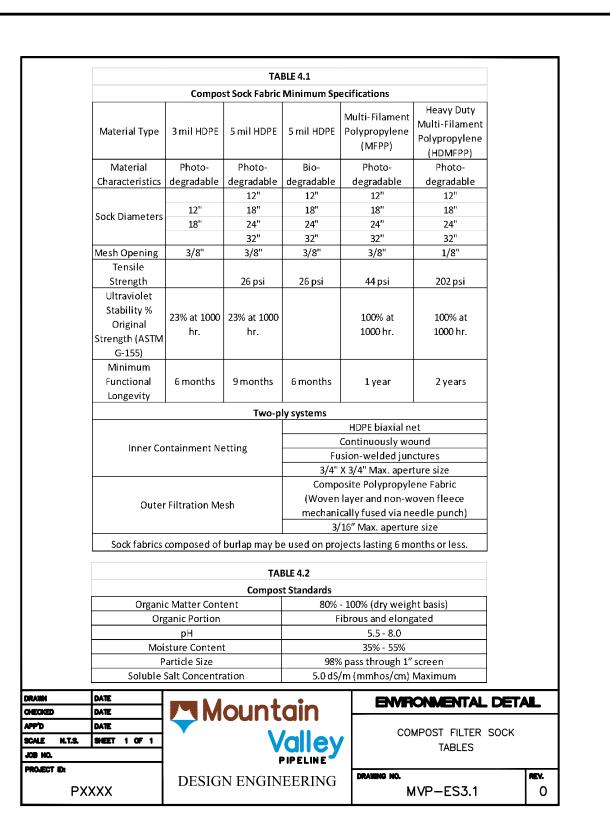
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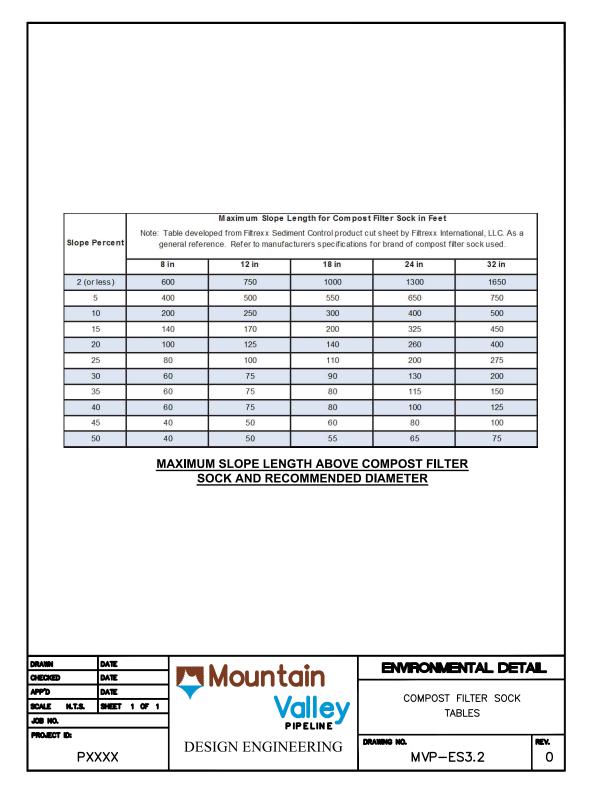
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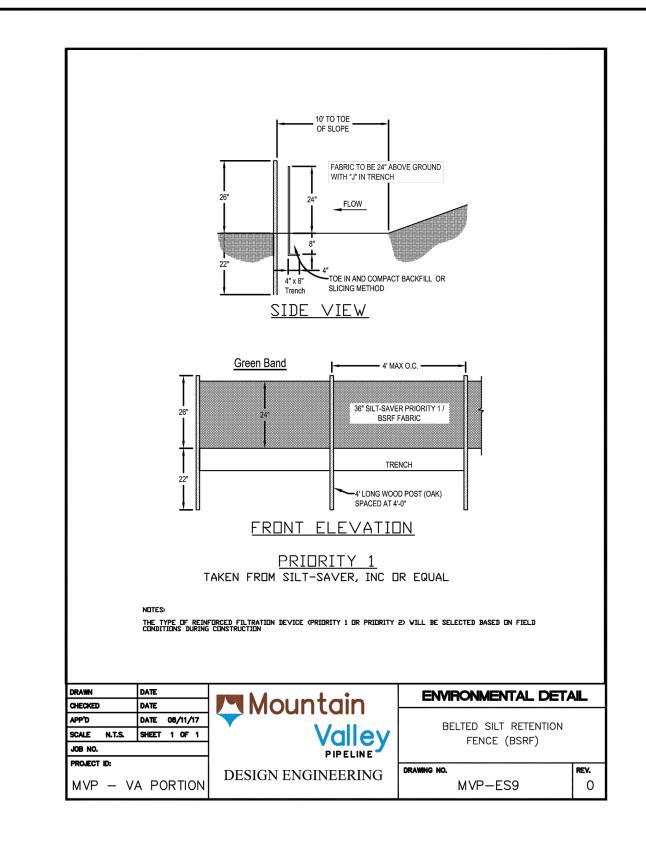
661 ANDERSEN DRIVE FOSTER PLAZA 7 PITTSBURGH, PA 15220

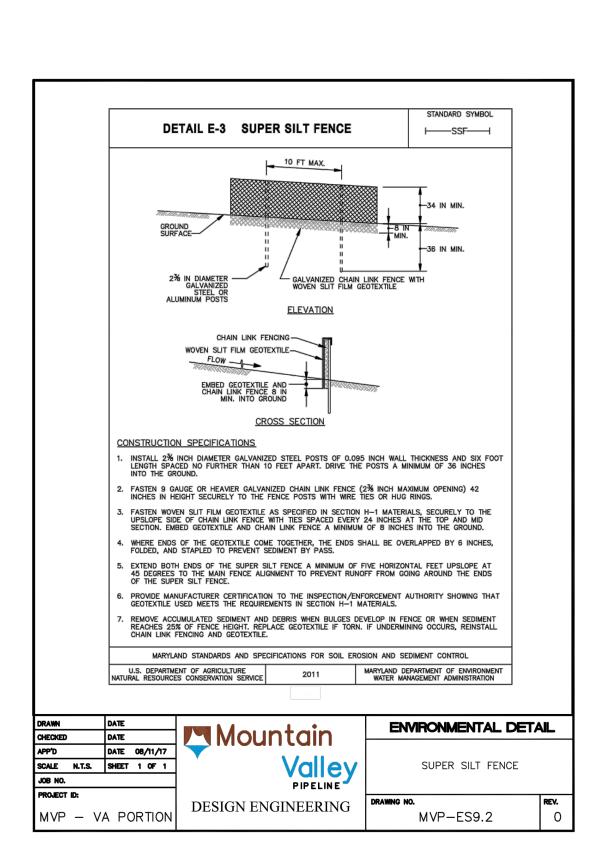
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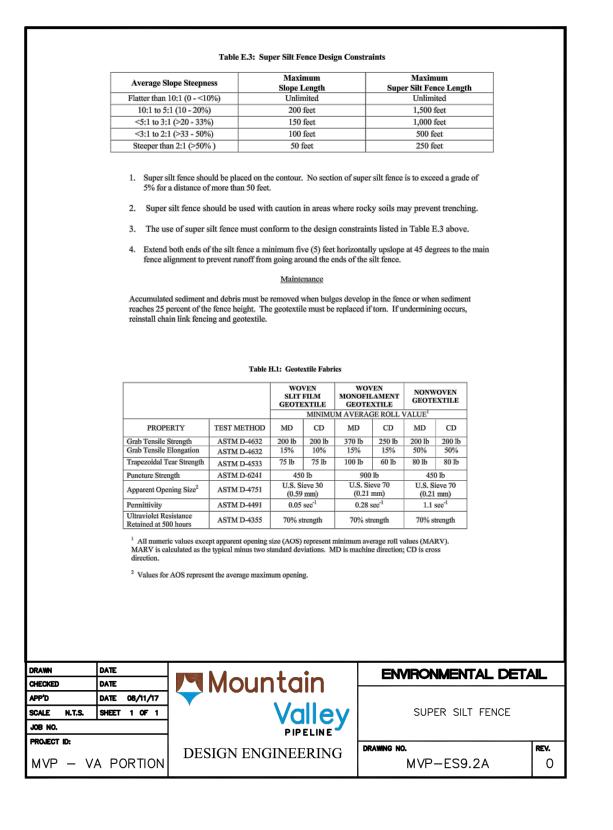


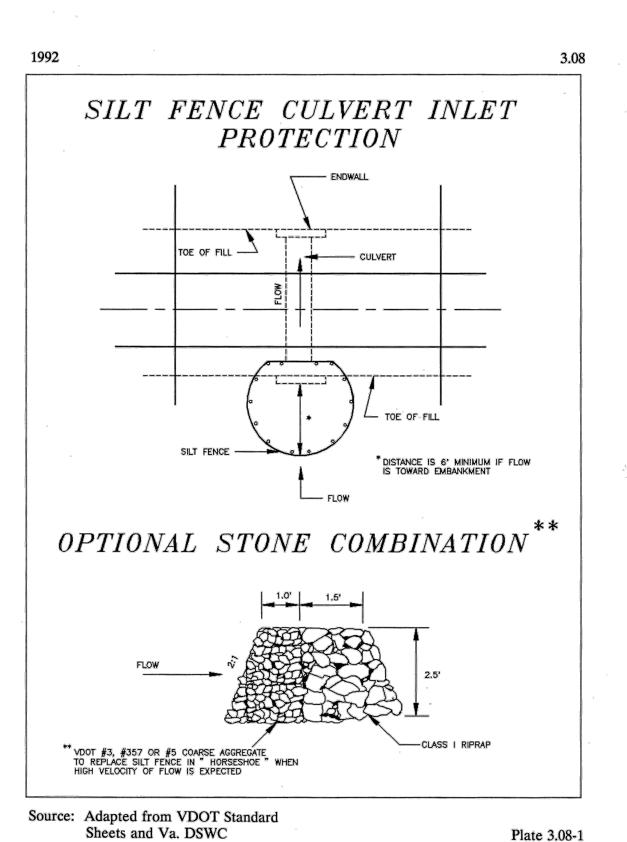






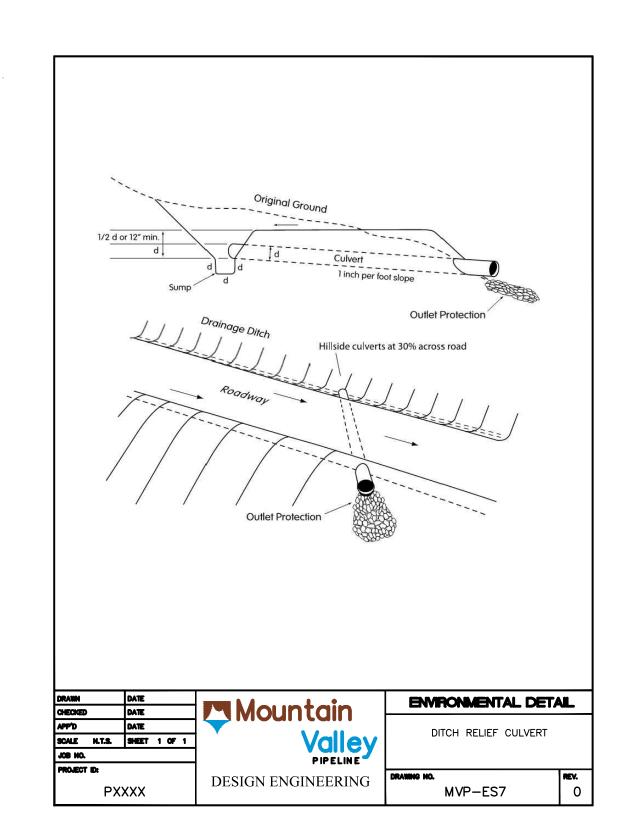






CULVERT INLET PROTECTION

DEVELOPED FROM VADEQ 1992 MANUAL ,



CULVERT SCHEDULE

<u>Culvert No.</u>	<u>Drainage</u> <u>Area (ac)</u>	10-Year Design Flow (cfs)	<u>Culvert</u> <u>Diameter</u> (in)	<u>Culvert</u> <u>Length (ft)</u>	Invert Elevation at Inlet (ft) ²	Invert Elevation at Outlet(ft) ²	<u>Culvert</u> <u>Slope</u>	<u>Culvert Material</u>
CC-1	6.27	5.75	24	130	654.3	653.3	0.8%	CPP or Approved Equal
CC-2	2.10	3.29	18	131	657.4	656.1	1.0%	CPP or Approved Equal
CC-3	0.80	1.44	18	110	658.0	654.0	3.6%	CPP or Approved Equal
CC-4 (Temporary)	2.90	4.73	18	179	653.8	650.0	2.1%	CPP or Approved Equal
CC-5	0.86	1.17	18	88	663.2	661.7	1.7%	CPP or Approved Equal
CC-6	1.31	1.71	18	98	658.1	657.5	0.6%	CPP or Approved Equal

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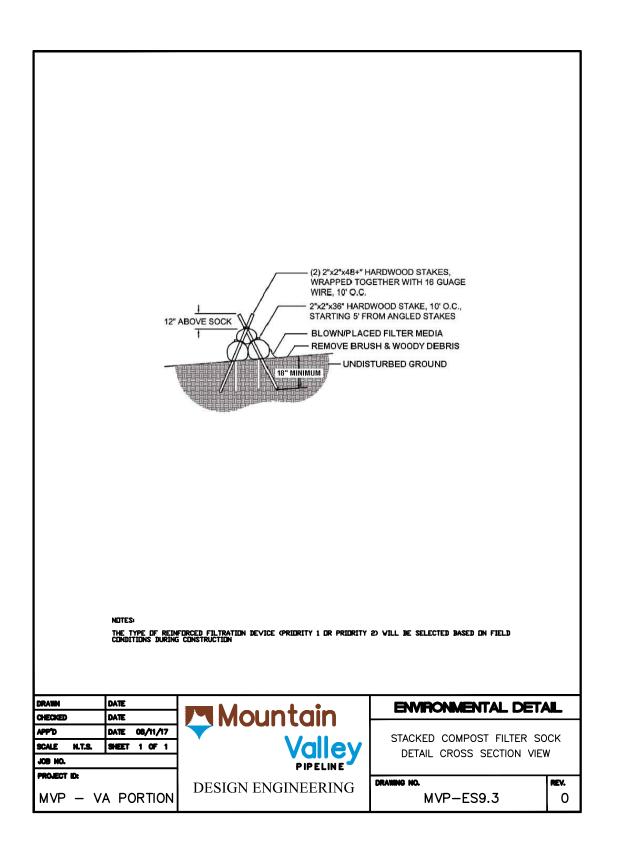
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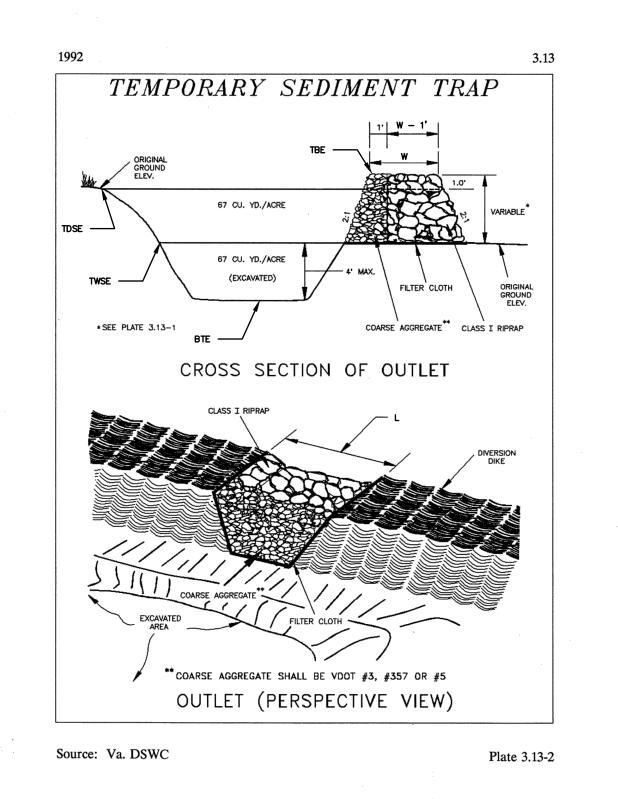
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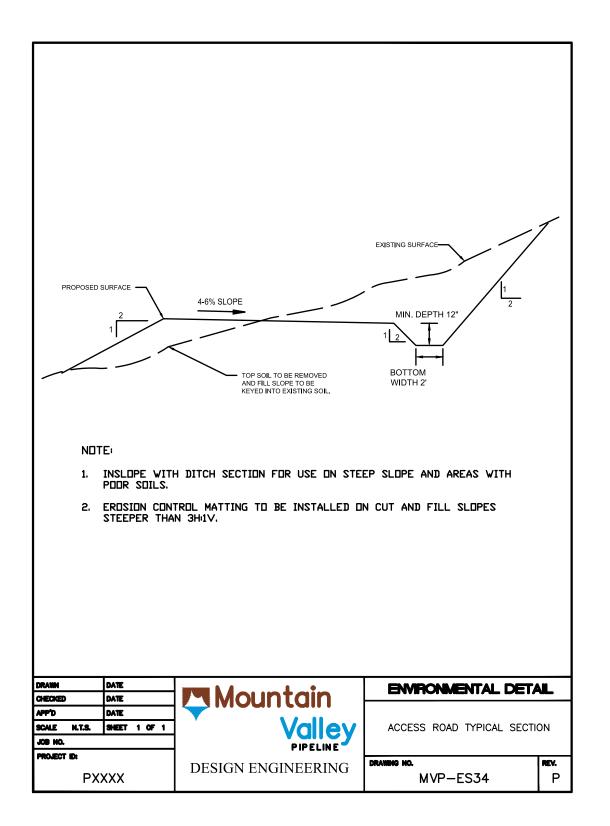
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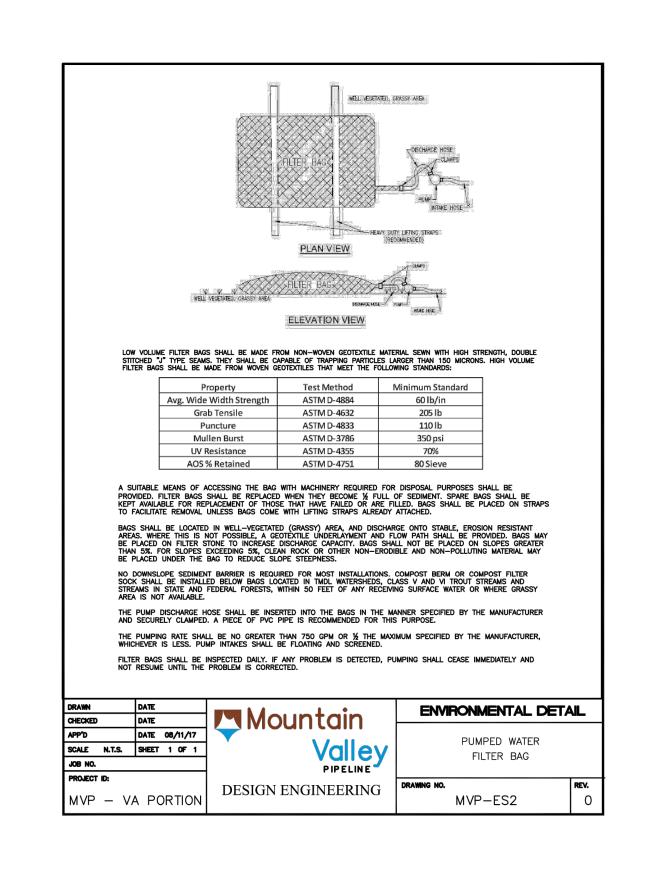
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DAVID J. WALLNER Lic. No. 0402057593









LEVEL SPREADER

CROSS SECTION

LEVEL SPREADER WITH VEGETATED LIP

CROSS SECTION

----- VARIABLE (MIN, 7') -

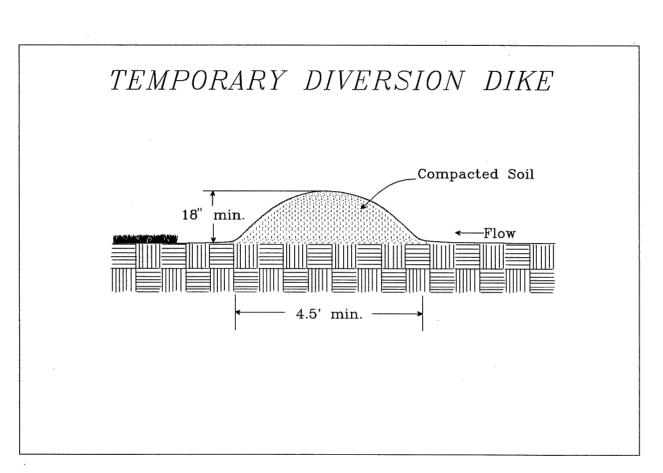
TEMPORARY SEDIMENT TRAP NOTE: REFER TO THE SEDIMENT TRAP PLAN VIEWS ON SHEET TRA-19 AND THE SEDIMENT TRAP SECTION VIEWS ON SHEET TRA-22 FOR ADDITIONAL

					SEDI	IMENT T	RAP					
		WI	ET STOR	AGE	DR'	Y STORA	.GE				ے	
Trap #	ST-1 2.91 ST-2 2.85 ST-3 2.70	Volumed Required (Cu. Yd.)	Volume Provided (Cu. Yd.)	Elevation	Volumed Required (Cu. Yd.)	Volume Provided (Cu. Yd.)	Elevation	Outlet Length (Ft.)	Bottom Elevation	Top of Berm Elevation	Top of Berm Width	Dimensions, L x W (Ft.)
ST-1	2.91	195	340	653.00	195	238	655.00	18	651.00	656.00	3	80x40
ST-2	2.85	191	288	642.00	191	370	644.00	18	639.00	645.00	4.5	86x36
ST-3	2.70	181	247	662.00	181	441	664.00	18	659.00	665.00	4.5	55x25
ST-4	2.70	181	242	663.00	181	453	665.00	18	660.00	666.00	4.5	55x25

SITE-SPECIFIC DETAILS FOR SEDIMENT TRAPS ST-1 AND ST-2.

III - 76

NOTE: ST-3 AND ST-4 TO BE MAINTAINED TO ENSURE CLEANOUT AND WET VOLUME DEWATERING BETWEEN STORM EVENTS.



Source: Va. DSWC **TEMPORARY DIVERSION DIKE/PERMANENT DIVERSION BERM**

N.T.S.

3.21 LEVEL SPREADER - LAST 20' OF DIVERSION NOT TO EXCEED 1% GRADE LEVEL SPREADER PERSPECTIVE VIEW NOTE: ALL TEMPORARY BERMS, SWALES AND LEVEL SPREADER DITCH MUST RECEIVE TEMPORARY SEEDING IMMEDIATELY AFTER INSTALLATION Source: Adapted from N.C. Erosion and Sediment

Control Planning and Design Manual

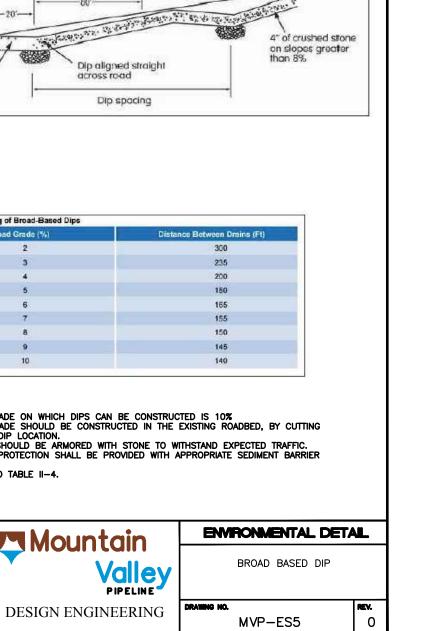
LEVEL SPREADER WITH RIGID LIP * MIN. PHYSICAL REQUIREMENTS OF FILTER CLOTH NOTED IN STD. & SPEC. 3.19, RIPRAP Source: Va. DSWC and N.C. Erosion and Sediment Control Planning and Design Manual

JUTE, OR EXCELSIOR
OR EQUIVALENT
STAPLED IN PLACE

	0-Year esign wv (cfs)	wel Spreader Schedu	er te d)
II	10-` Des Flow	Level Spread Length (ft)	Level Spreadd Lip (Vegeta d or Rigi
LS-1	1.15	12	Rigid
LS-2	7.77	82	Rigid
LS-3	1.71	18	Rigid

Plate 3.21-1

4" of crushed stone on slopes greater than 8% 3% Reverse Dip spocing DESIGN CRITERIA: 1. MAXIMUM ROAD GRADE ON WHICH DIPS CAN BE CONSTRUCTED IS 10% 2. A 3% REVERSE GRADE SHOULD BE CONSTRUCTED IN THE EXISTING ROADBED, BY CUTTING UPGRADE OF THE DIP LOCATION. 3. BROADBASED DIP SHOULD BE ARMORED WITH STONE TO WITHSTAND EXPECTED TRAFFIC. 4. DRAINAGE OUTLET PROTECTION SHALL BE PROVIDED WITH APPROPRIATE SEDIMENT BARRIER STRUCTURES. 5. SPACING: REFER TO TABLE II-4.



REFERENCES: VIRGINIA EROSION AND SEDIMENT CONTROL HANDBOOK, DATED 1992

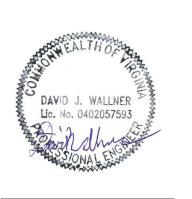
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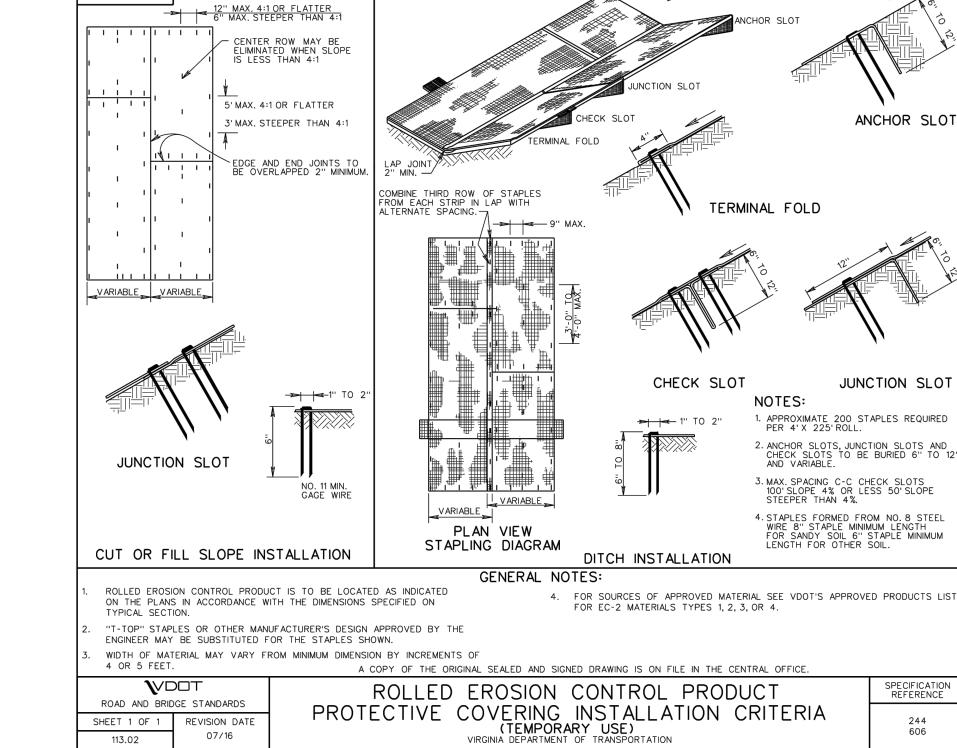
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Plate 3.21-2

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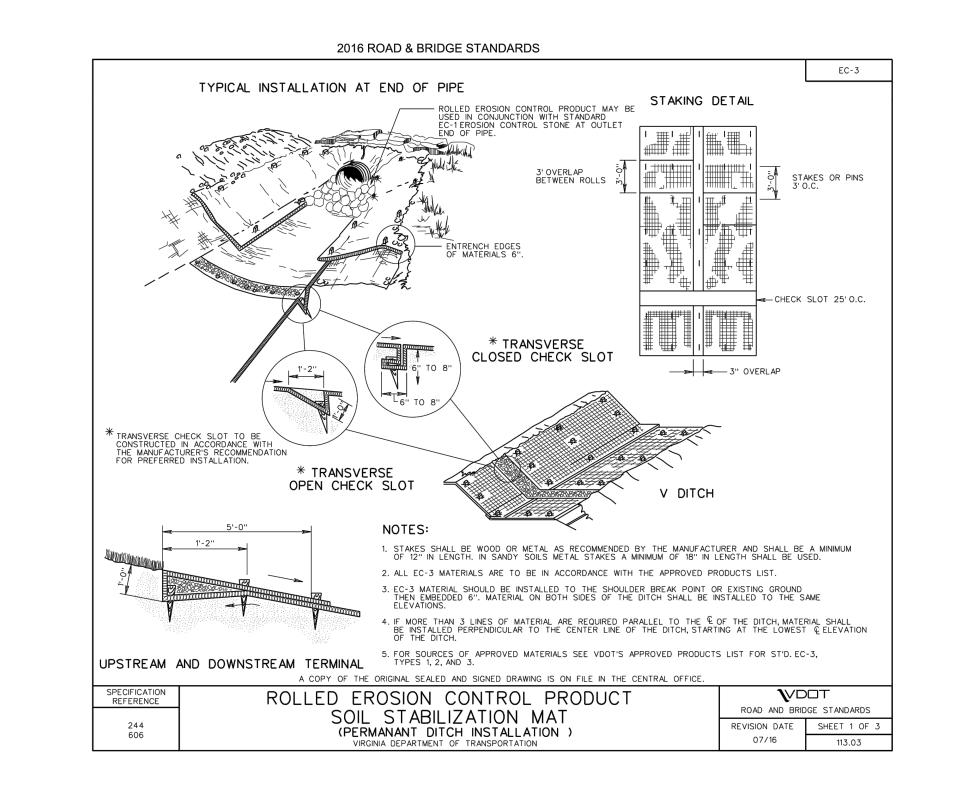
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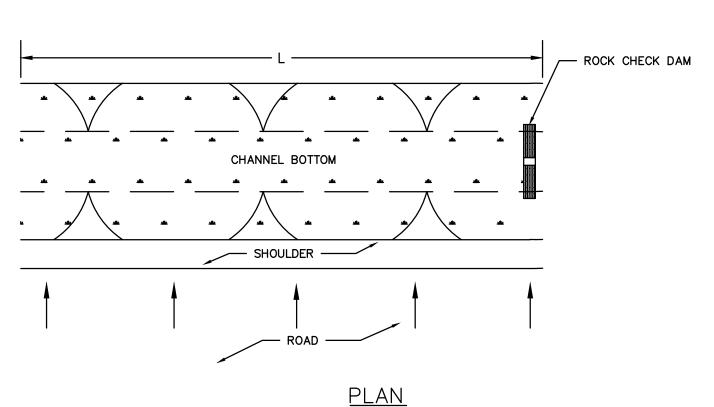
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2016 ROAD & BRIDGE STANDARDS

2016 ROAD & BRIDGE STANDARDS



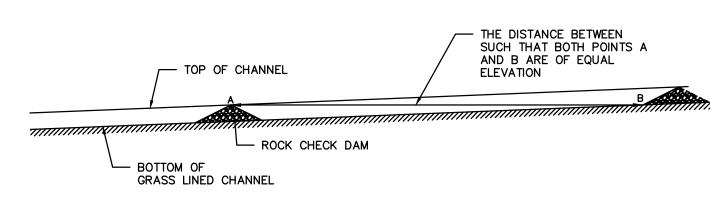


TOP OF

GEOTEXTILE LINING —

TRAPEZOIDAL DITCH

TYPICAL CHANNEL SECTION NOT TO SCALE



LONGITUDINAL PROFILE

TYPICAL VEGETATED CHANNEL WITH ROCK CHECK DAMS N.T.S.

		Channel (Geometry			Channel	Detention			Protec	tive Lining ^{1,2}	2,3,4,5,6				Channel C	apacity ^{7,8,9}	
Channel ID	Channel Slope (%, or Max % [Min %])	Channel Bottom Width, B (ft)	Channel Side Slopes Left, Z1 (H:V)			# of Check Dams	Channel Length, L (ft)	2-Year Design Flow (cfs)	Lining Category	Lining Type	Manning's n	Allowable Shear (lb/sf)	Allowable Velocity (fps)	Calculated Shear (lb/sf)	Calculated Velocity (fps)	10-Year Design Flow (cfs)	Calculated Flow Depth (ft)	Remarks
CH-A1	2.6 [1.1]	2	3	3	2	4	221	1.03	Grass-Lined	Grass-Legume Mix	0.027	N/A	4.0	0.28	2.39	4.48	0.48	
CH-A2	4.4 [1.1]	2	3	3	2	3	120	0.49	Grass-Lined	Grass-Legume Mix	0.027	N/A	4.0	0.26	2.22	1.71	0.29	
СН-В	4.4 [0.1]	2	3	3	2	4	263	0.44	Grass-Lined	Grass-Legume Mix	0.027	N/A	4.0	0.25	2.14	1.17	0.44	
CH-C	3.5 [2.0]	2	3	3	2	9	322	0.79	Grass-Lined	Grass-Legume Mix	0.027	N/A	4.0	0.30	2.42	2.59	0.31	
CH-D	2.7 [1.6]	2	3	3	2	3	126	0.19	Grass-Lined	Grass-Legume Mix	0.027	N/A	4.0	0.11	1.37	0.70	0.16	
CH-E	2.3 [1.9]	2	2	2	2	2	98	0.49	Grass-Lined	Grass-Legume Mix	0.027	N/A	4.0	0.17	1.85	1.44	0.23	
CH-F	2.0	10	2	2	2	N/A	N/A	0.98	Grass-Lined	Grass-Legume Mix	0.027	N/A	4.0	0.09	1.34	3.29	0.15	
CH-G (Temporary)	1.0	2	2	2	2	N/A	N/A	8.32	Geotextile	VDOT EC-3 Type 2	0.030	8.0	10.0	0.47	3.10	15.78	1.05	
СН-Н	3.5 [2.8]	10	2	2	1	N/A	N/A	1.47	Grass-Lined	Grass-Legume Mix	0.027	N/A	4.0	0.17	1.86	4.73	0.17	
CH-I (Temporary)	50.0 [3.6]	4	2	2	1.5	N/A	N/A	5.60	Geotextile	VDOT EC-3 Type 2	0.030	8.0	10.0	4.48	9.10	11.64	0.47	
CH-J	5.0	1.5	2	2	1	N/A	N/A	3.89	Geotextile	VDOT EC-3 Type 2	0.030	8.0	10.0	1.17	4.59	6.78	0.50	
CH-K	1.8	1	2	2	1.5	N/A	N/A	3.89	Geotextile	VDOT EC-3 Type 2	0.030	8.0	10.0	0.63	3.24	6.78	0.73	
CH-L	6.1 [2.8]	2	2	2	1.5	N/A	N/A	3.89	Geotextile	VDOT EC-3 Type 2	0.030	8.0	10.0	1.19	4.73	6.78	0.52	
CH-M	2.1	2	2	2	2	N/A	N/A	0.49	Geotextile	VDOT EC-3 Type 2	0.030	8.0	10.0	0.17	1.66	1.44	0.24	

ANCHOR SLOT

JUNCTION SLOT

SPECIFICATION REFERENCE

1. APPROXIMATE 200 STAPLES REQUIRED PER 4'X 225'ROLL.

ANCHOR SLOTS, JUNCTION SLOTS AND CHECK SLOTS TO BE BURIED 6" TO 12 AND VARIABLE.

4. STAPLES FORMED FROM NO. 8 STEEL WIRE 8" STAPLE MINIMUM LENGTH FOR SANDY SOIL 6" STAPLE MINIMUM LENGTH FOR OTHER SOIL.

TERMINAL FOLD

N/A = Not Applicable

NOTE:

¹The 2-Year 24-hour design flow was calculated in Hydraflow Hydrographs using TR-55 methodology.

² For Geotextile Linings, a Manning's n value of 0.030 was assumed based on the range of values provided in Table 7-2A of the VDOT Drainage Manual (Chapter 7).

³ For grass-lined channels, a Manning's n value of 0.027 was assumed based on the range of values provided in Appendix 7D-1 of the VDOT Drainage Manual.

⁴ For Geotextile Linings, allowable shear stress values are as reported in Table 7-1 of the VDOT Drainage Manual (Chapter 7).

For grass-lined channels, permissible velocities are as reported in Table 3.17-A of the VESCH STD & SPEC 3.17.

⁶ Shear and velocity calculated using the maximum channel slope condition to be conservative.

⁷The 10-Year 24-hour design flow was calculated in Hydraflow Hydrographs using TR-55 methodology.

⁸A minimum freeboard of 0.5 feet is assumed for design purposes in accordance with VA DEQ Stormwater Design Specification No. 3 - Grass Channels.

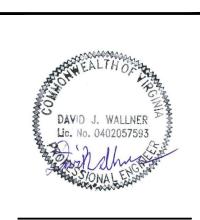
⁹ Flow depth calculated using the minimum channel slope condition to be conservative.

CHANNEL DETAIL

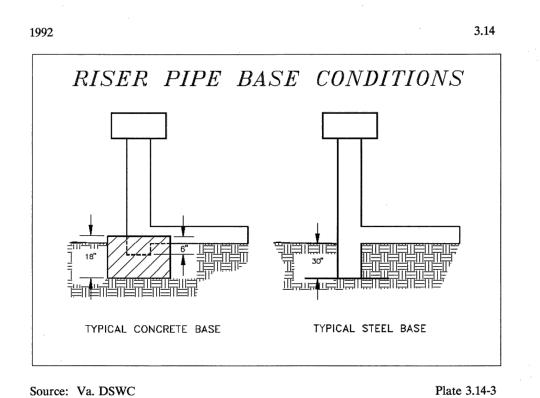
ALL CHANNELS HAVE BEEN DESIGNED IN ACCORDANCE WITH VADEQ STD & SPEC 3.17. CHANNELS WITH ROCK CHECK DAMS WILL SERVE AS WATER QUANTITY BMPS BUT ARE NOT INTENDED TO SERVE A WATER QUALITY FUNCTION SO THE VA BMP CLEARINGHOUSE SPECIFICATION NO. 3 - GRASS CHANNELS IS NOT APPLICABLE.

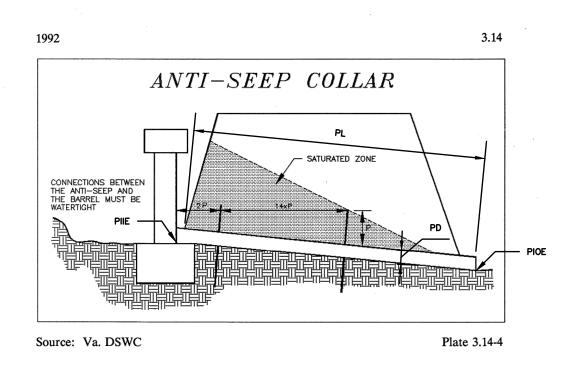
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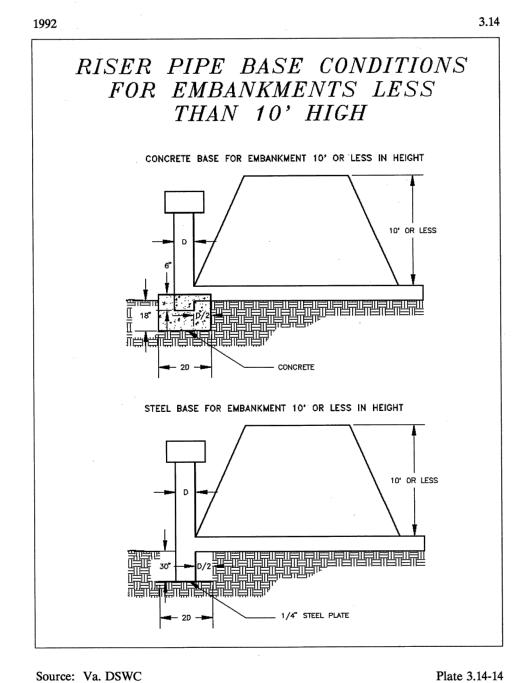
PITTSBURGH, PA 15220



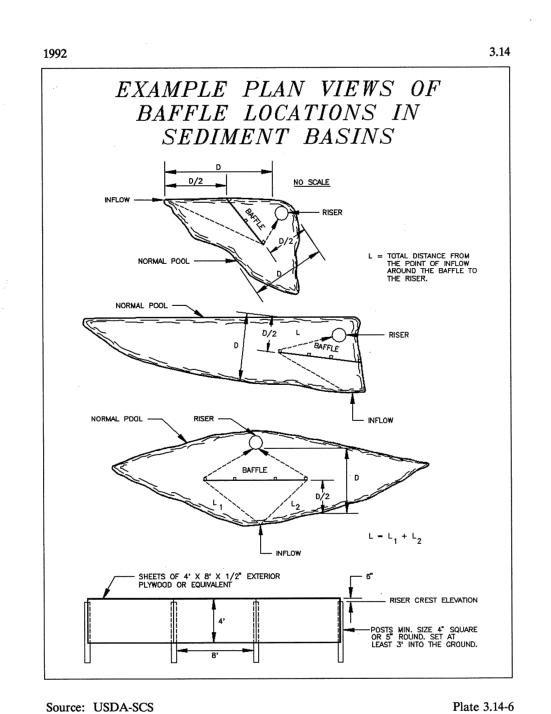
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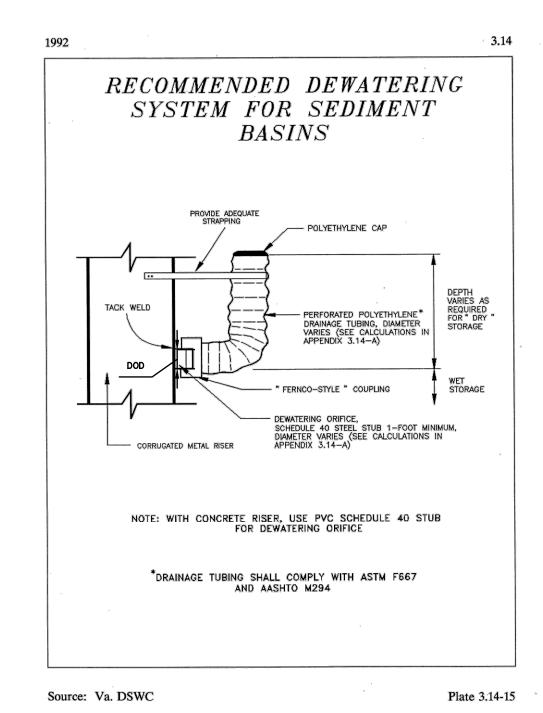






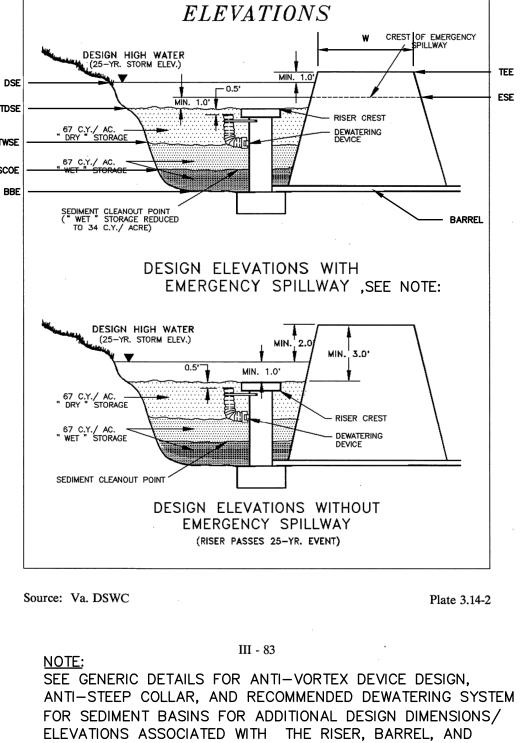
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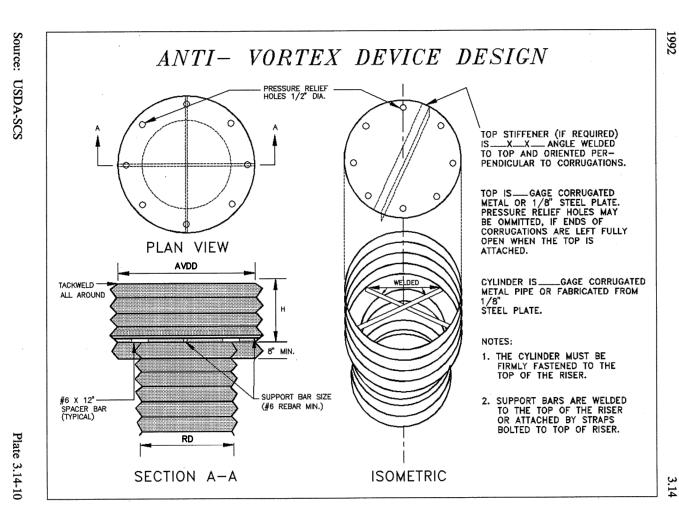
REFER TO THE SEDIMENT BASIN PLAN VIEWS ON SHEET TRA-19 AND THE SEDIMENT BASIN SECTION VIEWS ON SHEET TRA-23 FOR ADDITIONAL SITE-SPECIFIC DETAILS FOR SEDIMENT BASIN SB-1 AND SB-2.

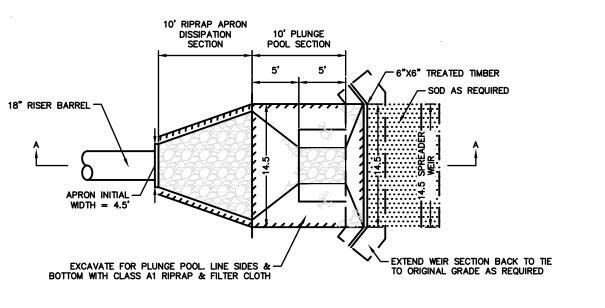
> SEDIMENT BASIN DETAILS TAKEN FROM VADEQ 1992 MANUAL

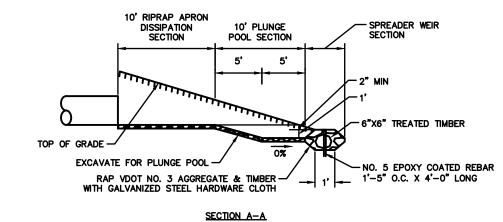


SEDIMENT BASIN SCHEMATIC

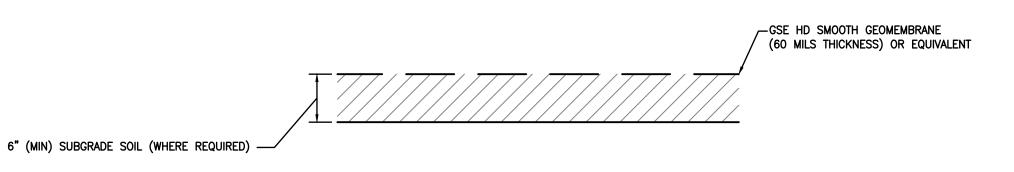
DEWATERING DEVICE, RESPECTIVELY.







SB-1/STORMWATER POND RISER BARREL OUTFLOW SPREADER DEVICE DESIGN N.T.S.



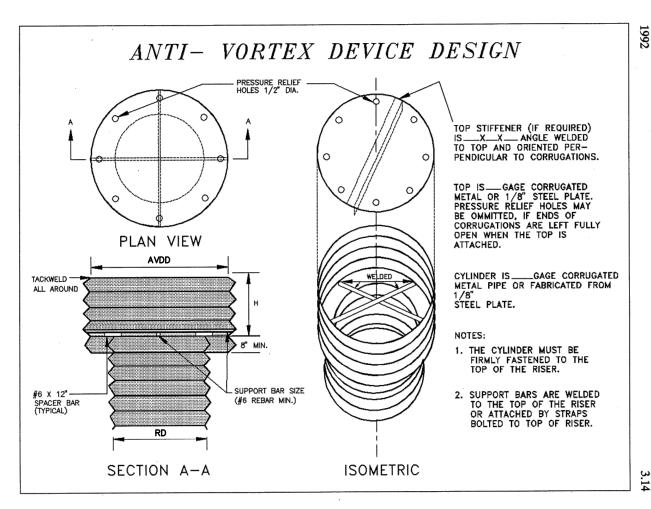
NOTE:

- . PREPARE LINER SUBGRADE TO PROVIDE A RELATIVELY SMOOTH SURFACE FREE OF PROTRUSIONS OR OTHER DEFECTS THAT MAY DAMAGE THE LINER OR INHIBIT THE INSTALLATION OF THE LINER. IF THE EXISTING SUBSURFACE MATERIAL IS UNSUITABLE, PROVIDE A SIX-INCH LIFT OF SUITABLE MATERIAL OVER EXISTING
- REFER TO THE MANUFACTURER'S INSTALLATION GUIDELINES AND THE TECHNICAL SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.

TYPICAL IMPERVIOUS LINER DETAIL N.T.S.

AN IMPERVIOUS LINER IS ONLY PROPOSED FOR SEDIMENT BASIN 1 (SB-1), WHICH WILL BE CONVERTED TO A STORMWATER POND DURING FINAL SITE RESTORATION (SEE SHEET TRA-25), SINCE IT RECEIVES RUNOFF FROM THE PERMANENT PAD WHICH IS CLASSIFIED AS A "HOTSPOT" DUE TO THE POTENTIAL POLLUTANTS STORED ON-SITE.

	TRANSCO SEDIMENT BASINS																								
Basin #	Drainage Area (Acres)	Volumed Required M (Cu. Yd.)	Volume Provided BS (Cu. Yd.)	Volumed Required (Cu. Yd.)	Volume Provided (Cu. Yd.)	Bottom of Basin Elevation BBE	Top Of Dry Storage Elevation TDSE	Riser Diameter RD (In.)	Top of Wet Storage Elevation TWSE	Sediment Clean-Out Elevation	Dewatering Orifice Diameter	25-Yr Design Storm Elevation DSE	Emergency Spillway Elevation ESE	Anti-Vortex Device Diameter	Top of Embankmen t Elevation TFF	Top of Embankmen t Width W (Ft.)	Flow Length to Width	Baffle Baffle Length (F+)	າປກັປາ Baffle Elevation	Pipe Length PL (Ft.)	Pipe Diameter PD (In.)	Pipe Para Invert In Fast Elevation PIIE	Invert Out Elevation PIOE	Number of Anti Seep Collars	Size of Anti Seep Collars (Ft)
SB-1	7.72	517	548	517	1721	639.00	642.00	36	639.80	639.40	7	642.18	643.00	54	645.00	6	2.25:1	60	642.50	40	18	639.00	638.15	2	5.5
SB-2	10.08	675	2090	675	2316	651.00	654.00	36	652.50	651.75	7	654.81	N/A	54	657.00	6	2.25:1	115	658.50	40	18	651.00	647.90	2	5.5

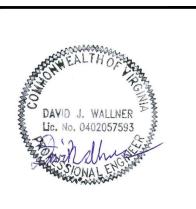




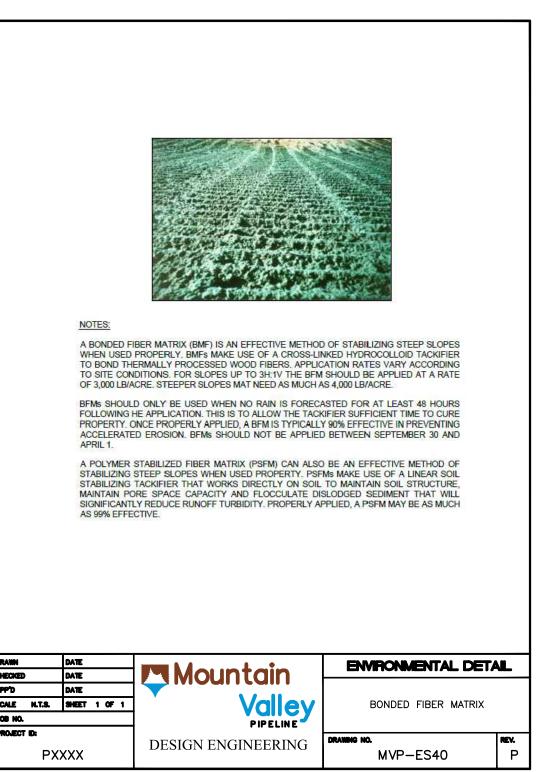


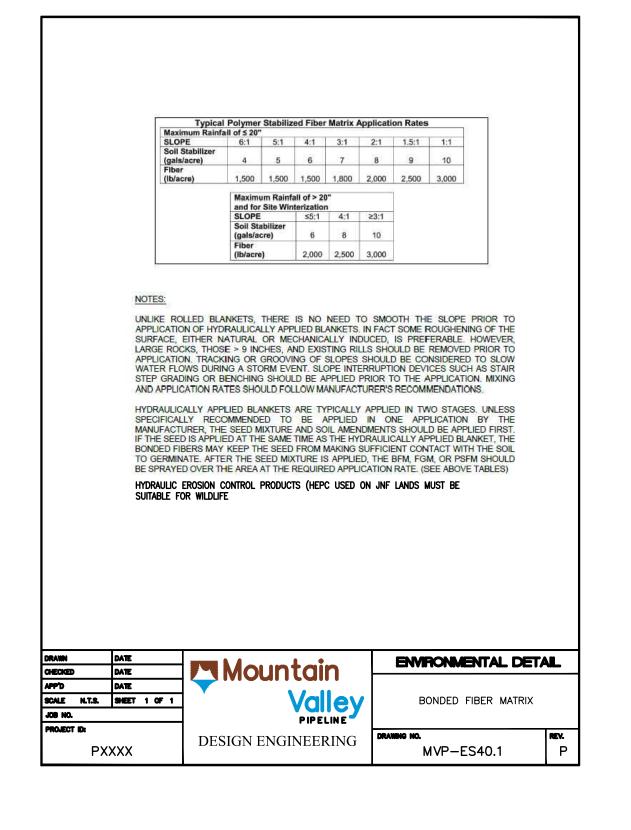
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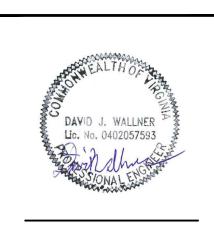
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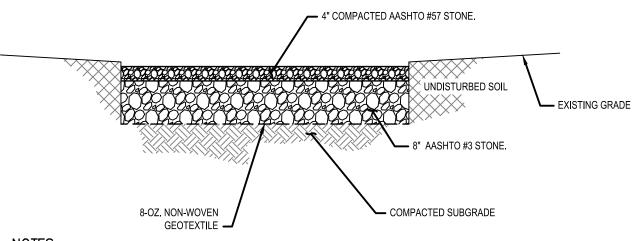




MOUNTAIN VALLEY F



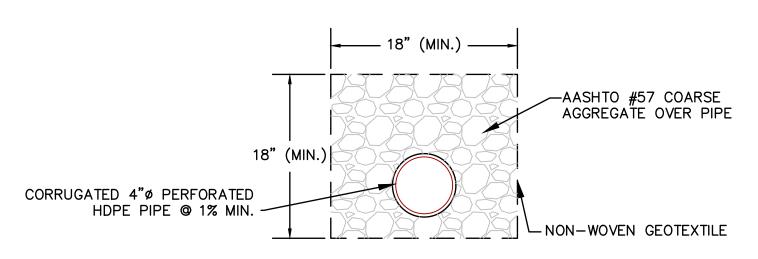
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- 1. COMPACT SUBGRADE PRIOR TO BACKFILL PLACEMENT. FOR BACKFILL, A MIN. 95% COMPACTION (ASTM D 698) IS REQUIRED.
- 2. UNSUITABLE MATERIAL SHALL BE REMOVED PRIOR TO SUBGRADE COMPACTION AND BACKFILL PLACEMENT. ADDITIONAL SUBGRADE COMPACTION NOT REQUIRED FOR MLV

PERMANENT GRAVEL PAD

N.T.S.

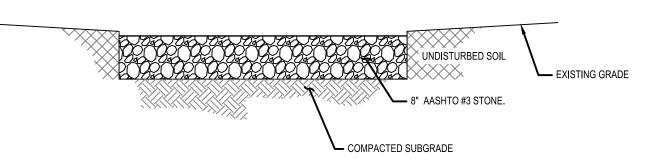


NOTE:

INSTALL SUBSURFACE DRAINS AT SEEPAGE AREAS AND AS NECESSARY DURING CONSTRUCTION. TIE THE SUBSURFACE DRAINS INTO SITE STORMWATER SYSTEM OR OUTLET BEYOND AND BELOW LIMITS OF NEW FILL. AT LEAST ONE DRAIN EVERY 8 VERTICAL FEET IS REQUIRED FOR FILL SLOPES THAT EXCEED 8 VERTICAL FEET.

SUBSURFACE BENCH DRAIN DETAIL

Transco Interconnec	t Quantitie	es Table		
Date: April 10, 2018				
ltem	Each	Length (LF)	Area/ Volu	ume
LOD HAS BEEN MERGED WITH PIPELINE LOD	-	-	-	AC
Proposed Permanent Access Road	-	1,611	-	
Proposed Temporary Access Road	-	243	-	
Aggregate- Interconnect Pad				
AASHTO #57 (assuming 1.3 TN/CY)	-	-	4,054	TN
AASHTO #3 (assuming 1.3 TN/CY)	-	-	12,173	TN
Aggregate- TEMPORARY CONSTRUCTION PAD				
AASHTO #57 (assuming 1.3 TN/CY)	-	-	0	TN
AASHTO #3 (assuming 1.3 TN/CY)	-	-	5,206	TN
Aggregate- PERMANENT ACCESS ROAD				
AASHTO #57 (assuming 1.3 TN/CY)	-	-	776	TN
AASHTO #4 (assuming 1.3 TN/CY)	-	-	227	TN
Aggregate- TEMPORARY ACCESS ROAD				
AASHTO #57 (assuming 1.3 TN/CY)	-	-	0	TN
AASHTO #3 (assuming 1.3 TN/CY)	-	-	157	TN
Permanent Cut	-	-	11,511	CY
Permanent Fill	-	-	8,304	CY
Temporary Cut	-	-	21,624	CY
Temporary Fill	-	-	20,510	CY
Bmp's				
12" Compost Filter Sock	-	2,600	-	
18" Compost Filter Sock	-	1,351	-	
24" Compost Filter Sock	-	0	-	
Stacked Compost Filter Sock	-	0	-	
Silt Fence	-	0	-	
Erosion Control Matting	-	-	15,168	SY
Stone Construction Entrance	-	-	4,108	SF
18" Cross Drain Culverts	5	- 1	-	
24" Cross Drain Culverts	1	- 1	-	
Channels	11	-	-	
VDOT EC-3 Type 2 Channel Liner	-	-	412	SY
Orange Construction Safety Fence	-	1955	-	
Riprap Outlet Protection	10	-	-	



6" (MIN) VDOT #1 COARSE AGGREGATE

TEMPORARY GRAVEL SURFACE SPECIFICATIONS

DISSIPATION OR MAINTENANCE NEEDS.

PROVIDED AS SOON AS VEGETATION REMOVAL IS COMPLETE.

1. COMPACT SUBGRADE PRIOR TO BACKFILL PLACEMENT. FOR BACKFILL, A MIN. 95% COMPACTION (ASTM D 698) IS REQUIRED.

• NO LAND DISTURBANCE WILL OCCUR AND THE GRAVEL WILL BE PLACED ON EXISTING GRADE.

• THE EXISTING SURFACE SHALL BE CLEARED OF ALL VEGETATION AND OTHER OBJECTIONABLE MATERIAL.

• A 6-INCH COURSE OF VDOT #1 COARSE AGGREGATE (AS PEER SECTION 203 OF VDOT'S ROAD AND BRIDGE SPECIFICATIONS) SHALL BE

• IN "HEAVY DUTY" TRAFFIC SITUATIONS THE AGGREGATE SHOULD INSTEAD BE PLACED AT AN 8- TO 10-INCH DEPTH TO AVOID EXCESSIVE

• IF THE GRAVEL SURFACE BECOMES CLOGGED WITH SEDIMENT AND OTHER DEBRIS, A TOP DRESSING OF NEW GRAVEL SHOULD BE APPLIED.

TEMPORARY GRAVEL SURFACE DETAIL

N.T.S.

(ATWS AND TEMPORARY MATERIAL STORAGE AREA)

3' X 3' TRIANGULAR AGGREGATE DRAIN (AASHTO No. 57) WRAPPED

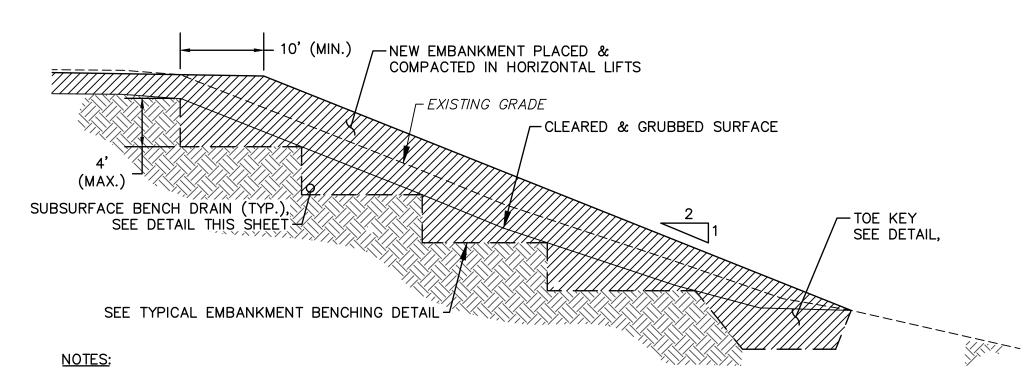
IN GEOTEXTILE

• GEOTEXTILE SHALL BE NON-WOVEN WITH AASHTO M288 SURVIVABILITY CLASS (1) AND A MIN. PERMITIVITY OF 90 GAL/MIN/FT2.

2. UNSUITABLE MATERIAL SHALL BE REMOVED PRIOR TO SUBGRADE COMPACTION AND BACKFILL PLACEMENT. ADDITIONAL SUBGRADE COMPACTION NOT REQUIRED FOR MLV

TEMPORARY GRAVEL PAD AND ACCESS ROAD

N.T.S.



- 1. CONSTRUCT BENCHES ON SLOPES STEEPER THAN 6:1 TO PROVIDE POSITIVE BONDING WITH EXISTING GROUND.
- 2. FOR BACKFILL A MIN. 95% COMPACTION (ASTM D 1557) IS REQUIRED.

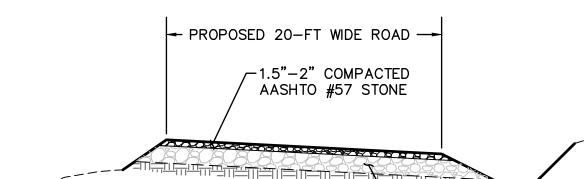
(AASHTO M288 CLASS I)

-EXISTING SURFACE

- 3. COMPACT SUBGRADE PRIOR TO BACKFILL PLACEMENT. IF SEEPS OR SPRINGS ARE ENCOUNTERED, PROVIDE DRAINS AND OUTLET THE WATER PER DIRECTION OF ENGINEER.
- 4. UNSUITABLE MATERIAL SHALL BE REMOVED PRIOR TO SUBGRADE COMPACTION AND BACKFILL PLACEMENT.

TYPICAL FILL BONDING BENCH DETAIL

N.T.S.

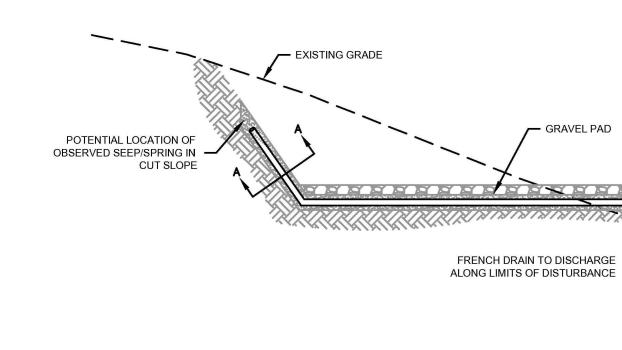


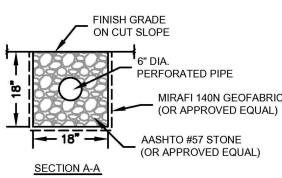
- 1. COMPACT SUBGRADE PRIOR TO BACKFILL PLACEMENT. FOR BACKFILL, A MIN. 95% COMPACTION (ASTM D 698) IS REQUIRED.
- 2. UNSUITABLE MATERIAL SHALL BE REMOVED PRIOR TO SUBGRADE COMPACTION AND BACKFILL PLACEMENT.

GRAVEL ACCESS ROAD DETAIL

(PERMANENT ACCESS ROAD MVP-PI-343.01)

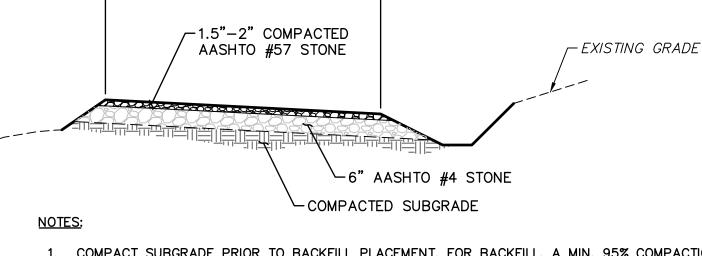
N.T.S.





IF EVIDENCE OF A SEEP/SPRING IN A CUT SLOPE IS OBSERVED, THE CONTRACTOR SHOULD INSTALL A FRENCH DRAIN PER THE DETAIL ABOVE.

FRENCH DRAIN AT OBSERVED

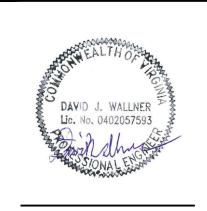


RIPRAP APRON / GEOTEXTILE FRENCH DRAIN TO DISCHARGE

SEEP/SPRING IN CUT SLOPES

TE TETRATECH complex world | CLEAR SOLUTIONS™ 661 ANDERSEN DRIVE FOSTER PLAZA 7

PITTSBURGH, PA 15220



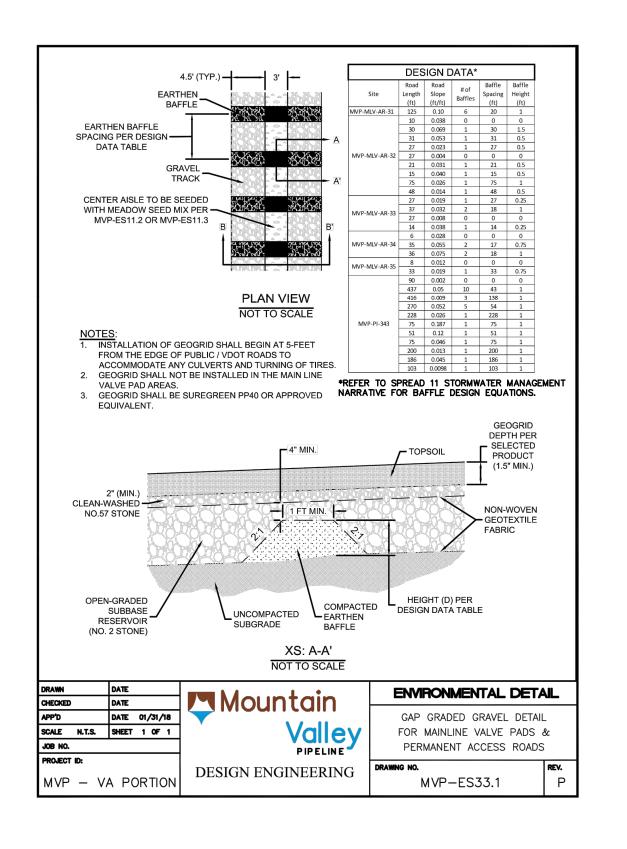
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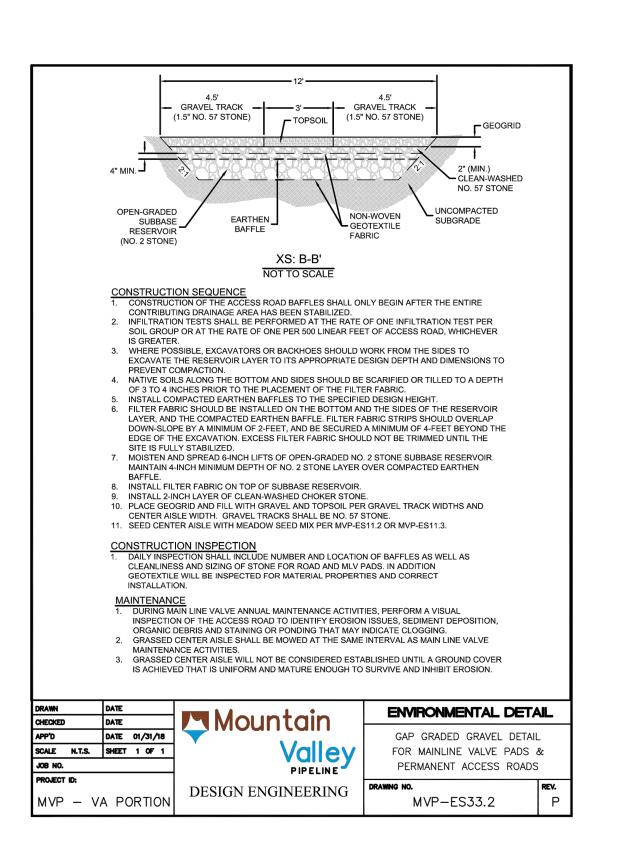
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PROPOSED-TYPICAL BONDING BENCHES (SEE DETAIL)

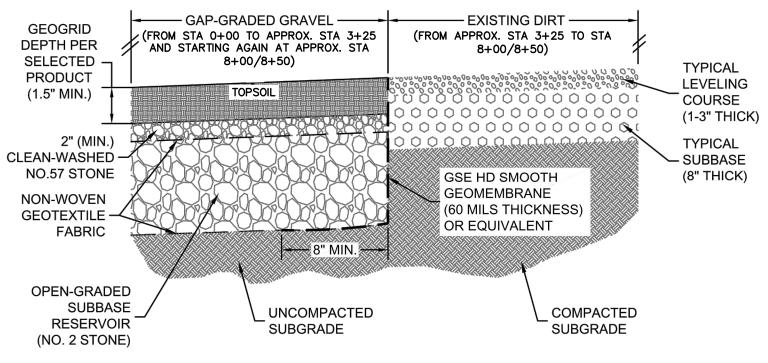
- 1. TOE KEYS SHOULD BE INCLUDED FOR ALL NEW FILL SLOPES OVER 10 FEET IN HEIGHT AND SHOULD BE CONSTRUCTED ALONG THE ENTIRE TOE OF THE SLOPE. THE TOE KEY SHOULD BE EXCAVATED TO COMPETENT RESIDUAL SOILS, WEATHERED BEDROCK, OR BEDROCK.
- 2. COMPACTED ENGINEERED FILL OR BEST AVAILABLE ROCK FILL, WHICH IS EXPECTED TO BE ON SITE, ARE SUITABLE FOR TOE KEY BACKFILL.
- 3. FOR TOE OF FILL SLOPES ENCOUNTERING WET, SOFT OR LOOSE SOILS, EXCAVATE INTO NATURAL SOILS OR WEATHERED BEDROCK. THE BASE OF THE TOE KEY SHALL BE A MINIMUM 10 FEET IN WIDTH AND INCLUDE A MINIMUM OF 5 FEET OF BEST AVAILABLE ROCK FILL OR AASHTO #1. THE REMAINING TOE KEY BACKFILL MAY BE EITHER COMPACTED ENGINEERED FILL OR BEST AVAILABLE
- 4. VARIATIONS IN THE DIMENSIONS OF THE ROCK TOE KEY SHOULD BE EXPECTED SINCE THEY WILL BE DEPENDENTS ON THE SLOPE/SOIL CONDITIONS PRESENT.
- 5. A DRAINAGE COLLECTION SYSTEM CONSISTING OF ASHTO #57 STONE WITH PERFORATED PIPE SHOULD BE INSTALLED WITH ALL TOE KEYS. THE DRAIN SHOULD CONSIST OF A 6-INCH DIAMETER PERFORATED PIPE ENCASED IN A GRANULAR FREE-DRAINING MATERIAL, PLACED IN A MINIMUM 3 FOOT BY 3 FOOT TRIANGULAR CROSS SECTION DRAIN. THE DRAIN SHOULD SLOPE TO ALLOW FOR GRAVITY DRAINAGE AND DAYLIGHT TO DIRECT WATER AWAY FROM THE TOE. THE STONE SHALL BE WRAPPED WITH 8-OZ GEOTEXTILE FABRIC.

TOE KEY DETAIL

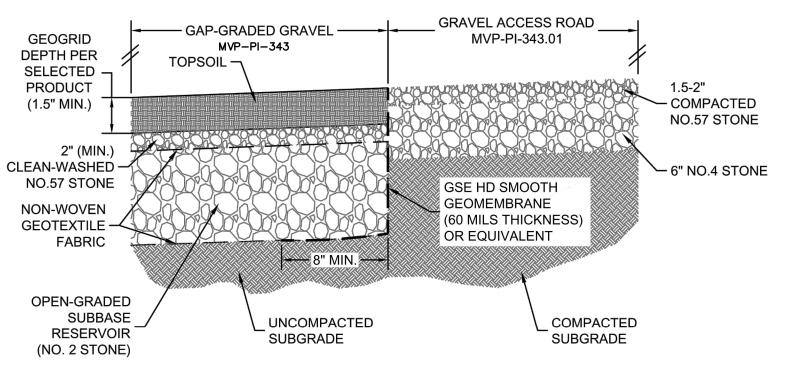




PERMANENT ACCESS ROAD MVP-PI-343 GAP **GRADED GRAVEL DETAILS**



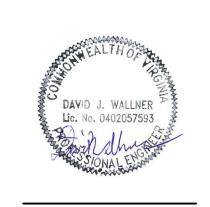
TRANSITION FROM GAP-GRADED GRAVEL TO EXISTING DIRT ALONG PERMANENT ACCESS ROAD MVP-PI-343 NOT TO SCALE



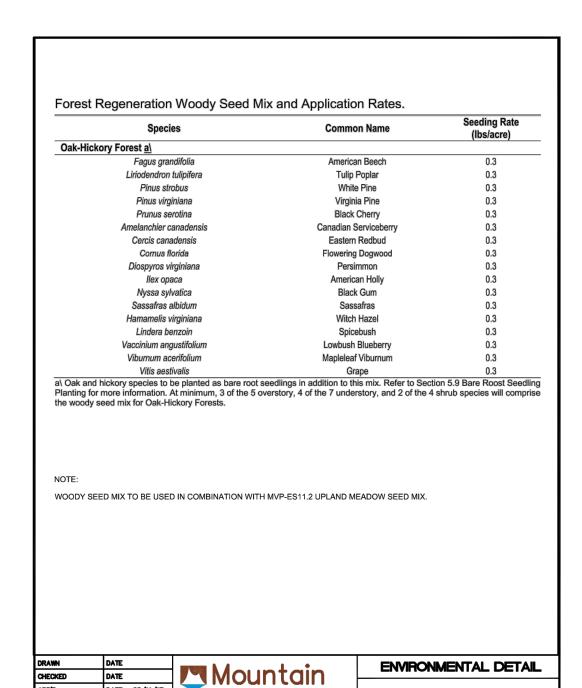
TRANSITION FROM PERMANENT ACCESS ROAD MVP-PI-343 TO GRAVEL ACCESS ROAD MVP-PI-343.01 NOT TO SCALE



PITTSBURGH, PA 15220



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PIPELINE

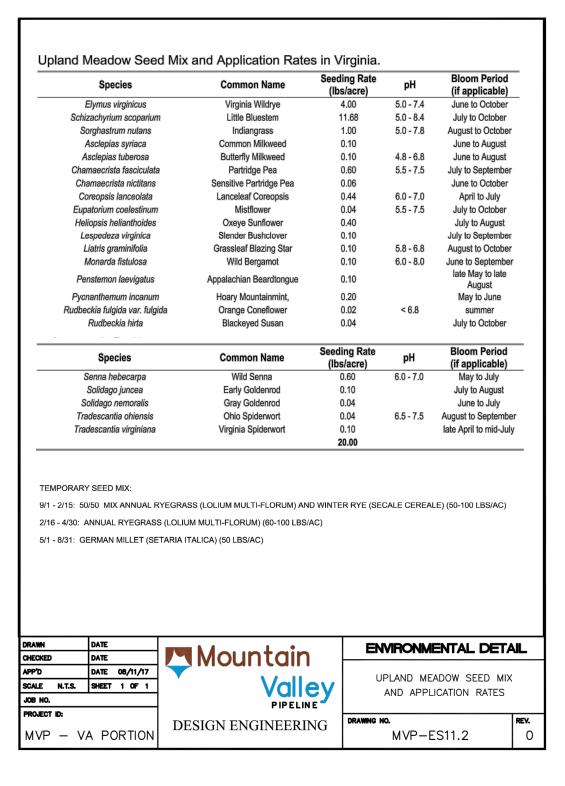
DESIGN ENGINEERING

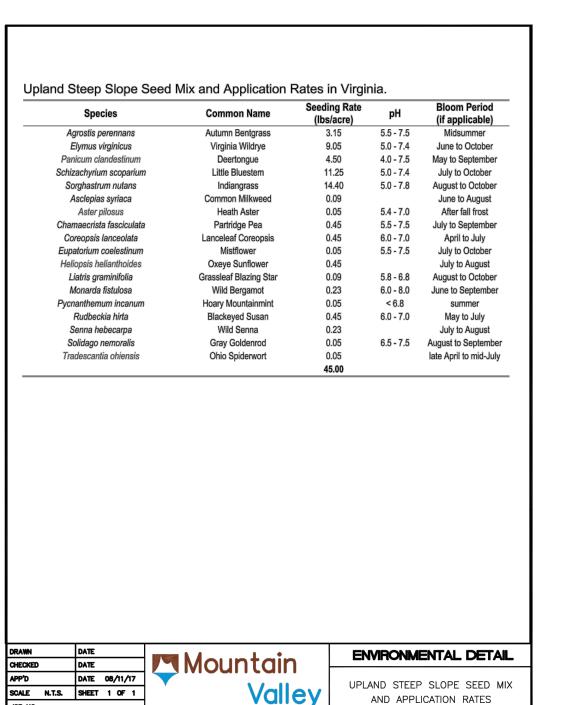
MVP - VA PORTION

OREST REGENERATION WOODY SEED

MIX AND APPLICATION RATES

MVP-ES11.1





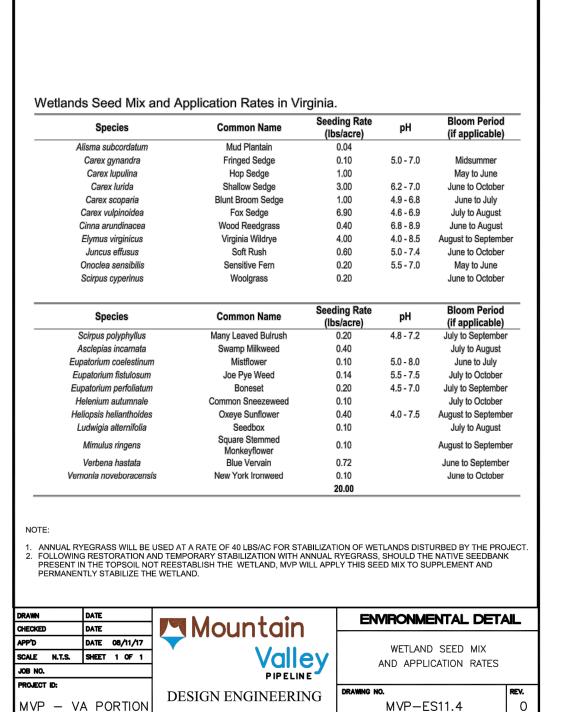
PIPELINE

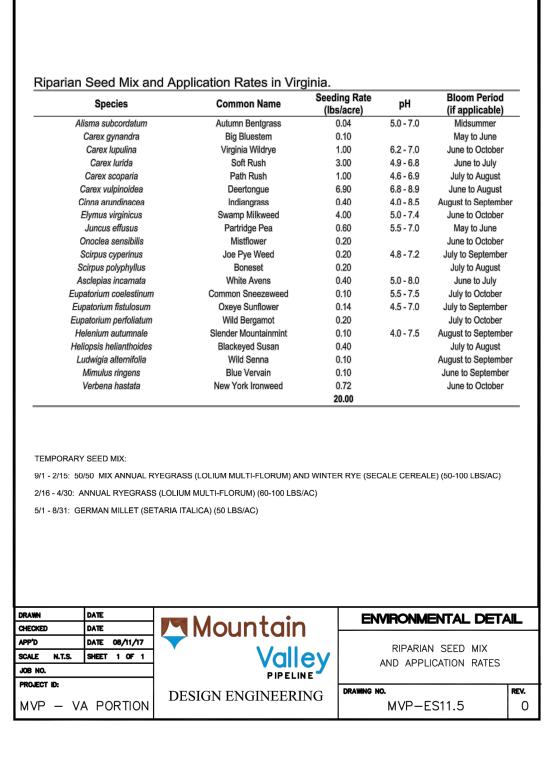
MVP-ES11.3

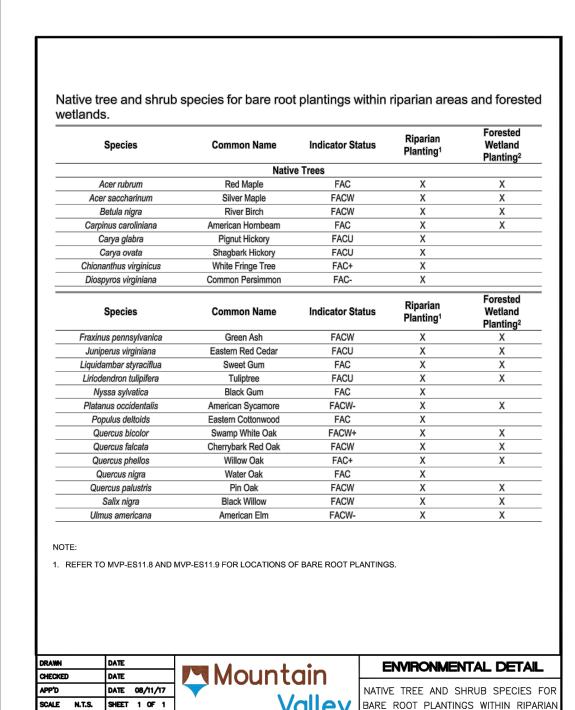
DESIGN ENGINEERING

Stream crossings proposed for bare-root seedling plantings.

MVP - VA PORTION



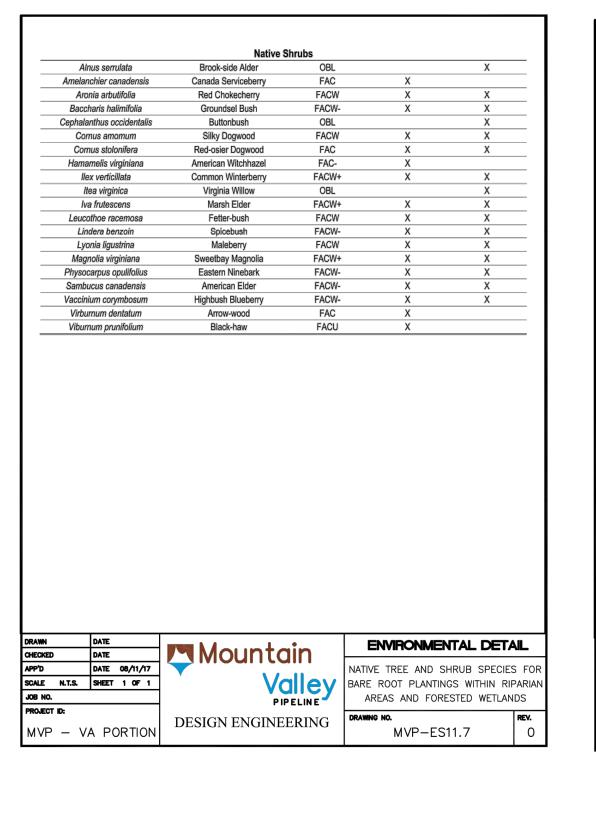




PIPELINE

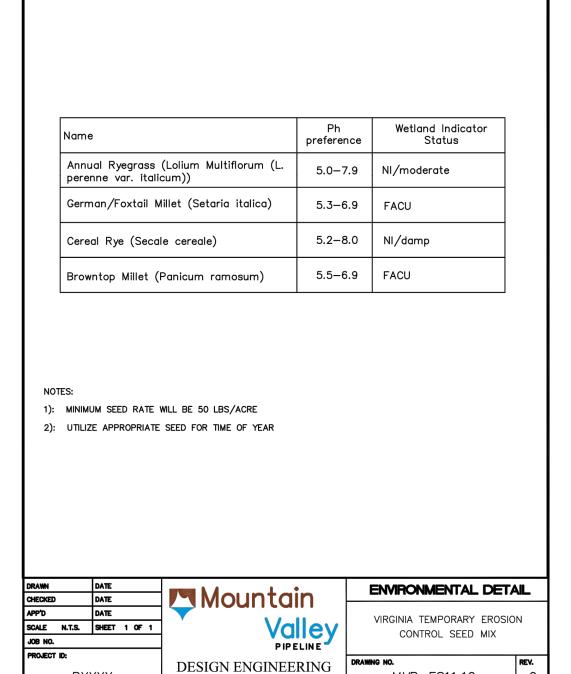
DESIGN ENGINEERING

MVP - VA PORTION



Waterbody Name	MP	County	State	Valuable Resource	
Kimballton Branch	199.1, 199.4	Giles	VA	headwaters of wild trout stream, coldwater stream	
Waterbody Name	MP	County	State	Valuable Resource	_
Stony Creek	200.4	Giles	VA	candy darter, green floater, coldwater stream, wild trout stream	
Little Stony Creek	204.4	Giles	VA	coldwater stream, wild trout stream	_
Sinking Creek	211.2	Giles	VA	candy darter, green floater, coldwater stream, wild trout stream, non-listed mussels	
UNT Craig Creek	219.2	Montgomery	VA	Headwaters of James spinymussel occurrences, USFS lands area	
UNT Craig Creek	219.3	Montgomery	VA	Headwaters of James spinymussel occurrences, USFS lands area	
Craig Creek	219.7	Montgomery	VA	Headwaters of James spinymussel	
				occurrences, USFS lands area Headwaters of James spinymussel	
Craig Creek	219.7	Montgomery	VA	occurrences, USFS lands area	
UNT Craig Creek	219.8	Montgomery	VA	Headwaters of James spinymussel occurrences, USFS lands area	
UNT Craig Creek	220.0	Montgomery	VA	Headwaters of James spinymussel occurrences, USFS lands area	
Mill Creek	222.2	Montgomery	VA	upstream of Roanoke logperch suitab habitat, orangefin madtom, coldwater stream, wild trout	
North Fork Roanoke River	227.2	Montgomery	VA	Roanoke logperch present, non-listed mussels present, orangefin madtom, coldwater stream, wild trout	
North Fork Roanoke River	227.4	Montgomery	VA	Roanoke logperch present, non-listed mussels present, orangefin madtom, coldwater stream, wild trout	
Bradshaw Creek	230.7	Montgomery	VA	Roanoke logperch suitable habitat, orangefin madtom, coldwater stream, wild trout	
Bradshaw Creek	231.5	Montgomery	VA	Roanoke logperch suitable habitat, orangefin madtom, coldwater stream, wild trout	_
Roanoke River	235.4	Montgomery	VA	Roanoke logperch present, orangefin madtom, non-listed mussels present	
Bottom Creek	241.1	Roanoke	VA	upstream of Bottom Creek Gorge, orangefin madtom, coldwater stream, wild trout	
Bottom Creek	242.5	Roanoke	VA	upstream of Bottom Creek Gorge, orangefin madtom, coldwater stream, wild trout	
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DATE 08/11/17	T		9	STREAM CROSSINGS PROPOSE	D FOR
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- VA PORTION	DESIGN	ENGINEERI	יים טיי	MVP-ES11.8	0

	Mill Creek		245.1	Roanoke	VA	upstream of Bottom Creek Gorge, orangefin madtom, coldwater stream, wild trout	
	Gr	een Creek	247.1	Franklin	VA	upstream of Bottom Creek Gorge, orangefin madtom, coldwater stream, wild trout	
	Gr	een Creek	247.4	Franklin	VA	upstream of Bottom Creek Gorge, orangefin madtom, coldwater stream, wild trout	
	North Fork	Blackwater River	249.7	Franklin	VA	Roanoke logperch suitable habitat, coldwater stream wild trout stream	
	Wate	rbody Name	MP	County	State	Valuable Resource	
	Te	els Creek	258.2	Franklin	VA	upstream of Roanoke logperch suitable habitat, one of numerous project crossings of Teels Creek	
	Te	els Creek	260.3	Franklin	VA	upstream of Roanoke logperch suitable habitat, one of numerous project crossings of Teels Creek	
_	Те	els Creek	261.0	Franklin	VA	upstream of Roanoke logperch suitable habitat, one of numerous project crossings of Teels Creek	
_	Те	els Creek	261.8	Franklin	VA	upstream of Roanoke logperch suitable habitat, one of numerous project crossings of Teels Creek	
	Те	els Creek	262.3	Franklin	VA	Roanoke logperch suitable habitat, one of numerous project crossings of Teels Creek contributing sediment impacts	
	Li	ttle Creek	262.6	Franklin	VA	Roanoke logperch suitable habitat, numerous crossings upstream contributing sediment impacts	
	Lî	ttle Creek	263.3	Franklin	VA	Roanoke logperch suitable habitat, non- listed mussels present, numerous crossings upstream contributing sediment impacts	
	Mag	godee Creek	269.4	Franklin	VA	Roanoke logperch suitable habitat	
	Black	kwater River	269.7	Franklin	VA	Roanoke logperch present, non-listed mussels present	,
	UNT to	Jacks Creek	278.8	Franklin	VA	orangefin madtom	
	Tu	rkey Creek	280.5	Franklin	VA	orangefin madtom	
_	Strav	wfield Creek	282.3	Franklin	VA	orangefin madtom	
		rrot Branch	282.9	Franklin	VA	orangefin madtom	
_		nikin Creek	284.4	Pittsylvania	VA	orangefin madtom	
		Rocky Creek	287.1 289.1	Pittsylvania Pittsylvania	VA VA	orangefin madtom Roanoke logperch present, orangefin madtom, mussels present including yellow lampmussel (VA threatened)	
	Hai	rpen Creek	289.9	Pittsylvania	VA	Roanoke logperch suitable habitat, orangefin madtom	
	Hai	rpen Creek	292.0	Pittsylvania	VA	orangefin madtom	
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MVP-ES11.10

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CONSTRUCTION SEQUENCE AND NO	MOUNTAIN VALLEY PIPELINE PROJECT – TRANSCO IN PITTSYLVANIA COUNTY, VIRGINIA	MOUNTAIN VALLEY PIPELINE, L 555 SOUTHPOINTE BLVD, SUITE 200	CANONSBIRC DA 15317
complex wol	TRAT Id CLEAR NDERSEN TER PLAZ JRGH, PA	SOLUTIONS DRIVE ZA 7	S™
	CONSTRUCTION PLANS		
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AREAS AND FORESTED WETLANDS

MVP-ES11.6

MULCHING

Definition

Application of plant residues or other suitable materials to the soil surface.

Purposes

- To prevent erosion by protecting the soil surface from raindrop impact and reducing the velocity
 of overland flow.
- To foster the growth of vegetation by increasing available moisture and providing insulation against extreme heat and cold.

Conditions Where Practice Applies

- Areas which have been permanently seeded (see Appendix B Typical Construction Details MVP-ES11.1 through ES12.3) should be mulched immediately following seeding.
- 2. Areas which cannot be seeded because of the season should be mulched to provide some protection to the soil surface. An organic mulch should be used, and the area then seeded as soon weather or seasonal conditions permit. It is not recommended that fiber mulch be used alone for this practice; at normal application rates it just simply does not provide the protection that is achieved using other types of mulch.
- Mulch may be used together with plantings of trees, shrubs, or certain ground covers which do not provide adequate soil stabilization by themselves.
- Mulch shall be used in conjunction with temporary seeding operations as specified in TEMPORARY SEEDING. Std. & Spec. 3.31

Planning Considerations

Mulches are applied to the soil surface to conserve a desirable soil property or to promote plant growth. A surface mulch is one of the most effective means of controlling runoff and erosion on disturbed land.

Mulches can increase the infiltration rate of the soil, reduce soil moisture loss by evaporation, prevent crusting and sealing of the soil surface, modify soil temperatures, and provide a suitable microclimate for

Organic mulch materials, such as straw, wood chips, bark, and fiber mulch have been found to be the most effective.

seed germination.

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JOB NO.		PIPELINE		
PROJECT ID:			DRAWING NO.	REV.
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Chemical soil stabilizers or soil binders should not be used alone for mulch. These materials are useful to bind organic mulches together to prevent displacement.

A variety of manufactured SOIL STABILIZATION BLANKETS AND MATTING (see Std. & Spec. 3.36) have been developed for erosion control in recent years. Some of these products can be used as mulches, particularly in critical areas such as waterways. They also may be used to hold other mulches to the soil surface.

The choice of materials for mulching will be based on the type of soil to be protected, site conditions, season and economics. It is especially important to mulch liberally in mid-summer and prior to winter, and on cut slopes and southern slope exposures.

nic Mulches

<u>Straw</u> - The mulch most commonly used in conjunction with seeding. The straw should come from wheat or oats (free of troublesome weed seeds) and may be spread by hand or machine. Straw can be windblown and must be anchored down by an acceptable method.

Hay – Hay shall not be used as mulch for Project activities.

<u>Com Stalks</u> - These should be shredded into 4- to 6-inch lengths. Stalks decompose slowly and are resistant to displacement.

<u>Wood Chips</u> - Suitable for areas that will not be closely mowed, and around ornamental plantings. Chips decompose slowly and do not require tacking. They must be treated with 12 pounds of nitrogen per ton to prevent nutrient deficiency in plants; however, can be a very inexpensive mulch if chips are obtained from trees cleared on the site.

<u>Bark Chips, Shredded Bark</u> - These are by-products of timber processing which are used in landscaped plantings. Bark is also a suitable mulch for areas planted to grasses and not closely mowed. It may be applied by hand or mechanically and is not usually toxic to grasses or legumes; additional nitrogen fertilizer is not required.

<u>Fiber Mulch</u> - Used in hydroseeding operations and applied as part of the slurry. It creates the best seed-soil contact when applied over top of (as a separate operation) newly seeded areas. These fibers do not require tacking, although tacking agents or binders are sometimes used in conjunction with the application of fiber mulch. This form of mulch does not provide sufficient protection to highly erodible soils. Additionally, fiber mulch will not be considered adequate mulch when used during the dry summer months or when used for late fall mulch cover. Use straw mulch during these periods. Fiber mulch may be used to tack (anchor) straw mulch. This treatment is well suited for steep slopes, critical areas, and areas susceptible to displacement.

There are other organic materials which make excellent mulches but are only available locally or seasonally. Creative use of these materials can reduce costs.

Chemical Mulches and Soil Binders

A wide range of synthetic, spray-on materials are marketed to stabilize and protect the soil surface. These are emulsions or dispersions of vinyl compounds, rubber or other substances which are mixed with water and applied to the soil. They may be used alone in some cases as temporary stabilizers, or in conjunction with fiber mulches or straw.

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PROJECT ID:			DRAWING NO.	REV.	
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When used alone, chemical mulches do not have the capability to insulate the soil or retain soil moisture that organic mulches have. This soil protection is also easily damaged by traffic. Application of these mulches is usually more expensive than organic mulching, and the mulches decompose in 60-90 days.

Blankets and Matting

Field experience has shown that plastic netting, when used alone, does not retain soil moisture or modify soil temperature. In some cases it may stabilize the soil surface while grasses are being established, but is primarily used in grassed waterways and on slopes to hold straw or similar mulch in place.

Jute mesh and other soil stabilization blankets are good choices for mulching on difficult slopes and in minor drainage swales. Most of the soil stabilization mattings (used to create a permanent matrix for root growth within the soil) must receive mulching in order to properly stabilize an area. Notably, some manufacturers have recently developed permanent mattings which include self-contained, temporary mulching materials; however, these measures will have to meet the requirements noted in Std. & Spec. 3.36, SOIL STABILIZATION BLANKETS AND MATTING, before they can be recommended for use on steep slopes and in channel flow situations.

The most critical aspect of installing blankets and mats is obtaining firm, continuous contact between the material and the soil. Without such contact, the material may fail and thereby allow erosion to occur. It is important to use an adequate number of staples and make sure the material is installed properly in order to maximize soil protection. These products are discussed in more detail in Std. & Spec. 3.36, SOIL STABILIZATION BLANKETS & MATTING.

MVP will utilize hydraulically applied soil stabilization blankets and matting (i.e. Earthguard, Flexterra, or equivalent) as an alternate to the rolled ESC blanket material identified under STD & SPEC 3.36. Information regarding the hydraulically applied blankets is provided under Appendix B MVP-ES40 and MVP-ES40.1.

Specifications |

Organic Mulches

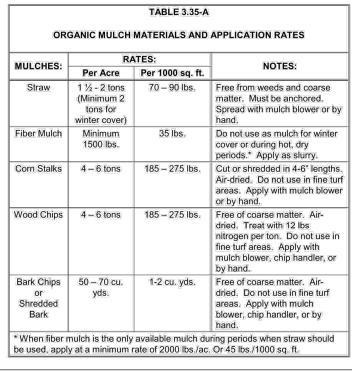
Organic mulches may be used in any area where mulch is required, subject to the restrictions noted in

Materials: Select mulch material based on site requirements, availability of materials, and availability of labor and equipment. Table 3.35-A lists the most commonly used organic mulches. Other materials, such as peanut hulls and cotton burs, may be used with the permission of the local Plan-Approving Authority.

<u>Prior to mulching</u>: Complete the required grading and install needed sediment control practices.
 <u>Lime and fertilizer</u> should be incorporated and surface roughening accomplished as needed. Seed should be applied prior to mulching except in the following cases:

- a. Where seed is to be applied as part of a hydroseeder slurry containing fiber mulch.
- b. Where seed is to be applied following a straw mulch spread during winter months.

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Application: Mulch materials shall be spread uniformly, by hand or machine.

When spreading straw mulch by hand, divide the area to be mulched into approximately 1,000 sq. ft. sections and place 70-90 lbs. (n to 2 bales) of straw in each section to facilitate uniform distribution.

<u>Mulch Anchoring</u>: Straw mulch must be anchored immediately after spreading to prevent displacement. Other organic mulches listed in Table 3.35-A do not require anchoring. The following methods of anchoring straw may be used:

- Mulch anchoring tool (often referred to as a Krimper or Krimper Tool): This is a tractor-drawn
 implement designed to punch mulch into the soil surface. This method provides good erosion
 control with straw. It is limited to use on slopes no steeper than 3:1, where equipment can operate
 safely. Machinery shall be operated on the contour.
- of a hydroseeder at a rate of 500-750 lbs/acre over top of straw mulch. It has an added benefit of providing additional mulch to the newly seeded area.
 3. Liquid mulch binders: Application of liquid mulch binders and tackifiers should be heaviest at

2. Fiber Mulch: A very common practice with widespread use today. Apply fiber mulch by means

3. Liquid mulch binders: Application of liquid mulch binders and tackifiers should be heaviest at edges of areas and at crests of ridges and banks, to prevent displacement. The remainder of the area should have binder applied uniformly. Binders may be applied after mulch is spread or may be sprayed into the mulch as it is being blown onto the soil.

The following types of binders may be used:

- Synthetic binders Formulated binders or organically formulated products may be used as recommended by the manufacturer to anchor mulch.
- *Asphalt Any type of asphalt thin enough to be blown from spray equipment is satisfactory. Recommended for use are rapid curing (RC-70, RC-250, RC-800), medium curing (MC-250, MC-800) and emulsified asphalt (SS-1, CSS-1, CMS-2, MS-2, RS-1, RS-2, CRS-1, and CRS-2).

Apply asphalt at 0.10 gallon per square yard (10 gal./1000 sq. ft. or 430 gal./acre). Do not use heavier applications as it may cause the straw to "perch" over rills. All asphalt designations are from the Asphalt Institute Specifications.

*Note: This particular method is not used as commonly today as it once was in the past. The development of hydraulic seeding equipment promoted the industry to turn to synthetic or organically based binders and tackifiers. When this method is used, environmental concerns should be addressed to ensure that petroleum-based products do not enter valuable water supplies. Avoid applications into waterways or channels.

- Mulch nettings: Lightweight plastic, cotton, or paper nets may be stapled over the mulch according to manufacturer's recommendations.
- 5. Peg and twine: Because it is labor-intensive, this method is feasible only in small areas where other methods cannot be used. Drive 8- to 10-inch wooden pegs to within 3 inches of the soil surface, every 4 feet in all directions. Stakes may be driven before or after straw is spread. Secure mulch by stretching twine between pegs in a criss-cross-within-a square pattern. Turn twine 2 or more times around each peg.

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Chemical Mulches

Chemical mulches* may be used alone only in the following situations:

- a. Where no other mulching material is available.
- In conjunction with temporary seeding during the times when mulch is not required for that practice.
- c. From March 15 to May 1 and August 15 to September 30, provided that they are used on areas with slopes no steeper than 4:1, which have been roughened in accordance with SURFACE ROUGHENING, Std. & Spec. 3.29. If rill erosion occurs, another mulch material shall be applied immediately.

*Note: Chemical mulches may be used to bind other mulches or with fiber mulch in a hydroseeded slurry at any time. Manufacturer's recommendations for application of chemical mulches shall be followed.

Maintenan

All mulches and soil coverings should be inspected periodically (particularly after rainstorms) to check for erosion. Where erosion is observed in mulched areas, additional mulch should be applied. Nets and mats should be inspected after rainstorms for dislocation or failure. If washouts or breakage occur, reinstall netting or matting as necessary after repairing damage to the slope or ditch. Inspections should take place up until grasses are firmly established. Where mulch is used in conjunction with ornamental plantings, inspect periodically throughout the year to determine if mulch is maintaining coverage of the soil surface; repair as needed.

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TOPSOILING & SOIL HANDLING FOR M.V.P.

Definitio

Methods of preserving and using the surface layer of undisturbed soil, often enriched in organic matter, in order to obtain a more desirable planting and growth medium.

Purposes

To provide a suitable growth medium for final site stabilization with vegetation and promote successful reforestation

Conditions Where Practice Applies

- Where the preservation or importation of topsoil is determined to be the most effective method of providing a suitable growth medium.
- 2. Where the subsoil or existing soil presents the following problems:
- a. The texture, pH, or nutrient balance of the available soil cannot be modified by reasonable means to provide an adequate growth medium.
- b. The soil material is too shallow to provide an adequate root zone and to supply necessary moisture and nutrients for plant growth.

3. Only on slopes that are 2:1 or flatter unless other measures are taken to prevent erosion and

c. The soil contains substances potentially toxic to plant growth.

sloughing.

Planning Considerations

Topsoil is the surface layer of the soil profile, generally characterized as being darker than the subsoil due to the presence of organic matter. It is the major zone of root development, carrying much of the nutrients available to plants, and supplying a large share of the water used by plants.

Although topsoil provides an excellent growth medium, there are disadvantages to its use. Stripping, stockpiling, and reapplying topsoil, or importing topsoil, may not always be cost-effective. Topsoiling can delay seeding or sodding operations, increasing the exposure time of denuded areas. Most topsoil contains weed seeds, and weeds may compete with desirable species.

In site planning, the option of topsoiling should be compared with that of preparing a seedbed in subsoil. The clay content of subsoils does provide high moisture availability and deter leaching of nutrients and, when properly limed and fertilized, subsoils may provide a good growth medium which is generally free

Advantages of topsoil include its high organic matter content and friable consistence, water-holding

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of weed seeds. In many cases topsoiling may not be required for the establishment of less demanding, lower maintenance plant material. Topsoiling is strongly recommended where ornamental plants or high-maintenance turf will be grown. Topsoiling is a required procedure when establishing vegetation on shallow soils, soils containing potentially toxic materials, and soils of critically low pH (high acid) levels.

If topsoiling is to be done, the following items should be considered:

- Whether an adequate volume of topsoil exists on the site. Topsoil will be spread at a compacted depth of 2 to 4 inches (depths closer to 4 inches are preferred).
- 2. Location of the topsoil stockpile so that it meets specifications and does not interfere with work
- Allow sufficient time in scheduling for topsoil to be spread and bonded prior to seeding or planting.
- 4. Care must be taken not to apply topsoil to subsoil if the two soils have contrasting textures. Clayey topsoil over sandy subsoil is a particularly poor combination, as water may creep along the junction between the soil layers, causing the topsoil to slough. Sandy topsoil over a clay subsoil is equally as likely to fail.
- If topsoil and subsoil are not properly bonded, water will not infiltrate the soil profile evenly and it will be difficult to establish vegetation. Topsoiling of steep slopes should be discouraged unless good bonding of soils can be achieved.

Specifications

Materia

Field exploration of the site shall be made to determine if there is sufficient surface soil of good quality to justify stripping. Topsoil shall be friable and loamy (loam, sandy loam, silt loam, sandy clay loam, clay loam). It shall be free of debris, trash, stumps, rocks, roots, and noxious weeds, and shall give evidence of being able to support healthy vegetation. It shall contain no substance that is potentially toxic to plant growth.

In areas where revegetation is of concern based on existing soil conditions and determined by the MVP Environmental Inspector (EI), topsoil samples shall be taken for analysis. Samples will be collected by the MVP EI and sent to a recognized laboratory for analysis of the following criteria:

Organic matter content shall be not less than 1.5% by weight.

pH range shall be from 6.0-7.5. If pH is less than 6.0, lime shall be added in accordance with soil test results or in accordance with the recommendations of the vegetative establishment practice being used.

Soluble salts shall not exceed 500 ppm.

Soil samples collected and sent for analysis will be identified by the MVP Constructions Spread # and pipeline station from which the sample was obtained. Areas that fail to revegetate following restoration will be sampled and analyzed based on the above parameters.

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IPELINE PROJECT – TRANSCO INTERCONNI
TSYLVANIA COUNTY, VIRGINIA
IN VALLEY PIPELINE, LLC
SOUTHPOINTE BLVD, SUITE 200

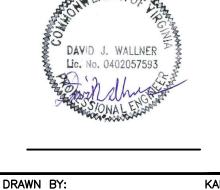
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FOSTER PLAZA 7

PITTSBURGH, PA 15220

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Topsoil Importing

Topsoil would be imported as needed in residential areas only. If additional off-site topsoil is needed, it must meet the standards stated above.

Stripping

Topsoil operations should not be performed when the soil is wet or frozen. Stripping shall be confined to the immediate construction area. A 4-to 6-inch stripping depth is common, but depth may vary depending on the particular soil. All perimeter dikes, basins, and other sediment controls shall be in place prior to stripping.

Stockpiling

Topsoil shall be stockpiled in such a manner that natural drainage is not obstructed and no off-site sediment damage shall result. Stabilize or protect stockpiles in accordance with MS #2.

Excavated subsoil shall be stockpiled separately from topsoil.

Side slopes of the stockpile shall not exceed 2:1.

Perimeter controls must be placed around the stockpile immediately; seeding of stockpiles shall be completed within 7 days of the formation of the stockpile, in accordance with Std. & Spec. 3.31, TEMPORARY SEEDING if it is to remain dormant for longer than 14 days (refer to MS #1 and MS #2).

Site Preparation Prior to and Maintenance During Topsoiling and Excavation

Before topsoiling or excavation, establish needed erosion and sediment control practices such as diversions, grade stabilization structures, berms, dikes, level spreaders, waterways, sediment basins, etc. These practices must be maintained during topsoiling and excavation.

Grading: Previously established grades on the areas to be topsoiled shall be maintained according to the approved plan.

<u>Liming</u>: Where the pH of the subsoil is 6.0 or less, or the soil is composed of heavy clays, agricultural limestone shall be spread in accordance with the soil test or the vegetative establishment practice being used.

<u>Bonding</u>: After the areas to be topsoiled have been brought to grade, and immediately prior to dumping and spreading the topsoil, the subgrade shall be loosened by disking or scarifying to a depth of at least 4-6 inches to ensure bonding of the topsoil and subsoil. Refer to 2.8.3 Soil Compaction Mitigation within the Project Standards and Specifications for additional information.

Applying Topsoil

Topsoil shall not be placed while in a frozen or muddy condition, when topsoil or subgrade is excessively wet, or in a condition that may otherwise be detrimental to proper grading or seeding. The topsoil shall be uniformly distributed to a minimum compacted depth of 2 inches on 3:1 or steeper slopes and 4 inches on flatter slopes or to mimic existing conditions present in the adjacent undisturbed areas. (See Table 3.30-A to determine volume of topsoil required for application to various depths). Any irregularities in the surface, resulting from topsoiling or other operations, shall be corrected in order to prevent the formation of depressions or water pockets.

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Once the topsoil has been applied to the subgrade the topsoil should be disked and raked. Excess rock will be removed from at least the top 12 inches of soil to the extent practicable in all cultivated or rotated cropland, managed pastures, hayfields, and residential areas, as well as other areas at the landowner's request. The size, density, and distribution of rock on the construction work area shall be similar to adjacent areas not disturbed by construction. The landowner or land management agency may approve other provisions in writing. Refer to Standards and Specifications Section 2.8 Final Grading for additional information.

DS OF TOPSOIL REQUATION TO VARIOUS I	
PER 1,000 (SQUARE FEET)	PER ACRE
3.1	134
6.2	268
9.3	403
12.4	537
15.5	672
18.6	806
	PER 1,000 (SOUARE FEET) 3.1 6.2 9.3 12.4 15.5

Soil Sterilants

Soil Sterilants

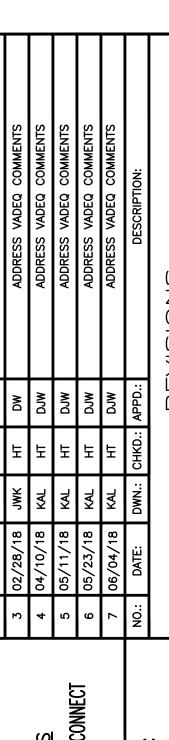
No seed shall be placed on soil which has been treated with soil sterilants until sufficient time has elapsed to permit dissipation of toxic materials.

Special Soil Related Requirements for Working in Wetlands

Norfolk District 2017 Nationwide Permit Regional Conditions, dated March 20, 2017 (subject to revision in Spring of 2017), NWP 12 – Utility Line Activities items 3.b.iii, 5.a, and 5.b require the following:

- Minimizing clearing of wetlands. Grubbing shall be limited to the permanent easement for underground utility lines. Outside of the permanent easement, wetland vegetation shall only be removed at or above the ground surface unless written justification is provided and the impacts are reviewed and approved by the Corps.
- Whenever practicable, excavated material shall be placed on a Corps confirmed upland site. However, when this is not practicable, temporary stockpiling is hereby authorized provided that:
- a. All excavated material stockpiled in a vegetated wetland area is placed on filter cloth, mats, or some other semi-permeable surface. The material will be stabilized with straw bales, filter cloth, etc. to prevent reentry into any waterway.
- b. All excavated material must be placed back into the trench to the original contour and all excess excavated material must be completely removed from the wetlands within 30 days after the pipeline has been laid through the wetland areas. Permission must be granted by the District Commander or his authorized representatives if the material is to be stockpiled longer than 30 days.

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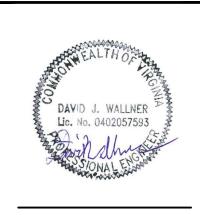


STRUCTION SEQUENCE AND ILEY PIPELINE PROJECT – TRANSCO PITTSYLVANIA COUNTY, VIRGINIA

TETRA TECH

661 ANDERSEN DRIVE FOSTER PLAZA 7 PITTSBURGH, PA 15220

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EROSION AND SEDIMENT CONTROL NARRATIVE

THE MOUNTAIN VALLEY PIPELINE PROJECT (PROJECT) WILL EXTEND FROM THE EXISTING EQUITRANS, L.P TRANSMISSION SYSTEM AND OTHER NATURAL GAS FACILITIES IN WÈTZEL COÚNTY, WEST VIRGINIA TO TRANSCONTINENTAL GAS PIPE LINE COMPANY, LLC'S ZONE 5 COMPRESSOR STATION 165 IN PITTSYLVANIA COUNTY, VIRGINIA. IN ADDITION, THE PROJECT WILL INCLUDE APPROXIMATELY 171,600 HORSEPOWER OF COMPRESSION AT THREE COMPRESSOR STATIONS CURRENTLY PLANNED ALONG THE ROUTE, AS WELL AS MEASUREMENT, REGULATION, AND OTHER ANCILLARY FACILITIES REQUIRED FOR THE SAFE AND RELIABLE OPERATION OF THE PIPELINE. THE PIPELINE IS DESIGNED TO TRANSPORT UP TO 2.0 MILLION DEKATHERMS PER DAY OF NATURAL GAS.

THE TRANSCO INTERCONNECT SITE IS LOCATED IN PITTSYLVANIA COUNTY, JUST SOUTH OF S.R. 692 (TRANSCO ROAD) IN TRANSCO VILLAGE (I.E., THE END OF SPREAD 11). ACCESS TO THE SITE WILL BE PROVIDED BY A NEWLY CONSTRUCTED PERMANENT GRAVEL ACCESS ROAD (MVP-PI-343.01), AND THE PERMANENT SITE WILL CONSIST OF A 310-FT BY 295-FT GRAVEL PAD AREA. THE LIMIT OF DISTURBANCE (LOD) FOR THE TRANSCO INTERCONNECT SITE. WHICH ALSO INCLUDES A PORTION OF THE SPREAD 11 PIPELINE, IS APPROXIMATELY 39.45 ACRES. THE PERMANENT PIPELINE RIGHT-OF-WAY (ROW) WILL BE 50 FEET WIDE.

TEMPORARY DEVELOPMENT WITHIN THE TRANSCO INTERCONNECT SITE INCLUDES A TEMPORARY PAD AND ACCESS ROAD THAT WILL BE USED FOR APPROXIMATELY TEN (10) WEEKS DURING THE CONSTRUCTION OF THE PERMANENT INTERCONNECT PAD AND GAS PIPING ON THE PAD, AS WELL AS A TEMPORARY MATERIAL STORAGE AREA AND AN ADDITIONAL TEMPORARY WORK SPACE (ATWS) THAT WILL BE USED FOR APPROXIMATELY NINE (9) MONTHS DURING CONSTRUCTION OF THE PIPELINE. TEMPORARY GRAVEL WILL BE PLACED OVER THE FULL EXTENT OF THE TEMPORARY PAD AND ACCESS ROAD, AND A LARGE PORTION OF THE TEMPORARY MATERIAL STORAGE AREA AND ATWS. BOTH THE TEMPORARY PAD/ACCESS ROAD AND TEMPORARY MATERIAL STORAGE AREA WILL BE RESTORED TO APPROXIMATE ORIGINAL CONDITIONS (APPROXIMATE PRE-EXISTING CONTOURS AND PRE-EXISTING LAND USE) FOLLOWING CONSTRUCTION OF THE INTERCONNECT PAD FACILITIES AND PIPELINE, RESPECTIVELY.

EXISTING SITE CONDITIONS

EXIST<mark>ING GROUND COVER INCLUD</mark>ES MEADOW, TURF, WOODS, DIRT ROADS, A SINGLE FAMILY HOME AND AN EXISTING GRAVEL ACCESS ROAD. THERE ARE NINE DRAINAGE AREAS FOR THE PROJECT. SLOPES ON THE SITE ARE GENERALLY BETWEEN 0 AND 10 PERCENT. THERE ARE NO STREAMS OR WETLANDS LOCATED WITHIN THE LIMIT OF DISTURBANCE (LOD) AT THIS SITE. THE SITE IS LOCATED ON ROLLING HILLS.

ADJACENT AREAS INCLUDE: INDUSTRIAL AREAS, FORESTED AREAS, SINGLE-FAMILY HOMES, PASTURE AND ROADS.

NO OFF-SITE LAND DISTURBING ACTIVITIES ARE PROPOSED. ANY OFF-SITE LAND-DISTURBING ACTIVITY ASSOCIATED WITH THE PROJECT MUST HAVE AN APPROVED ESC PLAN.

5. <u>SOILS:</u> THE SOILS LOCATED WITHIN THE LOD INCLUDE:

PITTSYLVANIA COUNTY:

CREEDMOOR FINE SANDY LOAM (9B), MAYODAN FINE SANDY LOAM (23B), MAYODAN FINE SANDY LOAM (23C).

CREEDMOOR SERIES SOILS CONSIST OF DEEP, MODERATELY WELL-DRAINED, AND MODERATELY PERMEABLE SOILS. RUNOFF CLASS IS VERY HIGH. THICKNESS IS APPROXIMATELY 65 INCHES. DEPTH TO HARD BEDROCK IS MORE THAN 80 INCHES. TEXTURE RANGES BY HORIZON, INCLUDING FINE SANDY LOAM AND SANDY CLAY.

MAYODAN SERIES SOILS CONSIST OF DEEP, WELL-DRAINED SOILS WITH HIGH PERMEABILITY. POTENTIAL FOR SURFACE RUNOFF IS MEDIUM. THICKNESS IS APPROXIMATELY 65 INCHES. DEPTH TO BEDROCK IS MORE THAN 80 INCHES. TEXTURE RANGES BY HORIZON INCLUDING FINE SANDY LOAM, CLAY, AND SANDY CLAY LOAM.

CRITICAL AREAS:

THERE ARE NO STREAMS AND WETLANDS WITHIN THE LOD. PRIOR TO GRADING ACTIVITIES, SEDIMENT BARRIERS WILL BE INSTALLED DOWNGRADIENT OF THE CONSTRUCTION WORK AREA AS NEEDED TO PREVENT THE FLOW OF SPOIL OFF-SITE. SEDIMENT BARRIERS WILL BE PROPERLY MAINTAINED THROUGHOUT CONSTRUCTION AND REINSTALLED AS NECESSARY UNTIL REPLACED BY PERMANENT EROSION CONTROLS OR RESTORATION OF DISTURBED ADJACENT UPLAND AREAS IS COMPLETE.

THE PROJECT IS LOCATED IN AN AREA THAT IS SUSCEPTIBLE TO POTENTIAL EROSION HAZARDS. THESE AREAS PRIMARILY OCCUR ON STEEP SLOPES. E&S CONTROLS ON THE SITE WILL MITIGATE EROSION HAZARDS. EROSION CONTROL BLANKET WILL BE PLACED IF A SLOPE AT THE SITE BECOMES UNSTABILIZED.

THERE ARE NO OTHER CRITICAL AREAS/FEATURES PRESENT AT THE SITE.

EROSION AND SEDIMENT CONTROL MEASURES:

UNLESS OTHERWISE INDICATED, ALL VEGETATIVE AND STRUCTURAL EROSION AND SEDIMENT CONTROL PRACTICES SHALL BE CONSTRUCTED AND MAINTAINED ACCORDING TO THE MINIMUM STANDARDS AND SPECIFICATIONS OF THE VIRGINIA EROSION AND SEDIMENT CONTROL HANDBOOK, THIRD EDITION, 1992, AS WELL AS ANY ADDITIONAL MEASURES REQUIRED BY APPLICABLE LOCAL STATE AND FEDERAL REGULATIONS.

- STRUCTURAL PRACTICES
 - 3.01 SAFETY FENCE
 - 3.02 CONSTRUCTION ENTRANCE
 - 3.04 STRAW BALE BARRIER
 - 3.05 SILT FENCE BARRIER 3.06 - BRUSH BARRIER
 - 3.09 TEMPORARY DIVERSION DIKE
 - 3.13 SEDIMENT TRAP
 - 3.14 SEDIMENT BASIN 3.17 - STORMWATER CONVEYANCE CHANNEL
 - 3.18 OUTLET PROTECTION
 - 3.20 ROCK CHECK DAM
 - 3.21 LEVEL SPREADER 3.22 - VEGETATIVE STREAMBANK STABILIZATION
 - 3.24 TEMPORARY STREAM CROSSING
 - 3.26 DEWATERING STRUCTURE
 - 3.27 TURBIDITY CURTAIN 3.29 - SURFACE ROUGHENING
 - MVP-ES2 PUMPED WATER FILTER BAG
- MVP-ES3 COMPOST FILTER SOCK
- MVP-ES9 BELTED SILT RETENTION FENCE MVP-ES9.2 - SUPER SILT FENCE
- MVP-ES9.3 STACKED COMPOST FILTER SOCK MVP-ES37 - TIMBER MAT / WETLAND CROSSING
- MVP-ES50.1 CLEAN WATER DIVERSION WITH END RELEASE
- VEGETATIVE PRACTICES
- 3.30 TOPSOIL (STOCKPILE) 3.31 - TEMPORARY SEEDING
- 3.32 PERMANENT SEEDING
- 3.35 MULCHING

PERMANENT STABILIZATION

- 3.36 SOIL STABILIZATION BLANKETS AND MATTING MVP-ES11.0 - TEMPORARY EROSION CONTROL SEEDING MIX
- MVP-ES11.1 FOREST REGENERATION WOODY SEED MIX AND APPLICATION RATES
- MVP-ES11.2 UPLAND MEADOW SEED MIX AND APPLICATION RATES MVP-ES11.3 - UPLAND STEEP SLOPE SEED MIX AND APPLICATION RATES
- MVP-ES11.4 WETLAND SEED MIX AND APPLICATION RATES
- MVP-ES11.5 RIPARIAN SEED MIX AND APPLICATION RATES
- MVP-ES11.6 NATIVE TREE AND SHRUB SPECIES FOR BARE ROOT PLANTINGS WITHIN RIPARIAN AREAS AND FORESTED WETLANDS
- MVP-ES11.7 NATIVE TREE AND SHRUB SPECIES FOR BARE ROOT PLANTINGS WITHIN RIPARIAN AREAS AND FORESTED WETLANDS
- MVP-ES11.8 STREAM CROSSINGS PROPOSED FOR BARE ROOT SEEDING PLANTINGS
- MVP-ES11.9 STREAM CROSSING FOR BARE ROOT SEEDING PLANTING
- MVP-ES46 46.2 TOPSOILING & SOIL HANDLING

ALL DISTURBED AREAS SHALL BE STABILIZED WITH PERMANENT SEEDING WITHIN SEVEN WORKING DAYS OF FINAL GRADING. WEATHER AND SOIL CONDITIONS PERMITTING, AS SPECIFIED IN THE PROJECT SPECIFIC STANDARDS AND SPECIFICATIONS FOR

9. STORMWATER RUNOFF CONSIDERATIONS:

PERMANENT DEVELOPMENT

PERMANENT DEVELOPMENT INCLUDES NEW IMPERVIOUS (GRAVEL) COVER FOR A 20-FEET WIDE PERMANENT GRAVEL ACCESS ROAD (MVP-PI-343.01) AND A 310-FEET BY 295-FEET GRAVEL PAD AREA. STORMWATER ANALYSIS AND BMP DESIGNS WILL BE PERFORMED TO ENSURE THAT THE FOLLOWING VIRGINIA STATE REGULATIONS HAVE BEEN SATISFIED:

- 1. WATER QUALITY (9VAC25-870-63) OR OFFSITE COMPLIANCE OPTIONS (9VAC25-870-69)
- WATER QUANTITY (9VAC25-870-66)
 - a. CONCENTRATED STORMWATER DISCHARGES THAT ARE RELEASED INTO A NATURAL OR MANMADE STORMWATER CONVEYANCE SYSTEM WILL BE IN COMPLIANCE WITH 9VAC25-870-66.B (CHANNEL PROTECTION) AND 9VAC25-870-66.C (FLOOD PROTECTION)
 - b. IF THERE IS NOT A DEFINED RECEIVING CHANNEL, IT WILL BE DEMONSTRATED THAT EITHER EXISTING SHEET FLOW CONDITIONS ARE MAINTAINED FOLLOWING CONSTRUCTION OR THAT THE PROPOSED OUTLET STRUCTURE RE-DISTRIBUTES DISCHARGE FOR THE 10-YEAR STORM AS SHEET FLOW; A SHEET FLOW DISCHARGE CONDITION FOR A PROPOSED OUTLET STRUCTURE (I.E., SPILLWAY, LEVEL SPREADER, PLUNGE POOL, RIPRAP APRON, ETC.) IS DEFINED AS ≤ 0.1-FT OF HEAD ON THE OUTLET STRUCTURE. INCREASED VOLUMES OF SHEET FLOW WILL BE EVALUATED IN ACCORDANCE WITH 9VAC25-870-66.D.

TEMPORARY DEVELOPMENT

TEMPORARY DEVELOPMENT INCLUDES A TEMPORARY PAD AND ACCESS ROAD, AS WELL AS A TEMPORARY MATERIAL STORAGE AREA AND AN ADDITIONAL TEMPORARY WORK SPACE (ATWS).

TEMPORARY GRAVEL WILL BE PLACED OVER THE ATWS LOCATED ON THE EAST SIDE OF THE PROPOSED ACCESS ROAD MVP-PI-343.01 HOWEVER, GRAVEL IN THESE AREAS WILL BE PLACED OVER A NON-WOVEN GEOTEXTILE WITH A PERMITTIVITY OF 90 GALLONS PER MINUTE PER SQUARE FOOT TO MAINTAIN INFILTRATION RATES OF THE EXISTING SOIL SURFACE BELOW. SINCE THERE IS NO PROPOSED GRADING OR LAND DISTURBANCE IN THESE AREAS, AND THE INFILTRATION RATES OF THE EXISTING SOIL SURFACE ARE BEING MAINTAINED, NO ADDITIONAL STORMWATER CONTROLS ARE REQUIRED.

TEMPORARY GRAVEL WILL BE PLACED OVER THE FULL EXTENT OF THE TEMPORARY PAD, TEMPORARY ACCESS ROAD, THE PROPOSED MATERIAL STORAGE LAYDOWN AREA, AND GRADING AND LAND DISTURBANCE (INCLUDING TOPSOIL REMOVAL) ARE PROPOSED, WHICH WILL RESULT IN AN INCREASE IN PEAK RUNOFF RATES IF LEFT UNMANAGED. DURING CONSTRUCTION WHILE TEMPORARY GRAVEL IS IN PLACE, THESE PROJECT AREAS WILL BE IN COMPLIANCE WITH THE FOLLOWING STORMWATER QUANTITY GUIDELINES AS DIRECTED BY THE VIRGINIA DEPARTMENT OF ENVIRONMENTAL QUALITY (DEQ):

1. WATER QUANTITY WILL BE CONTROLLED BY USING THE TEMPORARY BEST MANAGEMENT PRACTICES (BMPS) DESCRIBED IN THE VESCH INSTEAD OF THE PERMANENT BMPS DESCRIBED IN THE VIRGINIA STORMWATER BMP CLEARINGHOUSE. ALL PROPOSED BMPS WILL BE DESIGNED AND MAINTAINED IN ACCORDANCE WITH THE VESCH.

2. WHEN DISCHARGING INTO A NATURAL CHANNEL, DEMONSTRATE THAT THE 2-YEAR STORM DOES NOT OVERTOP THE CHANNEL BANKS AND THAT THE 2-YEAR VELOCITY IS NON-EROSIVE.

WHEN DISCHARGING INTO A MAN-MADE CHANNEL (WHICH INCLUDES ROAD-SIDE DITCHES), DEMONSTRATE THAT THE 10-YEAR STORM DOES NOT OVERTOP THE CHANNEL BANKS AND THAT THE 2-YEAR VELOCITY IS NON-EROSIVE.

4. WHEN DISCHARGING INTO A PIPE OR STORM SEWER SYSTEM, DEMONSTRATE THAT THE 10-YEAR STORM IS CONTAINED IN THE PIPE/SYSTEM.

5. IF THERE IS NOT A DEFINED RECEIVING CHANNEL, DEMONSTRATE SHEET FLOW FOR THE 10-YEAR STORM FOR 100 FEET DOWNSTREAM OF PROJECT SITE AND/OR OUTLET STRUCTURE. A SHEET FLOW DISCHARGE CONDITION FOR A PROPOSED OUTLET STRUCTURE (I.E., SPILLWAY, LEVEL SPREADER, PLUNGE POOL, RIPRAP APRON, ETC.) IS DEFINED AS ≤ 0.1-FT OF HEAD ON THE OUTLET STRUCTURE. IF THE 10-YEAR FLOW CONCENTRATES WITHIN THAT 100 FEET, DEMONSTRATE NON-EROSIVE VELOCITY.

SEDIMENT TRAPS/BASINS WERE DESIGNED TO MANAGE/CONTROL STORMWATER RUNOFF TO MEET THE APPLICABLE GUIDELINES LISTED ABOVE DURING CONSTRUCTION WHILE TEMPORARY GRAVEL IS IN PLACE. THE FOLLOWING ASSUMPTIONS WERE MADE WHEN DESIGNING SEDIMENT TRAPS/BASINS TO SATISFY THE STORMWATER QUANTITY GUIDELINES:

WHEN DESIGNING SEDIMENT TRAPS AND SEDIMENT BASINS. STAGE-STORAGE VOLUME CURVES AND OUTLET STRUCTURES WERE MODELED TO MATCH THE DESIGNS SHOWN ON THE EROSION AND SEDIMENT CONTROL (ESC) PLAN.

WHEN DESIGNING SEDIMENT TRAPS, THE STARTING WATER SURFACE ELEVATION WITHIN THE MODEL WAS ASSUMED TO BE AT THE TOP OF WET STORAGE ELEVATION WITH EXCEPTION TO SEDIMENT TRAPS 3&4 (ST-3 AND ST-4). DUE TO THE LIMITED SPACE AND THE FLAT TOPOGRAPHY AROUND ST-3 AND ST-4, IT IS NOT POSSIBLE TO SITE A SEDIMENT BASIN SO ST-3 AND ST-4 WILL BE MAINTAINED TO ENSURE DRAWDOWN BETWEEN STORM EVENTS; THEREFORE, THE WET AND DRY STORAGE VOLUMES ARE INCLUDED IN THE STAGE-STORAGE VOLUME CURVE WHEN ROUTING FLOW THROUGH ST-3 AND ST-4.

WHEN DESIGNING SEDIMENT TRAPS, FLOW THROUGH THE ROCK/RIPRAP OUTLET STRUCTURE OF THE SEDIMENT TRAP BELOW THE WEIR CREST ELEVATION WAS MODELED USING A STAGE-DISCHARGE CURVE THAT WAS CALCULATED USING DARCY'S LAW.

4. WHEN DESIGNING SEDIMENT BASINS, THE FOLLOWING ASSUMPTIONS WERE APPLIED WHILE PERFORMING ROUTING COMPUTATIONS TO DETERMINE THE 2- AND 25-YEAR STORM ELEVATIONS PER VESCH STD & SPEC 3.14:

- •THE STARTING WATER SURFACE ELEVATION IS AT THE TOP OF WET STORAGE ELEVATION.
- THE DEWATERING ORIFICE IS CLOGGED.

WHEN ANALYZING PEAK RUNOFF FROM THE SITE, THE FOLLOWING ASSUMPTIONS WERE APPLIED TO THE SEDIMENT BASIN WHILE PERFORMING THE ROUTING COMPUTATIONS:

- •THE STARTING WATER SURFACE ELEVATION IS AT THE TOP OF WET STORAGE ELEVATION.
- •THE DEWATERING ORIFICE IS ACTIVE.

10. 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 PROJECT SPECIFIC 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.

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

REPAIR OF ALL INEFFECTIVE TEMPORARY ESC MEASURES SHALL OCCUR WITHIN 24 HOURS OF IDENTIFICATION, OR AS SOON AS CONDITIONS ALLOW IF COMPLIANCE WITH THIS TIME FRAME WOULD RESULT IN GREATER ENVIRONMENTAL IMPACTS.

TEMPORARY BMPS WILL BE REMOVED UPON ACHIEVING VEGETATIVE STABILIZATION. DISTURBED AREAS NOT ATTAINING AN ACCEPTABLE VEGETATIVE COVER SHALL BE RE-SEEDED AS NEEDED UNTIL STABILIZATION IS ACHIEVED.

TEMPORARY ESC 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.

11. CALCULATIONS:

BMP SIZING AND INSTALLATION HAS BEEN BASED ON THE FOLLOWING CRITERIA INCLUDED BY REFERENCE IN BOTH THE ANNUAL STANDARDS AND SPECIFICATIONS AND THE GENERAL DETAILS INCLUDED WITH THE EROSION AND SEDIMENT CONTROL PLANS:

COMPOST FILTER SOCK - MVP-ES3.0, MVP-ES3.1, MVP-ES3.3

SILT FENCE - VADEQ STD & SPEC 3.05

SUPER SILT FENCE - MVP ES 9.2

STACKED COMPOST FILTER SOCK - MVP-ES9.3

TEMPORARY DIVERSION DIKE - VADEQ STD & SPEC 3.09

SEDIMENT TRAP - VADEQ STD & SPEC 3.13

SEDIMENT BASIN - VADEQ STD & SPEC 3.14

STORMWATER CONVEYANCE CHANNEL - VADEQ STD & SPEC 3.17

OUTLET PROTECTION - VADEQ STD & SPEC 3.18

LEVEL SPREADER - VADEQ STD & SPEC 3.21

RIPRAP - VADEQ STD & SPEC 3.19

CLEAN WATER DIVERSION WITH END RELEASE - MVP-ES50.1

EROSION CONTROL DEVICES SHALL BE MADE IMMEDIATELY.

12. GENERAL EROSION AND SEDIMENT CONTROL NOTES:

ES-1: UNLESS OTHERWISE INDICATED, ALL VEGETATIVE AND STRUCTURAL EROSION AND SEDIMENT CONTROL PRACTICES WILL BE CONSTRUCTED AND MAINTAINED ACCORDING TO MINIMUM STANDARDS AND SPECIFICATIONS OF THE VIRGINIA EROSION AND SEDIMENT CONTROL HANDBOOK AND VIRGINIA REGULATIONS 9VAC25-840 EROSION AND SEDIMENT CONTROL REGULATIONS.

ES-2: THE PLAN APPROVING AUTHORITY MUST BE NOTIFIED ONE WEEK PRIOR TO THE PRE-CONSTRUCTION CONFERENCE, ONE WEEK PRIOR TO THE COMMENCEMENT OF LAND DISTURBING ACTIVITY, AND ONE WEEK PRIOR TO THE FINAL INSPECTION.

ES-3: ALL EROSION AND SEDIMENT CONTROL MEASURES ARE TO BE PLACED PRIOR TO OR AS THE FIRST STEP IN CLEARING.

ES-4: A COPY OF THE APPROVED EROSION AND SEDIMENT CONTROL PLAN SHALL BE MAINTAINED ON THE SITE AT ALL TIMES. ES-5: PRIOR TO COMMENCING LAND-DISTURBING ACTIVITIES IN AREAS OTHER THAN INDICATED ON THESE PLANS (INCLUDING, BUT NOT LIMITED TO, OFF-SITE BORROW OR WASTE AREAS), THE CONTRACTOR SHALL SUBMIT A SUPPLEMENTARY EROSION

CONTROL PLAN TO THE OWNER FOR REVIEW AND APPROVAL BY THE PLAN APPROVING AUTHORITY. ES-6: THE CONTRACTOR IS RESPONSIBLE FOR INSTALLATION OF ANY ADDITIONAL EROSION CONTROL MEASURES NECESSARY TO PREVENT EROSION AND SEDIMENTATION AS DETERMINED BY THE PLAN APPROVING AUTHORITY

ES-7: ALL DISTURBED AREAS ARE TO DRAIN TO APPROVED SEDIMENT CONTROL MEASURES AT ALL TIMES DURING LAND DISTURBING ACTIVITIES AND DURING SITE DEVELOPMENT UNTIL FINAL STABILIZATION IS ACHIEVED.

ES-8: DURING DEWATERING OPERATIONS, WATER WILL BE PUMPED INTO AN APPROVED FILTERING DEVICE. ES-9: THE CONTRACTOR SHALL INSPECT ALL EROSION CONTROL MEASURES PERIODICALLY AND AFTER EACH RUNOFF-PRODUCING RAINFALL EVENT. ANY NECESSARY REPAIRS OR CLEANUP TO MAINTAIN THE EFFECTIVENESS OF THE

13. MINIMUM STANDARDS (MS):

ALL LAND-DISTURBING ACTIVITIES UNDERTAKEN ON PRIVATE AND PUBLIC LANDS IN THE COMMONWEALTH OF VIRGINIA MUST MEET THE 19 "MINIMUM STANDARDS" FOR ESC IN SECTION 4VAC50-30-40 OF THE VIRGINIA ESC REGULATIONS. THE APPLICANT WHO SUBMITS THE ESC PLAN TO THE PROGRAM AUTHORITY FOR APPROVAL IS RESPONSIBLE FOR ENSURING COMPLIANCE WITH THE MINIMUM STANDARDS THAT APPLY TO HIS/HER ACTIVITIES.

MS-1 SOIL STABILIZATION. PERMANENT OR TEMPORARY STABILIZATION SHALL BE APPLIED TO DENUDED AREAS WITHIN 7 DAYS AFTER FINAL GRADE IS REACHED ON ANY PORTION OF THE SITE. TEMPORARY SOIL STABILIZATION SHALL BE APPLIED WITHIN 7 DAYS TO DENUDED AREAS THAT MAY NOT BE AT FINAL GRADE BUT WILL REMAIN DORMANT FOR LONGER THAN 30 DAYS. PERMANENT STABILIZATION SHALL BE APPLIED TO AREAS THAT ARE TO BE LEFT DORMANT FOR MORE THAN ONE YEAR. LIME AND FERTILIZER WILL BE ADDED IN ACCORDANCE WITH THE PROJECT SPECIFIC STANDARDS AND SPECIFICATIONS.

MS-2 SOIL STOCKPILE STABILIZATION. DURING CONSTRUCTION, SOIL STOCKPILES AND BORROW AREAS SHALL BE STABILIZED OR PROTECTED WITH SEDIMENT TRAPPING MEASURES. TEMPORARY PROTECTION AND PERMANENT STABILIZATION SHALL BE APPLIED TO ALL SOIL STOCKPILES ON THE SITE AND BORROW AREAS OR SOIL INTENTIONALLY TRANSPORTED FROM THE PROJECT SITE.

MS-3 PERMANENT STABILIZATION. PERMANENT VEGETATIVE COVER SHALL BE ESTABLISHED ON DENUDED AREAS NOT OTHERWISE PERMANENTLY STABILIZED. PERMANENT VEGETATION SHALL NOT BE CONSIDERED ESTABLISHED UNTIL A GROUND COVER IS ACHIEVED THAT IS UNIFORM. MATURE ENOUGH TO SURVIVE. AND WILL INHIBIT EROSION.

MEASURES INTENDED TO TRAP SEDIMENT SHALL BE CONSTRUCTED AS A FIRST STEP IN ANY LAND-DISTURBING ACTIVITY AND SHALL BE MADE FUNCTIONAL BEFORE UPSLOPE LAND DISTURBANCE TAKES PLACE.

MS-5 STABILIZATION OF EARTHEN STRUCTURES. STABILIZATION MEASURES SHALL BE APPLIED TO EARTHEN STRUCTURES SUCH AS DAMS, DIKE'S AND DIVERSIONS IMMEDIATELY AFTER INSTALLATION.

MS-6 SEDIMENT TRAPS & SEDIMENT BASINS. SEDIMENT TRAPS AND BASINS SHALL BE DESIGNED AND CONSTRUCTED BASED UPON

MS-4 SEDIMENT BASINS & TRAPS. SEDIMENT BASINS. SEDIMENT TRAPS. PERIMETER DIKES. SEDIMENT BARRIERS. AND OTHER

1. SEDIMENT TRAPS:

1.2.MINIMUM STORAGE CAPACITY OF 134 CUBIC YARDS PER ACRE OF DRAINAGE AREA.

SEDIMENT BASINS:

THE TOTAL DRAINAGE AREA TO BE SERVED BY THE TRAP OR BASIN AS FOLLOWS:

1.1.ONLY CONTROL DRAINAGE AREAS LESS THAN THREE ACRES.

2.1. CONTROL DRAINAGE AREAS GREATER THAN OR EQUAL TO THREE ACRES. 2.2. MINIMUM STORAGE CAPACITY OF 134 CUBIC YARDS PER ACRE OF DRAINAGE AREA.

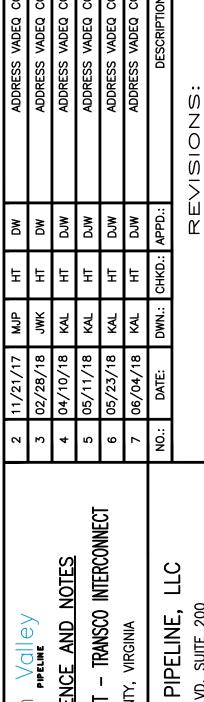
2.3. THE OUTFALL SYSTEM SHALL, AT A MINIMUM, MAINTAIN THE STRUCTURAL INTEGRITY OF THE BASIN DURING A TWENTY-FIVE YEAR STORM OF 24-HOUR DURATION.

MS-7 CUT AND FILL SLOPES DESIGN & CONSTRUCTION. CUT AND FILL SLOPES SHALL BE DESIGNED AND CONSTRUCTED IN A MANNER THAT WILL MINIMIZE EROSION. SLOPES FOUND TO BE ERODING EXCESSIVELY WITHIN ONE YEAR OF PERMANENT STABILIZATION SHALL BE PROVIDED WITH ADDITIONAL SLOPE STABILIZING MEASURES UNTIL THE PROBLEM IS CORRECTED.

MS-8 CONCENTRATED RUNOFF DOWN SLOPES. CONCENTRATED RUNOFF SHALL NOT FLOW DOWN CUT OR FILL SLOPES UNLESS CONTAINED WITHIN AN ADEQUATE TEMPORARY OR PERMANENT CHANNEL, FLUME, OR SLOPE DRAIN STRUCTURE.

MS-9 SLOPE MAINTENANCE. WHENEVER WATER SEEPS FROM A SLOPE FACE, ADEQUATE DRAINAGE OR OTHER PROTECTION SHALL

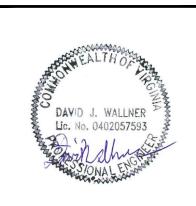
MS-10 STORM SEWER INLET PROTECTION. ALL STORM SEWER INLETS MADE OPERABLE DURING CONSTRUCTION SHALL BE PROTECTED SO THAT SEDIMENT-LADEN WATER CANNOT ENTER THE STORMWATER CONVEYANCE SYSTEM WITHOUT FIRST BEING FILTERED/ TREATED TO REMOVE SEDIMENT.





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DRAWN BY: CHECKED BY: APPROVED BY: 06/04/2018 DATE: SCALE: AS SHOWN SHT. NO. TRA-14 OF MS-11 STORMWATER CONVEYANCE PROTECTION. BEFORE NEWLY CONSTRUCTED STORMWATER CONVEYANCE CHANNELS OR PIPES ARE MADE OPERATIONAL, ADEQUATE OUTLET PROTECTION AND ANY REQUIRED TEMPORARY OR PERMANENT CHANNEL LINING SHALL BE INSTALLED IN BOTH THE CONVEYANCE CHANNEL AND RECEIVING CHANNEL.

MS-12 WORK IN LIVE WATERCOURSE. WHEN WORK IN A LIVE WATERCOURSE IS PERFORMED, PRECAUTIONS SHALL BE TAKEN TO MINIMIZE ENCROACHMENT, CONTROL SEDIMENT TRANSPORT AND STABILIZE THE WORK AREA TO THE GREATEST EXTENT POSSIBLE DURING CONSTRUCTION. NONERODIBLE MATERIAL SHALL BE USED FOR THE CONSTRUCTION OF CAUSEWAYS AND COFFERDAMS. EARTHEN FILL MAY BE USED FOR THESE STRUCTURES IF ARMORED BY NONERODIBLE COVER MATERIALS.

MS-13 CROSSING LIVE WATERCOURSE. WHEN A LIVE WATERCOURSE MUST BE CROSSED BY CONSTRUCTION VEHICLES MORE THAN TWICE IN ANY SIX-MONTH PERIOD, A TEMPORARY VEHICULAR STREAM CROSSING CONSTRUCTED OF NONERODIBLE MATERIAL SHALL BE PROVIDED.

MS-14 REGULATION OF WATERCOURSE CROSSING. ALL APPLICABLE FEDERAL STATE AND LOCAL REGULATIONS PERTAINING TO WORKING IN OR CROSSING LIVE WATERCOURSES SHALL BE MET.

MS-15 STABILIZING OF WATERCOURSE. THE BED AND BANKS OF A WATERCOURSE SHALL BE STABILIZED IMMEDIATELY AFTER WORK IN THE WATERCOURSE IS COMPLETED.

MS-16 UNDERGROUND UTILITY LINE INSTALLATION. UNDERGROUND UTILITY LINES SHALL BE INSTALLED IN ACCORDANCE WITH THE FOLLOWING STANDARDS IN ADDITION TO OTHER APPLICABLE CRITERIA:

- a. NO MORE THAN 500 LINEAR FEET OF TRENCH MAY BE OPENED AT ONE TIME.
- b. EXCAVATED MATERIAL SHALL BE PLACED ON THE UPHILL SIDE OF TRENCHES.
- C. EFFLUENT FROM DEWATERING OPERATIONS SHALL BE FILTERED OR PASSED THROUGH AN APPROVED SEDIMENT TRAPPING DEVICE, OR BOTH, AND DISCHARGED IN A MANNER THAT DOES NOT ADVERSELY AFFECT FLOWING STREAMS OR OFF-SITE
- d. MATERIAL USED FOR BACKFILLING TRENCHES SHALL BE PROPERLY COMPACTED IN ORDER TO MINIMIZE EROSION AND PROMOTE STABILIZATION.
- e. RESTABILIZATION SHALL BE ACCOMPLISHED IN ACCORDANCE WITH THESE REGULATIONS.
- f. COMPLY WITH APPLICABLE SAFETY REGULATIONS.

MS-17 VEHICULAR SEDIMENT TRACKING. WHERE CONSTRUCTION VEHICLE ACCESS ROUTES INTERSECT PAVED OR PUBLIC ROADS:

- a. PROVISIONS SHALL BE MADE TO MINIMIZE THE TRANSPORT OF SEDIMENT BY VEHICULAR TRACKING ONTO THE PAVED
- b. WHERE SEDIMENT IS TRANSPORTED ONTO A PAVED OR PUBLIC ROAD SURFACE, THE ROAD SURFACE SHALL BE CLEANED THOROUGHLY AT THE END OF EACH DAY.
- c. SEDIMENT SHALL BE REMOVED FROM THE ROADS BY SHOVELING OR SWEEPING AND TRANSPORTED TO A SEDIMENT CONTROL DISPOSAL AREA. STREET WASHING SHALL BE ALLOWED ONLY AFTER SEDIMENT IS REMOVED IN THIS MANNER.

MS-18 REMOVAL OF TEMPORARY MEASURES. ALL TEMPORARY EROSION AND SEDIMENT CONTROL MEASURES SHALL BE REMOVED WITHIN 30 DAYS AFTER FINAL SITE STABILIZATION OR AFTER THE TEMPORARY MEASURES ARE NO LONGER NEEDED, UNLESS OTHERWISE AUTHORIZED BY THE LOCAL PROGRAM AUTHORITY. TRAPPED SEDIMENT AND THE DISTURBED SOIL AREAS RESULTING FROM THE DISPOSITION OF TEMPORARY MEASURES SHALL BE PERMANENTLY STABILIZED TO PREVENT FURTHER EROSION AND SEDIMENTATION.

MS-19 STORMWATER MANAGEMENT. PROPERTIES AND WATERWAYS DOWNSTREAM FROM DEVELOPMENT SITES SHALL BE PROTECTED FROM SEDIMENT DEPOSITION, EROSION AND DAMAGE DUE TO INCREASES IN VOLUME, VELOCITY AND PEAK FLOW RATE OF STORMWATER RUNOFF FOR THE STATED FREQUENCY STORM OF 24-HOUR DURATION IN ACCORDANCE WITH THE FOLLOWING STANDARDS AND CRITERIA. STREAM RESTORATION AND RELOCATION PROJECTS THAT INCORPORATE NATURAL CHANNEL DESIGN CONCEPTS ARE NOT MAN-MADE CHANNELS AND SHALL BE EXEMPT FROM ANY FLOW RATE CAPACITY AND VELOCITY REQUIREMENTS FOR NATURAL OR MAN-MADE CHANNELS:

- a. CONCENTRATED STORMWATER RUNOFF LEAVING A DEVELOPMENT SITE SHALL BE DISCHARGED DIRECTLY INTO AN ADEQUATE NATURAL OR MAN-MADE RECEIVING CHANNEL, PIPE OR STORM SEWER SYSTEM. FOR THOSE SITES WHERE RUNOFF IS DISCHARGED INTO A PIPE OR PIPE SYSTEM, DOWNSTREAM STABILITY ANALYSES AT THE OUTFALL OF THE PIPE OR PIPE SYSTEM SHALL BE PERFORMED.
- b. ADEQUACY OF ALL CHANNELS AND PIPES SHALL BE VERIFIED IN THE FOLLOWING MANNER:
- 1. THE APPLICANT SHALL DEMONSTRATE THAT THE TOTAL DRAINAGE AREA TO THE POINT OF ANALYSIS WITHIN THE CHANNEL IS ONE HUNDRED TIMES GREATER THAN THE CONTRIBUTING DRAINAGE AREA OF THE PROJECT IN QUESTION; OR
- 2. (A) NATURAL CHANNELS SHALL BE ANALYZED BY THE USE OF A TWO-YEAR STORM TO VERIFY THAT STORMWATER WILL NOT OVERTOP CHANNEL BANKS NOR CAUSE EROSION OF CHANNEL BED OR BANKS.
- (b) ALL PREVIOUSLY CONSTRUCTED MAN-MADE CHANNELS SHALL BE ANALYZED BY THE USE OF A 10-YEAR STORM TO VERIFY THAT STORMWATER WILL NOT OVERTOP ITS BANKS AND BY THE USE OF A TWO-YEAR STORM TO DEMONSTRATE THAT STORMWATER WILL NOT CAUSE EROSION OF CHANNEL BED OR BANKS; AND
 - (c) PIPES AND STORM SEWER SYSTEMS SHALL BE ANALYZED BY THE USE OF A 10-YEAR STORM TO VERIFY THAT STORMWATER WILL BE CONTAINED WITHIN THE PIPE OR SYSTEM.
- c. IF EXISTING NATURAL RECEIVING CHANNELS OR PREVIOUSLY CONSTRUCTED MAN-MADE CHANNELS OR PIPES ARE NOT
- 1. IMPROVE THE CHANNELS TO A CONDITION WHERE A 10-YEAR STORM WILL NOT OVERTOP THE BANKS AND A TWO-YEAR STORM
- WILL NOT CAUSE EROSION TO THE CHANNEL, THE BED, OR THE BANKS; OR

 IMPROVE THE PIPE OR PIPE SYSTEM TO A CONDITION WHERE THE 10-YEAR STORM IS CONTAINED WITHIN THE
- 2. IMPROVE THE PIPE OR PIPE SYSTEM TO A CONDITION WHERE THE 10-YEAR STORM IS CONTAINED WITHIN THE APPURTENANCES;
- 3. DEVELOP A SITE DESIGN THAT WILL NOT CAUSE THE PRE-DEVELOPMENT PEAK RUNOFF RATE FROM A TWO-YEAR STORM TO INCREASE WHEN RUNOFF OUTFALLS INTO A NATURAL CHANNEL OR WILL NOT CAUSE THE PRE-DEVELOPMENT PEAK RUNOFF RATE FROM A 10-YEAR STORM TO INCREASE WHEN RUNOFF OUTFALLS INTO A MAN-MADE CHANNEL; OR
- 4. PROVIDE A COMBINATION OF CHANNEL IMPROVEMENT, STORMWATER DETENTION OR OTHER MEASURES WHICH IS SATISFACTORY TO THE VESCP AUTHORITY TO PREVENT DOWNSTREAM EROSION.
 - d. THE APPLICANT SHALL PROVIDE EVIDENCE OF PERMISSION TO MAKE THE IMPROVEMENTS.
 - e. ALL HYDROLOGIC ANALYSES SHALL BE BASED ON THE EXISTING WATERSHED CHARACTERISTICS AND THE ULTIMATE DEVELOPMENT CONDITION OF THE SUBJECT PROJECT.
 - f. IF THE APPLICANT CHOOSES AN OPTION THAT INCLUDES STORMWATER DETENTION, HE SHALL OBTAIN APPROVAL FROM THE VESCP OF A PLAN FOR MAINTENANCE OF THE DETENTION FACILITIES. THE PLAN SHALL SET FORTH THE MAINTENANCE REQUIREMENTS OF THE FACILITY AND THE PERSON RESPONSIBLE FOR PERFORMING THE MAINTENANCE.
 - g. OUTFALL FROM A DETENTION FACILITY SHALL BE DISCHARGED TO A RECEIVING CHANNEL, AND ENERGY DISSIPATORS SHALL BE PLACED AT THE OUTFALL OF ALL DETENTION FACILITIES AS NECESSARY TO PROVIDE A STABILIZED TRANSITION FROM THE FACILITY TO THE RECEIVING CHANNEL.
 - h. ALL ON-SITE CHANNELS MUST BE VERIFIED TO BE ADEQUATE.

ADEQUATE, THE APPLICANT SHALL:

i. INCREASED VOLUMES OF SHEET FLOWS THAT MAY CAUSE EROSION OR SEDIMENTATION ON ADJACENT PROPERTY SHALL

BE DIVERTED TO A STABLE OUTLET, ADEQUATE CHANNEL, PIPE OR PIPE SYSTEM, OR TO A DETENTION FACILITY.

- j. IN APPLYING THESE STORMWATER MANAGEMENT CRITERIA, INDIVIDUAL LOTS OR PARCELS IN A RESIDENTIAL, COMMERCIAL OR INDUSTRIAL DEVELOPMENT SHALL NOT BE CONSIDERED TO BE SEPARATE DEVELOPMENT PROJECTS. INSTEAD, THE DEVELOPMENT, AS A WHOLE, SHALL BE CONSIDERED TO BE A SINGLE DEVELOPMENT PROJECT. HYDROLOGIC PARAMETERS THAT REFLECT THE ULTIMATE DEVELOPMENT CONDITION SHALL BE USED IN ALL ENGINEERING CALCULATIONS.
- k. ALL MEASURES USED TO PROTECT PROPERTIES AND WATERWAYS SHALL BE EMPLOYED IN A MANNER WHICH MINIMIZES IMPACTS ON THE PHYSICAL, CHEMICAL AND BIOLOGICAL INTEGRITY OF RIVERS, STREAMS AND OTHER WATERS OF THE STATE.
- I. ANY PLAN APPROVED PRIOR TO JULY 1, 2014, THAT PROVIDES FOR STORMWATER MANAGEMENT THAT ADDRESSES ANY FLOW RATE CAPACITY AND VELOCITY REQUIREMENTS FOR NATURAL OR MAN-MADE CHANNELS SHALL SATISFY THE FLOW RATE CAPACITY AND VELOCITY REQUIREMENTS FOR NATURAL OR MAN-MADE CHANNELS IF THE PRACTICES ARE DESIGNED TO (I) DETAIN THE WATER QUALITY VOLUME AND TO RELEASE IT OVER 48 HOURS; (II) DETAIN AND RELEASE OVER A 24-HOUR PERIOD THE EXPECTED RAINFALL RESULTING FROM THE ONE YEAR, 24-HOUR STORM; AND (III) REDUCE THE ALLOWABLE PEAK FLOW RATE RESULTING FROM THE 1.5, 2, AND 10-YEAR, 24-HOUR STORMS TO A LEVEL THAT IS LESS THAN OR EQUAL TO THE PEAK FLOW RATE FROM THE SITE ASSUMING IT WAS IN A GOOD FORESTED CONDITION, ACHIEVED THROUGH MULTIPLICATION OF THE FORESTED PEAK FLOW RATE BY A REDUCTION FACTOR THAT IS EQUAL TO THE RUNOFF VOLUME FROM THE SITE WHEN IT WAS IN A GOOD FORESTED CONDITION DIVIDED BY THE RUNOFF VOLUME FROM THE SITE IN ITS PROPOSED CONDITION, AND SHALL BE EXEMPT FROM ANY FLOW RATE CAPACITY AND VELOCITY REQUIREMENTS FOR NATURAL OR MAN-MADE CHANNELS AS DEFINED IN ANY REGULATIONS PROMULGATED PURSUANT TO § 62.1-44.15:54 OR 62.1-44.15:65 OF THE ACT.
- m.FOR PLANS APPROVED ON AND AFTER JULY 1, 2014, THE FLOW RATE CAPACITY AND VELOCITY REQUIREMENTS OF § 62.1-44.15:52 A OF THE ACT AND THIS SUBSECTION SHALL BE SATISFIED BY COMPLIANCE WITH WATER QUANTITY REQUIREMENTS IN THE STORMWATER MANAGEMENT ACT (§ 62.1-44.15:24 ET SEQ. OF THE CODE OF VIRGINIA) AND ATTENDANT REGULATIONS, UNLESS SUCH LAND-DISTURBING ACTIVITIES ARE IN ACCORDANCE WITH 9VAC25-870-48 OF THE VIRGINIA STORMWATER MANAGEMENT PROGRAM (VSMP) REGULATION OR ARE EXEMPT PURSUANT TO SUBDIVISION C 7 OF

§ 62.1-44.15:34 OF THE ACT.

n. COMPLIANCE WITH THE WATER QUANTITY MINIMUM STANDARDS SET OUT IN 9VAC25-870-66 OF THE VIRGINIA STORMWATER MANAGEMENT PROGRAM (VSMP) REGULATION SHALL BE DEEMED TO SATISFY THE REQUIREMENTS OF THIS SUBDIVISION 19.

MS-19 COMPLIANCE DURING CONSTRUCTION

A. INTRODUCTION

THE PRIMARY INTENT OF MS-19 IS TO ENSURE THAT DOWN GRADIENT PROPERTIES ARE PROTECTED FROM ADVERSE IMPACTS RESULTING FROM INCREASES IN STORMWATER RUNOFF FROM DEVELOPMENT ACTIVITIES. IN ACCORDANCE WITH <u>9VAC25-870-66</u>.

WATER QUANTITY, COMPLIANCE WITH THE WATER QUALITY REQUIREMENTS CONTAINED IN THAT SECTION SATISFIES THE

"COMPLIANCE WITH THE MINIMUM STANDARDS SET OUT IN THIS SECTION SHALL BE DEEMED TO SATISFY THE REQUIREMENTS OF SUBDIVISION 19 OF 9VAC25-840-40 (MINIMUM STANDARDS; VIRGINIA EROSION AND SEDIMENT CONTROL REGULATIONS)."

THERE IS ONE PRIMARY FLOW REGIME ASSOCIATED WITH THE CONSTRUCTION PHASE OF THE PROJECT THAT WILL NEED TO BE ASSESSED FOR COMPLIANCE WITH MS-19. THIS FLOW REGIME INCLUDE FLOWS GENERATED DIRECTLY WITHIN THE PROJECT LIMIT OF DISTURBANCE (LOD) THAT ARE CONTROLLED BY PERIMETER CONTROLS CONSISTING OF COMPOST FILTER SOCKS (CFS) OR SILT FENCE AS WELL AS FLOWS ROUTED TO SEDIMENT TRAPS AND/OR SEDIMENT BASINS.

REGARDLESS OF THE SPECIFIC LOCATION AND/OR FLOW REGIME, ALL EROSION AND SEDIMENT CONTROL MEASURES INCLUDED IN THE DESIGN PLANS FOR THE PROJECT HAVE BEEN DEVELOPED AND DESIGNED TO BE IN FULL COMPLIANCE WITH STATE REQUIREMENTS, AS CONTAINED IN THE <u>VIRGINIA EROSION AND SEDIMENT CONTROL HANDBOOK</u> (VESCH), AS WELL AS THE APPROVED *PROJECT SPECIFIC STANDARDS AND SPECIFICATIONS*. AS A RESULT, ALL IMPLEMENTED PRACTICES (SILT FENCE, CFS, SOIL STABILIZATION, ETC.) WILL MEET ALL STATE REQUIREMENTS.

IN ALL INSTANCES OF OFFSITE STORMWATER FLOW DURING THE CONSTRUCTION PHASE OF THE PROJECT, COMPLIANCE WITH MS-19 IS PROVIDED THROUGH THE PROVISION OF SHEETFLOW BELOW THE RESPECTIVE EROSION AND SEDIMENT CONTROL PRACTICES ALONG THE PERIMETER (CFS OR SILT FENCE); SITE-SPECIFIC ANALYSES WILL BE COMPLETED WHEN SITING SEDIMENT TRAPS/BASINS AND LEVEL SPREADERS TO DEMONSTRATE COMPLIANCE WITH MS-19. A DESCRIPTION OF THE FLOW REGIME FOR DIRECT RUNOFF FROM DISTURBED AREAS OF THE PROJECT IS PROVIDED BELOW, FOLLOWED BY AN ANALYSIS THAT DEMONSTRATES THAT FLOW FROM THE PROPOSED PRACTICES WILL PROVIDE FOR NON-EROSIVE SHEET FLOW AND IS THEREFORE IN FULL COMPLIANCE WITH MS-19.

B. RUNOFF FROM PROJECT SITE

PROPERLY DESIGNED AND IMPLEMENTED EROSION AND SEDIMENT CONTROLS IN THE FORM OF SOIL STABILIZATION, STAND-ALONE CFS, AND/OR SILT FENCE WILL ENSURE DISTURBED AREAS WITHIN THE PROJECT SITE ARE PROTECTED IN ACCORDANCE WITH VESCH SPECIFICATIONS. PERIMETER CONTROLS (CFS AND/OR SILT FENCE, DEPENDING ON THE SPECIFIC LOCATION) WILL FILTER RUNOFF AND PROVIDE SHEETFLOW TO DOWNGRADIENT AREAS IN A NON-EROSIVE MANNER. THIS WILL RESULT IN RUNOFF FROM THE PROJECT SITE MEETING MS-19 REQUIREMENTS.

SHEETFLOW DISCHARGES

THE RELEVANT STANDARD REFERRED TO IN 9VAC25-870-66 IS IN SECTION D THAT CONTAINS THE REQUIREMENTS WHEN DISCHARGING STORMWATER IN THE FORM OF SHEETFLOW:

"A. INCREASED VOLUMES OF SHEET FLOW RESULTING FROM PERVIOUS OR DISCONNECTED IMPERVIOUS AREAS, OR FROM PHYSICAL SPREADING OF CONCENTRATED FLOW THROUGH LEVEL SPREADERS, MUST BE IDENTIFIED AND EVALUATED FOR POTENTIAL IMPACTS ON DOWN-GRADIENT PROPERTIES OR RESOURCES. INCREASED VOLUMES OF SHEET FLOW THAT WILL CAUSE OR CONTRIBUTE TO EROSION, SEDIMENTATION, OR FLOODING OF DOWN GRADIENT PROPERTIES OR RESOURCES SHALL BE DIVERTED TO A STORMWATER MANAGEMENT FACILITY OR A STORMWATER CONVEYANCE SYSTEM THAT CONVEYS THE RUNOFF WITHOUT CAUSING DOWN-GRADIENT EROSION, SEDIMENTATION, OR FLOODING. IF ALL RUNOFF FROM THE SITE IS SHEET FLOW AND THE CONDITIONS OF THIS SUBSECTION ARE MET, NO FURTHER WATER QUANTITY CONTROLS ARE REQUIRED."

SHEETFLOW DOWN GRADIENT OF THE LOD DURING THE CONSTRUCTION PHASE WILL BE PROVIDED BY PERIMETER CONTROLS THAT HAVE BEEN DESIGNED IN ACCORDANCE WITH THE APPROVED *PROJECT SPECIFIC STANDARDS AND SPECIFICATIONS*, AS WELL AS THE RELEVANT SPECIFICATIONS CONTAINED IN THE VESCH (AS NOTED ABOVE). EACH PRACTICE (SILT FENCE AND CFS) HAS BEEN SELECTED BASED ON THE SITE SPECIFIC CONDITIONS TO MAKE CERTAIN THAT THEY WILL FUNCTION PROPERLY AND AS INTENDED. CONFIRMATION THAT SHEETFLOW WILL BE PROVIDED DOWNGRADIENT OF EACH PRACTICE IS PROVIDE BELOW.

a) <u>SILT FENCE</u>

BY DEFINITION, SILT FENCE IS A FILTERING PRACTICE THAT HAS A STATED PERMEABILITY OF 0.3 GAL/MIN/SF (VESCH TABLE 3.05-A). ASSUMING A MAXIMUM PONDING DEPTH OF 24-IN, THIS WILL RESULT IN A FLOW RATE THROUGH THE FENCING OF 0.6 GAL/MIN/LF OF FENCING. CONVERTING, THIS EQUATES TO APPROXIMATELY 0.00134 CFS/LF (448.83 GPM = 1 CFS). THIS FLOW RATE CAN BE INSERTED INTO MANNING'S EQUATION TO SOLVE FOR THE CORRESPONDING DEPTH OF FLOW:

Q = (1.49/N) A R 2/3 S 1/2

WHERE:

- Q = OVERLAND FLOW RATE, CFS
- A = CROSS-SECTIONAL FLOW AREA PER LF OF FENCE (I.E. DEPTH X 1), FT2
- N = MANNING'S COEFFICIENT:

THIS PARAMETER WAS ASSUMED TO BE 0.24 FOR SHEETFLOW IN "DENSE GRASSES" (TR-55, TABLE 3-1. AREAS BELOW THE END TREATMENTS WILL BE SEEDED WITH A NATIVE GRASSES AND WOODY SPECIES, SO THE "DENSE GRASSES" N VALUE WAS DEEMED TO BE THE MOST APPROPRIATE VS THE "SHORT PRAIRIE GRASS" (N = 0.15) OR "BERMUDA GRASS" (N = 0.41) ALTERNATIVES).

R = HYDRAULIC RADIUS, FT:

THIS TERM IS DEFINED AS THE CROSS-SECTIONAL FLOW AREA DIVIDED BY THE WETTED PERIMETER. HOWEVER, FOR SHALLOW, WIDE FLOW THIS CAN BE ASSUMED TO BE EQUAL TO THE FLOW DEPTH. TO ILLUSTRATE, ASSUME A FLOW DEPTH OF 0.10 FT OVER A LENGTH OF 10 FT:

- R = A/WP
- = (0.1 FT * 10 FT) / (0.1 FT + 10 FT + 0.1 FT)
- = 1.0 FT2 / 10.2 FT
- = 0.098 FT

DEPTH = 0.10 FT IS A VALID ASSUMPTION

S = DOWN-GRADIENT OVERLAND SLOPE, FT/FT:

ASSUMING AN OVERLAND SLOPE OF 0.5 FT/FT AND AN "N" VALUE OF 0.24 (MEADOW), RESULTS IS A NOMINAL FLOW DEPTH OF 0.0078 FT:

0.00134 = (1.49/0.24) (DEPTH X 1) DEPTH 2/3 0.5 1/2

REARRANGING,

DEPTH 5/3 = 0.000305

DEPTH = 0.0078 FT

THIS FLOW DEPTH CAN THEN BE USED TO COMPUTE THE VELOCITY IN ACCORDANCE WITH:

V = Q/A

- = 0.00134 / 0.0078
- = 0.17 FPS

THIS VALUE IS AN ORDER OF MAGNITUDE LOWER THAN THE CONSERVATIVELY ASSUMED ALLOWABLE VELOCITY OF 2 FPS (BARE EARTH). THIS RESULT IS NOT UNEXPECTED AS THE PURPOSE OF SILT FENCE IS TO SLOWLY FILTER STORMWATER RUNOFF.

b) CFS

THE OTHER PERIMETER CONTROL THAT WILL BE IMPLEMENTED, DEPENDING ON THE SPECIFIC LOCATION, WILL BE CFS. THE COMPOST FILTER SOCKS ARE RATED BY THE AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO) IN THE DOCUMENT "FILTER BERMS AND FILTER SOCKS: STANDARD SPECIFICATIONS FOR COMPOST FOR EROSION/SEDIMENT CONTROL" TO PASS A RANGE OF FLOWS, FROM 4 TO OVER 10 GPM/LF (TABLE 2). A PRODUCT SPECIFIC CITATION OBTAINED FROM FILTREXX® STIPULATES A FLOW THROUGH RATE OF 22.5 GAL/MIN/LF FOR A 24-IN DIAMETER CFS (THE EFFECTIVE SIZE THAT WILL BE USED FOR THIS PROJECT). IN ORDER TO ENSURE A SHEETFLOW DEPTH OF NOT MORE THAN 0.10 FT BELOW THE CFS, AN EVEN HIGHER FLOW RATE OF 43 GPM WAS ASSUMED (VERY CONSERVATIVE).

ASSUMING A WORST CASE OF 43 GPM, THIS EQUATES TO A FLOW RATE OF 0.095 CFS/LF. USING MANNING'S EQUATION TO SOLVE FOR THE DEPTH OF FLOW USING THE SAME ASSUMPTIONS AND METHODOLOGY NOTED ABOVE RESULTS IN AN OVERLAND FLOW DEPTH OF 0.10 FT:

0.095= (1.49/0.24) (DEPTH X 1) DEPTH 2/3 0.5 1/2

REARRANGING

DEPTH 5/3 = 0.022 FT

DEPTH = 0.10 FT

THIS FLOW DEPTH CAN THEN BE USED TO COMPUTE THE VELOCITY IN ACCORDANCE WITH:

V = Q/A

- = 0.095/0.10
- = 0.95 FPS

THUS, THE CFS WILL ALSO PRODUCE SHEETFLOW IN A NON-EROSIVE MANNER THAT WILL NOT IMPACT DOWN GRADIENT PROPERTIES. AS A RESULT, SHEETFLOW DOWNGRADIENT FROM THE CFS PERIMETER CONTROL IMMEDIATELY FOLLOWING CONSTRUCTION IS ALSO IN FULL COMPLIANCE WITH M.S. 19.

c) LEVEL SPREADERS

IN THE EVENT THAT DISCHARGE IS NOT RELEASED TO A DEFINED RECEIVING CHANNEL, LEVEL SPREADERS WILL BE DESIGNED TO DEMONSTRATE SHEET FLOW (I.E., \leq 0.1-FT OF HEAD ON THE OUTLET) FOR THE 10-YEAR STORM EVENT.

d) <u>SEDIMENT TRAPS/BASINS</u>

IN THE EVENT THAT DISCHARGE FROM A SEDIMENT TRAP/BASIN IS NOT RELEASED TO A DEFINED RECEIVING CHANNEL, THE SEDIMENT TRAP WILL BE DESIGNED IN ACCORDANCE WITH THE VESCH AND TO DEMONSTRATE SHEET FLOW (I.E., ≤0.1-FT OF HEAD ON THE OUTLET) FOR THE 2-YEAR STORM EVENT.

e)<u>FLOODING</u>

BECAUSE SHEETFLOW HAS BEEN DEMONSTRATED FOR DOWNGRADIENT FLOWS DURING THE CONSTRUCTION PROCESS, COMPLIANCE WITH THE FLOODING PROVISION OF THE REGULATIONS (9VAC25-870-66 C. FLOOD PROTECTION) IS NOT REQUIRED. HOWEVER, THE SHEETFLOW PROVISION CITED IN THIS NARRATIVE DOES REQUIRE THAT "FLOODING" OF DOWNGRADIENT PROPERTIES OR RESOURCES" DOES NOT OCCUR. THE DEFINITION OF "FLOODING" PROVIDED IN THE REGULATIONS IS:

"FLOODING" MEANS A VOLUME OF WATER THAT IS TOO GREAT TO BE CONFINED WITHIN THE BANKS OR WALLS OF A STREAM, WATER BODY, OR CONVEYANCE SYSTEM AND THAT OVERFLOWS ONTO ADJACENT LANDS, THEREBY CAUSING OR THREATENING DAMAGE."

IN THIS INSTANCE, THERE ARE NO CONVEYANCES (I.E. SHEETFLOW), THEREFORE THE APPLICABLE PORTION OF THE DEFINITION IS RELATED TO OVERLAND FLOW THAT CAUSES OR THREATENS TO CAUSE DAMAGE. THIS ANALYSIS HAS DEMONSTRATED THAT THE SHEETFLOW FROM EITHER THE SILT FENCE OR CFS IS NON-EROSIVE. THEREFORE, THE TEMPORARY, NOMINAL INCREASES IN DOWN GRADIENT FLOW RATES THAT MAY OCCUR IN SOME SITUATIONS (NOTE - IN MANY INSTANCES THE FLOW RATES WILL ACTUALLY BE REDUCED AS A RESULT OF PONDING BEHIND THE SILT FENCE AND/OR CFS) WILL NOT RESULT IN DAMAGE AND THEREFORE COMPLIES WITH THE REQUIREMENTS OF MS-19.

2. <u>DISCHARGE TO A CONVEYANCE SYSTEM</u>

- a. SEDIMENT TRAPS WILL BE DESIGNED IN ACCORDANCE WITH THE VESCH AND TO CONTROL THE 2-YEAR STORM EVENT TO ENSURE THAT THERE IS NO INCREASE IN THE PEAK RATE OF RUNOFF AT THE DOWNSTREAM POINT OF DISCHARGE.
- b. A STORMWATER CONVEYANCE CHANNEL WILL BE DESIGNED IN ACCORDANCE WITH THE VESCH, AND ROCK CHECK DAMS WILL BE UTILIZED PER THE VESCH TO ATTENUATE PEAK RUNOFF FROM THE NEW ACCESS ROAD.

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-	2	05/11/18	KAL	ΤΗ	WLQ	ADDRESS VADEQ COMMENTS
	9	05/23/18	KAL	ΙН	Mra	ADDRESS VADEQ COMMENTS
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DN SEQUENCE AND NOTES

INE PROJECT - TRANSCO INTER

VANIA COUNTY, VIRGINIA

VALLEY PIPELINE, LLC

THPOINTE BLVD, SUITE 200

TETRA TECH

661 ANDERSEN DRIVE FOSTER PLAZA 7 PITTSBURGH, PA 15220

ONSTRUCTION PLANS



DRAWN BY:

CHECKED BY:

APPROVED BY:

DATE:

06/04/2018

SCALE:

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REVISION

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C. SUMMARY

SINCE IT HAS BEEN DEMONSTRATED THAT UNDER THE MOST CONSERVATIVE ASSUMPTIONS THAT SHEETFLOW DOWN GRADIENT OF THE PERIMETER CONTROLS WILL NOT "CAUSE OR CONTRIBUTE TO EROSION, SEDIMENTATION, OR FLOODING OF DOWN GRADIENT PROPERTIES" DURING AND IMMEDIATELY FOLLOWING CONSTRUCTION, THE CONSTRUCTION PHASE OF THE PROJECT WILL BE IN FULL COMPLIANCE WITH MS-19.

14. BEST MANAGEMENT PRACTICES INSTALLATION AND 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 SITE AREA CONSTRUCTION ACTIVITIES.

- A STONE CONSTRUCTION ENTRANCE, SHOWN ON DETAIL SHEET, 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 SILT FENCE OR COMPOST FILTER SOCK WILL BE PLACED AROUND SOIL STOCKPILES, AS NEEDED.
- STOCKPILE SLOPES WILL BE 2:1 OR FLATTER, AND STOCKPILES WILL NOT EXCEED 35 FEET IN HEIGHT.
- SEDIMENT TRAP(S) AND/OR SEDIMENT BASIN(S), ALONG WITH OTHER PERIMETER CONTROLS WHICH ARE INTENDED TO TRAP SEDIMENT, WILL BE CONSTRUCTED IMMEDIATELY AND WILL BE MADE FUNCTIONAL PRIOR TO UPSLOPE LAND DISTURBANCE. SEDIMENT TRAP(S) AND/OR SEDIMENT BASIN(S) SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE PLAN AND DETAIL SHEET.
- WETLANDS (IF PRESENT) WILL BE PROTECTED WITH SILT FENCE OR BELTED SILT RETENTION FENCE (BSRF). IN ADDITIONAL ORANGE CONSTRUCTION SAFETY FENCE WILL BE INSTALLED TO PROTECT WETLANDS FROM DISTURBANCÉ. STREAM CROSSINGS (IF PRESENT) WILL EITHER UTILIZE EXISTING CULVERTS OR BE SPANNED USING TIMBER MAT BRIDGES.
- 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.
- FOLLOWING PROJECT USE, SEGREGATED TOPSOIL WILL BE SPREAD OVER THE AREA FROM WHICH IT WAS REMOVED. DISTURBED AREAS WILL BE RESTORED TO THEIR ORIGINAL TOPOGRAPHIC CONTOURS AND LAND COVER WILL BE RETURNED TO PRE-EXISTING CONDITIONS.
- ALL DISTURBED AREAS WILL BE GRADED IN PREPARATION FOR SEEDING AND MULCHING. 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.
- 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.

GENERAL CONSTRUCTION SEQUENCE

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

- AT LEAST 3 DAYS PRIOR TO STARTING ANY EARTH DISTURBANCE ACTIVITIES, ALL CONTRACTORS INVOLVED WILL NOTIFY VA ONE CALL BY CALLING 811 OR 1-800-552-7001 OR VISIT VA811.COM
- 2. INSTALL TEMPORARY EROSION AND SEDIMENT (E&S) CONTROLS PRIOR TO EARTH DISTURBANCE. INSTALL SEDIMENT TRAPS AND SEDIMENT BASINS IN ACCORDANCE WITH VESCH STD & SPEC 3.13 AND 3.14 RESPECTIVELY ALONG WITH OTHER PERIMETER CONTROLS PRIOR TO UPSLOPE LAND DISTURBANCE. REFER TO BEST MANAGEMENT PRACTICES (BMP) ON THE PLAN AND DETAIL SHEETS. ORANGE CONSTRUCTION FENCE SHOULD BE PLACED AROUND SENSITIVE LOCATIONS AS SHOWN ON THE PLANS. HAND CLEARING IS PERMISSIBLE PRIOR TO E&S CONTROL INSTALLATION.
- 3. GENERAL CLEARING AND GRUBBING OF THE TREES AND BRUSH MAY COMMENCE AS NECESSARY FOR MATERIAL STORAGE LAYDOWN AREA, ACCESS ROAD, TEMPORARY PAD AND PERMANENT PAD CONSTRUCTION WITHIN THE LIMITS OF DISTURBANCE OR AS DIRECTED BY AN MVP DESIGNEE, WHICHEVER IS LESS. SMALLER DEBRIS SUCH AS SHRUBS AND LIMBS CAN BE CHIPPED AND UTILIZED ON-SITE AS PART OF THE SOIL STABILIZATION. UNLESS OTHERWISE DIRECTED BY THE LANDOWNER, LOGS WILL BE EITHER 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. IN THE PROPOSED ADDITIONAL TEMPORARY WORK SPACE (ATWS) AREA, REMOVE VEGETATION BY BRUSH HOGGING THE AREA AND REMOVE TREES (IF NECESSARY) BY HAND FELLING/CUTTING STUMPS AT THE GROUND SURFACE. NO GRUBBING OR OTHER SOIL DISTURBING ACTIVITIES WILL BE CONDUCTED, AND TOPSOIL STRIPPING WILL NOT OCCUR, IN THE ATWS AREA. INSTALL TEMPORARY GRAVEL OVER GEOTEXTILE AFTER ALL VEGETATION/TREES ARE REMOVED.
- 5. IT IS THE CONTRACTOR'S RESPONSIBILITY TO REMOVE AND DISPOSE, TO AN APPROVED VADEQ WASTE DISPOSAL SITE, EXISTING STRUCTURES WITHIN THE LOD AS DIRECTED BY AN MVP DESIGNEE. THE HOUSE IS TO REMAIN ONSITE.
- 6. STRIP TOPSOIL AND CONSTRUCT PROPOSED ACCESS ROADS WITH ROADSIDE DITCHES. CONSTRUCT TEMPORARY CHANNELS AND ASSOCIATED CULVERTS. PROVIDE SOIL STABILIZATION MATTING IN GRASS LINED CHANNELS CH-A, CH-B, CH-C, CH-D, CH-E, AND CH-F UNTIL VEGETATION IS ESTABLISHED. INSTALL CROSS DRAIN CULVERTS CC-1, CC-2, CC-3, CC-4, AND CC-5 WITH OUTLET PROTECTION AS SHOWN ON THE PLAN SHEETS.
- 7. INSTALL CHECK DAMS, AND INTERNAL PRE-TREATMENT FEATURES AS SHOWN ON THE PLAN. THE TOP OF EACH CHECK DAM SHOULD BE CONSTRUCTED TO THE DESIGN ELEVATION.
- 8. STRIP AND STOCKPILE TOPSOIL WITHIN THE LIMITS OF DISTURBANCE THE AREAS NEEDED TO CONSTRUCT THE PADS AND

STOCKPILE AREAS.

- 9. MINIMIZE TOTAL AREA OF DISTURBANCE TO THE EXTENT PRACTICABLE. MAINTAIN TEMPORARY TOPSOIL STOCKPILES WITHIN EXISTING SOIL EROSION AND SEDIMENT CONTROLS.
- 10. PROOF-ROLL ALL AREAS RECEIVING NEW FILL AND THE BOTTOM OF THE EXCAVATION (IF IN SOIL OR WEATHERED BEDROCK) WITH A 12-TON ROLLER COMPACTOR TO NON-VISIBLE MOVEMENT CRITERIA FOR THE TEMPORARY PAD, TEMPORARY LAYDOWN AREA, AND PERMANENT PAD. PROOF-ROLLING SHOULD NOT BE PERFORMED WHEN THE SUBGRADE IS WET OR FROZEN. IF ANY SOFT OR WET AREAS ARE ENCOUNTERED OR SOIL PUMPING IS OBSERVED, OVER-EXCAVATE THE AREA OR SINK-IN RIPRAP MATERIAL OF A MINIMUM 6 INCH SIZE AND COMPACT TO NO MOVEMENT. RIPRAP SHOULD BE COMPOSED OF LIMESTONE OR SANDSTONE.
- 11. UPON COMPLETION OF SATISFACTORY PROOF-ROLLING, THE AREA CAN BE BACKFILLED WITH WELL-COMPACTED FILL, WITH THE EXCEPTION OF TOPSOIL, ORGANIC MATERIAL, OR CARBONACEOUS MATERIAL. ON-SITE EXCAVATED MATERIALS, SOIL OR SOIL/ROCK MIXTURE ARE SUITABLE FOR USE AS FILL. THE SIZE OF ROCK SHOULD BE LIMITED TO 2/3 OF THE LIFT THICKNESS (SEQUENCE #13). SCARIFY EACH LIFT PRIOR TO THE PLACEMENT OF THE OVERLYING LIFT.
- 12. CREATE RIP RAP TOE KEY AND BONDING BENCHES PRIOR TO THE PLACEMENT OF BACKFILL ON EXISTING SLOPES PER "RIPRAP TOE KEY DETAIL AND TYPICAL FILL BONDING BENCH DETAIL." COMMON FILL FROM THE SITE IS ACCEPTABLE FOR PLACEMENT ABOVE THE TOE KEY AND BONDING BENCHES.
- 13. PLACE AND COMPACT FILL IN 9-INCH THICK LOOSE HORIZONTAL LIFTS IF PLACING SOIL OR UP TO 18 INCHES LOOSE LIFT THICKNESS IF PLACING SOIL/ROCK; COMPACT EACH LIFT TO 95 PERCENT OF THE MAXIMUM DRY DENSITY AT +/- 2% OF THE OPTIMUM MOISTURE CONTENT AS DETERMINED BY THE STANDARD COMPACTION TEST (ASTM: D698). SEAL/COMPACT FINAL LIFT OF THE DAY TO PREVENT PRECIPITATION FROM INFILTRATING INTO THE FILL PLACED ON THE SITE.
- 14. AN MVP DESIGNEE IS REQUIRED AT THE SITE DURING CONSTRUCTION TO MONITOR SITE DEVELOPMENT ACTIVITIES PER TETRA TECH'S RECOMMENDATIONS. THE DESIGNEE IS TO OBSERVE THE UNDERCUT, PROOF-ROLLING OF THE EXPOSED SUBGRADE/UNDERCUT PRIOR TO PLACING FILL AND TO MONITOR THE GRADATION, PLACEMENT AND COMPACTION OF FILL MATERIALS TO ENSURE THAT THE SPECIFIED GRADATION AND DENSITY REQUIREMENTS ARE BEING ACHIEVED. IN-PLACE NUCLEAR DENSOMETER TESTING SHOULD BE COMPLETED PER ASTM D 6938 EVERY 5,000 SQUARE FEET OR AT A MINIMUM OF ONE TEST PER LIFT. BASED UPON THE COMPLETION OF THE FIRST FEW LIFTS, THE CONTRACTOR AND THE ENGINEER MAY DEVELOP A CRITERION FOR FIELD COMPACTION OF SOILS. THE COMPACTION CRITERIA WOULD BE BASED ON NUMBER OF PASSES OF COMPACTION EQUIPMENT AND TYPE OF SOIL. USING THE SAME EQUIPMENT TO COMPACT THIS PARTICULAR SOIL TO THE REQUIRED DENSITY. IN THAT EVENT THE TESTING FREQUENCY FOR THE DENSITY MAY BE REDUCED PER RECOMMENDATION OF THE ENGINEER.
- 15. CONSTRUCT REMAINING TEMPORARY PAD AND PERMANENT PAD WITH 2:1 FILL SLOPES AND RIPRAP SLOPE LINING AS SHOWN ON THE PLAN SHEETS AND ON THE DETAIL SHEET.
- 16. STABILIZE EXPOSED AND UNWORKED SOILS AND STOCKPILES BY APPLICATION OF EFFECTIVE BMPS THAT PROTECT THE SOIL FROM THE EROSIVE FORCES OF RAINDROPS, FLOWING WATER, AND WIND, PERMANENT OR TEMPORARY SOIL STABILIZATION SHALL BE APPLIED TO AREAS WITHIN 7 DAYS AFTER FINAL GRADE IS REACHED ON ANY PORTION OF THE SITE. TEMPORARY SOIL STABILIZATION SHALL BE APPLIED WITHIN 7 DAYS THAT MAY NOT BE AT FINAL GRADE BUT WILL REMAIN DORMANT FOR LONGER THAN 14 DAYS. PERMANENT STABILIZATION SHALL BE APPLIED TO AREAS THAT ARE TO BE LEFT DORMANT FOR MORE THAN ONE YEAR.
- 17. REVEGETATE DISTURBED AREA PER SEEDING CHART OR PER LANDOWNER REQUEST. FOR 3:1 OR STEEPER SLOPES THE DISTURBED AREA WILL HAVE EROSION CONTROL FABRIC (BLANKETING OR FLEXTERRA) INSTALLED AS SHOWN ON THE DETAIL SHEET.
- 18. FINAL AGGREGATE ON PERMANENT PAD TO BE INSTALLED DURING TOP DRESSING (BY MECHANICAL CONTRACTOR).
- 19. 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 RESEEDED AS NEEDED UNTIL THE ENDPOINT IS ACHIEVED.
- 20. 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 CHOPPED AND SPREAD ON-SITE.

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.
- CONDUCTING INSPECTIONS OF TEMPORARY ESC CONTROLS AND SWM BMPS AT LEAST ONCE EVERY FOUR BUSINESS DAYS.
- TEMPORARY BMPS 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 RESEEDED AS NEEDED UNTIL THE ENDPOINT IS ACHIEVED.
- 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 THE SITE AREA TO PRE-CONSTRUCTION GRADES AND FINAL CLOSURE OF THE PROJECT DEFINED AS "ACHIEVING VEGETATIVE STABILIZATION". THE SEQUENCE IS:

 ALL TEMPORARY BMP'S WILL BE MAINTAINED IN PLACE DURING RESTORATION AS SHOWN ON THE PLANS UNTIL FINAL STABILIZATION OF THE CONTRIBUTING DRAINAGE AREA TO THE BMP IS ACHIEVED.

- 2. RESTORE TEMPORARY CONSTRUCTION PAD AND TEMPORARY STOCKPILES TO EXISTING GRADE AS SHOWN ON THE PLAN.
- 3. TEMPORARY E&S CONTROLS SUCH AS DIKES, SILT FENCES, AND OTHER EROSION CONTROL MEASURES SHOULD BE INTEGRATED INTO THE SWALE DESIGN THROUGHOUT THE CONSTRUCTION SEQUENCE. SPECIFICALLY, BARRIERS SHOULD BE INSTALLED AT KEY CHECK DAM LOCATIONS, AND EROSION CONTROL FABRIC SHOULD BE USED TO PROTECT THE CHANNEL.
- 4. REMOVE TEMPORARY GRAVEL AND UNDERLYING GEOTEXTILE WITHIN TEMPORARY MATERIAL STORAGE LAYDOWN AND ADDITIONAL TEMPORARY WORK SPACE (ATWS) AREAS, AND DISC/AERATE SOILS TO A DEPTH OF 4-6" TO FACILITATE REVEGETATION.
- 5. APPLY SPECIALTY SEEDS AS REQUIRED THAT WILL NOT BE HANDLED IN THE MULCH PHASE (STEP 6), SEED THE AREA USING THE SEED MIXES AND RATES SPECIFIED IN MVP-ES11.1 TO MVP-ES11.9.
- 6. 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).

- REMO CH-M. MAY SEDIMENT CONTROL F
- GRADE CHANNELS CH-H, CH-L, AND CH-M TO THE FINAL DIMENSIONS SHOWN ON THE PLAN. ANY ACCUMULATION OF SEDIMENT THAT DOES OCCUR WITHIN THE CHANNELS MUST BE REMOVED DURING THE FINAL STAGES OF GRADING TO ACHIEVE THE DESIGN CROSS-SECTION. INSTALL LEVEL SPREADER LS-2 AT THE OUTLET OF CHANNEL CH-H.
- HYDRO-SEED THE BOTTOM AND BANKS OF CHANNELS CH-H, CH-L, AND CH-M, AND PEG IN EROSION CONTROL FABRIC OR BLANKET WHERE NEEDED. AFTER INITIAL PLANTING, A BIODEGRADABLE EROSION CONTROL FABRIC SHOULD BE USED, CONFORMING TO STANDARD AND SPECIFICATION 3.36 OF THE VIRGINIA EROSION AND SEDIMENT CONTROL HANDBOOK.
- 10. PREPARE PLANTING HOLES FOR ANY BERMUDA GRASS OR EQUIVALENT, THEN PLANT MATERIALS AND WATER THEM WEEKLY IN THE FIRST TWO MONTHS. THE CONSTRUCTION CONTRACT SHOULD INCLUDE A CARE AND REPLACEMENT WARRANTY TO ENSURE VEGETATION IS PROPERLY ESTABLISHED AND SURVIVES DURING THE FIRST GROWING SEASON FOLLOWING CONSTRUCTION.
- 11. CONDUCT THE FINAL CONSTRUCTION INSPECTION AND DEVELOP A PUNCHLIST FOR FACILITY ACCEPTANCE.
- 12. FOLLOWING A DETERMINATION THAT THE SITE HAS ACHIEVED VEGETATIVE STABILIZATION, REMOVE PERIMETER CONTROLS ALONG THE LIMITS OF DISTURBANCE. THE COMPOST FILTER SOCK CAN BE "OPENED" AND THE MULCH CONTAINED WITHIN CAN BE SPREAD WITHIN THE LIMITS OF DISTURBANCE.

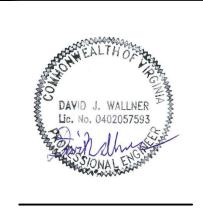
CONTROLS FOR CONSTRUCTION OF THE CHANNELS SHOULD BE INSTALLED AS SPECIFIED IN THE EROSION AND SEDIMENT	IOVAL OF CROSS CULVERT CC-4 AND SEDIMENT TRAPS ST-1 AND ST-2, AND INSTALLATION OF CHANNELS CH-H, CH-L, AND			
	Y ONLY BEGIN AFTER THE ENTIRE CONTRIBUTING DRAINAGE AREA HAS BEEN STABILIZED WITH VEGETATION. EROSION AND		ı	
PLAN.	CONTROLS FOR CONSTRUCTION OF THE CHANNELS SHOULD BE INSTALLED AS SPECIFIED IN THE EROSION AND SEDIMENT		ı	
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TRANSCO SWM NARRATIVE

I. PROJECT DESCRIPTION

THE TRANSCO INTERCONNECT SITE (PROJECT) IS PART OF THE MOUNTAIN VALLEY PIPELINE PROJECT, WHICH EXTENDS FROM WETZEL COUNTY, WEST VIRGINIA TO PITTSYLVANIA COUNTY, VIRGINIA. THE PROJECT SITE IS LOCATED IN PITTSYLVANIA COUNTY, JUST SOUTH OF S.R. 692 (TRANSCO ROAD) IN TRANSCO VILLAGE. EXISTING GROUND COVER WITHIN THE PROJECT'S 39.45-ACRE LIMIT OF DISTURBANCE (LOD) IS PRIMARILY FOREST, BUT THERE IS SOME EXISTING DEVELOPMENT INCLUDING A GRAVEL DRIVEWAY, A DIRT TRAIL, AND AN ABANDONED HOUSE. SOILS WITHIN THE PROJECT'S LOD ARE MOSTLY HYDROLOGIC SOIL GROUP (HSG) B WITH EXCEPTION TO A SMALL AREA TO THE SOUTHEAST WHICH IS MADE UP OF HSG D SOILS. SLOPES WITHIN THE PROJECT'S LOD ARE GENERALLY BETWEEN 0% AND 10%, AND THERE ARE NO STREAMS OR WETLANDS LOCATED WITHIN THE LOD.

THE PROJECT SITE WILL INCLUDE BOTH PERMANENT DEVELOPMENT AND TEMPORARY DEVELOPMENT:

PERMANENT DEVELOPMENT

PERMANENT DEVELOPMENT WITHIN THE PROJECT SITE INCLUDES A NEWLY CONSTRUCTED 20-FEET WIDE PERMANENT GRAVEL ACCESS ROAD (MVP-PI-343.01) AND A 310-FEET BY 295-FEET GRAVEL PAD AREA; A SECOND PERMANENT GRAVEL ACCESS ROAD THAT SPLITS OFF FROM MVP-PI-343.01 AND EXTENDS BEYOND THE PROJECT SITE (MVP-PI-343) IS ALSO PROPOSED. A PORTION OF THE SPREAD 11 PIPELINE IS ALSO WITHIN THE PROJECT LOD; THE PERMANENT PIPELINE RIGHT-OF-WAY (ROW) WILL BE 50-FEET WIDE.

TEMPORARY DEVELOPMENT

TEMPORARY DEVELOPMENT WITHIN THE PROJECT SITE INCLUDES A TEMPORARY PAD AND ACCESS ROAD THAT WILL BE USED FOR APPROXIMATELY TEN (10) WEEKS DURING THE CONSTRUCTION OF THE PERMANENT INTERCONNECT PAD AND GAS PIPING ON THE PAD, AS WELL AS A TEMPORARY MATERIAL STORAGE AREA AND AN ADDITIONAL TEMPORARY WORK SPACE (ATWS) THAT WILL BE USED FOR APPROXIMATELY NINE (9) MONTHS DURING CONSTRUCTION OF THE PIPELINE. TEMPORARY GRAVEL WILL BE PLACED OVER THE FULL EXTENT OF THE TEMPORARY PAD AND ACCESS ROAD, AND A LARGE PORTION OF THE TEMPORARY MATERIAL STORAGE AREA AND ATWS. BOTH THE TEMPORARY PAD/ACCESS ROAD AND TEMPORARY MATERIAL STORAGE AREA WILL BE RESTORED TO APPROXIMATE ORIGINAL CONDITIONS (APPROXIMATE PRE-EXISTING CONTOURS AND PRE-EXISTING LAND USE) FOLLOWING CONSTRUCTION OF THE INTERCONNECT PAD FACILITIES AND PIPELINE, RESPECTIVELY.

II. TRANSCO ANALYSIS

STORMWATER RUNOFF CONSIDERATIONS ASSOCIATED WITH TEMPORARY DEVELOPMENT ARE DISCUSSED IN DETAIL IN THE ESC NARRATIVE. THIS NARRATIVE PROVIDES DETAILED INFORMATION ON HOW THE PROPOSED STORMWATER MANAGEMENT METHODOLOGY FOR PERMANENT DEVELOPMENT IS IN FULL COMPLIANCE WITH VIRGINIA STATE REGULATIONS.

D. WATER QUALITY

THE TRANSCO-INTERCONNECT SITE CONTAINS EXISTING IMPERVIOUS COVER, MOST OF WHICH WILL REMAIN OR BE SLIGHTLY MODIFIED IN THE POST-CONSTRUCTION CONDITION AND CAN THEREFORE BE CLASSIFIED AS RE-DEVELOPMENT. THE TRANSCO-INTERCONNECT SITE CROSSES TWO (2) 6TH ORDER, OR HUC 12, BOUNDARIES: 030101050104 AND 030101050203. LAND USE TOTAL ACREAGE FOR EACH 6TH ORDER BOUNDARY IS AS FOLLOWS:

Land Cover	Α	В	С	D	Totals
Forest/Open Space (ROW)	0.00	23.51	0.00	0.27	23.78
Managed Turf	0.00	1.86	0.00	0.00	1.86
Ag Lands	0.00	0.00	0.00	0.00	0.00
Ex. Impervious Cover	0.00	0.78	0.00	0.05	0.83
New Impervious Cover	0.00	3.40	0.00	0.02	3.42
	0.00	29.55	0.00	0.34	29.89
			0.00	0.34	25.0
Land Cover	030101050203				
Land Cover Forest/Open Space (ROW)			C 0.00	D 0.00	Totals
Land Cover Forest/Open Space (ROW) Managed Turf	030101050203 A	В	С	D	
Forest/Open Space (ROW)	030101050203 A 0.00	B 8.54	C 0.00	D 0.00	Totals 8.54 0.29
Forest/Open Space (ROW) Managed Turf	030101050203 A 0.00 0.00	B 8.54 0.29	C 0.00 0.00	D 0.00 0.00	Totals
Forest/Open Space (ROW) Managed Turf Ag Lands	030101050203 A 0.00 0.00 0.00	B 8.54 0.29 0.00	C 0.00 0.00	D 0.00 0.00	Totals 8.5 0.2

VRRM CALCULATIONS SHOW THAT THE LOW PHOSPHORUS LOADING IN THE PRE- AND POST-CONSTRUCTION FORESTED AREAS OFFSET LOADING INCREASES FROM NEW IMPERVIOUS COVER, PER SECTION III.D.I. WATER QUALITY ABOVE. VRRM SITE DATA TABS FOR EACH OF THE TWO TRANSCO SITE 6TH ORDER BOUNDARIES ARE PROVIDED IN THE TRANSCO SITE PHOSPHORUS LOADING EXHIBIT.

	To	otal Phosp	horus Lo	ading [lk	o/yr]
Land Cover	Α	В	С	D	Totals
Forest/Open Space (ROW)	0.00	1.68	0.00	0.03	1.72
Managed Turf	0.00	0.89	0.00	0.00	0.89
Ag Lands	N/A	N/A	N/A	N/A	N/A
Ex. Impervious Cover	0.00	1.75	0.00	0.12	1.87
New Impervious Cover	0.00	7.72	0.00	0.05	7.78
	0.00	12.04	0.00	0.20	12.25
	0.00		0.00	0.20	12.25
	0301010				
Land Cover	0301010	050203			
Land Cover Forest/Open Space (ROW)	0301010 To	050203 otal Phosp	horus Lo	oading [Ik	o/yr]
	0301010 To	050203 otal Phosp B	horus Lo	p ading []k	o/yr] Totals
Forest/Open Space (ROW) Managed Turf	0301010 To A	050203 otal Phosp B 0.61	horus Lo	pading [lk D	o/yr] Totals 0.61
Forest/Open Space (ROW)	0301010 To A 0.00 0.00	050203 otal Phosp B 0.61 0.14	c C 0.00 0.00	D 0.00	o/yr] Totals 0.61 0.14
Forest/Open Space (ROW) Managed Turf Ag Lands	0301010 A 0.00 0.00 N/A	D50203 Dtal Phosp B 0.61 0.14 N/A	0.00 0.00 N/A	D 0.00 0.00 N/A	7 Totals 0.61 0.14 N/A

THIS FURTHER ANALYSIS SUPPORTED THE CONCLUSION THAT TOTAL PHOSPHORUS LOADING DOES NOT EXCEED THE 0.41 LB TP/AC/YR MAXIMUM WITHIN EACH 6TH ORDER BOUNDARY.

	Transco S	iite	
			TP Load*
6th Order	Area	TP Load	(lb
HUC 12	[ac]	[lb TP/yr]	TP/ac/yr]
Total LOD	39.45	14.65	0.37
030101050104 LOD	29.89	12.25	0.41
030101050203 LOD	9.56	2.40	0.25
*Cannot exceed 0.41 II	TP/ac/yr, o	r other reduct	ion
measures are required			

E. WATER QUANTITY

STORMWATER ANALYSIS AND BMP DESIGNS WERE PERFORMED TO ENSURE THAT VIRGINIA STATE REGULATION 9VAC25-870-66 HAS BEEN SATISFIED, SPECIFICALLY:

- 1. CONCENTRATED STORMWATER DISCHARGES THAT ARE RELEASED INTO A NATURAL OR MANMADE STORMWATER CONVEYANCE SYSTEM WILL BE IN COMPLIANCE WITH 9VAC25-870-66.B (CHANNEL PROTECTION) AND 9VAC25-870-66.C (FLOOD PROTECTION).
- 2. IF THERE IS NOT A DEFINED RECEIVING CHANNEL, IT WILL BE DEMONSTRATED THAT EITHER EXISTING SHEET FLOW CONDITIONS ARE MAINTAINED FOLLOWING CONSTRUCTION OR THAT THE PROPOSED OUTLET STRUCTURE RE-DISTRIBUTES DISCHARGE FOR THE 10-YEAR STORM AS SHEET FLOW; A SHEET FLOW DISCHARGE CONDITION FOR A PROPOSED OUTLET STRUCTURE (I.E., SPILLWAY, LEVEL SPREADER, PLUNGE POOL, RIPRAP APRON, ETC.) IS DEFINED AS ≤ 0.1-FT OF HEAD ON THE OUTLET STRUCTURE. INCREASED VOLUMES OF SHEET FLOW WILL BE EVALUATED IN ACCORDANCE WITH 9VAC25-870-66.D.

SINCE PERMANENT GRAVEL ACCESS ROAD MVP-PI-343 EXTENDS BEYOND THE PROJECT SITE, WATER QUANTITY REQUIREMENTS FOR MVP-PI-343 ARE ADDRESSED AS PART OF SPREAD 11; REFER TO THE SPREAD 11 SWM NARRATIVE FOR MORE INFORMATION. THIS SWM NARRATIVE AND THE CORRESPONDING TRANSCO CALCULATION REPORT (PROVIDED SEPARATELY) FOCUS ON STORMWATER MANAGEMENT FOR THE PERMANENT GRAVEL PAD TO ENSURE THAT THE APPLICABLE WATER QUANTITY REQUIREMENTS ARE SATISFIED.

i. SITE RUNOFF ANALYSIS

THE HYDROLOGY AND HYDRAULICS (H&H) ANALYSIS WAS PERFORMED IN ACCORDANCE WITH TR-55, URBAN HYDROLOGY FOR SMALL WATERSHEDS. THE TR-55 CALCULATIONS WERE MODELED USING THE AUTOCAD CIVIL 3D HYDRAFLOW EXTENSION.

THE PROJECT SITE IS LOCATED ON BOTH SIDES OF THE DRAINAGE DIVIDE SEPARATING THE HUC 030101050104 (CHERRYSTONE CREEK) AND HUC 030101050203 (SHOCKOE CREEK - BANISTER RIVER) WATERSHEDS. RUNOFF FROM THE SITE IS RELEASED TO A ROADSIDE DITCH THAT PARALLELS TRANSCO ROAD TO THE NORTH (DRAINAGE AREA DA-A), AN EXISTING NETWORK OF STREAMS TO THE SOUTH AND WEST (DRAINAGE AREA DA-C). THESE DRAINAGE AREAS WERE DIVIDED INTO MULTIPLE SUB-DRAINAGE AREAS TO EVALUATE THE EFFECTS ON EACH OF THESE EXISTING FEATURES FOLLOWING CONSTRUCTION. SPECIFICALLY, THE PROJECT SITE WAS SUB-DIVIDED INTO EIGHT SUB-DRAINAGE AREAS: DA-A1, DA-A2, DA-B1, DA-B2, DA-B3, DA-B4, DA-B5, AND DA-C. REFER TO THE *TRANSCO CALCULATION REPORT*, PROVIDED SEPARATELY, FOR DRAINAGE AREA MAPS AND MORE INFORMATION PERTAINING TO THE STORMWATER ANALYSIS SUMMARIZED IN THE FOLLOWING SECTIONS.

ii. CONCENTRATED DISCHARGES TO STORMWATER CONVEYANCE SYSTEMS

CONCENTRATED STORMWATER DISCHARGE FROM DA-A1 AND DA-A2 IS RELEASED TO A MANMADE STORMWATER CONVEYANCE SYSTEM (EXISTING DITCHLINE THAT PARALLELS TRANSCO ROAD), AND CONCENTRATED STORMWATER DISCHARGE FROM DA-B4 AND DA-B5 IS RELEASED TO A NATURAL CONVEYANCE SYSTEM (STREAMS S-KL18 AND S-H45, RESPECTIVELY). THESE SUB-DRAINAGE AREAS WERE EVALUATED IN ACCORDANCE WITH 9VAC25-870-66.B (CHANNEL PROTECTION) AND 9VAC25-870-66.C (FLOOD PROTECTION) OF THE VIRGINIA STATE REGULATIONS.

iii. SHEET FLOW

EXISTING SHEET FLOW CONDITIONS IN DA-B1, DA-B2, DA-B3 AND DA-C ARE MAINTAINED FOLLOWING CONSTRUCTION SINCE THE EXISTING LAND USE AND TOPOGRAPHIC CONDITIONS ARE EITHER BEING MAINTAINED DURING OR RESTORED FOLLOWING CONSTRUCTION.

LEVEL SPREADERS LS-1 AND LS-3 WERE DESIGNED AT THE OUTLET OF PROPOSED CULVERTS CC-5 AND CC-6, RESPECTIVELY, SINCE THEY DO NOT DISCHARGE DIRECTLY TO A CHANNEL; A LEVEL SPREADER (LS-2) WAS ALSO DESIGNED AT THE OUTLET OF CHANNEL CH-H IN DA-B4 SINCE THE EXISTING GEOMETRY OF THE BROAD SWALE IS NOT CLEARLY DEFINED AT THE POINT OF DISCHARGE. FOR DA-B5, THERE IS MINIMAL FLOW THROUGH THE RISER BARREL DURING THE 10-YEAR EVENT FOR THE POST-CONSTRUCTION CONDITION SO IT WAS DEMONSTRATED THAT THE PROPOSED RIPRAP APRON PROVIDES NON-EROSIVE SHEETFLOW OFFSITE AS AN ALTERNATIVE TO MEETING THE 9VAC25-870-66.B REQUIREMENT SINCE ZERO DISCHARGE FROM THE OUTLET STRUCTURE IS NEEDED IN ORDER TO SATISFY THAT REQUIREMENT; PER 9VAC25-870-66.D, INCREASED VOLUMES OF SHEETFLOW ARE ALLOWABLE AS LONG AS IT DOES NOT IMPACT DOWNGRADIENT PROPERTIES OR RESOURCES, AND A DOWNSTREAM POINT OF INTEREST ALONG STREAM S-H45 (I.E., DA-B5 POI; SEE TABLE 1) HAS BEEN EVALUATED TO DEMONSTRATE COMPLIANCE WITH THE CHANNEL PROTECTION (9VAC25-870-66.B) AND FLOOD PROTECTION (9VAC25-870-66.C) REQUIREMENTS.

iv.WATER QUANTITY BMPS

STORMWATER QUANTITY FOR THE 20-FEET WIDE PERMANENT GRAVEL ACCESS ROAD (MVP-PI-343.01) IS CONTROLLED/MANAGED VIA VEGETATED STORMWATER CONVEYANCE CHANNELS WITH ROCK CHECK DAMS TO PROVIDE STORMWATER DETENTION. STORMWATER QUANTITY FOR THE 310-FEET BY 295-FEET GRAVEL PAD AREA IS CONTROLLED/MANAGED VIA A PERMANENT STORMWATER POND. THESE STORMWATER QUANTITY BMPS WERE MODELED IN HYDRAFLOW AS RESERVOIRS.

BASED ON THE RESULTS PRESENTED IN THE SUMMARY TABLES BELOW, THE PROJECT SATISFIES THE APPLICABLE VIRGINIA STATE STORMWATER QUANTITY REGULATIONS.

			Wat	er Quantity S	ummary Tal	ole				
Point of			1-Year			2-Year			10-Year	ı
Interest (POI)	Type of Discharge	Pre- Peak Flow (cfs)	Post- Peak Flow (cfs)	Flow Differential		Post- Peak Flow (cfs)	Flow Differential	Pre- Peak Flow (cfs)	Post- Peak Flow (cfs)	Flow Differential
1	Concentrated to									
DA-A POI	Manmade Conveyance System	1.092	0.585	-0.507	4.768	3.695	-1.073	22.090	18.300	-3.790
¹ DA-A LOD Outlet POI	Concentrated to Manmade Conveyance System	0.346	0.204	-0.142	1.402	1.264	-0.138	6.115	5.746	-0.369
¹ DA-B4 POI	Concentrated to Natural Conveyance System	0.455	0.353	-0.102	1.810	1.767	-0.043	8.503	8.419	-0.084
^{1, 2} DA-B4 LOD Outlet POI	Concentrated to Natural Conveyance System	0.357	0.356	-0.001	1.443	1.575	0.132	6.798	7.768	0.970
¹ DA-B5 POI	Concentrated to Natural Conveyance System	0.110	0.088	-0.022	0.543	0.443	-0.100	2.858	2.765	-0.093

¹Energy Balance requirements are satisfied. Refer to the *Transco Calculation Report*, provided separately, for calculations.

²Level Spreader LS-2 has been sized at Outlet CH-H in DA-B4 to ensure non-erosive sheet flow up to the 10-year event since the geometry of the existing broad swale is not clearly defined at the point of discharge, and a downstream point of interest along Stream S-KL18 ("DA-B4 POI" above) was evaluated to demonstrate compliance with 9VAC25-870-66.B (Channel Protection) and 9VAC25-870-66.C (Flood Protection).

Level Spreader Schedule

Q	10-Year Design Flow (cfs)	Level Spreader Length (ft)	Level Spreader Lip (Vegetate d or Rigid)
LS-1	1.15	12	Rigid
LS-2	7.77	82	Rigid
LS-3	1.71	18	Rigid

C. PROPOSED CULVERTS

PROPOSED RELIEF CULVERTS ALONG THE PERMANENT ACCESS ROAD (MVP-PI-343.01) WERE SIZED TO SAFELY CONVEY THE 10-YEAR 24-HOUR DESIGN FLOW, AND OUTLET PROTECTION WAS DESIGNED IN ACCORDANCE WITH VESCH STD & SPEC 3.18. REFER TO THE TRANSCO CALCULATION REPORT, PROVIDED SEPARATELY, FOR MORE INFORMATION PERTAINING TO THE DESIGN CALCULATIONS. A SCHEDULE SUMMARIZING THE CULVERT DESIGNS IS PROVIDED BELOW.

			Та	ble 3 - Ditch Re	elief Culvert Sc	hedule		
<u>Culvert No.</u>	<u>Drainage</u> <u>Area (ac)</u>	10-Year Design Flow (cfs)	<u>Culvert</u> <u>Diameter</u> (in)	Culvert Length (ft)	Invert Elevation at Inlet (ft) ²	Invert Elevation at Outlet(ft) ²	<u>Culvert</u> <u>Slope</u>	<u>Culvert Material</u>
CC-1	6.27	5.75	24	130	654.3	653.3	0.8%	CPP or Approved Equal
CC-2	2.10	3.29	18	131	657.4	656.1	1.0%	CPP or Approved Equal
CC-3	0.80	1.44	18	110	658.0	654.0	3.6%	CPP or Approved Equal
CC-4 (Temporary)	2.90	4.73	18	179	653.8	650.0	2.1%	CPP or Approved Equal
CC-5	0.86	1.17	18	88	663.2	661.7	1.7%	CPP or Approved Equal
CC-6	1.31	1.71	18	98	658.1	657.5	0.6%	CPP or Approved Equal

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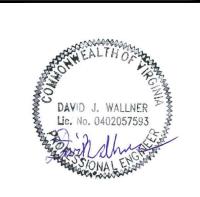
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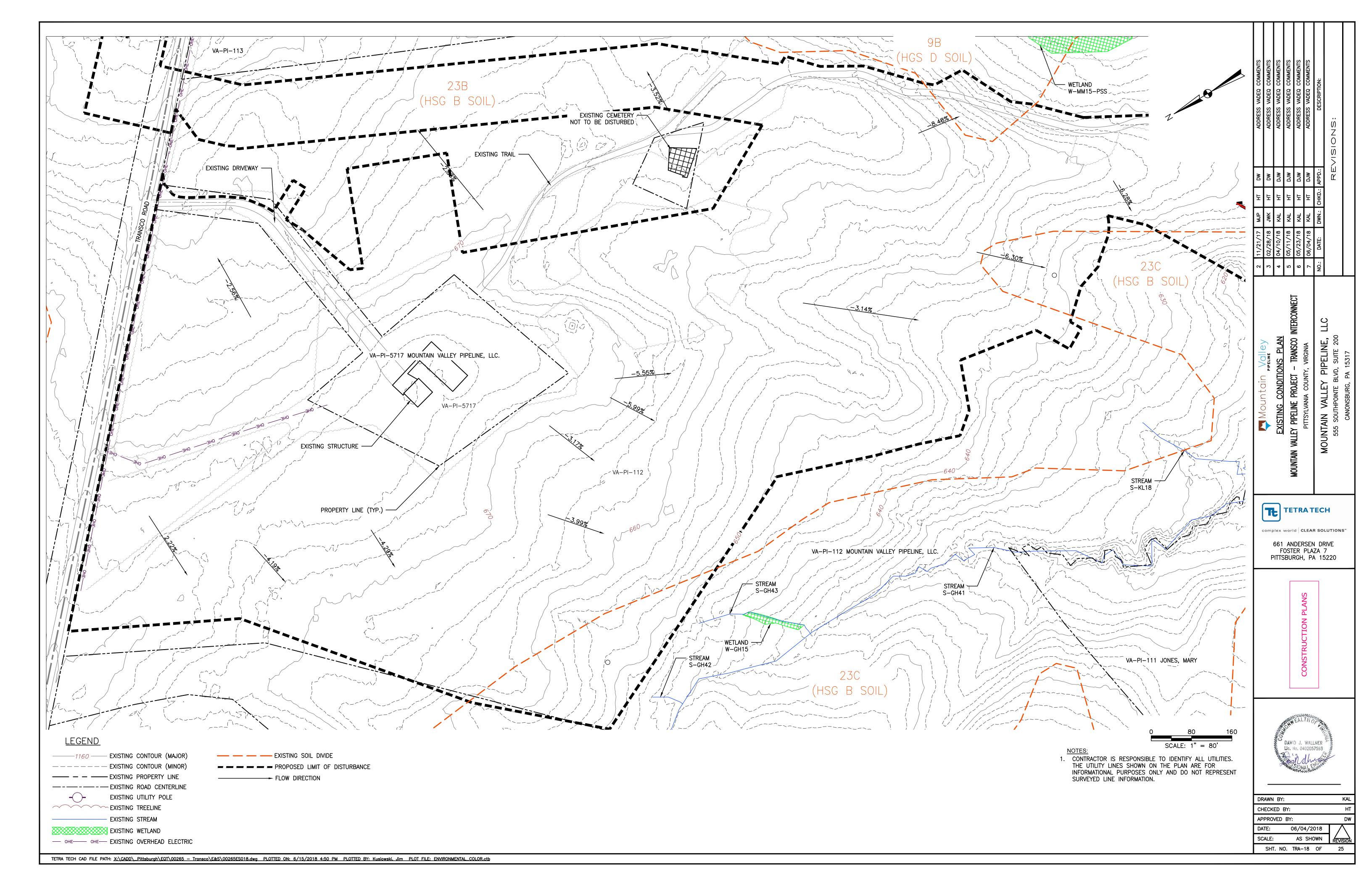
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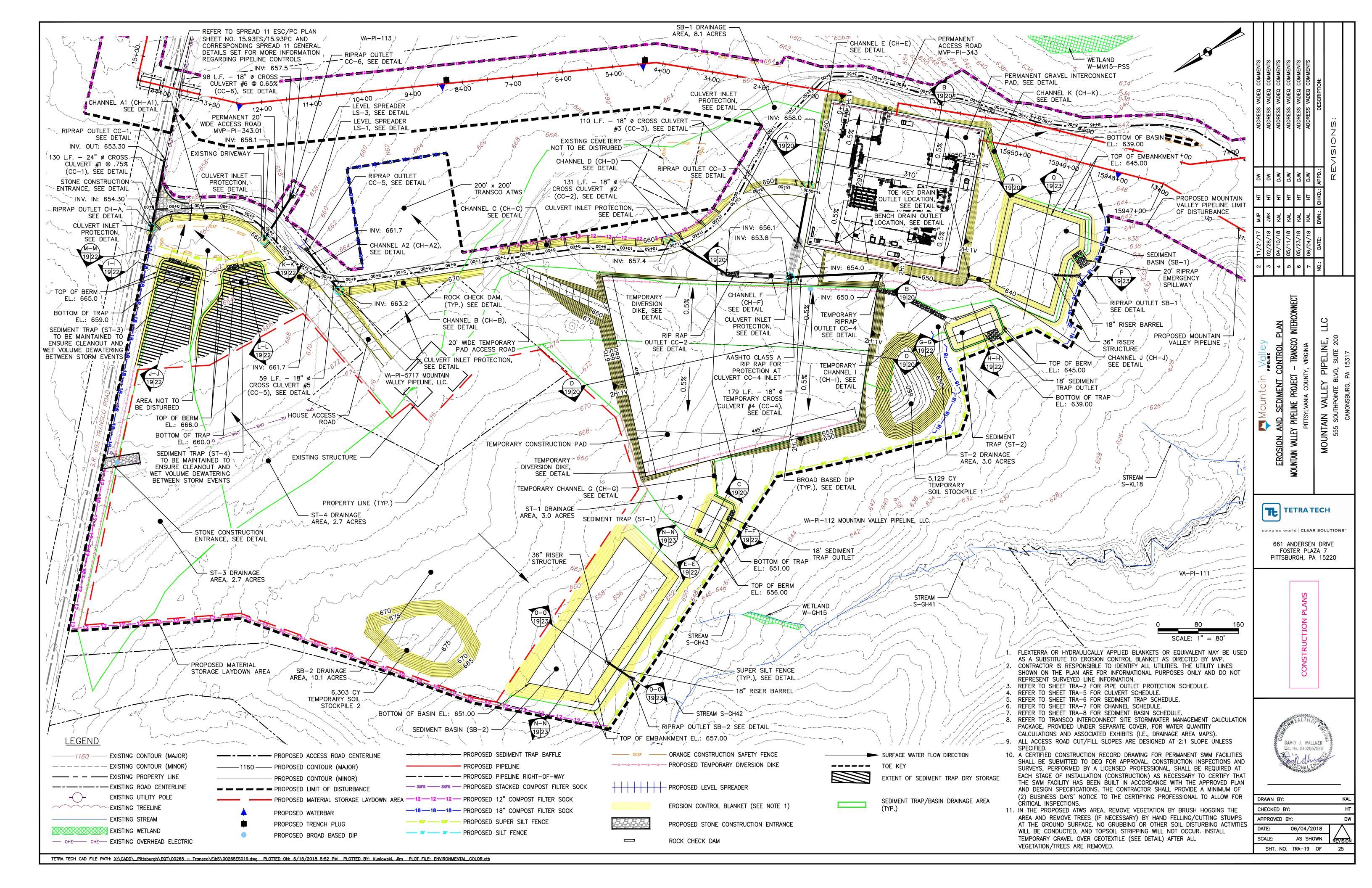
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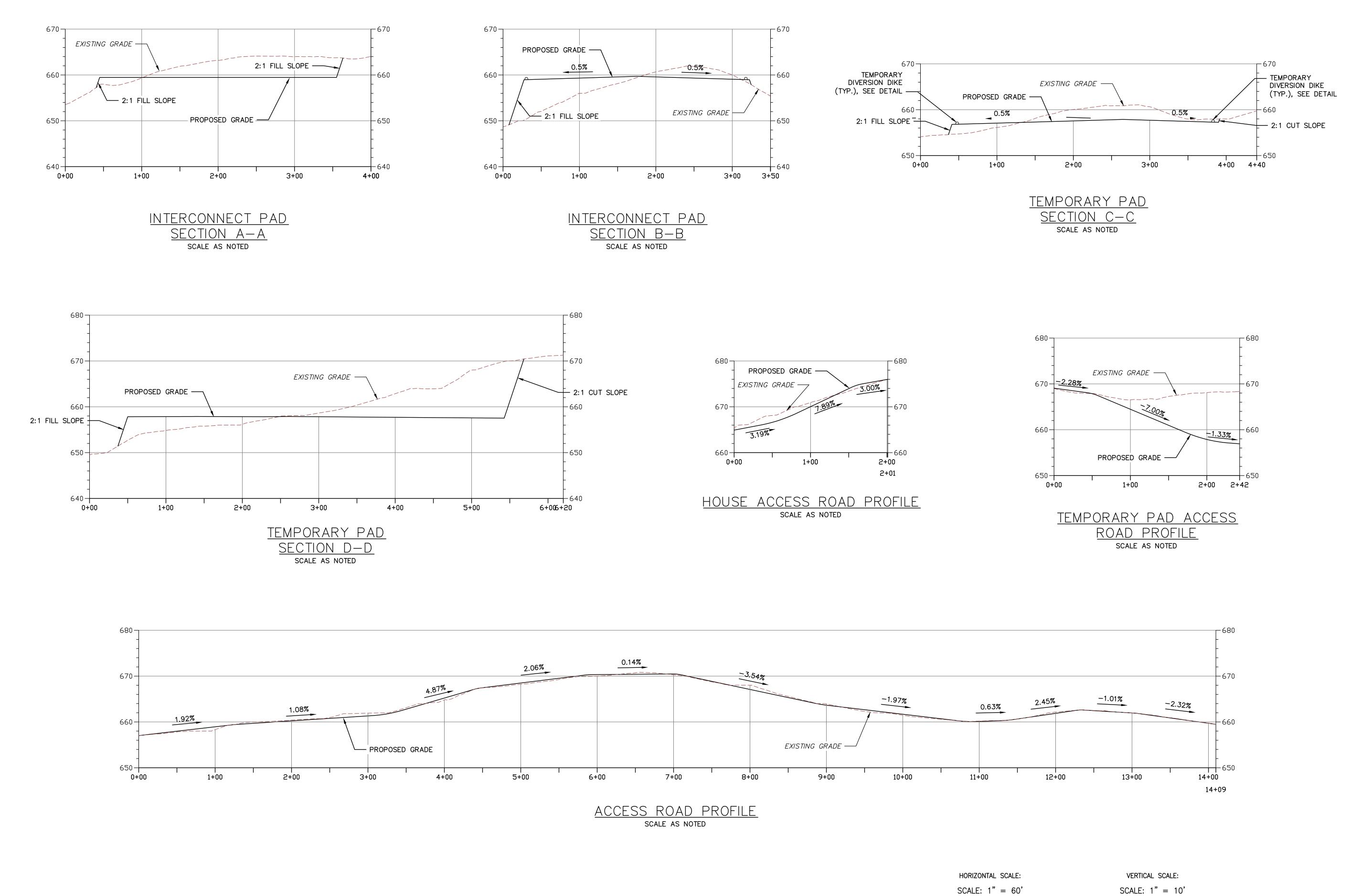
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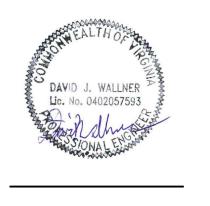


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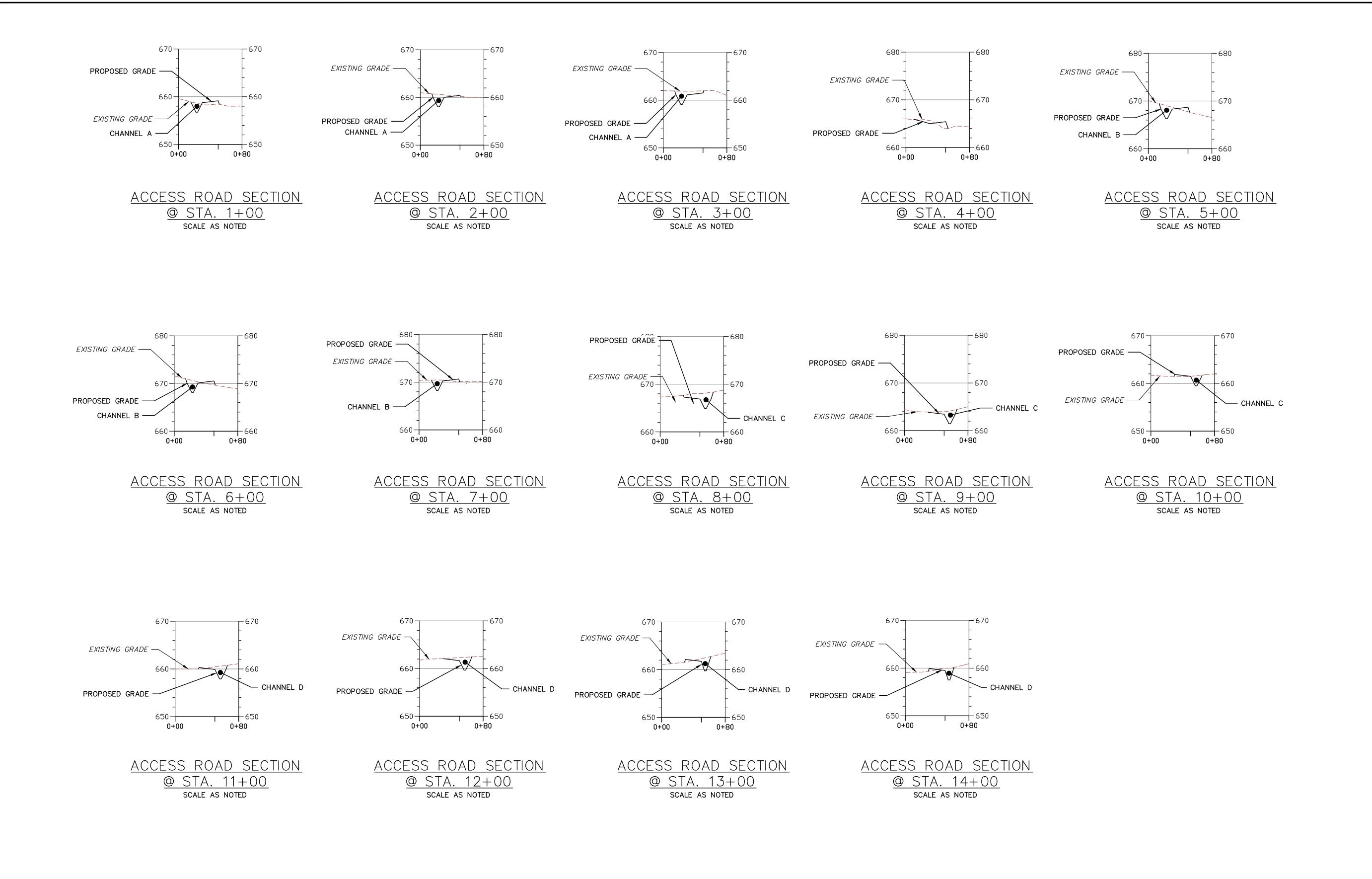
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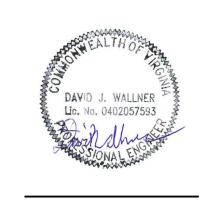
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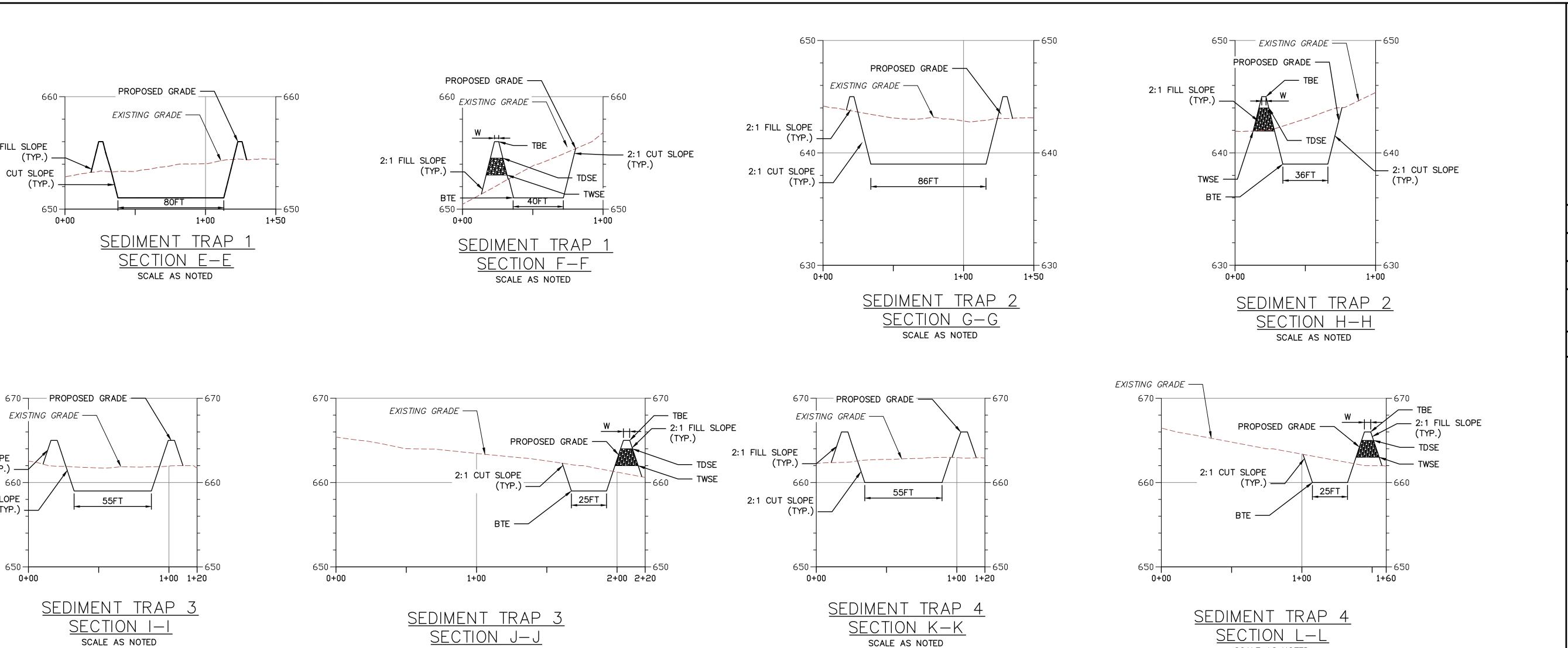


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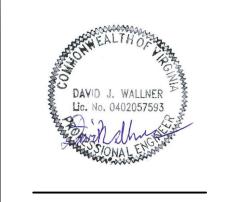


PROFILES AND SEC

SCALE AS NOTED

PIPELINE, LLC
LVD, SUITE 200

MOUNTAIN VALLEY
555 SOUTHPOINTE BI



DIVAMIN DI.			NA.
CHECKED E	BY:		Н
APPROVED	BY:		DJ
DATE:	06/04/2	2018	
SCALE:	AS SH	IOWN	REVISIO
SHT. NO). TRA-22	OF	25

PROPOSED GRADE -EXISTING GRADE -2:1 FILL SLOPE (TYP.) —

660-

2:1 FILL SLOPE

2:1 FILL SLOPE

650 —

0+00

(TYP.)

2:1 CUT SLOPE (TYP.) -

2:1 CUT SLOPE

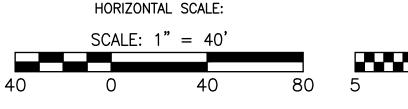
(TYP.)

(TYP.)

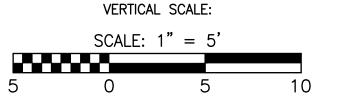
SEDIMENT TRAP 3 & 4 SECTION M-M

1+00

						SEDI	MENT TRAI	Р					
		es)	W	ET STORAG	Ε	D	RY STORAC	SE .	[ھ ر	<u>ا</u> ۾	.) .
	Trap #	Drainage Area (Acre	Volumed Required (Cu. Yd.)	Volume Provided (Cu. Yd.)	Elevation	Volumed Required (Cu. Yd.)	Volume Provided (Cu. Yd.)	Elevation	Outlet Length (F	Bottom Elevatior	Top of Berm Elevation	Top of Bel Width	Dimension L x W (Ft.
S	ST-1	2.91	195	340	653.00	195	238	655.00	18	651.00	656.00	3	80x40
5	ST-2	2.85	191	288	642.00	191	370	644.00	18	639.00	645.00	4.5	86x36
5	ST-3	2.70	181	247	662.00	181	441	664.00	18	659.00	665.00	4.5	55x25
9	ST-4	2.70	181	242	663.00	181	453	665.00	18	660.00	666.00	4.5	55x25

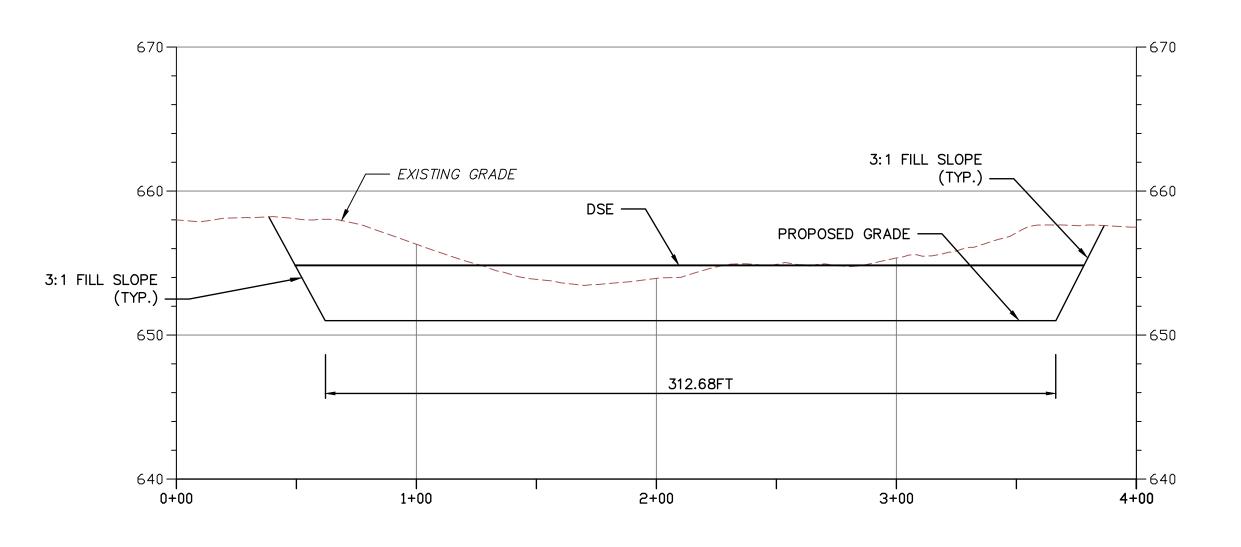


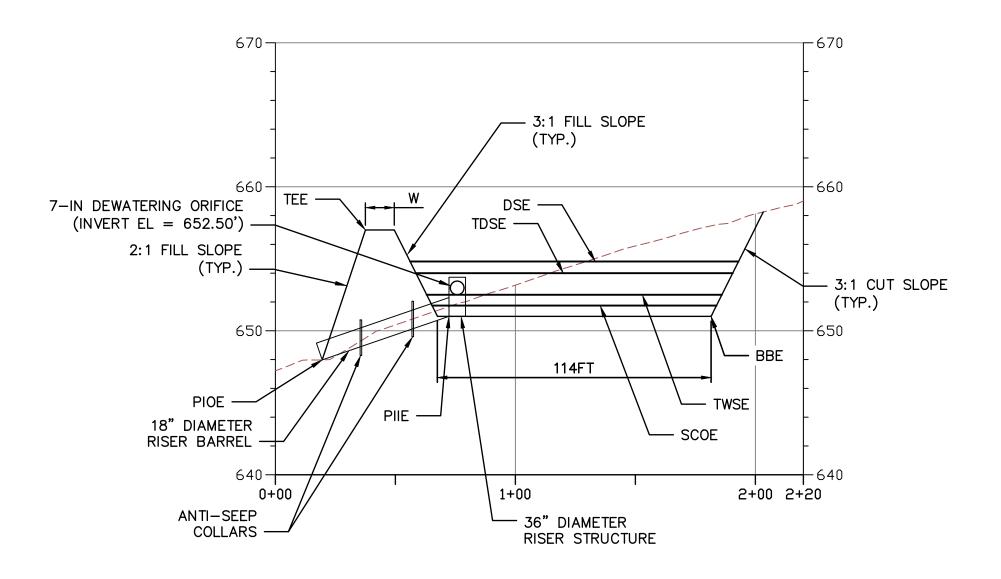
SCALE AS NOTED



2+00

2+40

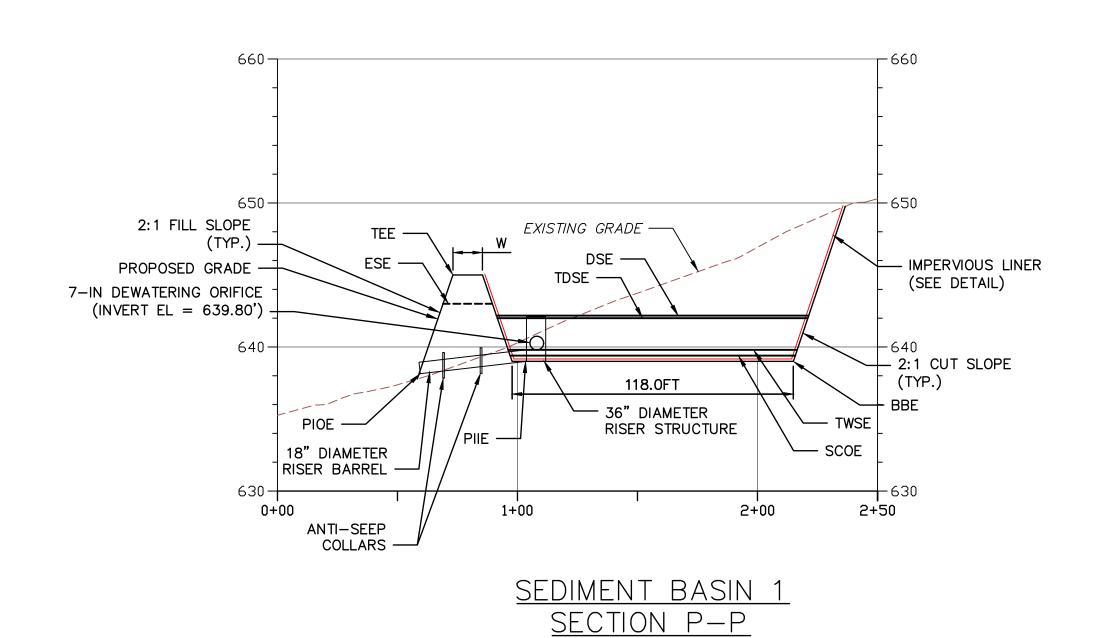


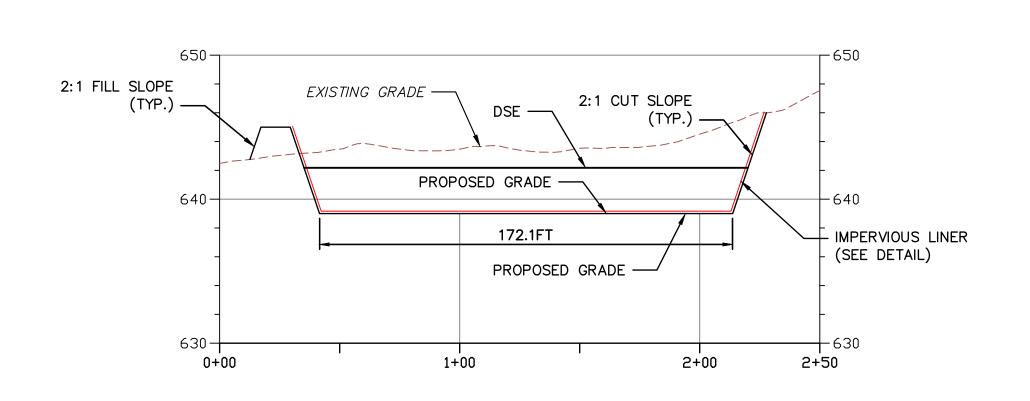


SEDIMENT BASIN 2
SECTION 0-0
SCALE AS NOTED



SCALE AS NOTED

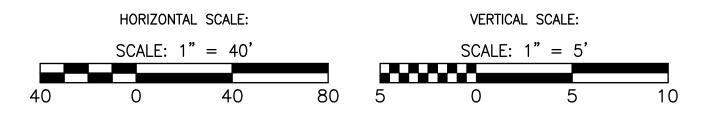




SEDIMENT BASIN 1
SECTION Q-Q
SCALE AS NOTED

												TRA	NSCO SEDIME	ENT BASINS											
Basin #	Drainage Area (Acres)	Volumed Required A	Volume Provided (Cu. Yd.)	Volumed Required (Cu. Yd.)	Volume Provided (Cu. Yd.)	Bottom of Basin Elevation BBE	Top Of Dry Storage Elevation	Riser Diameter RD (In.)	Top of Wet Storage Elevation TWSE	Sediment Clean-Out Elevation SCOE	Dewatering Orifice Diameter	25-Yr Design Storm Elevation DSE	Emergency Spillway Elevation ESE	Anti-Vortex Device Diameter AVDD (In.)	Top of Embankmen t Elevation TEE	Top of Embankmen t Width W (Ft.)	Flow Length to Width Ratio	Baffle Barrel Ba	Top of Baffle Elevation	Pipe Length PL (Ft.)	Pipe Diameter PD (In.)	Pipe Invert In Elevation PIIE	Invert Out Elevation PIOE	Number of Anti Seep Collars	Size of Anti Seep Collars (Ft.)
SB-	1 7.72	517	548	517	1721	639.00	642.00	36	639.80	639.40	7	642.18	643.00	54	645.00	6	2.25:1	60	642.50	40	18	639.00	638.15	2	5.5
SB-	2 10.08	675	2090	675	2316	651.00	654.00	36	652.50	651.75	7	654.81	N/A	54	657.00	6	2.25:1	115	658.50	40	18	651.00	647.90	2	5.5

SEDIMENT BASIN SCHEDULE



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000000	DAVID J. WALLNER Lic. No. 0402057593	
Z	STONAL ENGINEER	

TETRATECH

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661 ANDERSEN DRIVE FOSTER PLAZA 7 PITTSBURGH, PA 15220

CHECKED BY:

APPROVED BY:

DATE:

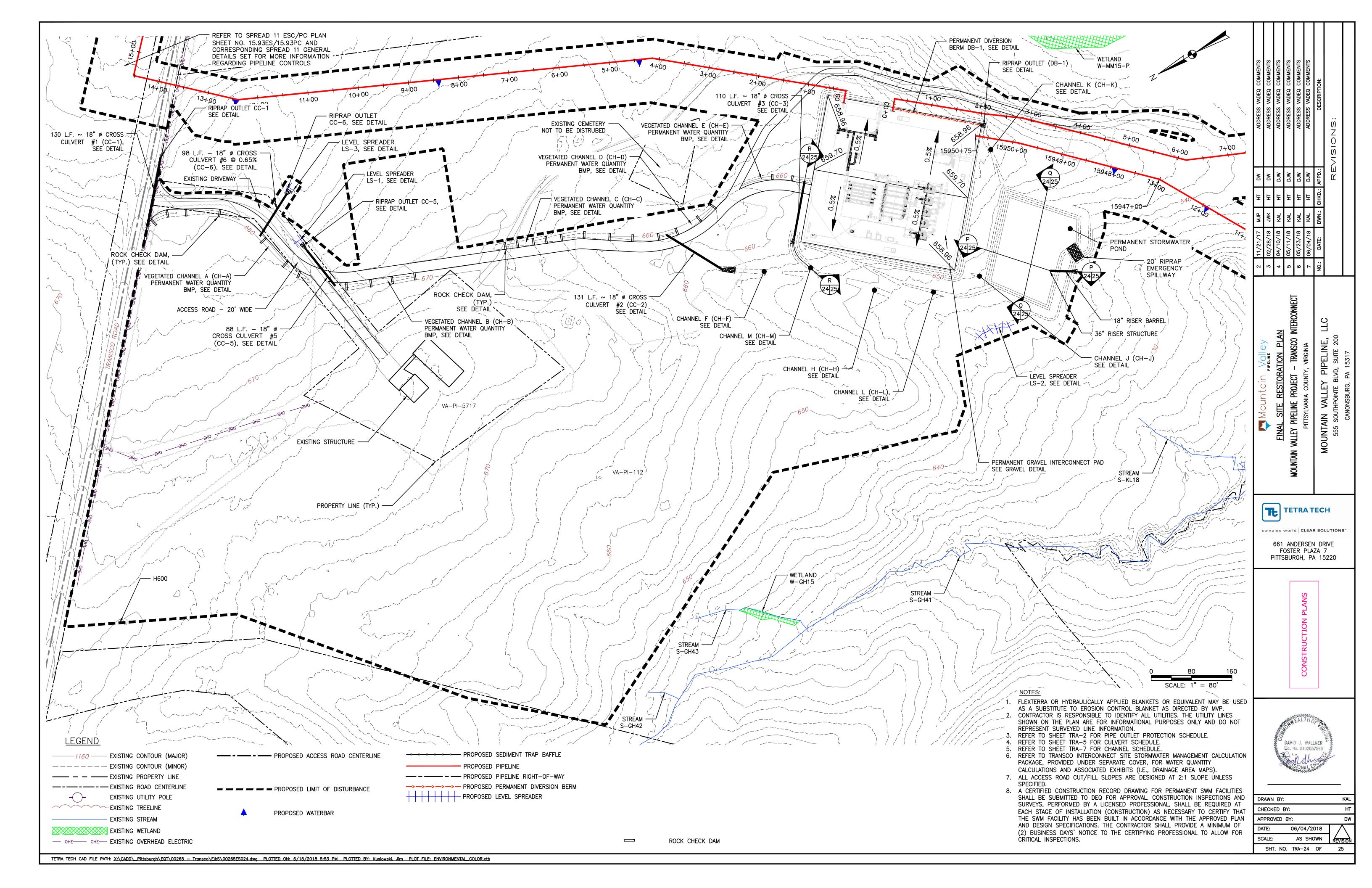
06/04/2018

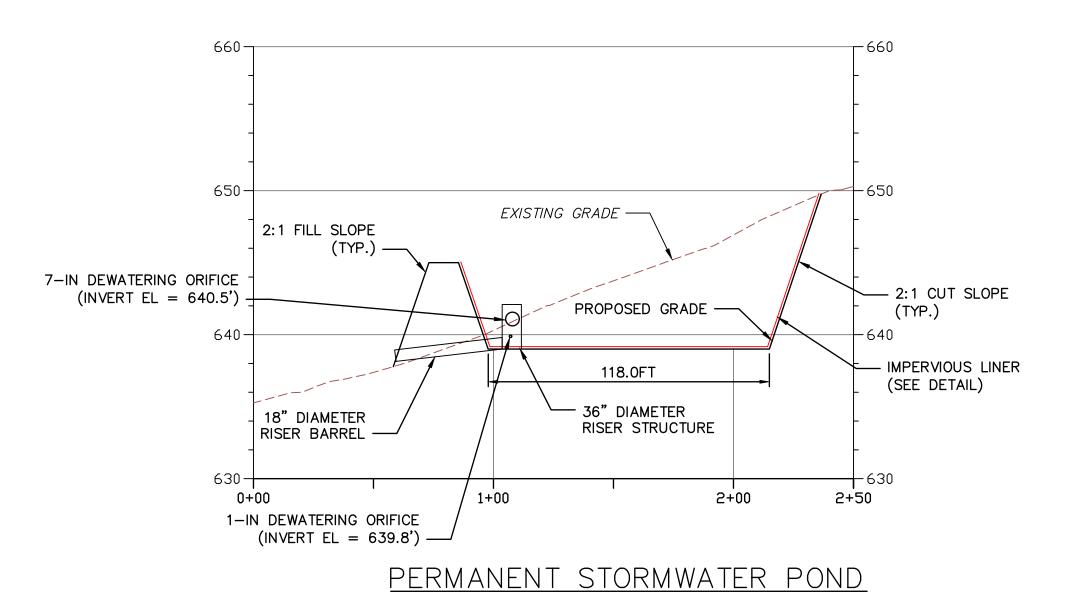
SCALE:

AS SHOWN

SHT. NO. TRA-23 OF 25

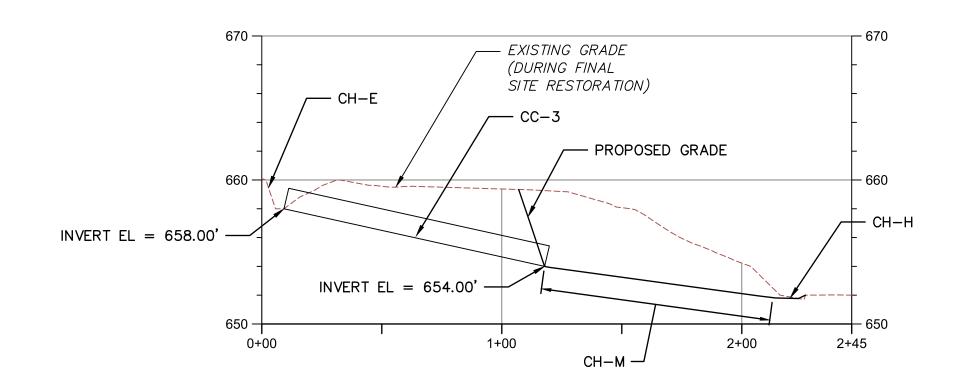
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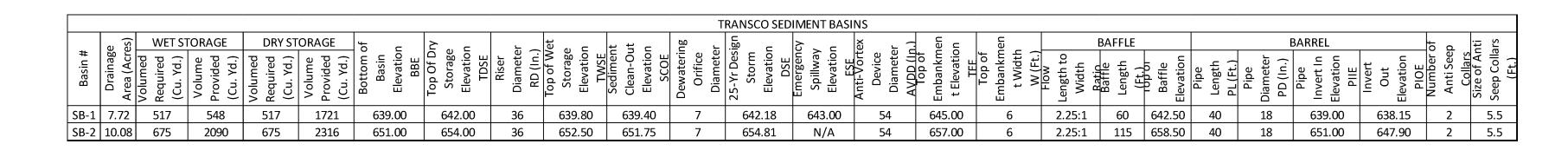


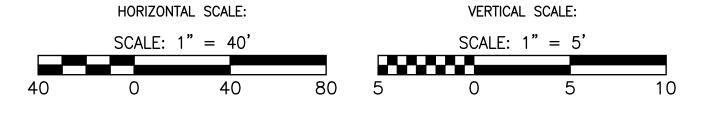
SECTION P-P SCALE AS NOTED

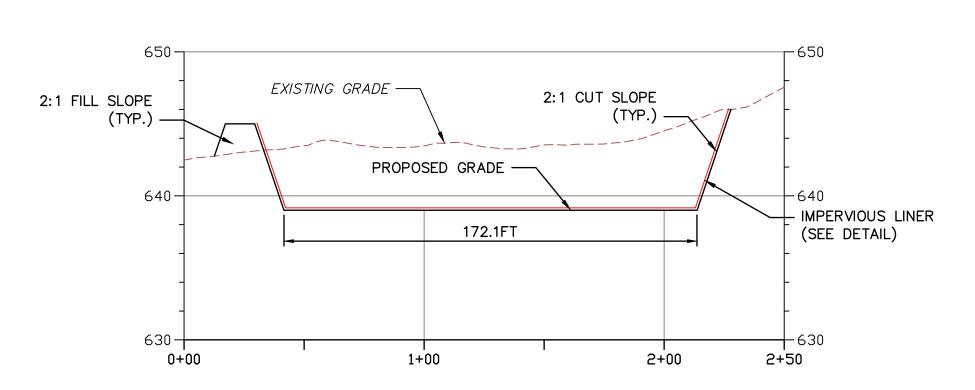
DURING RESTORATION, THE SEDIMENT BASIN DEWATERING ORIFICE AT EL. 639.80'
WILL BE PLUGGED AND A NEW 1-IN ORIFICE AND 7-IN ORIFICE WILL BE INSTALLED AS SPECIFIED
ABOVE TO SATISFY STORMWATER CONTROL REQUIREMENTS.



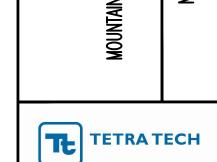
SCALE AS NOTED





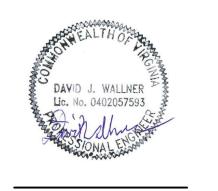


PERMANENT STORMWATER POND SECTION Q-Q SCALE AS NOTED



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PITTSBURGH, PA 15220



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