Site Restoration and Post-Construction Stormwater Management Plan

Pennsylvania Pipeline Project - South Central Region: Spreads 3, 4, 5

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Prepared for:
Sunoco Logistics, L.P.
525 Fritztown Road
Sinking Spring, PA 19608

Prepared by:
Tetra Tech, Inc.
661 Andersen Drive
Pittsburgh, PA 15220

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LIST OF ACRONYMS

ACRONYM	MEANING
ABACT	Antidegradation Best Available Combination of Technologies
BMP	Best Management Practice
E&SC	Erosion and Sediment Control
HDD	Horizontal directional drilling
HDPE	High-density polyethylene
HQ	High quality
NGL	Natural gas liquids
PADEP	Pennsylvania Department of Environmental Protection
PASDA	Pennsylvania Spatial Data Access
PCSM	Post-Construction Stormwater Management
ROW	Right of way
SR	Site Restoration
TSF	Trout stock fisheries
Tt	Tetra Tech, Inc.
UNT	Unnamed tributary
WWF	Warm water fisheries

1.0 INTRODUCTION

Tetra Tech, Inc. (Tt) has prepared this Site Restoration and Post-Construction Stormwater Management (PCSM) Plan (Plan) for Sunoco Pipeline, L.P. (SPLP) – Pennsylvania Pipeline Project, South Central Region: Spreads 3, 4, and 5. The Plan addresses activities associated with the Sunoco Pennsylvania Pipeline Project (SPPP) installation. Spreads 3, 4, and 5 (South Central Region) of this project are located in Blair, Huntingdon, Juniata, Perry, Cumberland, York, Dauphin, Lebanon, Lancaster, and Berks Counties, Pennsylvania (PA). A site location map is provided in Attachment 1. The site restoration portion of the Plan will ensure prompt and effective stabilization of the pipeline right of way, associated workspaces, temporary access roads, and vegetated block valve sites following pipeline construction, and the PCSM portion of the Plan will manage stormwater runoff from the permanent impervious aboveground facilities (block valve sites) and permanent access roads associated with the project.

2.0 SITE DESCRIPTION

Sunoco Pipeline, L.P. (SPLP) proposes to construct and operate the Pennsylvania Pipeline Project that would expand existing pipeline systems to provide natural gas liquid (NGL). The project involves the installation of approximately two parallel pipelines within a 306.8-mile, 50-foot-wide right-of-way (ROW) from Houston, Washington County, Pennsylvania (PA) to SPLP's Marcus Hook facility in Delaware County, PA with the purpose of interconnecting with existing SPLP Mariner East pipelines. A 20-inch diameter pipeline would be installed within the ROW from Houston to Marcus Hook (306.8 miles) and a second, 16-inch diameter pipeline, will also be installed in the same ROW. The second line is proposed to be installed from SPLP's Delmont Station, Westmoreland County, PA to the Marcus Hook facility, paralleling the initial line for approximately 255.8 miles. The majority of the new ROW will be co-located adjacent to existing utility corridors, including approximately 230 miles of pipeline that will be co-located in the existing SPLP Mariner East pipeline system. The 20-inch pipeline will be installed first, followed by the 16-inch line. Both pipelines will be installed within the same limit of disturbance (LOD) and in the same construction period. This Plan specifically relates to impacts associated with the South Central Region, Construction Spreads 3, 4, and 5.

Fifty feet will be maintained as permanent ROW. In addition, temporary use areas or extra workspaces will be required at some stream and road/railroad crossings; these will typically expand the construction ROW by 25 feet where needed. Construction activities will involve tree removal, clearing and grubbing within the ROW, trenching, pipe installation, and site restoration. The total LOD in the South Central Region will be approximately 1,692 acres. Acres disturbed by county will be as follows: Blair County with 230 acres disturbed, Huntingdon County with 270 acres disturbed, Juniata County with 31 acres disturbed, Perry County with 118 acres disturbed, Cumberland County with 306 acres disturbed, York County with 69 acres disturbed, Dauphin County with 131 acres disturbed, Lebanon County with 223 acres disturbed, Lancaster County with 75 acres disturbed, and Berks County with 239 acres disturbed.

Past and present land use of the project area and surrounding area is agricultural and forested land. Future land use will be a maintained vegetated natural gas pipeline ROW and agricultural land and forested land. Relevant topographic features including streams, streets, pipelines, structures, utility lines, fences, paving and other significant items along the gas line alignment are indicated on the plans, where applicable.

Twenty nine block valves are required to operate the pipeline for the PADEP Southcentral Region portion of the PPP project. Below is a summary table of the twenty nine block valves that will be constructed or co-located at an existing block valve with a proposed expansion.

Table 1
Block Valve And Station Summary Table

Block valve/Station	Co-located or New	County	Township	Receiving water	Designated Use	Existing use	Impairments	PCSM Required?
Valley Forge Road	New	Blair	Juniata	Trib 16353 to Dry Run	WWF	-	TMDL- Metals, pH, Organic Enrichment/ Low D.O.	Yes
Charger Highway	New	Blair	Blair	Trib 16332 to Beaverdam Breach	WWF	-	TMDL- Metals, pH, Organic Enrichment/ Low D.O.	Yes
Locke Mountain Road	New	Blair	Frankstown	Trib 16298 to Robinson Run	WWF	-	None	Yes
Juniata Valley Road	New – no impervious proposed	Blair	Frankstown	UNT to Frankstown Branch Juniata River	WWF	-	Industrial Point Source – Suspended Solids	No
High Street	New	Blair	Woodbury	Trib 16213 to Piney Creek	HQ-CWF	-	None	Yes
Raystown Road	New – no impervious proposed	Huntingdon	Penn	Trib 13451 to James Creek	WWF	-	None	No
Seven Points Loop	New – no impervious proposed	Huntingdon	Penn	Trib 13404 to Raystown Branch Juniata River	WWF	-	None	No
Happy Hills Road	New – no impervious proposed	Huntingdon	Union	Trib 13585 of Little Trough Creek	TSF	-	None	No
Hares Valley Road	New – no impervious proposed	Huntingdon	Union	Trib 13276 To Hares Valley Creek	TSF	-	None	No
Shade Valley Road	Co-located	Huntingdon	Tell	George Creek	CWF	-	None	Yes
Doylesburg	New	Perry	Toboyne	Sherman Creek	HQ-CWF	-	None	Yes (1)
Blue Mountain	Existing no change in footprint	Cumberland	Lower Mifflin	Doubling Gap Creek	HQ-CWF	-	None	No
Plainfield	Existing no change in footprint	Cumberland	Lower Frankford	UNT to Opossum Creek	HQ-TSF	-	None	No
Creek Road	New	Cumberland	North Middletown	Conodoguinet Creek	WWF	-	None	Yes

Table 1
Block Valve And Station Summary Table

Block valve/Station	Co-located or New	County	Township	Receiving water	Designated Use	Existing use	Impairments	PCSM Required?
Wolf Bridge Road	New – no impervious proposed	Cumberland	Middlesex	Conodoguinet Creek	WWF	-	None	No
W. Trindle Road	New – no impervious proposed	Cumberland	Silver Spring	Trindle Spring Run	CWF	-	Agriculture – Siltation, Construction – Siltation, Urban Runoff/Storm Sewers - Cause Unknown	No
Arcona Road	New – no impervious proposed	Cumberland	Lower Allen	Trib 63068 to Cedar Run	CWF	-	Source Unknown - Pathogens, Agriculture – Nutrients, Agriculture – Siltation, Agriculture - Other Habitat Alterations	No
Old York Road	Co-located – no additional impervious proposed	York	Fairview	Trib 10114 to Marsh Run	WWF	-	None	No
White House Lane	Existing no change in footprint	Dauphin	Lower Swatara	Susquehanna River	WWF	-	None	No
N. Union Street	New – no impervious proposed	Dauphin	Lower Swatara/ Middletown	UNT to Swatara Creek	WWF	-	None	No
Gates Road	Co-located	Dauphin	Conewago	UNT to Spring Creek	WWF	-	Source Unknown - Pathogens, Agriculture - Organic Enrichment/Low D.O., Agriculture - Siltation	Yes
Cornwall	Existing co-located	Lebanon	West Cornwall	Beck Creek	TSF	-	Agriculture – Nutrients; TMDL- Nutrients, Siltation, Organic	No (2)

Table 1
Block Valve And Station Summary Table

Block valve/Station	Co-located or New	County	Township	Receiving water	Designated Use	Existing use	Impairments	PCSM Required?
							Enrichment/Low D.O., Suspended Soilds	
Schaeffer Road	New – no impervious proposed	Lebanon	South Lebanon	UNT to Quittapahilla Creek	TSF	-	Pathogens, Urban Runoff/Storm Sewers, Bank Modifications, Other Habitat Alterations; TMDL-Nutrients; Siltation; Organic Enrichment/Low D.O.	No
Sinclair Road	New – no impervious proposed	Lebanon	Heidelberg	Trib 07680 to Hammer Creek	CWF	-	Agriculture-Siltation; Source Unknown-Pathogens	No
Hopeland Road	Co-located – no impervious proposed	Lebanon	Heidelberg	Middle Creek	WWF	-	Source Unknown-Pathogens	No
Blainsport	Existing no change in footprint	Lancaster	West Cocalico	UNT to Harnish Run	WWF	-	Habitat Modification-Other Habitat Alterations	No
Montello	Co-located – no impervious proposed	Berks	Spring	UNT to Cacoosing Creek	CWF	-	Source Unknown-Pathogens	No
Wyomissing Road	New – no impervious proposed	Berks	Cumru	Wyomissing Creek	HQ-CWF	-	Source Unknown-Pathogens; TMDL- Cause Unknown; Siltation	No
Morgantown Road	New – no impervious proposed	Berks	New Morgan	Hay Creek	EV	-	Source Unknown - Pathogens	No

(1) The Doylesburg Pump Station PCSM reports are provided separately. See Volume V, Tab 7 Sections 7.A, 7.B, and 7.C.
(2) The Cornwall block valve is located at the existing ME1 Cornwall pump station with runoff captured by the existing site PCSM BMPs.

2.1 TOPOGRAPHY

The work zone is located on ground of varying elevations. Site elevations vary from 285 feet (Susquehanna River) to 2,251 feet (approximately 8,250 feet along centerline from the western border of Blair County) above mean sea level based on the Pennsylvania Spatial Data Access (PASDA). The construction plans show the topography of the site and the surrounding area.

2.2 GEOLOGY AND SOILS

The soils and geologic formations surrounding the site are shown on the figures provided in Attachment 2. Attachment 2 also provides soil descriptions and properties of the soils found at the site. In general, the following actions will be taken to counteract soil limitations:

1. Erodible Soils - Prompt stabilization practices will be implemented to minimize the risk of erosion. PCSM facilities have been designed to minimize point-source discharges which increase the likelihood of downstream erosion.

2. Cut Banks Caves - Almost all Pennsylvania soils are susceptible to caving of cut banks. Cut slopes will be stabilized as soon as possible with seed and mulch to prevent sliding. Slopes are designed to not exceed 2H:1V.

3. Corrosive to Concrete or Steel Pipe - Pipes to be used on site shall be either HDPE or coated steel.

4. High Water Table - A seasonal high groundwater determination was conducted at the proposed block valve sites. PCSM facilities that infiltrate have been designed to maintain a 20" separation from the seasonal high groundwater table.

5. Low Strength - Most of Pennsylvania soils (73%) have relatively low strength. Precautions will be taken to prevent slope failures due to improper construction practices. Soils will be evaluated during construction of block valve sites and PCSM facilities to determine whether additional measures will need to be taken.

6. Piping Tendencies -Piping is the erosion by percolating waters or seepage in layer of subsoil resulting in caving and the formation of tunnels or pipes thorough which the soluble or granular material is removed. Where necessary, anti-seep collars will be used to prevent piping.

7. Poor Topsoil -Soil amendments will be added to site soils to promote vegetative growth.

8. Potentially Hydric -A wetland delineation has been performed to determine the presence of wetlands.

9. Potential Sinkhole - Should a sinkhole be encountered during construction, repair should be done under the direct observation and supervision of a professional geologist or licensed geotechnical engineer. Site specific sinkhole repairs should be developed on a case by case basis. Block valves located within karst

topography have been identified, and infiltration practices have been designed to minimize the risk of sinkholes.

To prevent sediment from leaving the site, stabilization practices will be implemented in disturbed areas as soon as practical. Geologic formations or soil conditions that may have the potential to cause pollution after earth disturbance were not observed during field activities. Infiltration tests were performed and results evaluated for the design of the proposed post construction stormwater BMP's.

2.3 SURFACE WATER HYDROLOGY

The SPPP area surface water runoff drains to surface waters and unnamed tributaries (UNT's) designated as high quality (HQ), warm water fisheries (WWF), exceptional value (EV), cold water fisheries (CWF), and trout stock fisheries (TSF) under Pa. Code 25 Chapter 93. Descriptions of the Primary Receiving Waters can be found in Table 1.

The plan contains Antidegradation Best Available Combination of Technologies (ABACT) BMPs to maintain the designated use of the receiving waters and prevent additional siltation from polluting the streams. The locations of the receiving waters relative to the project area can be seen on the USGS location map in Attachment 1.

3.0 SITE RESTORATION PRACTICES

Section 3.0 addresses restoration of the mainline pipeline, temporary workspaces, temporary access roads, and vegetated block valve sites. Following completion of pipeline installation and trench backfilling, the pipeline right of way, associated workspaces, and temporary access roads shall be returned to the general grade present prior to pipeline installation in order to maintain preconstruction drainage patterns. After completion of major construction work, topsoil that was stockpiled during construction will be placed along the ROW. Grounds disturbed by any of the operations necessary to complete the work for this project are to be permanently seeded, or if specified, sodded, unless occupied by structures, paved or designated as a permanent access road. Disturbed areas, which are at final grade, shall be seeded and mulched once final grades are achieved. The permanent seed mixture will restore disturbed areas to a meadow in good condition or better. If seeding cannot be completed within a four (4) day period due to weather conditions, the disturbed area will be mulched with straw at the rate of three (3) tons per acre. This straw will be anchored using a method described in Section 3.4.

Site restoration will be accomplished in several ways, depending on the site conditions:

Co-located valve sites at existing valve or station locations or those with no new impervious area – 4 (Blue Mountain, Plainfield, Blainsport, White House Lane) will be restored to the existing gravel condition, in accordance with 102.8g(2)(ii) and 102.8g(3)(iii).

Co-located valves where PCSM is covered by ME1 PCSM BMPs – The Cornwall valve site is being constructed at the existing pump station where runoff is captured by existing station BMPs. The Doylesburg valve site is being constructed at the existing Doyleburg ME1 pump station. The site restoration and PCSM is addressed with the station and is a separate report found in Section 7 of the permit application.

Valve sites with no impervious area (vegetated cover) – 16

Juniata Valley	Hares Valley	Old York Road	Hopeland
Raystown Road	Wolf Bridge	N. Union	Montello
Seven Points Loop	W. Trindle	Schaeffer	Wyomissing Road
Happy Hills	Arcona	Sinclair Road	Morgantown Road

Valve sites with new impervious area that require PCSM BMPs – 7

Valley Forge Road	Locke Mountain Road	Shade Valley Road	Gates Road
Charger Highway	High Street	Creek Road	

Block valves are typically surfaced with compacted gravel to provide a clean and a mud-free work area to facilitate inspection and access while minimizing maintenance costs. However, at the vegetated block valve locations listed above, right-of-way constraints preclude installation of stormwater BMPs which are needed if a compacted gravel work surface is installed. At these locations, in lieu of a compacted gravel surface, a vegetated surface will be established to return the site to meadow condition or better. At the remaining block valves (except the co-located valves), traditional gravel areas and PCSM BMPs will be installed because there is space available to install and they are preferred for site maintenance.

In order to prevent compaction of the ground surface and provide structural support for vehicles at the vegetated valve sites, Geoweb cellular confinement will be used to reinforce the topsoil layer and minimize rutting due to the occasional maintenance truck. Geoweb is manufactured by Presto Geosystems and is a 3-Dimensional structure made up of interconnected cells that confines the cellular fill and controls shearing, lateral and vertical movement.

If the subgrade is compacted from pipeline construction, it will be scarified prior to Geoweb installation per the procedures outlined below. Geoweb will be installed over a stabilization geotextile on the subgrade. The Geoweb cells will be filled with a mix of topsoil and aggregate to ensure the soil media can support a vegetative ground cover. The use of this topsoil/aggregate mix in a ratio of two-thirds aggregate (AASTHO #57) and one-third screened topsoil was selected based on the manufacturer's recommendation for load support combined with infiltration (see Attachment 7). AASHTO #57 is an open graded permeable aggregate with a void ratio of approximately 35-40 percent. At one-third of the mixture, the percentage of topsoil in the infill mix closely approximates the void ratio of the aggregate so that the aggregate supports the vehicular loads when confined in the Geoweb cells while the topsoil supports vegetation growth and permits infiltration.

The seeding will establish ground cover of a meadow condition or better, in accordance with Section 3.1. As a result of establishing ground cover of a meadow condition or better and because the aggregate, topsoil, Geoweb, and stabilization geotextile are all permeable, they will promote infiltration.

Once installed, Geoweb will help in preserving the subsoils in their decompacted state because the Geoweb will distribute vehicular loads and prevent rutting.

Access roads where Geoweb will be used have slopes up to approximately 20 percent. Manufacturer's recommendations as outlined in the attached letter from the manufacturer will be followed for anchoring the Geoweb (Attachment 7).

3.1 BMP DESCRIPTION AND CONSTRUCTION SEQUENCE

A generalized construction sequence is provided below. The construction sequence is intended to provide a general course of action to conform to the applicable regulatory agency requirements for site restoration and post-construction stormwater management of the site. Necessary steps for proper and

complete execution of work pertaining to this plan, whether specifically mentioned or not, are to be performed by the contractor. The contractor will comply with all requirements listed in this section. The contractor may be required to alter controls based on the effectiveness of controls or differing conditions encountered in the field. The appropriate county conservation district and DEP shall be contacted and must approve any deviation to the authorized plans.

A pre-construction meeting is required prior to the start of any construction activity. The Pennsylvania Department of Environmental Protection (PADEP) or applicable county conservation district, contractors, the landowner, appropriate municipal officials, and the plan preparer must be invited to this meeting at least 7 days in advance.

General Construction Sequence

1. Grade surface to finished grade elevations as soon as practicable following completion of pipe installation.

2. Surface roughening will be utilized to rough the soil surface with horizontal depressions for the purpose of reducing runoff velocity, increasing infiltration, aiding the establishment of vegetation, and reducing erosion. Surface roughening should be applied to slopes 3H:1V or steeper unless a stable rock face is provided or it can be shown that there is not a potential for sediment pollution to surface waters. For roughened surfaces within 50 feet of a surface water, and where blanketing of seeded areas is proposed as the means to achieving permanent stabilization, spray-on type blankets are recommended. Surface roughening shall be accomplished using dozers affixed with grouser tracked equipment. Dozers shall run up and down the slopes leaving horizontal grooves perpendicular to the slope. Dozer blades shall be raised and not used during surface roughening. Where compaction does occur, contractor shall scarify the soil or provide additional roughening such as deep ripping or chisel ripping to restore the area to a minimal compacted state. In areas of proposed infiltration, soils shall be amended to 2' below grade. See Soil Amendment and Restoration construction sequence below.

3. Place topsoil from topsoil stockpiles as the upper layer of backfill. Topsoil shall not be placed when the subgrade is frozen or when it is excessively wet or dry and shall not be handled when in a frozen or muddy condition.

4. Remove gravel and geotextile from the temporary access roads and scarify the soil. Refer to step 2 of this sequence to address compaction at access roads. After addressing compaction concerns, place topsoil that was stripped prior to installation of the access roads.

5. Immediately seed and mulch disturbed areas in accordance with the permanent seeding schedule once final grade is established and topsoil is placed.

6. Maintain erosion and sedimentation control devices until site work is complete and a uniform 70-percent perennial vegetative cover is established. Regrade and revegetate areas disturbed during the removal of the erosion and sediment controls.

Soil Amendment and Restoration Construction Sequence

1. Grade surface to finished grade elevations as soon as practicable following completion of pipe installation.
2. In the designated soil amendment area, till the ground and mix in the compost at a ratio of 2:1 (soil:compost) to a depth of 24 inches.
3. Immediately seed and mulch disturbed areas once final grade is established in accordance with the permanent seeding schedule.
4. Maintain erosion and sedimentation control devices until site work is complete and a uniform 70% perennial vegetative cover is established.

Geoweb Construction Sequence

1. Grade surface to subgrade elevations as soon as practicable following completion of pipe installation. Do not compact.
2. If needed, scarify the soil or provide additional roughening such as deep ripping or chisel ripping to restore the area to a minimal compacted state.
3. Install geotextile separation layer in accordance with manufacturer's recommendations.
4. Expand Geoweb to required dimensions and anchor edges with ATRA Anchors, if needed. Join adjacent sections with ATRA Keys.
5. Anchor Geoweb on slopes greater that 5% with 24" ATRA Anchors placed on a 3x8 cell pattern.
6. Mix and place engineered infill material (2/3 AASHTO #57 stone and 1/3 screened topsoil) into the Geoweb cells. Infill material shall be free-flowing and not frozen when placed in the Geoweb sections. Limit drop height to 3 feet to avoid damaging or displacement of the cell wall. Slightly overfill the cells and level off material once settlement is negligible. Do not compact.
7. Seed and mulch filled sections in accordance with the permanent seeding schedule once infill is placed.
8. Maintain erosion and sedimentation control devices until site work is complete and a uniform 70-percent perennial vegetative cover is established.

Permanent Seeding

Site preparation and establishment of permanent cover in areas other than lawns will be conducted according to the following guidelines:

SITE CONDITIONS	NURSE CROP	SEED MIXTURE (SELECT ONE MIXTURE)
SLOPES AND BANKS (NOT MOWED)		
WELL-DRAINED	1 PLUS	3, 5, 8, OR 12 (1)
VARIABLE DRAINAGE	1 PLUS	3 OR 7
SLOPES AND BANKS (MOWED)	1 PLUS	2 OR 10
WELL-DRAINED		
SLOPES AND BANKS (GRAZED/HAY)	1 PLUS	2,3, OR 13
WELL-DRAINED		
GULLIES AND ERODED AREAS	1 PLUS	3, 5, 7, OR 12 (1)
EROSION CONTROL FACILITIES (BMPS)		
SOD WATERWAYS, SPILLWAYS, FREQUENT WATER FLOW AREAS	1 PLUS	2, 3, OR 4
DRAINAGE DITCHES		
SHALLOW, LESS THAN THREE FEET DEEP	1 PLUS	2, 3, OR 4
DEEP, NOT MOWED	1 PLUS	5 OR 7
POND BANKS, DIKES, LEVEES, DAMS, DIVERSION CHANNELS, AND OCCASIONAL WATER FLOW AREAS		
MOWED AREAS	1 PLUS	2 OR 3
NON-MOWED AREAS	1 PLUS	5 OR 7
FOR HAY OR SILAGE ON DIVERSION CHANNELS AND OCCASIONAL WATER FLOW AREAS	1 PLUS	3 OR 13
HIGHWAYS		
NON-MOWED AREAS		
WELL-DRAINED	1 PLUS	5, 7, 8, OR 10
VARIABLE DRAINED	1 PLUS	3 OR 7
POORLY DRAINED	1 PLUS	3
AREAS MOWED SEVERAL TIMES PER YEAR	1 PLUS	2, 3, OR 10
UTILITY ROW		
WELL-DRAINED	1 PLUS	5, 8, OR 12 (1)
VARIABLE DRAINED	1 PLUS	3 OR 7
WELL-DRAINED AREAS FOR GRAZING/HAY	1 PLUS	2, 3, OR 13
EFFLUENT DISPOSAL AREAS	1 PLUS	3 OR 4
SANITARY LANDFILLS	1 PLUS	3, 5, 7, 11 (1), OR 12 (1)
SURFACE MINES		
SPOILS, MINE WASTES, FLY ASH, SLAG, SETTLING BASIN RESIDUES AND OTHER SEVERELY DISTURBED AREAS (LIME TO SOIL TEST)	1 PLUS	3, 4, 5, 7, 8, 11 (1) OR 12(1)
SEVERELY DISTURBED AREAS FOR GRAZING/HAY	1 PLUS	3 OR 13
LAWN	1 PLUS	PENNDOT Formula B

RECOMMENDED SEED MIXTURES			
MIXTURE NO.	**SPECIES**	**SEEDING RATES – PLS (1)**	
		MOST SITES	ADVERSE SITES (8)
1 (2)	spring oats (spring), or 64 96	64	96
	annual ryegrass (spring or fall), or	10	15
	winter wheat (fall), or	90	120
	winter rye (fall)	56	112
2 (3)	tall fescue, or 75	60	75
	fine fescue, or 40	35	40
	kentucky bluegrass, plus 25 30	25	30
	redtop(4), or	3	3

RECOMMENDED SEED MIXTURES			
MIXTURE NO.	**SPECIES**	**SEEDING RATES – PLS (1)**	
		MOST SITES	ADVERSE SITES (8)
	perennial ryegrass	15	20
3	birdsfoot trefoil, plus 6 10	6	10
	tall fescue	30	35
4	birdsfoot trefoil, plus	6	10
	reed canarygrass	10	15
5 (5)	Big Bluestem, plus	10	15
	tall fescue, or	20	25
	perennial ryegrass	20	25
6 (5,6)	Big Bluestem, plus	10	15
	annual ryegrass	20	25
7 (5)	birdsfoot trefoil, plus	20	30
	Big Bluestem, plus	20	30
	tall fescue	20	25
8	flatpea, plus	20	30
	tall fescue, or	20	30
	perennial ryegrass	20	25
9	Not applicable to project	N/A	N/A
10	tall fescue, plus	40	60
	fine fescue	10	15
11	deertongue, plus	15	20
	birdsfoot trefoil	6	10
12(7)	switchgrass, or	15	20
	big bluestem, plus	15	20
	birdsfoot trefoil	6	10
13	orchardgrass, or	20	30
	smooth bromegrass, plus	25	35
	birdsfoot trefoil	6	10

1. Pure live seed (pls) is the product of the percentage of pure seed times percentage germination divided by 100. For example, to secure the actual planting rate for switchgrass, divide 12 pounds pls shown on the seed tag. Thus, if the pls content of a given seed lot is 35 percent, divide 12 pls by 0.35 to obtain 34.3 pounds of seed required to plant one-acre. All mixtures in this table are shown in terms of pls.

2. If high-quality seed is used, for most sites seed spring oats at a rate of two bushels per acre, winter wheat at 11.5 bushels per acre, and winter rye at one bushel per acre. If germination is below 90 percent, increase these suggested seeding rates by 0.5 bushel per acre.

3. This mixture is suitable for frequent mowing. Do not cut shorter than 4 inches.

4. Keep seeding rate to that recommended in table. These species have many seeds per pound and are very competitive. To seed small quantities of small seeds such as weeping lovegrass and redtop, dilute with dry sawdust, sand, rice hulls, buckwheat hulls, etc.

5. Note not applicable because the project does not propose the use of Crownvetch.

6. Use for highway slopes and similar sites where the desired species after establishment is Big Bluestem.

7. Do not mow shorter than 9 to 10 inches.

8. If liming, fertilization, and preparation of seedbed are properly done and if care is taken to drill and cover the seed (or mulch applied), the rate for "most sites" should suffice. However, on eroded or coarse and poorly prepared seedbeds, particularly if the soil is very acidic or infertile, the rate for "adverse sites" should be used.

9. For seed mixtures 11 and 12, only use spring oats or weeping lovegrass (included in mix) as nurse crop.

In lawn areas, permanent cover will be established using the following PENNDOT seed mixture:

PENNDOT FORMULA B				
Seeding Rate	3 lbs. per 1,000 square feet			
Species	**% by Weight**	**Purity %**	**Minimum % Germination**	**Maximum % Weed Seed**
Kentucky Bluegrass	50	98	80	0.20
Perennial Rye	20	98	90	0.15
Red Fescue	30	98	85	0.15

Liming Rates

Minimum 6 tons per acre at 100% effective neutralizing value (% ENV), unless the soil test determines that a lesser amount is needed. To determine the actual amount of regular lime to apply, divide the amount called for by the soil test by the % ENV for the product used. For example, if 6 tons per acre is needed and the ENV for the lime used is 88%, divide 6 by 0.88 resulting in 6.8 tons needing to be applied. For dolomitic lime, which has a significant amount of magnesium in it, divide the amount called for by the soil test by the % calcium carbonate equivalent (% CCE) listed for the product instead of the % ENV. The % CCE may be above 100% which accounts for the fact that magnesium has a greater effect per pound than the calcium in regular lime. Note: When a soil test requires more than 8,000 pounds of lime per acre, the lime must be mixed into the top 6 inches of soil.

Fertilization Rates

Apply 10-20-20 at 600 pounds/acre, if top dressed or 1,000 pounds/ac, if incorporated, unless the soil test determines that the rate can be less than these minimums.

SOIL AMENDMENT APPLICATION RATE EQUIVALENTS				
Soil Amendment	Per Acre	Per 1,000 sq. ft.	Per 1,000 sq. yds.	
AGRICULTURAL LIME	6 TONS	240 LBS.	240 LBS.	or as per soil test; may not be required in agricultural fields
10-20-20 FERTILIZER	1,000 LBS.	25 LBS.	25 LBS.	or as per soil test; may not be required in agricultural fields

Temporary Seeding

Temporary grass cover will be established where soil stockpiles are exposed for a period greater than 4 days. The seed mixture for temporary cover will consist of 100% annual ryegrass. Seed will be applied at the rate of 40 pounds per acre or as recommended by a local recognized seed supplier approved by the Owner's representative. Prior to seeding, apply 1 ton of agricultural grade limestone per acre plus 10-10-10 fertilizer at the rate of 500 pounds per acre and work into the soil.

Mulching

The purpose of mulch is to reduce runoff and erosion, prevent surface compaction or crusting, conserve moisture, aid in establishing plant cover, and control weeds. Mulch will be applied on any area subject to erosion or that has unfavorable conditions for plant establishment and growth. The practice may be used alone or in conjunction with other structural and vegetative conservation practices such as waterways, ponds, sedimentation traps, or critical area planting. On sediment-producing areas where the period of exposure is less than two (2) months, mulch materials will be applied according to the following guidelines:

1. Straw mulch will be applied at the rate of 3 tons per acre. Chemically treated or salted straw is not acceptable as mulch.

2. Straw mulch will be anchored immediately after application by at least one of the following methods:

   A. "Crimped" into the soil using tractor-drawn equipment (straight-bladed coulter or similar).

      This method is limited to slopes no steeper than 3:1. Machinery should be operated on the contour. (Crimping of hay or straw by running it over with tracked machinery is not recommended.)

B. Asphalt, either emulsified or cut-back, containing no solvents or other diluting agents toxic to plant or animal life, uniformly applied at the rate of 31 gallons per 1,000 square feet.

C. Synthetic binders (chemical binders) may be used as recommended by the manufacturer to anchor mulch provided that sufficient documentation is provided to show that it is non-toxic to native plant and animal species.

D. Lightweight plastic, fiber, or paper nets may be stapled over the mulch according to the manufacturer's recommendations.

Mulched areas will be checked periodically and after each runoff event (e.g., rain, snowmelt, etc) for damage until the desired purpose of the mulching is achieved. Damaged portions of the mulch or tie-down material will be repaired upon discovery.

3.2 MATERIAL RECYCLING AND DISPOSAL

The operator will remove from the site, recycle, or dispose of all building materials and wastes in accordance with PADEP's solid waste management regulations at 25 Pennsylvania Code 260.1 et seq., 271.1 et seq., and 287.1 et seq. The contractor will not illegally bury, dump, or discharge building material or wastes at the site. Excess material brought into the site areas to facilitate construction access will be completely removed prior to rough grading and final surface stabilization. Expected construction wastes during site restoration will consist of packaging material and sediment cleaned from E&SC BMPs. Packaging from materials brought on site will be disposed of by a licensed hauler. Sediment removed from BMPs will either be spread in a protected area to dry and then recycled as fill material prior to permanent seeding or disposed of off-site. In cases where disposal is necessary, waste materials will be disposed of at an approved PADEP waste site.

3.3 THERMAL IMPACTS

Thermal impacts are most commonly associated with urbanization (i.e., increased impervious surfaces) that results in heated stormwater runoff flowing into receiving waters where it mixes, and potentially increases the base temperature of the surface water in streams. However, another contributing factor for stream temperature is solar exposure (radiant energy input) to the surface water, typically ponded, standing waters. The amount of heat transferred, and the degree of thermal pollution is of importance for fisheries management and the ecological integrity of receiving waters. Among the attributes that determine the contribution of solar energy to thermal impacts are the presence of riparian vegetation, as well as stream width, depth, flow regime (perennial, intermittent, ephemeral), and orientation.

Thermal impacts have been minimized by limiting the disturbed area to the maximum extent practicable. By minimizing the extent of the disturbed area, vegetative clearing, including forested areas, has been minimized. Vegetated block valve sites will be restored to a meadow in good condition or better, and no impervious surface

will be created at those sites. Following installation of the pipelines, existing grades along the pipeline right of way, additional temporary workspaces, and temporary access roads will be restored, permanent seeding will occur as soon as practicable to facilitate vegetative growth during germinating months, and the addition/creation of impervious surfaces in riparian areas has been avoided. By returning these areas to their existing grades, stormwater is unlikely to pond in these locations therefore minimizing the potential for ponded water to result in significant contributions to thermal impacts in receiving waters. In addition, thermal impacts will be minimized during site restoration by facilitating permanent seeding as soon as practicable to encourage vegetative growth. Although shade cover will be reduced in areas that were previously forested, there is no anticipated adverse effect to the receiving watersheds because the project will only clear a narrow corridor of vegetation within each respective watershed. The Project does not have thermal impacts. Specifically, thermal impacts will be avoided by implementing the following:

- Siting parallel to and overlapping with existing ROWs to minimize vegetation clearing at stream crossings;
- Reducing the construction ROW width and additional temporary workspaces at stream crossings;
- No grubbing, grading, or clearing of trees will occur within 50 feet of the top of stream bank until pipeline construction/installation is ready to proceed through that area.
- Restoring (seeding) disturbed areas/ROW as soon as practicable and /or directing runoff to vegetated areas to reduce the temperature of runoff prior to discharge into the streams; and,
- Restoring the stream banks and seeding/planting as soon as practicable to facilitate vegetative growth along the stream channel.

3.4 RIPARIAN FOREST BUFFERS

Pennsylvania Pipeline Project - Riparian Forest Buffer Waiver Request

The Pennsylvania Pipeline Project qualifies for an exception of the riparian forest buffer requirement under Chapter 102.14(d)(1)(ix) for areas within the Chapter 105 permit area. Existing riparian forest buffers within the project area are identified on the E&S plan drawings in Attachment 2 of the E&S Plan.

In addition to the exception, we are requesting a waiver under 102.14(d)(2)(ii) for areas within 150' of surface waters that are outside of the Chapter 105 permit area. A detailed riparian buffer waiver request has been prepared as an attachment to the ESCGP-2 Notice of Intent.

Demonstration of Waiver Necessity

A riparian forest buffer waiver is necessary to complete the intended scope of the pipeline project. The project involves the installation of approximately two parallel pipelines within a 306-mile, 50-foot-wide right-of-way (ROW) from Houston, Washington County, PA to SPLP's Marcus Hook facility in Delaware County, PA with the

purpose of interconnecting with existing SPLP Mariner East pipelines. A 20-inch diameter pipeline would be installed within the ROW from Houston to Marcus Hook (306 miles) and a second, 16-inch diameter pipeline, will also be installed in the same ROW. The second line is proposed to be installed from SPLP's Delmont Station, Westmoreland County, PA to the Marcus Hook facility, paralleling the initial line for approximately 255 miles. Spreads 3, 4, and 5 (South Central Region) of this project cross through Blair, Huntingdon, Juniata, Perry, Cumberland, York, Dauphin, Lebanon, Lancaster, and Berks Counties, Pennsylvania (PA). Due to the linear nature of the project and the surrounding topography, riparian forest buffers could not be avoided altogether.

Alternatives Analysis

Impacts to environmental resources, including riparian forest buffers, were evaluated during the pipeline routing phase of the project. Field teams were deployed to evaluate alternate routes based on environmental and constructability constraints. The final route that was selected minimizes environmental impacts to the maximum extent practicable while still maintaining the project's overall constructability and ensuring a safe working environment while also taking landowner constraints into consideration. Additionally, several variations of horizontal direction drill profiles were evaluated to minimize pullback areas, additional workspaces, and overall disturbance within riparian forest buffers. Permanent features, such as access roads and block valves, were evaluated to locate the features outside of the riparian forest buffer, where possible.

Demonstration of Minimizing Impacts

All disturbance activities, including those which impact riparian forest buffers, have been reduced to the maximum extent practicable. The limit of disturbance has been reduced to 50 feet wide at all stream crossings within the riparian forest buffer area where possible adjacent to the stream area required for crossing and construction. In areas where it is not practicable to reduce the LOD throughout the entire extent of the riparian forest buffer, the LOD has been reduced to 50 feet wide within 10 feet of the stream banks to limit the proximity of the work areas as per the stream crossing detail from the 2012 PADEP Erosion and Sediment Pollution Control Program Manual. The operations within the limit of disturbance near stream crossings typically includes a topsoil stockpile, a stockpile for pipe trench excavation material, a pipe trench, a travel lane, a work area for equipment operation and pipeline welding outside the trench, and an area to install the erosion control BMPs. In addition, site conditions such as steep slopes, varying depths of topsoil, and other on-site conditions limit the amount of work area. Reducing the limit of disturbance to a greater extent could potentially result in unsafe working conditions and would hinder the ability to complete the stream crossing within the required time frame of 24 hours or less. Workspaces that provide additional space for stream crossing activities have been placed outside of riparian forest buffers where possible.

Meeting Requirements of Chapter 102

All other aspects of Chapter 102 are being met. The project's Erosion and Sediment Control Plan and Site Restoration/Post-Construction Stormwater Management Plan have been designed in accordance with Chapter 102. In accordance with Chapter 102, and E&S plan has been developed to minimize the sediment entering the buffer areas. A site restoration plan is proposed to revegetate the areas adjacent to the buffers within the right of way.

3.5 INSPECTION AND MAINTENANCE PROCEDURES

Seeded areas will be inspected weekly and after each runoff event for bare spots, washouts, and healthy growth. Necessary repairs will be made immediately. Mulched areas will be checked periodically and after severe storms for damage until the desired purpose of the mulching is achieved. Damaged portions of the mulch or tie-down material will be repaired upon discovery.

All sedimentation control measures will remain in place until the disturbed areas are stabilized and a uniform 70-percent perennial vegetative cover is established. Any area not achieving a 70-percent vegetative cover will be reseeded and mulched within 24 hours of detection. If BMPs are found to be inoperative or ineffective during an inspection, PADEP should be contacted within 24 hours, followed by submission of a written noncompliance report to PADEP within 5 days of the initial contact.

Long-Term Maintenance

Long-term maintenance of the pipeline ROW will include periodic visual inspections for sufficient vegetative growth and cover. Insufficient vegetative cover is defined as any area not achieving a uniform 70-percent perennial vegetative cover. Bare spots and areas with insufficient vegetative cover will be reseeded and mulched within 24 hours of discovery. The right of way will be inspected for signs of erosion, especially on steep slopes. Corrective measures will be taken, as needed. If there is evidence of trench settling, the area will be regraded to maintain pre-construction drainage patterns, mulched, and seeded. A written report is required for each inspection and for each repair or maintenance activity, and the report should specify how to access the site. SPLP is responsible for maintaining the ROW under the provisions of this permit

3.6 ANTIDEGRADATION REQUIREMENTS

Earth- disturbance activities associated with the Pennsylvania Pipeline project will be located within siltation-impaired watersheds and HQ/EV special protection watersheds. A combination of non-discharge alternatives and the use of ABACT BMPs on site will protect the water quality of the receiving waters, in accordance with 25 Code §102.8(h).

Non-discharge alternatives were evaluated to minimize accelerated erosion and sedimentation and achieve zero net change in runoff between the pre- and post-construction conditions. The non-discharge alternatives

evaluated were the use of infiltration and maintaining pre-construction drainage patterns within the right of way, temporary additional workspaces, and temporary access roads. The permanent waterbars will not divert or diminish the amount of water within the watershed but are intended to manage runoff velocity and potential degradation related to sediment laden runoff into receiving waters. As such, the will be no change to pre-existing drainage patterns as the permanent water bars will continue to direct water to the same receiving waters while providing the protection required in the PADEP Manual regarding slopes. The non-discharge alternatives were incorporated wherever feasible by minimizing soil compaction, restoring the infiltration capacity of the soil prior to permanent seeding, and restoring the disturbed area back to its original grade and cover condition for the mainline pipeline. To alleviate compaction, surface roughening techniques such as deep ripping or chisel ripping will restore compacted areas to a minimal compacted state prior to permanent stabilization. The extent of the disturbed area will be minimized, and the duration of disturbance will be minimized by stabilizing disturbed areas as soon as practicable. ABACT BMPs will be used on site to protect and maintain the existing water quality of receiving waters.

Due to the linear nature of this project, all of the siltation impaired and HQ/EV special protection watersheds received the same non discharge alternative evaluation and incorporation of ABACT site restoration BMPs throughout the pipeline.

There are sixteen block valve facilities in the South Central Region that are proposed to be vegetated sites. Six of those facilities (W. Trindle Road, Arcona Road, Sinclair Road, Schaeffer Road, Wyomissing Road, and Morgantown Road) will be located in a special protection watershed. By proposing vegetation instead of gravel, there will be no increase in impervious area. In addition, four of the existing block valve/pump station sites are located in special protection watersheds (Doylesburg, Blue Mountain, Plainfield, and Cornwall). No expansion of the existing impervious area is proposed at these locations, except for Doylesburg which is covered under the pump station PCSM plan.

There will not be an increase in stormwater runoff rate or volume to prevent the physical degradation of the receiving water, such as scour, and stream bank destabilization. Stormwater runoff volume is not increasing throughout post-construction, and any post-construction stormwater discharge is managed so that it will not degrade the physical, chemical or biological characteristics of the receiving stream.

Filtration through the existing vegetation and soil is an efficient way to remove suspended stormwater pollutants such as sediment, as the suspended particles are physically filtered from the stormwater as it flows through the vegetation and percolates into the soil.

The extent of the disturbed area at each of the block valve sites will be minimized, and the duration of disturbance will be minimized by stabilizing disturbed areas as soon as practicable. Cut and fill for the project sites have been minimized. Where possible based on the criteria listed above, sites were located in areas with

shallow slopes to minimize the amount of cut and fill required. The sites will be restored promptly with proper vegetative cover techniques.

At sites where vegetated geoweb is proposed, antidegradation requirements for the special protection watersheds are met because no impervious area is proposed. The runoff will be managed so that it will not degrade the physical, chemical, or biological characteristics of the receiving streams.

ABACT site restoration BMPs will include the following:

- Pre-construction drainage pattern intact,
- Minimizing the disturbed area,
- No direct discharge to surface waters,
- Prompt site restoration,
- Proper vegetative cover techniques.

Antidegradation for block valve sites that propose PCSM BMPs is discussed in Section 4.6.

3.7 STORMWATER RUNOFF ANALYSIS

This section applies to all areas of the project that will be restored to a vegetated condition, which excludes permanent impervious cover proposed at permanent access roads and block valve sites. All disturbed areas within the pipeline right of way, additional temporary workspaces, and temporary access roads will be restored to a meadow in good condition or better or a lawn condition. The pre-construction drainage patterns surrounding the project will be maintained for the areas of the project covered under this section.

The proposed mainline pipeline will be restored in accordance with 102.8(n) and meet the requirements outlined in §§ 102.8(b), (c), (e), (f), (h), (i), (l), and (m).

In accordance with § 102.8(b), the following principles have been incorporated into the project design in accordance with the numbering in § 102.8(b): (1) The integrity of stream channels and the physical, biological, and chemical qualities of the receiving waters will remain unchanged. The site restoration principles will protect the existing and designated uses of the receiving waters. BMPs will be maintained until the site achieves stabilization during site restoration to ensure that runoff which leaves the project site will have no short-term adverse effects on the physical, biological, or chemical qualities of downstream receiving waters. The permanent seed mixture will restore the majority of the right of way to a meadow condition. Those areas which are not restored to a meadow condition will be restored to a lawn condition or forest. As a result of restoring the pipeline right of way as specified in the restoration plan, there will be no long-term effects to the physical, biological, or chemical qualities of downstream receiving waters. (2) The mainline pipeline will be restored to

original grade so flow paths will not be altered. The right of way will be restored to achieve a meadow in good condition or better, with the exception of areas that will be returned to lawn or forest. In addition, the pipeline right of way accounts for only a narrow corridor of development within each drainage area to the nearest receiving water. As a result, post-development runoff rates to the nearest receiving water will not increase. (3) The right of way will be restored to a meadow in good condition or better in most areas, with the exception of specified locations where the right of way will be restored to the equivalent of its predevelopment land cover (lawn or forest). As a result, any potential increase in stormwater runoff volume has been minimized to the maximum extent practicable. (4) There are no proposed, permanent impervious features associated with the mainline pipeline. Temporary access roads will be restored to a vegetated condition following installation of the pipeline. (5) Existing drainage features and vegetation will be protected by restoring the project area back to its original grade. As a result, drainage features and existing vegetation surrounding the project area will be preserved. (6) Land clearing and grading will be minimized because the project area has been limited to the area required to safely install the natural gas pipelines. The pipeline right of way will be returned to original grade following installation of the pipelines. (7) Soil compaction will be minimized by utilizing travel lanes within the pipeline right of way. Following construction, areas that have been compacted will be scarified or ripped, or soil amendments will be incorporated prior to backfilling topsoil and seeding. After initiating restoration, vehicular traffic will be restricted to prevent soil compaction. (8) As demonstrated in 102.8(2) and 102.8(3), potential increases in post development stormwater runoff has been minimized to the maximum extent practicable utilizing nonstructural restoration BMPs.

In accordance with § 102.8(c), the mainline Site Restoration and Post Construction Stormwater Management Plan has been planned and designed and will be implemented in consistency with the E&S Plan.

In accordance with § 102.8(e), the Site Restoration and Post Construction Stormwater Management Plan has been prepared by Robert F. Simcik, P.E. who is trained and experienced in PCSM design methods and techniques applicable to the size and scope of the proposed pipeline project.

In accordance with § 102.8(f), the Site Restoration and Post Construction Stormwater Management Plan contains drawings and a narrative consistent with the requirements of Chapter 102. The Plan has been designed to minimize the threat to human health, safety, and the environment to the greatest extent practicable. The Plan includes the required information as outlined in § 102.8(f)(1) through § 102.8(f)(15).

In accordance with § 102.8(h), nondischarge alternatives for Special Protection waters are evaluated in the Antidegradation section of the Site Restoration and Post Construction Stormwater Management Plan. The Plan includes ABACT BMPs where nondischarge alternatives do not exist for the project.

In accordance with § 102.8(i), the applicant has submitted the Site Restoration and Post Construction Stormwater Management Plan to the applicable county conservation districts and Department of Environmental

Protection for review and approval. Upon complaint or site inspection, the Plan will be available for subsequent review and inspection by the reviewing agencies.

In accordance with § 102.8(l), the permittee will include with the notice of termination "Record Drawings" with a final certification statement from a licensed professional, which reads as follows:

"I (name) do hereby certify pursuant to the penalties of 18 Pa.C.S.A. § 4904 to the best of my knowledge, information and belief, that the accompanying record drawings accurately reflect the as-built conditions, are true and correct, and are in conformance with Chapter 102 of the rules and regulations of the Department of Environmental Protection and that the project site was constructed in accordance with the approved PCSM Plan, all approved plan changes and accepted construction practices."

In accordance with § 102.8(m), the Site Restoration and Post Construction Stormwater Management Plan identifies that the permittee shall be responsible for long-term operation and maintenance of PCSM BMPs associated with permanent surface sites. However, there are no PCSM BMPs proposed as part of the mainline pipeline.

Stormwater runoff associated with construction of the permanent gravel access roads and block valve pads is discussed in Section 4.0.

4.0 POST-CONSTRUCTION STORMWATER MANAGEMENT ANALYSIS

Permanent gravel access roads and gravel block valve sites will be constructed as part of this project. A post-construction stormwater management analysis for stormwater runoff associated with these sites is addressed in Sections 4.1 through 4.7. Areas of the project that are being restored to a vegetated condition, including the pipeline right of way, associated workspaces, and temporary access roads are discussed in Section 3.0.

Twenty nine block valves are required to operate the pipeline for the PADEP Southcentral Region portion of the PPP project. The post-construction condition for each block valve site is as follows:

Co-located valve sites at existing valve or station locations or those with no new impervious area – 4 (Blue Mountain, Plainfield, Blainsport, White House Lane) will be restored to the existing gravel condition.

Co-located valves where PCSM is covered by ME1 PCSM BMPs – The Cornwall valve site is being constructed at the existing pump station where runoff is captured by existing station BMPs and not addressed here.

The Doylesburg valve site is being constructed at the existing Doyleburg ME1 pump station. The site restoration and PCSM is addressed with the station and is a separate report found in Section 7 of the permit application.

Valve sites with no impervious area (vegetated cover) – 16 locations where the vegetated topsoil will be reinforced with geoweb to provide structural stability and minimize compaction. At these locations there is no new impervious area and these utility infrastructure sites will be returned to vegetated conditions (meadow in good condition).

Juniata Valley	Hares Valley	Old York Road	Hopeland
Raystown Road	Wolf Bridge	N. Union	Montello
Seven Points Loop	W. Trindle	Schaeffer	Wyomissing Road
Happy Hills	Arcona	Sinclair Road	Morgantown Road

The proposed, vegetated block valve sites will be restored in accordance with 102.8(n) and meet the requirements outlined in §§ 102.8(b), (c), (e), (f), (h), (i), (l), and (m).

In accordance with § 102.8(b), the following principles have been incorporated into the project design in accordance with the numbering in § 102.8(b): (1) The integrity of stream channels and the physical, biological, and chemical qualities of the receiving waters will remain unchanged. The site restoration principles will protect the existing and designated uses of the receiving waters. BMPs will be maintained until the site achieves stabilization during site restoration to ensure that runoff which leaves the project site will have no short-term

adverse effects on the physical, biological, or chemical qualities of downstream receiving waters. The permanent seed mixture will restore the block valve site to a meadow condition. Geoweb will be utilized to mitigate the potential risk for compaction of topsoil on the block valve site. As a result, there will be no long-term effects to the physical, biological, or chemical qualities of downstream receiving waters. (2) Block valve sites will be graded, where necessary, to achieve usable slopes for equipment layout and vehicle access. The grading has been designed to utilize existing slopes in an effort to minimize grading. By minimizing grading, flow paths will only be minimally altered. The post development flow paths will slow the flow of runoff across the valve sites since grading will flatten existing slopes. The block valve will be seeded to achieve a meadow in good condition or better. As a result, post-development runoff rates to the nearest receiving water will not increase. (3) The block valves will be seeded to achieve a ground cover of a meadow in good condition or better. In addition, geoweb will ensure that void space and the infiltration capacity of the soil is maintained in the long term. As a result, any potential increase in stormwater runoff volume has been minimized to the maximum extent practicable. (4) This discussion relates to block valves which will be vegetated. The vegetated block valve sites do not have any proposed, impervious features associated with them. (5) Existing drainage features and vegetation will be protected by minimizing proposed grading. As a result, drainage features and existing vegetation surrounding the project area will be preserved to the maximum extent practicable. (6) Land clearing and grading will be minimized because the project area has been limited to the area required to safely install the natural gas pipelines. Grading at block valve sites has been minimized to the maximum extent practicable and has been designed to utilize existing slopes. (7) Soil compaction will be minimized by installing geoweb cellular confinement which will be filled with a mix of aggregate and topsoil. The geoweb will ensure that the void ratio and infiltration capacity of the soil is maintained, and the risk of compaction from vehicular traffic will be eliminated. The construction sequence and installation detail for geoweb specifies that care shall be taken so as not to compact the subgrade. (8) As demonstrated in 102.8(2) and 102.8(3), potential increases in post development stormwater runoff has been minimized to the maximum extent practicable utilizing nonstructural restoration BMPs.

In accordance with § 102.8(c), the mainline Site Restoration and Post Construction Stormwater Management Plan has been planned and designed and will be implemented in consistency with the E&S Plan.

In accordance with § 102.8(e), the Site Restoration and Post Construction Stormwater Management Plan has been prepared by Robert F. Simcik, P.E. who is trained and experienced in PCSM design methods and techniques applicable to the size and scope of the proposed project.

In accordance with § 102.8(f), the Site Restoration and Post Construction Stormwater Management Plan contains drawings and a narrative consistent with the requirements of Chapter 102. The Plan has been designed to minimize the threat to human health, safety, and the environment to the greatest extent practicable. The Plan includes the required information as outlined in § 102.8(f)(1) through § 102.8(f)(15).

In accordance with § 102.8(h), nondischarge alternatives for Special Protection waters are evaluated in the Antidegradation section of the Site Restoration and Post Construction Stormwater Management Plan. The Plan includes ABACT BMPs where nondischarge alternatives do not exist for the project.

In accordance with § 102.8(i), the applicant has submitted the Site Restoration and Post Construction Stormwater Management Plan to the applicable county conservation districts and Department of Environmental Protection for review and approval. Upon complaint or site inspection, the Plan will be available for subsequent review and inspection by the reviewing agencies.

In accordance with § 102.8(l), the permittee will include with the notice of termination "Record Drawings" with a final certification statement from a licensed professional, which reads as follows:

"I (name) do hereby certify pursuant to the penalties of 18 Pa.C.S.A. § 4904 to the best of my knowledge, information and belief, that the accompanying record drawings accurately reflect the as-built conditions, are true and correct, and are in conformance with Chapter 102 of the rules and regulations of the Department of Environmental Protection and that the project site was constructed in accordance with the approved PCSM Plan, all approved plan changes and accepted construction practices."

In accordance with § 102.8(m), the Site Restoration and Post Construction Stormwater Management Plan identifies that the permittee shall be responsible for long-term operation and maintenance of PCSM BMPs associated with permanent surface sites. However, there are no PCSM BMPs associated with vegetated block valve sites.

Valve sites with new impervious area that require PCSM BMPs – 7

Valley Forge Road	Locke Mountain Road	Shade Valley Road	Gates Road
Charger Highway	High Street	Creek Road	

New impervious area was minimized where possible by locating them adjacent to existing SPLP owned block valve sites which reduces the footprint for additional gravel area and access roads. The following sections address PCSM for the eight valve sites that propose new impervious surface.

4.1 BMP DESCRIPTION AND CONSTRUCTION SEQUENCE

Infiltration berms, infiltration trenches, slow release trenches and soil amendments will be used to manage stormwater onsite. Additional stormwater conveyance BMPs, including diversion berms, a level spreader, and channels will also be utilized. The proposed PCSM BMPs will be constructed in accordance with the PA Stormwater BMP manual. A description of the proposed PCSM BMPs and stormwater conveyance BMPs is below.

Infiltration Berm

An infiltration berm is a mound of compacted earth with sloping sides that is usually located along a contour on relatively gently sloping sites. Berms can also be created through excavation/removal of upslope material. The infiltration berms will retain flow and allow for infiltration. Infiltration berms will be a maximum of 2 feet high.

Soil Amendment and Restoration

Soil amendment and restoration is the process of improving disturbed soils and low organic soils by restoring soil porosity and adding a soil amendment, such as compost, for the purpose of reestablishing the soil's long-term capacity for infiltration and pollution removal.

Slow Release Trench

A slow release trench is a stone filled trench with a level bottom and a continuously perforated pipe. The trench will be lined with an impermeable liner. A slow release trench will retain stormwater runoff and release it slowly in areas where infiltration is undesirable or not feasible based on site soils.

Channel

Channels will be constructed to capture and convey stormwater runoff to PCSM BMPs.

Water Deflector

Water deflectors will be installed along several of the permanent access roads to convey runoff across the roadway. A deflector is typically constructed from a rubber belt held between two wooden planks.

Level Spreader

Earthen level spreaders will be used where diversion ditches or berms outlet onto areas of established vegetation. Earthen level spreaders allow sediment-free stormwater runoff to be released in sheet flow down a stabilized slope without causing erosion.

Diversion Berm

A diversion berm is a compacted berm that will be used to divert upslope stormwater runoff. Diversion berms are proposed to reduce the amount of upslope contributory drainage to PCSM BMPs.

Refer to the PCSM plan drawings for the locations of the proposed work for post construction stormwater management. A generalized construction sequence is provided below. The construction sequence is intended to provide a general course of action to conform to the applicable regulatory agency requirements for site restoration and post-construction stormwater management of the site. Necessary steps for proper and complete execution of work pertaining to this plan, whether specifically mentioned or

not, are to be performed by the contractor. The contractor will comply with all requirements listed in this section. The contractor may be required to alter controls based on the effectiveness of controls or differing conditions encountered in the field. The appropriate county conservation district and DEP shall be contacted and must approve any deviation to the authorized plans.

A pre-construction meeting is required prior to the start of any construction activity. The Pennsylvania Department of Environmental Protection (PADEP) or applicable county conservation district, contractors, the landowner, appropriate municipal officials, and the plan preparer must be invited to this meeting at least 7 days in advance.

Construction Sequence

1. Grade surface to finished grade elevations as soon as practicable following completion of pipe installation.
2. Install post construction BMPs after completion of pipeline construction:

Infiltration Berm

1. Install temporary sediment and erosion control BMPs as per the Pennsylvania Erosion and Sediment Pollution Control Program Manual.
2. Install orange construction fencing around the ponding area of the infiltration berm as shown on the PCSM Plan drawings. Complete site grading and stabilize within the limit of disturbance except where the infiltration berm will be constructed and the extent of the ponding area; make every effort to minimize berm footprint and necessary zone of disturbance (including both removal of existing vegetation and disturbance of empty soil) in order to maximize infiltration. If equipment must travel through the ponding area, timber matting shall be placed to minimize compaction, and equipment traffic shall be minimized.
3. Lightly scarify the soil in the area of the proposed berm before delivering soil to site.
4. Bring in fill material to make up the major portion of the berm. Soil should be added in 8-inch lifts and compacted after each addition according to design specifications. The slope and shape of the berm should be graded out as soil is added. This is a critical step of the sequence which requires oversight by a licensed professional.
5. Protect the surface ponding area at the base of the berm from compaction. This is a critical step of the sequence which requires oversight by a licensed professional.
6. Complete final grading of the berm after the top layer of soil is added. Tamp soil down lightly and smooth sides of the berm. The crest and base of the berm should be at level grade. This is a critical step of the sequence which requires oversight by a licensed professional.
7. Plant berm with turf, meadow plants, shrubs or trees, as desired.

8. Mulch planted and disturbed areas with compost mulch to prevent erosion while plants become established.

Soil Amendment and Restoration

1. Grade surface to finished grade elevations as soon as practicable following completion of pipe installation.
2. In the designated soil amendment area, till the ground and mix in the compost at a ratio of 2:1 (soil:compost) to a depth of 24 inches. This is a critical step of the sequence which requires oversight by a licensed professional.
3. Immediately seed and mulch disturbed areas once final grade is established in accordance with the permanent seeding schedule.
4. Maintain erosion and sedimentation control devices until site work is complete and a uniform 70% perennial vegetative cover is established.

Slow Release Trench

1. Install and maintain proper Erosion and Sediment Control Measures during construction.
2. Grade surface to finished grade elevations as soon as practicable.
3. If possible, install Slow Release Trench during later phases of site construction to prevent sedimentation and/or damage from construction activity. After installation, prevent sediment laden water from entering inlets and pipes. If it is not possible to install the Slow Release Trench during the later phases of construction, place compost filter sock upslope of the trench to prevent sediment from reaching and clogging the trench.
4. Excavate Slow Release Trench bottom to a uniform, level subgrade free from rocks and debris. This is a critical step of the sequence which requires oversight by a licensed professional.
5. Install an impermeable liner within the Slow Release Trench. Secure impermeable liner during stone placement with an anchor trench. This is a critical step of the sequence which requires oversight by a licensed professional.
6. Install upstream and downstream Control Structures, cleanouts, etc. This is a critical step of the sequence which requires oversight by a licensed professional.
7. Place uniformly graded, clean-washed aggregate in 8-inch lifts, lightly compacting between lifts. Light compaction shall ensure the aggregate won't settle below the intended top elevation of the trench. This is a critical step of the sequence which requires oversight by a licensed professional.
8. Install Continuously Perforated Pipe and underdrain outlet as indicated on plans. Backfill with uniformly graded, clean-washed aggregate in 8-inch lifts, lightly compacting between lifts. Light compaction shall ensure the aggregate won't settle below the intended top elevation of the trench. This is a critical step of the sequence which requires oversight by a licensed professional.

9. Place 6-inch lift of approved Topsoil over Slow Release Trench, as indicated on plans.
10. Seed and stabilize topsoil.
11. Any sediment that enters inlets during construction is to be removed within 24 hours.
12. Immediately seed and mulch disturbed areas once final grade is established in accordance with the permanent seeding schedule.
13. Maintain erosion and sedimentation control devices until site work is complete and a uniform 70% perennial vegetative cover is established.
14. Remove erosion sediment control measures upon establishment of a uniform 70% vegetative cover over the disturbed area. Re-grade and revegetate areas disturbed during the removal of the erosion and sediment controls.

Level Spreader

1. The uphill development shall be stabilized before diverting runoff to any dispersing flow techniques.
2. All contributing stormwater elements (infiltration berms, inlets, outlet control structures, pipes, etc.) shall be installed prior to installation of the level spreader.
3. HDPE pipe shall be installed along a contour uphill of the level spreader, with care taken to construct a slightly sloped bottom.
4. If necessary, install erosion control matting along the length of the level spreader and to a distance downhill, as specified by the manufacturer/supplier.
5. A berm shall be installed along the outlet of the HDPE pipe to ensure stormwater runoff is routed to the level spreader.

Permanent Seeding

Site preparation and establishment of permanent cover in areas other than lawns will be conducted according to the following guidelines:

SITE CONDITIONS	NURSE CROP	SEED MIXTURE (SELECT ONE MIXTURE)
SLOPES AND BANKS (NOT MOWED)		
WELL-DRAINED	1 PLUS	3, 5, 8, OR 12 (1)
VARIABLE DRAINAGE	1 PLUS	3 OR 7
SLOPES AND BANKS (MOWED)	1 PLUS	2 OR 10
WELL-DRAINED		
SLOPES AND BANKS (GRAZED/HAY)	1 PLUS	2,3, OR 13
WELL-DRAINED		
GULLIES AND ERODED AREAS	1 PLUS	3, 5, 7, OR 12 (1)
EROSION CONTROL FACILITIES (BMPS)		
SOD WATERWAYS, SPILLWAYS, FREQUENT WATER FLOW AREAS	1 PLUS	2, 3, OR 4
DRAINAGE DITCHES		
SHALLOW, LESS THAN THREE FEET DEEP	1 PLUS	2, 3, OR 4

SITE CONDITIONS	NURSE CROP	SEED MIXTURE (SELECT ONE MIXTURE)
DEEP, NOT MOWED	1 PLUS	5 OR 7
POND BANKS, DIKES, LEVEES, DAMS, DIVERSION CHANNELS, AND OCCASIONAL WATER FLOW AREAS		
MOWED AREAS	1 PLUS	2 OR 3
NON-MOWED AREAS	1 PLUS	5 OR 7
FOR HAY OR SILAGE ON DIVERSION CHANNELS AND OCCASIONAL WATER FLOW AREAS	1 PLUS	3 OR 13
HIGHWAYS		
NON-MOWED AREAS		
WELL-DRAINED	1 PLUS	5, 7, 8, OR 10
VARIABLE DRAINED	1 PLUS	3 OR 7
POORLY DRAINED	1 PLUS	3
AREAS MOWED SEVERAL TIMES PER YEAR	1 PLUS	2, 3, OR 10
UTILITY ROW		
WELL-DRAINED	1 PLUS	5, 8, OR 12 (1)
VARIABLE DRAINED	1 PLUS	3 OR 7
WELL-DRAINED AREAS FOR GRAZING/HAY	1 PLUS	2, 3, OR 13
EFFLUENT DISPOSAL AREAS	1 PLUS	3 OR 4
SANITARY LANDFILLS	1 PLUS	3, 5, 7, 11 (1), OR 12 (1)
SURFACE MINES		
SPOILS, MINE WASTES, FLY ASH, SLAG, SETTLING BASIN RESIDUES AND OTHER SEVERELY DISTURBED AREAS (LIME TO SOIL TEST)	1 PLUS	3, 4, 5, 7, 8, 11 (1) OR 12(1)
SEVERELY DISTURBED AREAS FOR GRAZING/HAY	1 PLUS	3 OR 13
LAWN	1 PLUS	PENNDOT Formula B

RECOMMENDED SEED MIXTURES			
MIXTURE NO.	**SPECIES**	**SEEDING RATES – PLS (1)**	
		MOST SITES	ADVERSE SITES (8)
1 (2)	spring oats (spring), or 64 96	64	96
	annual ryegrass (spring or fall), or	10	15
	winter wheat (fall), or	90	120
	winter rye (fall)	56	112
2 (3)	tall fescue, or 75	60	75
	fine fescue, or 40	35	40
	kentucky bluegrass, plus 25 30	25	30
	redtop(4), or	3	3
	perennial ryegrass	15	20
3	birdsfoot trefoil, plus 6 10	6	10
	tall fescue	30	35
4	birdsfoot trefoil, plus	6	10
	reed canarygrass	10	15
5 (5)	Big Bluestem, plus	10	15
	tall fescue, or	20	25
	perennial ryegrass	20	25
6 (5,6)	Big Bluestem, plus	10	15
	annual ryegrass	20	25
7 (5)	birdsfoot trefoil, plus	20	30
	Big Bluestem, plus	20	30

RECOMMENDED SEED MIXTURES			
MIXTURE NO.	**SPECIES**	**SEEDING RATES – PLS (1)**	
		MOST SITES	ADVERSE SITES (8)
8	tall fescue	20	25
	flatpea, plus	20	30
	tall fescue, or	20	30
	perennial ryegrass	20	25
9	Not applicable to project	N/A	N/A
10	tall fescue, plus	40	60
	fine fescue	10	15
11	deertongue, plus	15	20
	birdsfoot trefoil	6	10
12(7)	switchgrass, or	15	20
	big bluestem, plus	15	20
	birdsfoot trefoil	6	10
13	orchardgrass, or	20	30
	smooth bromegrass, plus	25	35
	birdsfoot trefoil	6	10

1. Pure live seed (pls) is the product of the percentage of pure seed times percentage germination divided by 100. For example, to secure the actual planting rate for switchgrass, divide 12 pounds pls shown on the seed tag. Thus, if the pls content of a given seed lot is 35 percent, divide 12 pls by 0.35 to obtain 34.3 pounds of seed required to plant one-acre. All mixtures in this table are shown in terms of pls.

2. If high-quality seed is used, for most sites seed spring oats at a rate of two bushels per acre, winter wheat at 11.5 bushels per acre, and winter rye at one bushel per acre. If germination is below 90 percent, increase these suggested seeding rates by 0.5 bushel per acre.

3. This mixture is suitable for frequent mowing. Do not cut shorter than 4 inches.

4. Keep seeding rate to that recommended in table. These species have many seeds per pound and are very competitive. To seed small quantities of small seeds such as weeping lovegrass and redtop, dilute with dry sawdust, sand, rice hulls, buckwheat hulls, etc.

5. Note not applicable because the project does not propose the use of Crownvetch.

6. Use for highway slopes and similar sites where the desired species after establishment is Big Bluestem.

7. Do not mow shorter than 9 to 10 inches.

8. If liming, fertilization, and preparation of seedbed are properly done and if care is taken to drill and cover the seed (or mulch applied), the rate for “most sites” should suffice. However, on eroded or coarse and poorly prepared seedbeds, particularly if the soil is very acidic or infertile, the rate for “adverse sites” should be used.

9. For seed mixtures 11 and 12, only use spring oats or weeping lovegrass (included in mix) as nurse crop.

In lawn areas, permanent cover will be established using the following PENNDOT seed mixture:

PENNDOT FORMULA B				
Seeding Rate	3 lbs. per 1,000 square feet			
Species	**% by Weight**	**Purity %**	**Minimum % Germination**	**Maximum % Weed Seed**
Kentucky Bluegrass	50	98	80	0.20
Perennial Rye	20	98	90	0.15
Red Fescue	30	98	85	0.15

Liming Rates

Minimum 6 tons per acre at 100% effective neutralizing value (% ENV), unless the soil test determines that a lesser amount is needed. To determine the actual amount of regular lime to apply, divide the amount called for by the soil test by the % ENV for the product used. For example, if 6 tons per acre is needed and the ENV for the lime used is 88%, divide 6 by 0.88 resulting in 6.8 tons needing to be applied. For dolomitic lime, which has a significant amount of magnesium in it, divide the amount called for by the soil test by the % calcium carbonate equivalent (% CCE) listed for the product instead of the % ENV. The % CCE may be above 100% which accounts for the fact that magnesium has a greater effect per pound than the calcium in regular lime. Note: When a soil test requires more than 8,000 pounds of lime per acre, the lime must be mixed into the top 6 inches of soil.

Fertilization Rates

Apply 10-20-20 at 600 pounds/acre, if top dressed or 1,000 pounds/ac, if incorporated, unless the soil test determines that the rate can be less than these minimums.

SOIL AMENDMENT APPLICATION RATE EQUIVALENTS				
Soil Amendment	Per Acre	Per 1,000 sq. ft.	Per 1,000 sq. yds.	
AGRICULTURAL LIME	6 TONS 1,000 LBS.	240 LBS. 25 LBS.	240 LBS. 25 LBS.	or as per soil test; may not be required in agricultural fields

10-20-20 FERTILIZER				or as per soil test; may not be required in agricultural fields

Temporary Seeding

Temporary grass cover will be established where soil stockpiles are exposed for a period greater than 4 days. The seed mixture for temporary cover will consist of 100% annual ryegrass. Seed will be applied at the rate of 40 pounds per acre or as recommended by a local recognized seed supplier approved by the Owner's representative. Prior to seeding, apply 1 ton of agricultural grade limestone per acre plus 10-10-10 fertilizer at the rate of 500 pounds per acre and work into the soil.

Mulching

The purpose of mulch is to reduce runoff and erosion, prevent surface compaction or crusting, conserve moisture, aid in establishing plant cover, and control weeds. Mulch will be applied on any area subject to erosion or that has unfavorable conditions for plant establishment and growth. The practice may be used alone or in conjunction with other structural and vegetative conservation practices such as waterways, ponds, sedimentation traps, or critical area planting. On sediment-producing areas where the period of exposure is less than two (2) months, mulch materials will be applied according to the following guidelines:

1. Straw mulch will be applied at the rate of 3 tons per acre. Chemically treated or salted straw is not acceptable as mulch.

2. Straw mulch will be anchored immediately after application by at least one of the following methods:

    a. "Crimped" into the soil using tractor-drawn equipment (straight-bladed coulter or similar).

    This method is limited to slopes no steeper than 3:1. Machinery should be operated on the contour. (Crimping of hay or straw by running it over with tracked machinery is not recommended.)

    b. Asphalt, either emulsified or cut-back, containing no solvents or other diluting agents toxic to plant or animal life, uniformly applied at the rate of 31 gallons per 1,000 square feet.

    c. Synthetic binders (chemical binders) may be used as recommended by the manufacturer to anchor mulch provided that sufficient documentation is provided to show that it is non-toxic to native plant and animal species.

    d. Lightweight plastic, fiber, or paper nets may be stapled over the mulch according to the manufacturer's recommendations.

Mulched areas will be checked periodically and after each runoff event (e.g., rain, snowmelt, etc) for damage until the desired purpose of the mulching is achieved. Damaged portions of the mulch or tie-down material will be repaired upon discovery.

4.2 MATERIAL RECYCLING AND DISPOSAL

The operator will remove from the site, recycle, or dispose of all building materials and wastes in accordance with PADEP's solid waste management regulations at 25 Pennsylvania Code 260.1 et seq., 271.1 et seq., and 287.1 et seq. The contractor will not illegally bury, dump, or discharge building material or wastes at the site. Expected construction wastes resulting from operation and maintenance of post-construction stormwater management BMPs will consist of sediment and debris cleaned from PCSM BMPs during maintenance and inspections. Sediment removed from PCSM BMPs during onsite maintenance and inspection activities will be disposed of off-site. In cases where disposal is necessary, waste materials will be disposed of at an approved PADEP waste site.

4.3 THERMAL IMPACTS

Thermal impacts are most commonly associated with urbanization (i.e., increased impervious surfaces) that results in heated stormwater runoff flowing into receiving waters where it mixes, and potentially increases the base temperature of the surface water in streams. However, another contributing factor for stream temperature is solar exposure (radiant energy input) to the surface water, typically ponded, standing waters. The amount of heat transferred, and the degree of thermal pollution is of importance for fisheries management and the ecological integrity of receiving waters. Among the attributes that determine the contribution of solar energy to thermal impacts are the presence of riparian vegetation, as well as stream width, depth, flow regime (perennial, intermittent, ephemeral), and orientation.

At locations where the addition/creation of a permanent compacted aggregate surface is proposed, a PCSM BMP is proposed to mitigate associated increases in runoff volume. No thermal impacts from aggregate surfaces are anticipated as the PCSM BMPs will capture runoff and allow infiltration time prior to downstream discharge, thereby mitigating any possible thermal impact which may exist. A detailed analysis is provided below for block valve sites that propose the addition of an impervious surface.

Block valve	Designated Use	Existing use	Site Specific Thermal Impact Analysis
Valley Forge Road	WWF	-	Potential pollution to surface waters from thermal impacts will be minimized by minimizing clearing and retaining existing vegetation where possible during construction. Following construction, permanent seeding will occur as soon as practicable to facilitate vegetative growth. Impervious surfaces have been minimized to the maximum extent possible and runoff is directed to vegetated areas and infiltration berms to cool runoff prior to discharge. Infiltration berms are proposed to infiltrate runoff which would recharge

Block valve	Designated Use	Existing use	Site Specific Thermal Impact Analysis
			the groundwater and allow for cooling. Ponded water can result in significant thermal impacts. The infiltration berms have been designed to dewater in less than 72 hours, so water will not pond for a significant period of time. A direct surface outlet is not proposed to the receiving surface water. The surface water flows across a mild slope approximately 100 feet through riparian area to the nearest receiving water.
Charger Highway	WWF	-	Potential pollution to surface waters from thermal impacts will be minimized by minimizing clearing and retaining existing vegetation where possible during construction. Following construction, permanent seeding will occur as soon as practicable to facilitate vegetative growth. Impervious surfaces have been minimized to the maximum extent possible and runoff is directed to vegetated areas and underground slow release trenches prior to discharge. The subsurface slow release trenches will prevent direct sunlight from reaching the stored stormwater runoff. A direct surface outlet is not proposed to the receiving surface water. The surface water flows several hundred feet across a mild slope to the nearest receiving water.
Locke Mountain Road	WWF	-	Potential pollution to surface waters from thermal impacts will be minimized by minimizing clearing and retaining existing vegetation where possible during construction. Following construction, permanent seeding will occur as soon as practicable to facilitate vegetative growth. Impervious surfaces have been minimized to the maximum extent possible and runoff is directed to vegetated areas and underground slow release trenches prior to discharge. The subsurface slow release trenches will prevent direct sunlight from reaching the stored stormwater runoff. A direct surface outlet is not proposed to the receiving surface water. The surface water flows across a very mild slope approximately 80 feet to the nearest receiving water.
High Street	HQ-CWF	-	Potential pollution to surface waters from thermal impacts will be minimized by minimizing clearing and retaining existing vegetation where possible during construction. Following construction, permanent seeding will occur as soon as practicable to facilitate vegetative growth. Impervious surfaces have been minimized to the maximum extent possible and runoff is directed to vegetated areas and an infiltration berm to cool runoff prior to discharge. The infiltration berm will infiltrate runoff which would recharge the groundwater and allow for cooling. Ponded water can result in significant thermal impacts. The infiltration berm has been designed to dewater in less than 72 hours, so water will not pond for a significant period of time. A direct surface outlet is not proposed to the receiving surface water. During larger storm events, water will overflow the infiltration berm into an area of soil amendment, which will further promote infiltration. Any surface water which does not infiltrate will flow across a gradual slope approximately 700 feet through a riparian area to the nearest receiving water.

Block valve	Designated Use	Existing use	Site Specific Thermal Impact Analysis
Shade Valley Road	CWF	-	Potential pollution to surface waters from thermal impacts will be minimized by minimizing clearing and retaining existing vegetation where possible during construction. Following construction, permanent seeding will occur as soon as practicable to facilitate vegetative growth. Impervious surfaces have been minimized to the maximum extent possible and runoff is directed to vegetated areas and infiltration berms to cool runoff prior to discharge. Infiltration berms are proposed to infiltrate runoff which would recharge the groundwater and allow for cooling. Ponded water can result in significant thermal impacts. The infiltration berms have been designed to dewater in less than 72 hours, so water will not pond for a significant period of time. A direct surface outlet is not proposed to the receiving surface water. Runoff will have the opportunity to infiltrate rather than discharging directly to a nearby surface water, thereby maintaining the cold water habitat. The surface water flows across a mild slope approximately 300 feet through a riparian area to the nearest receiving water.
Creek Road	WWF	-	Potential pollution to surface waters from thermal impacts will be minimized by minimizing clearing and retaining existing vegetation where possible during construction. Following construction, permanent seeding will occur as soon as practicable to facilitate vegetative growth. Impervious surfaces have been minimized to the maximum extent possible and runoff is directed to vegetated areas and an underground slow release trench prior to discharge. The subsurface slow release trench will prevent direct sunlight from reaching the stored stormwater runoff. A direct surface outlet is not proposed to the receiving surface water. The surface water flows approximately 150 feet to the nearest receiving water.
Gates Road	WWF	-	Potential pollution to surface waters from thermal impacts will be minimized by minimizing clearing and retaining existing vegetation where possible during construction. Following construction, permanent seeding will occur as soon as practicable to facilitate vegetative growth. Impervious surfaces have been minimized to the maximum extent possible and runoff is directed to vegetated areas and an infiltration berm to cool runoff prior to discharge. The infiltration berm will infiltrate runoff which would recharge the groundwater and allow for cooling. Ponded water can result in significant thermal impacts. The infiltration berm has been designed to dewater in less than 72 hours, so water will not pond for a significant period of time. During larger storm events, water will overflow the infiltration berm onto a vegetated area prior to entering the surface water. A direct surface outlet is not proposed to the receiving surface water. The surface water flows across a mild slope approximately 350 feet to the nearest receiving water.

Thermal impacts associated with vegetated block valve sites is not anticipated, as discussed in Section 3.3.

4.4 RIPARIAN FOREST BUFFERS

Pennsylvania Pipeline Project - Riparian Forest Buffer Waiver Request

The Pennsylvania Pipeline Project qualifies for an exception of the riparian forest buffer requirement under Chapter 102.14(d)(1)(ix) for areas within the Chapter 105 permit area. Existing riparian forest buffers within the project area are identified on the E&S plan drawings in Attachment 2 of the E&S Plan.

In addition to the exception, we are requesting a waiver under 102.14(d)(2)(ii) for areas within 150' of surface waters that are outside of the Chapter 105 permit area. A detailed riparian buffer waiver request has also been prepared and is included as an attachment to the ESCGP-2 Notice of Intent.

Demonstration of Waiver Necessity

A riparian forest buffer waiver is necessary to complete the intended scope of the pipeline project. The project involves the installation of approximately two parallel pipelines within a 306-mile, 50-foot-wide right-of-way (ROW) from Houston, Washington County, PA to SPLP's Marcus Hook facility in Delaware County, PA with the purpose of interconnecting with existing SPLP Mariner East pipelines. A 20-inch diameter pipeline would be installed within the ROW from Houston to Marcus Hook (306 miles) and a second, 16-inch diameter pipeline, will also be installed in the same ROW. The second line is proposed to be installed from SPLP's Delmont Station, Westmoreland County, PA to the Marcus Hook facility, paralleling the initial line for approximately 255 miles. Spreads 3, 4, and 5 (South Central Region) of this project are cross through Blair, Huntingdon, Juniata, Perry, Cumberland, York, Dauphin, Lebanon, Lancaster, and Berks Counties, Pennsylvania (PA). Due to the linear nature of the project and the surrounding topography, riparian forest buffers could not be avoided altogether.

Alternatives Analysis

Impacts to environmental resources, including riparian forest buffers, were evaluated during the pipeline routing phase of the project. Field teams were deployed to evaluate alternate routes based on environmental and constructability constraints. The final route that was selected minimizes environmental impacts to the maximum extent practicable while still maintaining the project's overall constructability and ensuring a safe working environment while also taking landowner constraints into consideration. Additionally, several variations of horizontal direction drill profiles were evaluated to minimize pullback areas, additional workspaces, and overall disturbance within riparian forest buffers. Permanent features, such as access roads and block valves, were evaluated to locate the features outside of the riparian forest buffer, where possible.

Demonstration of Minimizing Impacts

All disturbance activities, including those which impact riparian forest buffers, have been reduced to the maximum extent practicable. The limit of disturbance has been reduced to 50 feet wide at all stream crossings within the riparian forest buffer area where possible adjacent to the stream area required for crossing and construction. In areas where it is not practicable to reduce the LOD throughout the entire extent of the riparian forest buffer, the LOD has been reduced to 50 feet wide within 10 feet of the stream banks to limit the proximity of the work areas as per the stream crossing detail from the 2012 PADEP Erosion and Sediment Pollution Control Program Manual. The operations within the limit of disturbance near stream crossings typically includes a topsoil stockpile, a stockpile for pipe trench excavation material, a pipe trench, a travel lane, a work area for equipment operation and pipeline welding outside the trench, and an area to install the erosion control BMPs. In addition, site conditions such as steep slopes, varying depths of topsoil, and other on-site conditions limit the amount of work area. Reducing the limit of disturbance to a greater extent could potentially result in unsafe working conditions and would hinder the ability to complete the stream crossing within the required time frame of 24 hours or less. Workspaces that provide additional space for stream crossing activities have been placed outside of riparian forest buffers where possible. The post construction stormwater management infiltration berms and trenches are not located within riparian forested buffers.

Meeting Requirements of Chapter 102

All other aspects of Chapter 102 are being met. The project's Erosion and Sediment Control Plan and Site Restoration/Post-Construction Stormwater Management Plan have been designed in accordance with Chapter 102. In accordance with Chapter 102, and E&S plan has been developed to minimize the sediment entering the buffer areas. The post construction stormwater management plan has been design to control runoff rate and volume which may be discharge through riparian buffer areas.

4.5 INSPECTION AND MAINTENANCE PROCEDURES

Long-term maintenance of the pipeline ROW will include periodic visual inspections for sufficient vegetative growth and cover. Insufficient vegetative cover is defined as any area not achieving a uniform 70-percent perennial vegetative cover. Bare spots and areas with insufficient vegetative cover will be reseeded and mulched within 24 hours of discovery. The right of way will be inspected for signs of erosion, especially on steep slopes. Corrective measures will be taken, as needed. If there is evidence of trench settling, the area will be regraded to maintain pre-construction drainage patterns, mulched, and seeded. A written report is required for each inspection and for each repair or maintenance activity, and the report should specify how to access the site. SPLP is responsible for maintaining the ROW under the provisions of this permit.

Permanent proposed access roads and block valve pads will be constructed as part of the project. . The block valve access roads and pads will be inspected during the Sunoco operations valve site inspection and maintenance activities. Access roads and pads with aggregate will have additional aggregate applied as

needed to maintain an adequate thickness. The block valve access roads and pads restored to meadow condition will be inspected to verify a minimum of 70% vegetation is maintained. Any area not achieving a 70% vegetative cover shall be re-seeded and mulched within 24 hours of detection.

In areas where vegetated Geoweb is installed, in addition to inspecting the vegetation coverage, the Geoweb will be inspected for signs of damage affecting Geoweb performance, e.g., displaced cells or significantly torn cells. If the infill topsoil/aggregate mix settles over time and exposes the Geoweb, it will be filled with the same infill mixture and re-seeded. Note that with age, it is not unusual that the top of the Geoweb sections may become exposed and trampled with use. This does not affect the performance of the cellular confinement. If Geoweb becomes torn, it will be repaired. If the Geoweb becomes exposed it will be filled with the same infill mixture and re-seeded.

Inspection and maintenance procedures for permanent post-construction stormwater management facilities and stormwater conveyance BMPs are summarized below. If any post-construction stormwater management facilities are constructed prior to stabilization of upslope contributory drainage areas, inspections shall occur weekly and after runoff events until the surrounding area achieves stabilization. Sites located within karst terrain require more frequent long-term inspections, as specified in the Sinkhole Repair Plan in Attachment 2.

After stabilization has occurred the PCSM BMPs will continue to be inspected by Sunoco Operations in accordance with 25 Pa. Code 10-2.8(m) related to PCSM long-term operation and maintenance requirements and recorded in the Post Construction Stormwater Management Instrument Filling completed for each valve site that has a PCSM BMP.

In addition to the regularly scheduled inspection and maintenance activities, the infiltration BMPs (infiltration berms) should also be inspected within 72 hours after all storm events that meet or exceed the rainfall amount for the 2-year, 24-hour storm event. The inspector shall ensure that infiltration BMPs fully dewater within 72 hours. The table below provides the 2-year, 24-hour NOAA rainfall amounts corresponding to the block valves with PCSM BMPs associated with this project.

Block Valve	2-year 24-hour Rainfall (inches)
Valley Forge Road	2.69
Charger Highway	2.66
Locke Mountain Road	2.67
High Street	2.67

Shade Valley Road	2.74
Creek Road	2.82
Gates Road	2.97

Infiltration Berm

- The infiltration berm shall be inspected at least 4 times per year to ensure it is infiltrating properly and not clogged with sediment.
- Monitor drawdown time after the first major storm event (>1 inch rainfall depth). The berm shall dewater within a maximum of 72 hours. If the berm is not infiltrating within the specified timeframe, amend the soils within the ponding area of the berm (see Soil Amendment detail in plans).
- Vegetation over the berm shall be maintained as necessary, which may require annual mulching. Routinely remove accumulated debris and invasive plants as needed.
- Inspect for signs of flow channelization and restore level gradient immediately after any deficiencies are observed.

Soil Amendment and Restoration

- The soil restoration process may need to be repeated over time, due to compaction by use and/or settling.
- Soil amendment areas shall be inspected at least 4 times per year for signs of compaction. To remedy compaction, till the soil to a depth of 24 inches and mix in compost at a ratio of 2:1 (soil:compost).

Slow Release Trench

- Inlets and outlets for the slow release trench should be inspected and cleaned, as necessary, at least 4 times per year.
- The vegetation along the surface of the slow release trench should be maintained in good condition, and any bare spots revegetated as soon as possible.
- Vehicles should not be parked or driven on a slow release trench.

Channel

- Inspections to be done annually and within 48 hours after every major storm event (> 1 inch rainfall depth).
    - Inspect and correct erosions problems, damage to vegetation, and sediment and debris accumulation (address when > 3 inches at any spot or covering vegetation).

- For vegetated channels, inspect vegetation on side slopes for erosion and formation of rills or gullies, correct as needed.
- Inspect for pools of standing water, dewater and discharge to an approved location and restore to design grade.
- For vegetated channels, mow and trim vegetation to ensure safety, aesthetics, proper swale operation, or to suppress weeds and invasive vegetation; dispose of cuttings in a local composting facility; mow only when channel is dry to avoid rutting.
- Inspect for litter; remove prior to mowing.
- Inspect for uniformity is cross-section and longitudinal slope, correct as needed.
- Inspect channel inlet (curb cuts, pipes, etc.) and outlet for signs of erosion or blockage, correct as needed.
- Replace any displaced riprap for riprap lined channels.

Water Deflector

- Inspections to be done annually and within 48 hours after every major storm event (> 1 inch rainfall depth).

  Accumulated sediment shall be removed from the water deflector. The rubber belt shall be replaced when it is worn and no longer effective.

Earthen Level Spreader

- Inspections to be done annually and within 48 hours after every major storm event (> 1 inch rainfall depth).
- The receiving land shall be immediately restored to design conditions after any disturbance. Vegetated areas shall be seeded and blanketed.
- It is critical that even sheet flow conditions are sustained throughout the life of the level spreader, as their effectiveness can deteriorate due to lack of maintenance, inadequate design/location, and poor vegetation cover.
  - The area below the level spreader shall be inspected for clogging, density of vegetation, damage by foot or vehicular traffic, excessive accumulations, and channelization. Inspections shall be made on a quarterly basis for the first two years following installation, and then on a semiannual basis thereafter. Inspections shall also be made after every storm event greater than 1-inch.
  - Sediment and debris shall be routinely removed (but never less than semiannually), or upon observation, when buildup occurs in the clean outs. Regrading and reseeding may be necessary in the areas below the level spreader. Regrading may also be required when pools of standing water are observed along the slope. (In no case should standing water be allowed for longer than 72 hours).

- Maintaining a vigorous vegetative cover on the areas below the level spreader is critical for maximizing pollutant removal efficiency and erosion prevention. If vegetative cover is not fully established within the designated time, it may need to be replaced with an alternative species. (It is standard practice to contractually require the contractor to replace dead vegetation.) Unwanted or invasive growth shall be removed on an annual basis. Biweekly inspections are recommended for at least the first growing season, or until the vegetation is permanently established. Once the vegetation is established, inspections of health, diversity, and density shall be performed at least twice a year, during both the growing and non-growing season. Vegetative cover shall be sustained at 85% and replaced if damage greater than 50% is observed.

Diversion Berm

- Inspections to be done annually and within 48 hours after every major storm event (> 1 inch rainfall depth).
- Maintain turf grass and other vegetation by mowing and re-mulching.
- Routinely remove accumulated trash and debris.
- Remove invasive plants as needed.
- Inspect for signs of flow channelization; restore level gradient immediately after deficiencies are observed.

4.6 ANTIDEGRADATION REQUIREMENTS

Portions of the earth disturbance activities associated with the SPPP will be located within a HQ/EV watershed. A combination of non-discharge alternatives and the use of ABACT BMPs will be implemented to protect and maintain the existing water quality of the receiving waters.

Non-discharge alternatives were evaluated to minimize accelerated E&S and achieve zero net change in runoff between the pre and post-construction conditions. Non–discharge alternatives exist when the existing land use is revegetated and existing grade is restored, therefore resulting in no increase in runoff rate or volume from pre to post construction results. Other non-discharge alternatives implemented are limiting and minimizing the extent of disturbed areas and limiting the extent and duration of disturbance (phasing and sequencing) then stabilizing disturbed areas as soon as practicable. To alleviate compaction from construction and restoration activities, surface roughening techniques such as deep ripping or chisel ripping will restore compacted areas to a minimal compacted state. ABACT BMPs will be used onsite to protect and maintain the existing water quality of receiving waters also in areas where non-discharge alternatives exist.

Where non-discharge alternatives do not exist, ABACT BMPs will be used onsite to protect and maintain the quality of the receiving HQ and EV resources. The below table addresses the antidegradation analysis for the

specific block valve sites that require post construction stormwater management within High Quality, Exceptional Value and siltation impaired watersheds.

Block valve	Designated Use	Existing use	Site Specific Anti-degradation Analysis
High Street	HQ-CWF	-	High Street block valve is located within a special protection watershed. The project site was designed to minimize the total amount of impervious area. The impervious area for the High Street block valve was limited to the amount that is required to safely construct and operate the block valve. In addition, the previously proposed gravel turn-around was eliminated, and replaced with a grass area. Non-discharge alternatives were analyzed for this block valve site. The location of the High Street block valve site was evaluated by ASME B31.4 Valve Spacing 434.15.2(e) which states that mainline valves should not be more than 7.5 miles apart. The valve sites were located in such a way that they avoided environmentally sensitive areas (such as wetlands and floodplains), were close to an existing road, and close to power. Land owner preference was also accounted for while locating the block valve sites. Once all of these factors were taken into account, several block valve sites, including High Street, were located in special protection watersheds. Non-discharge alternatives were also considered when determining the type of BMP proposed. High Street block valve site utilizes an infiltration berm to manage stormwater. Stormwater runoff is infiltrated to the maximum extent possible. Stormwater runoff is spread out to flow through areas that have been restored to meadow conditions, to the infiltration berm, or to undisturbed area. There will not be an increase in stormwater runoff rate or volume to prevent the physical degradation of the receiving water, such as scour, and stream bank destabilization. Stormwater runoff volume is not increasing throughout post-construction, and any post-construction stormwater discharge is managed so that it will not degrade the physical, chemical or biological characteristics of the receiving stream. Runoff from the site will be managed by a downslope infiltration berm. Ponded runoff will be temporarily stored upslope of the berm until it infiltrates and filters through the soil media. Due to the design of the berm, which maintains a constant elevation through the entire berm length, the stormwater runoff will be released in sheet flow down a stabilized slope, without causing erosion, rather than concentrating the flow. Filtration through the existing

Block valve	Designated Use	Existing use	Site Specific Anti-degradation Analysis
			vegetation and soil is an efficient way to remove suspended stormwater pollutants such as sediment, as the suspended particles are physically filtered from the stormwater as it flows through the vegetation and percolates into the soil. This site drains to a HQ-CWF watershed, so in addition to the infiltration berm, soil amendment areas are proposed downstream of the block valve site. These areas are proposed to reduce runoff volume, promote infiltration, and filtrate stormwater runoff. The soil amendment areas will improve water quality in the HQ-CWF watershed. The extent of the disturbed area will be minimized, and the duration of disturbance will be minimized by stabilizing disturbed areas as soon as practicable. Cut and fill for the project site has been minimized. Where possible based on the criteria listed above, sites were located in areas with shallow slopes to minimize the amount of cut and fill required. There is minimal cut and fill required at the High Street block valve site. All of the block valve sites were graded towards the natural slope. No direct discharge to surface water occurs at the site. The site will be restored promptly with proper vegetative cover techniques. Antidegradation requirements for the special protection watershed are met because the post-construction stormwater infiltration volume equals or exceeds the pre-construction stormwater infiltration volume, and post-construction stormwater discharge is pretreated via infiltration berms. The runoff is managed so that it will not degrade the physical, chemical, or biological characteristics of the receiving stream.
Gates Road	WWF (siltation impaired)	-	Gates Road block valve is located within a siltation impaired watershed. The project site was designed to minimize the total amount of impervious area. The impervious area for the Gates Road valve was limited to the amount that is required to safely construct and operate the block valve. In addition, the previously proposed gravel turn-around was eliminated, and replaced with a grass area. Finally, an existing access road was utilized for the site, thus eliminating the need to create a larger impervious area. Non-discharge alternatives were analyzed for this block valve site. The location of the Gates Road block valve site was evaluated by ASME B31.4 Valve Spacing 434.15.2(e) which states that mainline valves should not be more than 7.5 miles

Block valve	Designated Use	Existing use	Site Specific Anti-degradation Analysis
			apart. The valve sites were located in such a way that they avoided environmentally sensitive areas (such as wetlands and floodplains), were close to an existing road, and close to power. Land owner preference was also accounted for while locating the block valve sites. Once all of these factors were taken into account, several block valve sites, including Gates Road, were located in special protection or siltation impaired watersheds. Non-discharge alternatives were also considered when determining the type of BMP proposed. Gates Road block valve site utilizes an infiltration berm to manage stormwater. Stormwater runoff is infiltrated to the maximum extent possible. Stormwater runoff is spread out to flow through areas that have been restored to meadow conditions, to an infiltration berm, or to undisturbed area. There will not be an increase in stormwater runoff rate or volume to prevent the physical degradation of the receiving water, such as scour, and stream bank destabilization. Stormwater runoff volume is not increasing throughout post-construction, and any post-construction stormwater discharge is managed so that it will not degrade the physical, chemical or biological characteristics of the receiving stream. Runoff from the site will be managed by a downslope infiltration berm. Ponded runoff will be temporarily stored upslope of the berm until it infiltrates and filters through the soil media. Due to the design of the berm, which maintains a constant elevation through the entire berm length, the stormwater runoff will be released in sheet flow down a stabilized slope, without causing erosion, rather than concentrating the flow. Filtration through the existing vegetation and soil is an efficient way to remove suspended stormwater pollutants such as sediment, as the suspended particles are physically filtered from the stormwater as it flows through the vegetation and percolates into the soil. The extent of the disturbed area will be minimized, and the duration of disturbance will be minimized by stabilizing disturbed areas as soon as practicable. Cut and fill for the project site has been minimized. Where possible based on the criteria listed above, sites were located in areas with shallow slopes to minimize the amount of cut and fill required. There is minimal cut and fill required at the Gates Road block valve site. All of the block valve sites were graded towards the natural slope. No direct discharge to surface water occurs

Block valve	Designated Use	Existing use	Site Specific Anti-degradation Analysis
			at the site. The site will be restored promptly with proper vegetative cover techniques. Antidegradation requirements for the special protection watershed are met because the post-construction stormwater infiltration volume equals or exceeds the pre-construction stormwater infiltration volume, and post-construction stormwater discharge is pretreated via infiltration berms. The runoff is managed so that it will not degrade the physical, chemical, or biological characteristics of the receiving stream.

4.7 STORMWATER RUNOFF ANALYSIS

No additional or new impervious area are proposed for Perry and Juniata Counties with this phase of the application. Additional impervious areas for block valves and access roads were evaluated for Blair, Huntingdon, Cumberland, York, Dauphin, Lebanon, Lancaster and Berks counties. The stormwater runoff analysis for the pump stations at Mt. Union, Doylesburg, Middletown, and Beckersville are prepared under separate cover.

The proposed impervious block valve access roads and gravel pads will remain as permanent facilities after pipeline construction is complete. The PCSM facilities for proposed, impervious block valve sites were designed in accordance with §§102.8(g)(2) and 102.8(g)(3). Where feasible, the PCSM design aimed to achieve the requirements outlined in the applicable Act 167 Plan. See the Block Valve and Pump Station PCSM Design Standard Table following this narrative. Site-specific discussion relating to PCSM design standards is included in the individual write-ups that accompany each set of calculations in Attachment 4.

The stormwater runoff rate and volume were evaluated for the drainage area encompassing the access road and/or valve site that drains to the nearest receiving water. Drainage area figures are provided as Attachment 4. Without BMPs, an increase in stormwater runoff rates and volume occurs in the watersheds as a result of the additional gravel installation for the 2-year 24-hour duration storm. Stormwater management BMPs have been designed to mitigate this difference. Construction details and calculation worksheets are also included in Attachments 3 and 4, respectively, of this report. There is no increase in the stormwater runoff rate for the 24-hour duration, 2-, 10-, 50-, and 100-year storm events as a result of the access road and valve site construction. The decrease in peak rate is calculated through the travel time/time of concentration adjustment taken from the PA Stormwater BMP Manual. The watershed analysis has been separated into detained and undetained areas for the drainage area. The time of concentration under post conditions has been increased for the detained volume stored by the PCSM BMPs. The undetained area time of concentration has not been adjusted for the bypass area. The time of concentration has been adjusted based on the amount of volume detained for each

routed/evaluated storm. The extended travel time is essentially the residence time of the storage elements, found by dividing the total storage by the 2-year, 24-hour storm duration peak flow rate. This increased travel time can be added to the time of concentration of the area to account for the slowing effect of the volume-reducing BMPs. The increased detention time is then evaluated for a detained condition in the model. Stormwater runoff and rate calculations are provided in Attachment 4.

Flow Chart D from the PA Stormwater BMP Manual was used to ensure that water quality requirements are being met. All areas requiring post-construction stormwater management achieve Control Guideline 1 (CG-1) for volume control, which provides water quality control and stream channel protection as well as flood control prevention. At least 90% of the disturbed site area is controlled by a BMP. As a result, TSS and TP requirements are considered met. Worksheet 10 has been utilized to demonstrate use of specific nitrate prevention/reduction BMPs. The PCSM BMPs have been adequately selected, sized, and distributed to preserve the water quality of downstream receiving waters.

Karst Topography

The following sites are believed to be within a 1.5-mile radius of documented sinkholes or depressions (source: http://www.gis.dcnr.state.pa.us/maps/): Juniata Valley, W. Trindle, Arcona, Schaeffer, and Montello.

The following sites are not believed to be within the nearby vicinity of documented sinkholes or depressions but are located on karst terrain (carbonates): Charger, Shade Valley, High Street, and Happy Hills.

At each of the block valve sites located in areas of karst terrain, several principles were employed to reduce the risk of sinkholes while still making every attempt to infiltrate stormwater runoff. The following principles were considered in the designs:

- Minimizing proposed impervious surfaces
- Maximizing the proposed loading ratios, with a goal of achieving a 3:1 loading ratio.
- Spreading stormwater runoff over a large area.
- Avoiding concentrating stormwater runoff.
- Conducting additional post construction inspection and maintenance.

Site-specific details are provided in the PCSM write-up which accompanies each of the block valve sites' stormwater management calculations in Attachment 4. In addition, a Sinkhole Repair Plan is included in Attachment 2 in the event that a sinkhole develops onsite.

Loading Ratios

Access Road/Valve Site	Loading Ratio Analysis
Valley Forge Road	The loading ratio of 8:1 (drainage area:infiltration area) is exceeded at the site. The 5:1 loading ratio (impervious area:infiltration area) has been met at the site. The impervious loading ratio for the site is 4.9:1. The drainage area loading ratio for the site is 20:1. Although the detained drainage area to the PCSM BMP is slightly above the recommended maximum impervious loading ratio, the other design considerations for infiltration BMPs beginning on page 15 in Appendix C of the PA Stormwater BMP Manual have been met (design considerations a, b, c, d, f, g, h, i, and j). Rather than serving as a rigid requirement, the PA Stormwater BMP Manual recommends loading ratios be used as a guideline for designing infiltration BMPs. The risk of exceeding the recommended loading ratios is that the PCSM BMP will not function as intended, or in the worst-case scenario, failure of the stormwater BMP. Failure of the proposed infiltration berm has been defined in the application as the inability to pond upslope of the berm or infiltrate within 72 hours. Based on sound engineering judgment of Robert Simcik, P.E. licensed in the state of PA, and the other design considerations in the PA Stormwater BMP Manual being met, it is not anticipated that the proposed berms will fail as a result of the designed loading ratios. Runoff from the impervious area and upslope contributory drainage area will be dispersed over three infiltration berms. The infiltration berms will be inspected regularly (at least 4 times per year) to ensure that they are not clogging with sediment, dewatering too slowly, or being washed out by large rain events from the contributory drainage area. In the event that an inspection shows evidence that the berms are not functioning properly, one of the ways to remedy the problem would be to construct upslope diversion. A permit modification would need to be filed prior to constructing upslope diversion.
Charger Highway	The loading ratio guidelines do not apply because the design does not propose an infiltration BMP.
Locke Mountain Road	The loading ratio guidelines do not apply because the design does not propose an infiltration BMP.
High Street	The loading ratio of 8:1 (drainage area:infiltration area) is exceeded at the site. The 5:1 loading ratio (impervious area:infiltration area) has been met at the site. In addition, the impervious loading ratio was further reduced, with a goal of achieving no greater than 3:1 because the site is located in an area of karst terrain. The impervious loading ratio for the site is 1.7:1. The drainage area loading ratio for the site is 15.3:1. Although the detained drainage area to the PCSM BMP is slightly above the recommended maximum impervious loading ratio, the other design considerations for infiltration BMPs beginning on page

	15 in Appendix C of the PA Stormwater BMP Manual have been met (design considerations a, b, c, d, f, g, h, I, and j). Rather than serving as a rigid requirement, the PA Stormwater BMP Manual recommends loading ratios be used as a guideline for designing infiltration BMPs. The risk of exceeding the recommended loading ratios is that the PCSM BMP will not function as intended, or in the worst-case scenario, failure of the stormwater BMP. Failure of the proposed infiltration berm has been defined in the application as the inability to pond upslope of the berm or infiltrate within 72 hours. Based on sound engineering judgment of Robert Simcik, P.E. licensed in the state of PA, and the other design considerations in the PA Stormwater BMP Manual being met, it is not anticipated that the proposed berm will fail as a result of the designed loading ratios. A large portion of upslope runoff to the proposed infiltration berm has been diverted with a diversion berm. The infiltration berm will be inspected regularly (at least 4 times per year) to ensure that it is not clogging with sediment, dewatering too slowly, or being washed out by large rain events from the contributory drainage area. In the event that an inspection shows evidence that the berm is not functioning properly, one of the ways to remedy the problem would be to expand the upslope diversion and further stabilize the area where the diversion berm outlets. A permit modification would need to be filed prior to expanding the upslope diversion.
Shade Valley Road	The maximum impervious loading ratio of 5:1 has been met. In addition, the impervious loading ratio was further reduced, with a goal of achieving no greater than 3:1 because the site is located in an area of karst terrain. The impervious loading ratio for Drainage Area 1 is 1.9:1. The impervious loading ratio for Drainage Area 2 is 1.2:1. The maximum Drainage Area loading ratio of 8:1 has been met in both drainage areas. The drainage area loading ratio for Drainage Area 1 is 5.7:1, and the drainage area loading ratio for Drainage Area 2 is 7.9:1.
Creek Road	The loading ratio guidelines do not apply because the design does not propose an infiltration BMP.
Gates Road	The maximum impervious loading ratio of 5:1 has been met. The impervious loading ratio for the site is 0.7:1. The maximum drainage area loading ratio of 8:1 has also been met. The drainage area loading ratio for the site is 3.2:1.

Below is a summary table of the stormwater volume and rate increase associated with the drainage areas at the permanent access roads and valve sites. Recommended infiltration rates were determined based on site evaluation, infiltration test rates from onsite testing, and the proximity and depth of the test locations compared to the proposed BMP. Recommended infiltration rates are provided in Attachment 5 of this report.

Access Road/Valve Site	County	Pre-Development Runoff Volume (acre-feet)	Post-Development Runoff Volume (acre-feet) w/o BMPs	Post-Development Runoff Volume (acre-feet) with BMPs	PCSM BMP Selected
Valley Forge Road	Blair	0.009	0.023	0.006	Infiltration Berm
Charger Highway Drainage Area 1	Blair	0.037	0.051	0.032	Slow Release Trench
Charger Highway Drainage Area 2	Blair	0.005	0.006	0.003	Slow Release Trench
Locke Mountain Road	Blair	0.048	0.060	0.043	Slow Release Trench
High Street	Blair	0.017	0.031	0.004	Infiltration Berm
Shade Valley Road Drainage Area 1	Huntingdon	0.036	0.051	0.033	Infiltration Berm
Shade Valley Road Drainage Area 2	Huntingdon	0.076	0.097	0.060	Infiltration Berm
Creek Road	Cumberland	0.064	0.078	0.050	Slow Release Trench
Gates Road	Dauphin	0.020	0.034	0.015	Infiltration Berm

Access Road/Valve Site	Pre-Dev. Rate, 2-year (cfs)	Post-Dev. Rate, 2-year (cfs)	Pre-Dev. Rate, 10-year (cfs)	Post-Dev. Rate, 10-year (cfs)	Pre-Dev. Rate, 50-year (cfs)	Post-Dev. Rate, 50-year (cfs)	Pre-Dev. Rate, 100-year (cfs)	Post-Dev. Rate, 100-year (cfs)
Valley Forge Road	0.276	0.21444	2.141	1.827	5.441	5.173	7.280	7.224
Charger Highway Drainage Area 1	1.348	1.151	3.025	2.823	5.326	5.263	6.505	6.368
Charger Highway Drainage Area 2	0.126	0.107	0.302	0.274	0.547	0.525	0.672	0.591
Locke Mountain Road	1.688	1.573	3.430	3.357	5.756	5.666	6.933	6.797
High Street	0.223	0.135	1.984	1.292	5.319	4.156	7.172	5.924
Shade Valley Road Drainage Area 1	1.210	0.977	3.035	2.569	5.782	4.955	7.344	6.434
Shade Valley Road Drainage Area 2	2.266	2.140	5.933	5.264	11.50	10.320	14.68	13.550
Creek Road	2.510	2.280	5.196	4.953	9.506	9.308	12.05	11.69
Gates Road	0.471	0.358	2.571	1.973	6.376	5.370	8.660	7.514

Note: Post development rate is detained runoff. Calculations for pre, post, and detained runoff are provided in Attachment 4.

5.0 REFERENCES

Erosion and Sediment Pollution Control Program Manual, Commonwealth of Pennsylvania, Department of Environmental Protection, Office of Water Management, March 2012.

Stormwater Management for Construction Activities - Developing Pollution Prevention Plans and Best Management Practices, United States Environmental Protection Agency, Office of Water, 1993.

Pennsylvania Stormwater Best Management Practices Manual, Pennsylvania Department of Environmental Protection, Bureau of Watershed Management, December, 2006.

Cresson, Hollidaysburg, Frankstown, and Williamsburg Quadrangles, Pennsylvania – Blair County, Geological Survey, United States Department of Interior.

Soil Survey of Blair County, Pennsylvania, United States Department of Agriculture, Soil Conservation Service.

Cassville, Entriken, Huntingdon, Williamsburg, Butler Knob, Mount Union, Aughwick, and Blairs Mills Quadrangles, Pennsylvania – Huntingdon County, Geological Survey, United States Department of Interior.

Soil Survey of Huntingdon County, Pennsylvania, United States Department of Agriculture, Soil Conservation Service.

Blain and Blairs Mills Quadrangles, Pennsylvania – Juniata County, Geological Survey, United States Department of Interior.

Soil Survey of Juniata County, Pennsylvania, United States Department of Agriculture, Soil Conservation Service.

Blain, Blairs Mills, Andersonburg, and Newville Quadrangles, Pennsylvania – Perry County, Geological Survey, United States Department of Interior.

Soil Survey of Perry County, Pennsylvania, United States Department of Agriculture, Soil Conservation Service.

Andersonburg, Newville, Landisburg, Plainfield, Carlisle, Shermans Dale, Mechanicsburg, Wetzville, and Lemoyne Quadrangles, Pennsylvania – Cumberland County, Geological Survey, United States Department of Interior.

Soil Survey of Cumberland County, Pennsylvania, United States Department of Agriculture, Soil Conservation Service.

Lemoyne Quadrangle, Pennsylvania – York County, Geological Survey, United States Department of Interior.

Soil Survey of York County, Pennsylvania, United States Department of Agriculture, Soil Conservation Service.

Lemoyne, Steelton, and Middletown Quadrangles, Pennsylvania – Dauphin County, Geological Survey, United States Department of Interior.

Soil Survey of Dauphin County, Pennsylvania, United States Department of Agriculture, Soil Conservation Service.

Elizabethtown, Lebanon, Manheim, Palmyra, Richland, and Womelsdorf Quadrangles, Pennsylvania – Lebanon County, Geological Survey, United States Department of Interior.

Soil Survey of Lebanon County, Pennsylvania, United States Department of Agriculture, Soil Conservation Service.

Ephrata, Sinking Spring, Terre Hill, and Womelsdorf Quadrangles, Pennsylvania – Lancaster County, Geological Survey, United States Department of Interior.

Soil Survey of Lancaster County, Pennsylvania, United States Department of Agriculture, Soil Conservation Service.

Reading, Sinking Spring, Morgantown, Terre Hill, Elverson, Downingtown, Pottstown, and Washington Quadrangles, Pennsylvania – Berks County, Geological Survey, United States Department of Interior.

Soil Survey of Berks County, Pennsylvania, United States Department of Agriculture, Soil Conservation Service.

Beaverdam Branch Watershed Act 167 Stormwater Management Plan, Perry County Subdivision and Land Development Ordinance with Stormwater Requirements, Cumberland County Stormwater Management Plan, York County Integrated Water Resource Plan, Dauphin county Phase 1 and 2 Watershed Act 167 Stormwater Management Plan, Lebanon County Comprehensive Plan, Tulpehocken Creek Act 167 Stormwater Management Plan, Cocalico Creek Act 167 Stormwater Management Plan, Lancaster County Integrated Water Resources Plan, Schuykill River Watershed Act 167 Plan, Conestoga River Watershed Act 167 Plan, and Cocalico Creek Watershed Act 167 Plan.

DCNR, 2016. *Invasive Plants in Pennsylvania, Crown Vetch,* Coronilla varia. Accessed October 25, 2016. http://www.dcnr.state.pa.us/cs/groups/public/documents/document/dcnr_010284.pdf.